

# SUMMARY REPORT OF WASTE TO LANDFILL

PERTH METROPOLITAN REGION  
WESTERN AUSTRALIA  
(1 July 1998 – 30 June 2002)

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**FEBRUARY 2003**



## NOTE

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## 1.0 Introduction

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In this report an analysis of data from Department of Environmental Protection's 'Solid Waste Database' has been carried out in order to provide a general guide on total quantity and categorisation of waste landfilled at the Perth Metropolitan Region as well as a quantitative assessment of where part of the Western Australian community stands in relation to the national target of halving waste (per capita) to landfill.

Efficient waste management encompasses waste disposal, waste minimisation and recycling but also collection, collation and appropriate management of data. The collection of data from Perth metropolitan landfill sites is gradually improving. A previous report on waste to landfill in Perth was released by Department of Environmental Protection in November 1998. The 1998 report gave a summary of waste disposed of to putrescible landfill sites in 1995, 1996, and 1997. Since data collection from 13 inert landfill sites in the metropolitan area commenced only in January 1998, inert waste was not included in the previous report. Without information from inert-waste sites pre-1998, the DEP data must be assumed to represent an underestimate of metropolitan landfilled wastes.

In this report, data for period July 1998 to Jun 2002 were analysed. For this period information on inert waste from DEP solid waste database is now available. The financial year is used as a base time period in order to make an easier comparison with other economic indicators which are usually expressed using financial year.

While relevant waste disposal information is not as complete or as comprehensive as would be desirable, the available data indicate that Western Australia was unable to achieve a 50% reduction in waste to landfill by 2000. In the Perth Metropolitan Region, waste to putrescible landfill decreased from 1.06 tonnes per capita in 1991 to 0.93 per capita in 2000. However, if inert wastes are included in landfill estimates, the total waste per capita in 1991 increased from 1.6 tonnes<sup>1</sup> to 2.0 tonnes per capita in 2000, an increase of 25%.

<sup>1</sup> Department of Environmental Protection, Summary Report of Waste to Putrescible Landfill Perth Metropolitan Region Western Australia (1995-1997), November 1998

## 2.0 State Waste Management and Recycling Target

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In 1991, a national target was set to halve waste (per capita) to landfill by 2000 under the Australian and New Zealand Environment and Conservation Council's (ANZECC) Waste Minimisation and Recycling Strategy based on per capita amounts of waste sent to landfill in 1990.

At a State level the 50% reduction was adopted in principle; however, uncertainty about 1991 baseline estimates led the DEP to adopt a secondary target of a 5% reduction in waste (per capita) to landfill per annum (i.e. 25% reduction by 1995 and 50% reduction by 2000) (Department of Environmental Protection 1998). These targets were still current in 2000 but proved to be unattainable.

To measure achievement of the State and national goal of halving waste (per capita) to landfill by the year 2000, it was necessary to establish the levels of waste disposal at our metropolitan landfills. The waste reduction target was set in 1992, based on the amount of waste landfilled during 1991, although reliable data was not available at that time. The '*State Recycling Blueprint*', *Department of Commerce and Trade and Western Australian Municipal Association, June 1993*, stated: "A number of estimates have been made of solid waste landfilled in Perth. The estimates have failed to reach a consistent conclusion because of the lack of a systematic approach to categorising and quantifying solid waste at tip sites."

The Blueprint's figure of 1.6 million tonnes was adjusted to 1.9 million tonnes of solid waste landfilled in the metropolitan region to account for an underestimate in building and demolition refuse (*Construction and Demolition Waste Processing Siting Study, Sinclair Knight Merz and Arthur Andersen, July 1994*) and for underestimates in visually estimated waste disposed of at landfill sites. For the population of 1,188,7623 in the Perth Metropolitan Region, the best estimate of the baseline quantity of waste landfilled during 1991 is 1.6 tonnes per person per year. This means that the target for 2000 was set at 0.8 tonnes per person per year.

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### Baseline Calculation for Waste to Landfill (both putrescible and inert) 1991, Perth Metropolitan Region

Options	1991 (tonnes)	Population 1991 <sup>3</sup>	Tonnes/Capita	Target Tonnes/Capita (Year 2000)
Blue Print <sup>1</sup>	1,600,000	1,188,762	1.4	0.7
Adjusted Blueprint figure <sup>2</sup>	1,866,088	1,188,762	1.6	0.8

**Table 1** Source: *Department of Environmental Protection Summary Report of Waste to Putrescible Landfill November 1998*

**Note**<sup>1</sup> Total tonnes to landfill taken from the 'State Recycling Blueprint 1993'.

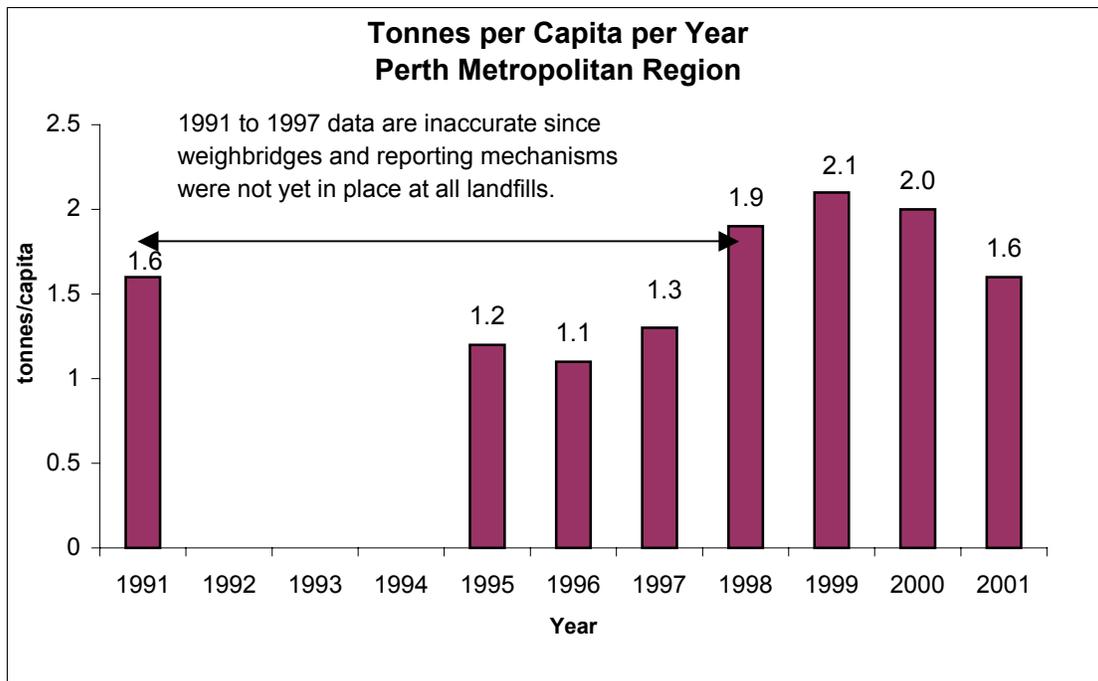
**Note**<sup>2</sup> Assuming that the weight of building and demolition waste landfilled was 610,700 tonnes (Sinclair Knight Merz 1994), 40 per cent of the 1991 estimate was from landfill without weighbridges, and increasing this contribution by 33 per cent, the adjusted total is 1.9 million tonnes.

**Note**<sup>3</sup> Source: ABS Population by Age and Sex (3235.5)

The quantity of waste to be disposed of at all metropolitan landfill sites in 1991 was estimated to be 1.6 tonnes per capita. If national target of halving waste to landfill is achieved there should only have been 0.8 tonnes of waste per capita going to landfill in 2000. In 2000 2.7 million tonnes of waste were disposed of at licensed landfill sites in the metropolitan area. This equates to 2.0 tonnes per capita which is a 25% increase on the 1991 figure.

Clearly the national target of halving waste to landfill in the Perth Metropolitan Region was not achieved. Serious reconsideration of waste minimisation and reduction strategies is required if the waste reduction target considers all waste disposed to landfill.

