Reth!nk Waste
TASMANIA

New Building Project

Construction & Demolition

Waste Audit

2021

justWASTE
CONSULTING

DOCUMENT RECORD

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Tasmania's three Regional Waste Management Group collaborate on residential, industry and school education and awareness programs under the communications banner: Rethink Waste Tasmania

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1. INTRODUCTION

Waste generation from the Australian construction and demolition (C&D) industry is estimated at 27 million tonnes of construction demolition waste (CDW) per year, accounting for 44% of Australia's waste production [1]. CDW is any waste produced by building and demolition activities, including new buildings, renovations, road and rail construction, earthworks and other activities associated with construction activities. Of this material, an estimated minimum of 35% is sent to landfill [1].

> *"Achieving a 40% average recovery rate from all streams by 2025 and 80% by 2030."*
>
> Draft Waste Action Plan, 2019

As reported in the National Waste Report 2020, CDW generation has grown significantly over the last 13 years and is now 32% higher than it was in 2007. Of this growth, most has been concentrated in the last five years [1]. The carbon footprint of Australia's construction sector is estimated at 18.1% of Australia's carbon footprint, of which, three of the top four contributors are electricity, water, and waste [2].

The Australian Bureau of Statistic's data indicates that Tasmania was the leading state for construction work between September 2018-2019, with construction growth trending at a rate of 5.6% [3].

Tasmania's CDW figures are not systematically captured as they are in other Australian states and clean fill/excavation waste is excluded from Tasmanian CDW landfill tonnage reports, making comparisons difficult. The National Waste Reporting database stated 35,540 tonnes of recorded CDW was landfilled in Tasmania in 2018-2019 [4]. This figure only captures declared CDW from the larger landfills and waste transfer stations, not always from small waste disposal sites or waste weights classified as 'mixed loads' by contractors.

There is no identifiable reason for Tasmania's overall percentage of CDW to vary significantly from the national average of 44% of overall waste production. Unfortunately, due to a smaller waste management sector overall and geographical and cost challenges limiting access to mainland recycling industries, it is also reasonable to assume that Tasmania has relatively lower than average recycling rates for many CDW materials.

The Tasmanian Government's *Draft Waste Action Plan, 2019* has set a 40% average recovery rate from all streams in 2025 and 80% by 2030 [5]. The Tasmanian Government is also

introducing a state-wide Waste Levy in July 2022 that will see a 6-year staged introduction of $60 per tonne on top of existing landfill operator fees [6].

The Tasmanian C&D industry needs to make some significant changes to its waste management practices in the near future or risk significant cost increases.

The three Regional Waste Management Groups (Cradle Coast Waste Services, Northern Tasmanian Waste Management Group and the Southern Tasmanian Waste Management Group) entered into an agreement with the Master Builders Association of Australia (MBTAS). This agreement aims to increase engagement in areas of waste education, resource recovery and recycling and waste minimisation across Tasmania's construction industry.

A series of waste audits from the start to finish of a new construction project will provide evidence of potential material recovery and how that may be practically achieved. This is the first of these audit reports.

This audit report reviews the materials disposed of and splits them into four categories (recyclable, inert, organic and residual waste) to identify which type of material is having the most impact in weight terms.

This audit report also profiles the materials being disposed of at each of the four recognised building stages (foundation, lock-up, fit-out and completion), to identify what type of materials are having the most impact at each stage.

Picture 1: Building project, CRADOC.

2. METHODOLOGY

2.1. Audit Site & Local WTS

Blue Gum Builders and Footprint Homes (Blue Gum) constructed a new dwelling at Cradoc in Tasmania's South.

There are four nearby waste transfer stations (WTS) in the Huon Valley local government area, the closest to the building site, Cygnet WTS, is 14mins drive south (17kms), open on Wednesdays 12pm – 4pm and weekends. Southbridge WTS is 17mins drive north, has a reuse shop and is open seven days. None of the four nearby WTS's accept builder's rubble or clean fill. Southbridge WTS accepts timber, metal, clean concrete and green waste for a fee, plus accepts standard kerbside recyclables and empty/dry paint cans free of charge.

The Southbridge WTS is the site that was used for the disposal of materials from the construction site.

2.2. Audit Process

There are two standard types of waste disposal methods on building sites, either a hired skip bin from a waste collection contractor, or the building company stockpiles the waste then once the stockpile reaches a certain size it's transferred to a trailer and taken to a local disposal point. Blue Gum followed the second method for this house construction and set up their own temporary cage on site.

For this audit JustWaste emptied the cage, measured, weighed and categorised all materials then placed them into the trailer to be taken for disposal.

The auditors performed four separate audits to coincide with four different stages of the building process, allowing JustWaste to provide a detailed waste generation profile at each stage of a residential build. The stages and audit dates are listed below.

Date	Audit No.	Building Stage
7th September 2020	1	Foundation
12th February 2021	2	Lock-up
10th March 2021	3	Fit-out
14th June 2021	4	Completion

Table 1: Audit dates and building stages

Picture 2: Waste Cage

2.3. Materials categorisation

Each waste category was weighted (kilograms) and measure for volume (cubic metres) as the materials from the cage were removed and categorised.

Picture 3: Tared scales with empty container

The materials were classified into categories (recyclables, organics, inert and residual waste) and then sub-categories to allow for further assessment and analysis. Table 2 provides a full breakdown of all audit classifications.

Within this report, percentages have been used to estimate the proportion each material or category represents within the audited waste material. Percentages have been mathematically rounded and therefore due to rounding errors may not always total 100%.

MATERIAL
Cardboard
Bottles and jars
PET #1
PVC #3
Plastic strapping
Soft Plastic
Black plastic wrap
Aluminium cans / foil
Steel / tin cans
Aerosol cans
Metal Other
Electrical wire
Polystyrene
Food kitchen
Untreated timber
Cement
Bricks / rubble
Plasterboard
Non recyclables rigid plastic
Composite plastic / metal (non recyclable)
Composite (mostly paper)
MDF Timber
Textiles - carpet
Chipboard timber
Waxed paper
Cement Sheeting
Insulation

Key:	
Yellow:	Recyclable
Green:	Organics
Brown:	Inert
Red:	Residual Waste

Table 2: Audit list of C&D material sub-categories

2.4. Limitations

This audit report assesses the C&D waste generated by one builder at one site, and therefore is a snapshot of an average-sized 'new residential build'. It does not account for variables due to differences in material specifications e.g. cladding, roofing types etc.

Blue Gum was requested to not change their behaviour based on the audit process. However, as with any business or individual aware that their waste is being audited, prior notification raises awareness of waste habits, and may influence waste disposal behaviour, in particular the correct treatment of hazardous waste material if applicable.

This is an audit report and not a definitive market research report on sector waste disposal behaviour. It should be noted that increasing the number of audit samples decreases all error margins.

3. ANALYSIS

3.1. Material Overview

The four audits weighed and measured materials totalling 2,804 kilograms and 13 cubic metres (m3) of categorised waste materials. Three categories were identified as being divertible – 'recyclables', 'inert' material and 'organics', the remaining material was classified as 'residual waste'.

Recyclables made up 27.79% of the total audit weight, inert materials 26.53% and organics 8.19%. This equated to almost two thirds (62.51%) being divertible material (Figure 1).

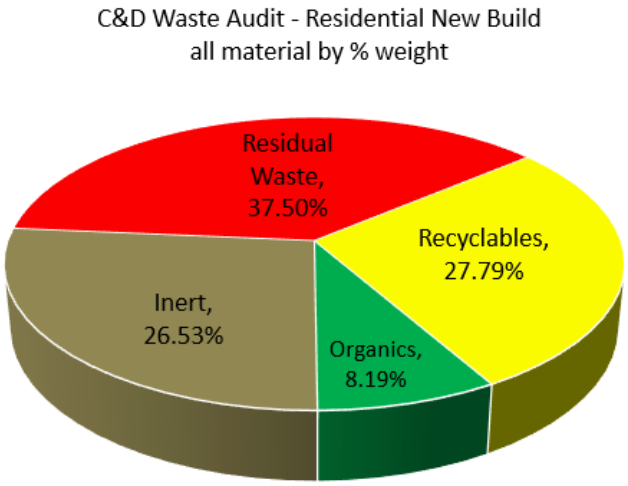

Figure 1: Material composition of entire build combined weight (by %)

Table 3 identifies the recoverable material at each of four building stages, by weight and by volume (m3). Volume analysis can have value when considering material storage and transport.

