Environment Protection Authority

2023 C&I Waste Audit Report

NSW GOVERNMENT

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We recognise Aboriginal peoples' spiritual and cultural connection and inherent right to protect the land, waters, skies and natural resources of NSW. This connection goes deep and has since the Dreaming.

We also acknowledge our Aboriginal and Torres Strait Islander employees who are an integral part of our diverse workforce and recognise the knowledge embedded forever in Aboriginal and Torres Strait Islander custodianship of Country and culture.

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Acronyms and abbreviations

APC	APC Waste Consultants
AWD	Australian Waste Database
AWT	alternative waste treatment (or technology)
AS	Australian Standard
CFL	compact fluorescent light (globes)
CDS	container deposit scheme
EC	EC Sustainable
DOC	degradable organic carbon
EPS	expanded polystyrene
ERA	extended regulated area
HDPE	high-density polyethylene
kg	kilogram
LDPE/LLDPE	low-density polyethylene
LGA	Local government area
MLA	Metropolitan Levy Area
MRF	materials recovery facility
MSW	municipal solid waste
NLA	Non-levied area
OH&S	Occupational health and safety
PET	polyethylene terephthalate
PP	polypropylene
PPE	personal protective equipment
PS	polystyrene
PVC	polyvinyl chloride
RLA	Regional Levy Area
RRA	regional regulated area
SMA	Sydney Metropolitan Area
WaSM	NSW Waste and Sustainable Materials Strategy 2041
WEEE	waste electronic and electrical equipment

Executive summary

This report contains the results of the fourth New South Wales (NSW) commercial and industrial (C&I) waste audit conducted over the past 20 years. It provides a level of granularity not available from other data sources in relation to the composition, source and delivery mode of NSW C&I waste.

The audit results provide meaningful and timely data for the entire sector and quantify the nature and amount of the specific materials currently taken to landfill for disposal. The data identifies:

- how well current resource-recovery activities are being embraced
- where greatest effort should be directed for further resource recovery by material and source
- where future opportunities exist for further resource recovery.

Based on data from facility reports, most C&I waste (69%) is generated in the Metropolitan Levy Area (MLA), while 26% is generated in the Regional Levy Area (RLA) and 5% in the non-levied area (NLA).

This audit report:

- details selected material categories and sub-categories of C&I waste
- identifies the composition and generation by industry sectors
- identifies potentially recoverable materials that are currently landfilled
- identifies key focus material categories and sub-categories to inform future public policy
- identifies differences in composition between regions and levy areas
- compares the 2014 and 2023 audit findings.

Key findings

Main components of C&I waste

This audit found the main components of C&I waste to be:

- garbage bags (44.8%)
- residuals (16.2%)
- organics (14.2%)
- plastic (7.9%).

Of material in garbage bags, the largest components were:

- organic materials (25.0%)
- paper and cardboard (20.3%)
- other (17.3%)
- plastic (16.4%).

When the contents of the garbage bags are distributed, the largest components were:

- organic materials (25.4%)
- residuals (16.2%)
- plastic (15.3%)
- paper and cardboard (13.4%).

Load compositions

Most C&I waste (82.5% by weight) arrives at disposal facilities in mixed loads. The rest arrives as ‘single material loads’ where 90% or more of the load is just one material. These two types of deliveries differ significantly in composition.

About 80% of mixed loads comprise just three materials: garbage bags (53.7%), organics (16.1%) and plastic (9.2%).

Single-material loads comprise mainly post-processing waste residuals (72.4%); aggregates, masonry and soils (13.1%); and organics (5.1%). Most single-source loads are from waste management operations (45.7%), manufacturing (31%), and public administration and safety (11.8%).

When garbage bags are opened and the contents distributed, the following five materials represent more than 80% of the mixed C&I waste loads:

- organics (29.6%)
- plastic (18.0%)
- paper and cardboard (16.0%)
- other material (9.8%)
- aggregate, masonry and soil (6.8%).

Sector of origin

By sector, C&I waste is generated by:

- small and medium enterprises (59.4%)
- waste management operations and facilities (10.6%)
- manufacturing (8.0%)
- administration and support services (6.8%).

Garbage bags came mainly from:

- SMEs (88.2%)
- shopping centres (3.7%)
- accommodation and food services (1.8%)
- health care and social assistance (1.3%).

Prospects for recovery

Each material was classified as ‘recoverable now’ (using current technology), ‘recoverable in the future’ (using future technology and changes in practice) or ‘not recoverable’.

If we exclude garbage bags and their contents (i.e. assume they cannot be accessed):

- 19.9% of C&I waste (610,479 tonnes/year) is recoverable now
- 34.0% of C&I waste (1,043,802 tonnes/year) is recoverable in the future.

If we assume that the contents of garbage bags can be accessed:

- 35.2% of C&I waste (1,080,480 tonnes/year) is recoverable now
- 53.3% of C&I waste (1,635,698 tonnes/year) is recoverable in the future.

The largest opportunity to improve waste diversion from landfill is to focus on the identified materials in section 8 deemed to be recoverable now to divert an additional 500–700,000 tonnes of material.

1 Introduction

The EPA has commissioned four separate detailed waste audits of C&I waste since 2003, carried out at selected representative landfills and transfer stations across NSW. The data collected determines the composition of the C&I waste stream and provides granularity not available from other data sources. Data is obtained by conducting both visual assessments and bag audits in accordance with a detailed procedure refined over time.

The first C&I waste audits in 2003 and 2008 were confined to the Sydney Metropolitan area only. The 2014 audit expanded the geographic reach and assessed 14 sites across the NSW landfill levy-paying regions. The 2014 audit supported the planning and delivery of the Waste Less, Recycle More Initiative, which was delivered from 2012 to 2022 with $802 million of funding. The audit provided baseline data on C&I recyclable materials being disposed of at landfills and determined the waste profiles by key industry sectors, regions and sub-regions, with a focus on potentially recyclable material.

In 2021 the NSW Government announced a further significant investment in resource recovery as part of the transition to a circular economy under the NSW Waste and Sustainability Materials Strategy 2041. Stage 1 (2021–2027) of the Strategy outlines actions over a six-year period to move NSW towards a circular economy. Alongside the Strategy, the Waste Delivery Plan outlines how the EPA will work with partners to deliver on the government's strategic waste priorities under both the NSW Waste and Sustainable Materials Strategy and the NSW Plastics Action Plan.

This 2023 C&I audit data will provide an evidence base to support:

- government and industry investment decisions for the C&I sector
- development of future EPA waste and recycling programs
- other non-financial programs and policies to increase recycling of C&I waste
- regional and sub-regional waste and resource-recovery planning
- benchmarking against 2014 audit data
- evaluation of the impacts of government initiatives including Waste Less, Recycle More (2012–2022) and the NSW Waste and Sustainable Materials Strategy 2041 (2022 onwards).

This audit also provides useful insights into the current composition of the NSW C&I waste stream by selected material categories and sub-categories, including identifying:

- which industry sectors generate the most C&I waste
- potentially recoverable materials that are currently being landfilled
- key focus material categories and sub-categories to help inform future public policy
- geographical differences in composition by levy region
- key differences between the 2014 and 2023 audit findings.

The EPA engaged APC Waste Consultants (APC) to undertake an audit of C&I waste deliveries at 14 representative waste disposal facilities across the Metropolitan Levy Area (MLA), the Regional Levy Area (RLA) and the non-levied area (NLA). This is the first time the NLA has been included in the audit.

Field work was undertaken between 31 July and 19 September 2023 and involved visually assessing 1,507 C&I waste loads and attributing the composition to 51 identifiable visual categories. In addition, EC Sustainable extracted 3,540 individual bags of waste from assessed loads at 11 sites and sorted their contents into 148 more detailed categories.

2 Project scope

This section summarises the scope of the 2023 NSW C&I waste audit. Full details of the project scope and method are contained in the *NSW C&I Audit Methodology* (the method), which is available on request from the EPA.

To capture current C&I activity in NSW, two types of C&I audits were undertaken as part of this project:

1. disposal-based (visual) audits of vehicles bringing waste to landfills and transfer stations
2. disposal-based (weight) audits of garbage bags being brought to landfills and transfer stations.

2.1 What is C&I waste?

The National Waste Report provides the following definition of C&I waste:

***Commercial and industrial (C&I) waste**: waste produced by institutions and businesses; includes waste from schools, restaurants, offices, retail and wholesale businesses, and industries including manufacturing.*

Wastes typically excluded from the definition are:

- on-site disposal
- liquid food organics waste
- disposal to sewer
- agricultural and mining wastes
- building wastes
- biosolids
- hazardous wastes
- fly ash and slags
- SME waste collected under a municipal contract.

Waste exclusions

The following are noted exclusions from this project, as detailed in the method:

- municipal solid wastes (MSW) – solid waste generated from municipal and residential activities and including waste collected by, or on behalf of, a municipal council
- construction and demolition (C&D) wastes – wastes generated from residential and commercial C&D activities, e.g. bricks and concrete, wastes related to office fit-outs
- gaseous wastes
- transfer station loads delivered to landfills. These were excluded from landfill assessment to avoid double counting
- C&I waste recovered for recycling at reprocessing facilities and diverted from landfill.

Waste inclusions

Aggregates, masonry and soils (AMS) – materials identified in loads of C&I waste that are unlikely to have been generated by businesses operating in the C&D industry sector. This category includes commercial building fit-out, landscaping and garden maintenance operations.

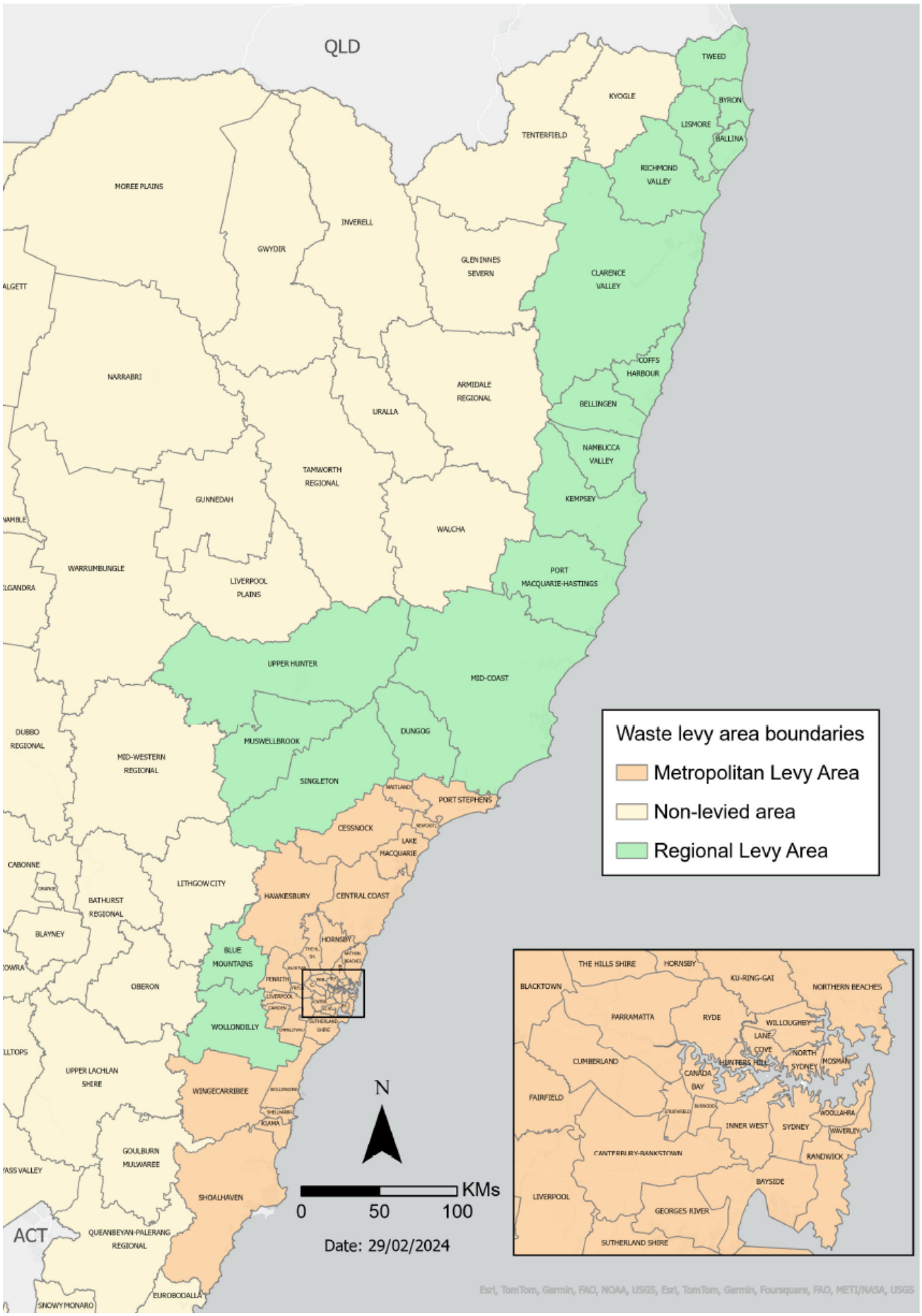
2.2 Geographic coverage

For the first time, the scope of this audit includes all three levy areas:

1. Metropolitan Levy Area (MLA) – Sydney Metropolitan area, the Illawarra and the Hunter regions
2. Regional Levy Area (RLA) – the mid and north coast councils, Blue Mountains, Wingecarribee and Wollondilly local government areas
3. Non-levied area (NLA) – remainder of the state.

Waste levy area boundaries are shown in the map below. The local government areas within the MLA, RLA and NLA are listed in Appendix A.

Figure 1 Map of NSW landfill levy boundaries



2.3 Sample size

A sample size of 1,500 loads for visual assessment and 2,000 individual bag samples was considered to provide a confidence interval of 90%. The sampling was divided between the three waste levy areas.

Table 1 Sample size proposed and actual by levy area

Levy area	Visual loads target	Individual bags target
MLA	1,200	2,600
RLA	150	450
NLA	150	450
Total	1,500	3,500

2.4 Target sectors

A key focus of the C&I audit method is the collection of data about targeted industry divisions and subdivisions as defined by Australian and New Zealand Standard Industrial Classification (ANZSIC) code (ABS & SNZ, 2006). The method specified 17 industry divisions and 12 subdivisions. The ANZSIC divisions and subdivisions targeted are listed below.

Table 2 ANZSIC code and label of target industry sectors and sources of waste

Code	Division	Subdivision
M	Manufacturing	Food product manufacturing
		Textile, leather, clothing and footwear
		Wood product manufacturing
		Polymer product and rubber product manufacturing
		Furniture and other manufacturing
W	Wholesale trade	Basic material wholesaling
		Grocery, liquor and tobacco product wholesaling
		Other good wholesaling
R	Retail trade	Food retailing
		Other store-based retailing
AF	Accommodation and food services	Accommodation
		Food and beverage
T	Transport, postal and warehousing	-
IT	Information media and telecommunications	-
F	Financial and insurance services	-
RE	Rental, hiring and real estate services	-
PS	Professional, scientific and technical services	-
AD	Administrative and support services	-
G	Public administration and safety	-
Ed	Education and training	-
H	Health care and social assistance	-
AR	Arts and recreation services	-
SC	Shopping centre	-
X	Other	-
U	Unknown (mostly SMEs)	-

Seven subdivisions that were not part of the 2014 project were added to 2023 audit. These were:

Manufacturing	**Wholesale trade**
C13 – Textile, leather, clothing and footwear manufacturing	F33 – Basic material wholesaling
C14 – Wood product manufacturing	F36 – Grocery, liquor and tobacco product wholesaling
C19 – Polymer product and rubber product manufacturing	F37 – Other goods wholesaling
C25 – Furniture and other manufacturing	

Definitions for each division and subdivision are provided in Appendix B.

Image 1 C&I waste loads being delivered to a Sydney transfer station. Credit: APC Waste Consultants

2.5 Recoverable materials

Each material in the C&I waste audit has been classified as either:

- *recoverable now* – using available technology
- *recoverable in the future* – through better source separation, development of emerging recycling technologies, existing recycling technologies becoming more easily accessible across NSW, and/or development of markets for recovered materials
- not recoverable – there are no current or emerging technologies that can feasibly recycle this material, or the material is being phased out, therefore recycling technologies and services are not expected to be available/developed to handle the material in the future.

Recoverable now

- Food organics – unpackaged
- Food organics – liquid
- Garden organics
- Wood – untreated
- Wood – untreated – pallets
- Wood – untreated – furniture
- Sawdust
- Cardboard – dry
- Cardboard – wet
- Paper – recyclable
- Paper – packaging
- Plastic – rigid packaging
- Plastic – EPS foam
- Glass – packaging
- Metal – ferrous – packaging
- Metal – ferrous – non-packaging
- Metal – aluminium – packaging
- Metal – aluminium – non-packaging
- Textiles – mattresses
- Rubber – tyres
- E&E – TVs
- E&E – computers and peripherals
- E&E – white goods
- E&E – photovoltaic systems
- E&E – other
- Chemicals/other hazardous (except oils)
- Aggregates, masonry & soils

Recoverable in the future

- Food organics – packaged
- Wood – single-use items
- Wood – treated/painted
- Wood – treated – pallets
- Wood – treated – furniture
- Wood – MDF & chipboard
- Cardboard – wet strength/waxed
- Plastic – other
- Other plastics (P7)
- Plastic film
- Glass – non-packaging
- Textiles – carpet & underlay
- Textiles – cloth & rags
- Leather
- Rubber – other
- Batteries
- Oils
- Nappies

Not recoverable

- Hand towels and contaminated tissue
- PS/EPS – single-use items
- Fines
- Floc (plastic and metal residuals from shredding)
- Building waste (composites)
- Pharmaceutical
- Asbestos
- Clinical
- Insulation
- Miscellaneous (this includes mixed boxes of items, luggage, bric-a-brac, brake residuals, drums of charcoal, air filters, glue, linoleum, synthetic grass, ducting)

3 Project method

The audit followed the method outlined in the *NSW C&I Audit Methodology*, prepared by Envisage Works. This section gives a brief overview of the method for the visual assessment and the garbage bag assessment.

3.1 Site recruitment

The method specified the number and type of sites per levy area to be audited.

APC contacted all nominated sites to introduce the project, seek relevant information and arrange a site inspection to confirm suitability for inclusion in the audit program.

All sites were co-operative and the site visits provided an opportunity to discuss the project in detail, meet management and operational staff, gain insights into site-specific operations and constraints, and identify audit locations, considering site safety, weather sensitivity and amenity and WHS issues pertinent to the audit. In addition, site safety protocols, site operations, vehicle numbers, traffic flow, staff inductions, vehicular coding and data management were discussed. Weighbridge operational staff were included in discussions, given that they are the first and last point of contact with the site by customers.

Site checklists were completed and detailed site-specific project plans submitted for each site, noting agreed vehicle interview and assessment locations and any site-specific works to be undertaken.

Not all sites were suitable or included, due to a range of factors. Alternative sites were nominated and substituted, in consultation with the EPA. Some sites requested preferred timing for the audit, based on site resourcing or planned site works. As the project was keen to minimise site disruption, where sites made specific requests regarding timing, every effort was made to accommodate such requests within the schedule, providing the timing fitted with the extensive intra-state travel and consecutive workdays could be undertaken. To protect commercially sensitive information, audit sites are not named in this report and audit findings have been aggregated to a regional level.

3.2 Scheduling

The audit method stated that the audits should occur at each facility over a minimum of two full consecutive weekdays in the same week and that the visual and garbage bags audit programs must be undertaken concurrently, with the bags being retrieved from loads that were visually assessed.

The schedule was constantly reviewed to accommodate new or emerging site-specific issues, so that the consecutive day work program could be delivered. The schedule also included substantial intra-state travel.

A pilot project was conducted in April 2023 at a suitable site to test and confirm the methods and calibrate the consistent application of the visual assessment between auditors. Officers of the NSW EPA attended to observe both the assessment of loads and the physical auditing of garbage bags.

3.3 Gatehouse survey

All incoming delivery drivers were interviewed to determine the origin of the waste. If the delivery was deemed to be a C&I load, the driver was asked about the source of the waste, the nature of the activity generating the waste, and the geographic locality where the waste was generated. A plain English language statement outlining the activity being undertaken was provided to all delivery drivers by either the weighbridge operator or interviewer.

The interviewer recorded the following information for all target loads at each site:

- date
- time
- vehicle registration plate

- vehicle type
- company delivering
- source by business code
- source by suburb
- disposal point on site
- for front and rear-lift vehicles, the number of businesses serviced.

Each waste delivery was recorded in accordance with the ANZSIC industry division codes and definitions as provided in Appendix B, where the code was known and/or as advised by delivery vehicle drivers. Whether or not the load was included in the audit program depended on the driver's responses to the questions above.

Image 2 Interviewing driver regarding source of waste delivery. Credit: APC Waste Consultants

3.4 Visual assessment

Each target vehicle was assessed during and after discharge. The audit method specified 12 consolidated material categories and 89 material types. It was anticipated that the full list of material types would be applied during the weight-based bag audits, and a reduced number of material types assessed for the visual-based audits, as many categories are only found in bagged waste. In consultation with the EPA, the visual categories were reduced to 51 material types and the bag audit categories increased to 148 material types. Appendix C lists the visual categories and material definitions used in the project. Staff recorded the following information for each load assessed:

- vehicle registration plate
- time
- date
- disposal point
- vehicle type
- vehicle volume
- observed volume at discharge
- degree of compaction

- degree of mixing/clumping
- if the load was >90% of single material
- material composition (litres per category).

Image 3 Mixed C&I delivery. Credit: APC Waste Consultants

Photographs of specific loads of interest were taken, subject to site conditions.

At transfer stations, the assessment was revised if resources were recovered from the delivered load by the facility operators. This was done in order to capture only those components destined for landfill. Scrap metal, timber, cardboard and mattresses were recovered at some sites.

Image 4 Timber recovered at the transfer station by site operators was deducted from the assessment
Credit: APC Waste Consultants

3.5 Garbage bag assessment

Garbage bags are defined as disposable plastic bags used to discard waste from on-site bins at C&I premises. Excluded from this definition are paper bags, hessian bags, bulker bags, small shopping carrier

bags, bags containing bulk non-specific material from manufacturing processes, insulation wrap and packaging materials wrapped in plastic. Figure 1 provides an example of the type of bags included and excluded from this study.

Figure 2 Examples of garbage bag types included and excluded. Credit: APC Waste Consultants

Included

Excluded

Garbage bag assessments were undertaken only on loads that visually contained more than 20% garbage bags by volume. Each sample contained 10 individual bags, therefore the 350 samples totalled 3,500 individual bags. Only one sample could be extracted per visually assessed load. The following steps were undertaken in relation to the collection of bagged waste:

1. planning – stakeholder engagement, site visits and safe work methods
2. mobilisation – staff training, site inductions, develop management systems and quality control
3. site set-up – collection area at landfill or transfer station
4. collection – 10 individual bags from assessed C&I loads containing more than 20% garbage bags
5. collation – all bags coded, weighed and recorded on a run sheet with sampling details
6. transfer – bags transported to the sorting site.

Image 5 Typical load containing bagged waste. Credit: APC Waste Consultants

All bag samples were delivered to a common sorting area rather than moving the audit team to the various sites, given the individual site constraints and space required to sort 148 categories. The following steps were involved in the sorting phase:

1. site set-up – prepare audit sorting area, label sorting bins and calibrate scales
2. bag receipt – audit team receives garbage bags and places them in sample number order, with bags from the same load grouped together
3. weigh full bags – prior to sorting, as a quality control check against the collection site data
4. sorting – bags are sorted into the 148 categories by placing materials into labelled 60-litre sorting bins
5. weigh each category – the weight of each material category is recorded (tare and gross bin)
6. material is tipped into 240-litre mobile garbage bins for recycling or disposal at the sorting site
7. photos are taken of sorted materials and materials of interest
8. site clean-up.

For findings of the garbage bag assessments refer to the *2023 C&I waste audit – garbage bag report*, available on the EPA website.

3.6 Data analysis

To support this audit, an 'Analysis and Reporting Specification Tool' was developed in MS Excel as per the *NSW C&I Audit Methodology*. The tool provides consistency in data collation and transparency and reproducibility of analyses for this and future audits for comparative analysis.

Data from the visual audit was collected on a volumetric basis and then converted to weight, based on the degree of compaction observed (high/medium/low) and the relevant compaction density values assigned. Some new material densities were applied based on industry input while the majority remained the same as for the 2014 C&I waste audit. The material density conversion factors used to convert litres observed to tonnes is provided in Appendix F.

All sites participating in the audit had weighbridges installed and no load estimations occurred. Each site provided a daily activity report from which target loads were identified. The registration number for each vehicle assessed was matched to the corresponding weighbridge data. The composition by weight per load was then scaled to the actual weighbridge record for each sampled load.

The garbage bag audit dataset, by weight, was consolidated into the vehicle dataset. Subcategories of the bag audit were consolidated to the 51 visual audit categories. Appendix E lists the bag material consolidation categories.

These categories were further consolidated to 12 summary categories:

1. Aggregates, masonry & soils
2. Electrical & electronic
3. Glass
4. Metal
5. Organics
6. Paper & cardboard
7. Plastic
8. Rubber
9. Textiles & leather
10. Hazardous
11. Residues
12. Other.

Data validation included two types of reviews.

- Review of all entries seeking to identify any potential outliers. Each numerical value was standardised to z-scores, and each value evaluated under the assumption that values greater than (3) indicate extreme data points. If extreme data points were found, they were individually reviewed to decide whether the value was realistic or was caused by an error. Notes made by assessors proved invaluable as they identified atypical or unusual waste composition. Each data point was either removed or kept according to the conclusion of the assessment. In total 10 assessments or 0.66% of assessments were removed as outliers.
- Some loads were excluded from scaling based on specific load and/or local knowledge, where unique deliveries were deemed to be atypical, not representative of other sites, or the result of a one-off event. Examples included deliveries of beehives contaminated with varroa mites and organic wastes from a cannabidiol (CBD) oil manufacturer.

Once all entered data was validated, the datasheet was protected to secure the raw data from unintentional modifications and preserve it for possible use outside the scope of the current tender.

The analysis was conducted by applying the Central Limit Theorem onto the collected data. This was used as an overarching theoretical approach in understanding accuracy of the estimations. An analysis of each participating site was provided to each site in a report format.

To obtain an estimate of the weight and composition of the total annual waste, the composition breakdown estimates of each load were scaled to the total quantity of C&I waste disposed of throughout the target year.

The suburb information obtained from the drivers delivering loads was converted to postcodes, then allocated to a local government area (LGA), then allocated to a Regional Organisation of Councils (ROC), then to a waste levy area.

All site data was aggregated to a waste levy region and scaled up using Waste Contribution Monthly Reports (WCMR) data, which is reported to the EPA under section 88 of the *Protection of the Environment Operations Act 1997*.

Specific analysis of interest by material types was undertaken, including:

- Recoverability – based on agreed definitions of 'recoverable now', 'recoverable in the future' and 'not recoverable'. Refer to Table 4.
- Degradable organic carbon (DOC) – material categories that contain materials that would degrade and produce greenhouse gases when disposed of in landfill, such as paper, cardboard, food, textiles, vegetation and nappies.
- Packaging materials – material categories containing materials used for packaging, such as paper, cardboard, glass, steel, aluminium and liquid paperboard.
- Single-use plastics in the bag audit.
- Container Deposit Scheme (CDS) eligible beverage containers in the bag audit.

All data was provided to the EPA in a single Excel file for ease of transferability.

This report presents results for NSW, by levy area – MLA, RLA and NLA. The dashboard provides an analysis by regional groupings of councils where there is sufficient data. Appendix A lists councils within each levy area and regional grouping.

Image 6 Single-use plastics in a C&I transfer station load. Credit: APC Waste Consultants

3.7 Representative sample

The sample for this audit is necessarily small due to the high per-capita cost and resource-intensive nature of waste auditing. There is always a small probability of inadvertently sampling waste from atypical loads, resulting in non-representative data. An outlier analysis was undertaken of all loads and 10 samples were removed from the overall analysis.

The sample was stratified geographically across the three levy areas, 14 sites and within nine regional groupings of councils. The days that audits were done at each site were chosen randomly.

Fourteen sites (eight landfills and six transfer stations) across NSW participated in the project. Some sites had both a landfill and a small-vehicle transfer station, where loads from small vehicles were consolidated and transported to the landfill for final disposal. In these cases, the site type was deemed to be a landfill. Nine sites were in the MLA, three sites in the RLA and two sites in the NLA. One thousand, five hundred and seven (1,507) loads were visually assessed, with 10 samples removed after being classed as outliers or atypical.

The number of sites and type of facility per levy area, and samples included in final analysis for both visual and garbage bags, are shown below.

Table 3 Sample size by levy area, audit type and samples achieved

Levy area	Visual target	Visual actual[1]	Bags target	Bags actual
MLA	1,200	1,136	2,600	2,720
RLA	150	207	450	370
NLA	150	154	450	450
Total	**1,500**	**1,497**	3,500	**3,540**

EC Sustainable proposed additional sorting categories for the bag audit to provide greater granularity, including 22 subcategories for textile and leather. The garbage bag sample size was increased from 2,000 to 3,500 individual bags to ensure robust data at a more detailed level.

A sample of 1,497 loads was analysed, with a volume of 16,882 m^3 and a weight of 3,924 tonnes.

Table 4 Disposal tonnes, vehicles and sites assessed

Levy area	Tonnes assessed	Vehicles assessed	Number of sites
MLA	3,256	1,136	4 landfills 5 transfer stations
RLA	433	207	2 landfills 1 transfer stations
NLA	236	154	2 landfills 0 transfer stations
Total	**3,924**	**1,497**	**8 landfills** **6 transfer stations**

Most samples (61.1%) were taken at transfer stations; 38.9% were taken at landfills. The transfer stations typically had smaller vehicles that carried smaller volumes of waste.

Table 5 Tonnes and vehicles assessed, by site type

Site type	Tonnes assessed	Vehicles assessed	Mixed loads assessed	Single-material loads assessed
Landfills	1,977	582	496	86

[1] Samples analysed after removal of outliers and atypical loads

Transfer stations	1,947	915	843	72

By levy area, 75.9% of samples were assessed in the MLA, 13.8% in the RLA and 10.3% in the NLA. Of the vehicles assessed at landfills, 60.0% were from the MLA, 27.8% from the RLA and 12.2% from the NLA. Of the transfer station samples, 86.0% were in the MLA, 4.9% in the RLA and 9.1% in the NLA.

Table 6 Sample size for visual audit by site type and levy region – number of sites

Site type	MLA	RLA	NLA	Overall
Landfills	4	2	2	8
Transfer stations	5	1	0	6
Total	**9**	**3**	**2**	**14**

Table 7 Sample size for visual audit by site type and levy region – number of loads assessed

Site type	MLA	RLA	NLA	Overall
Landfills	787	45	83	915
Transfer stations	349	162	71	582
Total	**1,136**	**207**	**154**	**1,497**

A sample of 3,540 bags weighing 5.92 tonnes was obtained. Most garbage bag samples (64%) were obtained from transfer stations, with 36% from landfills. By levy area, 77% of samples were obtained from the MLA, 10% from the RLA and 13% from the NLA.

Of the 1,260 bags obtained from landfills, 440 were from the MLA, 370 from the RLA and 450 from the NLA. All 2,280 transfer station samples were collected from the MLA. No transfer stations outside the MLA were sampled.

Table 8 Sample size for bag audit by site type and levy region – number of sites

Site type	MLA	RLA	NLA	Overall
Landfills	3	2	2	7
Transfer stations	4	0	0	4
Total	**7**	**2**	**2**	**11**

Table 9 Sample size for bag audit by site type and levy region – number of bags audited

Site type	MLA	RLA	NLA	Overall
Landfills	440	370	450	1,260
Transfer stations	2,280	0	0	2,280
Total	**2,720**	**370**	**450**	**3,540**

3.8 Study limitations

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

- Time frame visual audit field work was undertaken over 26.5 days between 31 July and 19 September 2023. The garbage bag sampling was conducted over 25 days with the bag audit conducted over 45 days in August to October 2023.
- Seasonality – seasons and weather events influence waste generation. This audit was undertaken across two seasons, from late July (winter) to mid-September (spring) and across seven regions from Metropolitan Sydney, the Illawarra, the Hunter, the Mid and Far North Coast and inland from the Central and Northern Tablelands. No adverse or significant weather events occurred throughout the audit.
- Sample size limitations – all surveys carry an element of sampling error, which is the mathematical error associated with using a sample to represent a total population. Taking larger samples reduces sampling error. The sampling error involved in waste audits is generally small and can be tabulated

by producing estimates augmented by upper and lower confidence intervals. The expected confidence interval for this study is 90%, with a 6% error margin. Results for regional groupings of councils, where sufficient samples were taken, were given either a high or medium confidence in the modelling.

- Logistical constraints – time, cost, access to sites willing to participate, sites that met WHS requirements, and sites that did not receive sufficient volumes of waste meant it was not possible to sample all regional groupings of councils.
- Weight-based analysis – the collection of data for this audit was recorded by volume and converted to weight using approved material densities supplemented by reliable local industry information and based on observed load compaction. Weight-based reporting may cause some materials to appear to be present in quite small proportions due to their comparatively low material densities (e.g. plastic film), but they account for considerable volume. Weight-based analysis has been used in this audit because it is a standard procedure for all public policy targets and strategies.

3.9 Data validation

The method specified the overall sample size of 1,500 vehicles and 2,000 garbage bags with sub-sampling in the MLA, the RLA and the NLA at a 90% confidence interval.

Data validation and statistical analysis was undertaken by APC Waste Consultants, using a model based on the *NSW C&I Audit Methodology* supplied by the EPA.

The EPA also engaged independent statisticians to undertake a peer review of the data analysis contained in this report.

The statistical analysis undertaken indicates overall remarkably robust results, due to the large sample size and the comparatively low variances of material distributions. The maximum standard error of the mean at a 90% CI for an individual material was 1% for garbage bags, providing confidence that the data is robust.

The average proportion of individual materials in the entire waste stream is provided in Appendix G, with the upper and lower bounds of the CIs calculated from the standard deviation of individual load percentages.

Overall, the estimates appear accurate and the variance (represented by the standard deviation), while reasonably high, is countered by the large sample size, leading to reasonably accurate percentage measures, even for small amounts. Examples include:

- Cardboard (dry) – while only representing 5.2% of material, dry cardboard has a standard error of the mean of 0.3%, leading to a 90% confidence interval of 4.7–5.7%.
- Wood (treated/painted) – with a large representation of 7.3%, this material has a standard error of the mean of 0.5%, leading to a 90% confidence interval of 6.5–8.1%.

Image Load of predominantly cardboard. Credit: APC Waste Consultants

3.9.1 Consolidated material categories

Analysis was undertaken of the consolidated material categories by weight to determine the confidence intervals at this level. This analysis shows particularly strong patterns in the data, and that the variability in composition of loads is quite high in particular material types. In summary, the analysis forms a robust body of data but patterns in some of the finer aspects of the analysis should be interpreted cautiously.

This analysis suggests:

- considerable variation in the weight of different audited loads, from 20 kg to over 17 tonnes
- considerable variation in the different material types present in C&I waste
- C&I is not a homogenous waste stream.

The most prevalent items in C&I loads are:

- plastics – present in 76% of undistributed loads and 82% of loads when garbage bag contents were distributed
- organics – present in 65% of undistributed loads and 80.8% of distributed loads
- paper and cardboard – present in 63.1% of undistributed loads and 69.9% of distributed loads.

Image 7 C&I Load with high organic composition. Credit: APC Waste Consultants

Table 10 Prevalence of material in loads audited – bags not dispersed

Material category	% prevalence in loads
Plastic	76.0%
Organics	65.0%
Paper & cardboard	63.1%
Garbage bags	44.7%
Textiles & leather	32.3%
Metal	30.7%
Aggregates, masonry & soils	19.2%
Electrical & electronic	10.4%
Other	9.1%
Glass	8.1%
Rubber	4.3%
Residuals	3.1%
Hazardous	1.7%

Table 11 Prevalence of material in loads audited – bags dispersed

Material category	% prevalence in loads
Plastic	82.0%
Organics	80.8%
Paper & cardboard	69.9%
Textiles & leather	61.7%
Metal	60.5%
Aggregates, masonry & soils	54.8%
Glass	48.0%
Rubber	46.5%
Hazardous*	46.2%
Electrical & electronic	45.8%
Other	44.7%
Residuals	3.1%

* Predominantly clinical from the healthcare sector

Image 8 Load of soft plastics. Credit: APC Waste Consultants

3.9.2 Data extrapolation

Material quantities are reported in terms of tonnage per year through the application of regional extrapolation factors. Extrapolation factors were derived by using the EPA's regional tonnes and applying the audit compositional profile per region. The steps shown in Figure 3 were followed to scale the data.

Figure 3 Data extrapolation flow diagram

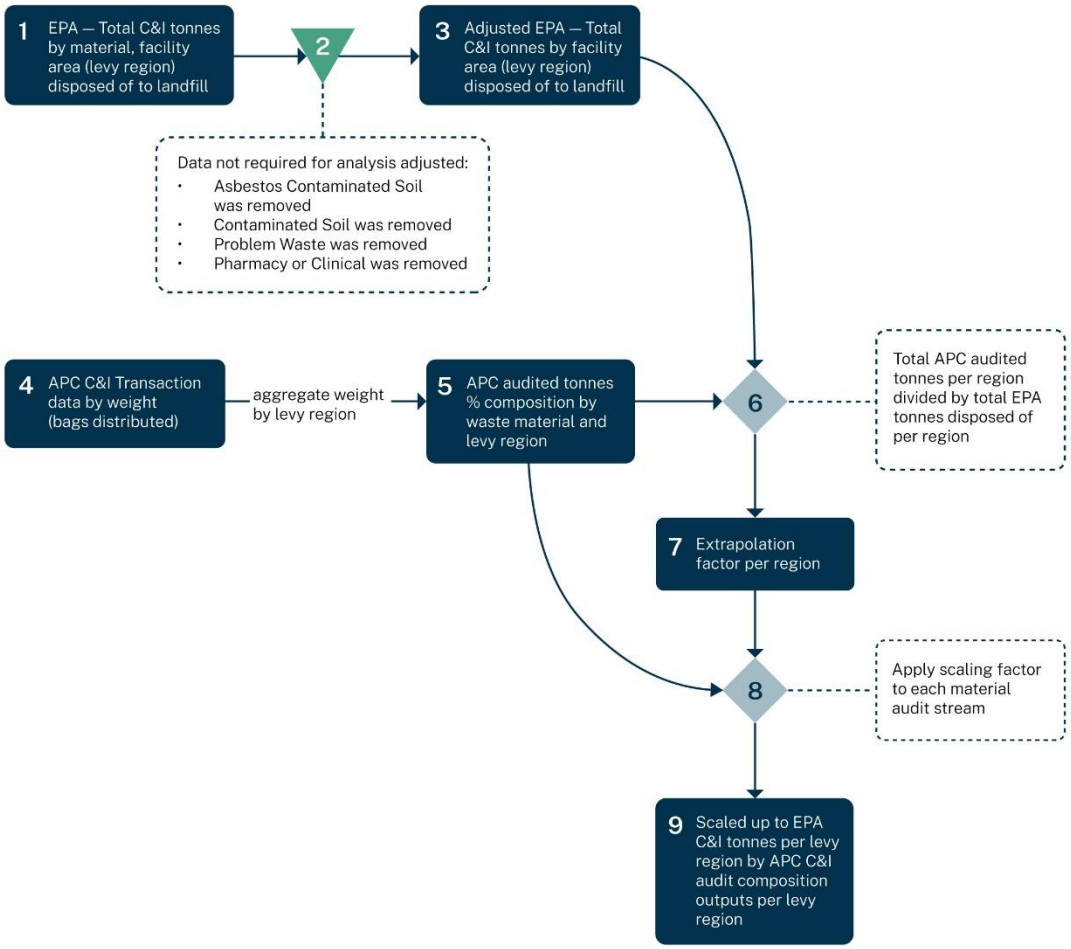


Image 9 Plastics were present in 76% of all loads visually assessed.
Credit: APC Waste Consultants

3.10 Dashboard

The dashboard, available on the EPA website, provides the data collected in this audit in an accessible format that allows users to analyse it themselves. Given the extensive and comprehensive nature of the data, it is not possible to present every analysis. By providing the dataset publicly, we've allowed users to seek information about specific data sets that are of interest to them.

The dashboard is broken down into the following sections.

