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Waste Audit Results

for University of Canterbury, May/June 2021

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June/July 2021

Contents

1. INTRODUCTION

Our Daily Waste specialises in comprehensive waste audits that analyse bin user behaviour and how behaviour change can be put into effect to maximise waste minimisation.

Below are the results of a waste audit undertaken at the University of Canterbury, 18th May to 4th June, 2021. The streams audited were the comingled recycling, landfill, organics, and a new PLA/compostables stream that has been added to the university's waste diversion system since the 2017 audit. Carried out over three weeks, waste was taken daily from a different part of the campus each week including: Meremere, The Undercroft, and the UCSA kitchens.

As such, we cannot provide a full overview of the UC's waste output, but this audit does provide valuable information about contamination rates and how the bins are being used. It also indicates a number of waste items that could easily be eliminated altogether, along with suggestions as to how the UC can better streamline its recycling/waste diversion system.

This report is informed by my prior knowledge of the UC's waste system, formed during my time as Waste Reduction Educator in 2011/12, along with another waste audit undertaken as a contractor in 2017. It is also influenced by my experiences on campus as a student from 1997 to 2008, and as a tutor/lecturer from 2001 to 2010. Having worked in both academic and facilities management departments, I have a particular understanding of, and love for the campus and community that nurtured my sustainability skills, so I have a vested interest in making the waste system work. All recommendations are to assist the university in minimising waste in general, but especially the landfill stream. From July, landfill levies are set to rise incrementally each year from $10 to $60 per tonne by 2024, so there is a financial incentive to reduce landfill in addition to the university's environmental commitments. ODW can provide ongoing consultancy and practical assistance to the UC to action these recommendations.

2. HEALTH & SAFETY

ODW takes Health & Safety seriously and all staff were fully briefed in both our own and the UC's H&S policies and they were complied with at all times. All H&S requirements (gloves, hand sanitiser, first aid kit etc.) were provided by ODW. There were no incidents or injuries incurred during the audit.

3. METHODOLOGY

The following methodology was used:

- Waste was collected daily from the agreed location by a Property Services staff member and delivered to the waste yard where we set up a table and buckets (Fig. 1).
- All bags of landfill were audited first, followed by recycling, and PLA/compostable streams (when provided).
- Organics had contamination removed and was weighed but it was not sorted into categories.
- Paper is no longer collected in the general recycling stations at the UC, so this stream was not audited separately.
- Individual bags were opened separately, and staff sorted each category of waste into buckets and bins according to volume.
- Once all waste from each stream was sorted, all categories were weighed and recorded.

Figure 1: The audit set-up

- At the end of each day's audit, waste was disposed of into appropriate skips and bins and the area left tidy.

4. LOCATIONS, WASTE CATERGORIES, and SAMPLE SIZE

4.1 Locations

The following locations and dates were chosen by Dr. Matt Morris to be audited:

- Meremere – 16th to 21st May.
- Undercroft – 22nd to 28th May.
- UCSA Production Kitchens (UCSA PK) – 29th May to 4th June. (Due to the flooding events in Canterbury that week, the Monday's audit had to be postponed, and unfortunately that day's waste was discarded by cleaning staff. However, all other days were audited.)

4.2 Waste categories/types

ODW's method is to sort waste into a number of categories so that we can better analyse problem areas. The following table includes a list of categories used, the items included, and what waste stream we classified them under.

Table 1 Categories waste was sorted into – all streams.

Landfill Category	Includes	Comments
Animal Waste	Dog poo bags, kitty litter	
Bottle/Container Lids	Plastic/metal bottle tops, plastic container lids	Many still going to recycling
Chopsticks	Wooden/PLA chopsticks	Cannot currently be composted
Cloths - Cleaning	All fabric cleaning cloths	
Coffee Cups	Cardboard coffee cups lined with plastic	
Coffee Cup Lids	Plastic coffee cup lids	
Cutlery	Plastic/metal cutlery	Plastic could be banned on campus
Drink Cartons	Milk and juice cartons, tetrapaks	
Foil Packaging	'Foil' style plastic packaging: muesli, chocolate bars etc.	
Napkins	Napkins/serviettes/tissues/paper towels	Could potentially go to compostable stream
Paper – non-recyclable	Paper bags/dirty paper/small pieces	Could potentially go to compostable stream
Plastic Cups	Plastic cups/McDonald's/juice etc.	
Plastic Packaging	Soft plastics/sushi/biscuit trays etc.	
Polystyrene	Takeaway polystyrene cups/clamshells	Should be banned on campus
PPE	Gloves/masks	
Receipts	Till/eftpos receipts	Could be given only on request
Sandwich Packs	Plastic sandwich packaging - triangular	Could be switched for paper bags
Single Use Packaging	Sauce/mayo/tea bag wraps/coffee pods	Could be eliminated/banned
Straws	Plastic/cardboard/PLA	Difficult to tell compostable straws apart
Tin Foil	Tin/aluminium foil	
Wipes	Fabric wipes	Can be mistaken for napkins
Yoghurt	Pottles/squeeze packs	Too dirty to recycle

Miscellaneous	Plastic strapping/pens/stationery etc.	
Recycling Category	**Includes**	**Comments**
Bottles - Milk	All milk bottles under 3l in size	Most had lids on and were too dirty to recycle
Bottles – Plastic	All plastic bottles under 3l in size	Some had lids on
Cans – Aluminium	All drink cans	
Cardboard	Boxes/packaging etc.	Most was wet from liquid contamination in recycling
Glass Bottles	All glass bottles – not broken	Very few collected
Glass Jars	Glass jars - clean	Very few collected
Paper - recyclable	Office/envelopes/magazines/newspaper	Most was wet from liquid contamination in recycling
Plastic Containers	Rigid containers with #1, 2 or 5	**All** were too dirty to recycle
Tins	All tins under 3l in size but with lids off	Most were too dirty to recycle
PLA/Compostable Category	**Includes**	**Comments**
Coffee Cups	All PLA lined cups labelled as compostable	Several different types, can be difficult to tell apart from plastic
Coffee Cup Lids	All lids labelled as PLA or compostable	Several different types, can be difficult to tell apart from plastic
Cutlery - Wooden	All wooden/bamboo cutlery	
Food Containers	PLA lined/cardboard/potato/sugarcane	
PLA Cups	All clear PLA cups	Can be difficult to tell apart from plastic
Skewers	All wooden skewers	
Organics Category	**Includes**	**Comments**
Organics	All food/coffee grounds/tea bags	Due to difficulty of separating organics this stream was not categorised further

4.3 Sample Size – Pre-sort

A total of 270kg was classified in contrast with 617kg in 2017. The Undercroft and UCSA PK were audited both years, but there was a larger sample provided in 2017 (Undercroft: 180kg; UCSA PK: 178kg) than in 2021 (Undercroft: 112kg; UCSA PK: 34kg). Some of this reduction may be accounted for by the loss of Monday 31st May's waste from the UCSA PK, along with a quieter than average week because of the disruption caused by flooding.

We were only provided with PLA/compostable bags for two days of the audit. This may have been due to a low use of these bins, but ideally we would be provided with bags for each stream, each day of the audit regardless of how much waste is in them. For future audits, I suggest a prior visit with the Property Services staff collecting the audit waste to ensure that all understand exactly what is required so that we get an accurate sample.

Fig. 2 represents the percentage of the total waste audited by bin origin – so 58% of the total waste audited was originally placed in the landfill bins, and only 1% was in the PLA/compostables bins.