Audit No.	Building Stage	TOTAL Disposed Material Weight (kg)	Total recoverable weight (kg)	% Recoverable
1	Foundation	383.82	254.19	66%
2	Lock-up	776.36	337.62	59%
3	Fit-out	1,146.13	814.90	71%
4	Completion	498.34	346.32	69%
TOTAL		**2,804.65**	**1,753.03**	**62%**

Audit No.	Building Stage	TOTAL Disposed Material Volume (m3)	Total recoverable volume (m3)	% Recoverable
1	Foundation	1.67	1.63	77%
2	Lock-up	4.75	2.82	59%
3	Fit-out	4.31	2.61	61%
4	Completion	2.29	1.65	72%
TOTAL		**13.02**	**8.70**	**67%**

Table 3: Weight and volumes for all audited materials, recoverable materials and their associated percentages per building stage.

3.1.1. Material Weights by Building Stage

The below chart breaks down the 2.8 tonnes of waste material by building stage, to identify which stage produces the most amount of waste by weight.

'Fit-out' produced the highest amount of waste, representing 41% of all waste produced during this house build, with 'lock-up' also contributing 28% (Figure 2). Together these two stages were responsible for 69% of all waste by weight.

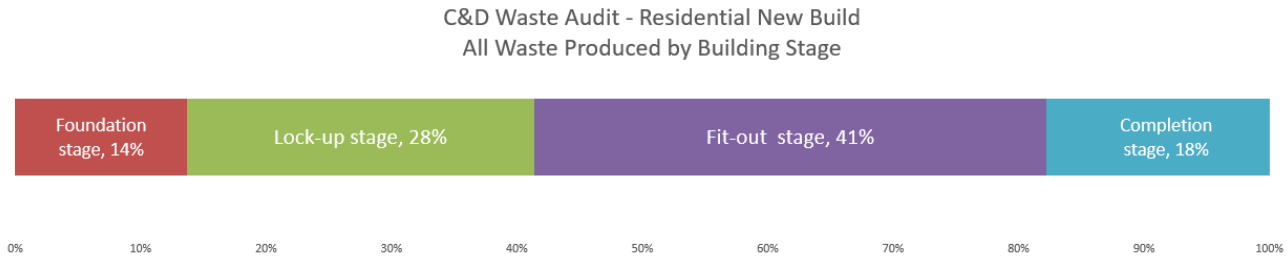

Figure 2: Waste production by building stage as % of overall waste weight

Figure 3 reviews the waste profiles at each stage of the build and identifies what type of waste (e.g. recyclable, organic, inert, residual) is contributing the most by weight at each stage.

While the Foundation stage did not produce much waste comparatively speaking (Figure 2), 'Recyclables' were contributing the most at the Foundation stage at over half (51.75%) of all waste produced at this stage (Figure 3).

'Residual waste' is the heaviest category of waste produced at the Lock-up stage (56.51%), 'inert materials' are the heaviest category at the Fit-out stage (46.36%) and at 'Completion' the waste is fairly evenly split by weight between 'recyclables', 'inert' and 'residual waste' (Figure 3).

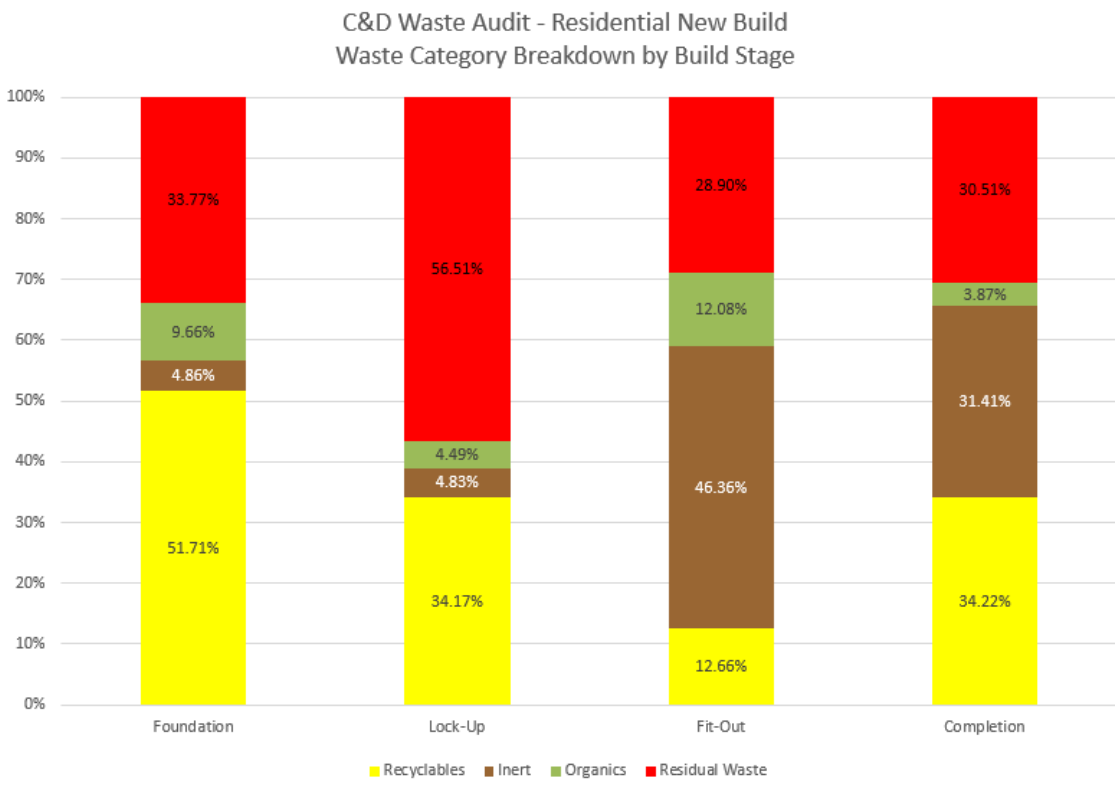

Figure 3: Waste by category as % of all waste produced at each building stage

The next four sections of this report analyses each of the four waste types (recyclables, inert, organics and residual waste) by providing a brief overview of its general characteristics, a detailed waste profile and impacts across the building cycle.

3.2. Recyclables

Recyclable materials within the construction industry differ significantly from household kerbside recyclables, nor are kerbside bins typically offered until Completion Certificates are issued. Due to this, all recyclable material must be taken to local landfills or waste transfer stations for treatment.

The types of recoverable materials from the C&D streams are commonly masonry, concretes, metals, timber, cardboard and some plastics. This audit identified 13 material types that can be reprocessed for reuse.

3.2.1. Recyclables Breakdown

Of the 2.8 tonnes of waste materials audited over the four building stages, 27.79% was identified as being recyclable using current recycling technology. Figure 4 below splits these recyclables into five categories [plastics, metals, cardboard, glass and other (electrical wire and polystyrene)] and compares their individual weights against the total weight of recyclables disposed of during the build.

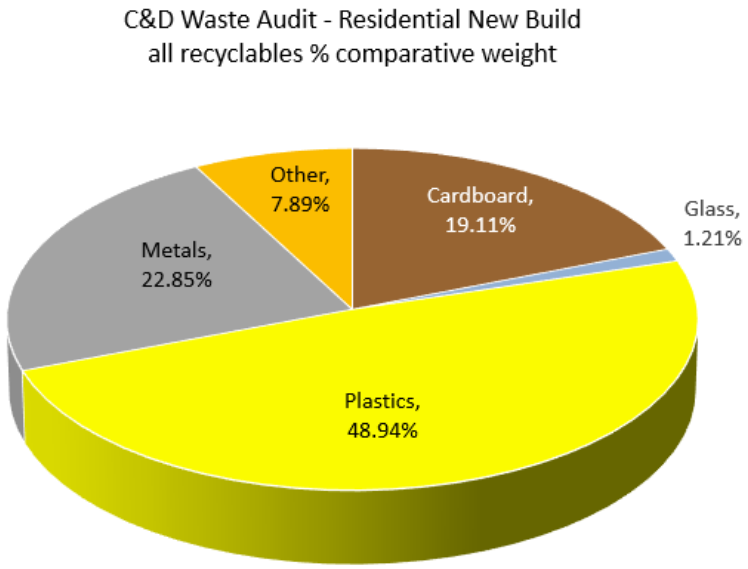

Figure 4: Recyclables by sub-category as % of all recyclables disposed of during build project

While 'metals' are significantly heavier than 'plastics' as a material type, this audit also identified that due to the much larger volume, 'plastics' was the recyclable type that contributed the most waste weight during the build. In absolute weight terms, 381.39 kgs of plastics was disposed of (221.11 kgs of which was soft plastic). Metals (all types) equated to 178.05 kgs.