Regional analysis Audit data scaled to reflect regional generation and composition	**Garbage bag analysis** Only garbage bag data, with three levels of material granularity.
Composition – by levy region, regional grouping, industry sector, recoverability and material category. ○ Based on two scenarios – bags dispersed and bags NOT dispersed. **Industry sector comparison** – by levy region, regional grouping, industry sector and material category. ○ Based on two scenarios – all-sector comparison including unknown (mixed SME) sectors, and identifiable sectors only.	**Focus areas** – by levy region, regional grouping, industry sector and material category. ○ Based on three focus area scenarios – recoverability potential, organics vs non-organics, and packaging vs non-packaging. **Industry sector comparison** – by levy region, regional grouping, industry sector and material category. ○ Based on three scenarios – leviable regions, organics vs non-organics, and packaging vs non-packaging.

The dashboard provides greater access and granularity; however, confidence in the data is reduced when drilling down into further detail, and such detail is only representative of a point-in-time survey.

Figure 4 Dashboard home screen

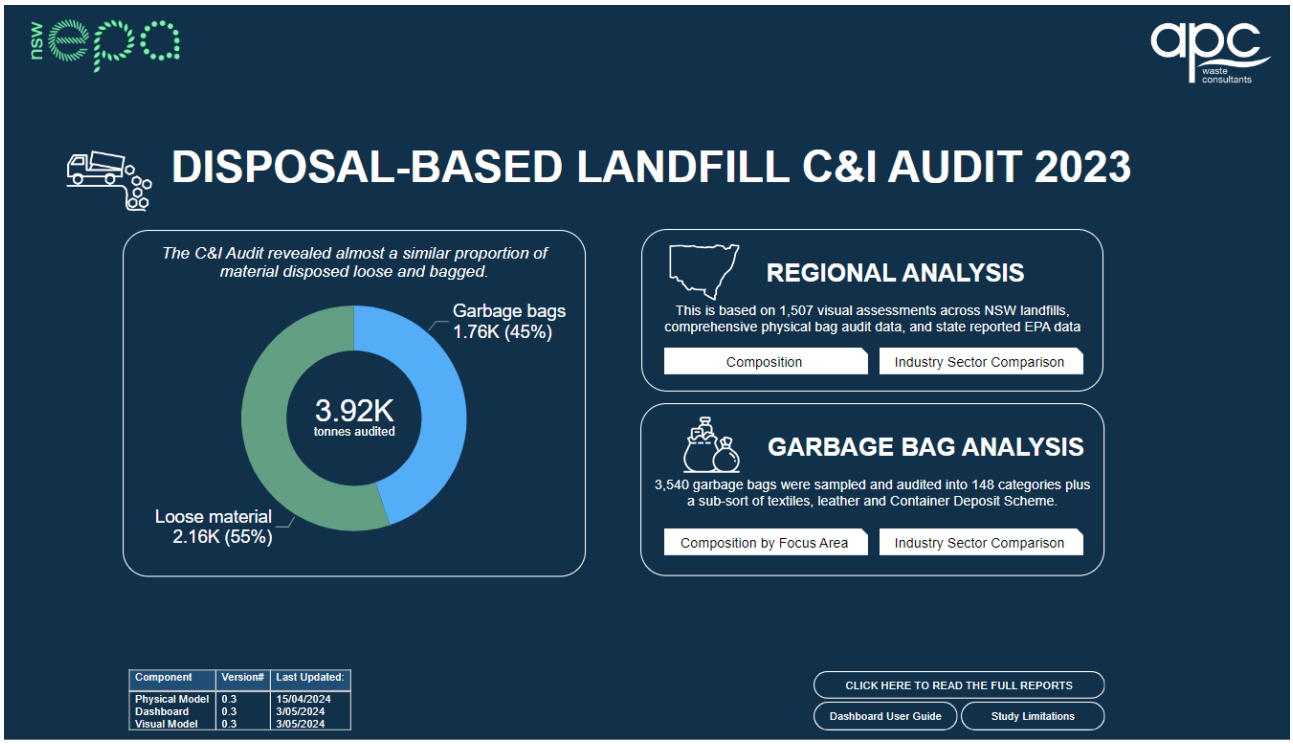


Figure 5 Example of dashboard visualisations – regional profile landing page

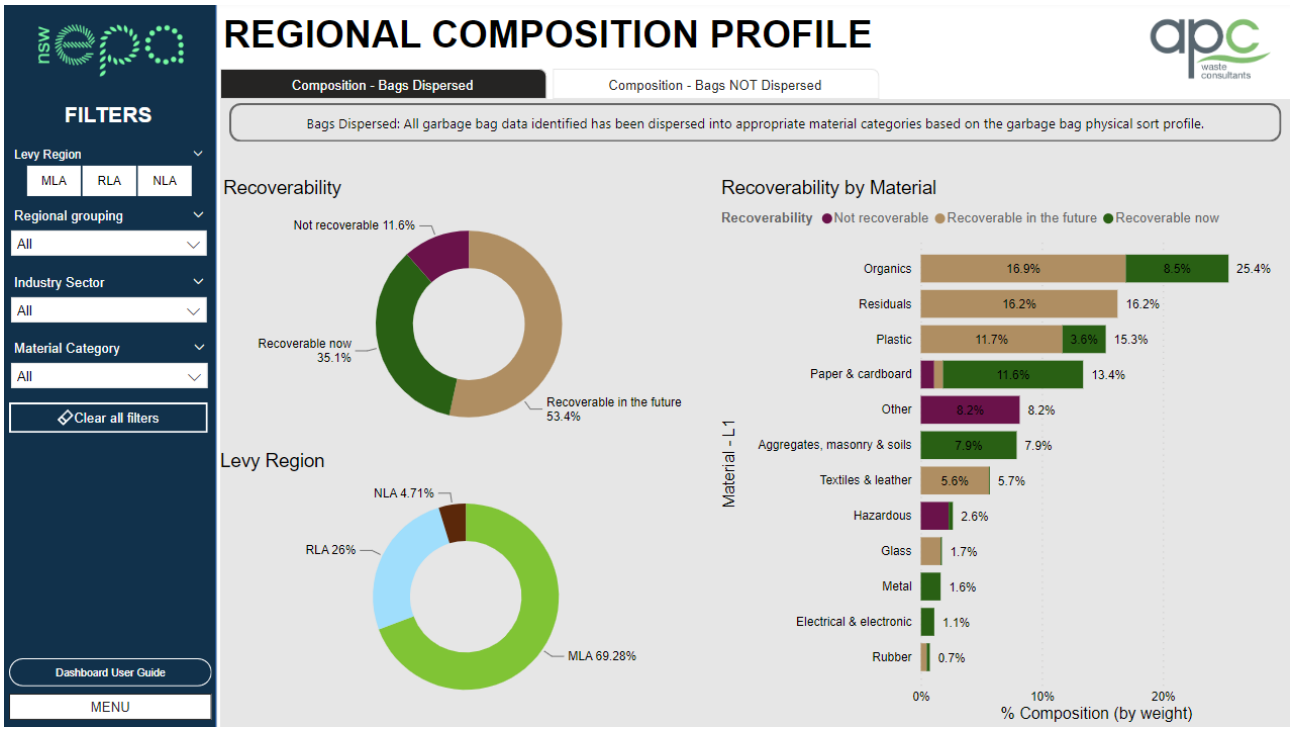
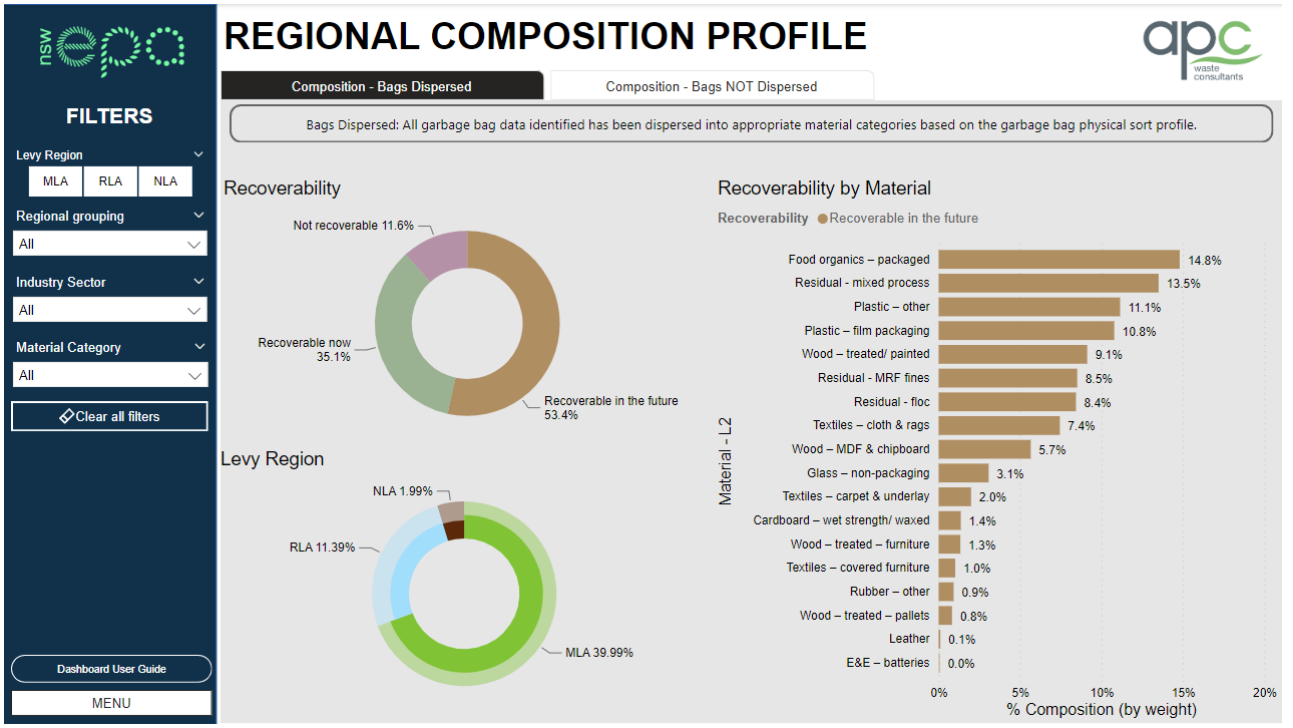


Figure 6 Example of dashboard visualisations – regional profile – drill down by 'recoverable in the future'



4 Key findings – NSW

All data is reported in tonnes and all percentages are by weight. As the result of rounding, values in the tables do not always add up to the displayed totals.

4.1 Where is C&I waste disposed of?

Based on the Waste Contribution Monthly Report (WCMR) submitted by licensed disposal facilities in the regulated areas of NSW in 2021–22, 69% of C&I waste is disposed in the MLA, 26% in the RLA and just 5% in the NLA, as shown in Figure 7.

Figure 7 Annual C&I disposal by region

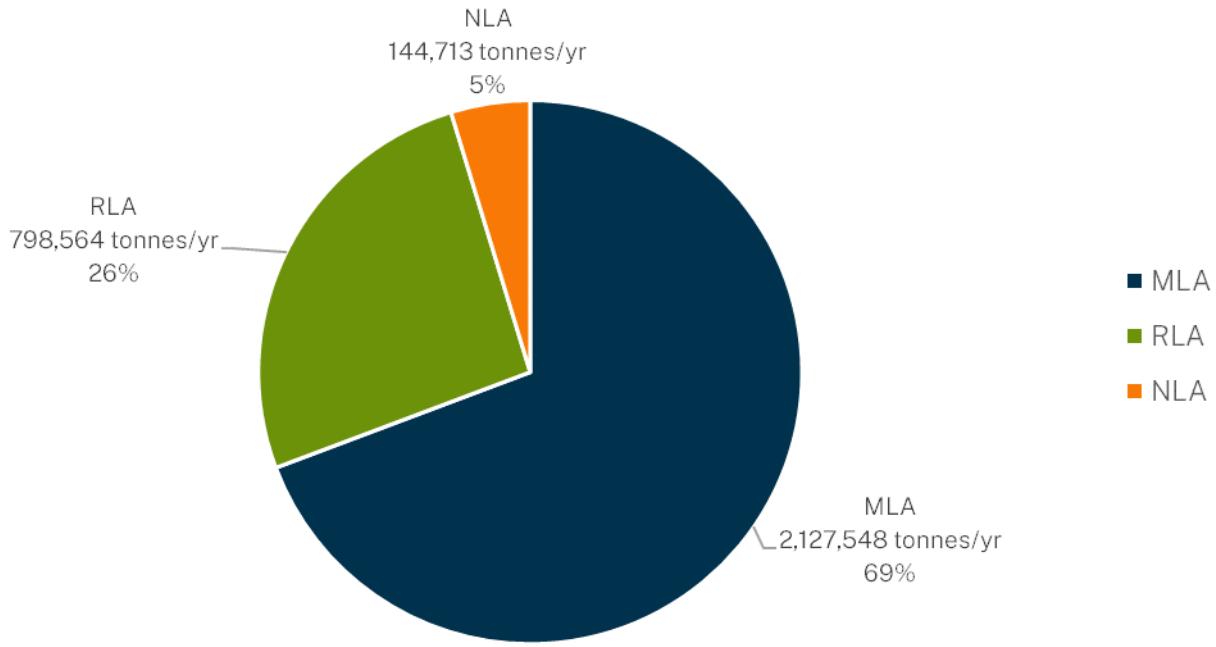


Image 10 Soft plastic film and hard plastics were common in C&I deliveries. Credit: APC Waste Consultants

4.2 Composition of C&I waste

Material categories and their definitions are provided in Appendix C.

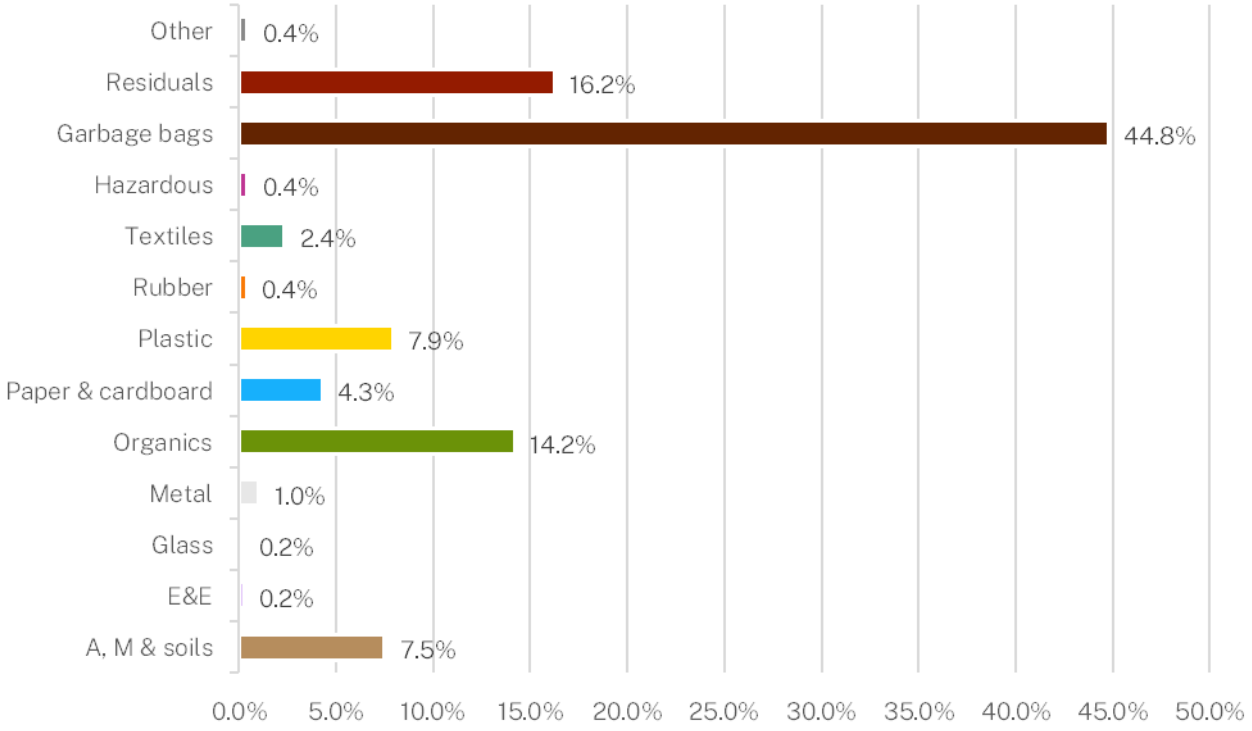
4.2.1. All load types – mixed and single-material loads

The main components of C&I waste are garbage bags (44.8%), residuals (16.2%), organics (14.2%) and plastic (7.9%).

Table 12 C&I waste composition – garbage bags as a category

Material category	MLA tonnes per year	MLA % of waste stream	RLA tonnes per year	RLA % of waste stream	NLA tonnes per year	NLA % of waste stream	Overall tonnes per year	Overall % of waste stream
Aggregates, masonry & soils	57,268	2.7%	144,161	18.1%	28,703	19.8%	230,132	7.5%
Electrical & electronic	4,754	0.2%	2,320	0.3%	434	0.3%	7,508	0.2%
Garbage bags	985,269	46.3%	352,772	44.2%	37,249	25.7%	1,375,290	44.8%
Glass	5,588	0.3%	871	0.1%	535	0.4%	6,994	0.2%
Hazardous	4,580	0.2%	7,522	0.9%	0	0.0%	12,102	0.4%
Metal	18,069	0.8%	9,822	1.2%	3,287	2.3%	31,178	1.0%
Organics	274,725	12.9%	118,255	14.8%	43,327	29.9%	436,307	14.2%
Other	9,540	0.4%	2,729	0.3%	891	0.6%	13,160	0.4%
Paper & cardboard	101,498	4.8%	24,139	3.0%	6,439	4.4%	132,076	4.3%
Plastic	167,834	7.9%	59,133	7.4%	16,086	11.1%	243,053	7.9%
Residuals	453,050	21.3%	45,280	5.7%	503	0.3%	498,834	16.2%
Rubber	4,099	0.2%	6,209	0.8%	1,597	1.1%	11,904	0.4%
Textiles	41,274	1.9%	25,351	3.2%	5,663	3.9%	72,289	2.4%
Total	**2,127,548**	**100.0%**	**798,564**	**100.0%**	**144,713**	**100.0%**	**3,070,826**	**100.0%**

Figure 8 Overall C&I waste composition – garbage bags as a category

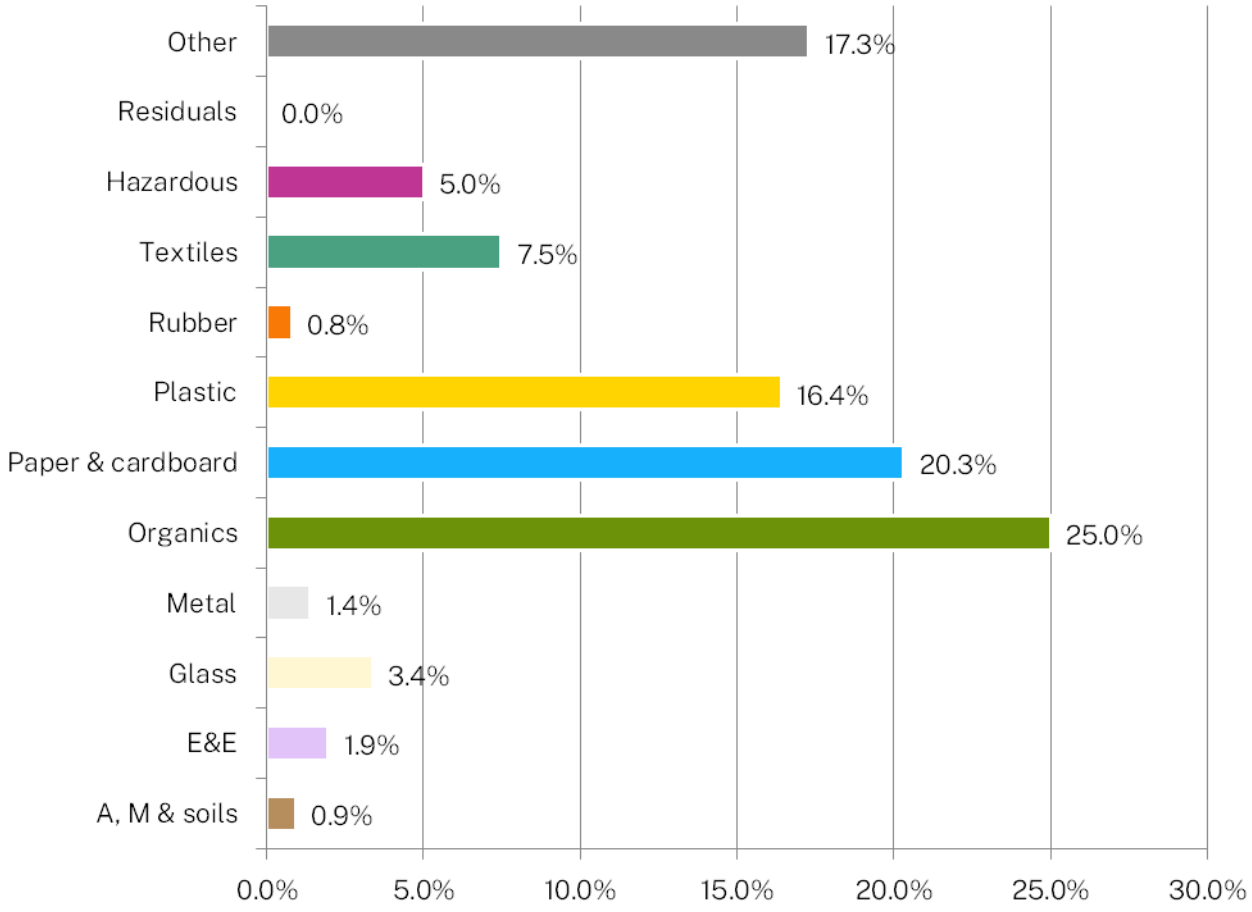


The largest components of material in garbage bags are organic materials (25.0%), paper and cardboard (20.3%), other (17.3%) and plastic (16.4%).

Table 13 Overall C&I waste – composition of garbage bags

Material category	MLA tonnes per year	MLA % of waste stream	RLA tonnes per year	RLA % of waste stream	NLA tonnes per year	NLA % of waste stream	Overall tonnes per year	Overall % of waste stream
Aggregates, masonry & soils	9,126	0.9%	3,455	1.0%	426	1.1%	13,008	0.9%
Electrical & electronic	18,906	1.9%	7,160	2.0%	594	1.6%	26,660	1.9%
Glass	33,082	3.4%	12,233	3.5%	1,157	3.1%	46,471	3.4%
Hazardous	48,783	5.0%	18,728	5.3%	1,665	4.5%	69,176	5.0%
Metal	14,002	1.4%	4,500	1.3%	634	1.7%	19,136	1.4%
Organics	246,711	25.0%	87,640	24.8%	9,661	25.9%	344,012	25.0%
Other	168,036	17.1%	64,199	18.2%	5,367	14.4%	237,602	17.3%
Paper & cardboard	202,133	20.5%	69,103	19.6%	8,263	22.2%	279,500	20.3%
Plastic	163,532	16.6%	55,849	15.8%	6,552	17.6%	225,933	16.4%
Residuals	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Rubber	7,920	0.8%	2,618	0.7%	463	1.2%	11,000	0.8%
Textiles	73,037	7.4%	27,287	7.7%	2,468	6.6%	102,792	7.5%
Total	**985,269**	**100.0%**	**352,772**	**100.0%**	**37,249**	**100.0%**	**1,375,290**	**100.0%**

Figure 9 Overall C&I waste composition – garbage bags distributed

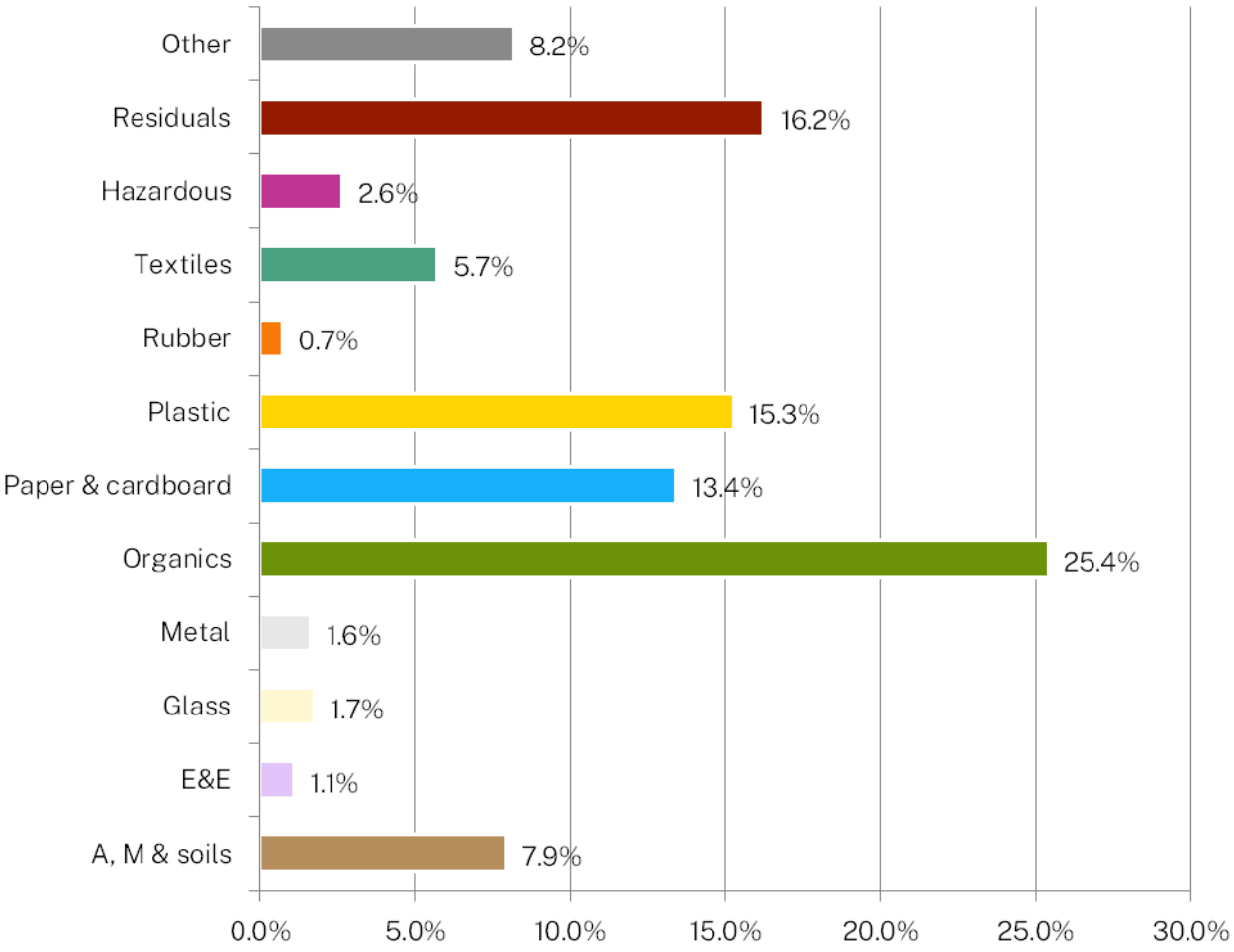


When the contents of the garbage bags are distributed, the largest components of C&I waste are organic materials (25.4%), residual (16.2%), plastic (15.3%) and paper and cardboard (13.4%).

Table 14 Overall C&I waste composition – garbage bags distributed

Material category	MLA tonnes /year	% of MLA waste stream	RLA tonnes /year	% of RLA waste stream	NLA tonnes /year	% of NLA waste stream	Overall tonnes /year	Overall % of waste stream
Aggregates, masonry & soils	66,395	3.1%	147,616	18.5%	29,129	20.1%	243,140	7.9%
Electrical & electronic	23,660	1.1%	9,480	1.2%	1,028	0.7%	34,168	1.1%
Glass	38,670	1.8%	13,104	1.6%	1,691	1.2%	53,465	1.7%
Hazardous	53,363	2.5%	26,250	3.3%	1,665	1.2%	81,279	2.6%
Metal	32,072	1.5%	14,321	1.8%	3,921	2.7%	50,314	1.6%
Organics	521,436	24.5%	205,895	25.8%	52,988	36.6%	780,319	25.4%
Other	177,576	8.3%	66,928	8.4%	6,258	4.3%	250,762	8.2%
Paper & cardboard	303,631	14.3%	93,242	11.7%	14,702	10.2%	411,576	13.4%
Plastic	331,366	15.6%	114,982	14.4%	22,638	15.6%	468,986	15.3%
Residuals	453,050	21.3%	45,280	5.7%	503	0.3%	498,834	16.2%
Rubber	12,019	0.6%	8,826	1.1%	2,060	1.4%	22,905	0.7%
Textiles	114,310	5.4%	52,638	6.6%	8,132	5.6%	175,080	5.7%
Total	**2,127,548**	**100.0%**	**798,564**	**100.0%**	**144,713**	**100.0%**	**3,070,826**	**100.0%**

Figure 10 Overall C&I waste composition – garbage bags distributed



Most C&I waste (82.5%) arrives at the disposal point in mixed loads. 17.5% arrives as single-material loads (where one material makes up 90% or more of the total load).

Figure 11 Overall mixed vs single material loads, by weight

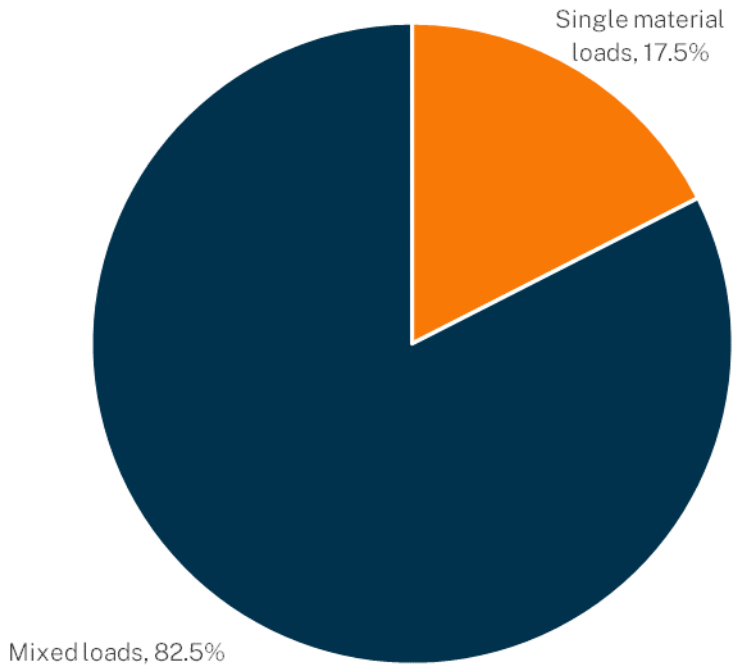


Image 11 Front-lift vehicles were the most common mode of delivery at both landfills and transfer stations
Credit: APC Waste Consultants

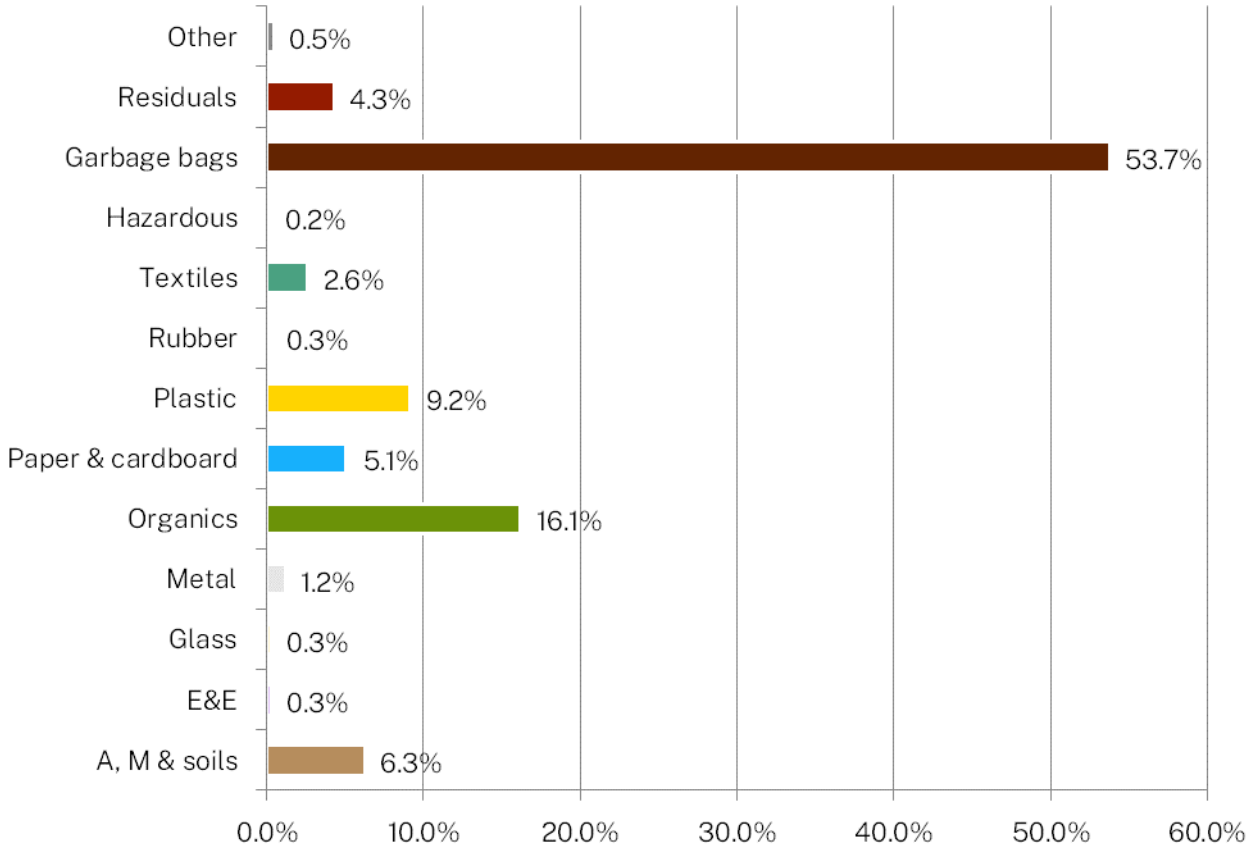
4.2.2. Composition of overall mixed loads

The waste in mixed loads is shown to comprise mainly garbage bags (53.7%), organics (16.1%) and plastic (9.2%).

Table 15 Mixed loads composition – garbage bags as a category

Material category	MLA tonnes / year	% of MLA waste stream	RLA tonnes /year	% of RLA waste stream	NLA tonnes /year	% of NLA waste stream	Overall tonnes /year	Overall % of waste stream
Aggregates, masonry & soils	48,503	2.9%	82,992	11.5%	27,997	23.1%	159,492	6.3%
Electrical & electronic	4,362	0.3%	2,320	0.3%	434	0.4%	7,116	0.3%
Garbage bags	971,615	57.5%	352,514	48.9%	36,816	30.4%	1,360,944	53.7%
Glass	5,588	0.3%	871	0.1%	535	0.4%	6,994	0.3%
Hazardous	3,038	0.2%	765	0.1%	0	0.0%	3,803	0.2%
Metal	17,632	1.0%	9,822	1.4%	2,861	2.4%	30,315	1.2%
Organics	263,322	15.6%	117,391	16.3%	28,034	23.1%	408,747	16.1%
Other	8,952	0.5%	2,515	0.3%	891	0.7%	12,358	0.5%
Paper & cardboard	99,171	5.9%	23,404	3.2%	6,429	5.3%	129,004	5.1%
Plastic	162,304	9.6%	58,896	8.2%	11,231	9.3%	232,432	9.2%
Residuals	63,392	3.8%	45,280	6.3%	0	0.0%	108,672	4.3%
Rubber	3,981	0.2%	1,227	0.2%	1,597	1.3%	6,805	0.3%
Textiles	38,028	2.3%	23,062	3.2%	4,391	3.6%	65,481	2.6%
Total	**1,689,887**	**100.0%**	**721,060**	**100.0%**	**121,216**	**100.0%**	**2,532,163**	**100.0%**

Figure 12 Composition of mixed loads – garbage bags as a category

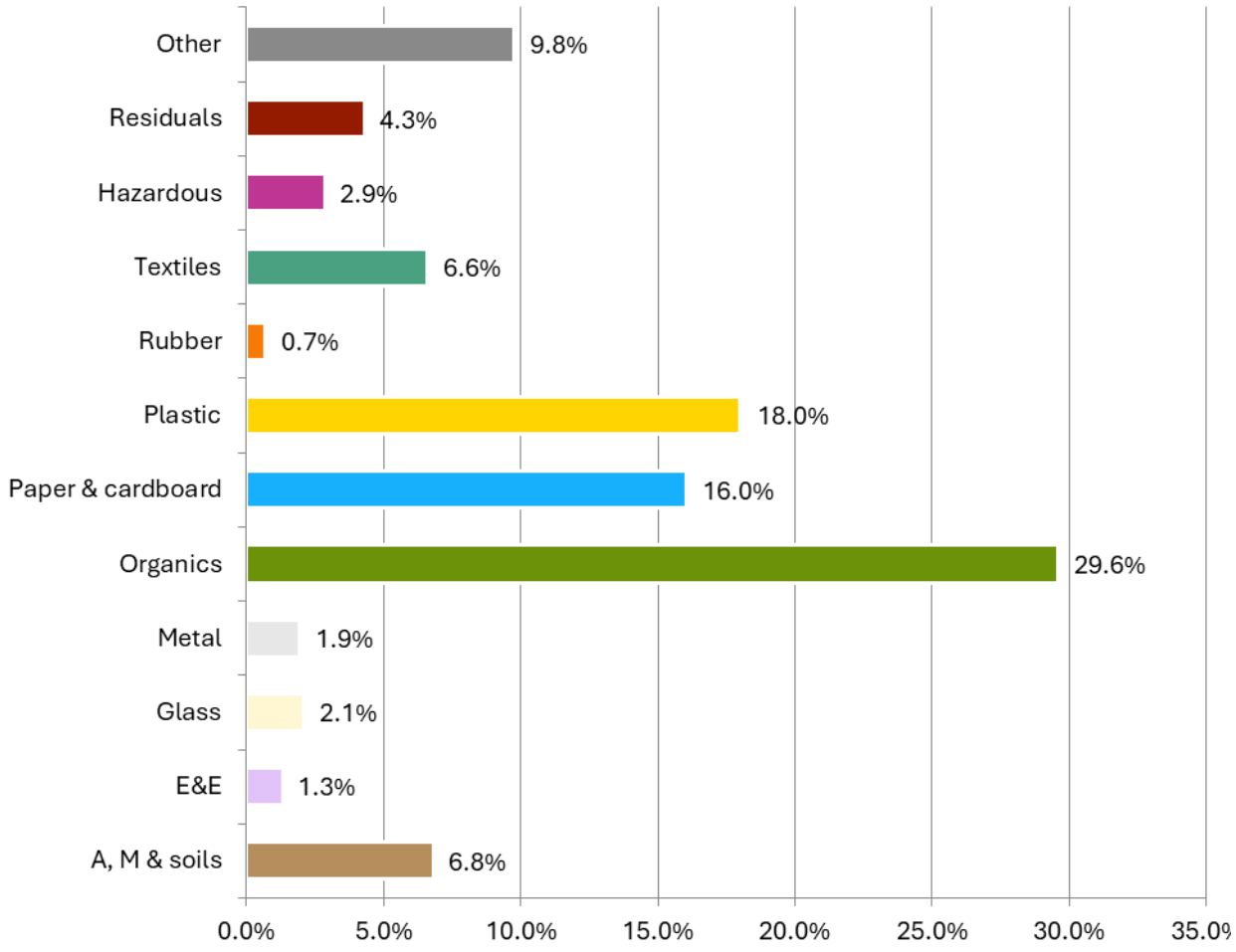


When the contents of the garbage bags are distributed, the mixed C&I waste is shown to comprise mainly organics (29.6%), plastic (18%), and paper and cardboard (16%).