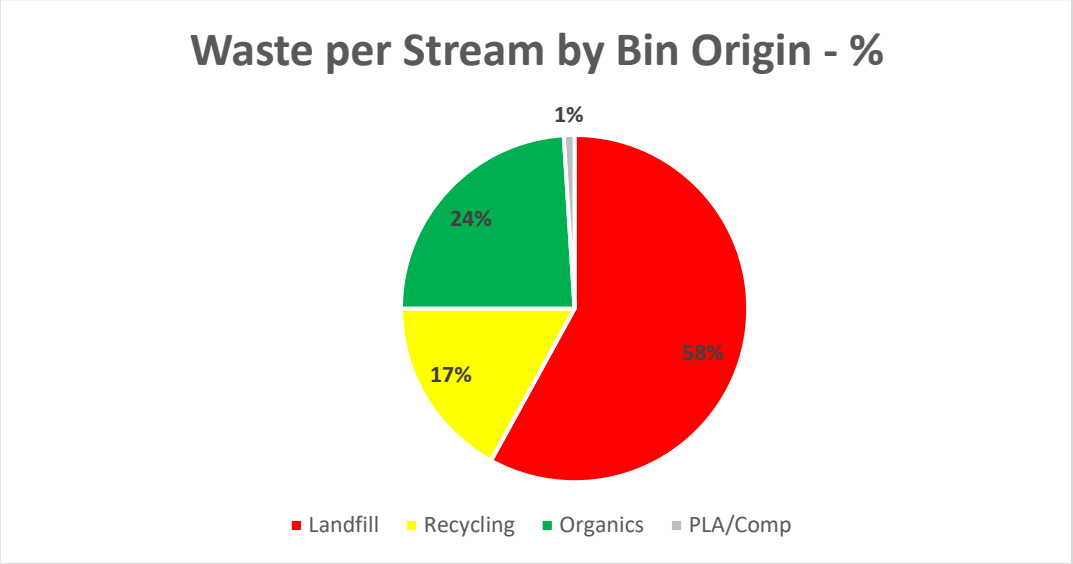

Figure 2: Waste per stream by bin origin

Table 2 indicates how the bins are being used and how much of each stream is going in the correct bin. The Container/Bin Used column records all the waste that had been collected in those bins prior to sorting. The After Sorting column indicates the items that should have been in that waste stream, once all the contamination was removed, a figure that is also represented as a percentage of the weight prior to sorting. I have included 2017's percentage figures for comparison where available.

Table 2 Total weight of waste per stream classified in origin and after sorting - kg

Waste Stream	Container/Bin Used - kg	After Sorting - kg	% Waste In Correct Bin	% Correct Bin 2017
Comingled Recycling	46.2	31.6	68%	70%
Landfill	156.8	61.0	39%	56%
PLA/Compostables	3.7	3.0	81%	N/A
Organics	63.5	59.7	94%	N/A

These results offer the first indication of how the bins are being used. This shows that the vast amount of bin users are using the landfill bins regardless of what it is they are discarding with 61% of the original landfill weight able to be diverted to other streams, up from 44% in 2017. In some ways this shows that people are being more cautious about what they are putting in the other bins – as shown by the higher percentages of recycling and organics in the right stream – and choosing landfill when they are unsure. However, given the cost of landfill removal to the university, that over 60% of it could be diverted is the figure that needs the most attention.

The organics stream is definitely the least contaminated (Fig. 3), but there are a lot of organics getting into the other streams. Given the low amount of the PLA/compostables stream audited, the 81% figure may be misleading. Having checked a few of those bins around campus however, and finding most were contaminated, I would expect that a larger sample of this stream would yield results that were more in line with the recycling figures.

Figure 3: Uncontaminated organics

5. OVERALL RESULTS AND OBSERVATIONS

Across all areas and streams, by weight, food waste is one of the biggest challenges the UC faces with regards to waste minimisation, and not enough of it is getting into the organics bin, although that stream is the cleanest. Most of the food waste not going to the organics is going to the landfill bins, which at least is a better result than for it to contaminate the recycling. A breakdown of each separate stream audited follows, but this section considers the distribution of the waste when all the streams are combined.

5.1 Breakdown of Waste per Stream by Weight

Fig. 4 shows the combined weight per stream *after* waste was sorted into categories, and it highlights that as in the 2017 audit, by weight, there is more organics than any other stream.

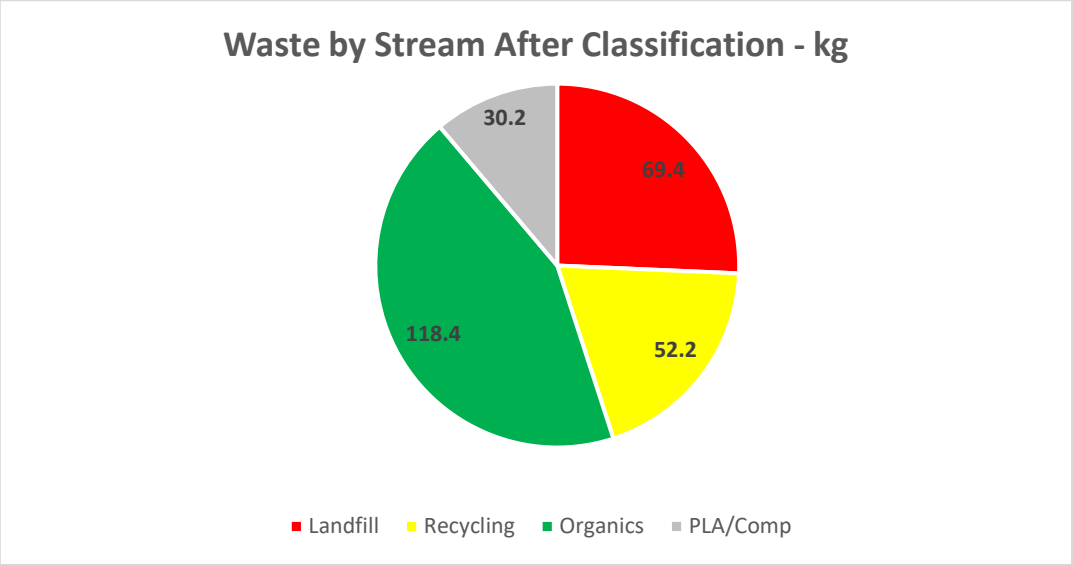

Figure 4 Waste per stream after classification – kg

That there is more of the comingled recycling that is clean enough going to the recycling bins rather than the other streams is positive. However, as in 2017, only half of the organics is getting to the right bin, and the new PLA/compostable stream is only attracting around 10% of the items that could go in it. Some of the organics can be accounted for by the café in the Meremere building sending all of their coffee grounds and food waste to landfill but these two streams require more attention and education about which bins they go in (see Figs. 5-7).

Figure 5 Organics and PLA/compostables in landfill from Meremere

Figure 6 Coffee grounds in landfill from Meremere

Figure 7 Contamination in comingled recycling

5.2 Breakdown of Waste per Stream by Percentage

Fig. 8 represents the above data as a percentage:

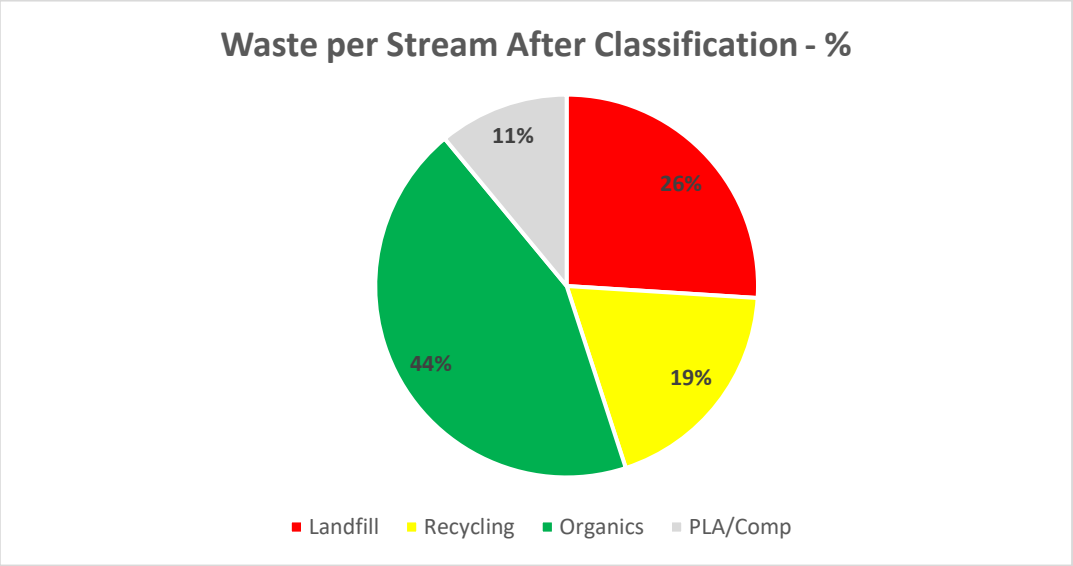

Figure 8 Waste per stream after classification by percentage

Thanks to the introduction of the PLA/compostables stream the landfillable items have reduced from 35% of all waste in 2017 to 26% in 2021, but because most of the PLA/compostables are still going to the landfill stream, this difference is not relevant other than showing the potential for diversion. By enabling better classification and education around what can go to the organics and PLA/compostables streams, along with diverting other items such as the napkins etc., the university could significantly reduce landfill and the associated fees.

6. COMINGLED RECYCLING

That the comingled recycling only makes up 52.2kg or 19% of the total weight audited across all streams can be somewhat attributed to the stream being bulkier but lighter than other types of waste. Lower recycling overall can also indicate that sustainability initiatives such as encouraging the use of reusable drink bottles are working.

However, the number of items that actually went to the comingled recycling bins is less than this figure suggests as shown in Table 3.

Table 3 Distribution of recyclable items across all streams by area

Waste Stream Kg	**Meremere**	**Undercroft**	**UCSA PK**	**Total**	**Total %**
Recycling in Recycling	6.7	22.0	2.9	31.6	60%
Recycling in Landfill	12.3	6.4	1.8	20.5	39%
Recycling in PLA/Compost	N/A	0	0.1	0.1	1%
Total All	**19**	**28.4**	**4.8**	**52.2**	**100%**

The items in the recycling bins that were clean enough to recycle were even lower than the 60% figure suggests. Nearly all of the milk bottles were not rinsed properly, if at all, and most of the paper and cardboard

was contaminated by liquids. Fortunately, the UC has a system in place where staff from Property Services remove most of the contamination from the recycling bags before collection so that there is less risk of the bins being rejected outright. However, it was noted whilst working in the waste yard, that not all of the sorters knew the recycling rules, especially around removing bottle tops, although that improved after it was pointed out. In addition, there did not seem to be enough time allocated to this role, as several days of recycling bags were often piled up during the time that we were working.

Bottle tops also continue to be one of the biggest contaminants in the recycling, along with lids from plastic containers (no longer recyclable). Although this is common across Canterbury, there needs to be clearer messaging about these rules at the UC.

6.1 Breakdown of Comingled Recycling by Stream

Of all the items found in the comingled recycling bags, only 69% of them were recyclable, and contamination was made up of items from all three other streams as shown in Fig. 9.

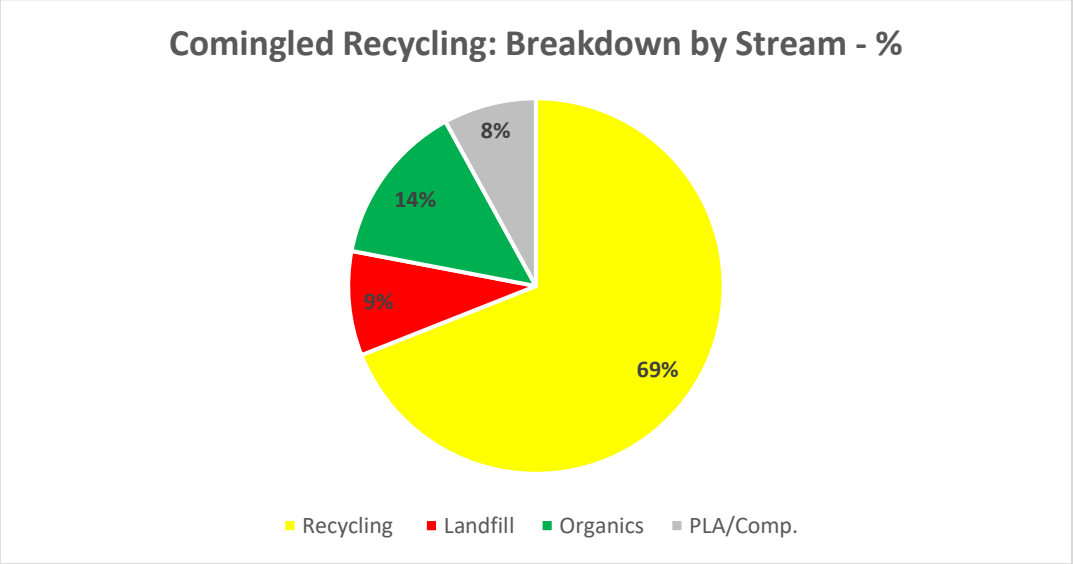

Figure 9 Comingled Recycling breakdown by stream – Percentage

Of the 31% contamination in the recycling, the amount of organic (14%) and PLA/compostables (8%) is of greatest concern as food especially is more likely to contaminate everything. There is some confusion about whether compostables can be recycled because they are cardboard (they cannot), so a greater focus on getting these items into the correct streams would benefit the recycling as well, especially because they are most likely to cause a comingled recycling bin to be rejected.

Figure 10 Unrinsed milk bottles with tops on

Figure 11 3l containers cut in half and cleaned – no longer recyclable

6.2 Breakdown of Recyclable Items by Type

Fig. 12 shows the weight of the recyclable items found in the comingled recycling bins by type.

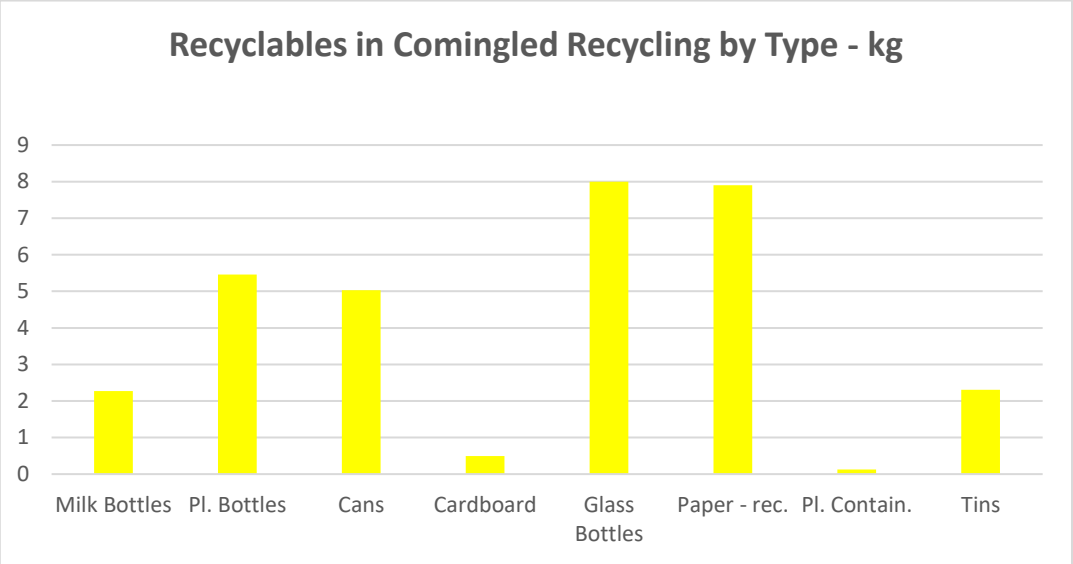

Figure 12 Breakdown of recyclable items in comingled recycling- kg

The following observations can be made:

- By volume, the most common items were cans, plastic bottles, and paper.
- Although they show the greatest weight, there were very few glass bottles collected.
- Whereas the 2017 audit showed that there were more plastic containers in the recycling, most of them were too dirty to recycle (Fig. 13). Hence, it is a positive trend that in 2021 there were more dirty plastic containers in landfill, suggesting that the region-wide messaging about recyclables being clean is cutting through for these items at least.
- Given that Eco Sort can only accept rigid containers that are numbers 1, 2 or 5 (and these must be clean and without lids), it makes sense to remove the plastic container option from the recycling stream altogether in order to simplify the messaging. By focussing on the cans, cardboard, bottles, paper, and tins, the comingled recycling would be more streamlined.
- Plastics continue to be problematic for the recycling industry as a whole and with the recent news that the government plan to ban many single use plastics, the more that the UC can do to phase them out the better (Figs 14, 15).