**Figure 1 : Waste to Landfill – Tonnes per Capita per Year Perth Metropolitan Region**



## 3.0 The DEP Solid Waste Database

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### 3.1 National Waste Classification System

The National Waste Classification (NWCS) System was developed in 1995 as a part of the National Waste Database, a project in the Waste Minimisation program of the CRC for Waste Management & Pollution Control Ltd, which has been established and supported under the Australian Government's Cooperative Research Centres Program. The project is funded by the Commonwealth EPA and CRC for Waste Management & Pollution Control Ltd. The NWCS was developed by a Technical Review Group composed of representatives from Environment and Waste Authorities in each State and Commonwealth.

A basic objective of this system is to enable unique identification of a waste stream and the composition of material types in that waste stream, so that comparable data may be collected from different regions.

Waste is categorised according to NWCS at the point of disposal. Initially the disposal method is recorded and the waste is then categorised by the three primary waste streams<sup>1</sup>: municipal waste, commercial and industrial waste, and, building and demolition waste. Waste is categorised further into waste sub-streams and then into material composition<sup>2</sup>. Tonnages are recorded against each category. Refer to Appendix A for a detailed description of the National Waste Classification System.

### 3.2 Method of Collection

The reporting of the waste data is a condition of licence for all landfill sites in the Perth Metropolitan Region. Landfill operators are required to quantify and categorise waste prior to disposal according to the National Waste Classification System. If any waste is generated in the metropolitan area and disposed of at country landfill site, reports on waste tonnage and classification are also required from that landfill site. One landfill at Australind, in the South West Region, receives metropolitan inert waste. In the cases where landfills receive waste from transfer stations, it is not possible to segregate and estimate tonnage for particular waste streams. This is the reason why some transfer stations also provide data on waste tonnage and classification.

<sup>1</sup> **Waste Stream** : The total weight of wastes arising from a particular source (either a principal or secondary source) in a particular region in a given time.

<sup>2</sup> **Material Composition** : The component material types, by % or weight, in a waste stream.

The figures in the database are in monthly tonnages and they are reported on a quarterly basis. Major putrescible sites provide their data by electronic transfer. The data is then downloaded into DEP solid waste database. Inert sites provide their data on hardcopy reports. Currently there are 7 putrescible landfill sites in the Perth Metropolitan Region. Five of them provide their data electronically. The 13 inert landfill sites provide hard copy reports.

### 3.3 What information is collected

The data are held in a Microsoft Access database that consists of a hierarchy of data fields ranging from urban solid waste streams to individual components of waste and to disposal routes. For detail description of data required by National Waste Classification System refer to Appendix A.

The information which is available from DEP solid waste database includes:

- Quantity of materials disposed of or processed at Perth's metropolitan licensed landfill sites by waste stream and whether the source segregation has been undertaken, by material type;
- Quantity of green waste composted or mulched at Perth metropolitan landfills;
- Quantity of other material recycled at Perth metropolitan inert landfills.

Data in the DEP's Solid Waste database are collected primarily to assist in:

- auditing landfill levy for waste disposed of at metropolitan landfill sites;
- to assess progress towards waste reduction targets; and
- to report to National Solid Waste Database.

Green waste which is mulched and material which is recycled and then removed from landfill site are exempted from the landfill levy.

## 4.0 Data Limitations

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### 4.1 Limited spatial coverage

A state-wide assessment of waste reduction is not possible due to limited data, especially from country areas. The DEP Solid Waste Database only accounts for waste landfilled in the metropolitan area. Country landfill sites are licensed and licensing may eventually require tip operators to report tonnages or volumes to the DEP in NWCS, thus improving understanding about country waste management practices. There is wide spatial coverage of waste disposal and recycling data for the metropolitan area, however, information is sparse in country areas north, south and east of Perth.

### 4.2 Temporal coverage

Some data in the DEP's Solid Waste Database date back to 1993. This data may have limited value for comparison with current data because of differences in observation based and computerised data collection methods and some considerable gaps in the time series. In the period from 1995 till 1997 the data set is more complete, although because visual estimates of tonnage were carried out, data may be unreliable. Since January 1998, waste disposal data from licensed putrescible and inert landfill sites in the metropolitan area have been reported to the DEP using NWCS format. The last four years of data collected in the State may be considered a solid basis from which to measure future performance.

### 4.3 Estimated Data

Due to information being unavailable for some landfill sites, in relation to some periods, it has been necessary to include estimated data in the report.

Because some data is estimated, it is possible that there will be changes in the existing data, due to corrections of the estimates and errors in the data reporting mechanism. Data in the DEP Solid Waste Database is subject to continuous updating. Information presented in this report represents the best information available at the time.

### 4.4 Waste Stream Classification

Although the NWCS provides for the breakdown per material composition of individual wastes disposed of at landfill sites, loads of waste delivered to these landfill sites are often made up of a range of materials. It is often difficult or impossible for a gate person to segregate and estimate tonnage for the major components of the waste. Such loads are usually registered as "mixed waste". Load mixing may influence disposal estimates for entire waste streams. This

occurs when different waste streams are collected together in one vehicle, eg. in some cases commercial and industrial waste has been included in the municipal waste stream and vice-versa.

#### 4.5 Reliability of Data

Overall, data collected from weighbridge measurements are considerably more reliable than the visual estimations of waste which was carried out prior to weighbridge use. Although all putrescible landfill sites and some inert sites in the metropolitan area now operate weighbridges (*Table 2*), sometimes it is not practical to weigh all loads. In these cases, at putrescible landfill sites a conversion factor is used. It is assumed that all car, trailer and utility loads of waste are 0.3 tonnes and of a standard volume (refer to Appendix A – Measurement/Transport Mode). For inert landfills without weighbridges, the quantity of waste is measured in cubic metres and converted to tonnes using a ratio of 1.3 tonnes per cubic metre. This conversion factor is set out in the Regulations, but a recent landfill density test carried out on one landfill indicates that this figure may be higher than the real density achieved.

<b>LANDFILL SITES WITH WEIGHBRIDGE</b>	
<b>Inert landfill sites</b>	<b>Putrescible landfill sites</b>
1. Atlas Group (Mirrabooka)	1. Hopkinson Road (City of Armadale)
2. Badgerup Road (City of Wanneroo)	2. Ranford Road (City of Canning)
3. Quinns Quarry (RCG Pty Ltd)	3. Henderson Road (City of Cockburn)
4. Thomas Road (Waste Stream Management)	4. Millar Road (City of Rockingham)
	5. Red Hill (EMRC)
	6. Tamala Park (MRC)
	7. West Australian Landfill Services (Cardup)

**Table 2.** Landfill Sites with weighbridges, Perth Metropolitan Region, April 2001

## 4.6 Green Waste

Prior to the introduction of landfill levy, some green waste diverted from landfill was included in the total tonnes of waste to landfill. This was because of different recording methods used at some landfill sites. The majority of green waste is delivered to disposal sites in trailers. Where sites did not record the material composition of the waste contained in the trailers, an assumption was made that the material was of 'mixed composition'.

Since greenwaste is exempted from landfill levy payment, the implementation of the landfill levy in July 1998 provided an incentive for better record keeping and increase in greenwaste diversion. It has to be noted that any weight or volume based measure of effectiveness in diversion of greenwaste by recycling will be affected by the reduction in weight and volume that is a result of the composting or mulching process.

## 5.0 Sites included into the Summary Report

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The information in this report relates to waste landfilled at the putrescible and inert landfill sites in the Perth Metropolitan Region in the period from July 1998 until July 2002.

- Putrescible landfilled sites and transfer station included in this summary are as follows:

Balcatta Transfer Station (City of Stirling)

Brockway Road Transfer Station (Western Metropolitan Regional Council)

Dawson Avenue (Kalamunda) – Closed 17 October 1997.

Henderson Road (City of Cockburn)

Hopkinson Road (City of Armadale)

Kelvin Road (City of Gosnells) – Closed December 1999.

