

HOFSTEDE & ASSOCIATES

WASTE MANAGEMENT & POLLUTION CONTROL



Waste Authority

Regional Investment Program Funding

RECYCLING CENTRE OF BALCATT A – COMMERCIAL MIXED BULKY WASTE AUDIT

**PREPARED BY
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EXECUTIVE SUMMARY

Hofstede & Associates was engaged by Mindarie Regional Council to conduct a waste audit of commercial mixed bulky waste entering the Recycling Centre of Balcatta, for subsequent transfer to Tamala Park Landfill site.

The purpose of the study was to identify and quantify waste fractions that can be removed from the waste stream, in order for the MRC to further develop methods of resource recovery.

The Recycling Centre of Balcatta was audited over a period of twenty one days. Auditors interviewed each commercial vehicle driver for the following information:

1. **Suburb of origin**
2. **Vehicle type**
3. **Source process**
 - **Demolition site**
 - **Construction site**
 - **Workshop waste**
 - **General clean-up (Commercial)**
 - **General clean-up (Residential)** – NB: This category represents all mixed waste brought in from private households by commercial operators. It is not an indication of waste brought in by householders direct.
 - **Other**
4. **Waste weight and truck volume**

Two representative samples were taken to identify and quantify bulky waste fractions; the first from the **open skip/tipper commercial vehicles** (who dispose of waste directly into the transfer shed), and the second from the **self haul/non-tipper commercial vehicles** (who dispose of waste into the transfer shed from a raised landing) – both samples were representative of the commercial mixed bulky waste destined for final



disposal at the Tamala Park Landfill site. The first of these samples was categorised using an excavator at the landfill site, so only those fractions that could be easily separated by such mechanical means were identified, those being:

- Timber
- Plastic
- Concrete
- Metal
- Green-Waste
- Carpet/Underlay
- Soft Furnishings/Mattresses
- Tyres
- Wall sheeting (Fibro, Gyprock etc)
- Residue/Mixed General Rubbish

The second sample was categorised through visual inspection of waste, so in addition to the above waste fractions, the auditors were also able to identify the following waste fractions in the sample from self haul/non-tipper vehicles:

- Glass
- Styrofoam
- Pallets
- Insulation
- Tiles/Bricks/Rubble
- Organics (inc. paper, soil etc)

Exactly 395 commercial mixed bulky waste loads were audited, representing 36% of all commercial vehicles entering the site within the twenty one day period. The drivers of all 1102 commercial vehicles carrying mixed bulky waste loads to the site during the audit period were interviewed for collection of suburb and waste source data. This data was used to estimate the total annual commercial mixed bulky waste being disposed of at the Recycling Centre of Balcatta, as summarised:



Table 1 Total Commercial Mixed Bulky Waste Delivered to the Recycling Centre of Balcatta

Annual Number of Commercial Vehicles	18,996
Annual Total Nett Weight (T)	28,230
Annual Total Volume (m ³)	185,835

OPEN SKIP/TIPPER COMMERCIAL VEHICLES – REPRESENTATIVE SAMPLE

Approximately 35% (69 tonnes) of the total waste sample weight was categorized into separate recyclable waste fractions, with the remaining 65% (129 tonnes) classed as residual waste. The largest component of the recoverable waste was **Mixed Timber** (14% of total sample weight), followed by **Carpet** (10% of total sample weight).

Upon visual inspection, it was identified that a further 55-80% of the residual waste fraction volume could actually be classed as recoverable material, leaving only 20-45% of the residual waste fraction volume to be classified as landfillable waste.

60% of all open skip/tipper commercial vehicle drivers reported their loads to have come from **general clean-ups from commercial sites**; this was by far the largest sector of reported waste sources, followed by 20% coming from **general clean-ups from residential sites**.

The suburb data for the open skips/tipper commercial vehicles revealed the following 10 suburbs to be the largest sources of mixed bulky waste:



Table 2 Open Skip/Tipper Representative Sample - Top ten waste source suburbs.

SUBURB	# TIPPERS	% TIPPERS
Balcatta	124	22.5
Osborne Park	60	10.9
Multiple Suburbs (within MRC)	45	8.2
Malaga	35	6.3
Perth	34	6.2
Wangara	22	4
Multiple Suburbs (all over Perth)	19	3.4
Landsdale	11	2
East Perth	10	1.8
Bayswater	7	1.3

SELF HAUL/NON-TIPPER COMMERCIAL VEHICLES – REPRESENTATIVE SAMPLE

The largest component of waste (by volume; m³) from the self haul/non-tipper representative sample was **timber** (24%), followed by **cardboard** (10%).

A summary of the total recoverable vs. landfillable waste fractions by volume (m³) is presented in Table 3:

Table 3 Self Haul/Non-tipper Representative Sample – Mixed Bulky Waste Characterisation of Recoverable vs. Landfillable Fractions

	Annual Volume (%)	Annual Volume (m3)
Total Biodegradable Waste Fraction	5	3,342
Total Recyclable Waste Fraction	83	55,485
Total Landfillable Waste Fraction	12	8,022



45% of all self haul/non-tipper commercial vehicle drivers reported their loads to have come from **general clean-ups from commercial sites**; this was the largest sector of reported waste sources, followed by **general clean-ups from residential sites** (40%).

In table 4, the suburb data for the self haul/non-tipper commercial vehicles shows the top 12 sources of mixed bulky waste:

Table 4 Self Haul/Non-tipper Representative Sample – Top Twelve Waste Source Suburbs

SUBURB	# NON-TIPPERS	% NON-TIPPERS
Perth	73	13.3
Osborne Park	55	10
Balcatta	33	6
Multiple Suburbs (within MRC)	16	2.9
Balga	13	2.4
Bayswater	13	2.4
Malaga	13	2.4
Subiaco	13	2.4
Mirabooka	12	2.2
Mt Lawley	11	2
Nollamara	11	2
Multiple Suburbs (all over Perth)	11	2

FUTURE COMMERCIAL MIXED BULKY WASTE PROJECTIONS

The following future projections of total commercial mixed bulky waste deliveries to the Recycling Centre of Balcatta are based on the primary criterion of population trends.