The top four heaviest recyclables across the build project were:

- Soft plastic was 7.92% of all waste by weight
- Metal Other (not aluminium/steel cans) was 5.78%
- Cardboard was 5.31% of all waste by weight
- Black plastic wrap was 3.38% of all waste by weight

Figure 5 (following page) breaks down this data further into the different recyclable material types to represent a 'recyclables stream profile'; and then ranks each by its relative weight of all recyclables disposed of.

'Soft plastics' was the highest sub-category of recyclables by weight at over a quarter of all recyclables audited (28.5%); 'black plastic wrap' equated to 12.15% of all recyclables by weight, together these two material types equated to 40.65% of all recyclables identified by weight (Figure 5). When looking at these two material types and their impact on all waste produced over the audit (including all categories e.g. inert, non-recyclable, residual waste), 'soft plastics' and 'black plastic wrap' together equated to 11.38% of all waste audited by weight and took up 22% of the total cubic volume of building waste audited.

The second most significant recyclable was 'metal other' at 20.79% by weight of all recyclables (Figure 5). Typically this subcategory referred to roof tin off-cuts.

Cardboard was the third most identified recyclable in this audit, at 19.11% of all recyclables (Figure 5).

Picture 4: Roof tin (metal sub-category)

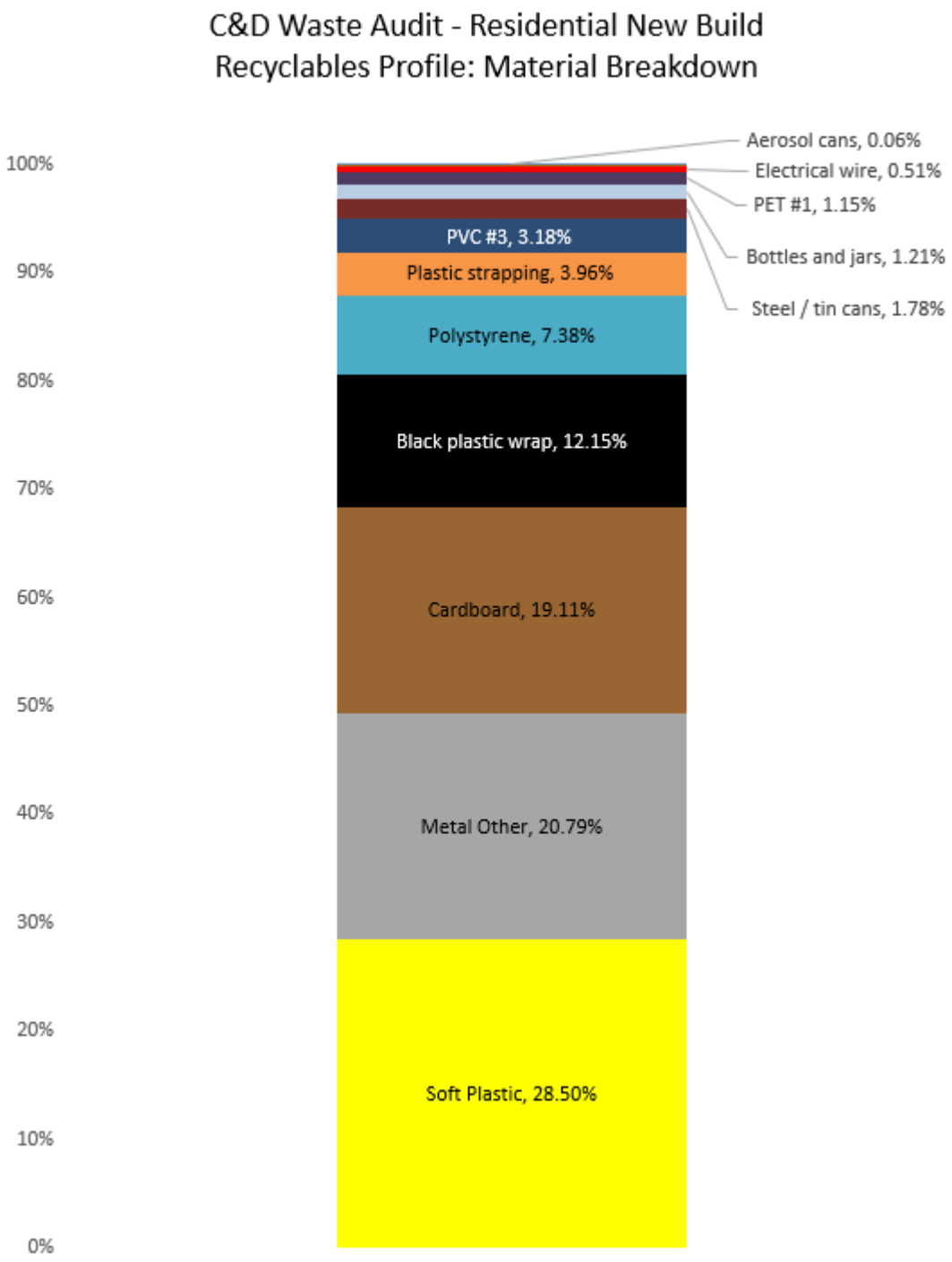

Figure 5: Recyclables Profile – individual recyclables and their comparative weights as a % of all recyclable weight

3.2.2. Recyclables Analysis by Building Stage

Figure 6 reports the percentage of recyclable material discarded per building stage, these figures are reported below against the % waste produced at that stage (by weight):

- Foundation stage = 14% of all waste, 51.7% was recyclable
- Lock-up stage = 28% of all waste, 34.17% was recyclable
- Fit-out stage = 41% of all waste, 12.66% was recyclable
- Completion stage = 18% of all waste, 34.22% recyclable

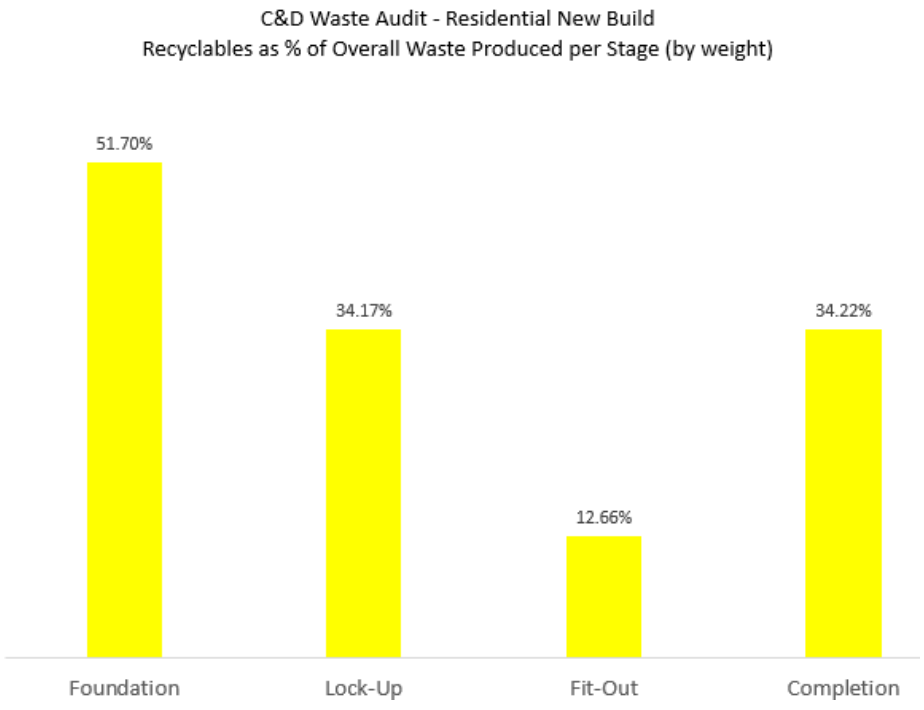

Figure 6: Recyclables as % of all waste produced at each building stage

Figure 7 analyses each individual recyclable type and identifies at what stage of the building process it had the most impact. This is useful when an opportunity or a market has been identified for a single recyclable type – this chart indicates at what stage of the build it will be most beneficial to arrange for its collection from the building site.