Figure 13 Unrinsed containers

Figure 14 Single use Nestle sprinkles

Figure 15 Single use packaging

6.3 Plastic Bottle Count

In 2021 we were asked to count plastic bottles as well as weigh them as there are options for replacing them with more sustainable alternatives, including cans and glass bottles. Table 4 indicates the number of bottles audited and what stream and area they originated from.

Table 4 Numbers of plastic bottles audited across areas and streams

Bottle Type No.	Meremere		Undercroft		UCSA PK		Total Per Stream		Total
Stream found in	**Rec**	**L-Fill**	**Rec**	**L-Fill**	**Rec**	**L-Fill**	**Rec**	**L-Fill**	**All Bottles**
Milk Bottles	44	8	0	0	0	0	**44**	**8**	**52**
Water/soda Bottles	35	19	125	22	14	3	**174**	**44**	**218**
Total	**79**	**27**	**125**	**22**	**14**	**3**	**218**	**52**	**270**

Given that recycling only made up 19% of all the waste audited, this is a high number of plastic bottles for a small sample, and it reinforces the value of banning them on campus, and having vendors switch to glass and cans, where there could also be incentives for returns. That the only milk bottles recorded came from the café in Meremere, indicates that the UCSA PK are having their empty milk bottles picked up by the supplier, a system that should be applied to all cafes on campus. In addition, every one of the milk bottles discarded by the café had not been rinsed properly, and most had lids on (see Fig .10).

6.4 Landfill Contamination in Comingled Recycling

Fig. 16 shows the breakdown of the 9% of landfill that contaminated the comingled recycling. Due to the very small weights for many of the items, for anything weighing less than 0.5kg I have categorised them into the following:

- Plastics: cutlery, packaging, cups, straws, single use
- Paper (non-recyclable): napkins, paper bags, receipts
- Other: chopsticks, coffee cups, drink cartons, tin foil, and misc.

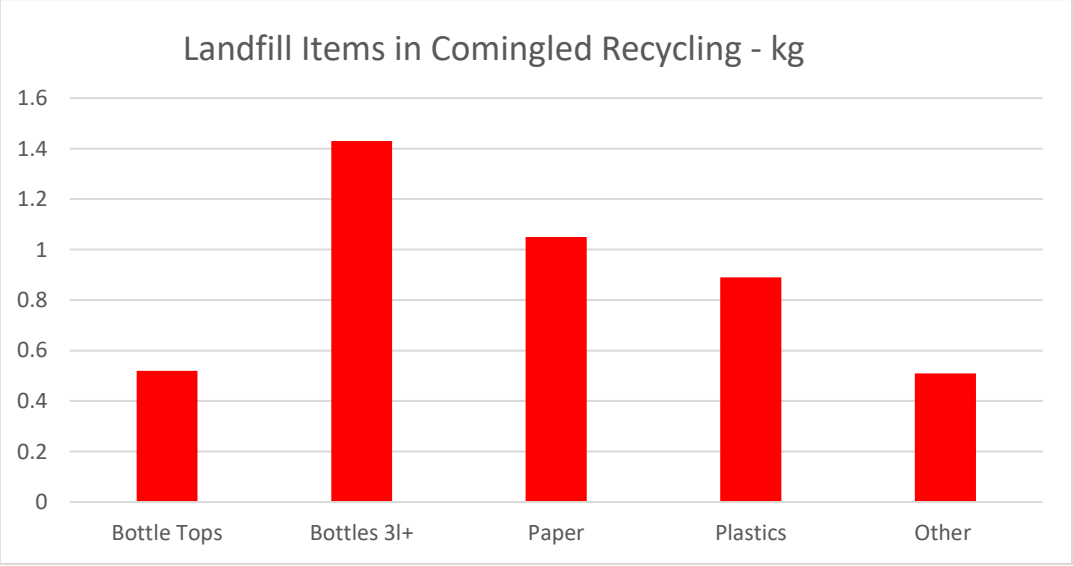

Figure 16 Breakdown of landfill items in comingled recycling - kg

The data indicates the following:

- Given how light bottle tops are, that they warrant a separate column indicates that although there has been an improvement on the 2017 figures, messaging that they need to be removed and put in the landfill is still required.
- It is only recently that Eco Sort have stopped accepting bottles over 3l, so this new rule has not been widely messaged to the public. It was great to see that the UCSA PK were making the effort to cut

them in half and clean them properly, (Fig.11), but on checking with Eco Sort they are still not able to be accepted due to the difficulty it presents to the optics machine that sorts the plastics.

- If a solution can be found to divert napkins/paper bags etc., and eliminate receipts, then paper contamination would be further reduced in the recycling.
- The plastics category includes items such as cutlery that may soon be banned (as per the recent announcement by the government) so it would be beneficial for the UC to phase them out before it becomes mandatory.

6.5 Organics Contamination in Comingled Recycling

At 14% of the weight of the comingled recycling, the food contamination was more than enough to warrant the rejection of bins. Even when the recycling is being sorted before disposal, removing food items takes up the most time, and is more likely to contaminate the clean recyclables it comes into contact with, causing the items to be sent to landfill.

Fig. 17 shows the types of organics contamination in the recycling by area.

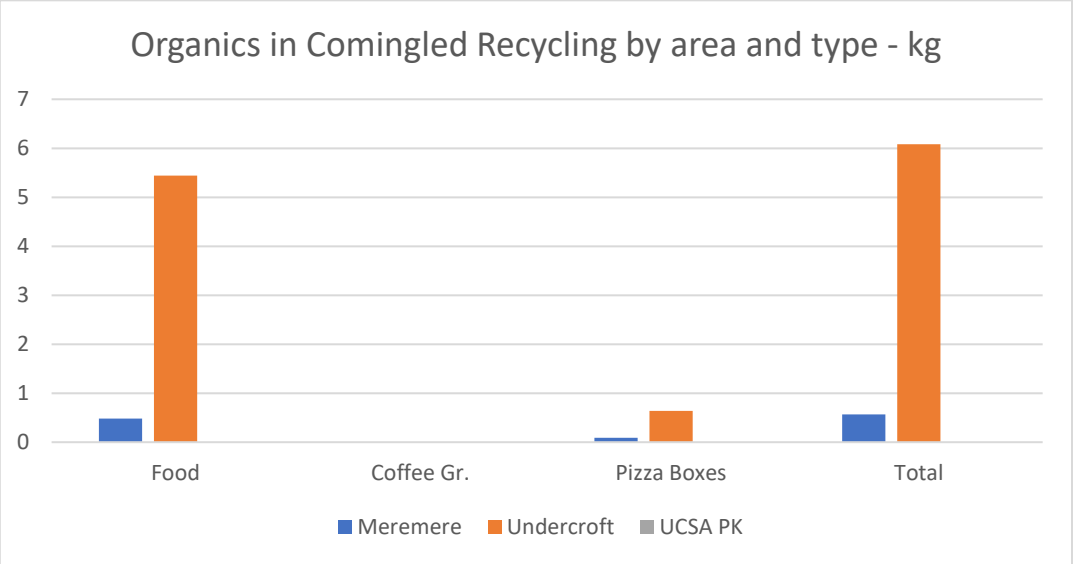

Figure 17 Organics in comingled recycling by area and type - kg

The data indicates the following:

- That most of the food contamination came from the Undercroft bins, which are used by those eating there.
- That the UCSA PK do not have an entry on the chart is because their recycling had zero organics contamination which is to be highly commended.
- It is also commendable that no coffee grounds made it into the recycling either, so even though the food content was high some progress has been made (Fig. 18).