Table 16 Mixed loads composition – garbage bags distributed

Material category	MLA tonnes per year	MLA % of waste stream	RLA tonnes per year	RLA % of waste stream	NLA tonnes per year	NLA % of waste stream	Overall tonnes per year	Overall % of waste stream
Aggregates, masonry & soils	57,496	3.4%	86,446	12.0%	28,416	23.4%	172,358	6.8%
Electrical & electronic	22,994	1.4%	9,477	1.3%	1,020	0.8%	33,491	1.3%
Glass	38,204	2.3%	13,100	1.8%	1,681	1.4%	52,985	2.1%
Hazardous	51,052	3.0%	19,470	2.7%	1,655	1.4%	72,177	2.9%
Metal	31,466	1.9%	14,318	2.0%	3,485	2.9%	49,268	1.9%
Organics	506,721	30.0%	204,989	28.4%	37,566	31.0%	749,276	29.6%
Other	174,406	10.3%	66,646	9.2%	6,233	5.1%	247,285	9.8%
Paper & cardboard	298,635	17.7%	92,444	12.8%	14,584	12.0%	405,663	16.0%
Plastic	323,711	19.2%	114,710	15.9%	17,690	14.6%	456,111	18.0%
Residuals	63,392	3.8%	45,280	6.3%	0	0.0%	108,672	4.3%
Rubber	11,795	0.7%	3,841	0.5%	2,050	1.7%	17,686	0.7%
Textiles	110,015	6.5%	50,339	7.0%	6,837	5.6%	167,192	6.6%
Total	**1,689,887**	**100.0%**	**721,060**	**100.0%**	**121,216**	**100.0%**	**2,532,164**	**100.0%**

Figure 13 Composition of mixed loads – garbage bags distributed



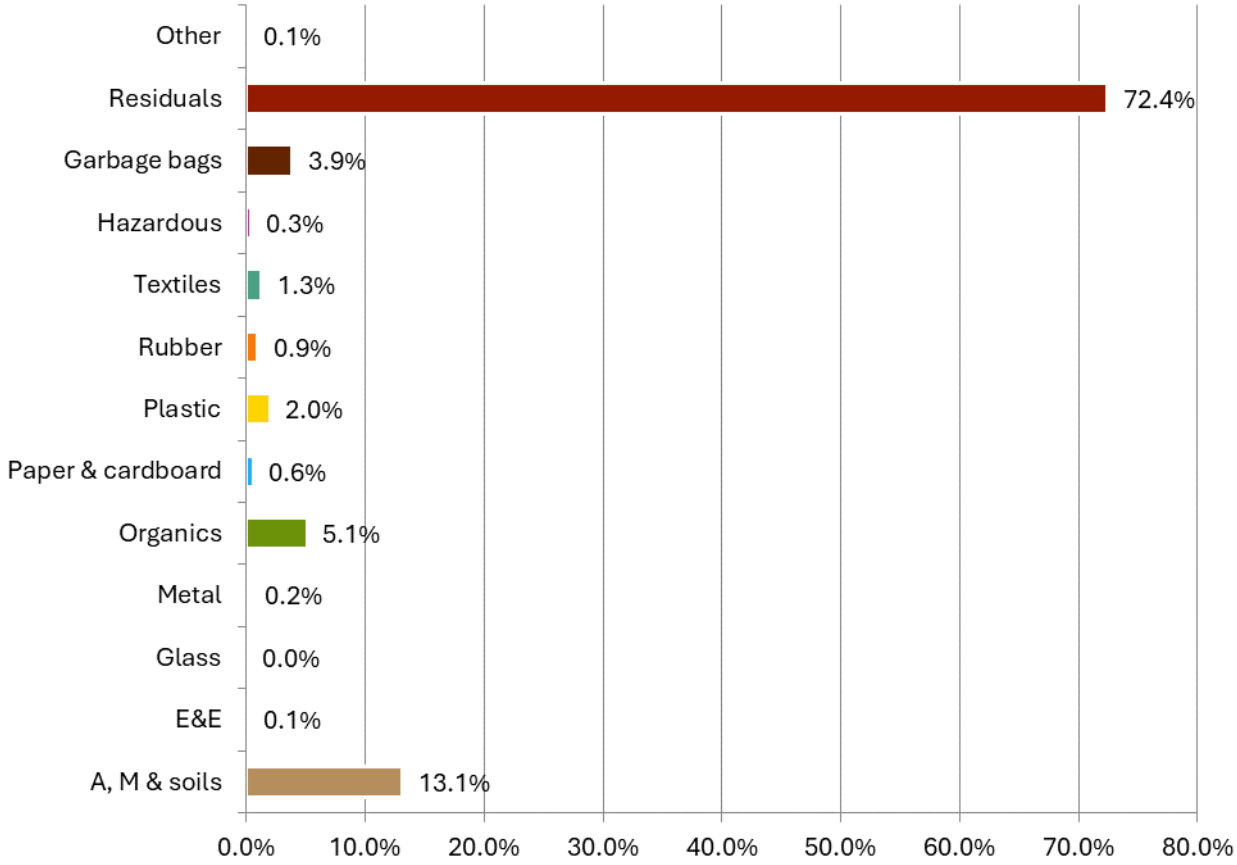
4.2.3. Composition of overall single-material loads

The waste in single-material loads is shown to comprise mainly residuals (72.4%), aggregates, masonry and soils (13.1%) and organics (5.1%).

Table 17 Single-material loads composition – garbage bags as a category

Material category	MLA tonnes per year	MLA % of waste stream	RLA tonnes per year	RLA % of waste stream	NLA tonnes per year	NLA % of waste stream	Overall tonnes per year	Overall % of waste stream
Aggregates, masonry & soils	8,766	2.0%	61,169	78.9%	706	3.0%	70,640	13.1%
Electrical & electronic	392	0.1%	0	0.0%	0	0.0%	392	0.1%
Garbage bags	13,654	3.1%	6,757	8.7%	433	1.8%	20,844	3.9%
Glass	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Hazardous	1,542	0.4%	258	0.3%	0	0.0%	1,801	0.3%
Metal	437	0.1%	0	0.0%	426	1.8%	863	0.2%
Organics	11,403	2.6%	864	1.1%	15,293	65.1%	27,560	5.1%
Other	588	0.1%	214	0.3%	0	0.0%	802	0.1%
Paper & cardboard	2,327	0.5%	734	0.9%	10	0.0%	3,072	0.6%
Plastic	5,530	1.3%	237	0.3%	4,855	20.7%	10,621	2.0%
Residuals	389,658	89.0%	0	0.0%	503	2.1%	390,162	72.4%
Rubber	118	0.0%	4,982	6.4%	0	0.0%	5,099	0.9%
Textiles	3,246	0.7%	2,289	3.0%	1,272	5.4%	6,808	1.3%
Total	**437,661**	**100.0%**	**77,504**	**100.0%**	**23,497**	**100.0%**	**538,664**	**100.0%**

Figure 14 Composition of single-material loads – garbage bags as a category

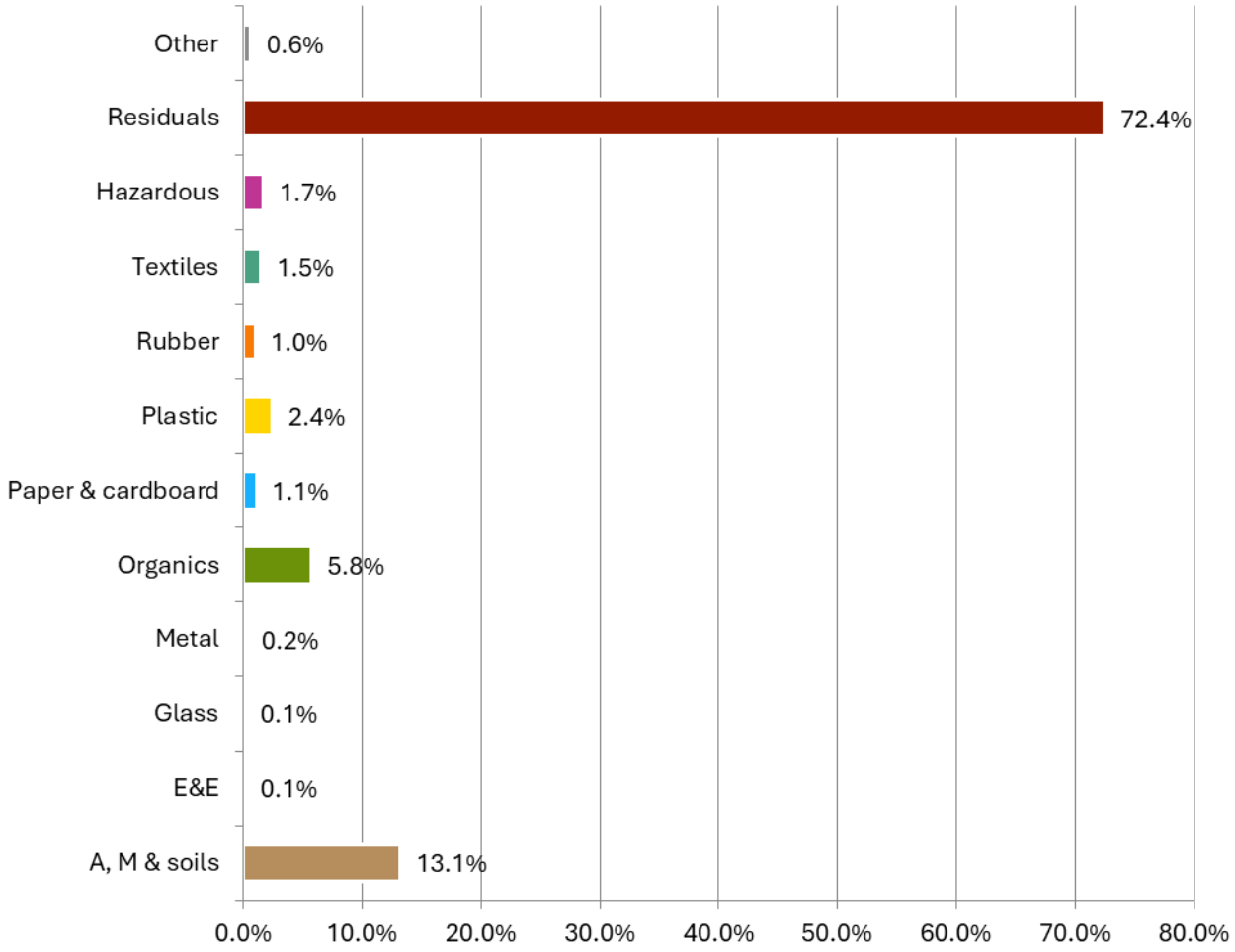


There is minimal change to the overall composition when the contents of the garbage bags are distributed because garbage bags are a small proportion of single-material loads.

Table 18 Single-material loads composition – garbage bags distributed

Material category	MLA tonnes /year	MLA % of waste stream	RLA tonnes /year	RLA % of waste stream	NLA tonnes /year	NLA % of waste stream	Overall tonnes /year	Overall % of waste stream
Aggregates, masonry & soils	8,898	2.0%	61,170	78.9%	713	3.0%	70,782	13.1%
Electrical & electronic	667	0.2%	3	0.0%	8	0.0%	677	0.1%
Glass	466	0.1%	3	0.0%	10	0.0%	480	0.1%
Hazardous	2,311	0.5%	6,780	8.7%	10	0.0%	9,102	1.7%
Metal	606	0.1%	4	0.0%	436	1.9%	1,045	0.2%
Organics	14,715	3.4%	906	1.2%	15,422	65.6%	31,043	5.8%
Other	3,170	0.7%	282	0.4%	25	0.1%	3,477	0.6%
Paper & cardboard	4,996	1.1%	799	1.0%	118	0.5%	5,913	1.1%
Plastic	7,655	1.7%	273	0.4%	4,947	21.1%	12,875	2.4%
Residuals	389,658	89.0%	0	0.0%	503	2.1%	390,162	72.4%
Rubber	223	0.1%	4,986	6.4%	10	0.0%	5,219	1.0%
Textiles	4,295	1.0%	2,299	3.0%	1,295	5.5%	7,889	1.5%
Total	**437,661**	**100.0%**	**77,504**	**100.0%**	**23,497**	**100.0%**	**538,664**	**100.0%**

Figure 15 Composition of single-material loads – garbage bags distributed



4.3 Who generates C&I waste?

4.3.1. C&I generation by industry sector

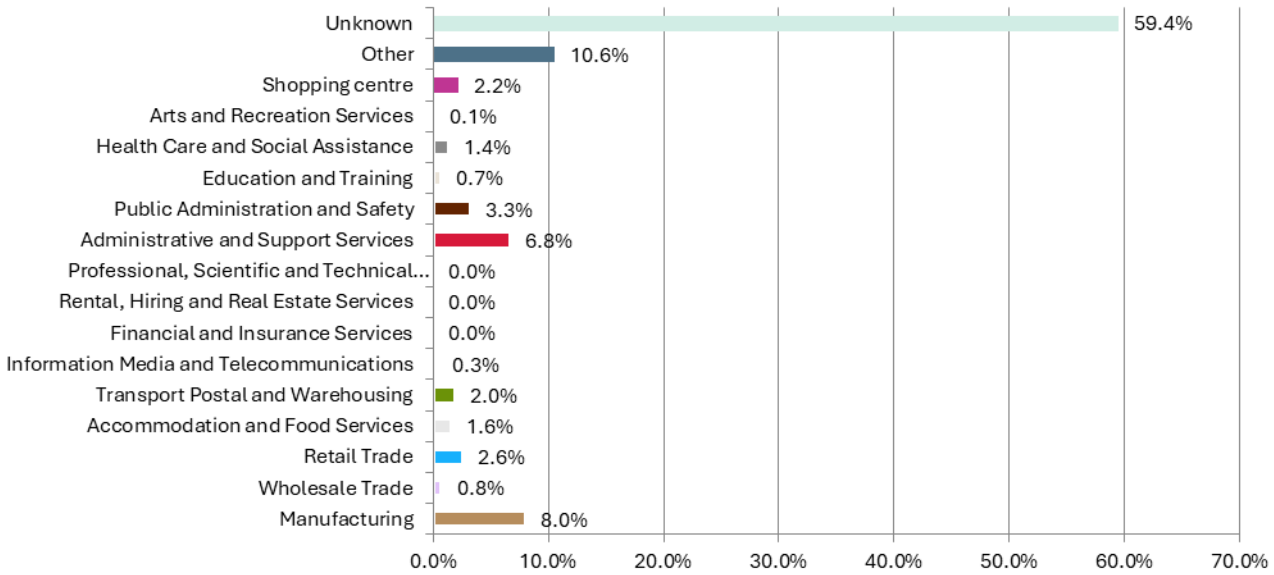
More than 59% of C&I was disposed of by unknown industry sectors, predominantly mixed SMEs. These were loads collected from multiple premises from different industry sectors in front and rear lift vehicles. The identifiable industry division (also referred to as sectors) that disposes of the most C&I waste is 'other'. They account for 10.6% of all C&I waste disposed of. This waste is predominantly residuals from waste management operations,. The identifiable industry divisions that dispose of the second and third most C&I waste are manufacturing (8.0%), and administration and support services (6.8%).

Table 19 Industry composition

Industry	MLA tonnes /year	MLA %	RLA tonnes /year	RLA %	NLA tonnes /year	NLA %	Overall tonnes /year	Overall %
Manufacturing	204,141	9.6%	8,013	1.0%	33,883	23.4%	246,037	8.0%
Wholesale trade	7,698	0.4%	13,367	1.7%	2,615	1.8%	23,679	0.8%
Retail trade	38,188	1.8%	34,967	4.4%	6,197	4.3%	79,352	2.6%
Accommodation and food services	30,739	1.4%	16,136	2.0%	3,462	2.4%	50,337	1.6%
Transport, postal and warehousing	40,645	1.9%	10,450	1.3%	9,600	6.6%	60,695	2.0%
Information media and telecommunications	9,580	0.5%	0	0.0%	479	0.3%	10,059	0.3%

Industry	MLA tonnes /year	MLA %	RLA tonnes /year	RLA %	NLA tonnes /year	NLA %	Overall tonnes /year	Overall %
Financial and insurance services	601	0.0%	222	0.0%	0	0.0%	823	0.0%
Rental, hiring and real estate services	144	0.0%	0	0.0%	0	0.0%	144	0.0%
Professional, scientific and technical services	1,451	0.1%	0	0.0%	0	0.0%	1,451	0.0%
Administrative and support services	107,017	5.0%	81,677	10.2%	18,624	12.9%	207,318	6.8%
Public administration and safety	25,080	1.2%	68,458	8.6%	8,017	5.5%	101,554	3.3%
Education and training	13,396	0.6%	997	0.1%	8,152	5.6%	22,545	0.7%
Health care and social assistance	38,946	1.8%	2,289	0.3%	2,296	1.6%	43,531	1.4%
Arts and recreation services	1,346	0.1%	923	0.1%	1,596	1.1%	3,865	0.1%
Shopping centres	66,287	3.1%	738	0.1%	1,228	0.8%	68,253	2.2%
Other	313,974	14.8%	10,819	1.4%	823	0.6%	325,616	10.6%
Unknown	1,228,315	57.7%	549,509	68.8%	47,744	33.0%	1,825,568	59.4%
Total	**2,127,548**	**100.0%**	**798,564**	**100.0%**	**144,713**	**100.0%**	**3,070,826**	**100.0%**

Figure 16 Overall C&I waste disposal by industry sector

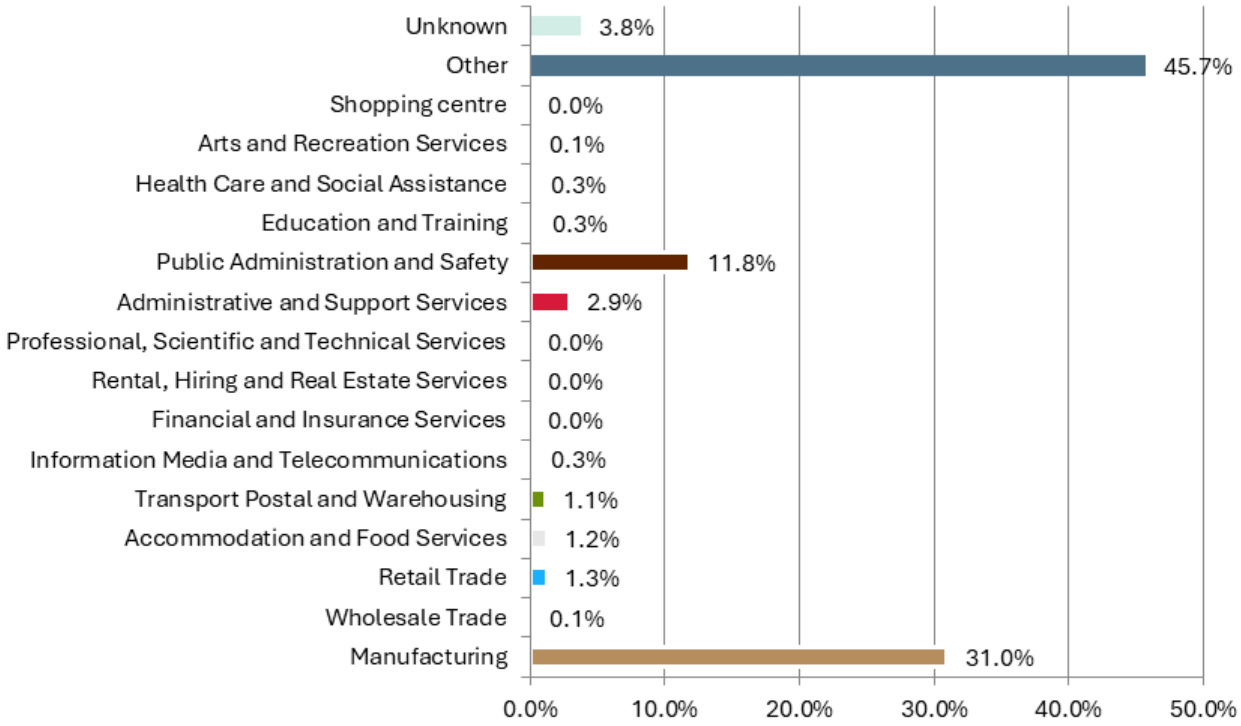


The single-material C&I loads were mainly from 'other' (45.7%). The waste was predominantly from waste management operations (i.e. MRF fines, floc and residuals), manufacturing (31%), and public administration and safety (11.8%).

Table 20 Industry composition – single-material loads only

Industry	MLA tonnes /year	MLA %	RLA tonnes /year	RLA %	NLA tonnes /year	NLA %	Overall tonnes /year	Overall %
Manufacturing	148,022	33.8%	5,317	6.9%	13,541	57.6%	166,880	31.0%
Wholesale trade	614	0.1%	0	0.0%	0	0.0%	614	0.1%
Retail trade	745	0.2%	5,206	6.7%	1,019	4.3%	6,970	1.3%
Accommodation and food services	4,051	0.9%	2,548	3.3%	0	0.0%	6,599	1.2%
Transport, postal and warehousing	1,542	0.4%	0	0.0%	4,395	18.7%	5,937	1.1%
Information media and telecommunic-ations	1,477	0.3%	0	0.0%	0	0.0%	1,477	0.3%
Financial and insurance services	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Rental, hiring and real estate services	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Professional, scientific and technical services	157	0.0%	0	0.0%	0	0.0%	157	0.0%
Administrative and support services	9,240	2.1%	4,763	6.1%	1,756	7.5%	15,759	2.9%
Public administration and safety	2,352	0.5%	59,448	76.7%	2,013	8.6%	63,814	11.8%
Education and training	1,542	0.4%	0	0.0%	172	0.7%	1,714	0.3%
Health care and social assistance	1,294	0.3%	222	0.3%	0	0.0%	1,515	0.3%
Arts and recreation services	470	0.1%	0	0.0%	0	0.0%	470	0.1%
Shopping centre	157	0.0%	0	0.0%	0	0.0%	157	0.0%
Other	245,727	56.1%	0	0.0%	503	2.1%	246,230	45.7%
Unknown	20,270	4.6%	0	0.0%	98	0.4%	20,369	3.8%
Total	**437,661**	**100.0%**	**77,504**	**100.0%**	**23,497**	**100.0%**	**538,663**	**100.0%**

Figure 17 C&I single loads disposal by industry sector



4.3.2. Garbage bag generation by industry sector

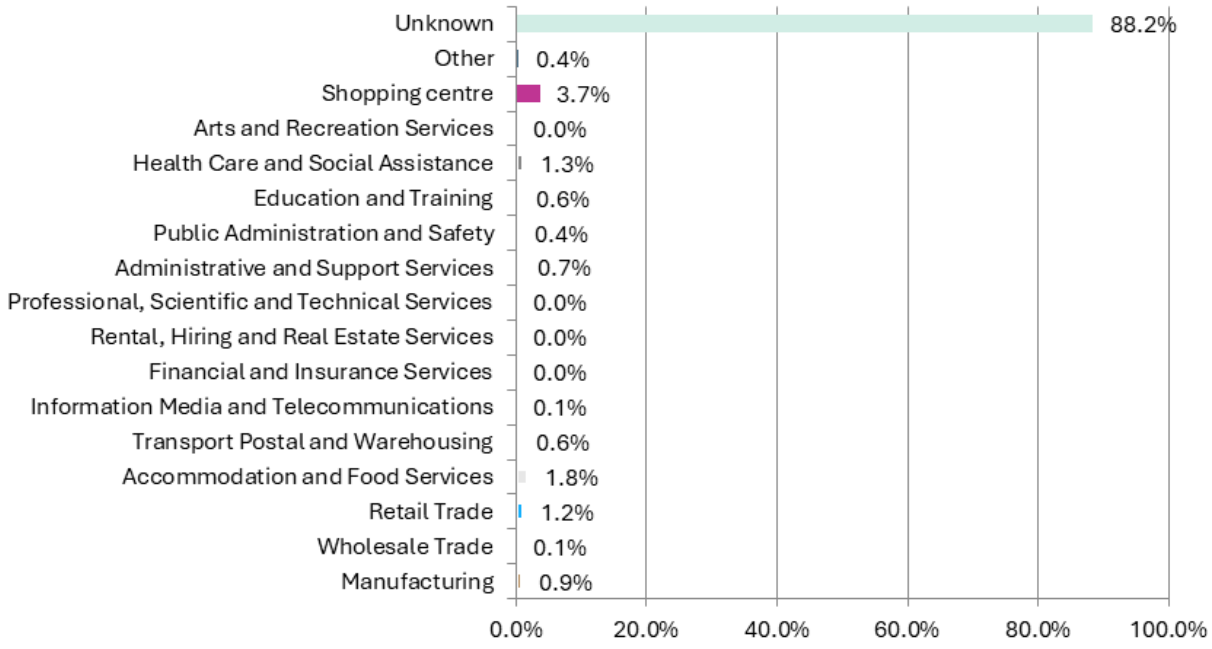
Eighty-eight per cent (88%) of all garbage bags disposed of were in loads from multiple small and medium enterprises (SMEs) deemed as 'unknown'. The next-largest sources were the shopping centre sector (3.7%), accommodation and food services (1.8%), and health care and social assistance (1.3%).

Table 21 Industry composition – garbage bag generation

Industry	MLA tonnes /year	MLA %	RLA tonnes /year	RLA %	NLA tonnes /year	NLA %	Overall tonnes /year	Overall %
Manufacturing	9,067	0.9%	0	0.0%	3,057	8.2%	12,124	0.9%
Wholesale trade	971	0.1%	0	0.0%	42	0.1%	1,013	0.1%
Retail trade	15,628	1.6%	180	0.1%	52	0.1%	15,860	1.2%
Accommodation and food services	19,766	2.0%	4,836	1.4%	245	0.7%	24,846	1.8%
Transport, postal and warehousing	4,125	0.4%	3,745	1.1%	0	0.0%	7,870	0.6%
Information media and telecommunications	2,008	0.2%	0	0.0%	0	0.0%	2,008	0.1%
Financial and insurance services	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Rental, hiring and real estate services	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Professional, scientific and technical services	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Administrative and support services	9,056	0.9%	190	0.1%	849	2.3%	10,095	0.7%

Industry	MLA tonnes /year	MLA %	RLA tonnes /year	RLA %	NLA tonnes /year	NLA %	Overall tonnes /year	Overall %
Public administration and safety	3,347	0.3%	1,140	0.3%	333	0.9%	4,820	0.4%
Education and training	3,652	0.4%	0	0.0%	4,580	12.3%	8,232	0.6%
Health care and social assistance	15,280	1.6%	222	0.1%	2,143	5.8%	17,644	1.3%
Arts and recreation services	16	0.0%	0	0.0%	573	1.5%	588	0.0%
Shopping centre	49,753	5.0%	0	0.0%	1,153	3.1%	50,906	3.7%
Other	6,063	0.6%	0	0.0%	0	0.0%	6,063	0.4%
Unknown	846,539	85.9%	342,459	97.1%	24,223	65.0%	1,213,221	88.2%
Total	**985,269**	**100.0%**	**352,772**	**100.0%**	**37,249**	**100.0%**	**1,376,927**	**100.0%**

Figure 18 Garbage bag generation by industry sector



4.4 Vehicle types

4.4.1. Vehicle types by facility type

The following table outlines the distribution of waste being delivered by different vehicle and facility types, based on the results observed in the audit. This may not be representative of all vehicles at all sites over a longer time frame. The delivery mode varies depending on facility type and will vary from facility to facility across NSW. Front-lift trucks deliver the most waste of all vehicle types at both landfills (33%) and at transfer stations (39%). At landfills, the next most common vehicles are walking-floor vehicles (31.6%), roll-on roll-off trucks (13.3%) and rear-lift trucks (10.1%). At transfer stations, the next most common vehicles are rear-lift trucks (31.5%), roll-on roll-off trucks (17%) and tipper trucks (3.1%).

Table 22 Vehicle type and disposal locations

Vehicle type	Landfill % of waste stream by weight	Transfer station % of waste stream by weight
Car	0.0%	0.0%
Car and trailer	0.0%	0.0%
Car and box trailer	0.0%	0.0%
Trailer regular	0.0%	0.0%
Trailer box	0.0%	0.0%
Station wagon	0.0%	0.0%
Station wagon and trailer	0.0%	0.0%
Station wagon and box trailer	0.0%	0.0%
4-wheel drive	0.0%	0.0%
4–wheel drive and trailer	0.3%	0.1%
Ute	0.6%	1.0%
Ute and trailer	1.6%	1.3%
Van	0.3%	1.7%
Van and trailer	0.2%	0.1%
Pantech	0.4%	2.6%
Front-lift	33.1%	39.1%
Rear-lift	10.1%	31.5%
Skip truck	2.8%	1.7%
Side-lift	0.4%	0.3%
Tipper	4.4%	3.1%
Flat-bed	0.0%	0.5%
Semi-trailer	0.8%	0.0%
Roll-on roll-off	13.3%	17.0%
Walking-floor	31.6%	0.0%
Total	**100.0%**	**100.0%**

4.4.2. Vehicle types by industry sector

The following table shows the waste delivered by type of vehicle in each major industry sector if the observations of the audit are extrapolated to annual levels across the state. The main findings are:

- Manufacturing delivers in walking-floor trucks, followed by roll-on roll-off.
- Administrative and support services have a relatively even spread of vehicle types, using tippers, roll-on roll-off, skip trucks, and utes and trailers.
- Shopping centres predominantly use roll-on roll-off vehicles and compactor bins.

Table 23 ANZSIC code and label of target industry sectors by vehicle type

Vehicle type	Manufacturing % of waste stream	Administrative and support services % of waste stream	Shopping centre % of waste stream
Car	0.0%	0.2%	0.2%
Car and trailer	0.0%	0.0%	0.0%
Car and box trailer	0.0%	0.0%	0.0%
Trailer regular	0.0%	0.0%	0.0%

Vehicle type	Manufacturing % of waste stream	Administrative and support services % of waste stream	Shopping centre % of waste stream
Trailer box	0.0%	0.0%	0.0%
Station wagon	0.0%	0.2%	0.0%
Station wagon and trailer	0.0%	0.1%	0.0%
Station wagon and box trailer	0.0%	0.0%	0.0%
4-wheel drive	0.0%	0.1%	0.0%
4-wheel drive and trailer	0.0%	2.6%	0.0%
Ute	0.4%	7.9%	0.4%
Ute and trailer	0.1%	15.2%	0.4%
Van	0.2%	10.3%	0.1%
Van and trailer	0.0%	1.9%	0.0%
Pantech	0.4%	5.7%	0.3%
Front-lift	6.5%	0.0%	0.0%
Rear-lift	0.0%	0.6%	8.4%
Skip truck	0.1%	15.6%	0.0%
Side-lift	0.0%	0.0%	0.0%
Tipper	1.8%	19.4%	1.6%
Flat-bed	1.1%	2.1%	0.0%
Semi-trailer	4.5%	0.0%	0.0%
Roll-on roll-off	29.2%	18.0%	88.6%
Walking-floor	55.9%	0.0%	0.0%
Total	**100.0%**	**100.0%**	**100.0%**

4.5 Recoverable materials

4.5.1. Potential recovery of C&I waste currently disposed

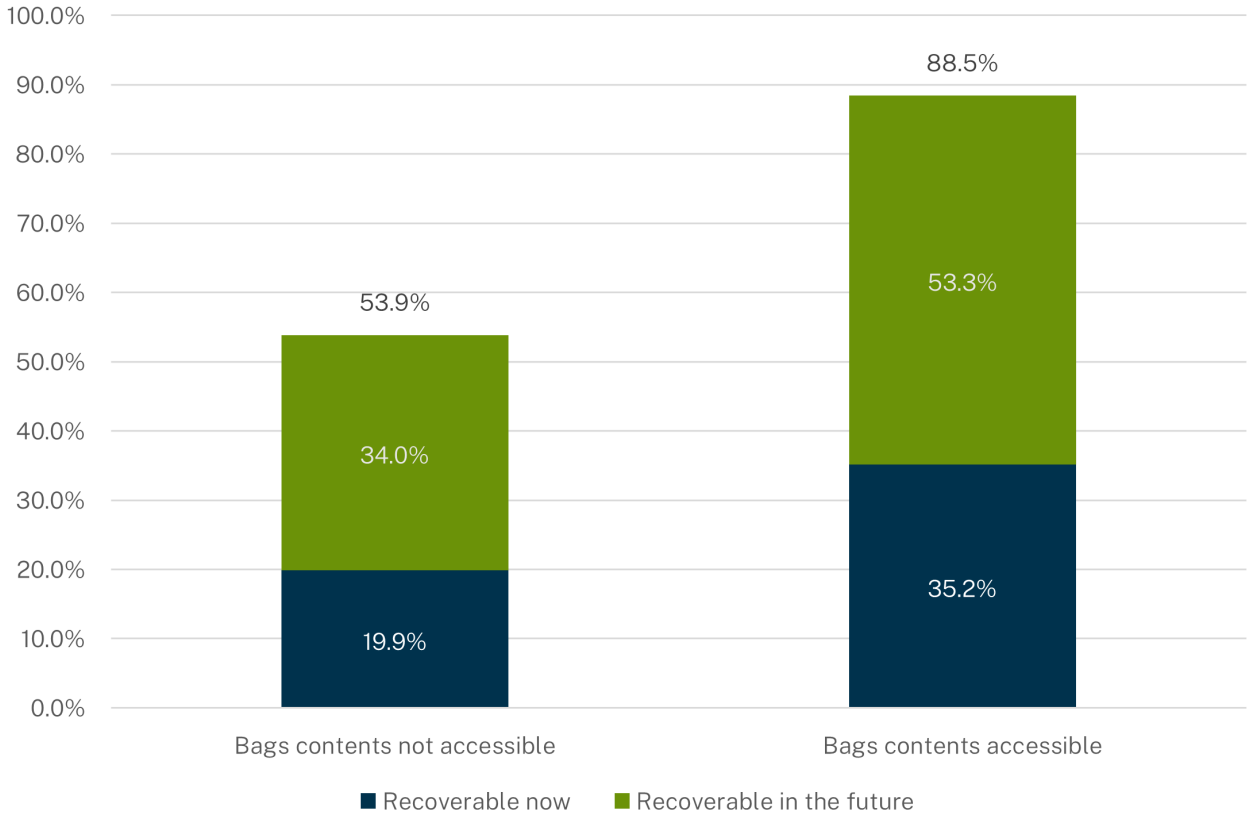
If we assume that the contents of garbage bags are not recoverable because they cannot be accessed, then:

- 19.9% of C&I waste (610,479 tonnes/year) is recoverable now
- 34.0% of C&I waste (1,043,802 tonnes/year) is recoverable in the future
- a total of 53.9% of C&I waste (1,654,281 tonnes/year) is potentially recoverable.

If we assume that the contents of garbage bags **can be accessed**, then:

- 35.2% of C&I waste (1,080,480 tonnes/year) is recoverable now
- 53.3% of C&I waste (1,635,698 tonnes/year) is recoverable in the future
- a total of 88.5% of C&I waste (2,716,178 tonnes/year) is potentially recoverable.

Figure 19 C&I waste currently disposed of that could be recovered



The figure below provides more detail of the potential recovery of C&I waste, assuming that garbage bag **contents are not available** for recovery.

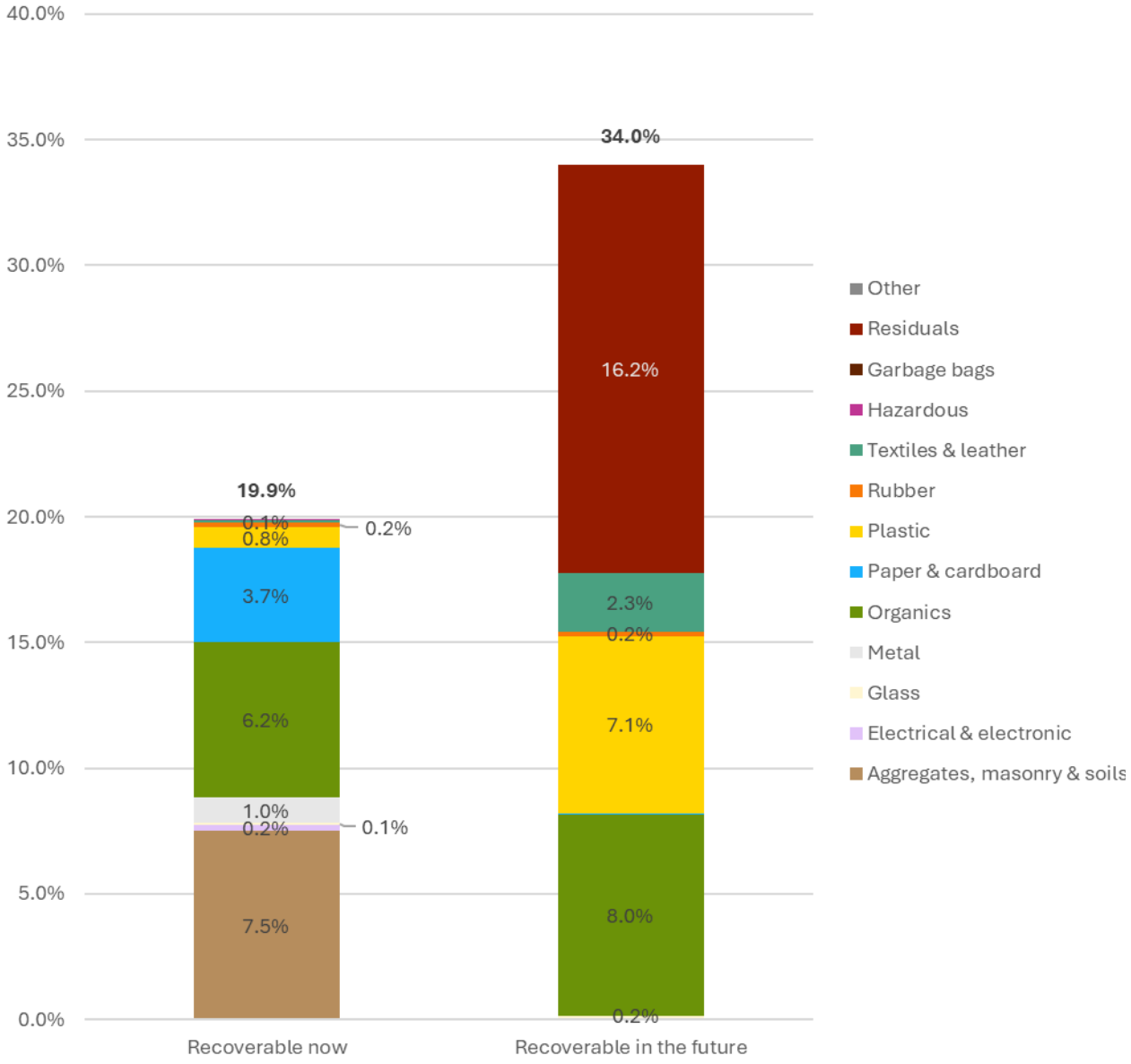
The largest opportunities for waste that is recoverable now are:

- aggregates, masonry and soils (7.5%)
- organics (6.2%)
- paper and cardboard (3.7%)
- metal (1.0%).

In the future, the largest opportunities for increased recovery of C&I waste are:

- residuals, including MRF fines, PEF residuals, shredder floc and sludge (16.2%)
- organics (8.0%)
- plastic (7.1%)
- textiles and leather (2.3%).

Figure 20 Detail of C&I waste currently disposed of that could be recycled – garbage bag contents not accessible



The figure below illustrates more detail of the potential recovery of C&I waste, assuming that garbage bag contents are accessible for recovery.