For example, 'soft plastics' constituted 17% of all the waste produced by weight at the Foundation stage, 11.6% of all the waste produced at Lock-Up stage, but only 3.4% of all the waste produced at Fit-Out stage and 5.5% of all the waste produced at Completion stage (Figure 7). Therefore 'soft plastic' is produced in more volume in the first half of the building process, and its collection and removal from site waste would be most beneficial if it can coordinate with 'lock-up'.

'Cardboard' was disposed of across all four building stages, but contributed the most to 'Completion' waste by weight, therefore is worth recycling at the end of the project.

Please Note: As this chart looks at each material separately and its relative impact *at each building stage*, it will not add up to 100%. Please refer to 3.2.1 for recyclable breakdown, or the DATA Appendix for the total contribution of individual items to the overall waste discarded across all four building stages.

Figure 7 also does not list the following recyclables as their weight contribution was not statistically significant overall: 'bottles and jars' which constituted just 0.34% of all waste by weight, 'electrical wire' at 0.14% 'aluminium cans/foil' at 0.06% and 'aerosol cans' at 0.02% and of all waste by weight.

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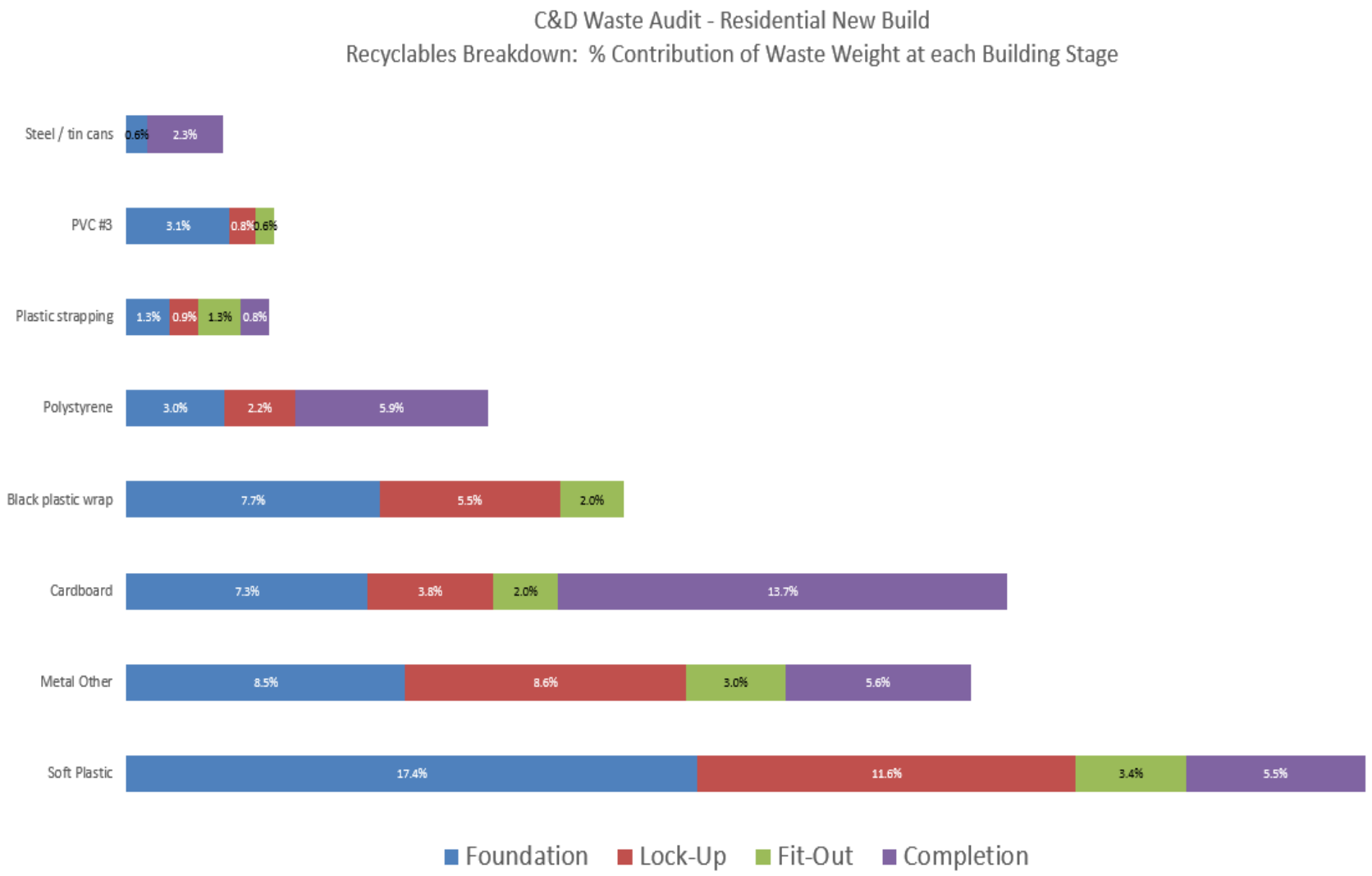

Figure 7: Major recyclables and their % contribution to the weight of waste produced at each building stage

3.3. Inert Material

Inert material is waste which is neither chemically nor biologically reactive. For this audit, the JustWaste auditors classified three material types into this category, 'plasterboard', 'bricks/rubble' and 'cement'.

The classification and acceptability of this material varies between Waste Transfer Stations and Landfill operators, for example 'brick/rubble' and 'cement' can be classified together as 'builders rubble' or may need be separated due to different gate fee pricing. Plasterboard can be classified as 'builders waste' or 'general waste' or even contaminated 'commercial waste' if from demolition work.

3.3.1. Inert Materials Breakdown

Of all waste materials audited across the four building stages, 'inerts' constituted over a quarter (26.53%) of all disposed material by weight (Figure 1).

When reviewed for their contribution by weight of all waste deposited across the entire build:

- 'Plasterboard' was 19.82% of all waste by weight
- 'Bricks/rubble' was 3.55%
- 'Cement' was 3.16%

It should be noted that even though the overall volume contribution (m3) of these items was low (plasterboard 9%, bricks/rubble 1% and cement 1% by volume of all material assessed), these material types are particularly significant due to their weight and exponential growth/impact potential.

Example only: A waste stream audit on a 25 square house-build may have 25% inert material by weight, but a 30 square house could have 35% of all waste just composed of these three material types. This is worth noting as weight equals disposal cost, the larger the house the more the need for inert material diversion if diversion targets are to be met in Tasmania's Draft Waste Action Plan.

Figure 8 compares the three material types against each other for their respective weight contribution. Plasterboard constituted almost three quarters (74.7%) of all inert materials (by weight) disposed of during the build.

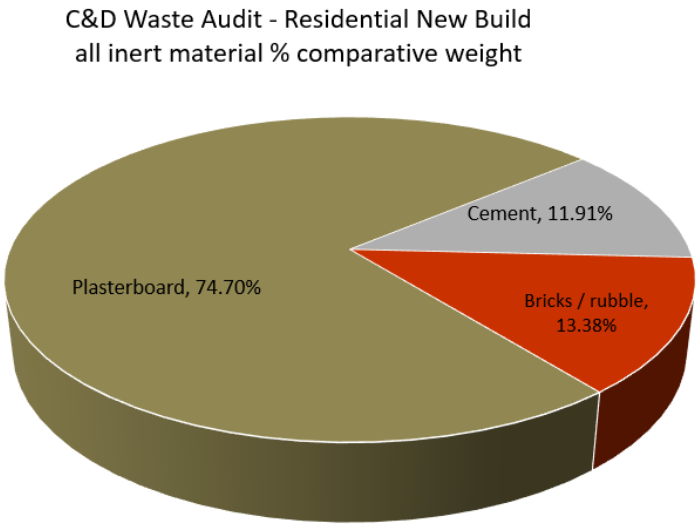

Figure 8: Inert materials disposed of during build project and their relative weight

Picture 5: Plasterboard

3.3.2. Inert Materials Analysis by Building Stage

Figure 9 reports the percentage of 'inert material' discarded at each building stage, as a percentage of all waste discarded at that stage. This identifies at which building stage 'inert materials' are contributing the most by weight.

Almost half (46.36%) of all waste discarded at the Fit-Out stage were either 'concrete', 'bricks and rubble' or 'plasterboard'. When combined with all inert materials discarded at the Completion stage, over three quarters (77.77%) of all 'inert materials' discarded were done so in the second half of the build.