The current (2009) commercial bulky waste measurements per capita (based on the current combined population of: Town of Victoria Park; City of Stirling; Town of Cambridge; Town of Vincent and City of Perth) are:



Commercial Mixed Bulky Waste per Capita (Tonnes)	0.0997
Commercial Mixed Bulky Waste per Capita (m ³)	0.7

Estimations of future (2010-2020) commercial mixed bulky waste deliveries to Recycling Centre of Balcatta (based on the current per capita measurements) are shown in Table 5 and Figure1:

Table 5 Recycling Centre of Balcatta - 2010-2020 Commercial Mixed Bulky Waste Delivery Projections

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Population Projection	285720	288400	290280	292160	294040	295920	297800	300120	302440	304760	307080
Projected Weight (Tonnes)	28486	28753	28941	29128	29315	29503	29691	29922	30153	30385	30616
Projected Volume (M³)	200004	201880	203196	204512	205828	207144	208460	210084	211708	213332	214956

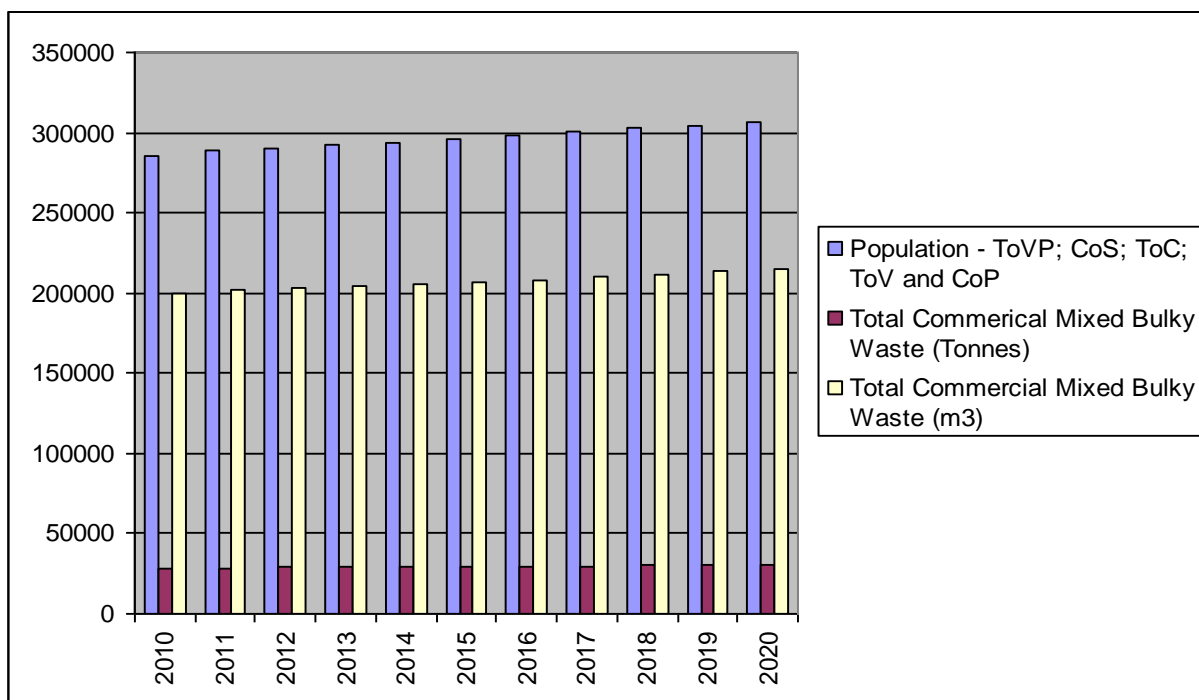


Figure 1 Recycling Centre of Balcatta - 2010-2020 Commercial Mixed Bulky Waste Delivery Projections



GLOSSARY

Carpet/Underlay	Used carpets/underlay and any off-cuts from new rolls.
Concrete	Broken concrete slabs/walls/fencing and concrete rubble.
Furnishing	Furnishings suitable for re-use, or with recycling potential.
General clean-up (Commercial)	This waste source category represents all mixed bulky waste brought in from commercial sites, by commercial operators (as reported by driver).
General clean-up (Residential)	This waste source category represents all mixed bulky waste brought in from private households by commercial operators (as reported by driver). It is not an indication of waste brought in by householders direct.
Green-Waste	Any green/brown organic material suitable for mulching and/or composting.
Landfillable	Any waste deemed as non-recoverable.
Metal	Any scrap metals including white goods suitable for re-use or recycling.
MRC	Mindarie Regional Council



Non-tipper Vehicles	Any vehicles without tipping facilities that dispose of waste from the transfer station landing platform into the transfer shed.
OH&S	Occupational Health and Safety
Open Skips	Skip bins brought in by greater than 1 tonne trucks for disposal directly into the transfer shed.
Organics	Any materials suitable for mulching or composting (inc. waste paper, food waste, soil etc).
Pallets	In reusable condition were recorded separate to timber as they were recognised as having value in their current form as a re-usable product.
Plastic	Any bulky plastic products, toys, and loose plastic materials suitable for re-use or recycling.
Recoverable	Any material/waste fraction that has potential for re-use or recycling, and is therefore not considered landfillable waste.
Re-useable	Any material/waste fraction that has the potential for re-use with no major dismantling or processing required.
Recyclable	Any material/waste fraction that is capable of being of use again after processing.
Residue/Mixed Rubbish	Any portion of the mixed bulky waste stream that did not fall under one of the recoverable waste



fraction categories, or was not easily categorised due to the degree of mixing with other waste products.

Self Haul

Delivery of mixed bulky waste by the person(s)/operator(s) who generated the waste.

Soft Furnishings

Soft Furnishings suitable for re-use or with recycling potential.

Tiles/Bricks/Rubble

Including any broken ceramic products.

Timber

Re-usable timber off-cuts or mixed timber products.

Tipper Vehicles

Any commercial vehicles with tipper facilities that dispose of waste directly into the transfer shed.

Wall sheeting

Used Fibro, Gyprock etc. with potential for re-use or recycling.



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1 INTRODUCTION

1.1 BACKGROUND TO THE STUDY

Hofstede & Associates was engaged by Mindarie Regional Council to conduct an audit of the mixed bulky waste stream entering the Tamala Park landfill site, via the transfer facilities at the Recycling Centre of Balcatta, and delivered to Tamala Park landfill direct.

The project scope was to collect a representative sample of the mixed bulky waste stream delivered to both the Recycling Centre of Balcatta and the Tamala Park Landfill site. This sample data was to be used to estimate sources, weight and volumes of bulky waste fractions potentially available for recycling or alternate disposal.

The overall aim of the project was to identify opportunities to reduce the amount of bulky waste being landfilled at Tamala Park Landfill site in order to prolong its lifespan.

It was identified that the majority of the mixed bulky waste stream was being delivered by commercial operators, so it was decided that the audit focus should be on all mixed bulky waste delivered by contractors and commercial operators.

Waste streams not to be measured included council verge collections (as this stream was to be accounted for in a separate project (Project 3), waste from council and commercial compactor trucks (as this stream, once compacted, was no-longer considered bulky waste), and general rubbish delivered by householders direct.