Mandurah Transfer Station (City of Mandurah)

Millar Road (City of Rockingham)

Ranford Road (City of Canning)

Red Hill (Eastern Metropolitan Regional Council)

Shale Road, Cardup (Waste Australian Landfill Services)

Tamala Park (Mindarie Regional Council)

- Inert landfill sites included in this summary are as follows:

Mathieson Road (Shire of Mundaring)

Mortimer Road (AAA Bulk Haulage)

Driver Road (Non Organic Disposals)

Quinns Road ( RCG Pty Ltd)

Lefroy Road (City of Fremantle)

Cnr Moran St & Lefroy Rd, Beaconsfield (Moltoni Corp. Pty Ltd, closed June 2002)

Flyn Drive (Eclipse Resources Pty Ltd)

Wanneroo Road (Eclipse Resources Pty Ltd)

Abercrombie Road (Eclipse Resources Pty Ltd)

Thomas Road (Waste Stream Management Pty Ltd)

T J Depiazzi and Son (closed March 1998)

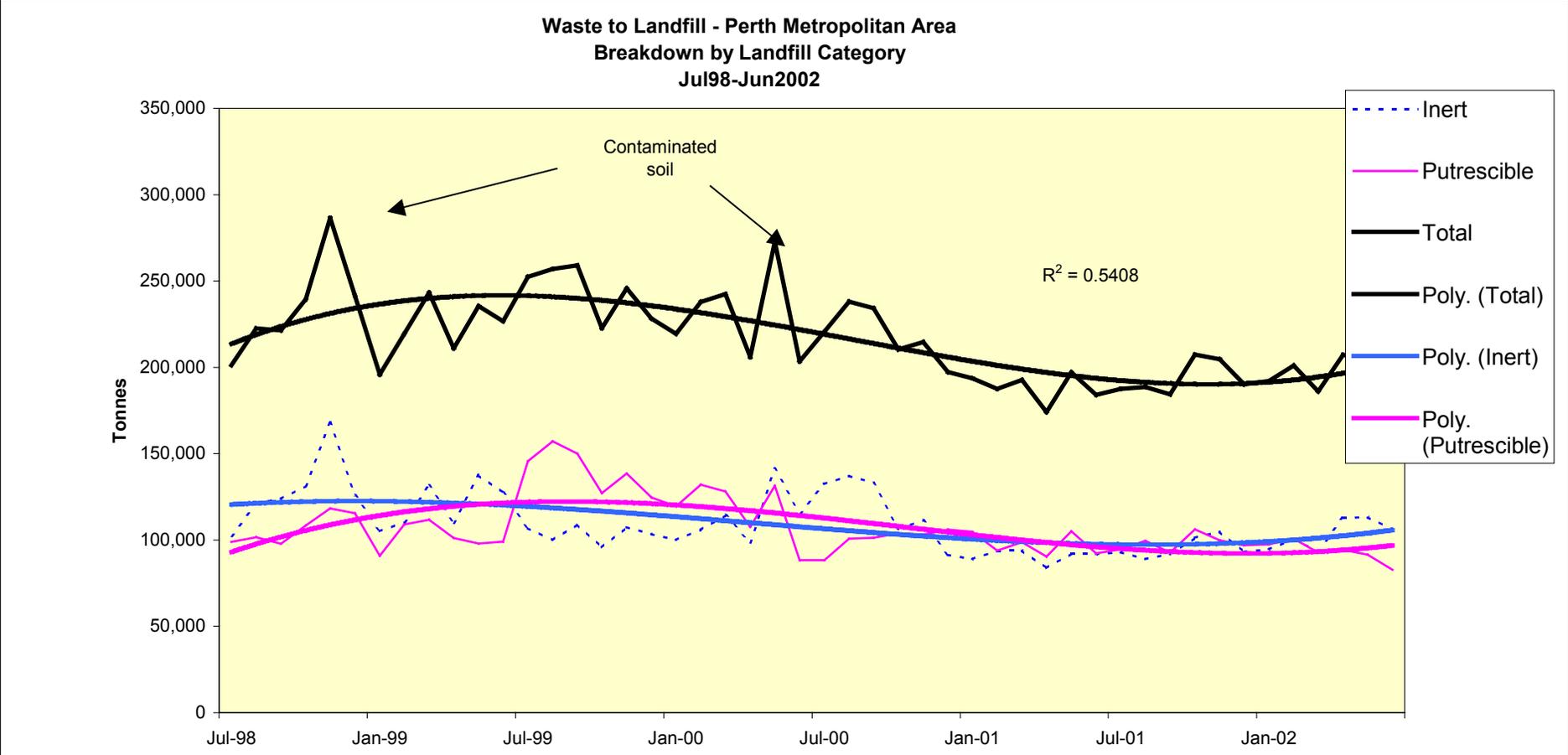
Badgerup Road (City of Wanneroo)

Alexander Drive (Atlas Group Pty Ltd)

Barrett Street (McDowall Affleck, closed December 2001)

Bird Road (McLean Recycling Pty Ltd, closed June 2002)

Australind Sand Supplies (JW Cross & Sons)



**Figure 2:** Trend lines: Waste to Landfill, Breakdown by Landfill Category July 1998 – June 2001

## 6.0 Summary Data Perth Metropolitan Region

### 01 July 1998 - 30 Jun 2002

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#### 6.1 Total tonnes to landfill

While the trend line over five years period show a decrease in the waste to landfill in Perth Metropolitan Region (*Figure 2*), the national and state target to halve waste to landfill by the year 2000 has not been achieved. Total waste to landfill in the Perth Metropolitan Region has increased from 1.9 million tonnes in 1991 to 2.7 million tonnes in 2000, an increase of 42%. However, there were doubts about the veracity of some of the earlier data.

The trend line over a four years period from July 1998 to July 2002 shows a steady decrease in the total waste to landfill. The highest point is in November 1998 when a significant quantity of inert waste, including 20,000 tonnes of contaminated soil was landfilled at Thomas Road landfill operated by Waste Stream Management Pty Ltd. In may 2000 Red Hill landfill site accepted around 30,000 tonnes of contaminated soil from the Omex contaminated site remediation project.

Upon introduction of concrete recycling in April 2000, the amount of inert waste disposed of at Thomas Road landfill site has decreased by 30% to 40%. The decreasing trend in waste to WasteStream Management's landfill continued until January 2002 when it started to rise again. As the level of recycling at this landfill shows steady increase, the main factors which caused the increase in total waste to landfill, appears to be the increasing economic activity in the surrounding area, more competitive prices of disposal than at other inert landfills in Perth metropolitan area and the closure of McLean Recycling's landfill. Recycling of concrete at Thomas Road landfill, though increasing, is not at the rate which Waste Stream Management expected. The factors which may impact on the level of concrete recycling are: limited market demand, low landfill levy charges on inert waste (\$1 per tonne) and the number of inert landfills without weighbridges. As the disposal price at the landfills without weighbridge is determined by volume, customers with heavy loads are likely to choose to go to these landfills.

Because of the uncertainty of the base line figure, DEP adopted as a secondary target a 5 per cent reduction in waste per capita to landfill each year (ie equivalent to 50 percent reduction over 10 years). The figures for 2001/02 show a dramatic downturn in the waste disposed to Perth metropolitan landfills (Table 3).

Year	Waste to landfill (tonnes per capita)			Annual change per capita (%)		
	Putrescible	Inert	Combined	Putrescible	Inert	Combined
97/98	0.85	0.81*	n.a.	n.a.	n.a.	n.a.
98/99	0.92	1.10	2.02	8.2	n.a.	n.a.
99/00	0.95	1.16	2.11	3.3	5.5	4.5
00/01	0.85	0.90	1.75	-10.5	-22.4	-17.1
00/02	0.82	0.85	1.67	-3.5	-5.6	-4.6
<b>TARGET</b>				<b>-5%</b>	<b>-5%</b>	<b>-5%</b>

**Table 3** Waste to Landfill, Annual Change per Capita

\* 0.81 6 months data only

Data collection from inert landfill sites in the Australian Waste Classification system format commenced in January 1998.

The dramatic downturn in waste disposed to inert landfill appears to be directly associated with the downturn in construction.

The downturn in waste disposed to putrescible landfill does not appear to be due to an increase in recycling or other waste diversion, or any irregularity in reporting:

1. The data submitted for municipal recycling rebate claims indicates that the levels of kerbside recycling and greenwaste processing by local governments are not significantly greater than in previous periods; and
2. There is a consistency in waste reduction across the landfills monitored for the Landfill Levy.