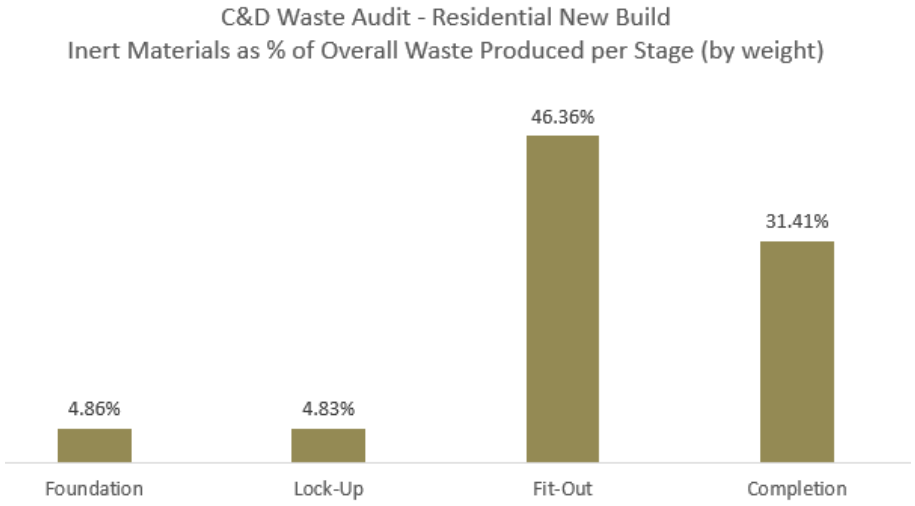

Figure 9: Inert materials as % of all waste produced at each building stage

Figure 10 provides a breakdown of each of the three material types, and their respective contribution to waste weight by build stage. As can be expected, 'cement' and 'plasterboard' were not detected in the Foundation and Lock-up stages. 'Bricks and rubble', while a small contributor to overall waste weight (3.55%, refer inert material breakdown), this material was detected at all stages of the build.

Plasterboard represented over a third of all the waste produced (by weight) at Fit-out stage (37.39%) and a quarter of all waste produced (by weight) at the Completion stage (25.55%).

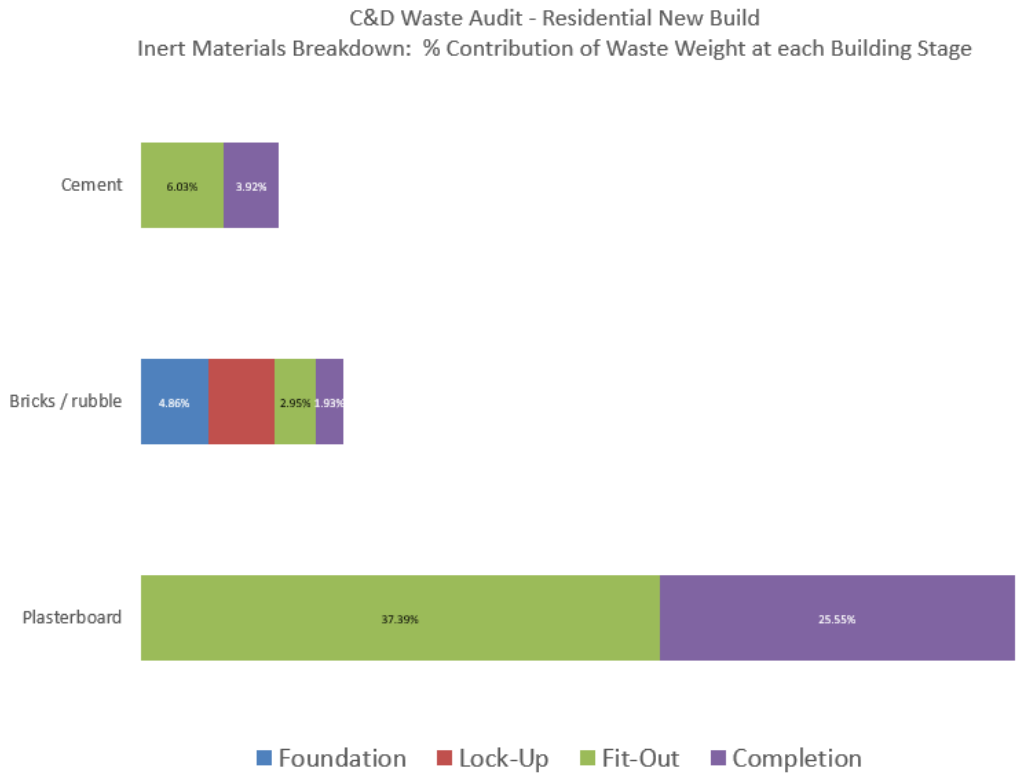

Figure 10: Inert materials by sub-category and their contribution to the weight of waste produced at each building stage

3.4. Organics

Organics is defined as any animal and plant based material and degradable carbon such as paper, cardboard and timber. It is problematic in landfills as its decomposition emits significant volumes of the greenhouse gases carbon dioxide and methane, a gas 25% more effective than carbon dioxide at trapping the earth's heat.

For a C&D audit, JustWaste classified 'organics' as untreated timber and any food waste workers bring on site. Over the four audits, organics constituted 8.19% of overall waste by weight (Figure 1).

3.4.1. Organics Breakdown

Of the 2,804 kilograms audited, 229.64 kgs was organic waste. This consisted of 219.66 kgs of untreated timber and 9.98 kgs of food waste (approximately 96% timber, 4% food waste).

3.4.2. Organics Analysis by Building Stage

Food waste was only detected in the first half of the build and is not statistically significant in weight terms. The profile for untreated timber, as a percentage of the overall weight of waste produced per building stage, is shown in Figure 11 below. The audit identified that untreated timber was disposed of throughout all four building stages, with the most wastage occurring at Fit-out, where it constituted 12.08% of all waste produced at this stage of the build.

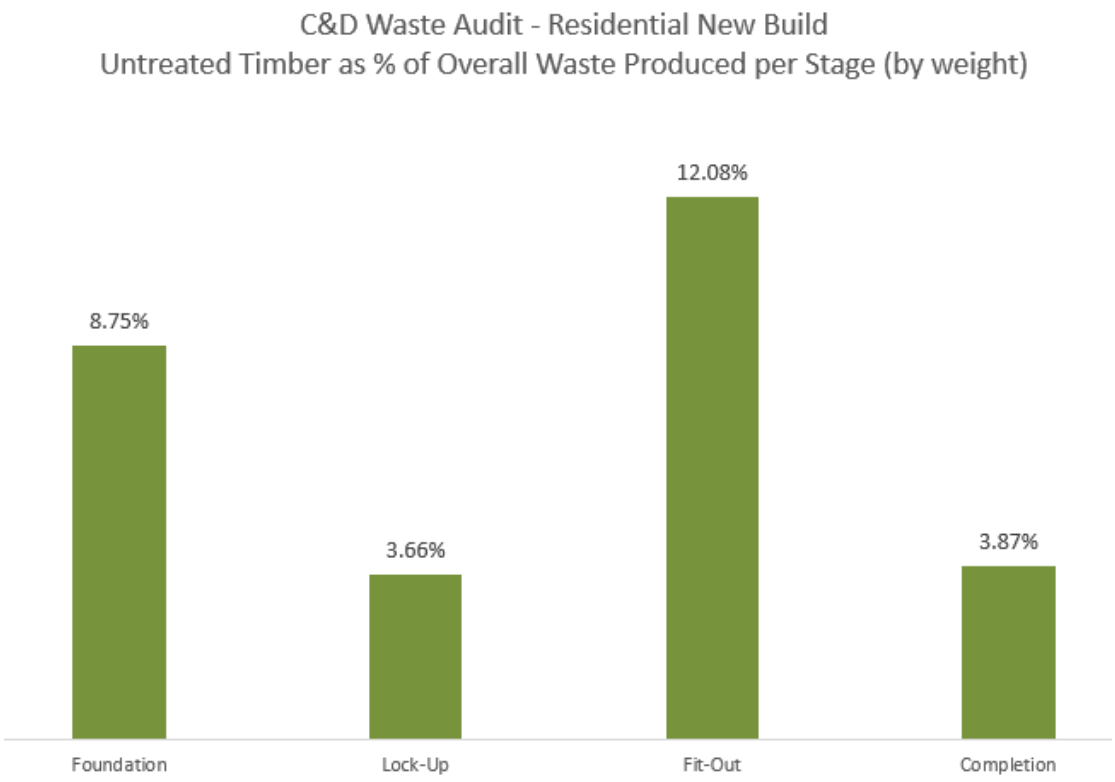

Figure 11: Untreated timber and its contribution to the weight of waste produced at each building stage

3.5. Residual Waste

Residual, or general waste refers to material which doesn't yet have a divertible option and must be sent to landfill for disposal. It does not include items classified as 'special', 'hazardous' or 'controlled' waste such as asbestos or paint.