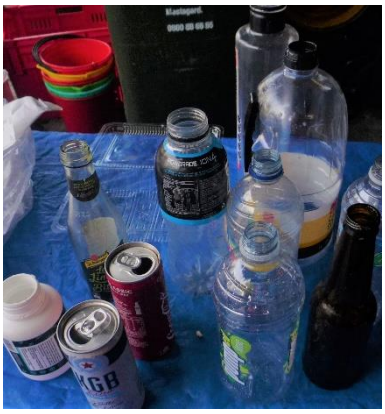

Figure 18- Clean recycling bottles and cans

6.6 PLA/Compostables Contamination in Comingled Recycling

As the newest stream there is the most confusion about what bin the PLA/compostables should go in as shown by 8% of the comingled recycling being made up of these items. Fig. 19 shows the types of PLA/compostables contamination in the recycling by area.

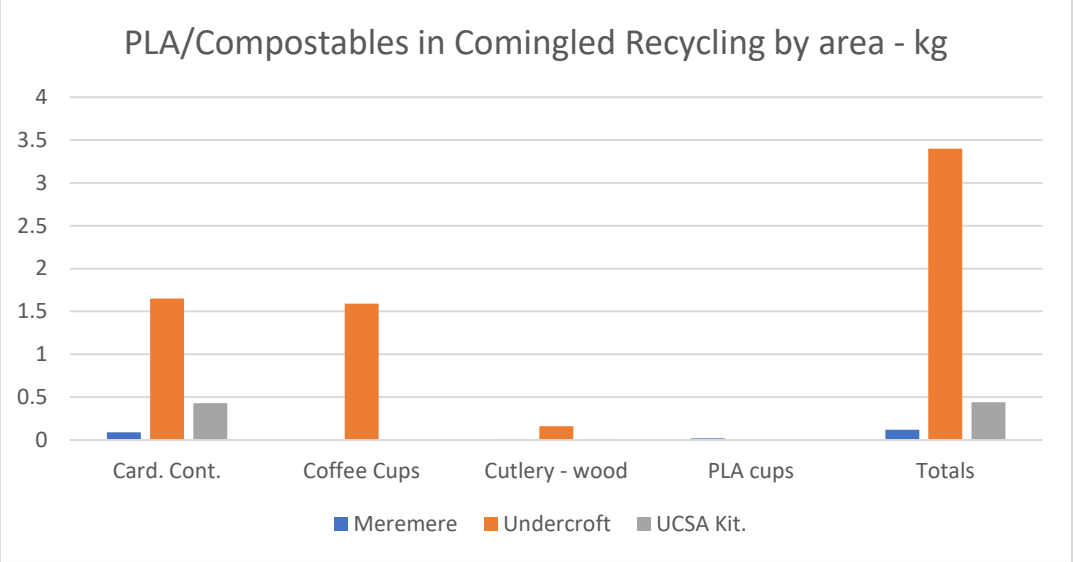

Figure 19 PLA/compostables in comingled recycling by area and type - kg

The data indicates the following:

- Once again, the UCSA PK have largely kept these items out of the comingled recycling.
- The biggest confusion occurred in the Undercroft, where the items were often binned as a parcel and due to there being cardboard some may assume they are recyclable.

7. LANDFILL

That across the UC the landfill stream is the one most used was backed up by the volumes being picked up. Waste fees are charged by volume and there are two 4.5m^3 frontload skips emptied daily (Monday to Friday), and an another 1.5m^3 frontload skip that has been brought in for the overload. In addition to all three being filled to the brim, the 7.5m^3 gantry skip which is meant to be for construction landfill only was also filled with black plastic bags on most of the days we were there (see Figs. 20, 21.). Rather than being included in the frontload skips emptied into one truck, a gantry requires a different truck to make two trips to the UC, to pick it up, and return it after emptying it. In the first instance, I recommend finding a front-loading solution so that the gantry does not have to be used for general landfill bags, as it is more financially and environmentally costly to have waste removed this way.

The waste audit suggests that over half of this waste could be diverted to another stream, indicating the significance of the problem and the associated costs, especially with the landfill levies set to rise to $60 per tonne by 2024.

Figure 20 Extra front load skip brought in for landfill

Figure 21 Black landfill bags in gantry skip for construction waste

The distribution of landfillable items across all the streams is shown in Fig. and it is a positive outcome with only 12% of all landfillable items becoming contamination in the other streams.

Table 5 Distribution of landfillable items across all streams and areas - kg.

Waste Stream kg	Meremere	Undercroft	UCSA PK	Total	Total %
Landfill in Landfill	35.6	21.4	4.0	61.0	88%
Landfill in Recycling	0.6	2.3	1.5	4.4	6%
Landfill in Organics	3.5	0.1	0.1	3.7	5%
Landfill in PLA/Compost	N/A	0.2	0.1	0.3	1%
Total All	**39.7**	**24.0**	**5.7**	**69.4**	**100%**

7.1 Breakdown of Landfill by Stream

However, what is of most concern is what is also going in the landfill bins, with the majority of the waste originating from those bins being made up of items that could be diverted. Although 58% of the total waste audited originated from the landfill bins, after classification the landfillable items found in all streams totalled only 26% (69.4kg) compared with organics at 44% (108.4kg).

Fig. 22 shows that the landfill bins are being used for all waste streams with only 39% of the landfill bags being made up of landfillable items.

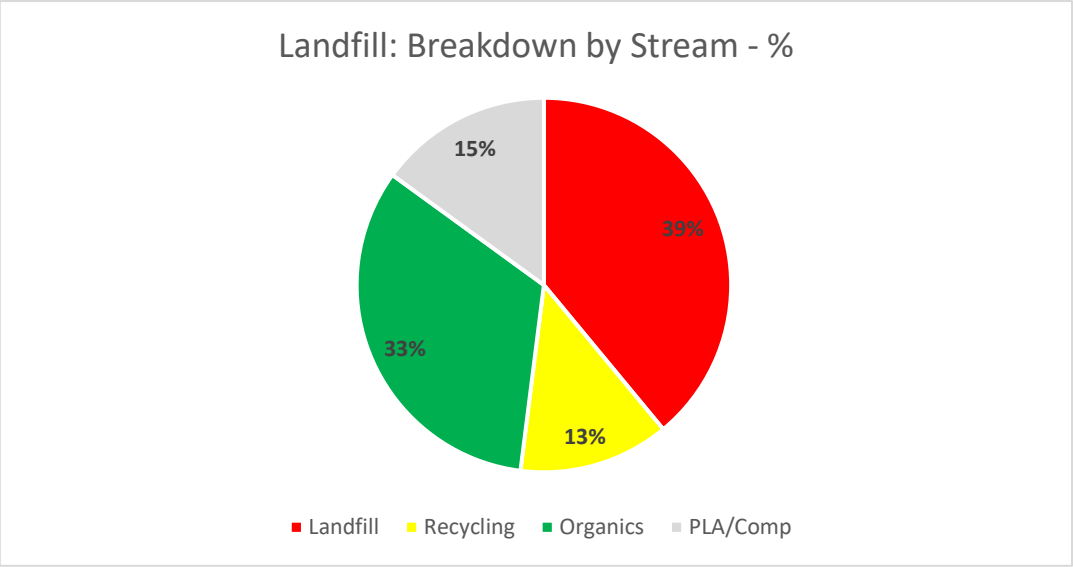

Figure 22 Landfill breakdown by stream – %

As noted previously, some of the 13% of the recyclables found were dirty, so this indicates that people are using the landfill when recycling is not an option. However, with 33% made up of organics and 15% made up of PLA/compostables these are the items that the UC need to focus on getting to the right stream in order to bring the volume, weight, and cost of landfill down.