At the Recycling Centre of Balcatta any vehicles carrying *clean* recyclable materials (eg straight green-waste, bricks/concrete and bulk construction waste) were excluded from the audit, as these fractions of the waste stream are already separated at the Recycling Centre of Balcatta for recycling, and therefore diverted from Tamala Park Landfill.

1.2 OBJECTIVES AND REQUIRED OUTCOMES

The purpose of the study was to characterise and quantify:

- The major sources of mixed bulky waste (by source process, delivery vehicle type, and suburb);
- Waste fractions in the mixed bulky waste stream with recycling potential or potential for disposal other than a mixed waste landfill.



1.3 RELEVANCE TO CO PROJECTS AND REGIONAL WASTE STRATEGY

The project was developed to encompass a key recommendation listed in part three of the schedule of recommendations incorporated in the Regional Strategic Waste Minimisation Plan (view **Table 6**).

Table 6 Extract of "action item" from SWMP

SWMP Item No.	Recommendation	Action Date
A	Action Items listed by subject - Bulky hardwaste and green waste (delivered to landfill via transfer stations)	
3.4	The makeup of the commercial waste stream from member Local Governments and contractors that is sent to Tamala Park for disposal be analysed for its recycling potential	2010/2011
3.7	Conducting an analysis of a significant portion of the hardwaste placed on the verge and that delivered to the Recycling Centre of Balcatta and to the Tamala Park landfill and transfer station	2009/2010
3.10	Commence the redesign of the Tamala Park transfer station and amend the tipping policy and fees structure to increase the amount of waste recycled	2010/2011
3.11	Work collectively to identify and introduce best practice for the design and operation of waste transfer waste minimisation and recycling functions conducted at the Recycling Centre of Balcatta and the transfer station at Tamala Park	2010/2011
3.12	Investigate the introduction of excavators to "pick" through bulky waste delivered by member Local Governments and casual tippers with the objective of removing recyclable materials to slow the consumption of landfill airspace	2008/2009
3.13	Collaborate with the City of Stirling to investigate the use of	2010/2011



	mechanised means (such as moving floors) to: <ul style="list-style-type: none">• Improve the safety of client tipping waste• Reduce the amount of waste sent to landfill by recovering recyclable materials from the bulky waste stream	
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The Mindarie Regional Council's landfill site is filling rapidly and based on current trends will be full by 2020-2021.

While the Council has taken steps to divert the amount of household waste going to landfill by the use of Alternative Waste Technology, very little action has been taken to divert the other major waste streams that make up approximately 56% of solid waste going to landfill at Tamala Park.

This project is designed to identify the makeup of these various waste streams, identify their sources (where they represent a single significant source). This information will then allow the Mindarie Regional Council and the City of Stirling to redesign their respective transfer stations including charging policy and materials handling procedures to increase the amount of waste diverted from landfill.

2 METHODOLOGY

2.1 PLANNING

The first phase of the audit was the planning phase. This involved preliminary site visits to both of the audit locations, and meetings with staff from the Recycling Centre of Balcatta, Tamala Park Landfill, and Mindarie Regional Council. Project logistics and desired outcomes were discussed and agreed upon. From this, a waste audit procedure was developed and approved.

The standard hours of operation at the Recycling Centre of Balcatta are 7.30am to 4.00pm. To obtain a representative sample of the mixed bulky waste entering the transfer site, the program was designed to cover all operating hours Monday to Sunday.



2.2 AUDIT METHODOLOGY

2.2.1 Recycling Centre of Balcatta Audit Methodology

Two auditors attended the transfer station during the 21 day audit period. The survey process involved continuous observation and interviewing of all drivers of commercial vehicles entering the transfer station during the defined period. The first auditor, situated at the weighbridge station, conducted a visual observation of each commercial vehicle entering the site and conducted an interview with the truck driver. From this, the auditor categorized each vehicle as either:

1. **Open skip / Tipper vehicle** - (see figure 2 for example);
2. **Self haul / Non-tipper vehicle** - (> 1 tonne non-tipper truck, trailer, utility, van, car).

These two categories were surveyed separately for the following reasons:

- Open skip/tipper vehicle waste could not be surveyed at the Balcatta site, as tippers dispose of their waste inside the transfer station shed. Due to the sheer scale of waste, and health and safety policy preventing Hofstede and Associates auditors from entering this area, a sample of the bulky waste stream was loaded onto a specific *Atlas* truck for categorisation at Tamala Park landfill site.

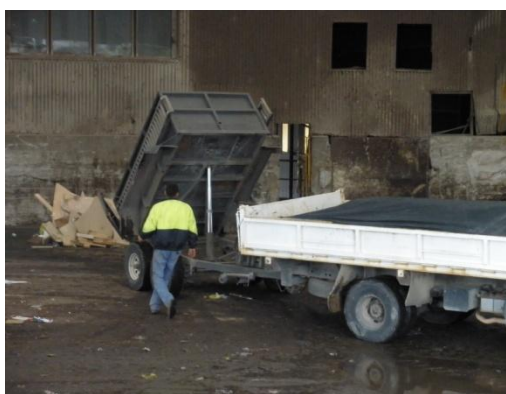


Figure 2 A tipper truck driver unloads inside the transfer shed.



- All non-tipper vehicles dispose of their rubbish from a raised landing, into the transfer station shed. A second auditor was surveying and categorising a sample of this section of the bulky waste stream at the Balcatta site.



Figure 3 A waste auditor measuring and categorising a non-tipper commercial mixed bulky waste load.

- To establish waste data that was relevant to the different management procedures and infrastructure necessary for tipper vs. non-tipper vehicles. Such data would be useful for the proposed redevelopment of the Recycling Centre of Balcatta.

The auditor at the weighbridge conducted a brief interview with each driver, firstly to determine if the waste fell into the mixed bulky waste category, and if so, to record:

- 1. Suburb of origin**
- 2. Vehicle type**
- 3. Source process**
 - **Demolition site**
 - **Construction site**
 - **Workshop waste**
 - **General clean-up (Commercial)**



- **General clean-up (Residential)** – NB. This category represents all mixed waste brought in from private households by commercial operators. It is not an indication of waste brought in by householders direct.
 - **Other**
4. **Waste weight and truck volume** – NB. The total weight and volume data for Balcatta are presented as estimates only due to the following reasons:
- Nett weight could not be recorded for the majority of non-tipping vehicles due to the weigh-in, weigh-out system currently in operation at the Recycling Centre of Balcatta. Any vehicle carrying a load less than 1 tonne is not weighed on the way out; therefore our capacity to collect weight data for non-tipper vehicles was limited. Of the 550 self haul/non-tipper vehicles interviewed, 438 were recorded as “*carrying load less than 1 tonne*”. Some of the light commercial vehicles passing through the transfer station did however have their TARE weights listed on the computer system, and so in these instances, nett weights were calculated. These weights were used, along with the data from day two of the audit to establish average non-tipper vehicle weight data.