Best practice waste management for these materials needs to focus on waste reduction, particularly during the planning and purchasing stages.

3.5.1. Residual Waste Breakdown

This audit identified that just over one third (37.5%) of all waste produced over the course of this build was residual waste (Figure 1). This equated to just over one tonne of residual waste (1,051.61 kgs).

The following material types were identified and have been listed from the heaviest to the lightest; next to each is their overall impact on all waste generated across the build:

- Non-recyclable rigid plastic, 9.65% of all waste by weight
- Cement sheeting, 8.61%
- Chipboard timber, 6.55%
- MDF timber, 5.62%
- Insulation, 4.47%
- Waxed paper, 1.33%
- Textiles – carpet, 0.65%
- Composite plastic/metal, 0.34%
- Composite (mostly paper), 0.27%

When considering total volume (m3), residual waste represented 35.82% of the total volume of waste produced over the entire building project. The three categories taking up the most space were 'rigid plastic' (12% of all waste by volume), 'insulation' (10%) and 'cement sheeting' (7%).

The following chart creates a 'waste stream profile' by comparing all the residual waste material types for their relative weight in the residual waste stream.

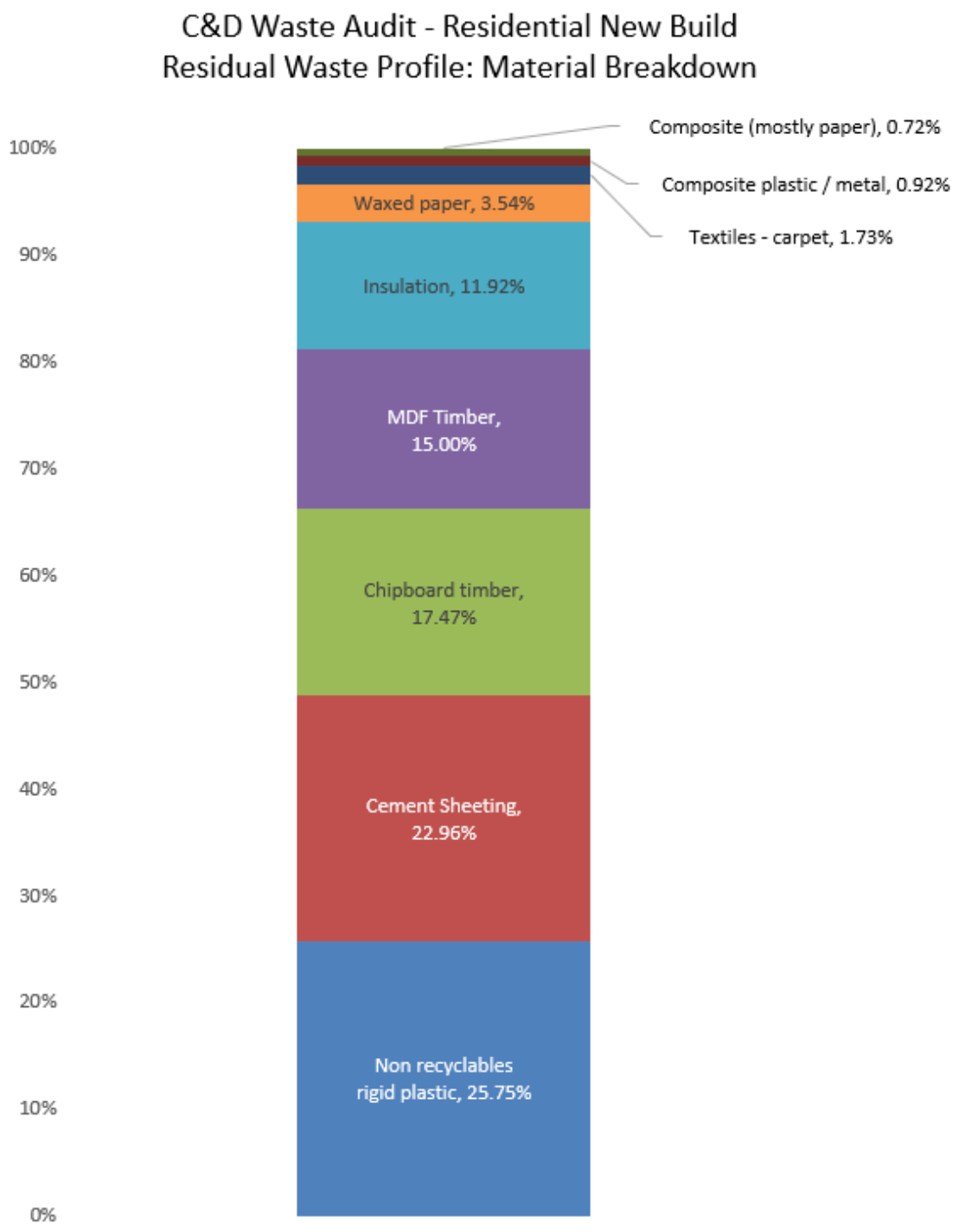

Figure 12: Residual Waste Profile – residual waste sub-categories and their comparative weights as a % of all residual waste

3.5.2. Residual Waste Analysis by Building Stage

Residual waste was produced across all stages of the build but had the most impact in terms of weight at the Lock-up stage, where it equated to 56.51% by weight of all waste produced at this stage. The top three heaviest items disposed of during Lock-up was cement sheeting, rigid plastic and chipboard, 16.76%, 13.16% and 10.92% of all waste at this stage, respectively.

In terms of m3 of residual waste being disposed of, both Lock-up and Fit-out stages resulted in waste that took up more than average space. At Lock-up, this was due to the disposal of cement sheeting (9.64% of all waste disposed at this stage by volume), and at Fit-out, the item most responsible for taking up bin space was insulation, at 17.97% of all waste by volume at this stage.

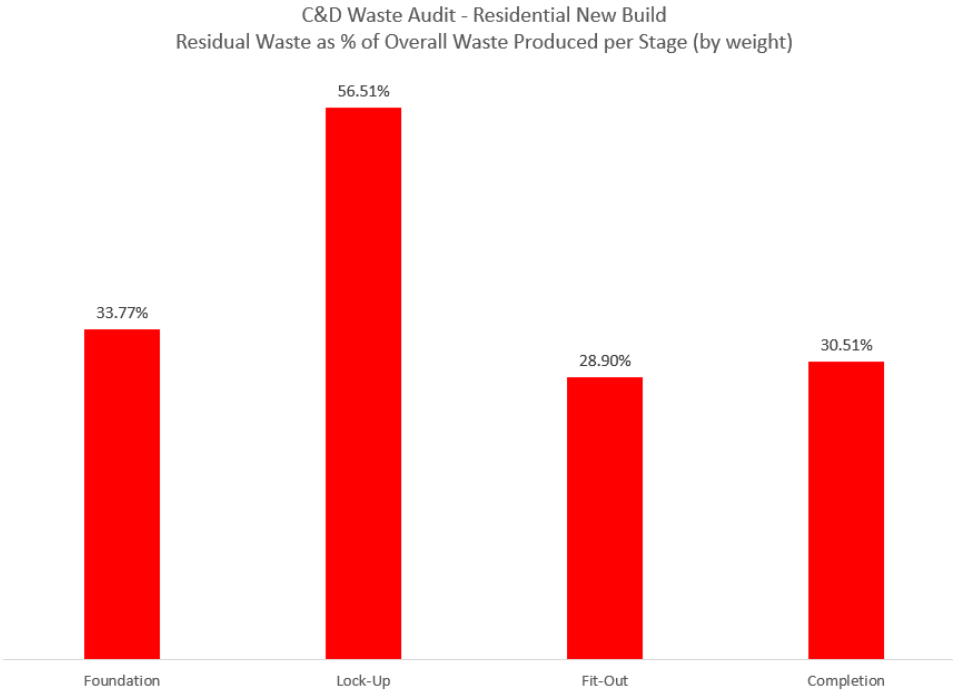

Figure 13: Residual waste as % of all waste produced at each building stage, by weight