Therefore, this would suggest that the reduction in waste disposal to putrescible landfill is more likely to be linked to the effects on consumption of an economic downturn in this period, rather than any significant change in recycling or waste generating behaviour in the community.

The total tonnage of waste disposed of to putrescible landfill sites was greater than total tonnage of waste disposed of to inert landfills only in 1997/1998. This is likely to be a consequence of less rigorous reporting requirements at that time. By the end of 1998 reporting was consistent for all landfills. As data collection from inert landfill sites gradually improved, in the next three financial years the amount of inert waste become greater than waste landfilled to Perth putrescible landfill sites (*Table 1*).

The following factors could also have impacted on the slower increase rate in waste disposed to putrescible landfills in Perth Metropolitan Region:

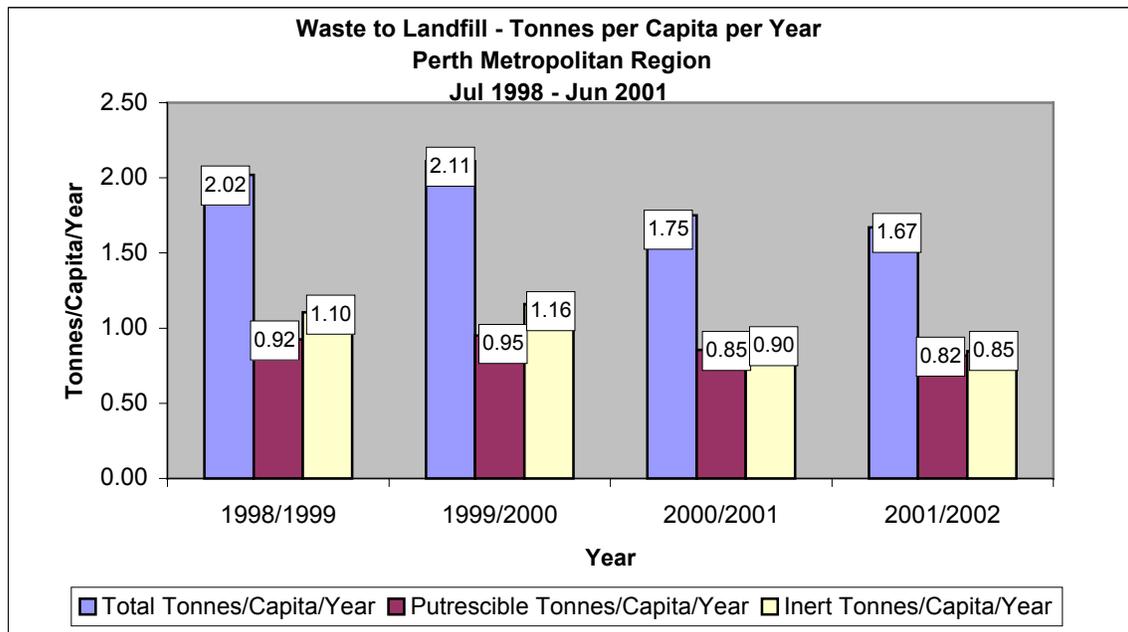
- diversion of greenwaste to composting facilities;
- reduction in green waste at source (e.g. home composting); and
- Increased recycling.

Financial Year	Waste to landfill		
	Putrescible	Inert	Combined
<b>Jul97/Jun98 tonnes</b>	1,132,751	1,071,374	2,204,125
Population 1	1,328,849	1,328,849	
Waste per Capita	<b>0.85</b>	<b>0.81</b>	
<b>Jul98/Jun99 tonnes</b>	1,249,811	1,494,039	2,743,850
Population	1,352,281	1,352,281	
Waste per Capita	<b>0.92</b>	<b>1.10</b>	
<b>Jul99/Jun00 tonnes</b>	1,297,311	1,595,717	2,893,028
Population	1,371,060	1,371,060	
Waste per Capita	<b>0.95</b>	<b>1.16</b>	
<b>Jul00/Jun01 tonnes</b>	1,188,334	1,255,715	2,444,049
Population	1,391,040	1,391,040	
Waste per Capita	<b>0.85</b>	<b>0.90</b>	
<b>Jul01/Jun02 tonnes</b>	1,149,318	1,193,198	2,342,515
Population	1,407,143	1,407,143	
Waste per Capita	<b>0.82</b>	<b>0.85</b>	

**Table 4** Total waste to Landfill

1/Incomplete data for inert landfills

2/ABS estimates of resident populations for major population centres at 30 June extrapolated to December