On day two of the audit, the City of Stirling conducted a trial with a new weighing system, whereby every single vehicle was weighed in, and weighed out. This system proved very valuable for the audit purposes, as the recorded nett weight data could be used to establish an average nett weight for each non-tipper vehicle type (view **section 3.5** for breakdown of self haul/non-tipper mass and volumes by vehicle type).

- The volume data for self haul/non-tipper vehicles is based on an auditors’ measurement of waste as it was unloaded at the transfer station. It is therefore representative of un-compacted mixed bulky waste.

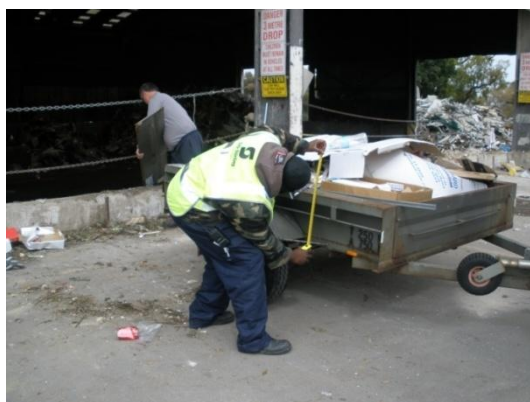


Figure 4 A waste auditor measuring a load of commercial mixed bulky waste materials.

- The volumes of the open skips/tipper vehicles were collected during the driver interviews and are an indication of truck size alone, and not strictly the volume of bulky waste. This is the case for all open skip/ tipper vehicle volume data that follows. The truck volumes have been recorded assuming that they are at capacity upon arrival at the transfer station. This however is not the case in all instances, but reflects a worst case scenario to allow for conservative planning.



Figure 5 A waste auditor conducting a driver interview at the Recycling Centre of Balcatta weighbridge.

A representative sample of waste was taken from randomly selected vehicles with loads containing a majority of bulky waste. This helped to eliminate the large proportion of



general waste going into the bulky waste sample. The auditor at the weighbridge was responsible for notifying the second auditor (via 2-way radio), which of the open skip/tipper trucks were to be set aside for the waste audit. The representative sample was then transported to Tamala Park landfill site (as the waste accumulated to fill a truck load), where it underwent segregation into recoverable bulky waste fractions. The representative sample data from the open skip/tipper vehicles was recorded accumulatively at Tamala Park, by Mr Brendan Mohr of the Mindarie Regional Council, and Tamala Park operations staff.



Figure 6 Representative mixed bulky waste sample from open skips/tipper vehicles before transportation to Tamala Park.

2.3 DEFINITION OF RECOVERABLE BULKY WASTE

Due to the mechanical categorization process of the waste samples from open skip/non-tipper vehicles, it was established that only the materials that could be separated with an excavator were to be categorised. These fractions were:

- Timber
- Plastic
- Concrete
- Metal
- Green-Waste
- Carpet / Underlay



- Soft Furnishings/Mattresses
- Tyres
- Wall sheeting (Fibro, Gyprock etc)
- Residue/Mixed General Rubbish

It was possible to categorise the bulky waste from self haul/non-tipper vehicles more specifically as we were not relying on mechanical means of separation (ie. the waste could be categorized through simple observation during the unloading process). For this reason we were able to include more categories of waste fractions for the self haul/non-tipper vehicles. These fractions were:

- Plastic
- Cardboard
- Timber
- Concrete
- Metal (inc. white goods)
- Green-Waste
- Carpet/Underlay
- Glass
- Styrofoam
- Pallets
- Furnishings
- Mattresses
- Wall sheeting (Fibro, Gyprock etc)
- Insulation
- Tiles/Bricks/Rubble
- Organics (inc. paper, soil etc)
- Residue/Mixed General Rubbish



3 RESULTS- COMMERCIAL MIXED BULKY WASTE

3.1 TOTAL COMMERCIAL MIXED BULKY WASTE

The data in **Table 7** represents total nett weight and volume of all commercial mixed bulky waste material (ie. that delivered by open skips/tipper and self haul/non-tipper vehicles combined) delivered during the defined audit period.

3.1.1 Recycling Centre of Balcatta - Total Mass and Volume of Mixed Bulky Waste Delivered by Commercial Operators

During the continuous 21 day audit period, a total of 395 vehicles were sampled out of a total of 1102 commercial vehicles identified as carrying mixed bulky waste loads. Thus, 36% of all commercial vehicles carrying mixed bulky waste loads into the Recycling Centre of Balcatta were audited.

It was assumed that the waste entering the site during the three week period was typical of general disposal patterns and therefore not prone to large degrees of variation.

Key audit data and the total mass and volume of commercial mixed bulky waste delivered to Recycling Centre of Balcatta during the audit period is summarized in **Table 7**.



Table 7 - Total mass and volume of commercial mixed bulky waste delivered to Recycling Centre of Balcatta during the audit period.

TOTAL COMMERCIAL VEHICLES INTERVIEWED	1102
TOTAL COMMERCIAL VEHICLES AUDITED (REP. SAMPLE)	395
% AUDITED	36%
TOTAL NETT WEIGHT (Tonnes)	1,675
TOTAL VOLUME (M ³)	10,979

(Note: figures are based on sample data collected during the defined audit period).

3.2 COMMERCIAL MIXED BULKY WASTE MASS AND VOLUME BY DELIVERY VEHICLE TYPE

3.2.1 Recycling Centre of Balcatta – Open Skips/Tipper Vehicles

The sample, total , and average mass and volume of commercial mixed bulky waste delivered to Recycling Centre of Balcatta via open skip/tipper vehicles during the audit period is summarized in **Table 8** .



Table 8 Balcatta – Total, and average mass and volume of commercial mixed bulky waste delivered by open skips/tipper vehicles during audit period.

TOTAL # OPEN SKIP/TIPPERS INTERVIEWED	552
TOTAL # OPEN SKIP/TIPPERS AUDITED (Rep. Sample)	127
% of Open Skip/Tippers audited	23%
WEIGHT (Tonnes)	
Sample Nett Weight (T)	198
Total Nett Weight (T)	1,267
Average Nett Weight per Tipper Vehicle (T)	2.3
VOLUME (m³)	
Sample Volume (m ³)	1,319
Total Volume (m ³)	6,903
Average Volume per Tipper Vehicle (m ³)	12.5



3.2.2 Recycling Centre of Balcatta – Self Haul/Non-tipper Vehicles

The total, and average mass and volume of commercial mixed bulky waste delivered to Recycling Centre of Balcatta via self haul/non-tipper vehicles during the audit period is summarized in **Table 9** .