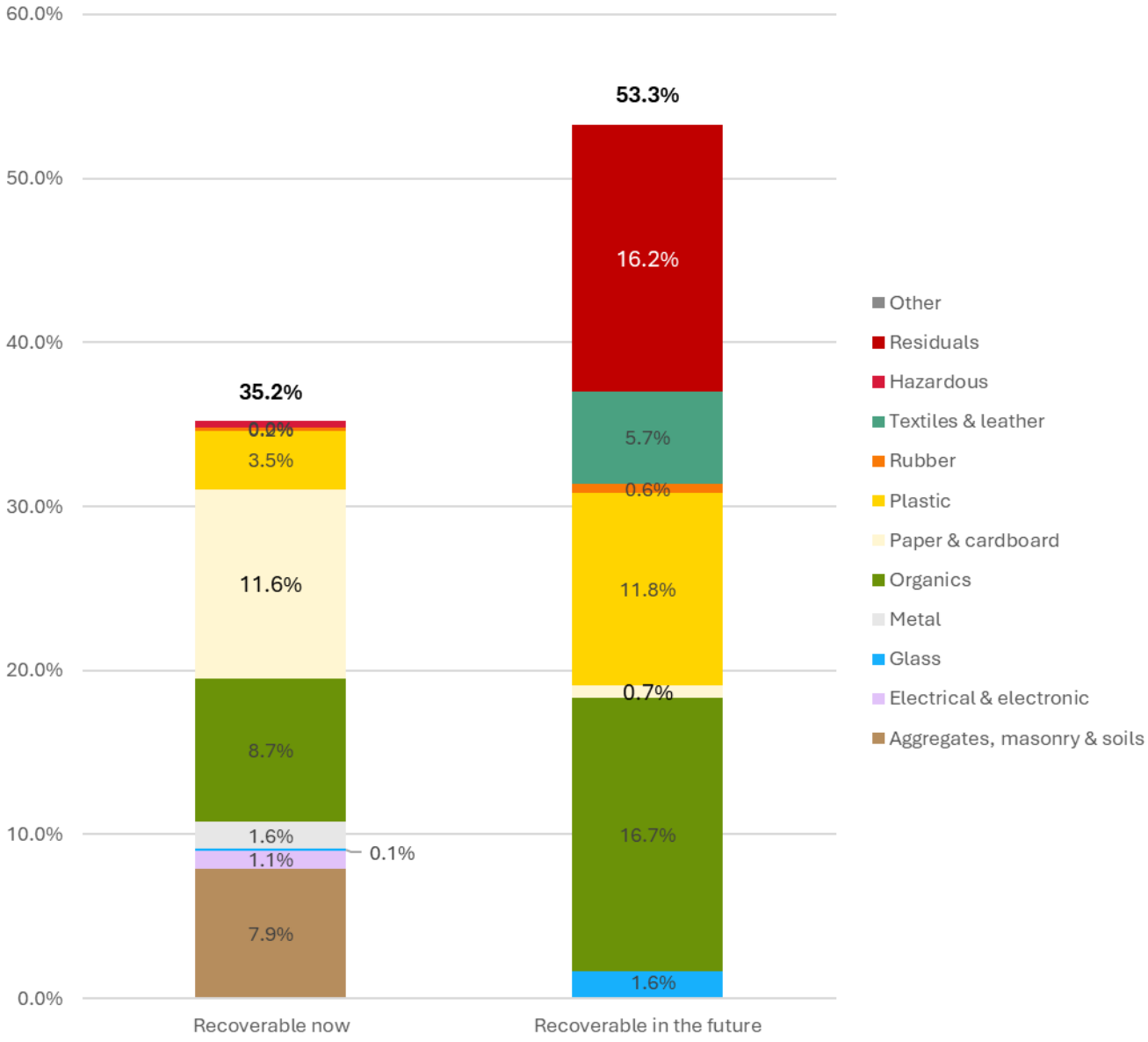
The largest opportunities for recovery now are:

- paper and cardboard (11.6%)
- organics (8.7%)
- aggregates, masonry and soils (7.9%).
- plastic (3.5%).

In the future, the largest opportunities for increased recovery of C&I waste are:

- organics (16.7%)
- residuals, including pulp, PEF, flock and sludge (16.2%)
- plastic (11.8%)
- textiles and leather (5.7%).

Figure 21 Detail of C&I waste currently disposed of that could be recycled – garbage bag contents accessible



4.5.2. C&I potentially recovered – by industry sector

Figure 22 illustrates more detail of the potential recovery of C&I waste by the industry sector, assuming that garbage bag **contents are not available** for recovery. This is based on what was presented during the audit period.

The largest opportunities for recovery now are:

- professional, scientific and technical services (79%)
- public administration and safety (76%)
- wholesale trade (66%)
- rental, hiring and real estate services (64%).

In the future, the largest opportunities for increased recovery of C&I waste are:

- other (waste and resource management industry) (94%)
- manufacturing (75%).

With garbage bag contents not recycled, the weighted average for material recoverable now is 23% across all industries. This will rise to 54% in the future if further recovery processing opportunities are unlocked.

Figure 22 C&I waste potentially recyclable, by industry sector – garbage bag contents not accessible

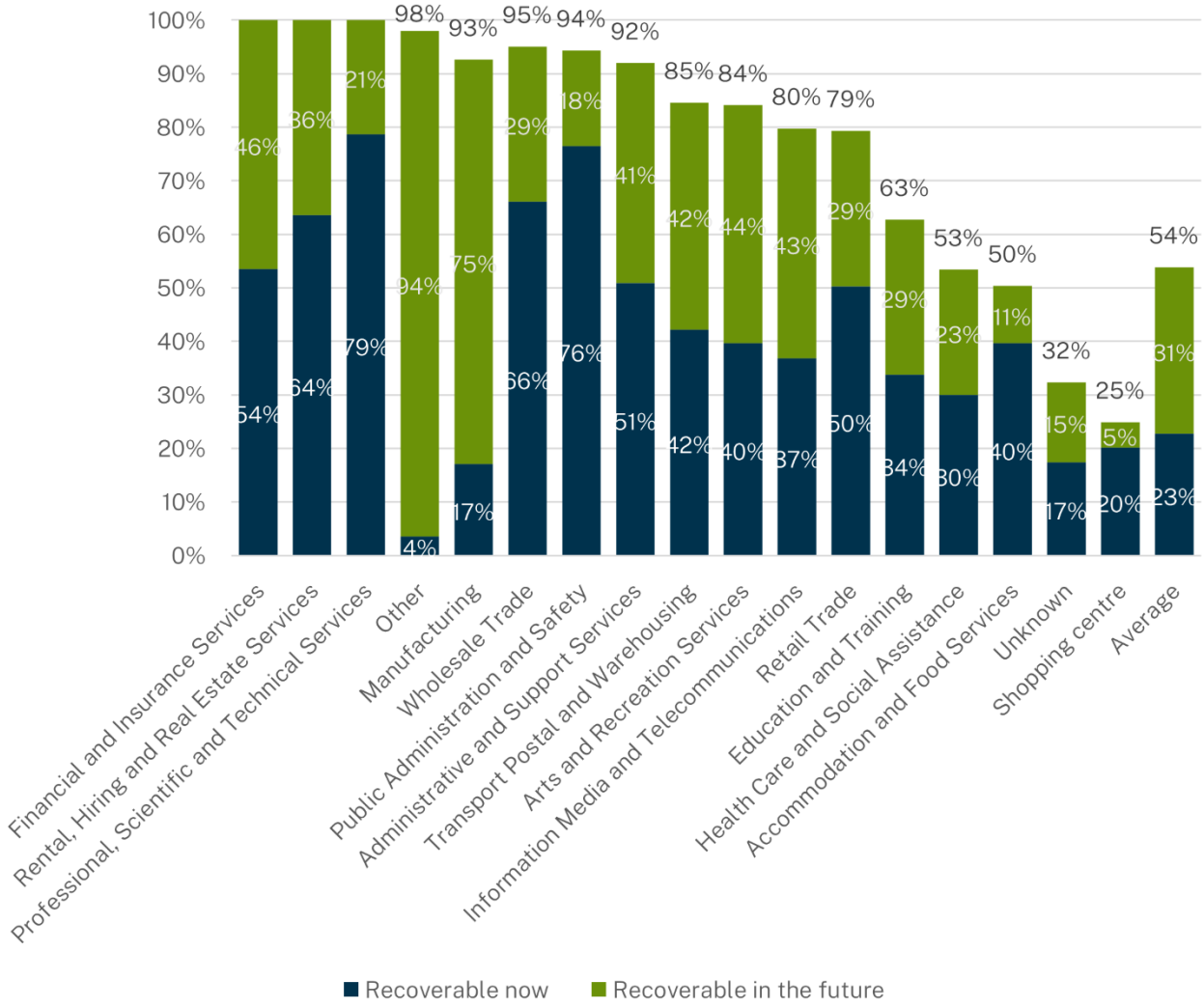
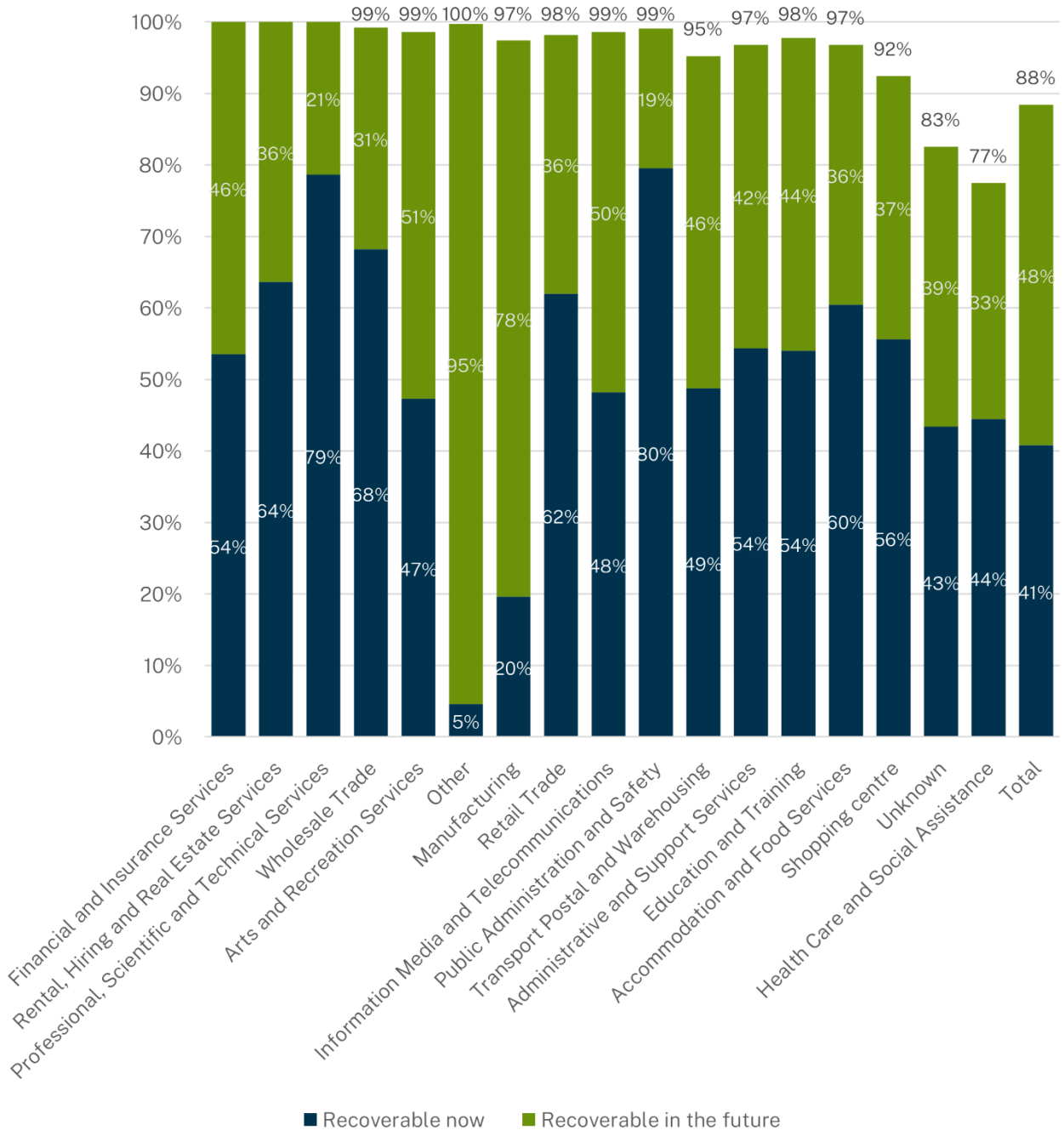


Figure 23 provides more detail of the potential recovery of C&I waste by industry sector, assuming that garbage bag contents are accessible for recovery.

The largest opportunities for recovery now are quite similar:

- public administration and safety (80%)
- professional, scientific and technical services (79%)
- wholesale trade (68%)
- rental, hiring and real estate services (64%).
- With garbage bag contents added, the weighted average for material recoverable now is 41% across all industries. This will rise to 88% in the future if further recovery processing opportunities are unlocked.

Figure 23 C&I waste potentially recyclable, by industry sector – garbage bag contents accessible



4.6 Trends in C&I waste

The NSW Government's last disposal-based C&I waste audit was conducted in 2014. This section is a high-level comparison of the results from that study and the present one.

It should be noted that the studies were conducted with slightly different methodologies. The main difference is the geographic coverage of samples collected: the 2023 audit includes non-levied areas that were not sampled in the 2014 audits. The MLA in 2023 covers the same area as the SMA and ERA combined from 2014. The RLA in 2023 covers the same area as the RRA in 2014.

Table 24 2014 and 2023 audit parameters

Parameter	2014 Audit	2023 Audit
Tonnes assessed	3,950	3,924
Vehicles assessed	2,000	1,497
Sites assessed	10 landfills 4 transfer stations	8 landfills 6 transfer stations
Areas assessed	Sydney Metro Area (SMA) Extended Regulated Area (ERA) Regional Regulated Area (RRA)	Metro Levy Area (MLA) Regional Levy Area (RLA) non-levied area (NLA)

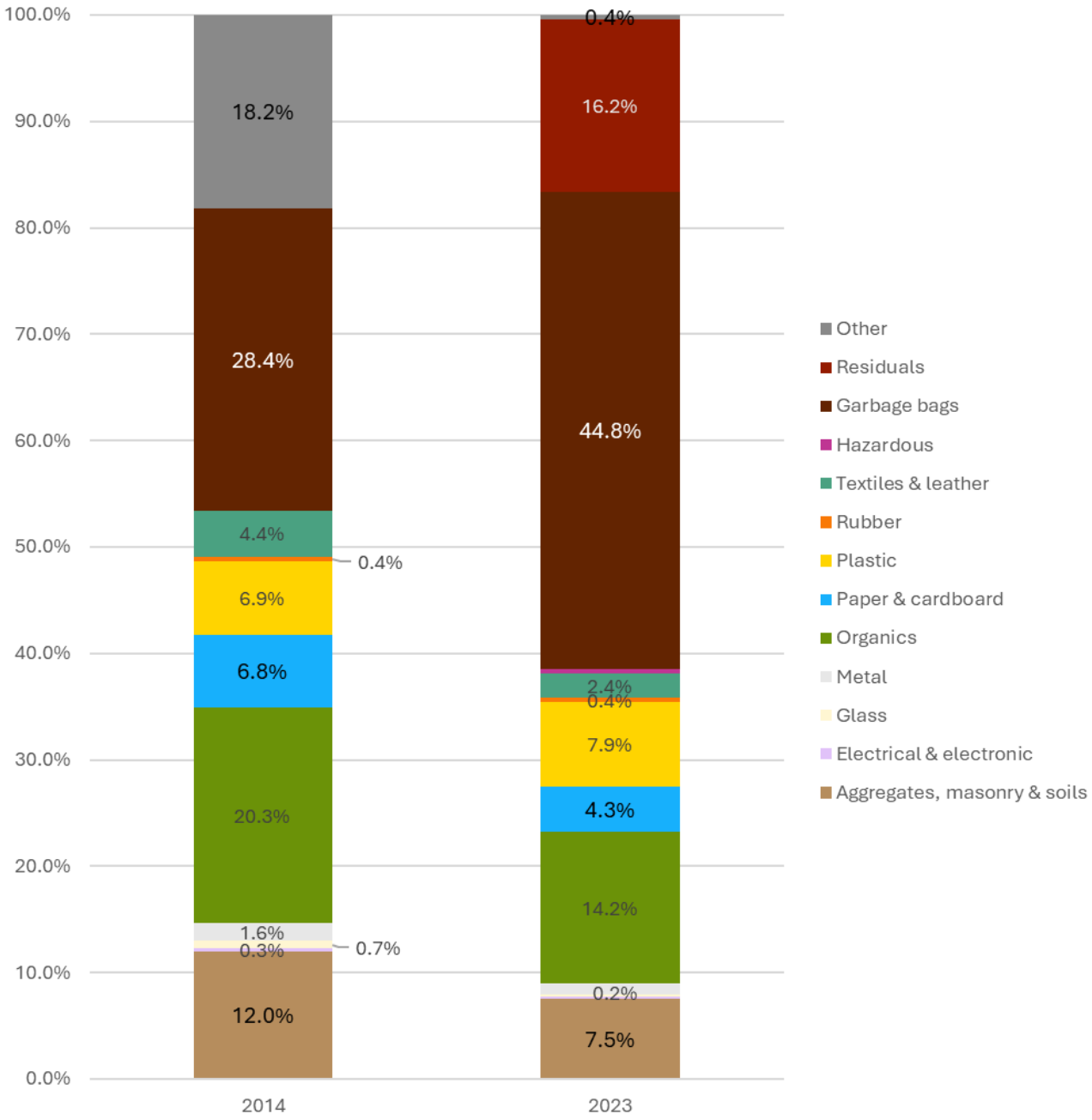
Image 12 Typical load of C&I waste. Credit: APC Waste Consultants

4.6.1. Comparison of C&I waste composition

Figure 24 shows a comparison of the overall waste composition estimated for each study period. Key observations from the two studies are:

- garbage bags increased significantly, by 16.4%
- aggregates, masonry and soils fell by 4.5%
- organic material fell by 6.1%
- other material/residuals from waste and resource-recovery processing facilities were almost identical in the two audits.

Figure 24 C&I waste composition comparison, 2014 and 2023, by material type, with garbage bags as a material stream

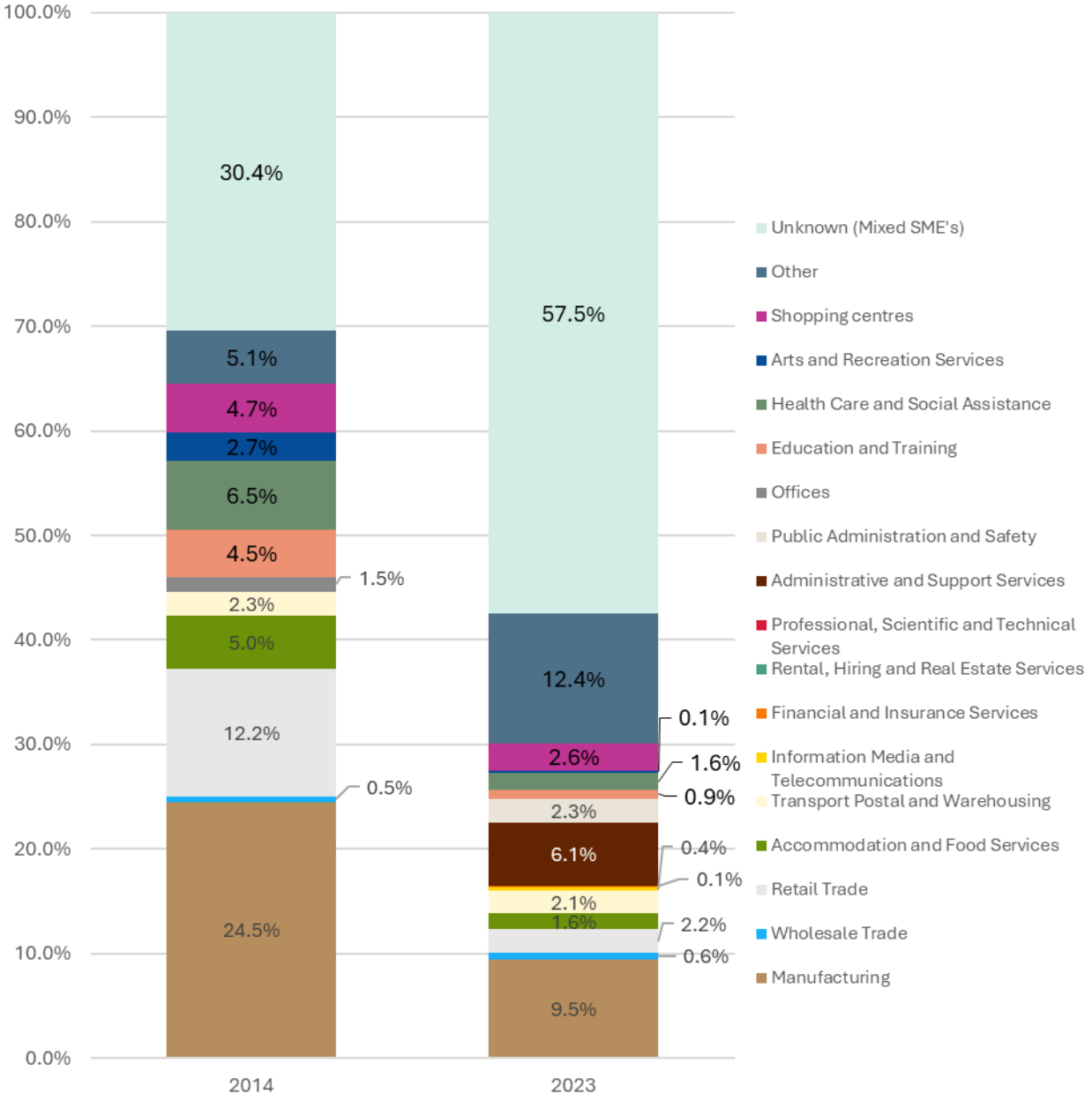


4.6.2. Industry sources of C&I waste

Figure 25 shows the results of the 2014 and 2023 audits by industry source; however, some sectors have changed between the audits and some categories are not directly comparable. Key observations from the two studies are:

- There has been a significant rise in the 'unknown' source category, which includes SMEs. The change is from 30.4% in 2014 to 57.5% in 2023, a 27.1% increase. These loads are mainly front and rear lift vehicles delivering waste from a variety of SMEs where the sources are deemed unknown as many businesses are contributing to the load.
- Other increases include the 'other' category, which has risen from 5.1% to 12.4%, and administrative and support services, which has risen from zero per cent to 6.1%.
- There have been reductions in several categories: in manufacturing, from 24.5% to 9.5%; retail, from 12.2% to 2.2%; health care and social assistance, from 6.5% to 1.6%; accommodation and food service, from 5% to 1.6%; shopping centres, from 4.7% to 2.6%; education and training, from 4.5% to 0.9%; and arts and recreation, from 2.7% to 0.1%.
- 'Wholesale trade' is almost identical in the 2014 audit and 2023 audit, changing from 0.5% to 0.6%.

Figure 25 C&I waste to landfill, 2014 and 2023, by ANZSIC division



5 Key findings: Metropolitan Levy Area (MLA)

The local government areas (LGAs) in the Metropolitan Levy Area (MLA) are listed in Appendix A. A subset of nine facilities located in these LGAs was audited. The data extrapolated from the audits was then scaled to represent the MLA.

Image 13 Mixed C&I delivery

5.1 MLA C&I waste composition

The main components of C&I waste disposed in the MLA are:

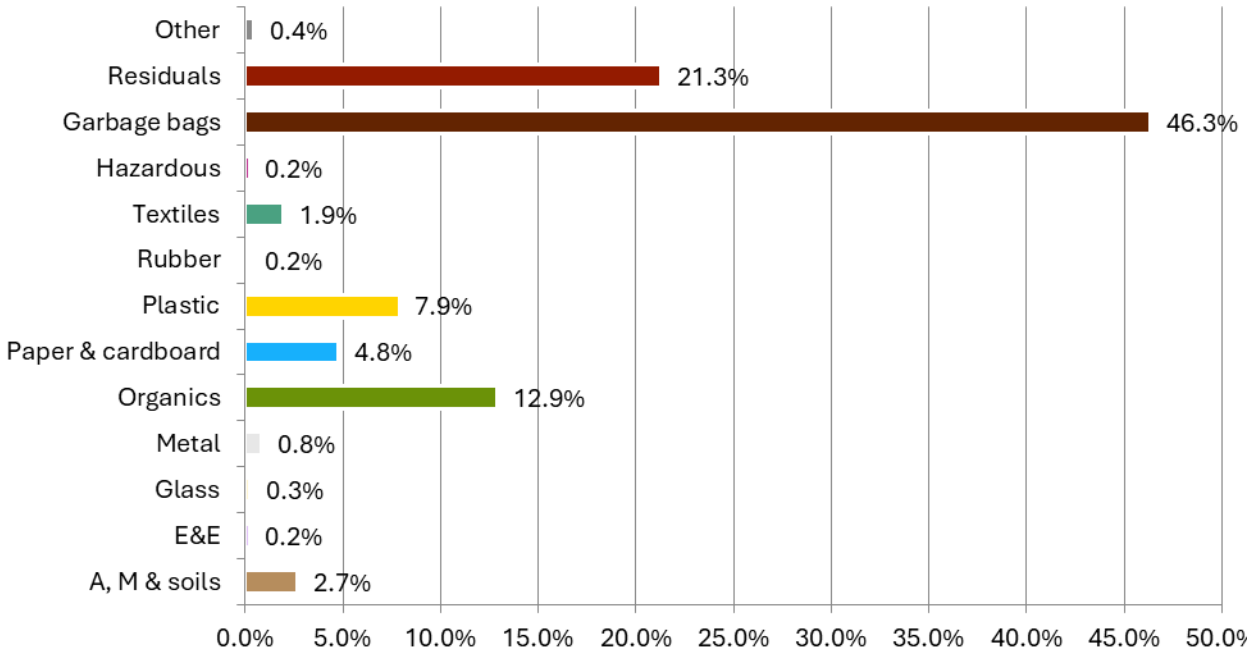
- garbage bags (46.3%)
- residuals (21.3%)
- organics (12.9%)
- plastic (7.9%)
- paper and cardboard (4.8%).

Table 25 MLA generation and composition – garbage bags as a category

Material	Tonnes per year	% of waste stream
Aggregates, masonry & soils	57,268	2.7%
Electrical & electronic	4,754	0.2%
Glass	5,588	0.3%
Metal	18,069	0.8%
Organics	274,725	12.9%
Paper & cardboard	101,498	4.8%
Plastic	167,834	7.9%

Material	Tonnes per year	% of waste stream
Rubber	4,099	0.2%
Textiles	41,274	1.9%
Hazardous	4,580	0.2%
Garbage bags	985,269	46.3%
Residuals	453,050	21.3%
Other	9,540	0.4%
Total	**2,127,548**	**100.0%**

Figure 26 MLA composition – garbage bags as a category



When the contents of garbage bags are distributed, the main materials in C&I waste in the MLA are:

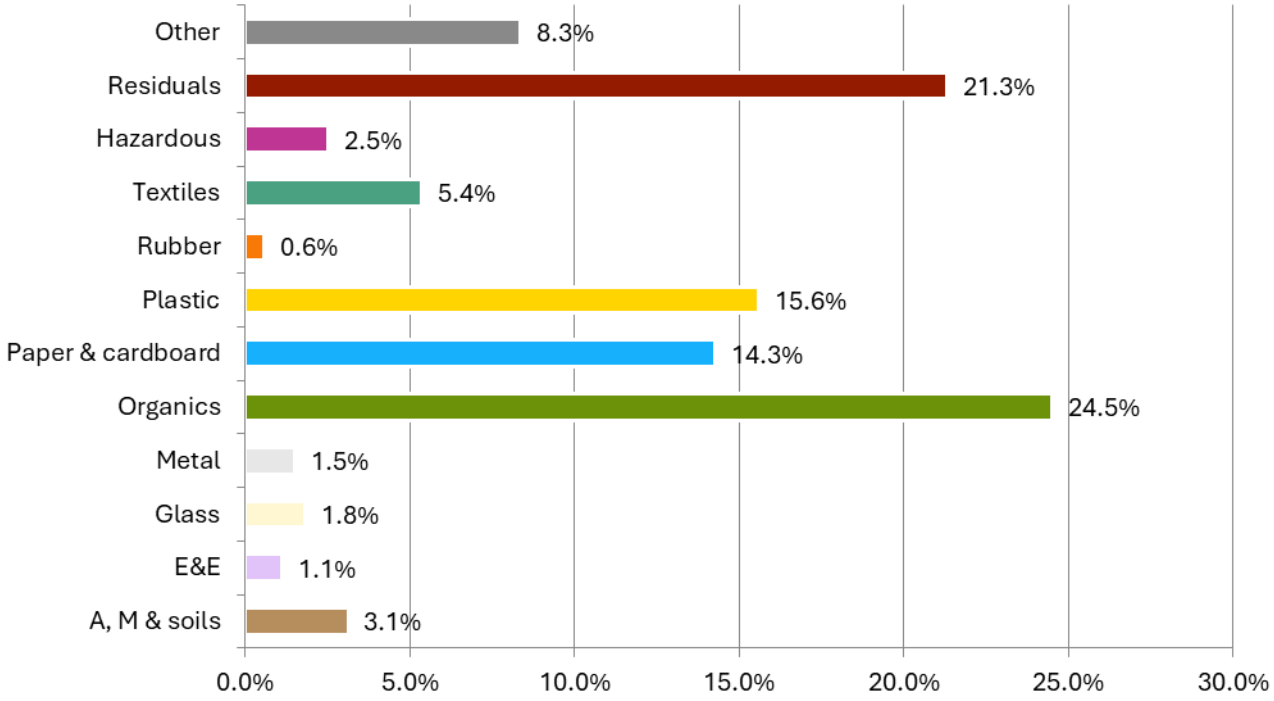
- organics (24.5%)
- residuals (21.3%)
- plastic (15.6%)
- paper and cardboard (14.3%)
- other, predominantly insulation (8.3%).

Table 26 MLA generation and composition – garbage bag contents distributed

Material	Tonnes per year	% of waste stream
Aggregates, masonry & soils	66,395	3.1%
Electrical & electronic	23,660	1.1%
Glass	38,670	1.8%
Metal	32,072	1.5%
Organics	521,436	24.5%
Paper & cardboard	303,631	14.3%
Plastic	331,366	15.6%
Rubber	12,019	0.6%
Textiles	114,310	5.4%
Hazardous	53,363	2.5%

Material	Tonnes per year	% of waste stream
Residuals	453,050	21.3%
Other	177,576	8.3%
Total	**2,127,548**	**100.0%**

Figure 27 MLA composition – garbage bag contents distributed



5.2 MLA C&I waste by industry sector

In the MLA, the industry sectors disposing of the most C&I waste in mixed loads are:

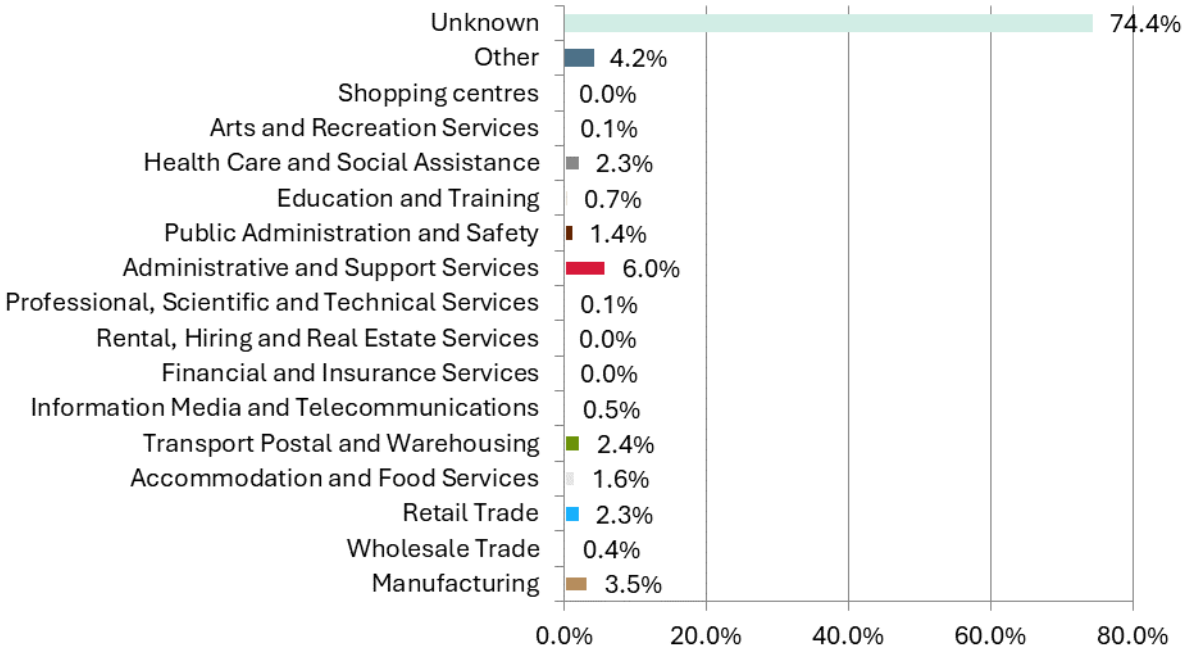
- unknown generators – material from mixed SMEs (74.4%)
- administrative and support services (6.0%)
- other – predominantly waste and resource management processors (4.2%)
- manufacturing (3.5%).

Table 27 MLA generation and composition by industry sector – mixed loads

Industry	Tonnes per year	% of waste stream
Manufacturing	56,119	3.5%
Wholesale trade	7,084	0.4%
Retail trade	37,443	2.3%
Accommodation and food services	26,687	1.6%
Transport, postal and warehousing	39,103	2.4%
Information media and telecommunications	8,103	0.5%
Financial and insurance services	601	0.0%
Rental, hiring and real estate services	144	0.0%
Professional, scientific and technical services	1,294	0.1%
Administrative and support services	97,777	6.0%

Industry	Tonnes per year	% of waste stream
Public administration and safety	22,727	1.4%
Education and training	11,854	0.7%
Health care and social assistance	37,652	2.3%
Arts and recreation services	876	0.1%
Shopping centres	0	0.0%
Other	68,247	4.2%
Unknown (mixed SMEs)	1,208,045	74.4%
Total	**1,623,757**	**100.0%**

Figure 28 MLA – C&I disposal by industry sector – mixed loads



Assessing single-material loads only, generation is mostly by:

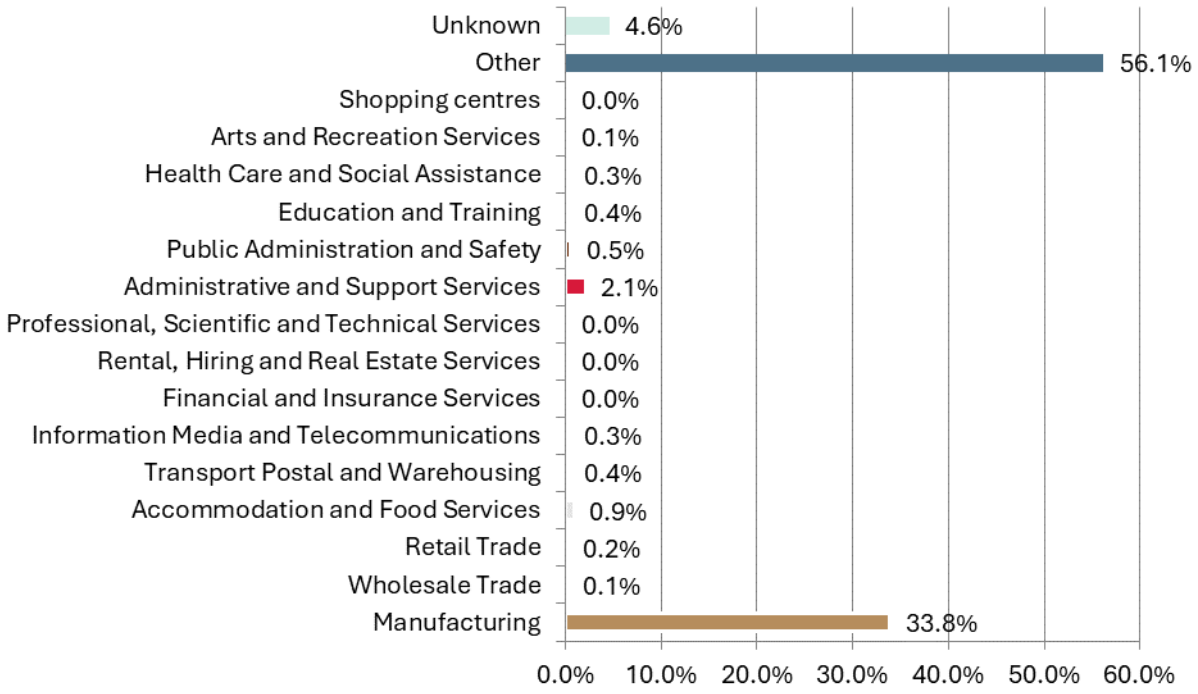
- other – predominantly waste and resource management processors (56.1%)
- manufacturing (33.8%)
- unknown – driver could not specify generator source (4.6%)
- administrative and support services (2.1%).

Table 28 MLA generation and composition by industry sector – single-material loads

Industry	Tonnes per year	% of waste stream
Manufacturing	148,022	33.8%
Wholesale trade	614	0.1%
Retail trade	745	0.2%
Accommodation and food services	4,051	0.9%
Transport, postal and warehousing	1,542	0.4%
Information media and telecommunications	1,477	0.3%
Financial and insurance services	0	0.0%
Rental, hiring and real estate services	0	0.0%

Industry	Tonnes per year	% of waste stream
Professional, scientific and technical services	157	0.0%
Administrative and support services	9,240	2.1%
Public administration and safety	2,352	0.5%
Education and training	1,542	0.4%
Health care and social assistance	1,294	0.3%
Arts and recreation services	470	0.1%
Shopping centres	157	0.0%
Other	245,727	56.1%
Unknown	20,270	4.6%
Total	**437,661**	**100.0%**

Figure 29 MLA – C&I disposal by industry sector – single-material loads



5.3 MLA Recoverable materials

Materials in the C&I waste stream are classified as either recoverable now, recoverable in the future or not recoverable (see section 2.5, *Recoverable materials*).

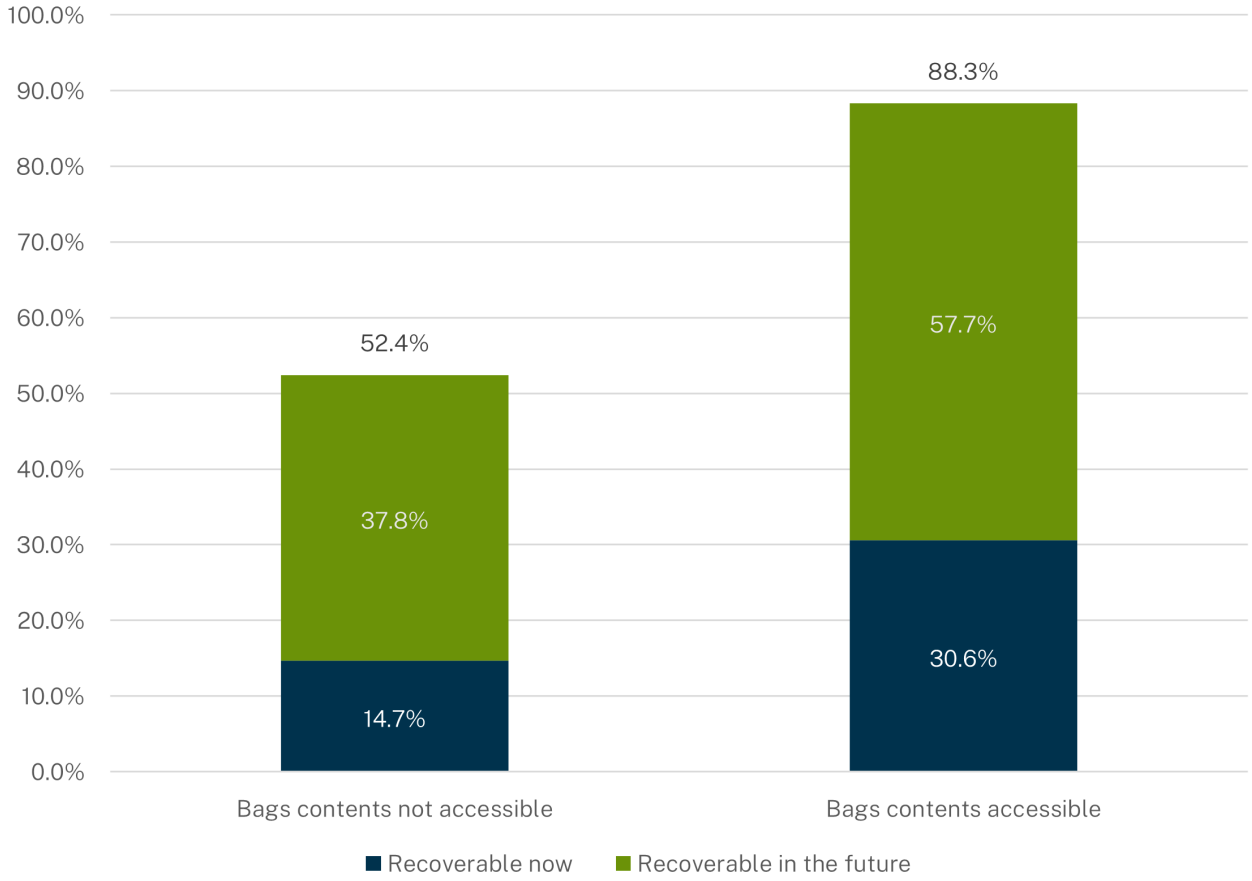
If the contents of garbage bags are not accessible:

- 14.7% of C&I waste disposed of in the MLA is recoverable now
- this could potentially increase by 37.8% (to 52.4%) in the future.