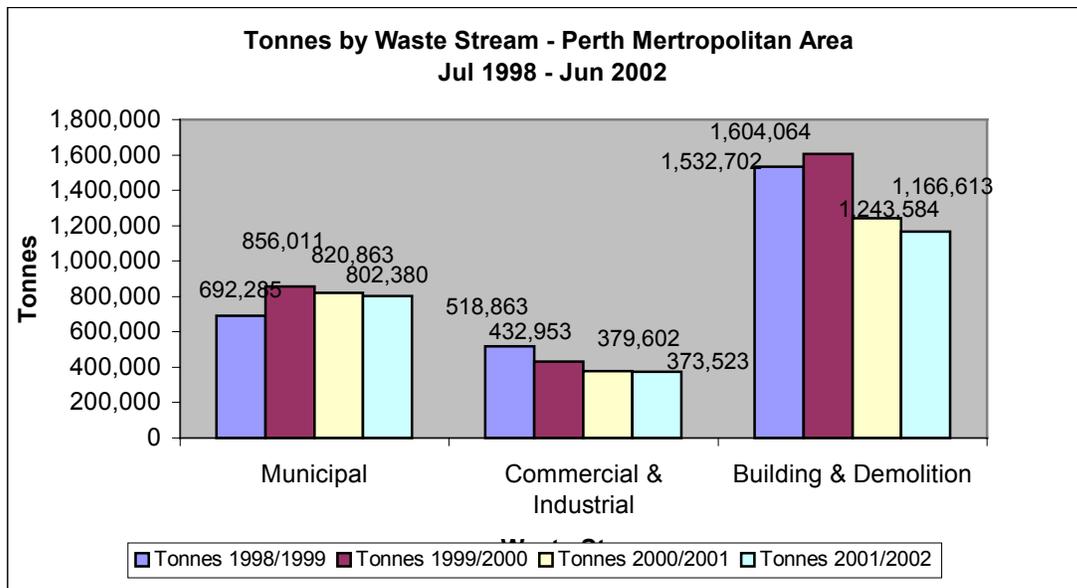


**Figure 3**

## 6.2 Waste Streams to Landfill – Perth Metropolitan Region

### 6.2.1 Total tonnage

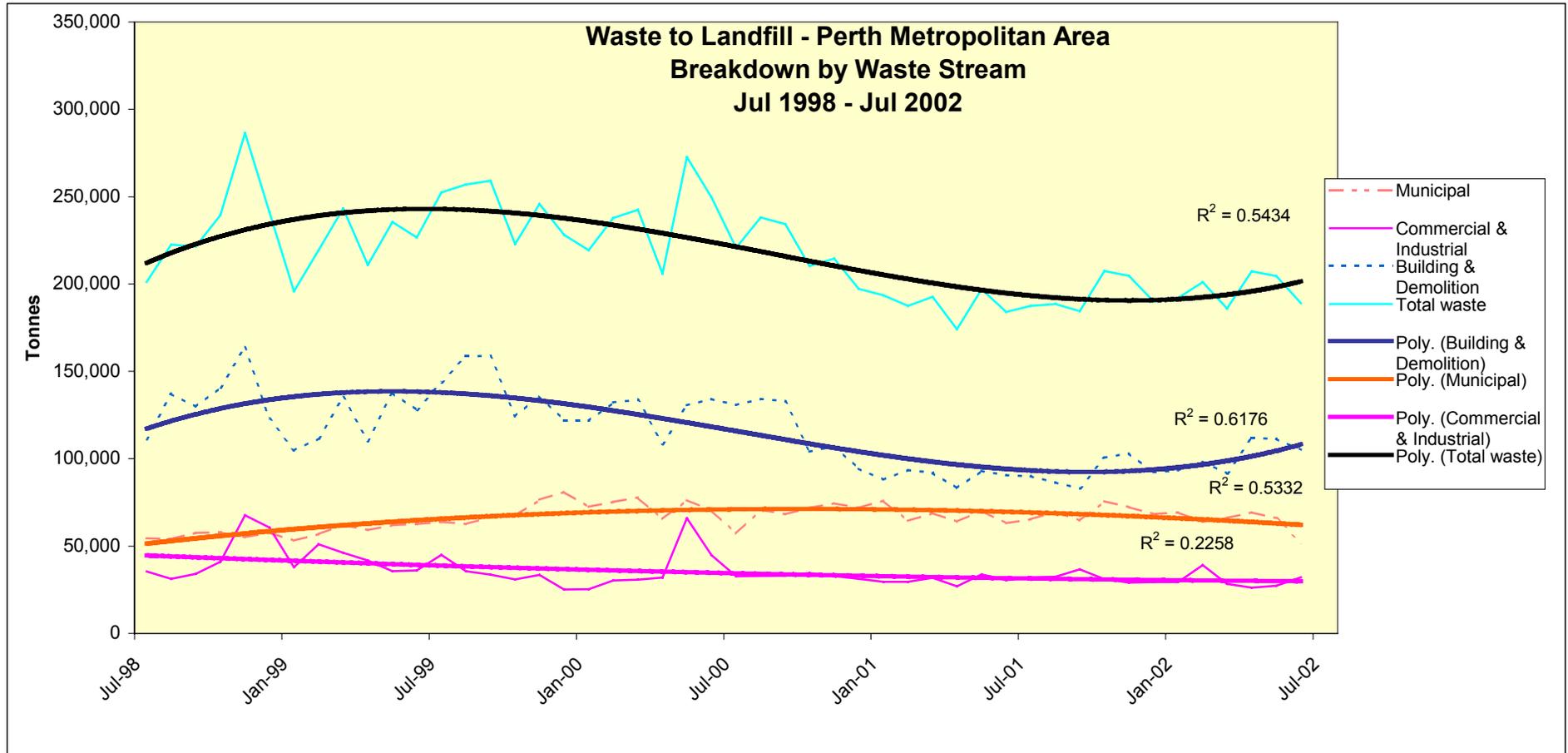
The annual tonnage of commercial and industrial waste disposed of at metropolitan landfill sites reached its peak in 1998/99. After this year commercial and industrial waste shows a decreasing trend. The tonnage of building and demolition waste increased between 1998/99 and 1999/00. The collection of waste data from inert landfills commenced in January 1998 and since then gradually improved. It is possible that in this period a greater proportion of building and demolition waste has been recorded. The data on total tonnage of municipal waste also shows an increase between 1998/99 and 1999/2000. The year 1999/00 records the highest quantity of waste – 2.9 million tonnes. After this year data on all three waste streams shows a decreasing trend.

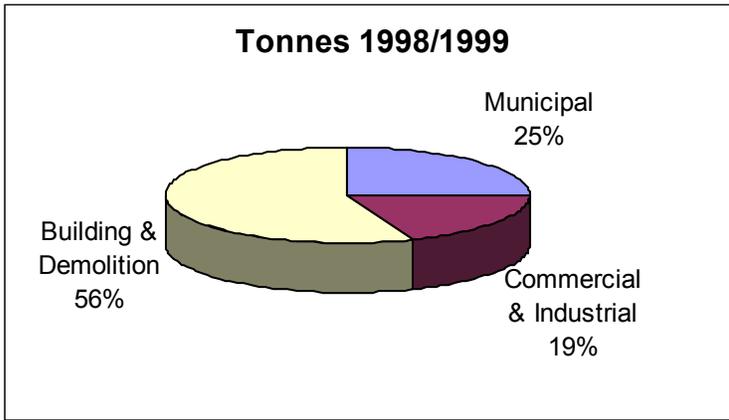


**Figure 4**

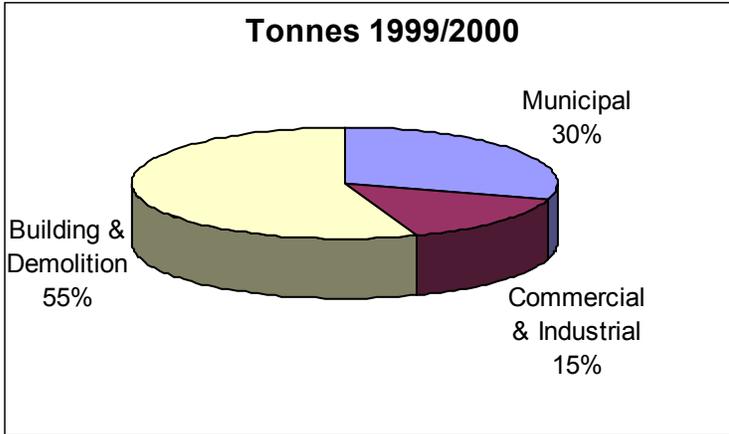
However, if the monthly series of data is considered, the whole picture is a slightly different. In trend terms the total waste to landfill declined between September 1999 and July 2001. In the year 2001/02, data on the total waste again shows an increasing trend. Since the building and demolition waste stream contributes 50% of the total waste, the trend line for total waste tends to follow the trend in the building and demolition waste. While trend lines for building and demolition and commercial and industrial waste streams show a declining trend, municipal waste reached its maximum in 1999/2000 and then remained at that level till June 2002. The slight drop in municipal waste and increase in commercial and industrial waste in the quarter ending in June 2002 reflects the change in the waste structure at Cardup landfill, where 80% of waste accepted at this landfill at this time was commercial and industrial waste and just 20% was municipal. This ratio is an estimate since it is not possible to determine the exact quantity of the individual waste streams delivered to the Cardup landfill site from Welshpool transfer station in the mixed loads.

Figure 5 – Waste to landfill – Breakdown by Waste Stream by Waste Stream trend lines

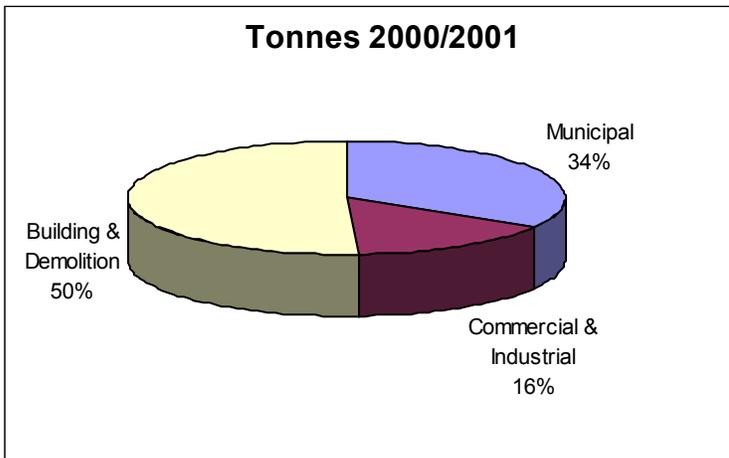




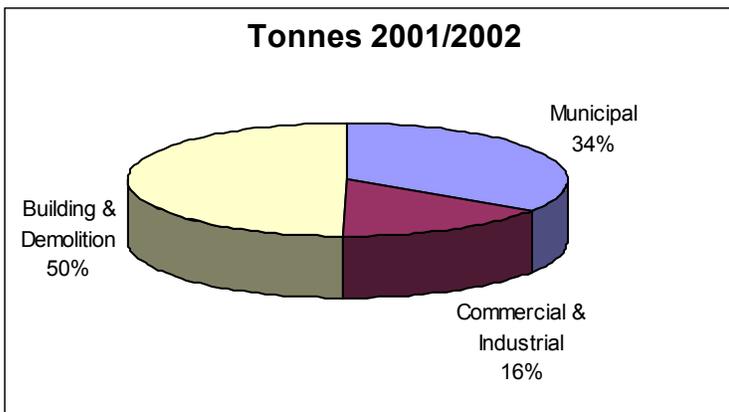
Waste Stream	Tonnes 1998/1999
Municipal	692,285
Commercial & Industrial	518,863
Building & Demolition	1,532,702
<b>Total waste</b>	<b>2,743,850</b>