Table 9 Balcatta - Total and average mass and volume of commercial mixed bulky waste delivered by self haul/non-tipper vehicles during audit period.

TOTAL # SELF HAUL/NON-TIPPERS INTERVIEWED	550
TOTAL # SELF HAUL/NON-TIPPERS AUDITED (Rep. Sample)	268
% of Self Haul/Non-tippers audited	49%
WEIGHT (Tonnes)	
Sample Nett Weight (T)	181
Total Nett Weight (T)	371
Average Nett Weight per Non-tipper Vehicle (T)	0.674
VOLUME (m³)	
Sample Volume (m ³)	1,986
Total Volume (m ³)	3,878
*Average Volume per Non-tipper Vehicle (m ³)	7.05



*The average volume per non-tipper vehicle of 7.05m³ seems relatively large. This can be accounted for by the large proportion of greater than one tonne self haul/non-tipper vehicles passing through the transfer station. Of the 550 self haul/non-tipper vehicles interviewed, 199 were classified as “**greater than 1 tonne trucks**”. A full breakdown of self haul/non-tipper mass and volume by vehicle type is shown in **section 3.5**.

The volume extremes between non-tipper vehicle types are shown in **Figures 7 and 8**.



Figure 7 An example of a > 1 tonne non-tipper vehicle.



Figure 8 A self haul/non-tipper vehicle driver unloading a car trailer of mixed bulky waste.



3.3 TOTAL ANNUAL COMMERCIAL MIXED BULKY WASTE DELIVERED TO BALCATT A

Based on the sample data and number of commercial operators interviewed during the audit period, the following tables provide estimates of the annual mixed bulky waste delivered to the Recycling Centre of Balcatta by commercial operators.

The following data is based on a 362 day working year to account for the three days that the Recycling Centre of Balcatta is closed for operations; Good Friday, Christmas Day and New Years Day.

3.3.1 Recycling Centre of Balcatta – Annual Total Mixed Bulky Waste Delivered by Commercial Operators

Table 10 Balcatta – annual total mixed bulky waste delivered by commercial operators.

Annual Number of Commercial Vehicles	18,996
Annual Total Nett Weight (T)	28,230
Annual Total Volume (m ³)	185,835



3.3.2 Recycling Centre of Balcatta – Annual Mixed Bulky Waste Delivered by Commercial Operators via Open Skips / Tipper Vehicles

Table 11 annual mixed bulky waste delivered by commercial operators via open skips/tipper vehicles.

Annual Number of Open Skip/Tipper Vehicles	9,515
Annual Total Nett Weight (T)	21,835
Annual Total Volume (m ³)	118,986

3.3.3 Recycling Centre of Balcatta – Annual Mixed Bulky Waste Delivered by Commercial Operators via Self Haul / Non-tipper Vehicles

Table 12 Balcatta - annual mixed bulky waste delivered by commercial operators via self haul/non-tipper vehicles.

Annual Number of Non-tipper Vehicles	9,481
Annual Total Nett Weight (T)	6,394
Annual Total Volume (m ³)	66,849



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3.4 COMMERCIAL MIXED BULKY WASTE - WASTE CHARACTERISATION BY VEHICLE TYPE

3.4.1 Recycling Centre of Balcatta – Open Skips/Tipper Vehicles

The following data is based on the sample of 127 open skip/tipper vehicles. This number of trucks represented 23% of the total number of commercial open skip/tipper vehicles carrying bulky waste into the transfer station during the three week period.

The weight and percentage of the separated waste fractions is shown in **Table 13**, and graphically in **Figure 9**.

Table 13 characterisation of Commercial mixed bulky waste delivered by open skips/tipper vehicles.

Waste	Sample Weight (Tonnes)	Sample Weight (%)	Annual Weight (Tonnes)
Mixed Plastic	1	1	218
Mixed Timber	27	14	3,057
Concrete	3	1	218
Metal	13	6	231
Carpet	20	10	2,184
Soft Furnishings/ Mattresses	1	1	218
Wall Sheeting	5	2	437
Tyres	0.05	<1	5
*Residue	129	65	1,4193
Total Sample	198	100	21,835



Approximately 35% (69 tonnes) of the total waste sample was categorized into separate recyclable waste fractions, with the remaining 65% (129 tonnes) classed as residual waste.

*From a visual inspection, it was identified that 50%-70% of the residual waste volume was made up of biodegradable paper and cardboard products. It was also identified that loose recyclable plastics made up 5 -10% of the volume of the residual waste.

Based on this data, of the 21,835 tonnes of commercial mixed bulky waste delivered by open skips/tipper vehicles annually, **7,642 tonnes** could be diverted for **recycling**. In addition to this, anywhere from **55-80%** of the residual waste volume could have **biodegradables** and **recyclables** removed for processing, leaving only **20-45%** of the residual waste volume actually to be considered **landfillable** waste.

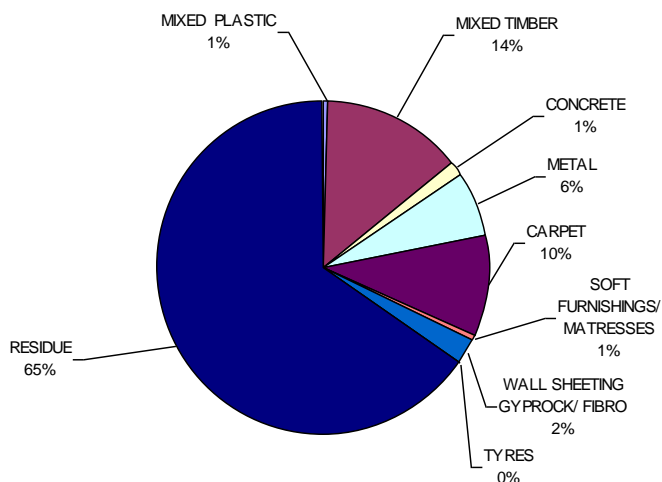


Figure 9 – Breakdown of Commercial mixed bulky waste delivered by open skips/tipper vehicles.



3.4.2 Recycling Centre of Balcatta - Self Haul/Non-tipper Vehicles

The following data is based on the sample of 268 self haul/non-tipper vehicles. This number of trucks represented 49% of the total amount of commercial self haul/non-tipper vehicles carrying bulky waste into the transfer station during the three week period. The waste fraction breakdown according to volume is shown in **Tables 14 and 15**. The percentage breakdown of the waste fractions according to volume is shown graphically in **Figure 10**.