If the contents of garbage bags were accessible:

- 30.6% could be recovered now.
- 88.3% could be recovered in the future.

Figure 30 MLA – C&I waste currently disposed of that could be recycled



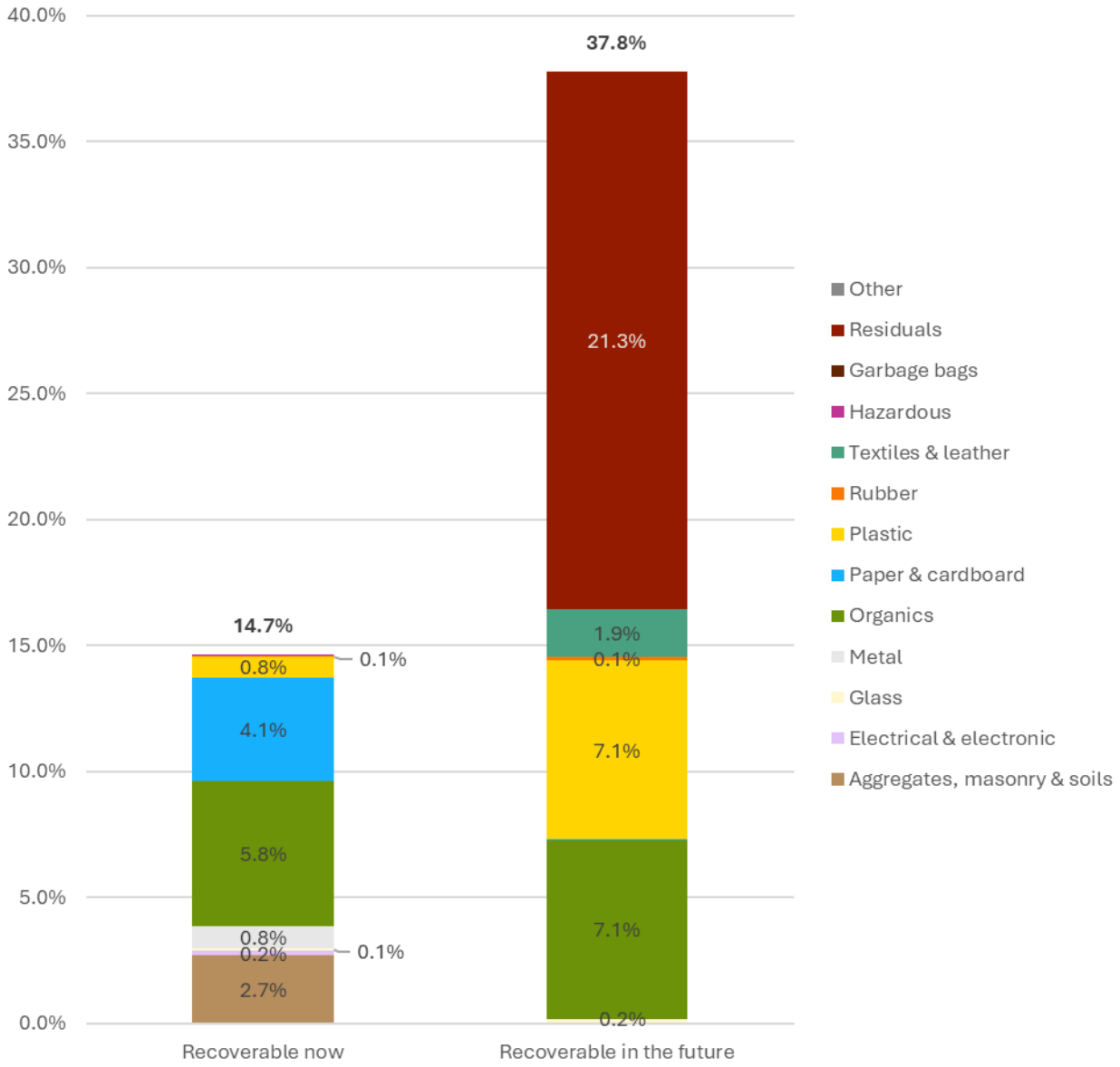
The potential for recovery of C&I waste now in the MLA (**excluding** the contents of garbage bags) is highest for:

- organics (5.8%)
- paper and cardboard (4.1%)
- aggregates, masonry and soils (2.7%)
- metal (0.8%)
- plastic (0.8%).

In the future, the greatest opportunities will be for:

- residuals (21.3%)
- organics (7.1%)
- plastic (7.1%)
- textiles and leather (1.9%).

Figure 31 MLA – detail of C&I waste currently disposed of that could be recycled – garbage bag contents not accessible



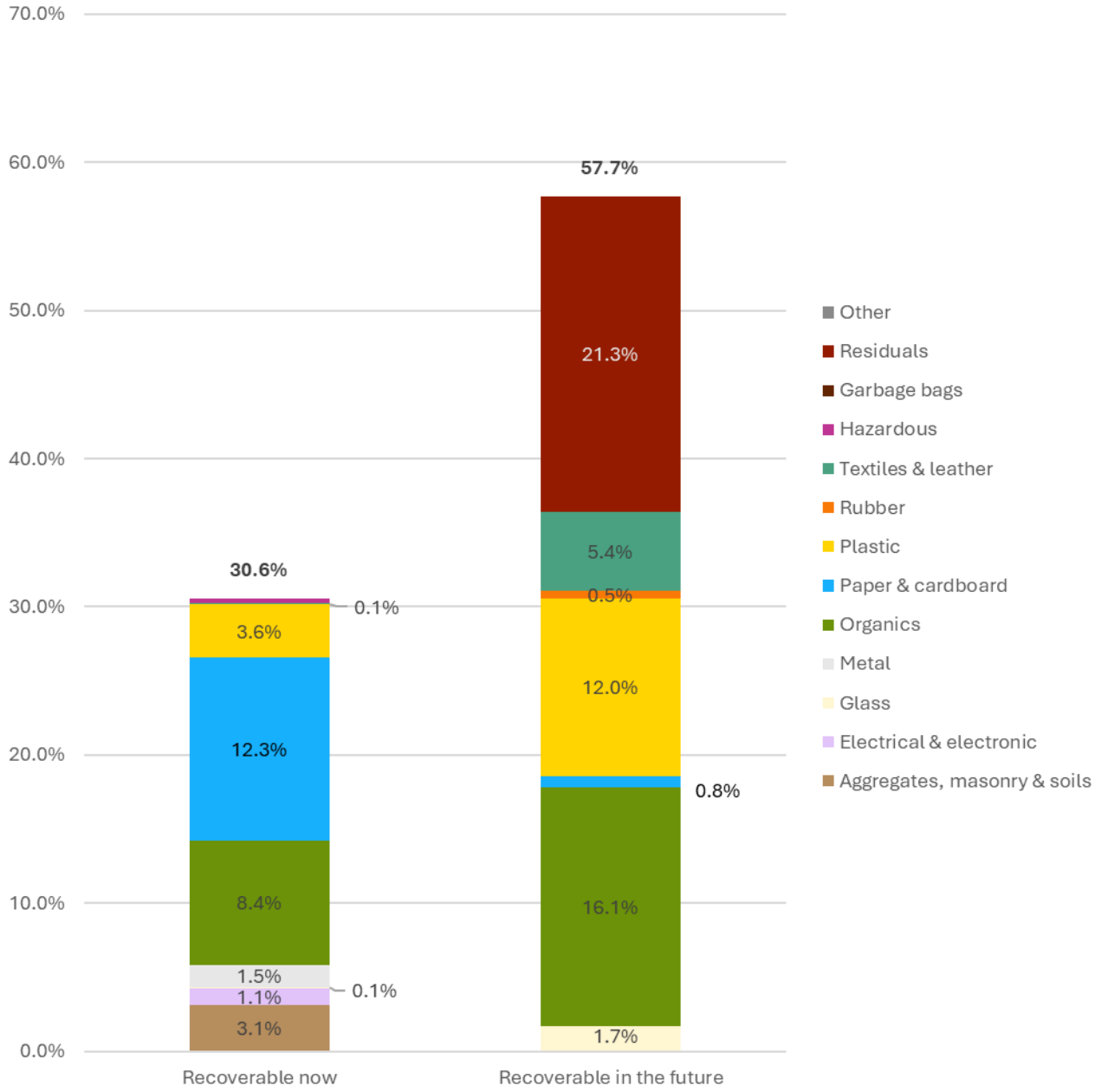
The potential for recovery of C&I waste in the MLA now (**including** the contents of garbage bags) is highest for:

- paper and cardboard (12.3%)
- organics (8.4%)
- plastic (3.6%)
- aggregates, masonry and soils (3.1%).

In the future, the key opportunities will be for:

- residuals (21.3%)
- organics (16.1%)
- plastic (12.0%)
- textiles and leather (5.4%).

Figure 32 MLA – detail of C&I waste currently disposed that could be recycled – garbage bag contents accessible



5.4 MLA trends in C&I waste

This section provides a high-level comparison of the results from the 2014 and 2023 C&I waste audits.

Table 29 Overview of assessment, 2014 and 2023, MLA

Parameter	2014 Audit	2023 Audit
Tonnes assessed	2,740	3,256
Vehicles assessed	1,424	1,136
Sites assessed	8 landfills 4 transfer stations	4 landfills 5 transfer stations
Areas assessed	Sydney Metro Area (SMA) Extended Regulated Area (ERA)	Metro Levy Area (MLA)

More mixed loads were observed in the 2023 C&I audit than in the 2014 audit.

Figure 33 MLA loads comparison, 2013–14 and 2022–23

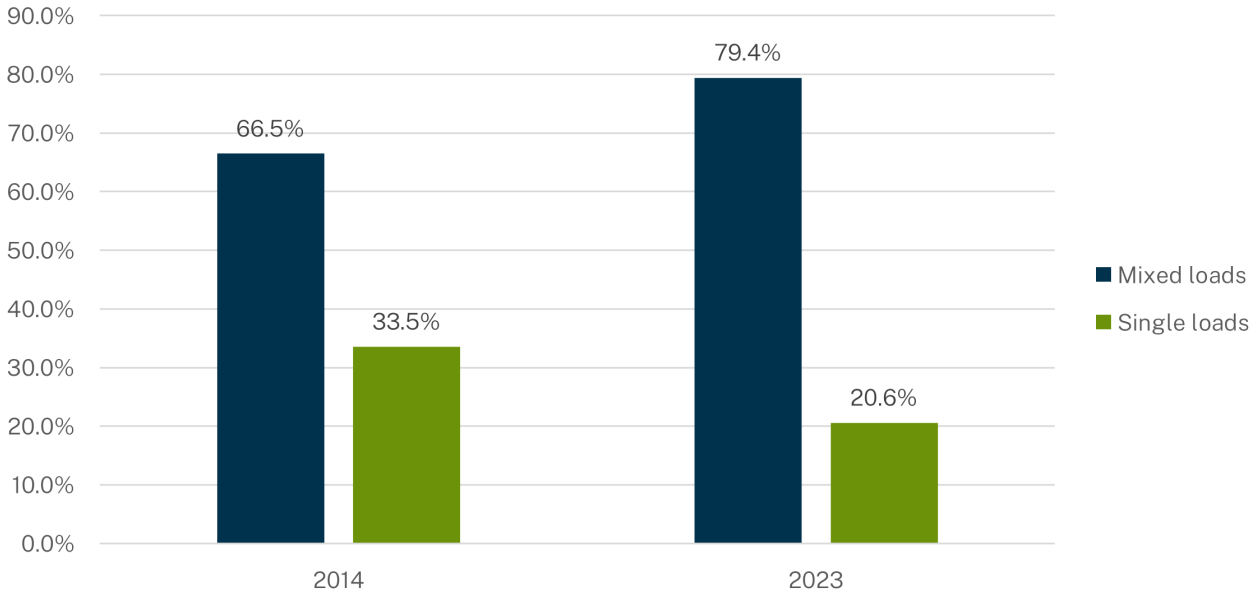
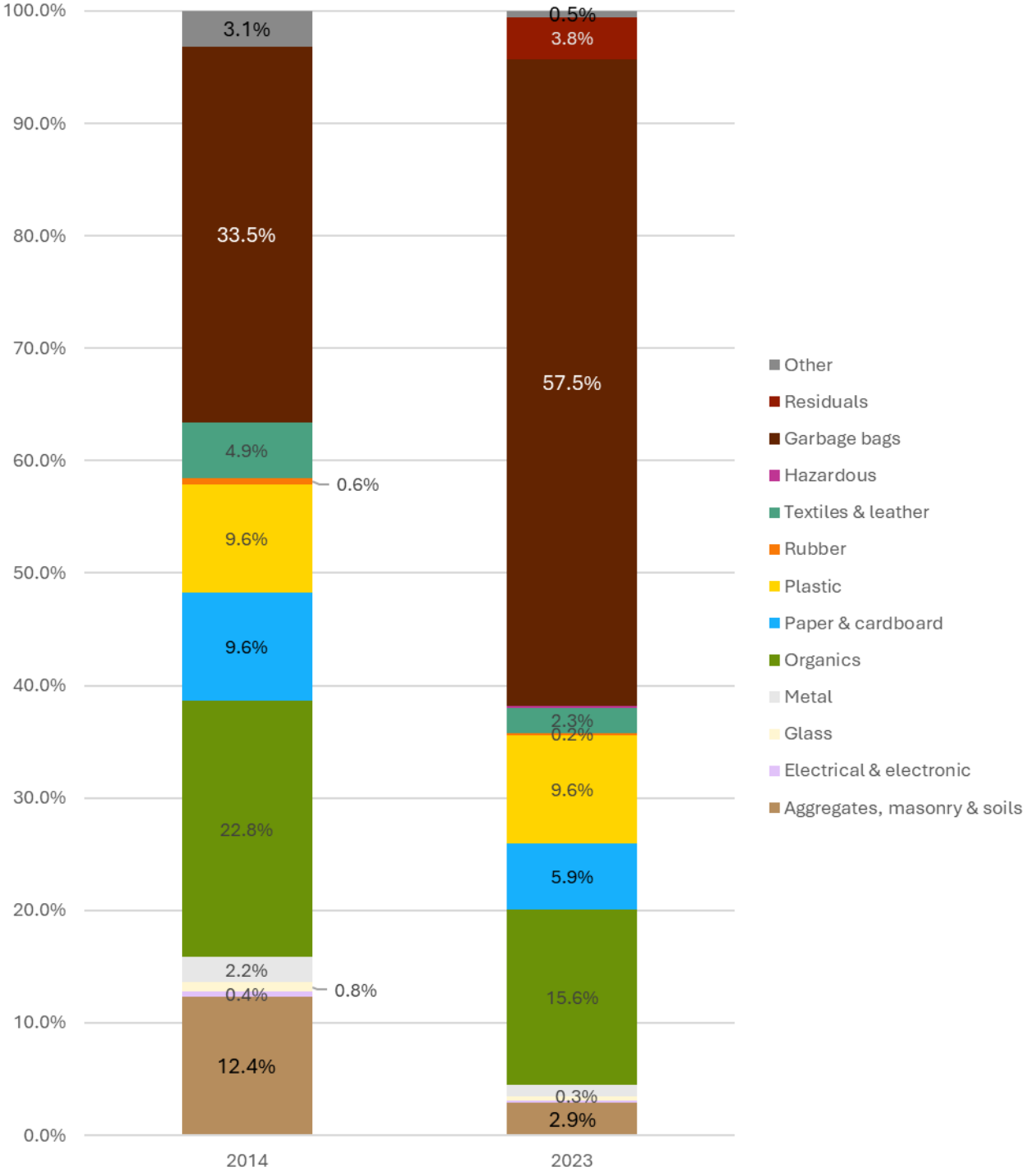


Figure 34 shows the overall waste composition estimated for the two study periods. Key observations were:

- waste in garbage bags was significantly higher in 2023, by 24.0%
- aggregates, masonry and soils fell by 9.5%
- organic material fell by 7.3%.

Figure 34 MLA C&I waste to landfill, 2013–14 and 2022–23, by material type, garbage bag contents not distributed



6 Results: Regional Levy Area (RLA)

6.1 RLA C&I waste composition

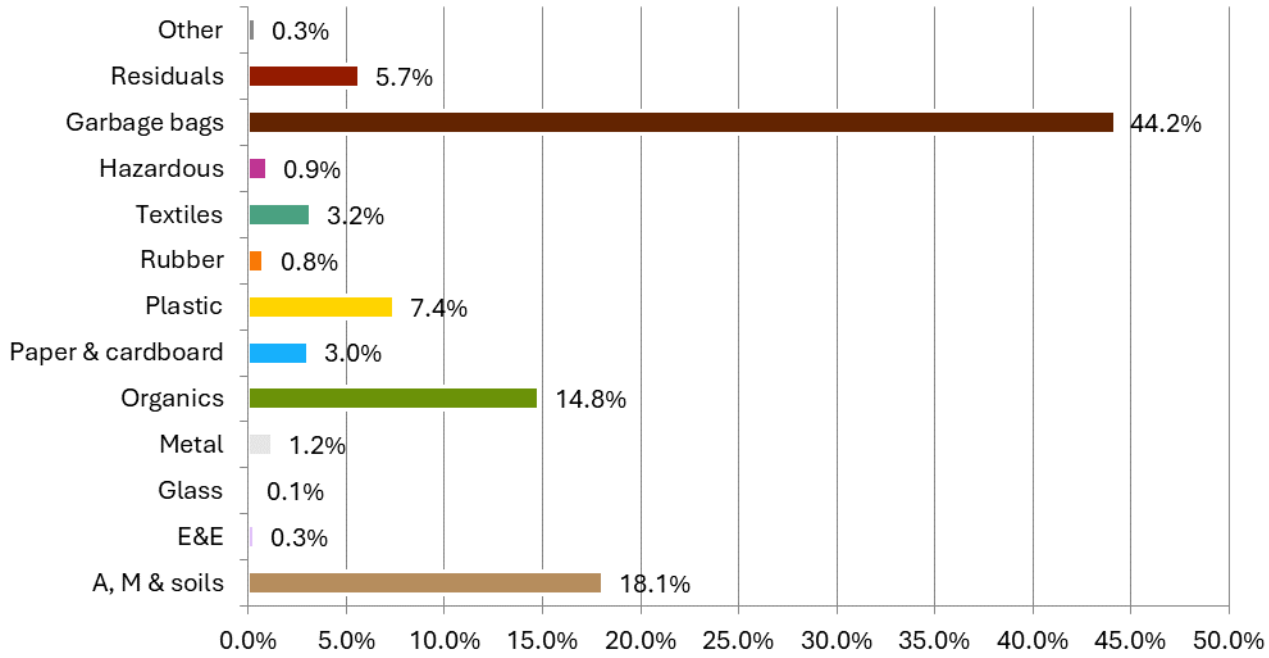
The main components of C&I waste disposed in the RLA are:

- garbage bags (44.2%)
- aggregates, masonry and soils (18.1%)
- organics, predominantly treated wood and MDF (14.8%)
- plastic (7.4%)
- residuals (5.7%).

Table 30 RLA generation and composition – garbage bags as a category

Material	Tonnes per year	% of waste stream
Aggregates, masonry & soils	144,161	18.1%
Electrical & electronic	2,320	0.3%
Glass	871	0.1%
Metal	9,822	1.2%
Organics	118,255	14.8%
Paper & cardboard	24,139	3.0%
Plastic	59,133	7.4%
Rubber	6,209	0.8%
Textiles	25,351	3.2%
Hazardous	7,522	0.9%
Garbage bags	352,772	44.2%
Residuals	45,280	5.7%
Other	2,729	0.3%
Total	**798,564**	**100.0%**

Figure 35 RLA composition – garbage bags as a category



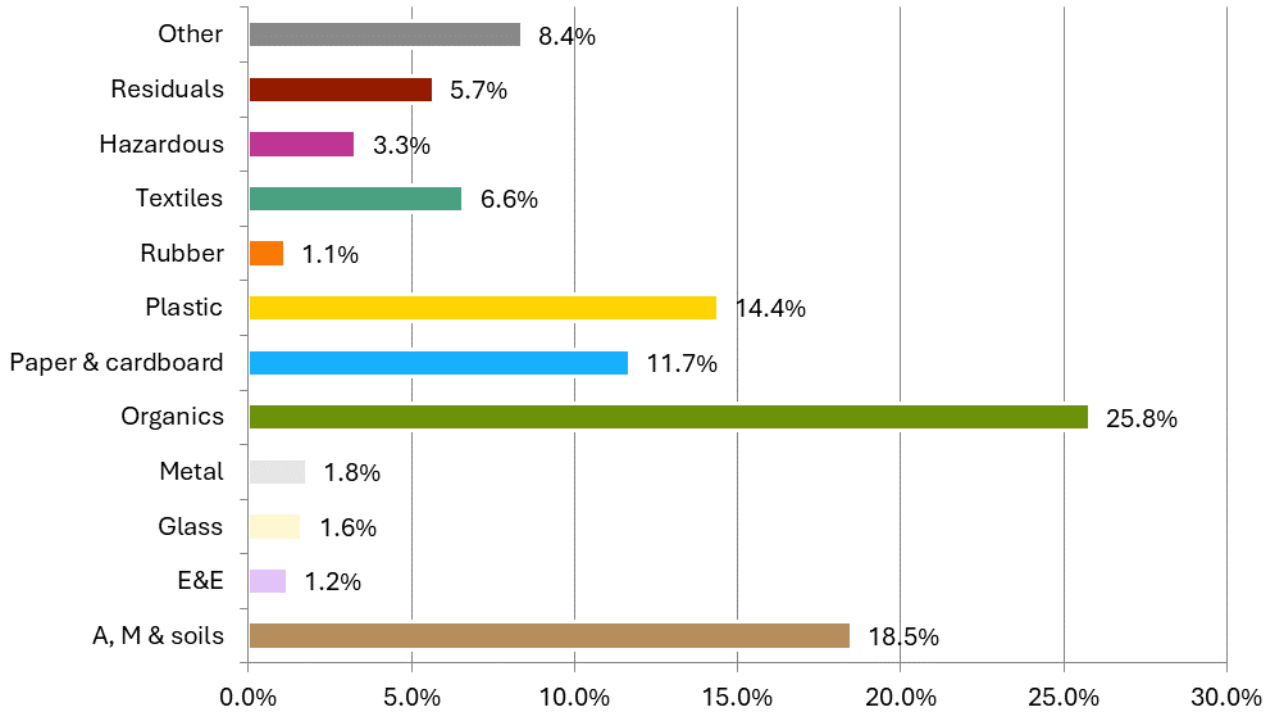
When the contents of garbage bags are distributed, the main materials in C&I waste in the RLA are:

- organics (25.8%)
- aggregates, masonry and soils (18.5%)
- plastic (14.4%)
- paper & cardboard (11.7%)
- other (8.4%).

Table 31 RLA generation and composition – garbage bag contents distributed

Material	Tonnes per year	% of waste stream
Aggregates, masonry & soils	147,616	18.5%
Electrical & electronic	9,480	1.2%
Glass	13,104	1.6%
Metal	14,321	1.8%
Organics	205,895	25.8%
Paper & cardboard	93,242	11.7%
Plastic	114,982	14.4%
Rubber	8,826	1.1%
Textiles	52,638	6.6%
Hazardous	26,250	3.3%
Residuals	45,280	5.7%
Other	66,928	8.4%
Total	**798,564**	**100.0%**

Figure 36 RLA – contents of garbage bags in C&I waste



6.2 RLA C&I by industry sector

In the RLA, the industry sectors disposing of the most C&I waste in mixed loads are:

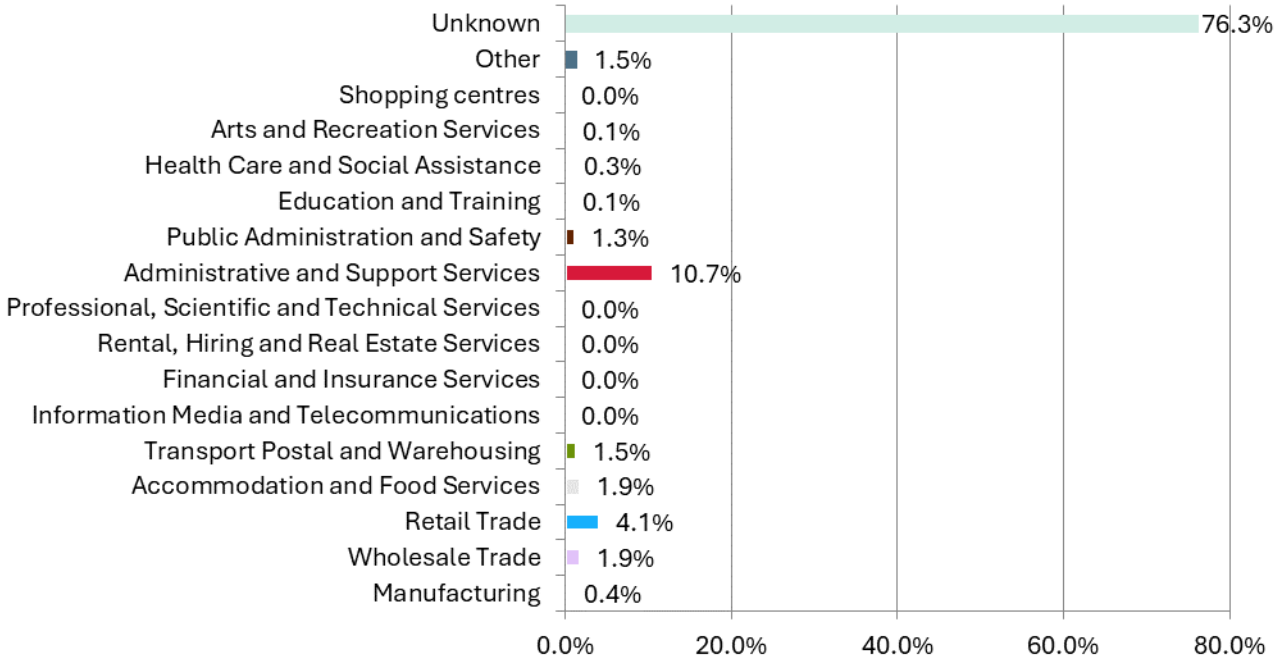
- unknown generators – mixed SMEs (76.3%)
- administrative and support services (10.7%)
- retail trade (4.1%)
- wholesale trade, and accommodation and food services (1.9%).

Table 32 RLA generation and composition by industry sector – mixed loads

Industry	Tonnes per year	% of waste stream
Manufacturing	2,695	0.4%
Wholesale trade	13,367	1.9%
Retail trade	29,761	4.1%
Accommodation and food services	13,588	1.9%
Transport, postal and warehousing	10,450	1.5%
Information media and telecommunications	0	0.0%
Financial and insurance services	222	0.0%
Rental, hiring and real estate services	0	0.0%
Professional, scientific and technical services	0	0.0%
Administrative and support services	76,914	10.7%
Public administration and safety	9,010	1.3%
Education and training	997	0.1%
Health care and social assistance	2,068	0.3%
Arts and recreation services	923	0.1%
Shopping centres	0	0.0%
Other	10,819	1.5%

Industry	Tonnes per year	% of waste stream
Unknown	549,509	76.3%
Total	**720,321**	**100.0%**

Figure 37 RLA – C&I disposal by industry sector – mixed loads



Assessing single-material loads only, generation is mostly by:

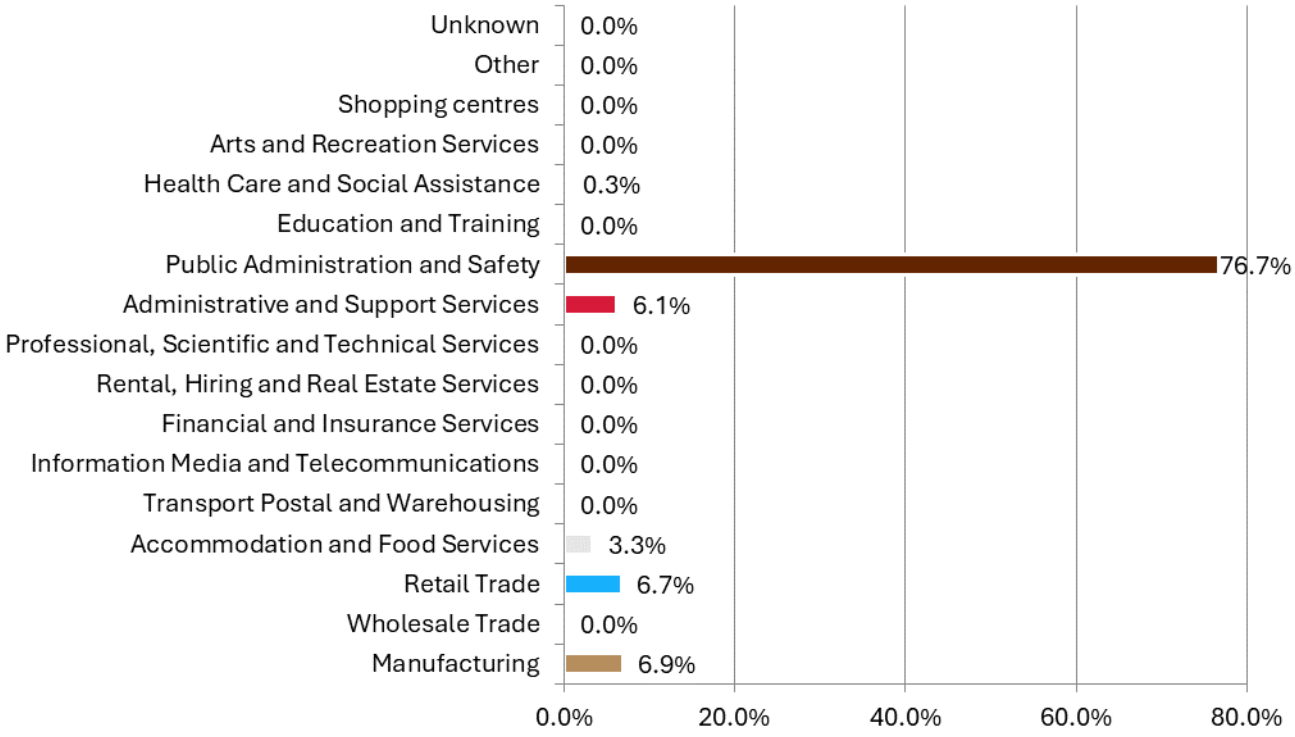
- public administration and safety (76.7%)
- manufacturing (6.9%)
- retail trade (6.7%)
- administrative and support services (6.1%).

Table 33 RLA generation and composition by industry sector – single-material loads

Industry	Tonnes per year	% of waste stream
Manufacturing	5,317	6.9%
Wholesale trade	0	0.0%
Retail trade	5,206	6.7%
Accommodation and food services	2,548	3.3%
Transport, postal and warehousing	0	0.0%
Information media and telecommunications	0	0.0%
Financial and insurance services	0	0.0%
Rental, hiring and real estate services	0	0.0%
Professional, scientific and technical services	0	0.0%
Administrative and support services	4,763	6.1%
Public administration and safety	59,448	76.7%
Education and training	0	0.0%
Health care and social assistance	222	0.3%
Arts and recreation services	0	0.0%
Shopping centres	0	0.0%
Other	0	0.0%
Unknown	0	0.0%

Industry	Tonnes per year	% of waste stream
Total	**77,504**	**100.0%**

Figure 38 RLA – C&I disposal by industry sector – single-material loads



6.3 RLA recoverable materials

Materials in the C&I waste stream are classified as either recoverable now, recoverable in the future or not recoverable (see section 2.5, *Recoverable materials*).

If the contents of garbage bags are not accessible:

- 28.9% of C&I waste disposed of in the RLA is recoverable now
- the amount of waste recoverable will potentially increase by 25.2% (to 54.1%) in the future.

When the contents of garbage bags are accessible:

- 43.9% of C&I waste could be recovered now
- there is a potential increase by 43.8% (to 87.7%) in the future.

Figure 39 C&I waste currently disposed of that could be recycled – RLA

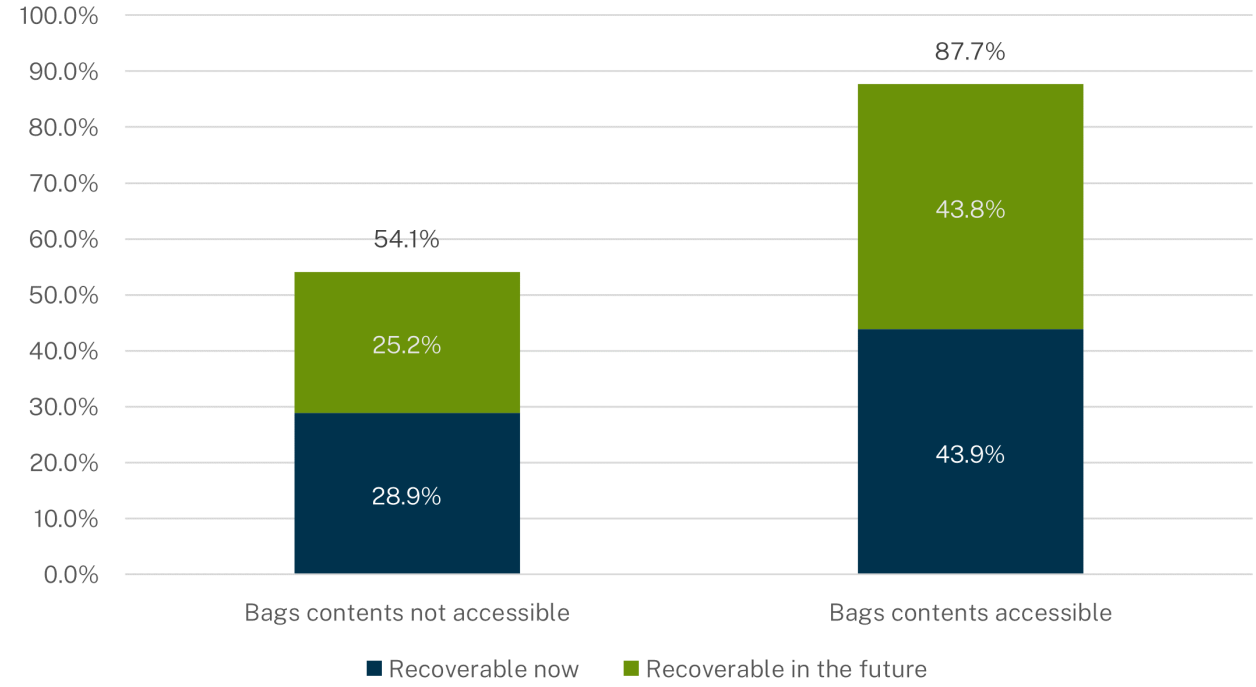


Image 14 Bagged waste is 44% of all C&I waste deliveries. Credit: APC Waste Consultants

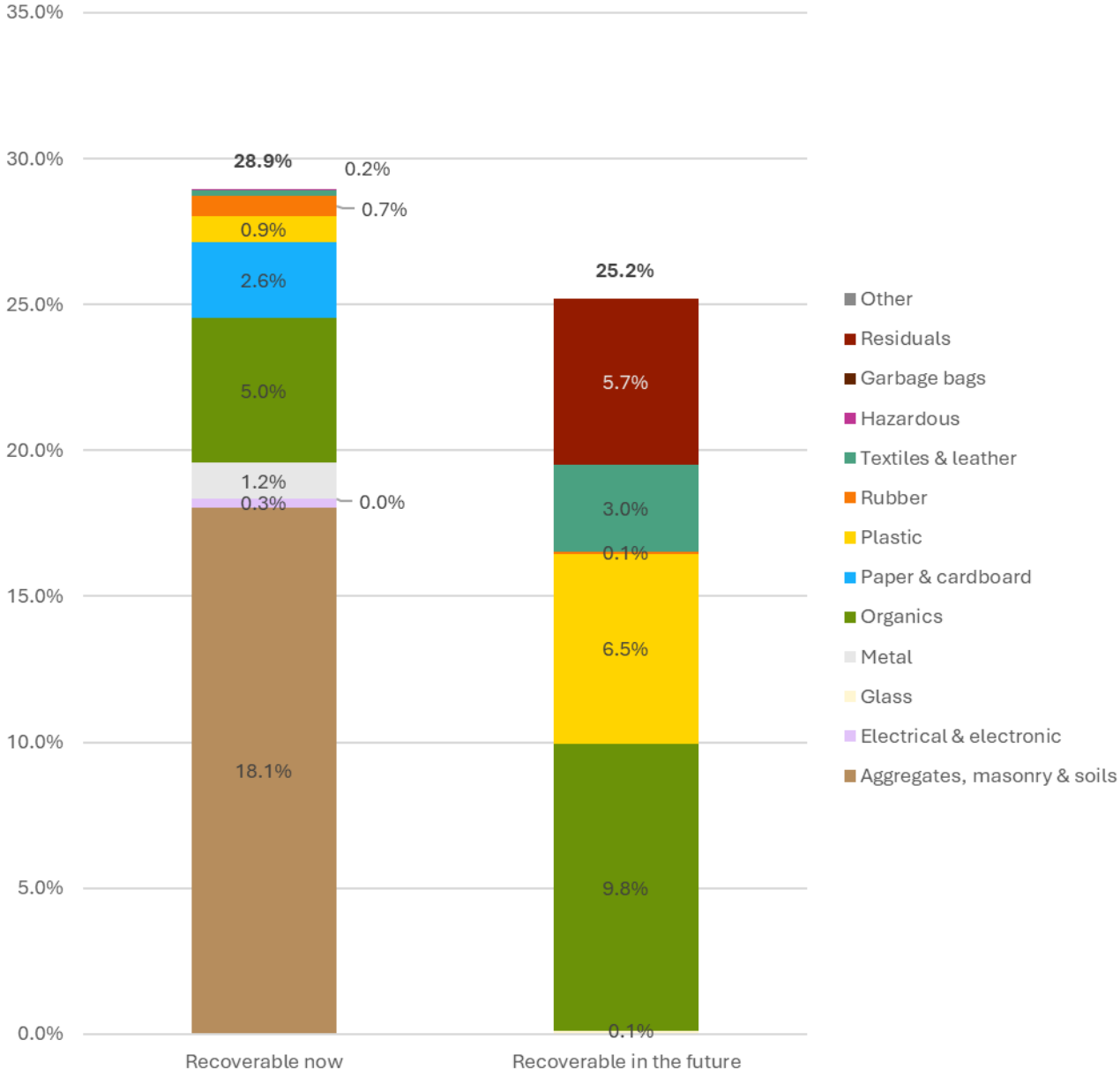
The potential for recovery of C&I waste in the RLA (**excluding** the contents of garbage bags) is highest for:

- aggregates, masonry and soils (18.1%)
- organics (5.0%)
- paper and cardboard (2.6%)
- metal (1.2%).

In the future, the greatest C&I recovery opportunity will be for:

- organics (9.8%)
- plastic (6.5%)
- residuals (5.7%)
- textiles and leather (3.0%).