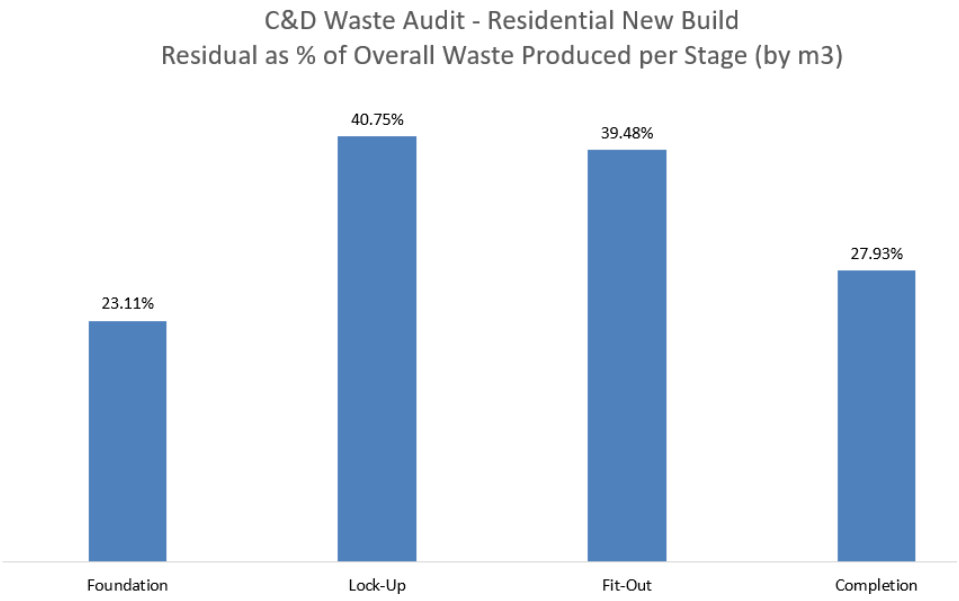

Figure 14: Residual waste as % of waste produced at each building stage, by volume

4. DISCUSSION

With the introduction of Tasmania's State Waste Levy in July 2022, there is a strong need for the C&D sector to examine their waste streams in greater detail and identify all opportunities to improve resource efficiency and reduce landfill fees. To demonstrate the potential cost savings from this one build:

> If the audited 2,804 kgs of materials were disposed of at the Launceston landfill, with current commercial fees of $108/tonne, the waste disposal cost equates to $302. When the new State Waste Levy is added at $60 tonne, this increases the disposal cost of this build to $470. This audit however has highlighted that at least 62% of the total waste materials generated by a residential new build could be reused or recycled. If this material could be diverted, the builder would save $291 on landfill fees alone, plus potentially gain revenue for any on-sold materials.

However construction waste sorting for diversion purposes presents a number of complex challenges. The Journal '*Resources Conservation and Recycling*' [7], quotes the following six critical success factors:

1. Manpower
2. Market for recycled materials
3. Waste sortability
4. Better management
5. Site space
6. Equipment for sorting of construction waste

The next section of this report will briefly outline the above six factors to include some Tasmanian context, plus identifies six C&D waste materials and their recyclability status in Tasmania.

4.1.1. Manpower

Skills Tasmania and Keystone Tasmania (formerly know as the Tasmanian Building and Construction Industry Training Board), in their '*Workforce Action Plan 2021'*, state that 75% of Tasmanian building and construction businesses employ less than 6 people and have an aging workforce [8]. Sub-contracting is standard practice on C&D sites, which presents an education challenge for unified best practice in onsite waste disposal behaviour.

4.1.2. Market for Recycled Materials

A key driver for materials resource recovery, Tasmania is a relatively small and immature market for secondary materials and lacks price competitiveness against new raw materials or when shipping recycled products interstate or overseas. A whole-of-market growth focus is urgently needed to boost material recovery efforts, including incentives, support and regulatory monitoring of a fixed percentage of 'recycled content' in procurement contracts.

4.1.3. Waste Sortability

C&D waste materials are varied – this audit separated a standard new build waste stream into 27 categories, and this did not include all the different resin types in both hard and soft plastics. While some categories are easily identified, e.g. cardboard, others, such as brick/rubble/fill are defined differently by different waste disposal sites. Recyclable or divertible material have the most value when sorted into 'clean streams', with the Australian Government's '*Construction and Demolition Waste Guide 2012'* stating that higher recovery rates are achieved when waste materials are segregated early [9]. However in Tasmania, with historically low incentives for C&DW separation, the propensity is for mixed CDW collection onsite, with sorting occurring at waste disposal sites, if at all.

Sorting of C&D divertibles at disposal sites also requires transfer stations / landfills to have suitably located and appropriately sized segregation areas where loads can be sorted and recoverable materials separated and, where applicable, deducted from total load weights. Having this provision at disposal sites would assist both builders who utilise cages/trailers and also waste contractors who use bulk bins. The

alternative is separation of materials at the building site, then being able to haul them in a cost and time effective manner while keeping the materials separate.

4.1.4. Better management

Better management of waste onsite is the responsibility of the building and construction industry, and can be achieved through education, training and awareness building of the necessity to change disposal practices.

Better management of construction waste is also the responsibility of waste disposal businesses. The Local Government Association of Tasmania, in their '*Waste and Resource Management Strategy 2017*', identified CDW as high priority, stating that "the C&D sector in particular presents a significant opportunity for the recovery of materials from industrial sources at landfill sites" It went on to recommend "….separate drop off zones at the landfill and rudimentary sorting processes to separate concrete, metals, timber, cardboard, plasterboard and other recyclables" [10].

In their '*Construction and Demolition Waste Status Report 2011'* the Australian Government notes that in South Australia, CDW materials are prohibited at landfills if they have not been pre-sorted [11]. In Tasmania, there are a number of waste disposal sites which are unmanned, making this currently impractical.

4.1.5. Site Space

A critical consideration for both building sites and waste disposal sites.

In the Journal '*Construction Management and Economics'*, industry specialists stated that "The experience of regional C&D recyclers indicate that successful recycling operations require a minimum of 0.8 ha of clear space for processing equipment, incoming waste stockpiles, recycled materials, and manoeuvring room for mobile equipment and operations. [12]"

If sorting CDW material onsite, there needs to be adequate, level space for storage bins, have good signage and be easily accessible by both builders and any collection vehicles. The onsite bins also need to be secure from theft, weather and dumping.

4.1.6. Equipment for sorting of construction waste

Can be generalised or task-specific, however almost always represents significant capital investment and unlikely to pass a cost-benefit analysis for Tasmania's smaller waste disposal operators or Council approval unless income generation streams rise significantly due to increased waste diversion from the C&D sector. The opportunity for hire-sharing of mobile plant equipment could be investigated and incentivised, copying best practice models from interstate and overseas.

4.2. Opportunities and Challenges – materials

The following material types were all identified in this audit as having significant impact on the waste stream. These items have been examined in more detail to identify recycling opportunities and barriers.

4.2.1. Plasterboard

Plasterboard material was by far the biggest individual contributor to the overall waste stream at 19.82% of all waste across the build project (refer 3.2.1). As can be expected, it is generated in highest quantities during Fit-out and Completion (37.39% of all Fit-out waste and 25.55% of all Completion waste by weight).

This material has been classified as inert, however could be classified and treated as an 'organic' as it composts well in the industrial composting process. However the 'compostable' diversion option only applies to plasterboard off-cuts from new builds, and not plasterboard from renovation or demolition projects as the material is then contaminated by paint.

It should also be noted that new build plasterboard would need careful separation from other waste materials if it were diverted to industrial composting facilities, to ensure no contamination from other waste materials.

Picture 6: Plasterboard

4.2.2. Soft plastic

Plastic wrapping is extensively used in the building industry. The use of black plastic sheeting in the slab construction, in addition to the many materials delivered pallet-wrapped or wrapped in soft plastic packaging, examples include insulation, timber and bricks. A significant proportion of interior residential build items during the 'Fit-out' and 'Completion' stages also come with their own plastic film or wrapping.

These two types of soft plastic are considered recyclable and represented 11.30% (by weight) of the total sample.

Two types of soft plastic, horticultural film and silage wrap, are currently recycled in Tasmania's north by Envorinex, who use injection mould processing to manufacture a range of recycled plastic products. The feedstock material (soft plastic for recycling) must be delivered to Envorinex clean and single-stream e.g. no mixing of soft plastics resin types. Currently Envorinex do not take pallet-wrap from other sources and are not looking for further feed stock without increased market expansion and sales contracts for their end products. Additionally black plastic has low market interest vs clear plastic.

Replas, based in Melbourne, are the destination for the REDcycle consumer soft plastic program, and use compression moulding in their manufacturing process, therefore can take a wider range of soft plastic types.