Waste Stream	Tonnes 1999/2000
Municipal	856,011
Commercial & Industrial	432,953
Building & Demolition	1,604,064
<b>Total waste</b>	<b>2,893,028</b>



Waste Stream	Tonnes 2000/2001
Municipal	820,863
Commercial & Industrial	379,602
Building & Demolition	1,243,584
<b>Total waste</b>	<b>2,444,049</b>



Waste Stream	Tonnes 2001/2002
Municipal	802,380
Commercial & Industrial	373,523
Building & Demolition	1,166,613
<b>Total waste</b>	<b>2,342,515</b>

**Figure 6** Waste Stream Composition

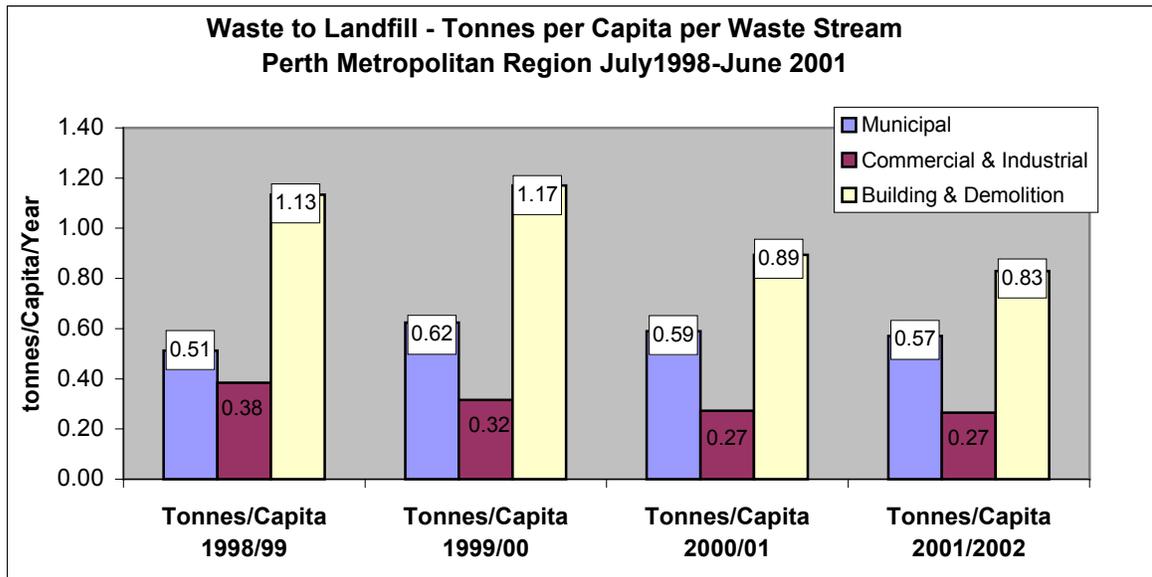
## 6.2.2 Waste Stream Composition

Waste composition of urban solid wastes can vary significantly and is indicative of the modes of economic activity and drivers for waste generation in each urban center. The waste composition for Perth Metropolitan Area in 1998/1999, 1999/2000, 2000/01, 2001/02 was as per *figure 6*.

*Note:*

*Some commercial and industrial waste is included in the data representing the municipal waste stream and vice-versa. This could occur, for example when a contractor who collects the municipal wastes also collects commercial and industrial wastes in the same load.*

Figure 7 shows tones of waste per capita and per waste stream.



*Figure 7*

### 6.2.2.1 Building and Demolition Waste Stream

Building and demolition waste in the period July 1998 - June 2002 contributes over 50% of all solid wastes disposed at landfill in Perth Metropolitan Region. This equates to approximately 1 tonne per capita per year (*Figure 7*). As the loads of waste delivered to the landfill sites are often made up of a range materials, it is often difficult or impossible for a gate person to segregate and estimate the tonnage for the major components of the waste. B&D waste stream typically consists of mixed inert materials: concrete, soil, rubble, and bricks.

The relatively high level of building and demolition waste in the period July 1998 - June 2002 may be explained by a number of factors:

- increasing amounts of waste are being disposed of legally at waste facilities rather than being illegally dumped;
- misclassification of building and demolition waste as municipal (commercial and industrial) waste has been prevented with introduction of the waste reporting system;
- the increase in building and demolition activity in Perth Metropolitan Area;
- building and demolition waste reporting mechanisms have improved.

### **6.2.2.2 Commercial and Industrial Waste**

Commercial and Industrial wastes in the period July 1998 - June 2002 contribute 15 - 20 per cent of the total solid waste stream. This equates to approximately 0.3 tonnes, per capita per year (*Figure 7*). The primary source of C&I wastes is commercial establishments and non-biodegradable wastes from industrial and manufacturing processes, particularly packaging processes and the food and hospitality industry.

### **6.2.2.3 Municipal Waste**

Municipal waste includes wastes collected by councils or their agents from households weekly kerbside waste service, wastes delivered to disposal sites by residents' own vehicles, waste from council activities such as bulk kerbside collections, street litter collections, waste from parks and waste from sweeping machines.

Approximately 30 % of the solid waste stream in Perth is municipal or council waste, much of it from domestic households. This equates to approximately 0.6 tonnes per capita per year (*Figure 7*).

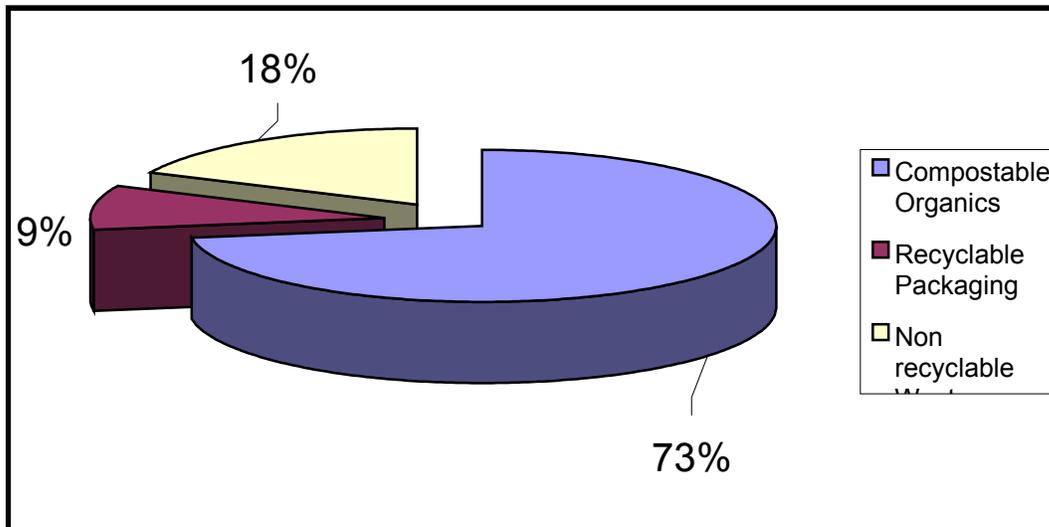
Data in DEP's solid waste database doesn't give information on the contribution of each material in the municipal waste stream, because municipal waste is often delivered to landfill in the mixed loads.

The material composition of domestic waste stream is only possible to determine by undertaking studies on the waste composition, such as the Murdoch University study (1999)<sup>1</sup> on average content of household MGBs in the City of Stirling (*Figure 8*).

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<sup>1</sup>Domestic Waste Composition Study for City of Stirling, Murdoch University, 1999.