Figure 40 RLA – detail of C&I waste currently disposed of that could be recycled – garbage bag contents not accessible



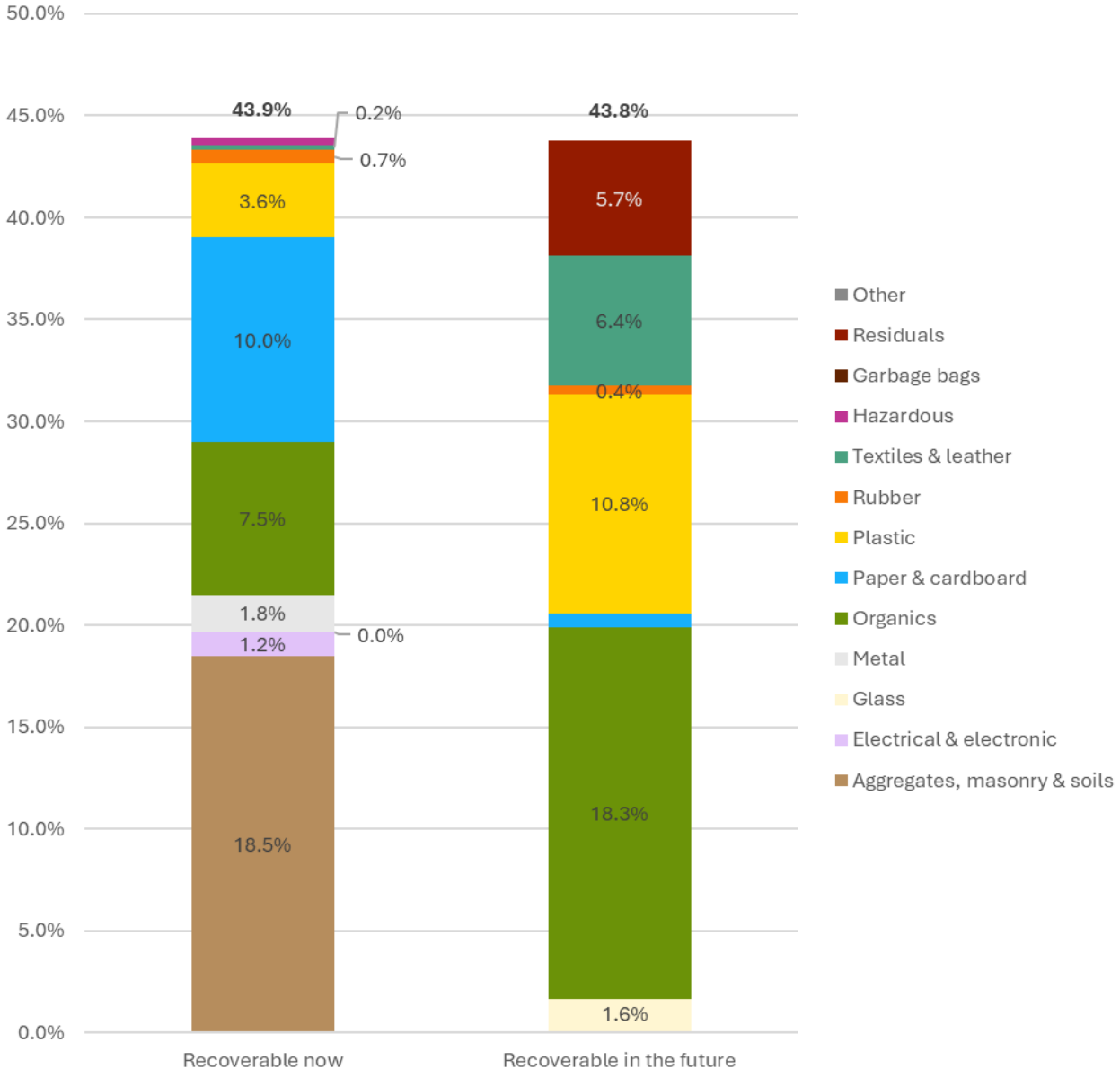
The potential for recovery of C&I waste in the RLA (**including** the contents of garbage bags) is highest for:

- aggregates, masonry and soils (18.5%)
- paper and cardboard (10.0%)
- organics (7.5%)
- plastic (3.6%).

In the future, the greatest C&I recovery opportunity will be for:

- organics (18.3%)
- plastic (10.8%)
- textiles and leather (6.4%)
- residuals (5.7%).

Figure 41 RLA – detail of C&I waste currently disposed of that could be recycled – garbage bag contents accessible



6.4 RLA trends in C&I waste

This section provides a high-level comparison of the results from the 2014 and 2023 C&I waste audits.

Table 34 Overview of assessment, 2014 and 2023, RLA

Parameter	2014 Audit	2023 Audit
Tonnes assessed	1,210	433
Vehicles assessed	576	207
Sites assessed	6 landfills 0 transfer stations	2 landfills 1 transfer station
Areas assessed	Regional Regulated Area (RRA)	Regional Levy Area (RLA)

Slightly more mixed loads were observed in the 2023 C&I audits than in the 2014 audit.

Figure 42 RLA loads comparison, 2014 and 2023

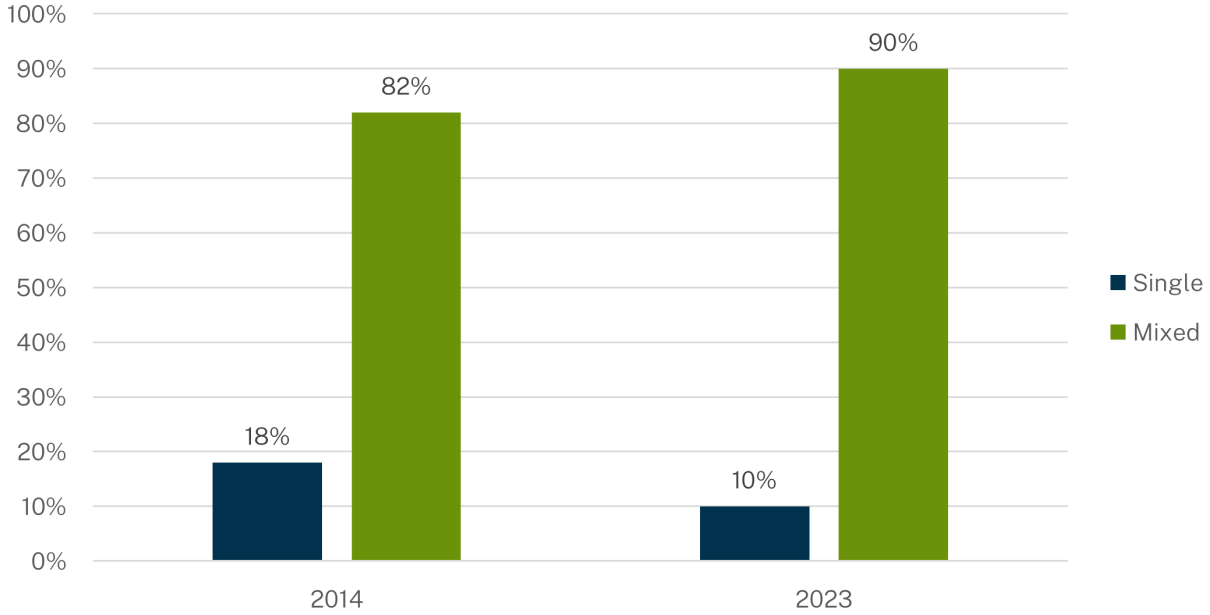
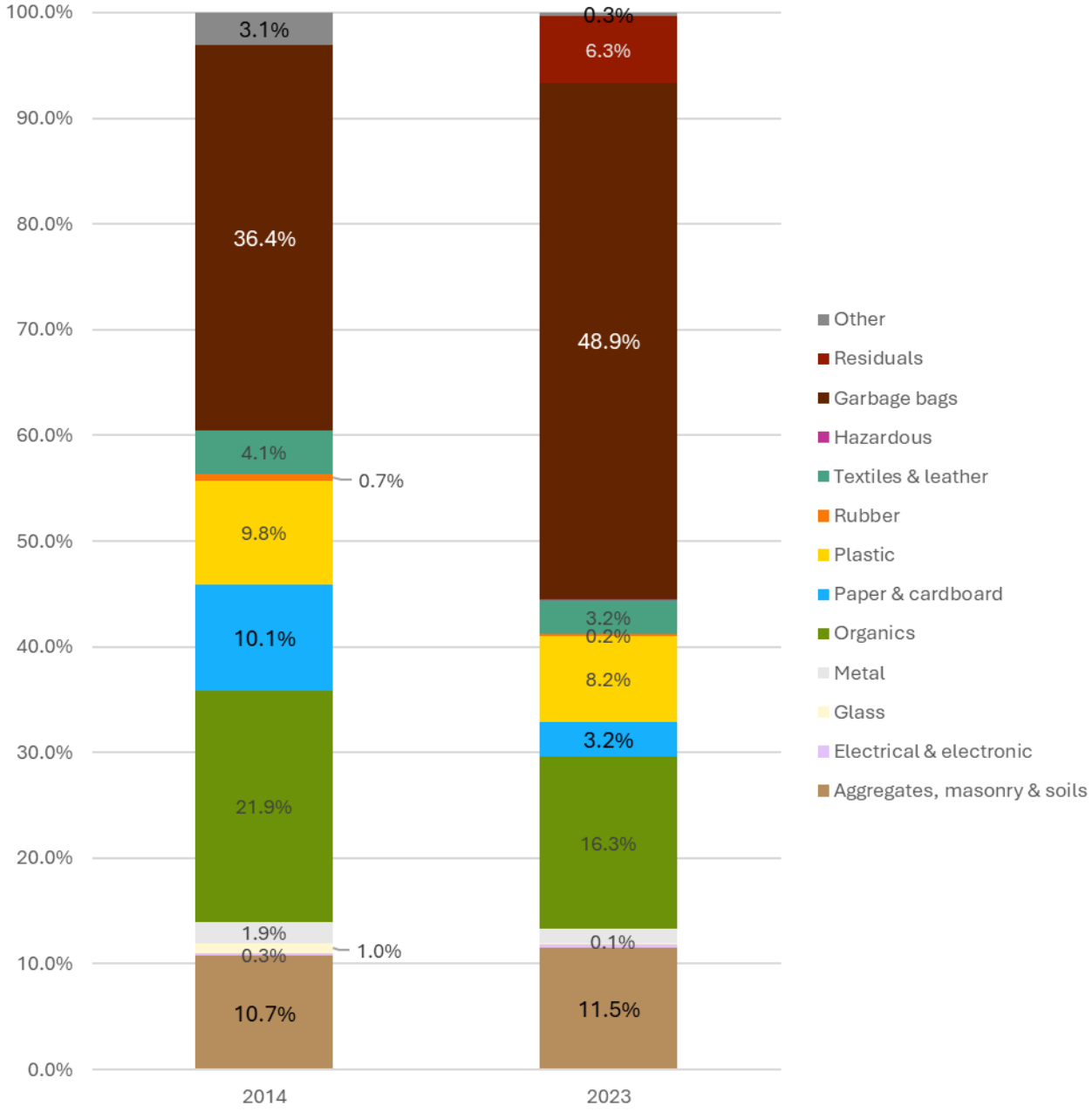


Figure 43 shows the overall waste composition estimated for the two study periods. Key observations are:

- waste in garbage bags rose by 12.5%
- paper and cardboard fell by 6.8%
- organic material fell by 5.6%.

Figure 43 RLA C&I waste to landfill, 2014 and 2023, by material type



7 Results: Non-levied area (NLA)

7.1 NLA C&I waste composition

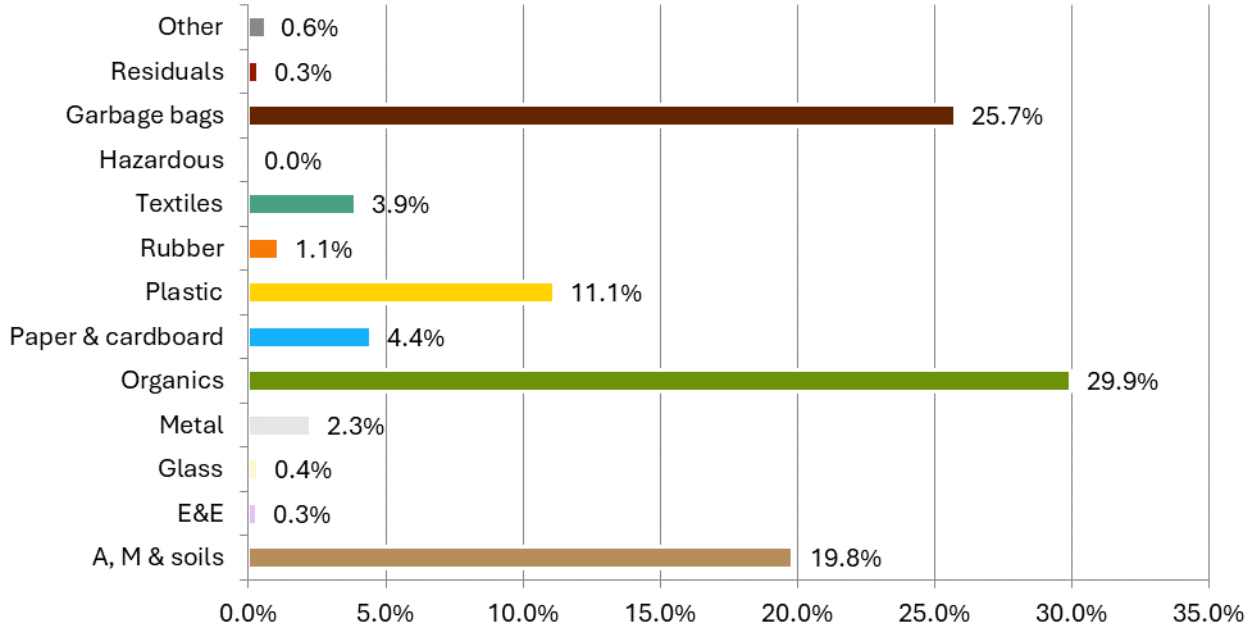
The main components of C&I waste disposed in the NLA are:

- organics, predominantly sawdust and packaged food (29.9%)
- garbage bags (25.7%)
- aggregates, masonry and soils (19.8%)
- plastic (11.1%)
- paper and cardboard (4.4%).

Table 35 NLA generation and composition – garbage bags as a category

Material	Tonnes per year	% of waste stream
Aggregates, masonry & soils	28,703	19.8%
Electrical & electronic	434	0.3%
Glass	535	0.4%
Metal	3,287	2.3%
Organics	43,327	29.9%
Paper & cardboard	6,439	4.4%
Plastic	16,086	11.1%
Rubber	1,597	1.1%
Textiles	5,663	3.9%
Hazardous	0	0.0%
Garbage bags	37,249	25.7%
Residuals	503	0.3%
Other	891	0.6%
Total	**144,713**	**100.0%**

Figure 44 NLA composition – garbage bags as a category



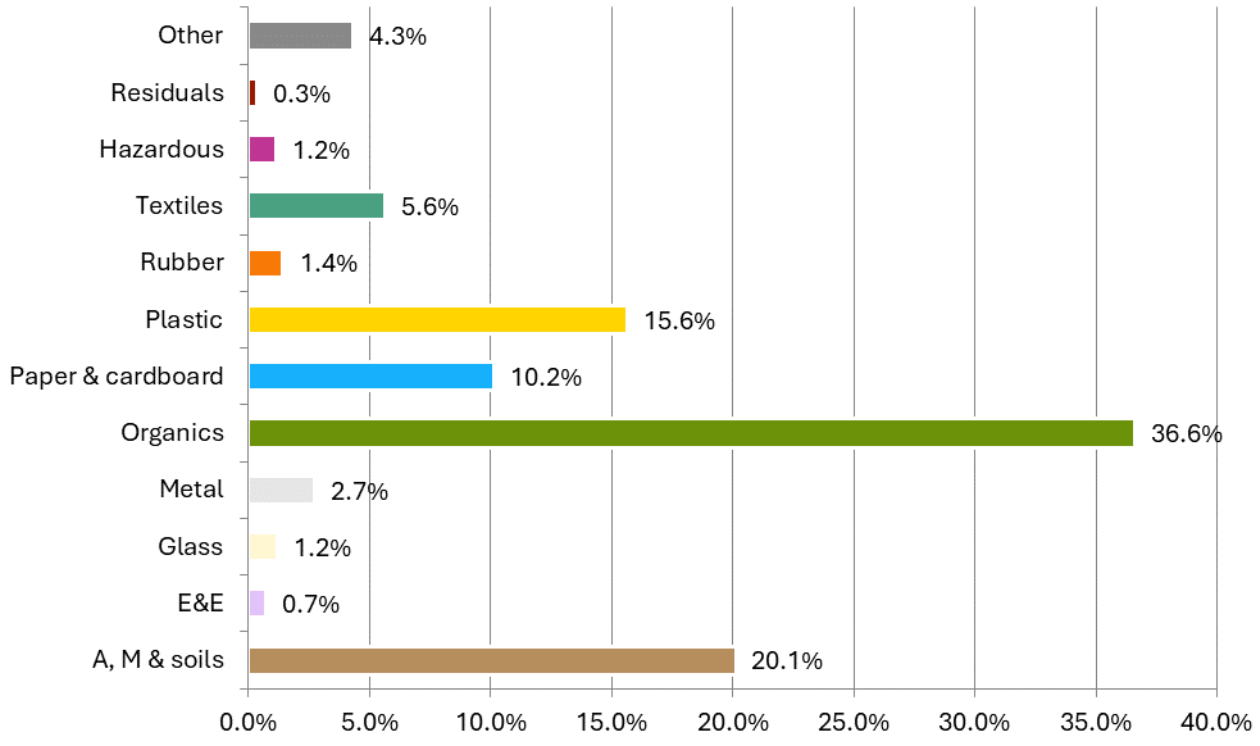
When the contents of garbage bags are distributed, the main materials in C&I waste in the RLA are:

- organics, mainly packaged food and sawdust (36.6%)
- aggregates, masonry and soils (20.1%)
- plastic (15.6%)
- paper and cardboard (10.2%)
- textiles (5.6%).

Table 36 NLA waste generation and composition – garbage bag contents distributed

Material	Tonnes per year	% of waste stream
Aggregates, masonry & soils	29,129	20.1%
Electrical & electronic	1,028	0.7%
Glass	1,691	1.2%
Metal	3,921	2.7%
Organics	52,988	36.6%
Paper & cardboard	14,702	10.2%
Plastic	22,638	15.6%
Rubber	2,060	1.4%
Textiles	8,132	5.6%
Hazardous	1,665	1.2%
Residuals	503	0.3%
Other	6,258	4.3%
Total	**144,713**	**100.0%**

Figure 45 NLA – contents of garbage bags in C&I waste



7.2 NLA C&I by industry sector

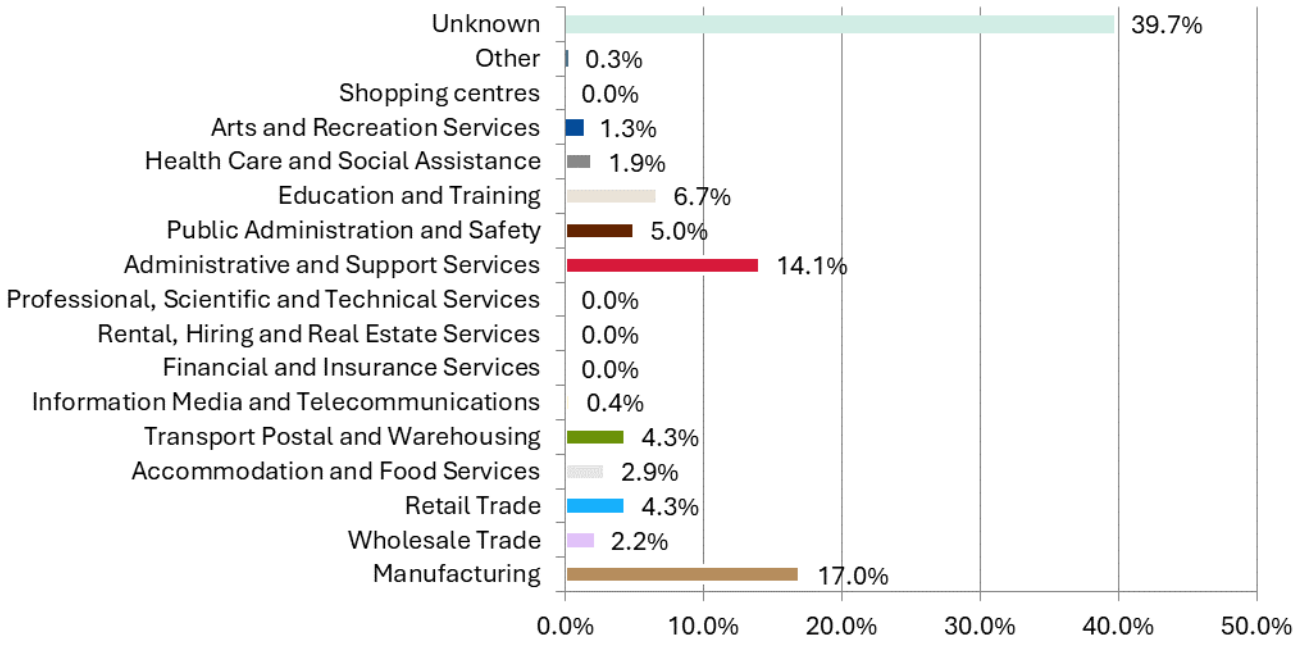
In the NLA, the industry sectors disposing of the most C&I waste in mixed loads are:

- unknown generators – mixed SMEs (39.7%)
- manufacturing (17.0%)
- administrative and support services (14.1%)
- education and training (6.7%).

Table 37 NLA generation and composition by industry sector – mixed loads

Industry	Tonnes per year	% of waste stream
Manufacturing	20,342	17.0%
Wholesale trade	2,615	2.2%
Retail trade	5,178	4.3%
Accommodation and food services	3,462	2.9%
Transport, postal and warehousing	5,205	4.3%
Information media and telecommunications	479	0.4%
Financial and insurance services	0	0.0%
Rental, hiring and real estate services	0	0.0%
Professional, scientific and technical services	0	0.0%
Administrative and support services	16,868	14.1%
Public administration and safety	6,003	5.0%
Education and training	7,980	6.7%
Health care and social assistance	2,296	1.9%
Arts and recreation services	1,596	1.3%
Shopping centres	0	0.0%
Other	319	0.3%
Unknown	47,645	39.7%
Total	**119,988**	**100.0%**

Figure 46 NLA – C&I disposal by industry sector – mixed loads



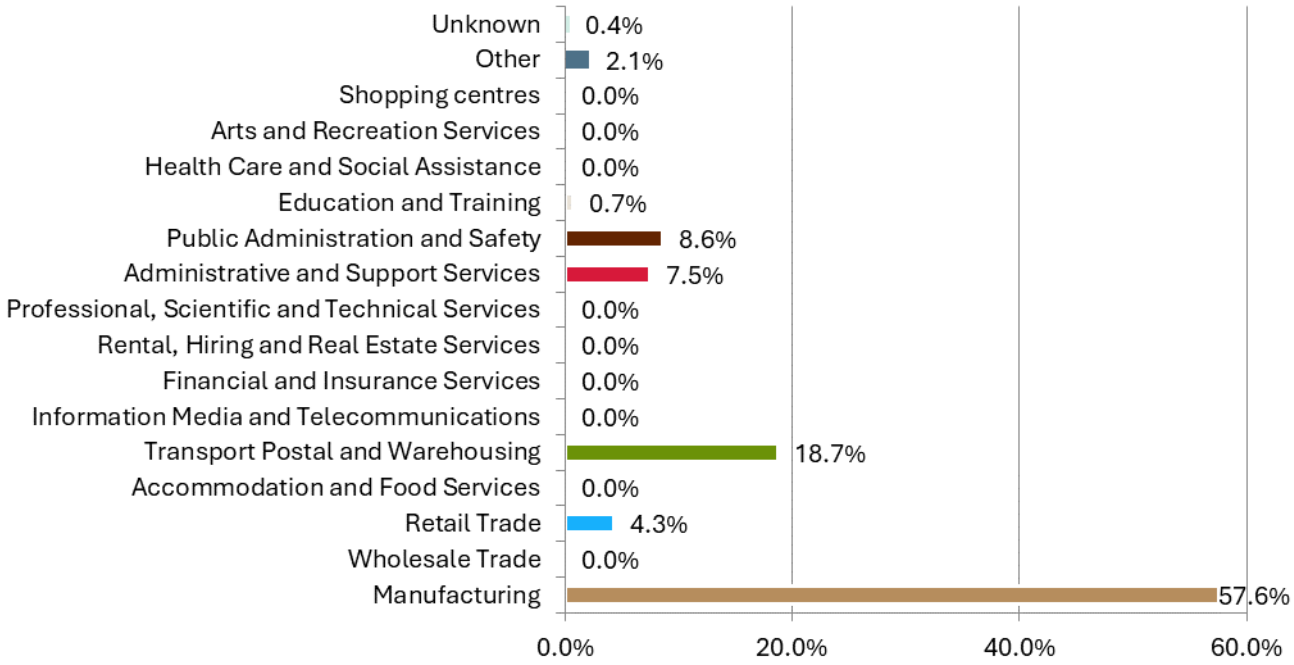
Assessing single material loads only, generation is mostly by:

- manufacturing (57.6%)
- transport, postal and warehousing (18.7%)
- public administration and safety (8.6%)
- administrative and support services (7.5%).

Table 38 NLA generation and composition by industry sector – single-material loads

Industry	Tonnes per year	% of waste stream
Manufacturing	13,541	57.6%
Wholesale trade	0	0.0%
Retail trade	1,019	4.3%
Accommodation and food services	0	0.0%
Transport, postal and warehousing	4,395	18.7%
Information media and telecommunications	0	0.0%
Financial and insurance services	0	0.0%
Rental, hiring and real estate services	0	0.0%
Professional, scientific and technical services	0	0.0%
Administrative and support services	1,756	7.5%
Public administration and safety	2,013	8.6%
Education and training	172	0.7%
Health care and social assistance	0	0.0%
Arts and recreation services	0	0.0%
Shopping centres	0	0.0%
Other	503	2.1%
Unknown	98	0.4%
Total	**23,497**	**100.0%**

Figure 47 NLA – C&I disposal by industry sector – single-material loads



7.3 NLA recoverable materials

Materials in the C&I waste stream are classified as either recoverable now, recoverable in the future or not recoverable (see section 2.5, *Recoverable materials*).

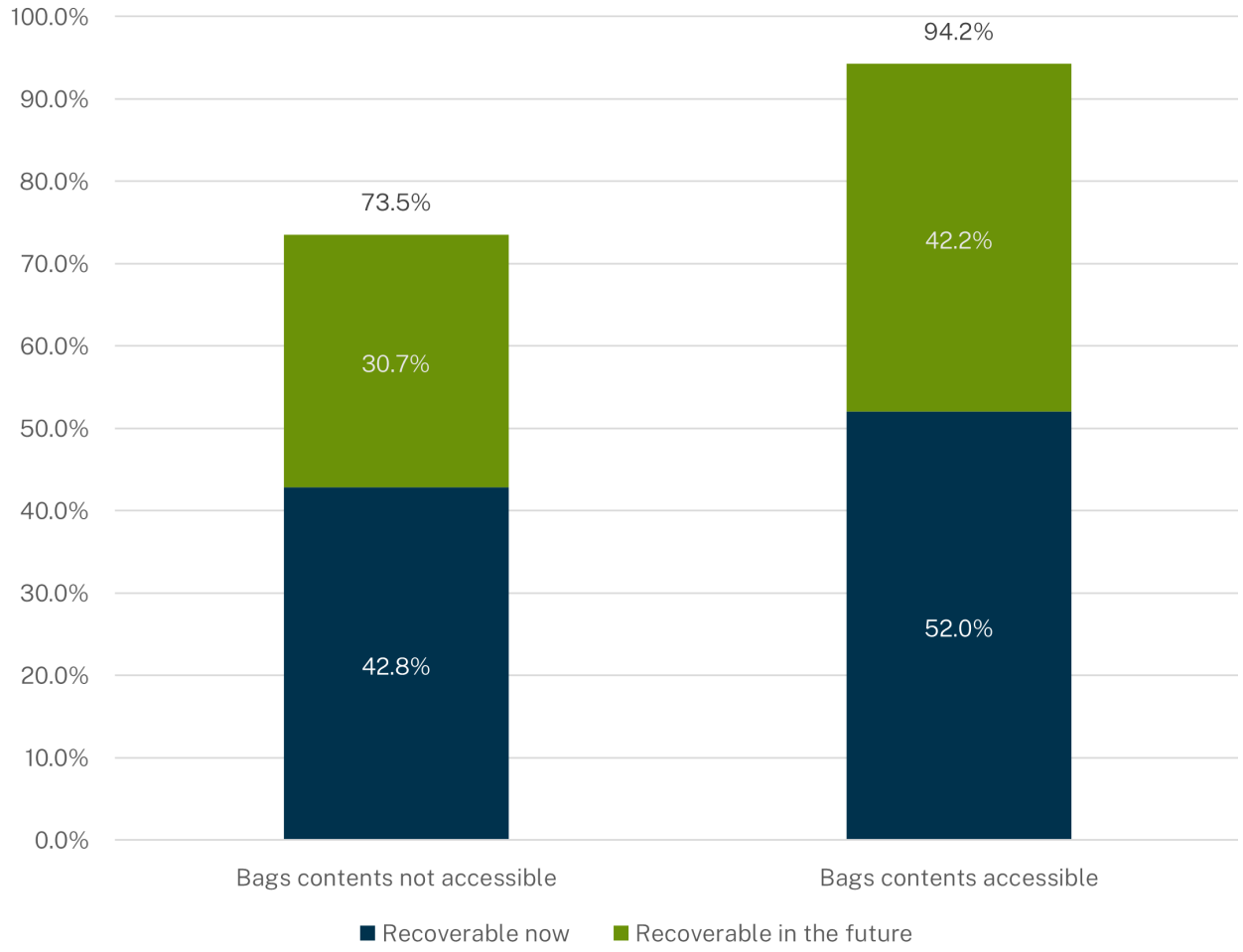
If the contents of garbage bags are not accessible:

- 42.8% of C&I waste disposed of in the NLA is recoverable now
- recoverable waste will potentially increase by 30.7% (to 73.5%) in the future.

When the contents of garbage bags are accessible:

- 52.0% of C&I waste could be recovered now
- recoverable waste could potentially increase by 42.2% (to 94.2%) in the future.

Figure 48 C&I waste currently disposed of that could be recycled – NLA



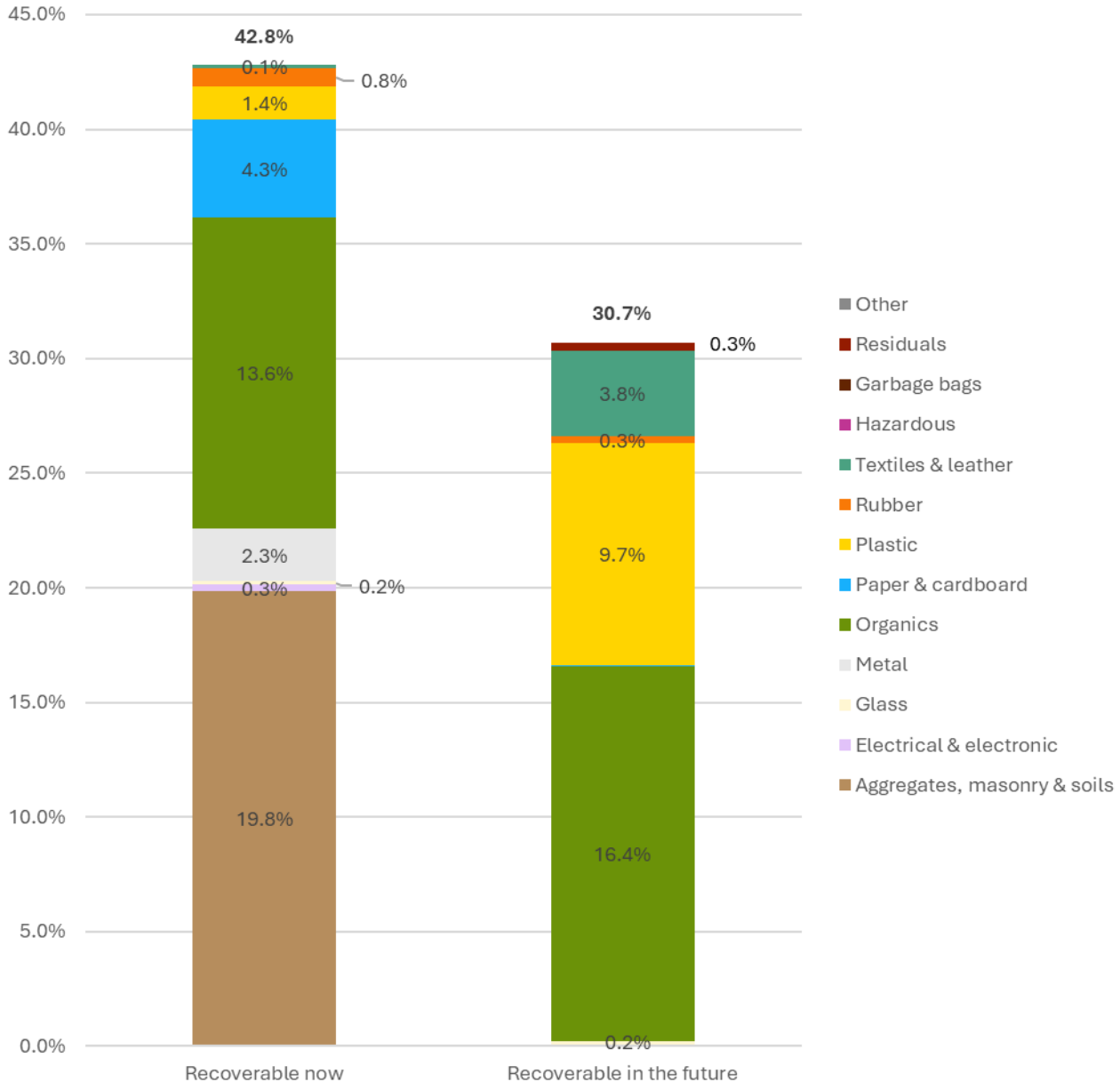
The potential for recovery of C&I waste in the NLA (**excluding** the contents of garbage bags) is highest for:

- aggregates, masonry and soils (19.8%)
- organics (13.6%)
- paper and cardboard (4.3%)
- metal (2.3%).

In the future, the greatest C&I opportunity for recovery will be:

- organics (16.4%)
- plastic (9.7%)
- textiles and leather (3.8%).

Figure 49 NLA – detail of C&I waste currently disposed of that could be recycled – garbage bag contents not accessible



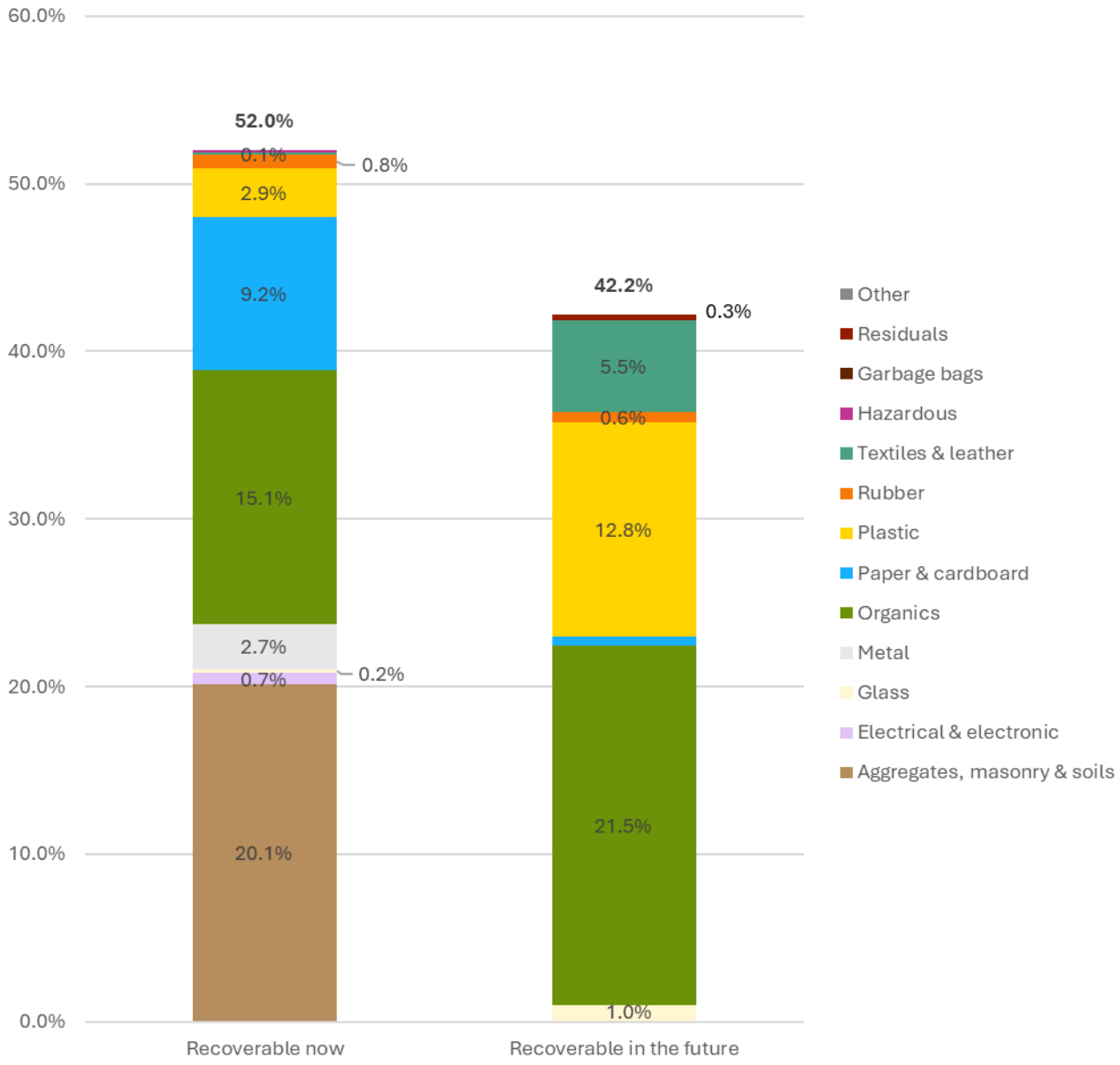
The potential for recovery of C&I waste in the NLA (**including** the contents of garbage bags) is highest for:

- aggregates, masonry and soils (20.1%)
- organics (15.1%)
- paper and cardboard (9.2%)
- plastic (2.9%).

In the future, the greatest opportunity for recovery will be:

- organics (21.5%)
- plastic (12.8%)
- textiles & leather (5.5%)
- glass (1.0%).

Figure 50 NLA – detail of C&I waste currently disposed of that could be recycled – garbage bag contents accessible



7.4 NLA trends in C&I waste

This section provides a high-level comparison of the results from the 2014 and 2023 C&I waste audits.

Table 39 Overview of assessment, 2014 and 2023, NLA

Parameter	2014 Audit	2023 Audit
Tonnes assessed	Non-levied areas not previously assessed	236
Vehicles assessed		154
Sites assessed		2 landfills 0 transfer stations
Areas assessed		Non-levied area (NLA)

No trend analysis could be conducted for the NLA region as no data was collected in the 2014 audit in this area.

Image 15 Landfill in the non-levy region. Credit: APC Waste Consultants

8 Discussion

Data for this study was collected using the prescribed method. In total, 1,497 C&I loads were visually assessed and allocated to 51 categories. The same assessors were used across 14 waste disposal facilities, to provide continuity. The visual observations were converted to weight using published material densities. The composition was then scaled to the actual weight of the assessed load using the weight recorded by the weighbridge when the vehicle entered the facility. Simultaneously, 3,500 garbage bags were extracted from the same observed loads and sorted into 148 detailed categories, and then aggregated to the same 51 categories as for the visual assessment. The entire load compositions were then extrapolated to the EPA's reported total tonnes of C&I waste sent to landfill by levy region.

While the statistical validation of the data shows it has a very small error margin, at 90% confidence interval, the audit was conducted over a defined period at each disposal site. Auditing different sites may have led to different compositional data due to differing waste sources and load types. This report contains indicative data on waste composition, generation, source and mode of delivery. Care should be taken in drawing conclusions, as only a small number of loads were assessed in some regions and for some sectors.

With these constraints in mind, this report identifies opportunities to further reduce waste going to landfill from the C&I sector.

The waste sector continues to evolve and when comparing results between the 2014 and 2023 C&I audits, we are also looking at a decade of innovation and change that could influence current practices. Changes we have seen include (but are not limited to):

- the nature of products and packaging
- the consolidation of waste collection and disposal services among fewer, larger companies
- increases in waste disposal pricing (in part by incremental increase in the landfill levy)
- changes in consumption and disposal behaviour
- new processing facilities
- new and emerging waste streams
- new end-products in some cases replacing virgin materials
- creation of new end markets for specific materials.

The main component of C&I waste in 2023 was garbage bags (44.8% – an increase of 16.5% from 2014). Garbage bags were generated predominantly by SMEs (88.2%), followed by shopping centres (3.7%), accommodation and food services (1.8%) and health care and social assistance (1.3%).