Picture 7: Soft plastic wrap (insulation)

4.2.3. Cement, concrete, bricks, builders rubble

This material type is relatively simple to process where crushing facilities exist, or mobile crushing rigs can be brought onsite where practical. It has established end markets in low-grade roads and pavement sub-bases. As a substitute for virgin crushed rock, it can offer additional 10-15% additional volume [8].

However there isn't a high demand in Tasmania for the recycled product and sending material to existing processors such as Spectran, Boral or Hazell Bros is geographically challenging for many builders due to both distance and weight. A more market-focused approach is recommended to drive up demand if this material is to be diverted from landfill. Examples could include identifying new end-use opportunities, mobile crushing rig sponsorship, regulatory monitoring of 'recycled content' purchasing policies, price increases at disposal sites, State government policy enforcement, LGA procurement monitoring and civil contractor education.

4.2.4. Cardboard

Cardboard, an easily identifiable and highly recyclable material, equated to 5.31% of the audited waste materials by weight, and 6% by volume. It was disposed of throughout the building process, however the highest amount was produced during the 'Completion' stage. Challenges associated with cardboard recycling onsite include wind / rain protection, and education around flattening to conserve space, and removal of contamination e.g. plastic strapping.

Many WTS's and landfills have separate cardboard collection systems, some accept cardboard free of charge.

4.2.5. Timber

The vast majority of C&DW timber comes from the demolition side of C&D, however this new build audit still identified 'untreated timber' as 7.83% of all waste by weight, and 8% of all waste by volume, indicating cost savings are possible if it is separated from the residual waste stream.

Stopping 'untreated timber' from being deposited as general waste in landfills requires mulching equipment at the disposal point. Mulched timber can used for landfill cover or on-sold as animal bedding (a market already being supplied by forestry offcuts). Recovery shops may also take untreated timber, or it could be diverted to industrial composters, however care and education would be needed to ensure no treated timber or composite/particle board is included in the 'timber pile' onsite. Second-hand pallets are often sought after by local community groups or social media group for firewood and garden hardscaping.

4.2.6. Metals

Metals (all types) equated to 178.05 kgs of all waste audited (6.35% of all waste by weight).

Metal recycling is considered profitable, and some bin hire contractors will separate metals out of mixed C&D waste. Due to fluctuating prices, it is often most cost-effective to stockpile metal off-cuts and scraps until prices are high.

5. RECOMMENDATIONS

There is a need for leadership to create change within this sector and drive better management of waste streams, resources and costs. The below recommendations are a list of actions that have potential to create the momentum needed before the State Waste Levy fully impacts the C&D sector in 2028, and to achieve the Tasmanian Government target of a 40% average recovery rate from all streams in 2025 and 80% by 2030.

5.1. Industry Recommendations

a) Create an industry steering group. Members to include representative bodies such as HIA, MBT Master Plumbers Association, Green Building Council Australia, Build Environment & Infrastructure Tasmania (BEIT); accredited 'Green Star' builders e.g. Hutchinson Builders; Registered Industry Trainers and industry recyclers such as Hazell Bros, Boral, Veolia, Cleanaway and Environex.

b) Create a 'Road Map for CDW' utilising current best practice models and adopt to suit local market conditions. Resources listed at the end of his report provide starting points for further research.

c) Use the MBA WA's C&D Smart Waste Guide for Builders as a template to develop a Tasmanian Smart Waste Guide for Builders. This resource includes checklists and template Waste Management Plans – refer to Appendix B.

d) Integrate Waste Management Plans in Building and Construction training packages and apprenticeships, and develop short Professional Development courses focusing on their implementation.

e) Investigate the process by which Waste Management Plans can be integrated into LGA building approvals, similar to soil and erosion management plans.

f) Introduce a Master Builders Tasmania Awards for Excellence category for waste reduction initiatives in the residential building sector.

g) Lobby for funds from the upcoming Tasmanian Waste Levy to improve recycling facilities and equipment for the processing of construction and demolition waste

h) Explore innovative opportunities e.g. for agricultural cover bricks/cement/rubble for vineyards where material absorbs heat through the day and helps keep vine temperatures warmer at night.

Picture 8: Trailer, filled from cage

Picture 9: C&D loads from bulk bins delivered to Launceston Landfill.

5.2. Builders Recommendations

a) Investigate the best option for the storage, collection and disposal of waste from the building project.

b) Locate the local disposal site (transfer station, landfill) and investigate the recycling opportunities available.

c) If utilising a waste collection contractor, seek information and options on recycling.

d) Identify the waste materials that may be created during each stage of the building project and implement a waste plan.

e) Implement source separation systems within the building project to enable the recycling of these materials easier and less time consuming at the disposal point. Signage and training is necessary.

f) Speak to suppliers about the packaging of materials.

Figure 15: Building site separation example

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APPENDIX 1: DATA

	CATEGORY TOTAL					SUB-CATEGORY TOTAL					MATERIAL TOTAL			
CATEGORY	Weight (kg)	Weight (%)	Volume (Litre)	Volume (%)	SUB-CATEGORY	Weight (kg)	Weight (%)	Volume (Litre)	Volume (%)	MATERIAL	Weight (kg)	Weight (%)	Volume (Litre)	Volume (%)
Recycling	779.35	27.79	5865.00	45.06	Cardboard	148.95	5.31	829.00	6.37	Cardboard	148.95	5.31	829	6.37
					Glass	9.46	0.34	31	0.24	Bottles and jars	9.46	0.34	31	0.24
					Plastics	381.39	13.60	3315.00	25.47	PET #1	9.00	0.32	61	0.47
										PVC #3	24.75	0.88	110	0.85
										Plastic strapping	30.87	1.10	211	1.62
										Soft Plastic	222.11	7.92	1,731	13.30
										Black plastic wrap	94.66	3.38	1,202	9.23
					Metals	178.05	6.35	637	4.89	Aluminium cans / foil	1.70	0.06	10	0.08
										Steel / tin cans	13.88	0.49	52	0.40
										Aerosol cans	0.48	0.02	8	0.06
										Metal Other	161.99	5.78	567	4.36
					Other	61.50	2.19	1,053	8.09	Electrical wire	3.98	0.14	23	0.18
										Polystyrene	57.52	2.05	1,030	7.91
Organics	229.64	8.19	1,115	8.57	Organics	229.64	8.19	1,115	8.57	Food kitchen	9.98	0.36	17	0.13
										Untreated timber	219.66	7.83	1,098	8.44
Inert	744.04	26.53	1,374	10.56	Inert	744.04	26.53	1,374	10.56	Cement	88.65	3.16	84	0.65
										Bricks / rubble	99.57	3.55	176	1.35
										Plasterboard	555.82	19.82	1,114	8.56
Residual Waste	1051.62	37.50	4,662	35.82	Residual Waste	1051.62	37.50	4,662	35.82	Non recyclables rigid plastic	270.78	9.65	1,595	12.25
										Composite plastic / metal (non recyclable)	9.64	0.34	33	0.25
										Composite (mostly paper)	7.61	0.27	30	0.23
										MDF Timber	157.70	5.62	235	1.81
										Textiles - carpet	18.17	0.65	42	0.32
										Chipboard timber	183.68	6.55	443	3.40
										Waxed paper	37.23	1.33	136	1.04
										Cement Sheeting	241.41	8.61	883	6.78
										Insulation	125.40	4.47	1,265	9.72
	2804.65	100.00	13,016	100.00		2804.65	100.00	13,016	100.00		2804.65	100.00	13,016	100.00

APPENDIX 2: E.G. OF C&D WASTE MANAGEMENT PLAN

The below has been reproduced from the 'Master Builders Smart Waste Guide' prepared by Maters Builders WA, and can be downloaded here.

Waste management plan template

This template can be downloaded from
www.mbawa.com

Note that you will need to tailor this plan to allow for the type of waste that your job is likely to produce, and to suit the type of wastes that you decide to separate, if you use the source separation recycling system.

Project	
Site Address	
Subcontractors involved	
Responsible site manager	

	Material Quality							
	Total waste	Reused onsite	Reused offsite	Recycled for use onsite	Recycled for use offsite	Sent to recycling facility	Sent to landfill	Contractor used
Soil/fill sand								
Rock/rubble								
Concrete								
Plaster/ Plasterboard								
Tiles								
Bricks & pavers								
Timber								
Plastics/PVC								
Metal								
Green waste								
Paper + Cardboard								
Glass								
Other								
Hazardous (paint, oil, asbestos)								
Totals								
% of total	100%							
Target %								