7.2 Breakdown of Landfill Items by Type

Fig. 23 shows the breakdown of landfillable items in the landfill stream.

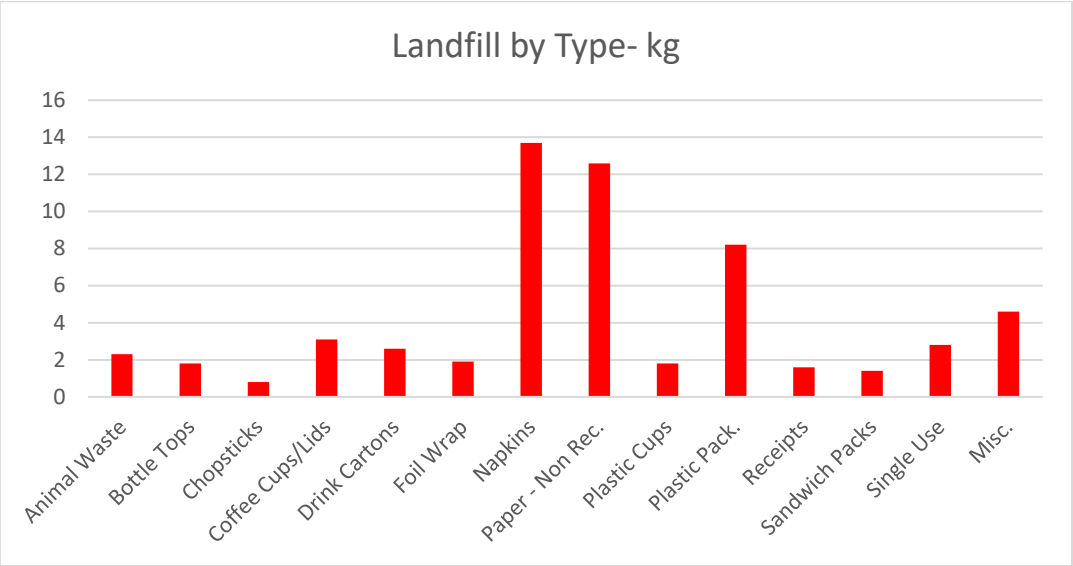

Figure 23 Breakdown of landfill items in landfill by type - kg

The following observations can be made:

- Due to their low weights some items have been included in the miscellaneous category, including: cloths, plastic cutlery, gloves and masks, polystyrene, straws, tin foil, wipes, and yoghurt containers (Fig. 24).
- One positive trend is that there were more bottle tops in the landfill (1.8 kg) than in the comingled recycling (0.5kg) in this audit compared to 2017 where there were more left on the recycling (1.5kg) than in landfill (1.2kg). However, work still needs to be done to get this message through, particularly with regards to milk bottles.
- The coffee cups/lids included here were only the non-compostable cups, many of which were brought in from outside of campus.
- The bulk of the landfill is made up of paper items (napkins, paper towels, and paper bags) that could potentially be diverted to the PLA/compostables stream and reduce the landfill by up to a third.
- Receipts are another high landfill item that could be eliminated by requiring all UC and UCSA businesses to provide receipts only on request.
- The single use items were mostly made up of tomato sauce, soy, mayo, butter, sugar, and other condiments (Fig. 25) that could potentially be eliminated from the waste stream through initiatives such as encouraging vendors to provide them at the counter in bottles/bowls etc. for customers to add to meals and drinks themselves.

Figure 24 Landfill sorted into categories

Figure 25 Single use plastic containers and lids - not recyclable

7.3 Comingled Recycling in Landfill

Recycling in the landfill made up 13% of the total weight of the landfill bags but, given the greater volume of these items, getting them to the comingled recycling stream will reduce landfill volumes and the associated costs. Fig. 26 shows the breakdown of the recycling items found in the landfill bags:

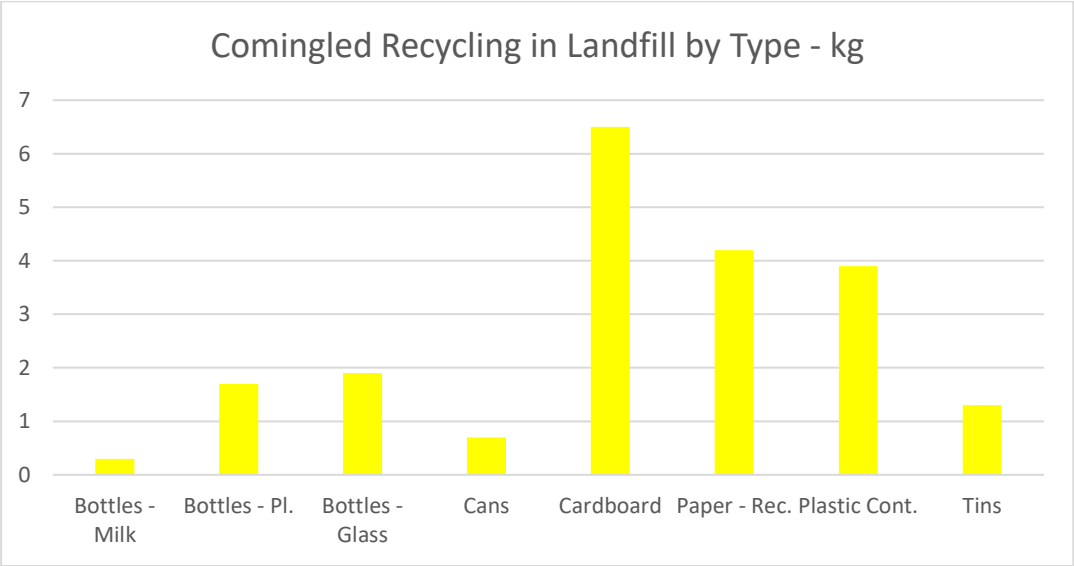

Figure 26 Breakdown of comingled recycling in landfill by type

The following observations can be made:

- As noted previously, the plastic containers that could potentially have been recycled were too dirty to go to the comingled recycling. That they have been put in the landfill bins is the best outcome.
- With 6.5kg of cardboard going to landfill, and only 0.49kg going to the comingled recycling, this is another stream that could be diverted. In 2017 there was only 2.2 kg of cardboard in the landfill, so the increase in 2021 is a worrying trend given the lower amount of waste audited overall. Some of this may be down to the removal of the grey paper bins from the general recycling stations.

7.4 Organics in Landfill

Organics accounts for 33% of the landfill stream, up from 31% in 2017. The following table shows the weight of organics collected by area.

Table 6 Organics in landfill by area - kg.

Waste Stream	Meremere	Undercroft	UCSA PK	Total
Organics in Landfill	30.4	20.0	1.2	51.6

The following observations can be made:

- The bags from Meremere account for the highest number of organics in the landfill, due to the café not separating food or coffee grounds into an organics bin.
- The UCSA PK only had 1.2kg of organics in the landfill stream (down from 43kg in 2017, and 127kg in 2014). This is a vast improvement that indicates the value of education and feedback.
- The organics items in the Undercroft landfill bins were mostly made up of leftover meals tucked inside the packaging, along with the cutlery and serviettes, showing that people make tidy packets of their waste, which they then bin as one item rather than sorting into the correct bins.

7.5 PLA/Compostables in Landfill

As the newest waste stream at the UC the PLA/compostables make up 15% of the landfill. Fig. shows the distribution of these items across the different areas.