Drivers indicated that many collection companies have introduced, effectively, 'wet' and 'dry' collection routes or runs, delivering different streams to different facilities, and that many 'dry' loads are diverted to reprocessing facilities that recover a range of materials and divert them from landfill. These sites offer lower gate fees to attract feedstock because the commodity value of the recovered materials offsets operational costs and the loads are exempt from the landfill levy. As a consequence, only C&I loads with putrescible materials, typically contained in bags, have to be sent to facilities licensed to handle putrescible waste.

Between 2014 and 2023, aggregates, masonry and soils have reduced from 12.0% to 7.5%. Organic material has decreased from 20.3% to 14.2% in 2023. Smaller decreases have been achieved in both paper and cardboard and textiles, both falling by 2.0–2.5%.

Other material and residuals from waste and resource-recovery processing facilities are almost identical in both the 2014 and 2023 audits, and present both challenges and opportunities.

The most significant increase, 16.4%, has been the proportion of material presented in bags, which rose from 28.4% to 44.8%.

The largest C&I waste contributors to landfill in the NSW regulated area are:

- mixed small and medium enterprises (SMEs) at 57.5%
- waste management operations and facilities (12.4%)

- manufacturing (9.5%)
- administration and support services (6.1%).

Most C&I waste (82.5% by weight) arrives at disposal facilities in mixed loads; 17.5% arrives in single-material loads, where one material accounts for more than 90% of the entire load.

The main components of C&I waste are:

- garbage bags (44.8%)
- residuals (16.2%),
- organics (14.2%)
- plastic (7.9%).

When the contents of the garbage bags are opened and distributed, the main components are:

- organic materials (25.4%)
- residual (16.2%)
- plastic (15.3%)
- paper and cardboard (13.4%).

Approximately 80% of mixed loads comprise three materials:

- garbage bags (53.7%)
- organics (16.1%)
- plastic (9.2%).

When the contents of the garbage bags are opened and the contents distributed, the following materials represent more than 80% of the mixed C&I waste loads:

- organics (29.6%)
- plastic (18.0%)
- paper and cardboard (16.0%)
- other material (9.8%)
- aggregate, masonry and soil (6.8%).

Single material loads contain mostly:

- post-processing waste residuals (72.4%)
- aggregates, masonry and soils (13.1%)
- organics (5.1%).

The majority of these single-source loads are from:

- waste management operations (45.7%)
- manufacturing (31.0%)
- public administration and safety (11.8%).

The largest opportunity to improve diversion is to focus on the materials deemed to be recoverable now. Eleven materials, shown in Table 40, account for over 500,000 tonnes of current C&I waste disposal.

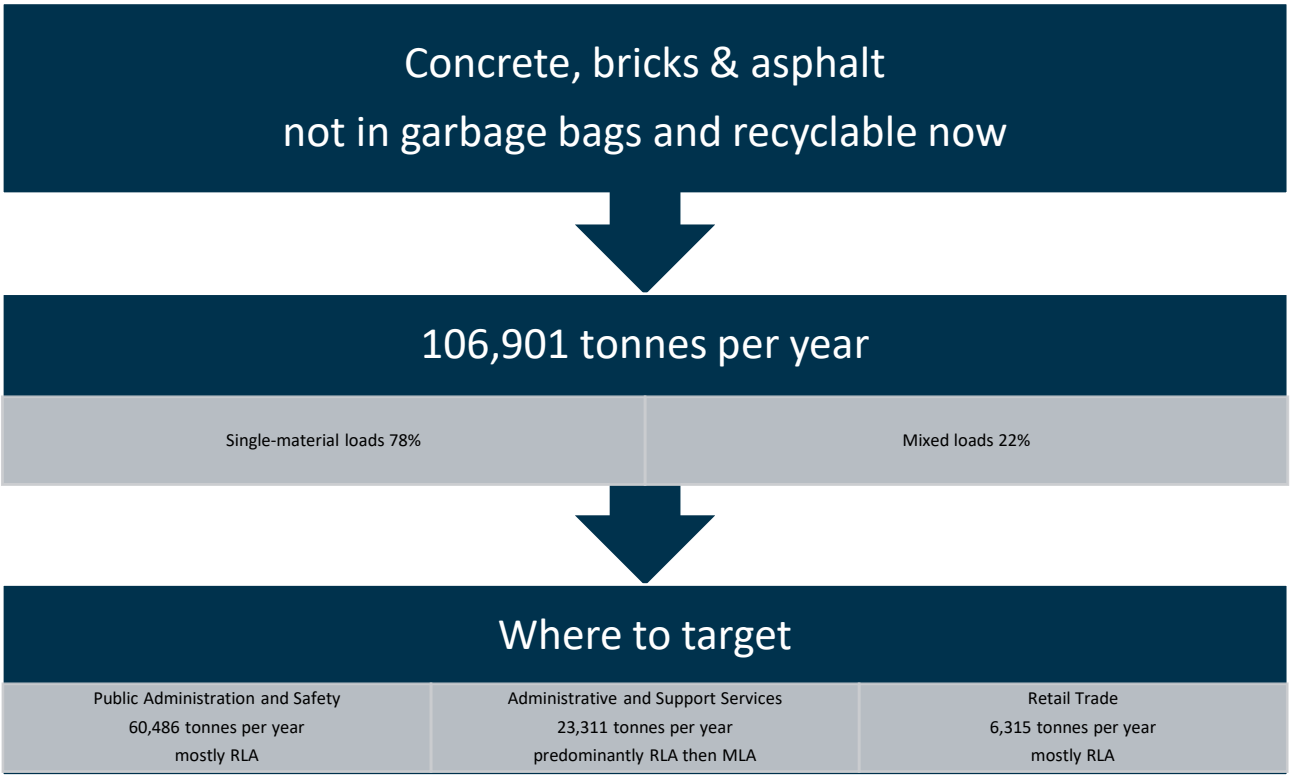
Table 40 C&I materials landfilled but deemed as recoverable now (tonnes)

Aggregates, Masonry & Soil **221,343 tonnes**	**Plastic, Cardboard & Metal** **124,484 tonnes**	**Organics** **176,421 tonnes**
concrete, brick and asphalt – 106,901	cardboard dry – 85,282	food – 49,447
plasterboard – 73,193	metal ferrous – 19,719	garden organics – 38,731
soil, clay and rubble – 41,249	plastic – rigid packaging – 19,483	sawdust – 33,687
		wood pallets – 29,291

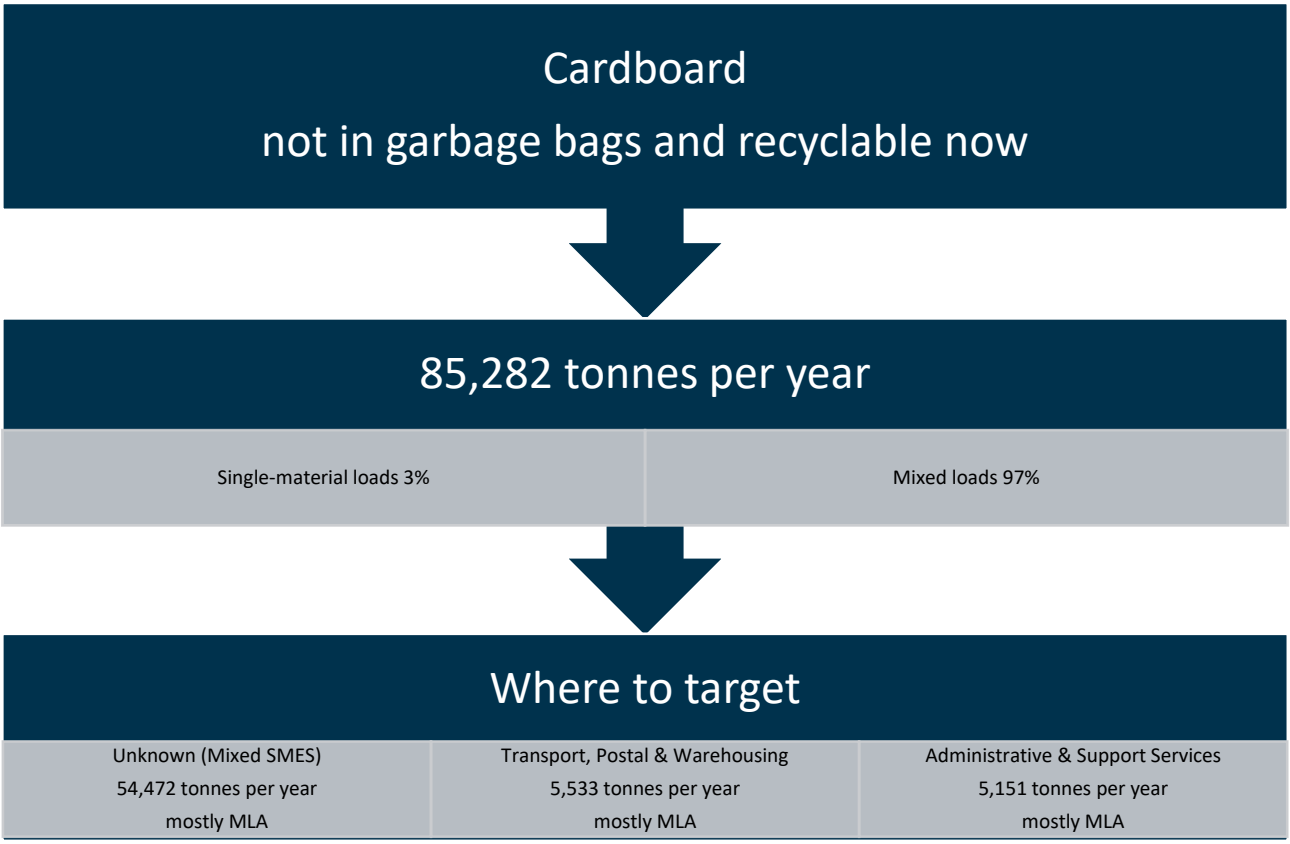
wood untreated – 25,265

The graphics below show the material, the load type in which it is delivered, the industry sector generating the material and the key levy region in which disposal occurs.

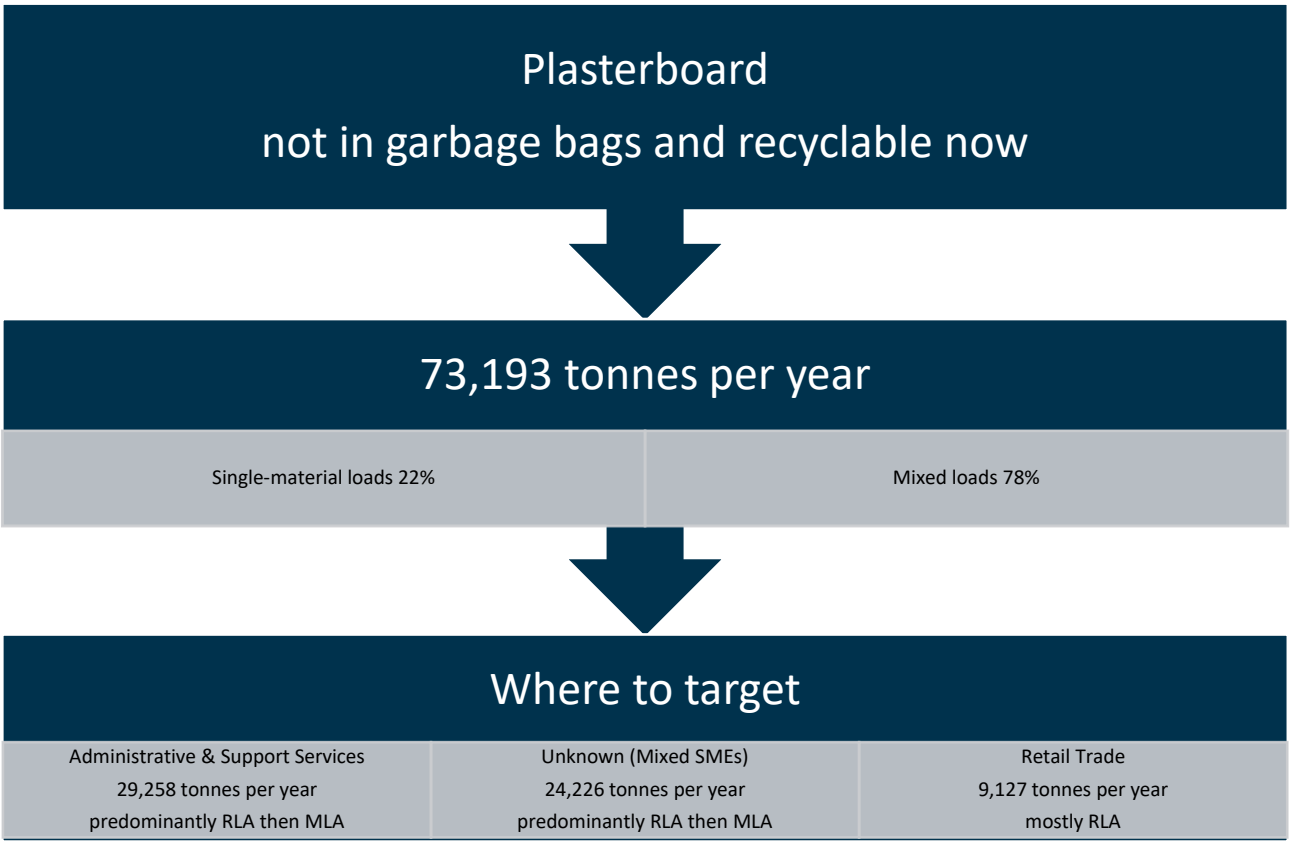
8.1 Concrete, bricks & asphalt



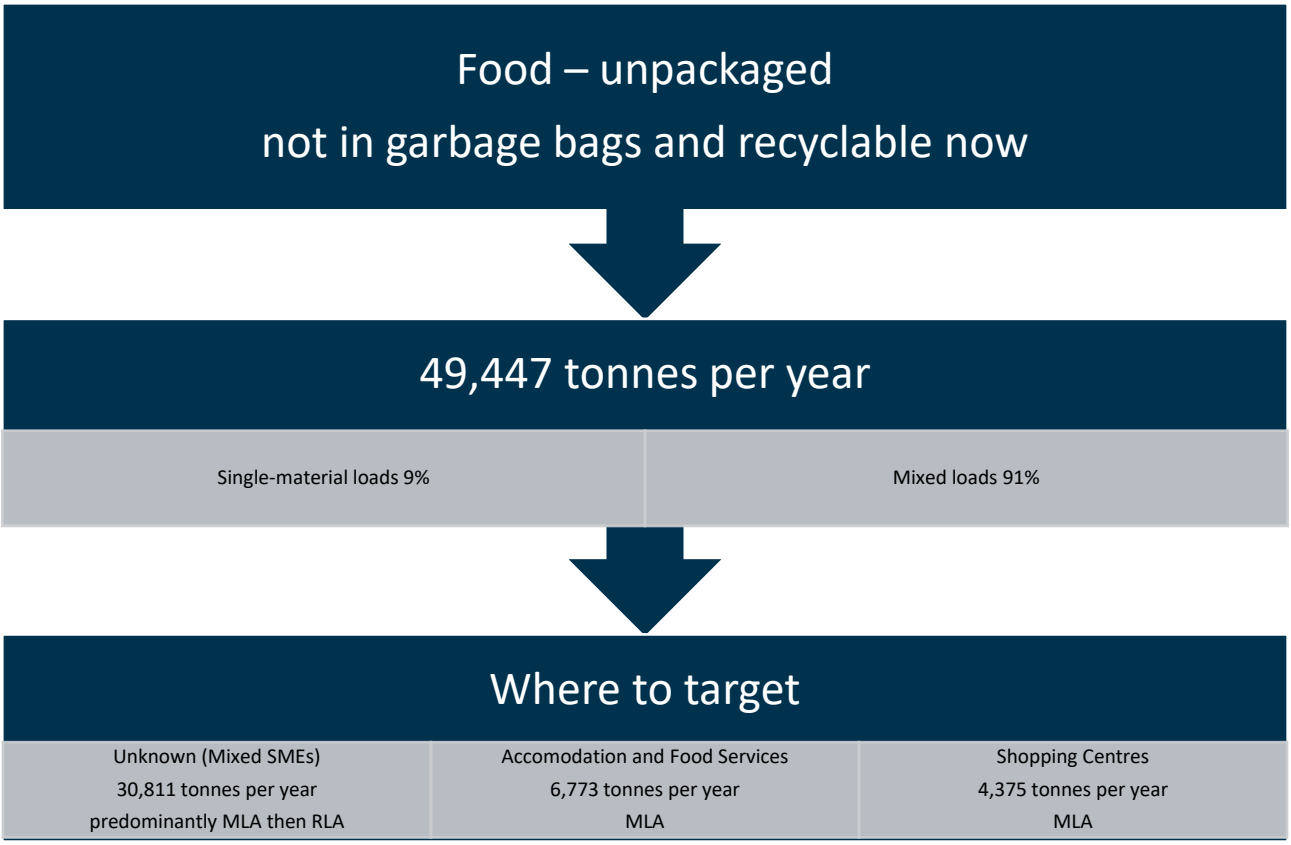
8.2 Cardboard



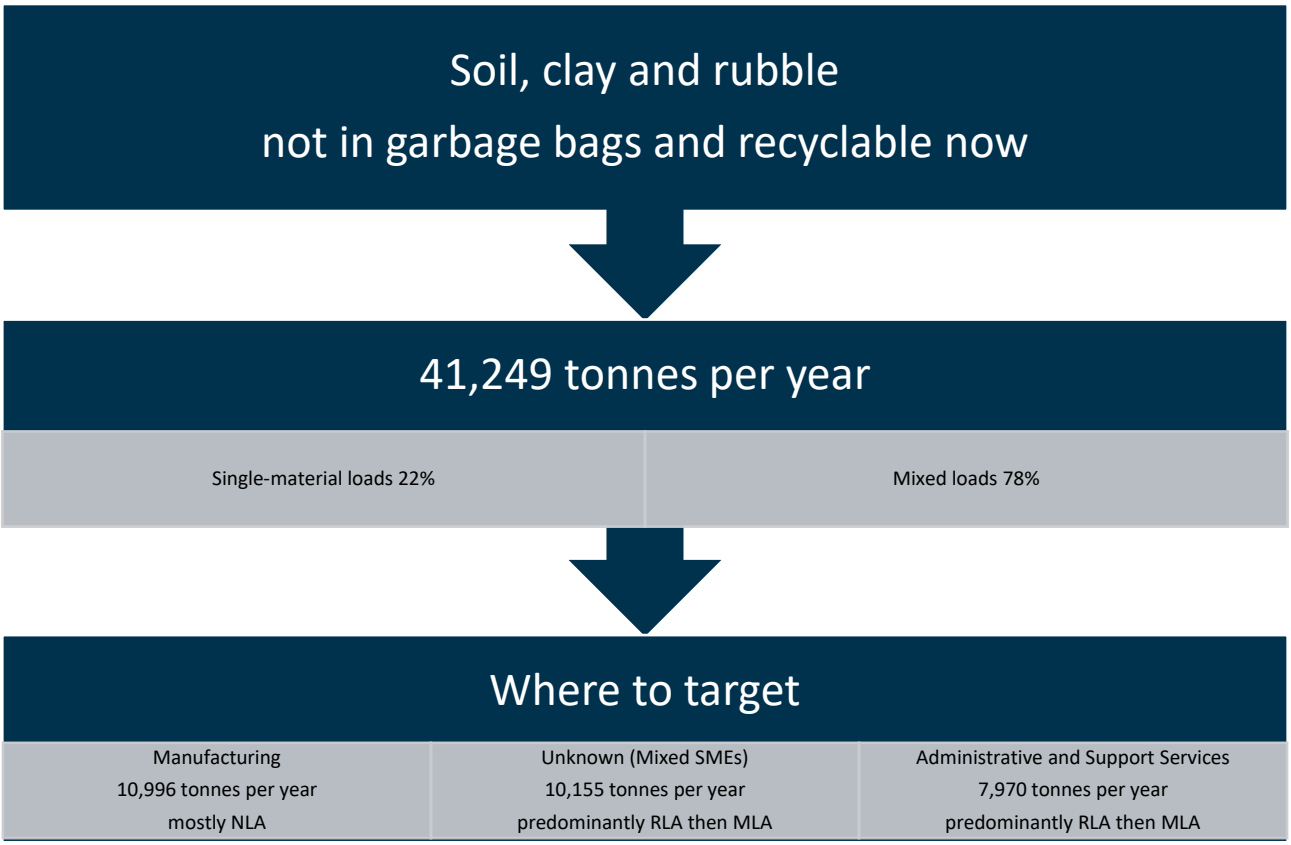
8.3 Plasterboard



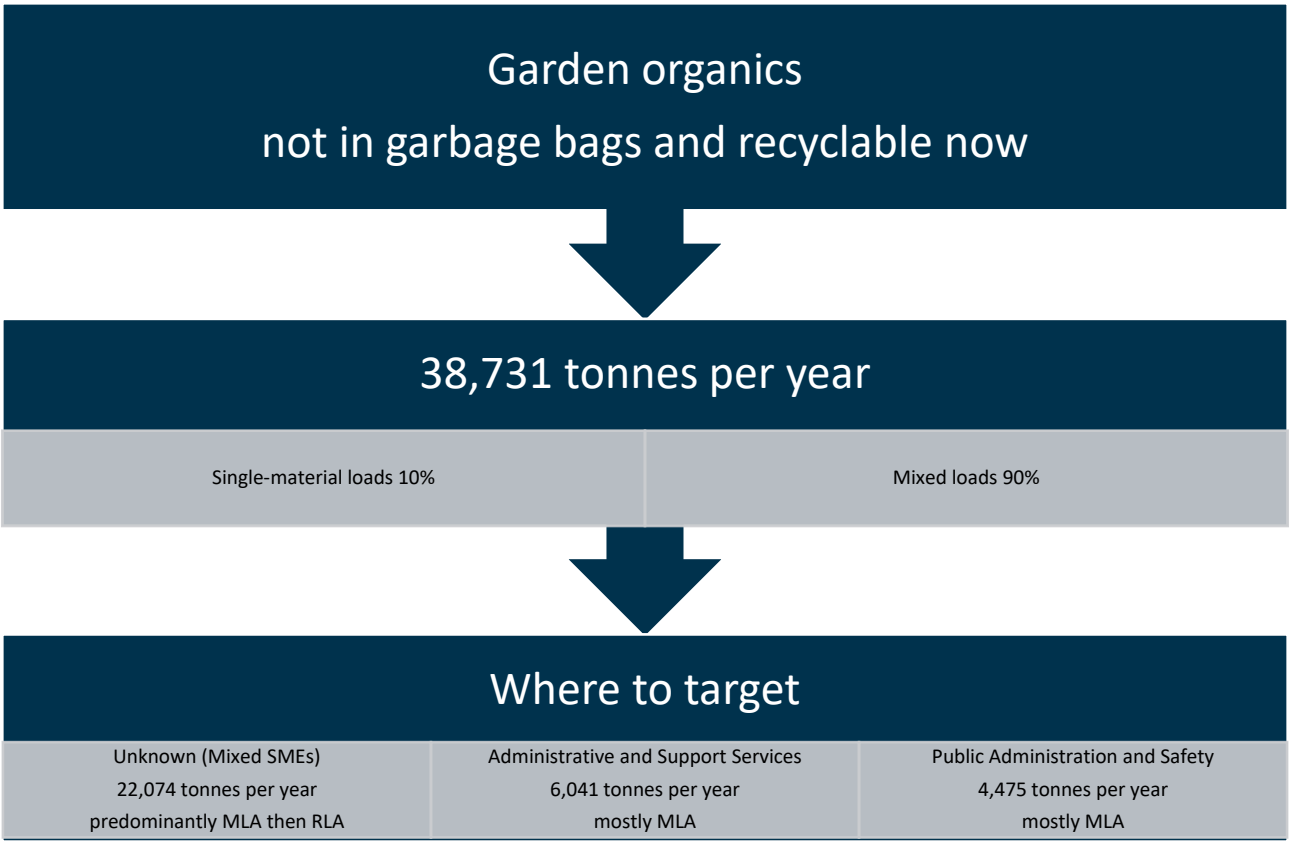
8.4 Food – unpackaged



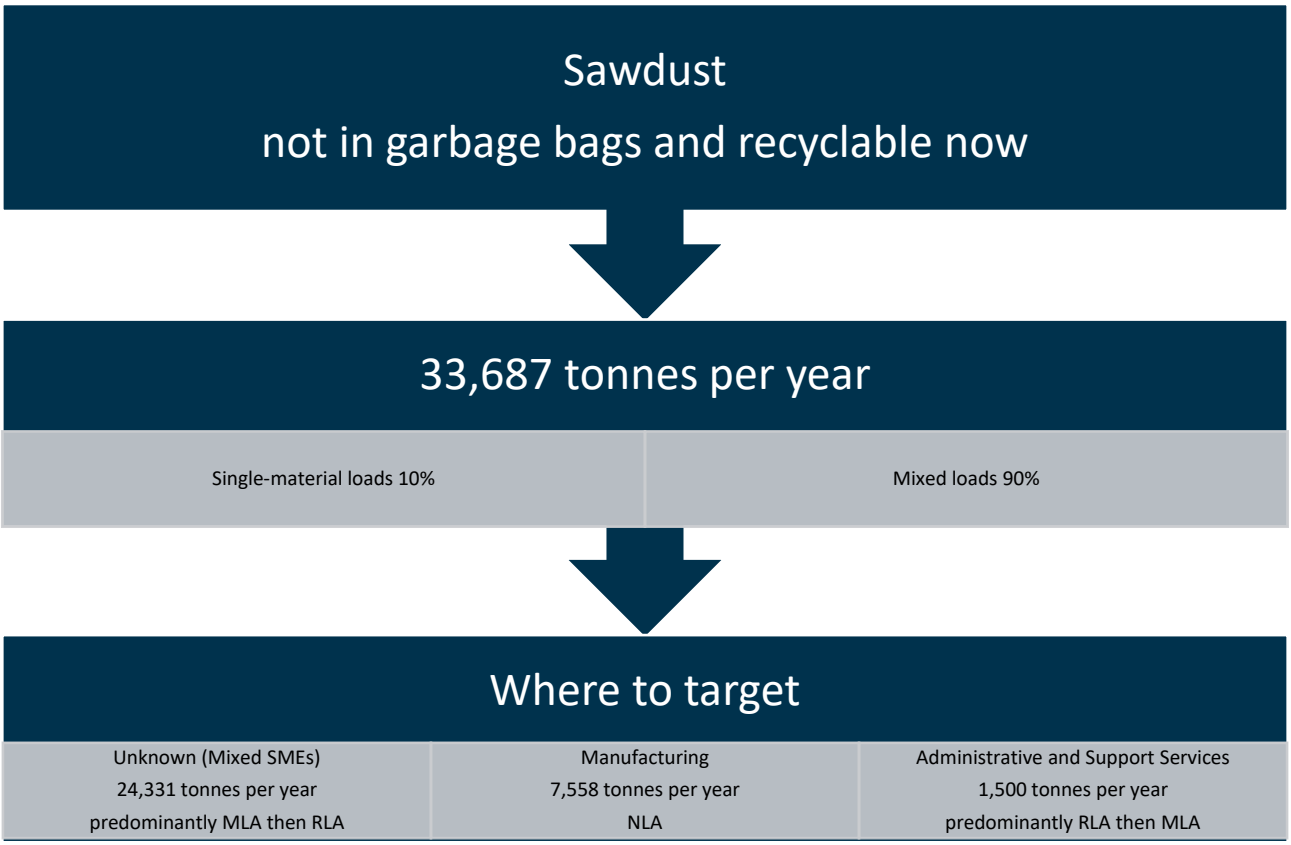
8.5 Soil, clay and rubble



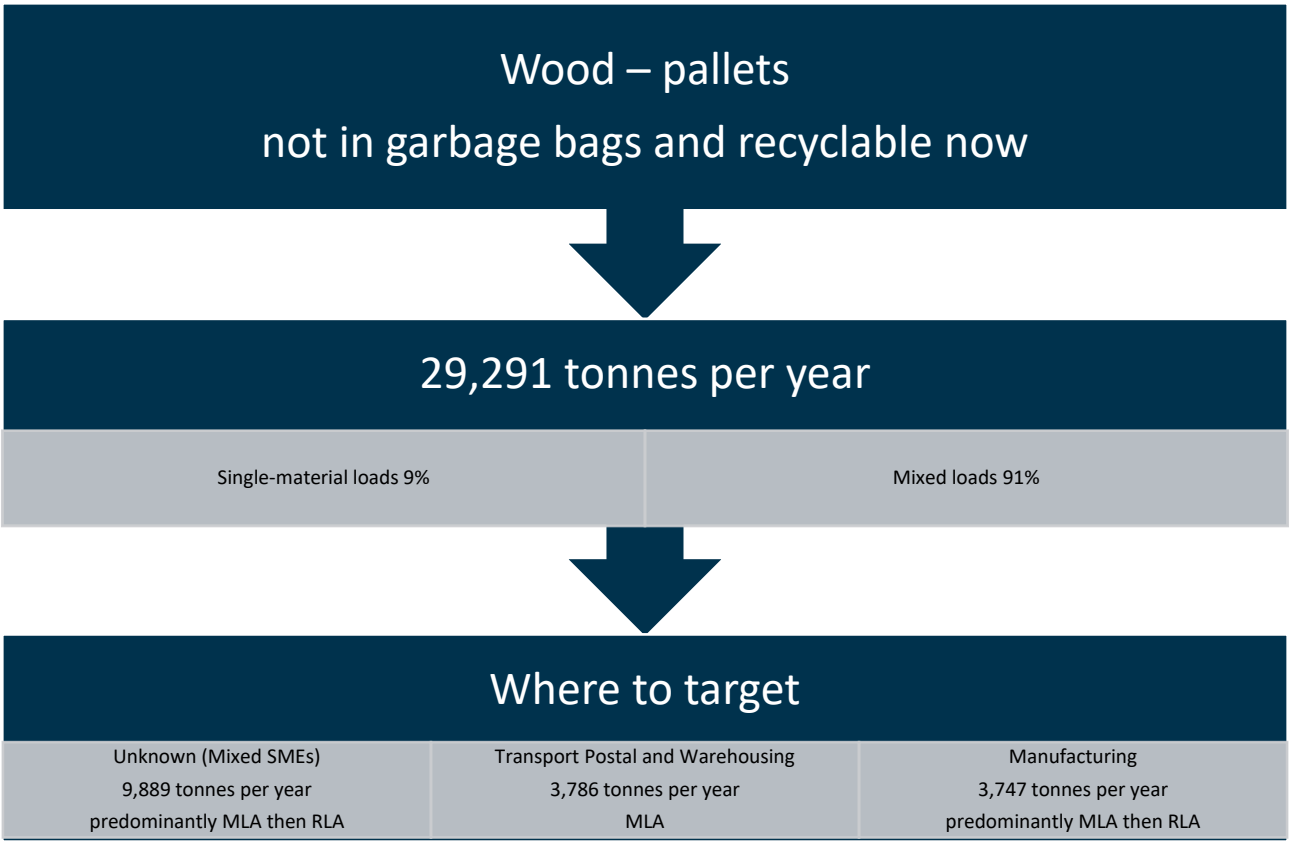
8.6 Garden organics



8.7 Sawdust

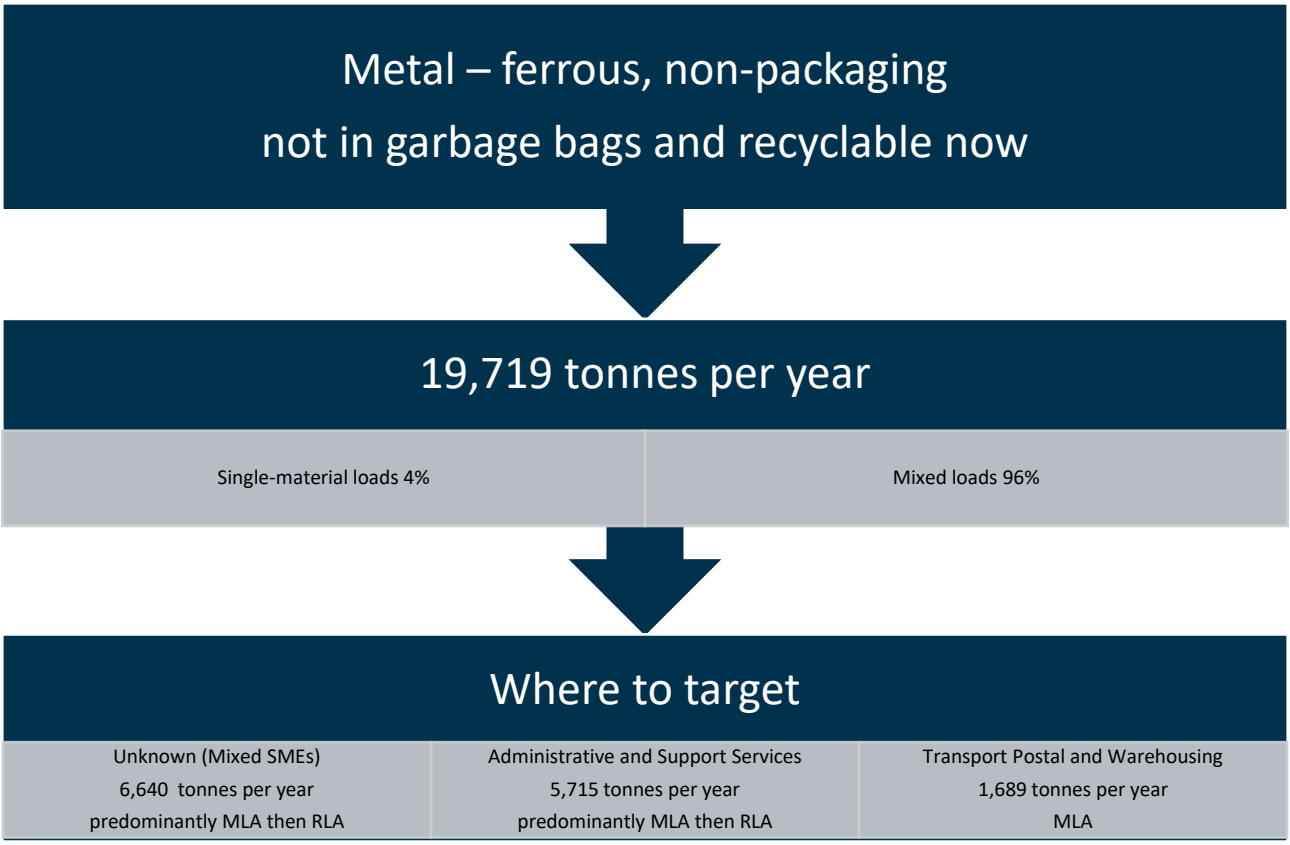


8.8 Wood – pallets



8.9 Wood – untreated

8.10 Metal – ferrous, non-packaging



8.11 Plastic – rigid plastic

Improved access to the contents of bagged material across eight materials will unlock a recoverable feedstock of over 700,000 tonnes of material C&I waste material currently disposed to landfill. This has been summarised in Table 41.

Table 41 C&I materials landfilled but deemed as recoverable now (tonnes) if bagged contents accessible

Aggregates, Masonry & Soil **182,399 tonnes**	**Plastic, Paper & Cardboard** **384,523 tonnes**	**Organics** **140,489 tonnes**
concrete, brick and asphalt – 106,909	cardboard dry –129,489	food – 81,161
plasterboard – 75,490	paper – packaging – 94,761	garden organics – 59,328
	paper – other recyclable – 93,085	
	plastic – rigid packaging – 67,188	

All plastic, paper, cardboard and organics materials listed above are predominantly sourced from the mixed SME sector with:

- 279,903 tonnes generated in the MLA region
- 113,105 tonnes generated in the RLA region.

Aggregates, masonry and soil materials has been sourced through four key sectors in the RLA region including:

- 59,739 tonnes from the public administration and safety sector
- 25,186 tonnes from the administration and support sector
- 18,432 tonnes from mixed SMEs
- 13,442 tonnes from retail trade sector.

Complete access to material in bags will increase availability of:

- cardboard by almost 35% (from 85,282 tonnes to 129,489 tonnes)
- paper (packaging and other recyclable) by 187,846 tonnes
- food organics by almost 40% (from 49,447tonnes to 81,161 tonnes)
- garden organics availability by 35% (from 38,731 tonnes to 59,328 tonnes).

9 Conclusion

- The EPA's Waste and Sustainable Material Strategy (2041) has the target of an 80% average recovery rate from the MSW, C&D and C&I waste streams by 2030. In 2023 the average recycling rate for NSW was 66%, with a 51% recovery rate for C&I waste. Currently, just over two and a half million tonnes of C&I waste are disposed of at landfills across the state, of which 69% is generated in the MLA.
- The results of this 2023 waste audit across 14 landfills and transfer stations and the three levy areas identifies the nature, composition, source, delivery mode and geographic region of C&I waste disposed of to landfill.
- The data from this audit provides unique insights and an evidence base to guide future policy, programs and funding and where future interventions are most needed, helping NSW to transition to a circular economy.
- This audit suggests the greatest challenge is that most C&I waste (82.5%) arrives at disposal facilities in mixed loads, of which almost 60% is generated by small and medium enterprises (SMEs). At these businesses, general waste is typically serviced by front and rear lift vehicles and aggregated, so the precise sources of the waste are unidentifiable.
- However, the largest opportunity to reduce waste to landfill, improve diversion and recovery is to focus on the materials deemed to be recoverable now based on current and available technology (not available infrastructure capacity). Currently, 19.9% of all C&I waste going to landfill in NSW, or approximately 610,479 tonnes, is resources with established end markets that should be kept within the economy. This increases by up to 35.2% should there be improved access to material that is bagged.
- The largest amount of material currently landfilled is aggregates, masonry & soils, including concrete and plasterboard, which combined account for 221,343 tonnes. Cardboard (85,282 tonnes) and ferrous metals (19,719 tonnes) are recyclable commodities with well-established resource recovery operations and transport pathways to a limited number of processing centres. Improved access to material in bags will unlock up to an additional 44,207 tonnes of cardboard and 187,846 tonnes of paper (packaging and other recyclable) feedstock for recovery.
- With government commitment to climate change mitigation and a transition to net zero, the current 176,421 tonnes of organics (comprising pallets, untreated wood, food, garden organics and sawdust, plus cardboard at 85,282 tonnes) must be a key focus for policy and program interventions. Improved access to material in bags will increase availability of food organics by up to almost 40% (from 49,447tonnes to 81,161 tonnes) and garden organics availability by up to 35% (from 38,731 tonnes to 59,328 tonnes).
- During the nine years between NSW landfill audits the study has seen a substantial increase in material being presented in bags (28.4% to 44.8%), greater presence of residuals from waste processing facilities (16.2%), and a decrease in organics (20.3% to 14.2%). Diverting recoverable materials prior to bagging and/or accessing garbage bag contents will revolutionise recovery, given the increasingly significant contribution of bagged waste to the C&I waste mix going to landfill.
- Going forward, improved source segregation, collection systems, new technologies and expanded processing facilities will enable greater recovery of materials and contribute to keeping resources in the circular economy.