Table 14 Balcatta - Commercial mixed bulky waste fractions, sample breakdown by volume – Self haul/non-tipper vehicles.

Waste	Volume (M ³)	Volume (%)	Annual Volume (M ³)
Paper	20	1	668
Plastic	139	7	4,679
Cardboard	199	10	6,685
Timber	477	24	16,044
Concrete	40	2	1,337
Metal	139	7	4,679
Glass	39	2	1,337
Green-Waste	79	4	2,674
Styrofoam	40	2	1,337
Pallets	60	3	2,005
Textiles	20	1	668
Furnishings	139	7	4,679
Mattresses	60	3	2,005
Carpet & Underlay	119	6	4,011
Wall Sheeting	139	7	4,679
Insulation	20	1	668



Bricks/Rubble	4	<1	135
Residue	238	12	8,022
Total Sample	1986	100	66,849

Table 15 breakdown by volume of Commercial mixed bulky waste delivered by - Self haul/non-tipper vehicles.

	Annual Volume (%)	Annual Volume (m3)
Total Biodegradable Waste Fraction	5	3,342
Total Recyclable Waste Fraction	83	55,485
Total Landfillable Waste Fraction	12	8,022

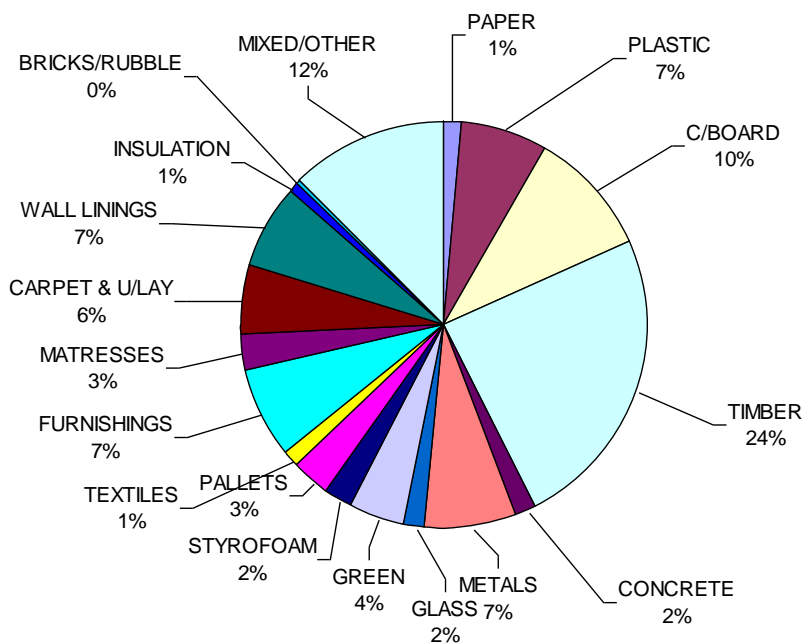


Figure 10 breakdown by volume of Commercial mixed bulky waste fractions, delivered by – Self haul/non-tipper vehicles.



3.5 BREAKDOWN OF COMMERCIAL MIXED BULKY WASTE DELIVERED BY–SELF HAUL/NON-TIPPER VEHICLES

3.5.1 Recycling Centre of Balcatta – Self Haul/Non-tipper Vehicles

Table 16 Breakdown of commercial mixed bulky waste delivered by vehicle type during the during the audit period.

VEHICLE TYPE	Count	Avg. Nett weight (Tonnes)	Total Nett weight (Tonnes)	Avg. sample volume (m ³)	Total volume (m ³)
>1 tonne non-tippers	199	0.858	170.742	10.7	2,129
Vehicles towing trailers	69	0.786	120.258	5.1	780
Utes	59	0.408	28.152	3.7	255
Vans	153	0.267	15.753	4.5	266
Vehicle type not recorded	70	0.515	36.050	6.4	448
TOTALS	550	0.674	370.955	7.05	3,878
% Vehicle type recorded	87%				
% Vehicle Type not recorded	13%				



3.6 COMMERCIAL MIXED BULKY WASTE –BREAKDOWN OF WASTE SOURCE BY VEHICLE TYPE

3.6.1 Recycling Centre of Balcatta – Open Skips/Tipper Vehicles

Table 17 Balcatta – Commercial mixed bulky waste breakdown by source process – Open skips/tipper vehicles.

Source Process	Count	% of Total Open Skips/Tipper Vehicles
Demolition Site	18	3%
Construction Site	65	10%
Workshop Waste	22	3%
General Clean-up (Commercial)	392	60%
*General Clean-up (Residential)	142	21%
Other	23	3%
TOTAL	662	100%
Average number of sources per load	1.2	

*The **General Clean-up (Residential)** category represents all mixed waste brought in from private households by commercial operators. It is not an indication of waste brought in by householders direct.

A number of drivers reported waste collection from a variety of sources per trip. For this reason, the total count for source process (662) exceeds the total number of tipper trucks that were interviewed (552). An average number of sources per load category (1.2) has been included to highlight the fact that some trucks will indeed be bringing in bulky waste from greater than one source, and may contain a mix of bulky waste and general waste as a result.



Those wastes recorded under the “**Other**” category, included waste from such sources as:

- A hostel for the homeless;
- Waste from schools;
- Wombat Waste (general rubbish left over after a sorting and recovery process at the wombat waste site);
- General rubbish pick up (ie. could not be included in the bulky waste categories);
- One load of furniture and timber products direct from the Recycling Centre of Balcatta shop.

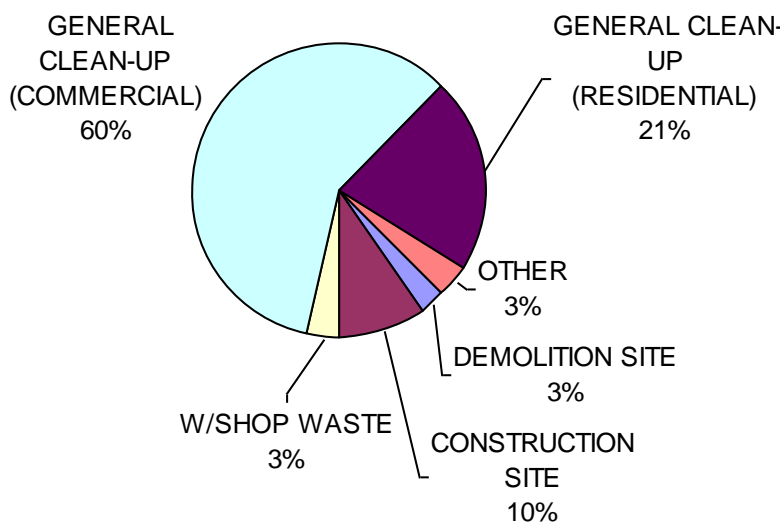


Figure 11 Commercial mixed bulky waste % breakdown by source process for Open skips/tipper vehicles.