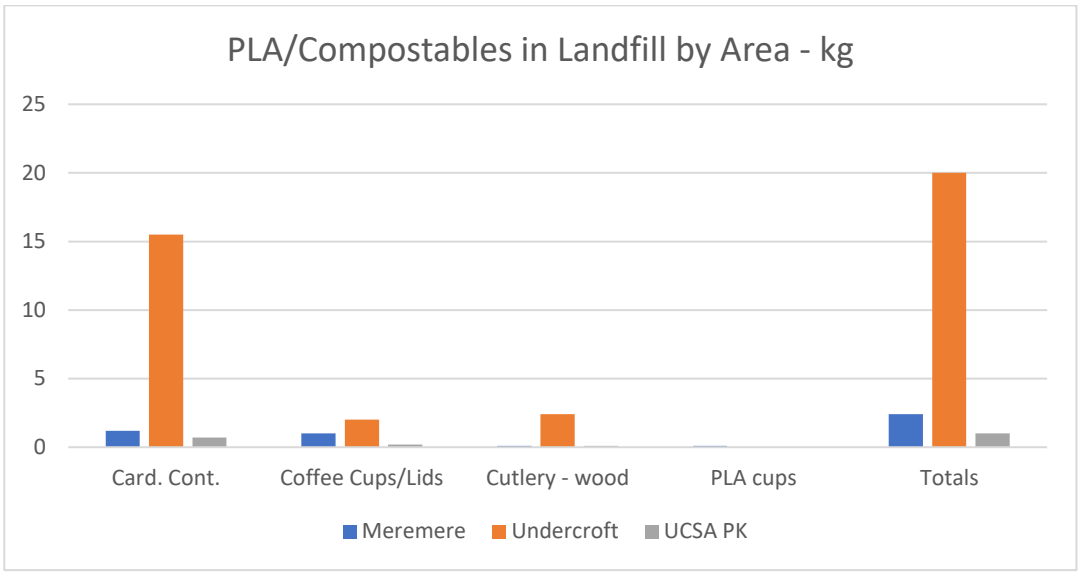

Figure 27 Breakdown of PLA compostables by area and type - found in all streams - kg

The following observations can be made:

- Because the food vendors in the Undercroft use these items almost exclusively it is to be expected that this area accounts for the highest number going to landfill.
- The blue PLA/compostables stream was originally set up to take PLA-lined coffee cups, which may account for why fewer cups were found in the landfill compared to food containers and wooden cutlery.
- Again, the UCSA PK was the most effective at keeping these items out of the landfill stream.

8. ORGANICS

Weighing in at 118kg across all streams the organics items accounted for 44% of all the waste audited. While some of this can be attributed to organics weighing more than other streams, this high level of food waste continues to be problematic, both in volume and which bin it is going to.

8.1 Breakdown of Organics by Stream

On a positive note, the organics steam was the least contaminated of all streams audited, with less than 2kg of landfill and PLA/compostables being found in total across all areas as shown in Fig. 28.

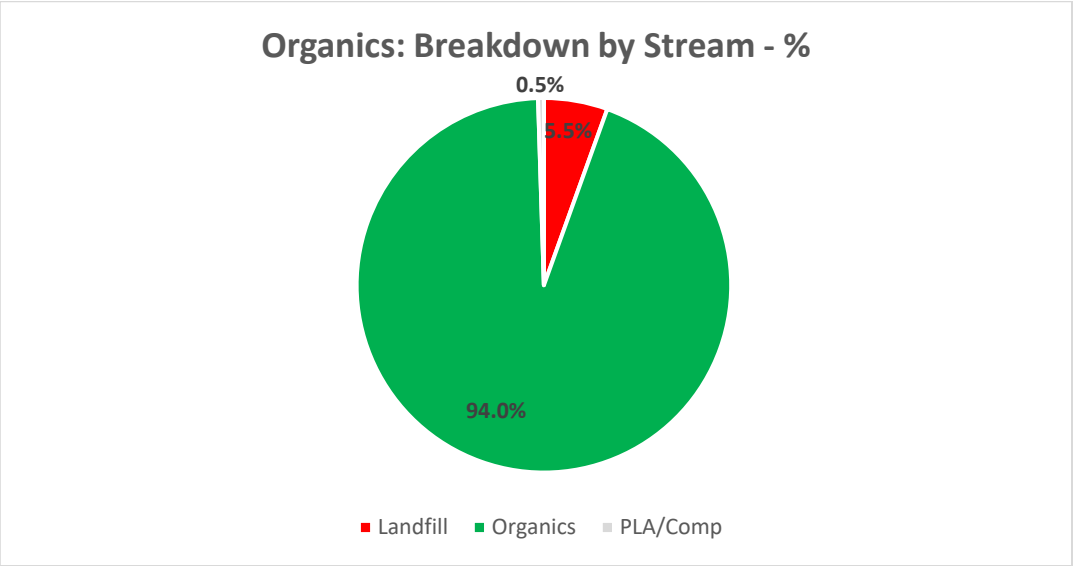

Figure 28: Breakdown of organics bins by stream

That there was no recycling and very little landfill and PLA/compostables is an excellent outcome. That the UC can achieve such success in one stream shows that it can be done for others.

8.2 Distribution of Organics across all Streams

However, only 50% of the eligible organic items are getting into the organics stream. Due to the difficulty and risk of auditing organics we did not sort it into categories, but the total weight distribution across all streams for each area is recorded below in Table 7.

Table 7 Distribution of organics items across all streams and areas - kg

Waste Stream kg	Meremere	Undercroft	UCSA PK	Total	Total %
Organics in Organics	29.8	9	20.9	59.7	50
Organics in Landfill	30.4	20	1.2	51.6	44
Organics in Recycling	0.5	6.1	0	6.6	5
Organics in PLA/Compost.	n/a	0	0.3	0.3	1
Total All	**60.7**	**35.1**	**22.4**	**118.2**	**100%**

The following observations can be made:

- Although organics makes up 44% of the total waste, only 50% of that is actually getting to the correct stream.
- The work done since the 2017 audit with the UCSA PK to reduce food waste overall and ensure it goes to the organics stream is to be commended and the above figures show the value of such an approach.
- That there were more than double the organics items found in the landfill bins in the Undercroft than in the organics bins, indicates that people are highly reluctant to separate their food waste.
- In the Meremere waste, the high number of organics items going to the landfill bins was mostly down to the café not separating their coffee grounds and food preparation waste.

- Despite the café waste not going to Meremere's organics stream, nearly 30kg is still quite high for that area. Some of this was the remains of a departmental function, with trays of uneaten items thrown out that could have been taken home or offered to students in the department.
- Meremere's organics bags were almost free of contamination, but unfortunately, all of the bags were plastic rather than the special compostable PLA bags that should line that stream (Fig. 29). This would have been due to the Property Services staff working in that area either not knowing that the PLA bags should be used or having run out and not replenished them. Because plastic bags in the organics bins will result in the bins being rejected, attention should be paid to cleaner training and supplies to ensure this is not a regular occurrence.

Figure 29 Organics from Meremere in plastic bags/

Fig. 30 shows the above totals for all areas as a percentage, indicating the extent of the problems with getting the food waste into the right stream.