**Domestic Waste Components  
Murdoch University Study  
1999**



**Figure 8**

**Domestic Waste Components**  
Murdoch University, 1999

food waste	26.7
garden waste	20.9
non recyclable paper	8.8
newspaper	7.4
cardboard	3.7
other recyclable paper	2.6
other putrescible	2
liquid paper containers	0.5
<b>Compostable Organics</b>	<b>72.6</b>
recyclable glass	5.8
recyclable ferrous	1.5
recyclable aluminium	0.7
PET containers	0.7
HDPE containers	0.7
<b>Recyclable Packaging</b>	<b>9.4</b>
non recyclable plastic	6.3
ceramics, dirt & dust	4.5
contaminated plastic	2.5
wood and rubber	2.2
other metals	1.4
hazardous waste	0.6
non recyclable glass	0.5
<b>Non recyclable Waste</b>	<b>18</b>
Total	100.00

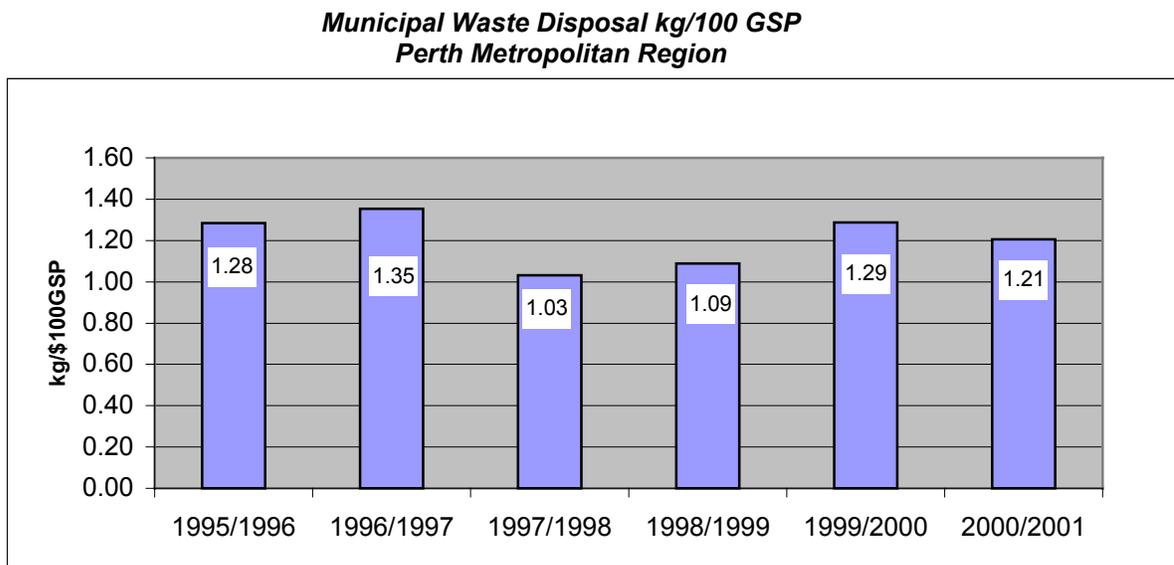
### 6.3 Waste disposal rates and economic activity

The majority of other states in Australia have not been reporting according to NWCS. Some states have changed the way of measuring waste reduction performance. New South Wales converted the annual tonnage of waste disposed of to kilograms per \$100 of GSP and B&D waste to a kg/\$100 building and engineering construction work done (BECWD).

The basis for the argument to use kilograms of waste per \$100 of GSP rather than kilograms of waste per capita per year is that the amount of waste varies with economic activity. To remove the effect of economic activity from the data used to establish the underlying trend in each waste stream, it is necessary to divide the total tonnage of waste disposed of annually by a standard measure of economic activity. Economic activity is usually measured as gross domestic product (GDP) in the case of Australia, or gross State product in its states.

#### 6.3.1 Municipal waste disposal kg/100 GSP

The data set in DEP's solid waste database is more complete from 1995 onwards although some data date back to 1993. Data for the period 1995 – 1997 have been reported by DEP in 1998 in "Summary Report of Waste to Putrescible Landfill Perth Metropolitan Region Western Australia (1995-1997)". In period 1994 – 1996 all reported putrescible landfill sites did not operate a weighbridge. Data in the *figure 9* shows that municipal waste disposal was at the highest level in 1996/1997: 1.35 kg of municipal waste per \$100 GSP. In 1997/98 municipal waste disposal declined by 24% and then started to slowly rise. In 1999/2000 municipal waste was at the same level as in 1995/1996: 1.28kg/\$100GSP.



**Figure 9**

### 6.3.2 Commercial and Industrial Waste Disposal

Data in *figure 10* shows that amount of commercial and industrial waste disposed of decreased moderately from 1.01 kg/\$100GSP in 1995/1996 to 0.65 kg/\$100GSP in 1999/2000 (a decrease of 36%).

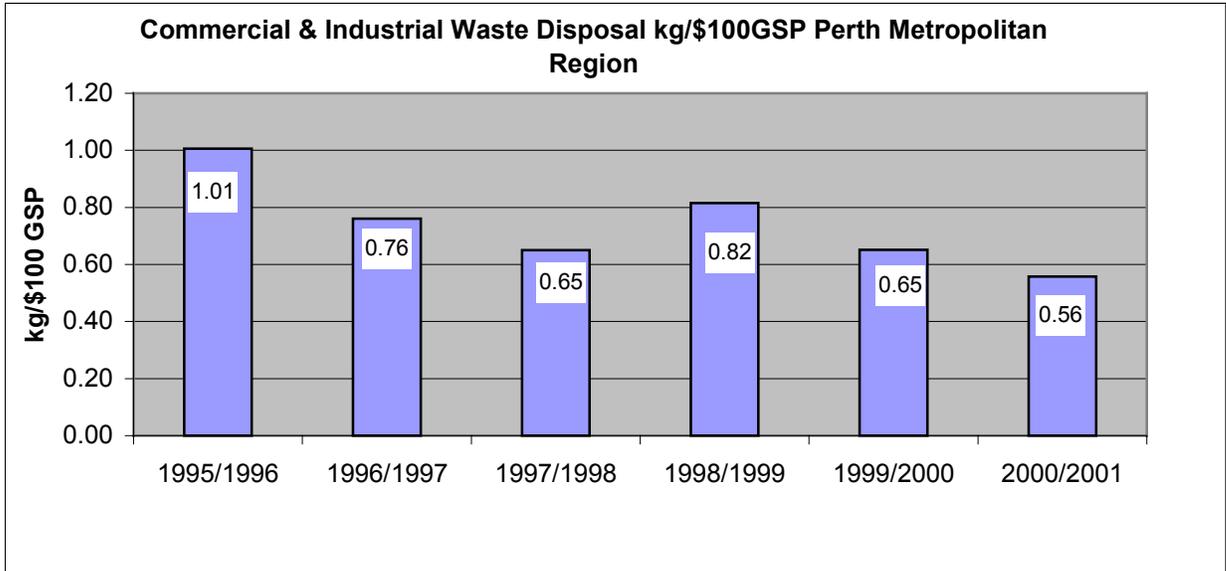


Figure 10

### 6.3.3 Building and Demolition Waste Disposal

The data in this report also shows that waste generation is still directly proportional to economic growth. Building and demolition activities create around 50% of the total waste to landfill (*figure 6*). Figure 11 shows the link between the level of new construction and waste from the construction industry. This shows there has been little change in waste generating behaviour in the construction industry.