3.6.2 Self Haul/Non-tipper Vehicles

Table 18 Commercial mixed bulky waste breakdown by source process – Self haul/non-tipper vehicles.

Source Process	Count	% of Total Self Haul/Non-tipper Vehicles
Demolition Site	11	2%
Construction Site	47	8%
Workshop Waste	22	4%
General Clean-up (Commercial)	258	45%
*General Clean-up (Residential)	230	40%
Other	8	1%
TOTAL	576	100%
Average number of sources per load	1.05	

*The **General Clean-up (Residential)** category represents all mixed waste brought in from private households by commercial operators. It is not an indication of waste brought in by householders direct.

A number of the non-tipper vehicle drivers reported waste collection from a variety of sources. For this reason, the total count for source process (576) exceeds the total number of non-tipper vehicles that were interviewed (550). An average number of sources per load (1.05) has been included to highlight the fact that some trucks will indeed be bringing in bulky waste from greater than one source, and may contain a mix of bulky waste and general waste as a result.

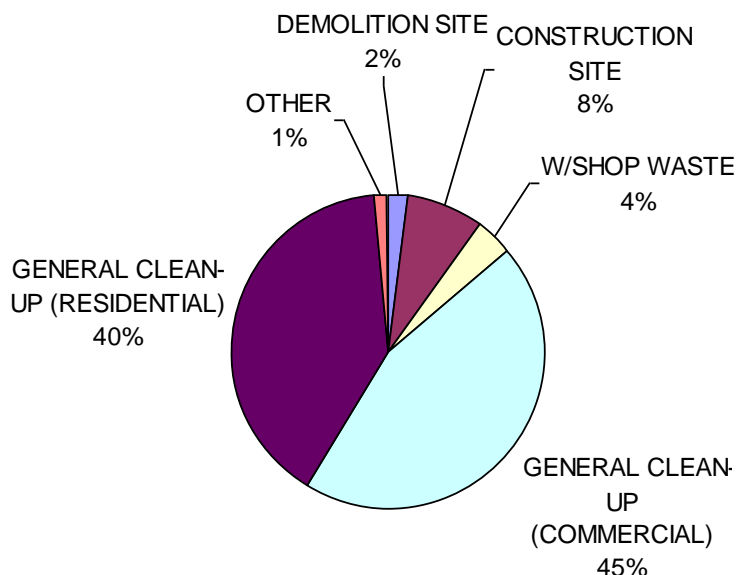


Figure 12 Commercial mixed bulky waste % breakdown by source process – Self haul/non-tipper vehicles.

3.7 COMMERCIAL MIXED BULKY WASTE – BREAKDOWN OF WASTE SUBURB OF ORIGIN BY VEHICLE TYPE

3.7.1 Recycling Centre of Balcatta – Open Skips/Tipper Vehicles

Table 19 Breakdown of commercial mixed bulky waste delivery by suburb of origin – Open skips/tipper vehicles.

SUBURB	# TIPPERS	% TIPPERS
Balcatta	124	22.5
Osborne Park	60	10.9
Multiple Northern Suburbs	45	8.2
Malaga	35	6.3
Perth	34	6.2
Wangara	22	4



Multiple Suburbs (All Over)	19	3.4
Landsdale	11	2
East Perth	10	1.8
Bayswater	7	1.3
Balga	5	0.9
Ballajura	5	0.9
Beechboro	1	0.2
Belmont	2	0.4
Bentley	1	0.2
Balga	1	0.2
Bullsbrook	2	0.4
Burns Beach	1	0.2
Caversham	1	0.2
Churchlands	1	0.2
City Beach	3	0.5
Claremont	5	0.9
Clarkson	1	0.2
Cottesloe	2	0.4
Craigie	2	0.4
Dalkeith	3	0.5
Dianella	4	0.7
Doubleview	4	0.7
Duncraig	3	0.5
Floreat	3	0.5
Fremantle	1	0.2
Girrawheen	1	0.2
Glendalough	1	0.2
Grayland	1	0.2
Greenwood	2	0.4
Gwelup	1	0.2
Hamersley	5	0.9
Herne Hill	3	0.5
High Wickham	1	0.2
Hillarys	6	1.1
Iluka	1	0.2



Inglewood	1	0.2
Innaloo	6	1.1
Joondalup	5	0.9
Kalamunda	2	0.4
Karrakatta	1	0.2
Karrinyup	6	1.1
Kewdale	1	0.2
Kingsley	1	0.2
Leederville	4	0.7
Manning	1	0.2
Marangaroo	3	0.5
Merriwa	1	0.2
Midland	2	0.4
Mirabooka	3	0.5
Morley	5	0.9
Mosman Park	2	0.4
Mt Claremont	1	0.2
Mt Hawthorn	3	0.5
Mt Lawley	4	0.7
Mullaloo	1	0.2
Murdoch	3	0.5
Nedlands	4	0.7
Neerabup	1	0.2
Nollamara	2	0.4
Northbridge	2	0.4
North Perth	1	0.2
Ocean Reef	1	0.2
Peppermint Grove	1	0.2
Scarborough	3	0.5
Shenton Park	3	0.5
Stirling	5	0.9
Subiaco	6	1.1
Swanbourne	4	0.7
Swan View	1	0.2
Trigg	1	0.2



Wanneroo	3	0.5
Warnbro	1	0.2
Warwick	2	0.4
Wembley	1	0.2
Westminster	1	0.2
West Perth	1	0.2
Whitfords	5	0.9
Woodvale	1	0.2
Yokine	2	0.4
Suburb Not Recorded	4	0.7
TOTALS	552	100

3.7.2 Recycling Centre of Balcatta – Self Haul/Non-tipper Vehicles

Table 20 Breakdown of commercial mixed bulky waste delivery by suburb of origin – Self haul/non-tipper vehicles.