Appendix A: List of NSW local government areas by levy area and regional grouping

Table 42 Local government areas by regional group and levy region

Council name	Regional group	Levy region
Albury City Council	Riverina and Murry Joint Organisation (RAMJO)	NLA
Armidale Regional Council	Northern Inland Regional Waste (NIRW)	NLA
Ballina Shire Council	North East Waste (NE Waste)	RLA
Balranald Shire Council	RAMJO	NLA
Bathurst Regional Council	NetWaste voluntary regional waste group (NetWaste)	NLA
Bayside Council	Southern Sydney Regional Organisation of Councils (SSROC)	MLA
Bega Valley Shire Council	Canberra Regional Joint Organisation (CRJO)	NLA
Bellingen Shire Council	MidWaste regional waste forum (MidWaste)	RLA
Berrigan Shire Council	RAMJO	NLA
Blacktown City Council	Western Sydney Regional Organisation of Councils (WSROC)	MLA
Bland Shire Council	Riverina Eastern Regional Organisation of Councils (REROC)	NLA
Blayney Shire Council	NetWaste	NLA
Blue Mountains City Council	WSROC	RLA
Bogan Shire Council	NetWaste	NLA
Bourke Shire Council	NetWaste	NLA
Brewarrina Shire Council	NetWaste	NLA
Broken Hill City Council	NetWaste	NLA
Burwood Council	SSROC	MLA
Byron Shire Council	NE Waste	RLA
Cabonne Council	NetWaste	NLA
Camden Council	Macarthur Strategic Waste Alliance (MSWA)	MLA
Campbelltown City Council	MSWA	MLA
City of Canada Bay	SSROC	MLA
City of Canterbury Bankstown	SSROC	MLA
Carrathool Shire Council	RAMJO	NLA
Central Coast Council	Hunter	MLA
Central Darling Shire Council	NetWaste	NLA
Cessnock City Council	Hunter Joint Organisation (Hunter)	MLA
Clarence Valley Council	NE Waste	RLA
Cobar Shire Council	NetWaste	NLA
Coffs Harbour City Council	MidWaste	RLA
Coolamon Shire Council	REROC	NLA
Coonamble Shire Council	NetWaste	NLA
Cootamundra–Gundagai Regional Council	REROC	NLA
Cowra Council	NetWaste	NLA

Council name	Regional group	Levy region
Cumberland City Council	WSROC	MLA
Dubbo Regional Council	NetWaste	NLA
Dungog Shire Council	Hunter	RLA
Edward River Council	RAMJO	NLA
Eurobodalla Shire Council	CRJO	NLA
Fairfield City Council	WSROC	MLA
Federation Council	RAMJO	NLA
Forbes Shire Council	NetWaste	NLA
Georges River Council	SSROC	MLA
Gilgandra Shire Council	NetWaste	NLA
Glen Innes Severn Council	NIRW	NLA
Goulburn Mulwaree Council	CRJO	NLA
Greater Hume Council	REROC	NLA
Griffith City Council	RAMJO	NLA
Gunnedah Shire Council	NIRW	NLA
Gwydir Shire Council	NIRW	NLA
Hawkesbury City Council	WSROC	MLA
Hay Shire Council	RAMJO	NLA
Hilltops Council	CRJO	NLA
Hornsby Shire Council	Northern Sydney Regional Organisation of Councils (NSROC)	MLA
Hunters Hill Council	NSROC	MLA
Inner West Council	SSROC	MLA
Inverell Shire Council	NIRW	NLA
Junee Shire Council	REROC	NLA
Kempsey Shire Council	MidWaste	RLA
Kiama City Council	Illawarra Shoalhaven Joint Organisation (ISJO)	MLA
Ku-ring-gai Council	NSROC	MLA
Kyogle Council	NE Waste	RLA
Lachlan Shire Council	NetWaste	NLA
Lake Macquarie City Council	Hunter	MLA
Lane Cove Council	NSROC	MLA
Leeton Shire Council	RAMJO	NLA
Lismore City Council	NE Waste	RLA
Lithgow City Council	NetWaste	NLA
Liverpool City Council	WSROC	MLA
Liverpool Plains Shire Council	NIRW	NLA
Lockhart Shire Council	REROC	NLA
Lord Howe Island	Not applicable	RLA
Maitland City Council	Hunter	MLA
Midcoast Council	Hunter	RLA
Midwestern Regional Council	NetWaste	NLA

Council name	Regional group	Levy region
Moree Plains Shire Council	NIRW	NLA
Mosman Council	NSROC	MLA
Murray River Council	RAMJO	NLA
Murrumbidgee Council	RAMJO	NLA
Muswellbrook Shire Council	Hunter	RLA
Nambucca Valley Council	MidWaste	RLA
Narrabri Shire Council	NIRW	NLA
Narrandera Shire Council	RAMJO	NLA
Narromine Shire Council	NetWaste	NLA
Newcastle City Council	Hunter	MLA
North Sydney Council	NSROC	MLA
Northern Beaches Council	Not applicable	MLA
Oberon Council	NetWaste	NLA
Orange City Council	NetWaste	NLA
Parkes Shire Council	NetWaste	NLA
Parramatta Council	WSROC	MLA
Penrith City Council	MSWA	MLA
Port Macquarie–Hastings Council	MidWaste	RLA
Port Stephens Council	Hunter	MLA
Queanbeyan–Palerang Regional Council	CRJO	NLA
Randwick City Council	SSROC	MLA
Richmond Valley Council	NE Waste	RLA
City of Ryde	NSROC	MLA
Shellharbour Council	ISJO	MLA
Shoalhaven City Council	ISJO	MLA
Singleton Council	Hunter	RLA
Snowy Monaro Regional Council	CRJO	NLA
Snowy Valleys Council	CRJO	NLA
Strathfield Council	SSROC	MLA
Sutherland Shire Council	SSROC	MLA
City of Sydney	SSROC	MLA
Tamworth Regional Council	NIRW	NLA
Temora Shire Council	REROC	NLA
Tenterfield Shire Council	NIRW	NLA
The Hills Shire Council	WSROC	MLA
Tweed Shire Council	NE Waste	RLA
Upper Hunter Shire Council	Hunter	RLA
Upper Lachlan Shire Council	CRJO	NLA
Uralla Shire Council	NIRW	NLA
Wagga Wagga City Council	REROC	NLA
Walcha Council	NIRW	NLA
Walgett Shire Council	NetWaste	NLA

Council name	Regional group	Levy region
Warren Shire Council	NetWaste	NLA
Warrumbungle Shire Council	NetWaste	NLA
Waverley Council	SSROC	MLA
Weddin Shire Council	NetWaste	NLA
Wentworth Shire Council	RAMJO	NLA
Willoughby City Council	NSROC	MLA
Wingecarribee Shire Council	CRJO	MLA
Wollondilly Shire Council	MSWA	RLA
Wollongong City Council	ISJO	MLA
Woollahra Municipal Council	SSROC	MLA
Yass Valley Council	CRJO	NLA

Appendix B: ANZSIC industry sector definitions

Industry sector	Examples of business types within the division
Manufacturing	**Food product manufacturing**: Meat and meat product manufacturing, seafood processing, dairy product manufacturing, fruit and vegetable processing, oil and fat manufacturing, grain mill and cereal product manufacturing, bakery product manufacturing, sugar and confectionery manufacturing, other food product manufacturing
	Textile, leather, clothing and footwear
	Wood product manufacturing
	Polymer product and rubber product manufacturing
	Furniture and other manufacturing: Furniture, machinery and equipment, metal and metal products
Wholesale trade	**Basic material wholesaling**
	Grocery, liquor and tobacco product wholesaling: Food and beverage distributors, beer, wine and distilled alcoholic beverage wholesalers
	Other good wholesalers: Clothing and accessory wholesalers, toy and hobby goods and supplies wholesalers, textile, fabric, leather, footwear wholesalers, electronics and computer equipment wholesalers, furniture and home furnishings wholesalers, photographic equipment and supplies wholesalers, paper and paper product wholesalers, building materials and supplies wholesalers, plumbing and heating equipment and supplies wholesalers, lumber and other construction materials wholesalers
Retail trade	**Food retailing**: Grocery stores and supermarkets
	Other store-based retailing: Clothing, accessory stores, health and personal care stores, sporting goods, hobby, book and music stores, furniture and home furnishings stores, electronics and appliance stores, building material and garden equipment and supplies dealers, general merchandise stores, motor vehicle and parts dealers, gasoline stations
Accommodation and food services	**Accommodation**: Hotels and motels, bed and breakfasts, hostels, guest houses, boutique hotels, serviced apartments, inns, backpackers' lodges, resorts, campgrounds, RV parks, timeshare properties, Airbnb
	Food and beverage: Restaurants, cafes, bars, pubs, food trucks, bakeries, wineries, breweries, coffee shops, and catering companies
Transport, postal and warehousing	**Transport, postal and warehousing:** Trucking companies, couriers and delivery services, shipping and freight companies, air and sea cargo transport companies, warehousing and storage companies, postal and courier activities, removalists and relocation companies, passenger transport companies, pipeline transport companies
Information media and telecommunications	**Information media and telecommunications:** Telecommunications carriers, internet service providers, television broadcasting companies, radio broadcasting companies, newspaper publishers, book publishers, music publishers, software publishers, web search portals and search engines, data processing and hosting services, computer system design services, IT consulting services, video game development companies, motion picture and video production companies, and sound recording studios
Financial and insurance services	**Financial and insurance services:** Banks, credit unions, investment firms, insurance companies, mortgage lenders, brokerage firms, accounting firms, tax preparation services, financial planning services, venture capital firms, private equity firms, hedge funds, real estate investment trusts, pension funds and commodity exchanges
Rental, hiring and real estate services	**Rental, hiring and real estate services:** Real estate agencies, property management companies, car rental companies, equipment rental companies, event rental companies, party supply rental companies, furniture rental companies, audio-visual equipment rental companies, construction equipment rental companies, boat and yacht rental companies, aircraft rental and leasing companies, staffing agencies, recruitment agencies, talent agencies
Professional, scientific, and technical services	**Professional, scientific and technical services:** Law firms, accounting firms, architectural firms, engineering firms, consulting firms, advertising agencies, market research firms, public relations firms, scientific research and development companies, environmental consulting firms, computer programming and software development companies, data processing and hosting companies, translation and interpretation services

Industry sector	Examples of business types within the division
Administrative and support services	**Administrative and support services:** Office administrative services, call centres and answering services, document preparation services, security and investigation services, janitorial services, landscaping services, pest control services, temporary staffing agencies, employment placement agencies, building maintenance and repair services, waste collection and disposal services, travel agencies, convention and trade show organisers, packaging and labelling services, printing and copying services
Public administration and safety	**Public administration and safety:** Government agencies, police departments, fire departments, emergency medical services, correctional facilities, courts and tribunals, border control agencies, transportation safety agencies, regulatory agencies, disaster relief agencies, homeland security agencies, national parks and wildlife agencies, public health agencies, consumer protection agencies
Education and training	**Education and training:** Public and private schools, colleges and universities, vocational training centres, technical schools, language schools, tutoring and test preparation services, online education platforms, corporate training and development services, leadership training companies, management consulting firms, career counselling services
Health care and social assistance	**Health care and social assistance:** Hospitals, medical clinics, dental clinics, nursing homes, assisted living facilities, home healthcare agencies, mental health clinics, addiction treatment centres, rehabilitation facilities, social work agencies, childcare providers, family counselling services, elderly care services
Arts and recreation services	**Arts and recreation services:** Movie theatres, music venues, art galleries, museums, sports teams and leagues, fitness centres and gyms, dance studios, yoga studios, photography studios, event planning and production companies, amusement parks, bowling alleys
Shopping centre	**Shopping centre:** Large, enclosed complex of shops, restaurants and other businesses
Other	**None of the above:** If source is identifiable and is not one of the categories above (generally waste management operations)
Unknown	**None or mix of the above:** If source (generally SMEs) cannot be identified through the gatehouse survey or during garbage bag audits

Appendix C: Visual audit material definitions

Material category	Definition
Garbage bags	Enclosed bags of garbage
A, M & soils – concrete, bricks & asphalt	Any concrete, cement, bricks, tiles, stones
A, M & soils – plasterboard	Plaster board
A, M & soils – soil, clay & rubble	Uncontaminated soil, clay and rubble
A, M & soils – other	Inert material not elsewhere classified including building material
E&E – batteries	Batteries (lead/acid batteries)
E&E – computers and peripherals	Computers, monitors, photocopiers, fax machines, printers, etc.
E&E – TVs	Televisions
E&E – white goods	Washing machines, fridges, etc.
E&E – photovoltaic systems	Rooftop solar
E&E – other	Includes small appliances – details to be noted**.**
Glass – non-packaging	Window glass, windscreens, broken bottles, non-recyclable glass such as wine glasses
Glass – packaging	Glass bottles and jars
Metal – ferrous – non-packaging	Packaging items that are mainly steel/iron
Metal – ferrous – packaging	Non-packaging items that are mainly steel/iron including motors
Metal – aluminium – non-packaging	Aluminium cans, trays and foil
Metal – aluminium – packaging	Aluminium siding, copper wire, any items that are mainly non-packaging related metal but are not steel/iron including motors
Food organics – packaged	Packaging post-consumer food items
Food organics – unpackaged	Pre- and post-consumer fruit, vegetables, meat, fat, bone
Food organics – liquid	
Garden organics	Plant material, leaves, grass, small branches
Sawdust	Sawdust
Wood – MDF & chipboard	Products made of MDF and chipboard
Wood – treated – furniture	Wardrobes, varnished furniture, wooden chairs, doors, old kitchen benches,
Wood – treated – pallets	Timber treated pallets
Wood – treated/painted	Pieces of solid timber with visible signs of chemical treatment. CCA-treated timber has a green tinge, e.g. ‘copper logs’, painted fence posts, engineered timber products
Wood – untreated	Pieces of solid timber without any visible signs of treatment, timber off-cuts, posts
Wood – untreated – furniture	Furniture made from wood, with no treatment such as pine furniture
Wood – untreated – pallets	Timber untreated pallets
Cardboard – dry	Dry cardboard boxes, printed and branded cardboard, cardboard off-cuts,
Cardboard – wet	Wet and soiled cardboard, including fruit boxes, etc.
Cardboard – wet strength/waxed	Wet strength/waxed/waxed cardboard used to package material to stand sweating such as beer cartons

Material category	Definition
Paper – office	Photocopy paper, books, printing and writing papers, magazines, catalogues, brochures and leaflets
Paper – other	Newspapers, paper, rolls of low-grade paper, hand towels, contaminated paper
Paper – packaging	Coated and uncoated paper packaging
Plastic – EPS foam	Packaging foam
Plastic – film packaging	Film wrap, plastic bags (not filled)
Plastic – other	All other plastics not elsewhere classified – details to be noted
Plastic – rigid packaging	Plastic bottles and jars – margarine, food/beverage containers (PICs 1–6).
Rubber – other	Inner tubes, rubber mats, rubber tubes, rubber washers, foam rubber
Rubber – tyres	All tyres (full and shredded).
Leather	Leather clothing, craft leather, some shoes, belts with belt buckles
Textiles – carpet & underlay	Rolls of carpet, carpet off-cuts, carpet tiles, felt or foam underlay, synthetic underlay
Textiles – cloth & rags	Clothes, rags, rolls of fabric, fabric off-cuts.
Textiles – covered furniture	Material or leather/vinyl-covered furniture
Textiles – mattresses	Any mattress,
Asbestos	Asbestos and asbestos-containing products or building materials
Insulation	Rigid fibrous or fibreglass insulation, foil-faced, foam or cellulose insulation
Residual	Residual fines, floc, pulp, sludge, processed engineered fuel, AWT Residuals
Hazardous – chemicals/other hazardous	Includes chemicals, lamps, fire extinguishers, contaminated material
Hazardous – clinical	Clinical waste including sharps and cytotoxic wastes

Appendix D: Material recoverability aggregation

Recoverable now

- Food organics – unpackaged
- Food organics – liquid
- Garden organics
- Wood – untreated
- Wood – untreated – pallets
- Wood – untreated – furniture
- Sawdust
- Cardboard – dry
- Cardboard – wet
- Paper – recyclable
- Paper – packaging
- Plastic – rigid packaging
- Plastic – EPS foam
- Glass – packaging
- Metal – ferrous – packaging
- Metal – ferrous – non-packaging
- Metal – aluminium – packaging
- Metal – aluminium – non-packaging
- Textiles – mattresses
- Rubber – tyres
- E&E – TVs
- E&E – computers and peripherals
- E&E – white goods
- E&E – photovoltaic systems
- E&E – other
- Chemicals/other hazardous (except oils)
- Aggregates, masonry & soils

Recoverable in the future

- Food organics – packaged
- Wood – single-use items
- Wood – treated/painted
- Wood – treated – pallets
- Wood – treated – furniture
- Wood – MDF & chipboard
- Cardboard – wet strength/waxed
- Plastic – other
- Other plastics (P7)
- Plastic film
- Glass – non-packaging
- Textiles – carpet & underlay
- Textiles – cloth & rags
- Leather
- Rubber – other
- Batteries
- Oils
- Nappies

Not recoverable

- Hand towels and contaminated tissue
- PS/EPS – single-use items
- Fines
- Floc (plastic and metal residuals from shredding)
- Building waste (composites)
- Pharmaceutical
- Asbestos
- Clinical
- Insulation
- Miscellaneous (this includes mixed boxes of items, luggage, bric-a-brac, brake residuals, drums of charcoal, air filters, glue, linoleum, synthetic grass, ducting)

Appendix E: Garbage bag categories and consolidation

	Sorting category	Visual category	Summary category	Recyclable	Degradable Organic Content	Packaging
S-1	Food organics – unpackaged	Food organics – unpackaged	Organics	☑	☑	☒
S-2	Food organics – packaged	Food organics – packaged	Organics	○	☑	☒
S-3	Food organics – cooking oil	Food organics – liquid	Organics	☑	☑	☒
S-4	Food organics – other liquid	Food organics – liquid	Organics	☑	☑	☒
S-5	Garden organics	Garden organics	Organics	☑	☑	☒
S-6	Organics – other putrescible	Garden organics	Organics	☑	☑	☒
S-7	Wood/untreated – single-use items (e.g., bamboo cutlery, stirrers)	Wood – untreated	Organics	○	☑	☒
S-8	Wood/untreated – board/pole	Wood – untreated	Organics	☑	☑	☒
S-9	Wood/untreated – pallets	Wood – untreated – pallets	Organics	☑	☑	☒
S-10	Wood/untreated – furniture	Wood – untreated – furniture	Organics	☑	☑	☒
S-11	Wood/untreated – chipboard/MDF	Wood – MDF & chipboard	Organics	○	☑	☒
S-12	Wood/untreated – sawdust	Sawdust	Organics	☑	☑	☒
S-13	Wood/treated/painted – board/pole	Wood – treated/painted	Organics	○	☑	☒
S-14	Wood/treated/painted – pallets	Wood – treated – pallets	Organics	○	☑	☒
S-15	Wood/treated/painted – furniture	Wood – treated – furniture	Organics	○	☑	☒
S-16	Wood/treated – chipboard/MDF	Wood – MDF & chipboard	Organics	○	☑	☒
S-17	Wood/treated – sawdust	Wood – treated/painted	Organics	○	☑	☒
S-18	Cardboard dry – packaging	Cardboard – dry	Paper & cardboard	☑	☑	☑
S-19	Cardboard dry – production spoils	Cardboard – dry	Paper & cardboard	☑	☑	☒

	Sorting category	Visual category	Summary category	Recyclable	Degradable Organic Content	Packaging
S-20	Cardboard dry – waxed	Cardboard – wet strength/waxed	Paper & cardboard	○	☑	☑
S-21	Cardboard wet – packaging	Cardboard – wet	Paper & cardboard	☑	☑	☑
S-22	Cardboard – NOT CDS – wine/champagne casks/sachets >1–3 L	Cardboard – dry	Paper & cardboard	☑	☑	☑
S-23	Cardboard – pizza boxes	Cardboard – dry	Paper & cardboard	☑	☑	☑
S-24	Cardboard wet – production spoils	Cardboard – wet	Paper & cardboard	☑	☑	☒
S-25	Cardboard wet – waxed/wet strength – boxes	Cardboard – wet strength/waxed	Paper & cardboard	○	☑	☑
S-26	Cardboard – disposable – coffee cups – compostable	Cardboard – wet strength/waxed	Paper & cardboard	○	☑	☑
S-27	Cardboard – disposable – coffee cups – non-compostable	Cardboard – wet strength/waxed	Paper & cardboard	○	☑	☑
S-28	Cardboard – disposable – other cups	Cardboard – wet strength/waxed	Paper & cardboard	○	☑	☑
S-29	Paper – photocopy paper	Paper – recyclable	Paper & cardboard	☑	☑	☒
S-30	Paper – magazines/catalogues	Paper – recyclable	Paper & cardboard	☑	☑	☒
S-31	Paper – brochures and leaflets	Paper – recyclable	Paper & cardboard	☑	☑	☒
S-32	Paper – books	Paper – recyclable	Paper & cardboard	☑	☑	☒
S-33	Paper – printing/writing (other office)	Paper – recyclable	Paper & cardboard	☑	☑	☒
S-34	Paper – other packaging	Paper – packaging	Paper & cardboard	☑	☑	☑
S-35	Paper – newsprint	Paper – recyclable	Paper & cardboard	☑	☑	☒
S-36	Paper – brown kraft paper	Paper – packaging	Paper & cardboard	☑	☑	☑
S-37	Paper – rolls of low grade	Paper – packaging	Paper & cardboard	☑	☑	☒
S-38	Paper – hand towels	Paper – non-recyclable	Paper & cardboard	☒	☑	☒
S-39	Paper – single-use items	Paper – recyclable	Paper & cardboard	☑	☑	☒

	Sorting category	Visual category	Summary category	Recyclable	Degradable Organic Content	Packaging
S-40	Paper – contaminated (incl. tissue; excl. hand towels)	Paper – non-recyclable	Paper & cardboard	✗	✓	✗
S-41	Plastic – PET beverage container (P1) – CDS	Plastic – rigid packaging	Plastic	✓	✗	✓
S-42	Plastic – PET beverage container (P1) – NOT CDS – fruit & veg juice >1–3 L	Plastic – rigid packaging	Plastic	✓	✗	✓
S-43	Plastic – PET beverage container (P1) – NOT CDS – cordial	Plastic – rigid packaging	Plastic	✓	✗	✓
S-44	Plastic – PET beverage container (P1) – NOT CDS – flavoured milk >1–3 L	Plastic – rigid packaging	Plastic	✓	✗	✓
S-45	Plastic – PET beverage container (P1) – NOT CDS – other	Plastic – rigid packaging	Plastic	✓	✗	✓
S-46	Plastic – PET packaging (P1) (excl. beverage container)	Plastic – rigid packaging	Plastic	✓	✗	✓
S-47	Plastic – PET other non-beverage/non-packaging (P1) – cups	Plastic – other	Plastic	○	✗	✗
S-48	Plastic – PET other non-beverage/non-packaging (P1) – other	Plastic – other	Plastic	○	✗	✗
S-49	Plastic – HDPE beverage container (P2) – CDS	Plastic – rigid packaging	Plastic	✓	✗	✓
S-50	Plastic – HDPE beverage container (P2) – NOT CDS	Plastic – rigid packaging	Plastic	✓	✗	✓
S-51	Plastic – HDPE packaging (excl. beverage container) (P2)	Plastic – rigid packaging	Plastic	✓	✗	✓
S-52	Plastic – HDPE other non-beverage/non-packaging (P2)	Plastic – other	Plastic	○	✗	✗
S-53	Plastic – PVC beverage container (P3) – CDS	Plastic – rigid packaging	Plastic	✓	✗	✓
S-54	Plastic – PVC beverage container (P3) – NOT CDS – cordial	Plastic – rigid packaging	Plastic	✓	✗	✓
S-55	Plastic – PVC beverage container (P3) – NOT CDS – other	Plastic – rigid packaging	Plastic	✓	✗	✓
S-56	Plastic – PVC packaging (excl. beverage container) (P3)	Plastic – rigid packaging	Plastic	✓	✗	✓

	Sorting category	Visual category	Summary category	Recyclable	Degradable Organic Content	Packaging
S-57	Plastic – PVC other non-beverage/non-packaging (P3)	Plastic – other	Plastic	○	☒	☒
S-58	Plastic – LDPE packaging (P4)	Plastic – rigid packaging	Plastic	☑	☒	☑
S-59	Plastic – LDPE non-packaging (P4)	Plastic – other	Plastic	○	☒	☒
S-60	Plastic – PP packaging (P5)	Plastic – rigid packaging	Plastic	☑	☒	☑
S-61	Plastic – PP non-packaging (P5) – cups	Plastic – other	Plastic	○	☒	☒
S-62	Plastic – PP non-packaging (P5) – other	Plastic – other	Plastic	○	☒	☒
S-63	Plastic – PS packaging (P6)	Plastic – rigid packaging	Plastic	○	☒	☑
S-64	Plastic – EPS packaging container (P6)	Plastic – rigid packaging	Plastic	☑	☒	☑
S-65	Plastic – PS/EPS – straws	Plastic – other	Plastic	☒	☒	☒
S-66	Plastic – PS/EPS – stirrers	Plastic – other	Plastic	☒	☒	☒
S-67	Plastic – PS/EPS – cutlery	Plastic – other	Plastic	☒	☒	☒
S-68	Plastic – PS/EPS – cups	Plastic – other	Plastic	☒	☒	☒
S-69	Plastic – PS/EPS – coffee cup lids	Plastic – rigid packaging	Plastic	☒	☒	☒
S-70	Plastic – PS/EPS – stemmed cotton buds	Plastic – other	Plastic	☒	☒	☒
S-71	Plastic – PS – plates/bowls	Plastic – other	Plastic	☒	☒	☒
S-72	Plastic – EPS – plates/bowls	Plastic – other	Plastic	☒	☒	☒
S-73	Plastic – other plastic beverage container (P7) – CDS	Plastic – rigid packaging	Plastic	○	☒	☑
S-74	Plastic – other plastic beverage container (P7) – NOT CDS	Plastic – rigid packaging	Plastic	○	☒	☑
S-75	Plastic – other plastic packaging (excl. beverage containers) (P7)	Plastic – rigid packaging	Plastic	○	☒	☑
S-76	Plastic – other plastic non- beverage/ non-packaging (P7)	Plastic – other	Plastic	○	☒	☒
S-77	Plastic – film – packaging – single-use HDPE bags	Plastic – film packaging	Plastic	○	☒	☑

	Sorting category	Visual category	Summary category	Recyclable	Degradable Organic Content	Packaging
S-78	Plastic – film – packaging – single-use 'boutique' (LDPE) bags	Plastic – film packaging	Plastic	○	☒	☑
S-79	Plastic – film – packaging – reusable non-woven PP bag	Plastic – film packaging	Plastic	○	☒	☑
S-80	Plastic – film – packaging – other	Plastic – film packaging	Plastic	○	☒	☑
S-81	Plastic – film – non-packaging	Plastic – other	Plastic	○	☒	☒
S-82	Plastic – polystyrene foam (EPS)	Plastic – EPS foam	Plastic	☑	☒	☑
S-83	Plastic – other	Plastic – other	Plastic	○	☒	☒
S-84	Glass – containers beverage – CDS	Glass – packaging	Glass	☑	☒	☑
S-85	Glass – containers beverage – NOT CDS – wine/champ	Glass – packaging	Glass	☑	☒	☑
S-86	Glass – containers beverage – NOT CDS – spirits	Glass – packaging	Glass	☑	☒	☑
S-87	Glass – containers beverage – NOT CDS – flavoured alcoholic beverage	Glass – packaging	Glass	☑	☒	☑
S-88	Glass – containers beverage – NOT CDS – fruit & veg juice >1–3L	Glass – packaging	Glass	☑	☒	☑
S-89	Glass – containers beverage – NOT CDS – cordial	Glass – packaging	Glass	☑	☒	☑
S-90	Glass – containers beverage – NOT CDS – flavoured milk >1-3L	Glass – packaging	Glass	☑	☒	☑
S-91	Glass – containers beverage – NOT CDS – unflavoured milk	Glass – packaging	Glass	☑	☒	☑
S-92	Glass – containers beverage – NOT CDS – other	Glass – packaging	Glass	☑	☒	☑
S-93	Glass – containers non-beverage	Glass – packaging	Glass	☑	☒	☑
S-94	Glass – containers (fines)	Glass – packaging	Glass	☑	☒	☑
S-95	Glass – plate/non-packaging (other glass)	Glass – non-packaging	Glass	○	☒	☒
S-96	Metal (ferrous) – packaging beverage – CDS	Metal – ferrous – packaging	Metal	☑	☒	☑

	Sorting category	Visual category	Summary category	Recyclable	Degradable Organic Content	Packaging
S-97	Metal (ferrous) – packaging beverage – NOT CDS – flavoured alcoholic beverage	Metal – ferrous – packaging	Metal	✓	✗	✓
S-98	Metal (ferrous) – packaging beverage – NOT CDS – other	Metal – ferrous – packaging	Metal	✓	✗	✓
S-99	Metal (ferrous) – packaging non-beverage	Metal – ferrous – packaging	Metal	✓	✗	✓
S-100	Metal (ferrous) – non-packaging	Metal – ferrous – non-packaging	Metal	✓	✗	✗
S-101	Metal (non-ferrous) – packaging beverage – CDS	Metal – aluminium – packaging	Metal	✓	✗	✓
S-102	Metal (non-ferrous) – packaging beverage – NOT CDS – flavoured alcoholic beverage	Metal – aluminium – packaging	Metal	✓	✗	✓
S-103	Metal (non-ferrous) – packaging beverage – NOT CDS – other	Metal – aluminium – packaging	Metal	✓	✗	✓
S-104	Metal (non-ferrous) – packaging non-beverage	Metal – aluminium – packaging	Metal	✓	✗	✓
S-105	Metal (non-ferrous) – non-packaging	Metal – aluminium – non-packaging	Metal	✓	✗	✗
S-106	Textiles – carpet and underlay	Textiles – carpet & underlay	Textiles & leather	○	✓	✗
S-107	Textiles – mattresses	Textiles – mattresses	Textiles & leather	✓	✓	✗
S-108	Textiles – cloth/rags	Textiles – cloth & rags	Textiles & leather	○	✓	✗
S-109	Leather	Leather	Textiles & leather	○	✓	✗
S-110	Rubber – tyres, tubes	Rubber – tyres	Rubber	✓	✗	✗
S-111	Rubber – other	Rubber – other	Rubber	○	✗	✗
S-112	E&E – TVs	E&E – TVs	Electrical & electronic	✓	✗	✗
S-113	E&E – computers and peripherals	E&E – computers and peripherals	Electrical & electronic	✓	✗	✗
S-114	E&E – mobile phones	E&E – other	Electrical & electronic	✓	✗	✗
S-115	E&E – toner cartridges	E&E – other	Electrical & electronic	✓	✗	✗

	Sorting category	Visual category	Summary category	Recyclable	Degradable Organic Content	Packaging
S-116	E&E – white goods	E&E – whitegoods	Electrical & electronic	✓	✗	✗
S-117	E&E – photo-voltaic systems – rooftop	E&E – photovoltaic systems	Electrical & electronic	✓	✗	✗
S-118	E&E – photo-voltaic systems – portable	E&E – photovoltaic systems	Electrical & electronic	✓	✗	✗
S-119	E&E – smoke detectors	E&E – other	Electrical & electronic	✓	✗	✗
S-120	E&E – other	E&E – other	Electrical & electronic	✓	✗	✗
S-121	C&D – concrete	A, M & soils – concrete, bricks & asphalt	Aggregates, masonry & soils	✓	✗	✗
S-122	C&D – bricks	A, M & soils – concrete, bricks & asphalt	Aggregates, masonry & soils	✓	✗	✗
S-123	C&D – tiles	A, M & soils – other	Aggregates, masonry & soils	✓	✗	✗
S-124	C&D – rock/dirt/soil	A, M & soils – soil, clay & rubble	Aggregates, masonry & soils	✓	✗	✗
S-125	C&D – asphalt	A, M & soils – concrete, bricks & asphalt	Aggregates, masonry & soils	✓	✗	✗
S-126	C&D – plasterboard	A, M & soils – plasterboard	Aggregates, masonry & soils	✓	✗	✗
S-127	Asbestos	Asbestos	Hazardous	✗	✗	✗
S-128	Hazardous/special – batteries – lead acid (e.g. car)	E&E – batteries	Electrical & electronic	○	✗	✗
S-129	Hazardous/special – batteries – large removable (e.g. e-bike/power tool)	E&E – batteries	Electrical & electronic	○	✗	✗
S-130	Hazardous/special – batteries – other	E&E – batteries	Electrical & electronic	○	✗	✗
S-131	Hazardous/special – gas bottles	Hazardous – Chemicals/other hazardous	Hazardous	✓	✗	✗
S-132	Hazardous/special – fire extinguishers	Hazardous – Chemicals/other hazardous	Hazardous	✓	✗	✗
S-133	Hazardous/special – fluorescent lamps (lights)	Hazardous – Chemicals/other hazardous	Hazardous	✓	✗	✗

	Sorting category	Visual category	Summary category	Recyclable	Degradable Organic Content	Packaging
S-134	Hazardous/special – chemicals	Hazardous – Chemicals/other hazardous	Hazardous	☑	☒	☒
S-135	Hazardous/special – paint	Hazardous – Chemicals/other hazardous	Hazardous	☑	☒	☒
S-136	Hazardous/special – oil (empty)	Hazardous – Chemicals/other hazardous	Hazardous	○	☒	☒
S-137	Hazardous/special – oil (with contents)	Hazardous – Chemicals/other hazardous	Hazardous	○	☒	☒
S-138	Hazardous/special – pharmaceutical	Hazardous – Clinical	Hazardous	☒	☒	☒
S-139	Hazardous/special – personal care with microbeads	Hazardous – Clinical	Hazardous	☒	☒	☒
S-140	Hazardous/special – clinical – sharps	Hazardous – Clinical	Hazardous	☒	☒	☒
S-141	Hazardous/special – clinical – other	Hazardous – Clinical	Hazardous	☒	☒	☒
S-142	Fines (<10 mm)	Other waste	Residual	☒	☒	☒
S-143	Liquid paperboard (cardboard) – CDS	Cardboard – wet strength/waxed	Paper & cardboard	○	☑	☑
S-144	Liquid paperboard (cardboard) – NOT CDS	Cardboard – wet strength/waxed	Paper & cardboard	○	☑	☑
S-145	Liquid paperboard (cardboard) – other packaging	Cardboard – wet strength/waxed	Paper & cardboard	○	☑	☑
S-146	Nappies (incl. AHW)	Other waste	Other	○	☑	☒
S-147	Insulation	Insulation	Other	☒	☒	☒
S-148	Other (specify in notes)	Other waste	Other	☒	☒	☒

Appendix F: Material density conversion factors

#	Type	Density – low (kg/m³)	Density – medium (kg/m³)	Density – high (kg/m³)
1	A, M & soils – concrete, bricks & asphalt	830	830	830
2	A, M & soils – plasterboard	922	922	922
3	A, M & soils – soil, clay & rubble	470	550	640
4	A, M & soils – other	470	550	640
5	E&E – batteries	170	170	350
6	E&E – computers and peripherals	265	265	265
7	E&E – TVs	185	185	185
8	E&E – white goods	105	113	120
9	E&E – photovoltaic systems	709	709	709
10	E&E – other	105	113	120
11	Glass – non-packaging	411	411	411
12	Glass – packaging	280	280	280
15	Metal – ferrous – non-packaging	120	310	500
16	Metal – ferrous – packaging	120	120	120
17	Metal – aluminium – non-packaging	139	169.5	200
18	Metal – aluminium – packaging	139	139	139
20	Food organics – packaged	343	514	1029
21	Food organics – unpackaged	343	514	1029
22	Food organics – liquid	1029	1029	1029
23	Garden organics	91	227	445
24	Sawdust	250	300	350
25	Wood – MDF & chipboard	180	220	260
26	Wood – treated – furniture	160	170	400
27	Wood – treated – pallets	156	156	156
28	Wood – treated/ painted	180	220	260
29	Wood – untreated	120	160	360
30	Wood – untreated – furniture	160	170	400
31	Wood – untreated – pallets	156	156	156
32	Cardboard – dry	55	92.5	130
33	Cardboard – wet	190	225	260
34	Cardboard – wet strength/ waxed	55	92	130
41	Paper – recyclable	76	152	228
42	Paper – non-recyclable	76	152	228
44	Paper – packaging	76	152	228
46	Plastic – rigid packaging	72	72	72

#	Type	Density – low (kg/m³)	Density – medium (kg/m³)	Density – high (kg/m³)
58	Plastic – EPS foam	14	21	28
60	Plastic – film packaging	39	78	156
64	Plastic – other	170	170	360
65	Rubber – other	260	260	260
66	Rubber – tyres	260	260	260
67	Leather	91	91	240
68	Textiles – carpet & underlay	100	150	350
69	Textiles – cloth & rags	80	104	200
70	Textiles – covered furniture	90	100	450
71	Textiles – mattresses	50	50	50
73	Asbestos	260	260	260
74	Hazardous – chemicals/other hazardous	227	227	227
75	Hazardous – clinical	227	227	227
77	Garbage bags	87	170	348
80	Insulation	87	170	348
84	Residual – pulp	170	170	350
85	Residual – MRF fines	66	99	198
86	Residual – PEF	170	170	350
87	Residual – floc	250	250	250
88	Residual – sludge	170	170	350
89	Residual – mixed process	230	230	230
90	Other	0	0	0

Appendix G: Key statistical indicators for all individual materials (scaled, bagged materials distributed)

Material categories	Mean percentage	Standard error of the mean	Lower bound	Upper bound
Garbage bags	27.4%	1.0%	25.8%	29.0%
A, M & soils – concrete, bricks & asphalt	4.1%	0.4%	3.4%	4.7%
A, M & soils – plasterboard	4.7%	0.4%	4.0%	5.4%
A, M & soils – soil, clay & rubble	1.2%	0.2%	0.9%	1.6%
A, M & soils – other	0.5%	0.1%	0.3%	0.7%
E&E – batteries	0.0%	0.0%	0.0%	0.0%
E&E – computers and peripherals	0.3%	0.1%	0.2%	0.4%
E&E – TVs	0.0%	0.0%	0.0%	0.1%
E&E – white goods	0.5%	0.1%	0.3%	0.7%
E&E – photovoltaic systems	0.0%	0.0%	0.0%	0.0%
E&E – other	0.4%	0.1%	0.3%	0.6%
Glass – non-packaging	0.6%	0.1%	0.5%	0.8%
Glass – packaging	0.2%	0.0%	0.1%	0.2%
Metal – ferrous – non-packaging	1.8%	0.2%	1.5%	2.1%
Metal – ferrous – packaging	0.4%	0.1%	0.3%	0.6%
Metal – aluminium – non-packaging	0.5%	0.1%	0.4%	0.7%
Metal – aluminium – packaging	0.1%	0.0%	0.1%	0.2%
Food organics – packaged	0.5%	0.2%	0.2%	0.7%
Food organics – unpackaged	1.0%	0.2%	0.7%	1.3%
Food organics – liquid	0.0%	0.0%	0.0%	0.1%
Garden organics	2.8%	0.3%	2.2%	3.4%
Sawdust	0.8%	0.1%	0.5%	1.0%
Wood – MDF & chipboard	4.0%	0.3%	3.5%	4.5%
Wood – treated – furniture	2.3%	0.3%	1.8%	2.7%
Wood – treated – pallets	1.3%	0.2%	1.0%	1.7%

Material categories	Mean percentage	Standard error of the mean	Lower bound	Upper bound
Wood – treated/painted	7.3%	0.5%	6.5%	8.1%
Wood – untreated	1.7%	0.2%	1.4%	2.1%
Wood – untreated – furniture	0.5%	0.1%	0.3%	0.8%
Wood – untreated – pallets	2.1%	0.3%	1.7%	2.5%
Cardboard – dry	5.2%	0.3%	4.7%	5.7%
Cardboard – wet	1.2%	0.1%	0.9%	1.4%
Cardboard – wet strength/waxed	0.0%	0.0%	0.0%	0.0%
Paper – recyclable	0.3%	0.1%	0.1%	0.4%
Paper – non-recyclable	0.5%	0.1%	0.4%	0.6%
Paper – packaging	0.4%	0.1%	0.3%	0.5%
Plastic – EPS foam	0.8%	0.2%	0.5%	1.0%
Plastic – film packaging	3.4%	0.2%	3.0%	3.7%
Plastic – other	5.6%	0.4%	5.0%	6.2%
Plastic – rigid packaging	1.9%	0.2%	1.6%	2.2%
Rubber – other	0.4%	0.1%	0.2%	0.6%
Rubber – tyres	0.2%	0.1%	0.0%	0.3%
Leather	0.0%	0.0%	0.0%	0.0%
Textiles – carpet & underlay	3.9%	0.4%	3.2%	4.6%
Textiles – cloth & rags	1.3%	0.2%	1.0%	1.6%
Textiles – covered furniture	2.0%	0.3%	1.6%	2.5%
Textiles – mattresses	0.2%	0.1%	0.1%	0.3%
Asbestos	0.7%	0.2%	0.4%	1.1%
Insulation	1.3%	0.2%	1.0%	1.7%
Residual – MRF fines	1.2%	0.3%	0.7%	1.6%
Residual – flock	0.5%	0.2%	0.2%	0.8%
Residual – pulp	0.0%	0.0%	0.0%	0.0%
Residual – PEF	0.0%	0.0%	0.0%	0.0%
Residual – sludge	0.0%	0.0%	0.0%	0.0%
Residual – mixed process	1.2%	0.3%	0.8%	1.7%
Hazardous – chemicals/other hazardous	0.3%	0.1%	0.1%	0.5%
Hazardous – clinical	0.2%	0.1%	0.0%	0.4%
Other	0.0%	0.0%	0.0%	0.0%