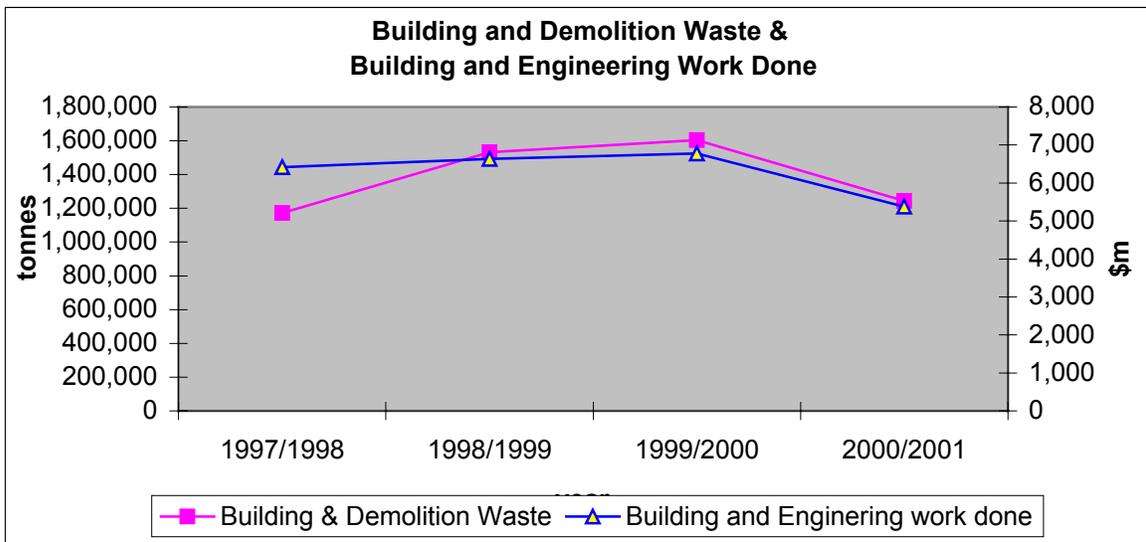


Figure 11

## Conclusion

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The achievement of the waste reduction to landfill objective set in 1991 is somewhat ambiguous at present. The results shown in this report clearly highlight that the levels of waste generation are much higher than initially expected and that the boundaries of the objective should have been better defined. While the metropolitan area has approached the 0.8 tonnes of waste to landfill per capita goal for putrescible landfill sites, including inert wastes brings the figure to 1.6 tonnes of total waste per capita in the year 2001.

The varied performance of different waste streams suggests that separate waste reduction targets for each waste stream should also be considered. While the achievement of waste reduction targets has not been at the desired rate, the implementation of the landfill levy in Western Australia has provided funds to direct towards waste reduction and recycling strategies.

The solid waste database is not a useful tool for nationwide comparisons because WA is the only state reporting according to the requirements. However, it is useful for auditing the landfill levy and for monitoring the State's performance in reducing waste to landfill. As such it provides essential information that will reveal how effective our waste reduction strategies are over time.

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### **Disclaimer**

The Department of Environmental Protection has exercised all due care and attention in the collation and presentation of this report but can give no warranty regarding the accuracy or completeness of the information supplied by others. Any person intending to rely on this information should independently verify the information before doing so and in referring to the information for the initial stages of this reporting system should take particular note of the comments made about changes that may have been made as to how waste was disposed of.

## Summary of tables and figures

### Tables:

Table 1: Baseline Calculation for Waste to Landfill 1991, Perth Metropolitan Region, Department of Environmental Protection Summary Report of Waste to Putrescible Landfill November 1998. *Page 4*

Table 2: Landfill Sites with weighbridges, Perth Metropolitan Region. *Page 9*

Table 3: Waste to Landfill, Annual Change per Capita. *Page 14*

Table 4: Total Waste to Landfill. *Page 15*

### Figures:

Figure 1: Waste to Landfill -Tonnes per Capita per Calendar Year, Perth Metropolitan Region. *Page 5*

Figure 2: Trend lines – Waste to Landfill by Landfill Category, Perth Metropolitan Region, July 1998 – June 2002. *Page 12*

Figure 3: Waste to Landfill – Tonnes per Capita per Financial Year, Perth Metropolitan Region July 1998 –June 2002. *Page 15*

Figure 4: Waste tonnage by Waste Stream – Perth Metropolitan Region, July 1998 – June 2002. *Page 16*

Figure 5 Trend lines – Waste to Landfill by Waste Stream, Perth Metropolitan Region, July 1998 – June 2002. *Page 17*

Figure 6 Waste Stream Compositions 1998/1999, 1999/2000, 2000/2001. 2001/2002. *Page 18*

Figure 7 Waste Tonnage per Waste Stream per Capita. *Page19*

Figure 8 Domestic Waste Components, Murdoch University Study 1999. *Page 21*

Figure 9 Municipal Waste Disposal kg/100 GSP *Page 22*

Figure 10 Commercial & Industrial Waste Disposal kg/100GSP. *Page 23*

Figure 11 Building and Demolition Waste & Building and Engineering Work Done. *Page 23*

## **APPENDIX A**

### **National Waste Classification System**

## APPENDIX A

### National Waste Classification System

The National Waste Classification System (NWCS) is a method of recording and categorising waste quantities as it enters waste disposal sites. The NCWS database provides information on waste disposal as opposed to waste generation.

#### Description of data required

##### 1. Processing/Disposal Route

The processing/disposal route records the method of waste processing or disposal at the waste facility.

Number	Route	Description
1	Recycling	Representing material delivered to a landfill site that is subsequently recycled and removed.
2	Composting	Material that is stored and composted separately on site
3	Incineration	Disposal by incineration.
4	Landfill	Final disposal on site.
5	On-Site	Waste disposal facilities that dispose of the waste created by the owner of the waste disposal facility.
6	Cover	Cover material as defined in the Landfill Levy Administration Policy 1998.
7	Non Waste	Material purchased and brought on-site eg. limestone for road building.

##### 2. Waste Stream – Principal and Secondary Sources

The three principal waste stream sources are;

- Municipal
- Commercial/industrial;
- Building/demolition.

## APPENDIX A

### 2.1 Municipal Waste

Definition: waste from households and council services.

#### Municipal Waste Secondary Sources

Domestic Waste (A1)	Waste collected by councils or their agents from households, once to two times weekly from 55-330 litre bins
Other Domestic Waste (A2)	Waste delivered to waste disposal sites in resident own vehicles, waste from kerbside collections and neighbourhood bins.
Other Council (A3)	Municipal waste collected by councils for council services such as street litter collections, waste from parks and waste from sweeping machines.

### 2.2 Commercial and Industrial

Waste from ANZSIC (Australian and New Zealand Standard Industrial Classification) industry types and materials from processing/disposal facilities.

#### ANZSIC type industries

0	Unknown
A	Agriculture
B	Mining
C	Manufacturing
D	Electricity, Gas and Water
F	Wholesale and Retail Trade
G	Transport and Storage
HIJ	Service Sector
K	Community services (health and education)
L	Recreation, Tourism

#### X – Waste Processing Facility

Materials from recycling, composting and incineration facilities that are rejected to landfill should be allocated a secondary source of x. This code identifies that the same quantity of waste will also be recorded at the landfill disposal site. When looking at waste quantities for a specific region, the quantities coded with 'X' can be subtracted off the total to avoid double counting.

## APPENDIX A

### 2.3 Building and Demolition

Definition: waste from the demolition of households, council activities (eg roads, bridges and footpaths) and from ANZSIC industry type facilities.

#### Secondary Sources for Building and Demolition Waste

Households	2 - other domestic
Council Activities	3 - other council
ANZSIC industry type facilities	See previous table

### 3. Measurement/Transport Mode

For waste that passes over a weighbridge, the measurement/transport mode is zero. For small loads not weighed and for sites without weighbridges, the numbers of vehicles by type are recorded. The AWCS database automatically calculates tonnages by multiplying the number of vehicles by the average weight of the load for that particular vehicle. The table below details the vehicle types and the average weight of the loads used to calculate tonnages.

Transport Mode	Transport Mode Number	Weight (T)
Cars, station wagons	1	0.3
Utes,p/vans, single axle trailers	2	0.3
Lge utes, multiple axle trailers	3	0.3
Open trucks, Gross wt < 5t	4	3.5
Open trucks, 5t<Gr wt <12t	5	6
Open trucks, Gross wt >12t	6	7.5
Compactors, bins < 8m <sup>3</sup>	7	4
Compactors, bins 8 – 12m <sup>3</sup>	8	5
Compactors, bins 12 – 19 m <sup>3</sup>	9	6.5
Compactors, bins 19 – 32 m <sup>3</sup>	10	7.5
Compactors, bins > 32 m <sup>3</sup>	11	8

**Note:** These conversions refer to waste disposed of to landfill over time where the waste is predominantly putrescible.

### 4. Material Composition

Material composition of the waste is determined at the gate house.

### 5. Other Data Required

- Date
- Weight of waste
- Municipality