SUBURB	# NON-TIPPERS	% NON-TIPPERS
Perth	73	13.3
Osborne Park	55	10
Balcatta	33	6
Multiple Northern Suburbs	16	2.9
Balga	13	2.4
Bayswater	13	2.4
Malaga	13	2.4
Subiaco	13	2.4
Mirabooka	12	2.2
Mt Lawley	11	2
Nollamara	11	2
Multiple Suburbs (All Over)	11	2
Alexander Heights	1	0.2
Applecross	1	0.2
Attadale	1	0.2
Ballajura	4	0.7



Bassendean	1	0.2
Bateman	2	0.4
Beechboro	2	0.4
Bedford	1	0.2
Belmont	3	0.5
Booragoon	1	0.2
Byford	1	0.2
Cannington	3	0.5
Canning Vale	2	0.4
Carine	10	1.8
Caramar	1	0.2
City Beach	2	0.4
Claremont	6	1.1
Como	3	0.5
Craigie	2	0.4
Dianella	7	1.3
Doubleview	8	1.5
Duncraig	3	0.5
East Perth	1	0.2
Eden Hill	1	0.2
Ellenbrook	2	0.4
Embleton	1	0.2
Floreat	3	0.5
Forrestfield	1	0.2
Girrawheen	4	0.7
Gnangara	1	0.2
Glendalough	1	0.2
Greenwood	6	1.1
Guildford	1	0.2
Gwelup	2	0.4
Hamersley	3	0.5
Highgate	1	0.2
High Wickham	3	0.5
Hillarys	5	0.9
Iluka	2	0.4



Inglewood	3	0.5
Innaloo	2	0.4
Joondalup	2	0.4
Kalamunda	1	0.2
Kalaroo	2	0.4
Kardinya	2	0.4
Karrinyup	6	1.1
Kelmscott	1	0.2
Kewdale	2	0.4
Kingsley	6	1.1
Kinross	1	0.2
Kondoola	4	0.7
Kwinana	1	0.2
Landsdale	1	0.2
Lathlain	1	0.2
Leederville	7	1.3
Lockridge	1	0.2
Mandurah	1	0.2
Manning	1	0.2
Marangaroo	1	0.2
Marmion	2	0.4
Maylands	3	0.5
Merriwa	1	0.2
Midland	1	0.2
Morley	3	0.5
Mt Hawthorn	5	0.9
Mullaloo	1	0.2
Nedlands	2	0.4
Noranda	3	0.5
North Perth	9	1.6
Ocean Reef	2	0.4
Padbury	1	0.2
Parkwood	2	0.4
Peppermint Grove	1	0.2
Redcliffe	1	0.2



Riverton	1	0.2
Rockingham	1	0.2
Scarborough	10	1.8
Shenton Park	2	0.4
South Perth	3	0.5
Stirling	7	1.3
Swanbourne	3	0.5
Swan Valley	1	0.2
Thornlie	2	0.4
Tuart Hill	2	0.4
Victoria Park	1	0.2
Wanneroo	3	0.5
Wangara	7	1.3
Warnbro	1	0.2
Warwick	2	0.4
Wembley	4	0.7
West Leederville	1	0.2
Westminster	8	1.5
West Perth	6	1.1
Whitfords	4	0.7
Wollamara	1	0.2
Woodvale	2	0.4
Yanchep	2	0.4
Yokine	9	1.6
Suburb Not Recorded	7	1.3
TOTALS	550	100



3.8 COMMERCIAL MIXED BULKY WASTE FUTURE PROJECTIONS

Future projections of commercial mixed bulky waste deliveries to the Recycling Centre of Balcatta are essential for the future management, and eventual closure of the Tamala Park landfill site. The primary criterion used for the future projections is population trends.

The current (2009) commercial bulky waste measurements per capita (based on the current combined population of: Town of Victoria Park; City of Stirling; Town of Cambridge; Town of Vincent and City of Perth) are:

Commercial Mixed Bulky Waste per Capita (Tonnes)	0.0997
Commercial Mixed Bulky Waste per Capita (m ³)	0.7

Based on these figures, the future commercial mixed bulky waste deliveries to Tamala Park, via the Recycling Centre of Balcatta is shown by graphically in **Table 21 and Figure 13**.

Table 21 Recycling Centre of Balcatta - 2010-2020 Commercial Mixed Bulky Waste Delivery Projections

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Population Projection	285720	288400	290280	292160	294040	295920	297800	300120	302440	304760	307080
Projected Weight (Tonnes)	28486	28753	28941	29128	29315	29503	29691	29922	30153	30385	30616
Projected Volume (M³)	200004	201880	203196	204512	205828	207144	208460	210084	211708	213332	214956

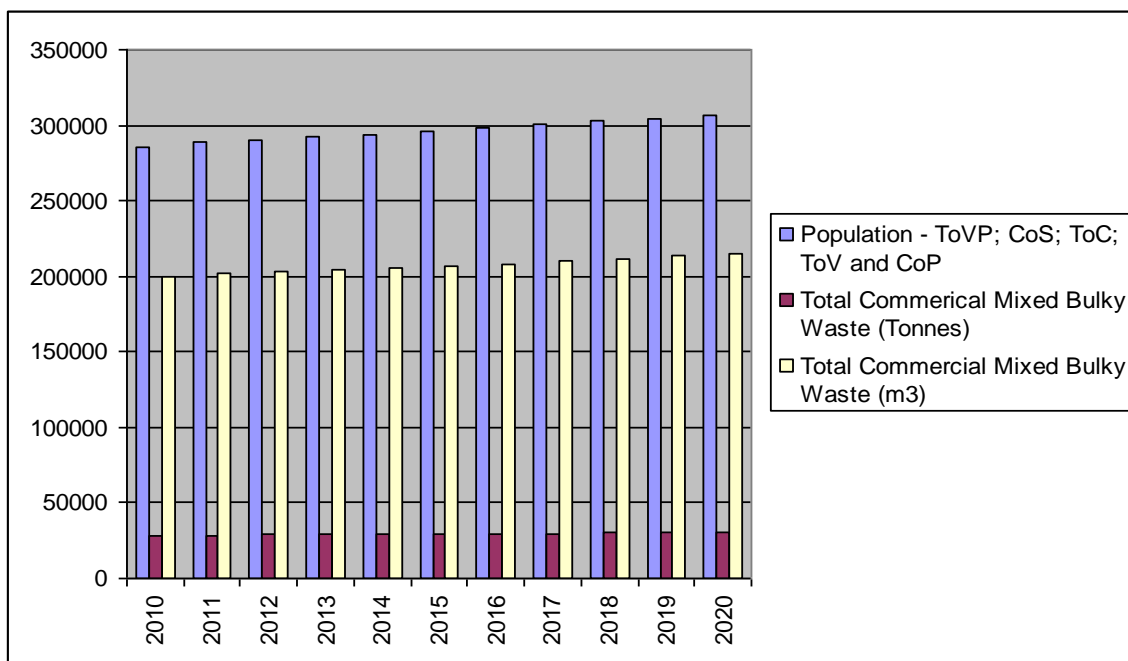


Figure 13 Recycling Centre of Balcatta - 2010-2020 Commercial Mixed Bulky Waste Delivery Projections