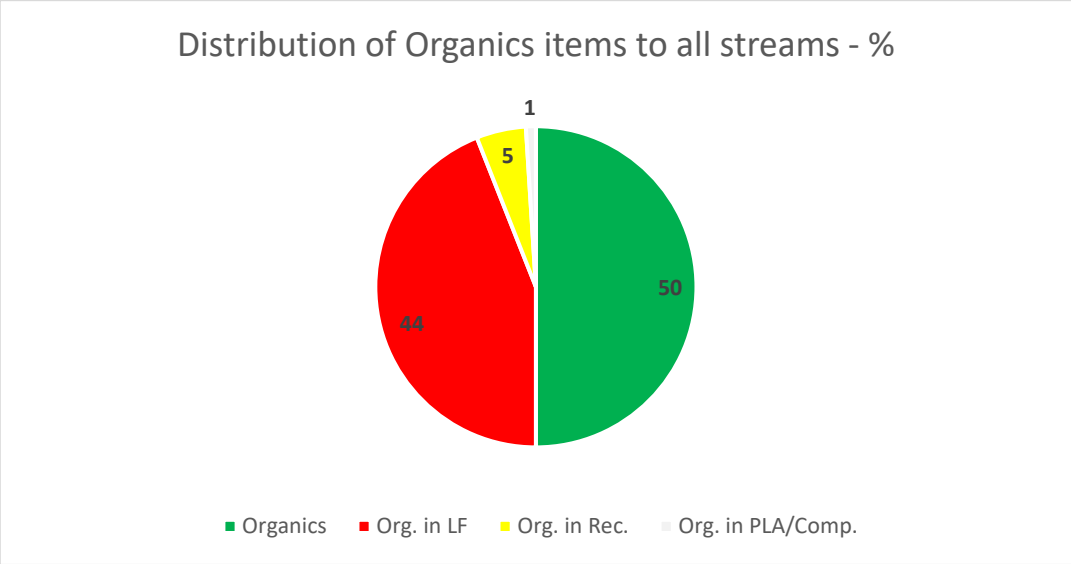

Figure 30 Distribution of organics items to all streams

8.3 Addressing Food Waste

There are a number of reasons for such high consumer food waste including the size of the portions, along with cultural habits around leaving food on your plate to indicate affluence. Given the environmental issues with food waste getting into landfill, and the high cost of transportation for the organics that does make it to Living Earth, there is a real imperative for the UC to reduce these figures through initiatives such as:

- Working with food vendors to ensure that portions are not too large.
- Requiring departments to have a diversion plan for leftover catering.
- More closely aligning with the Love Food Hate Waste programme in general.

9. PLA/Compostables

The switch to PLA/compostable foodware in the UCSA cafés was driven by students and the UC responded by installing bins with blue lids that have the most visible signage of any stream (Fig. 31). After the bags have been collected by Envirowaste, they are taken to their yard where the contents are sorted, shredded, and compacted, before being sent to a private commercial composter.

Figure 31 Back board signage for PLA/compostables stream

There were only two days' worth of PLA/compostables bags put aside for us to audit (one for the Undercroft and the other the UCSA PK), so the total audited for this stream amounted to 3kg, around 1% of the total waste audited. At first I thought that this stream had been left out of the daily collections, but on checking with the cleaning staff it seems that there were very few bags because the bins are not used enough to warrant emptying them every day. This was borne out by the low number of bags awaiting collection in the waste yard (see Fig. 32), which indicates that although the UCSA and students campaigned for these items to be separated (at a higher cost than landfill), the items are not actually getting put in the bins provided for them. Instead, the PLA/compostables stream is being disposed of in the landfill and recycling streams as shown by the table below.

Figure 32 PLA/compostables bags awaiting collection

Table 8 Distribution of PLA/compostables across streams and areas - kg

Waste Stream Kg	Meremere	Undercroft	UCSA PK	Total	Total %
PLA/Compost. in PLA/Compost.	n/a	2.1	0.9	3.0	10%
PLA/Compost. in Landfill	2.4	20.1	1.1	23.6	78%
PLA/Compost. in Recycling	0.1	3.4	0.1	3.6	12%
PLA/Compost. in Organics	n/a	n/a	0.1	0.1	0%
Total All	**2.5**	**25.6**	**2.2**	**30.3**	**100%**

The following observations can be made:

- Despite the visible signage for this stream in the Undercroft only 10% of the items made it to the right bin (Fig. 33)
- That the PLA/compostables are not getting into the organics bins (where the most confusion would normally occur) is a positive indication that people at least know they cannot go to that stream.
- The presence of the PLA/compostables in the recycling is of the greatest concern as they can cause bins to be rejected. While the sorting process should remove these items at the UC, the confusion is probably reaching to home recycling (where they may end up) and affecting the CCC's kerbside collection.
- In the Otto café the pizza slices were served on compostable plates (even though there is a kitchen so reusables could potentially be used) and they were filling the single rubbish bin that was out, with no options provided for diverting them (Fig. 34). All cafés should be fitted with compostable bins to ensure there is the option for them to be separated.

Figure 33 Compostable containers and paper bags in landfill

- That the majority of these items go to landfill is at least ensuring
- they do not contaminate the other streams but given the expense and the time Envirowaste, the UC Sustainability Office, and Property Services have put into collecting this stream on behalf of the UCSA, there needs to be better education, preferably as a joint venture by the UC and UCSA.

Figure 34 Unsorted compostables in Otto Café general bin

9.1 Breakdown of PLA/compostables by Type

The sample of PLA/compostables bags was too small to provide much data about the individual items found in that stream, but across all the streams the breakdown of PLA/compostables by item is shown in Fig. 35.

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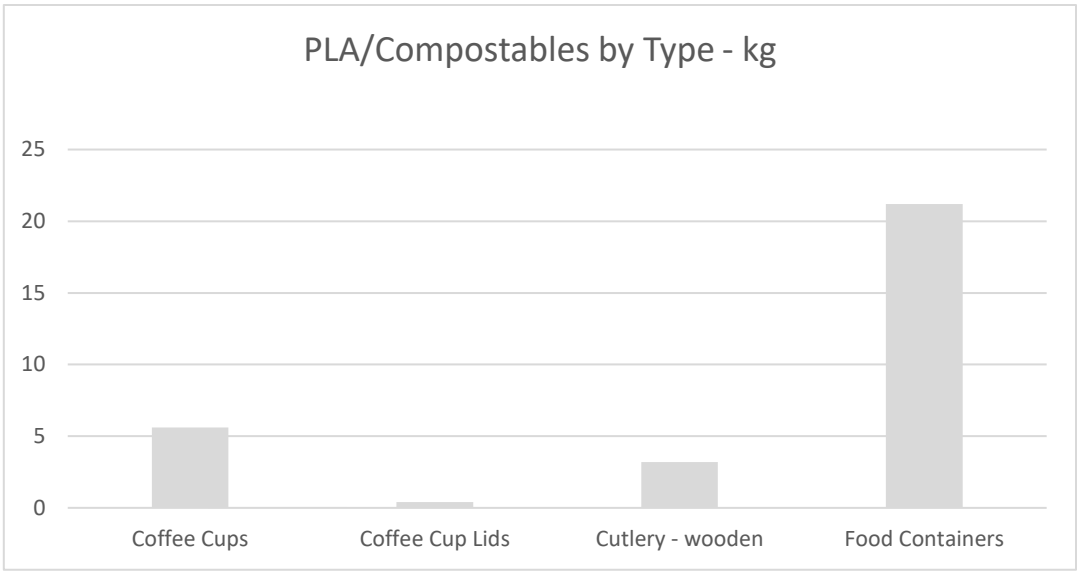

Figure 35 Total across all streams of PLA/compostables by type kg

That there are far fewer coffee cups than food containers is a positive sign that suggests that people may be using reusable cups. If this is the case, then it would be good to run a similar campaign about reusable cutlery and containers.

10. E-WASTE

We were asked to take note of any e-waste being disposed of through the general waste system, but the only item found during the audit was a remote control for a data projector (Fig 36). Although this was only a small sample of the UC's waste overall, this indicates that in general this stream is being separated and disposed of correctly.

Figure 36 Remote control found in landfill

11. RECOMMENDATIONS

The recycling/waste diversion system at the UC underwent a major upgrade in 2011, that included the purchase of bin lids in the standard recycling colours, and matching signage based on the 2010/11 waste

audit, some of which is still in use. However, a lot has changed in the recycling and composting industries since then. While Envirowaste, the UC Sustainability Office and Property Services have responded to some of these changes – including the removal of the paper stream from general recycling stations and the addition of a PLA/compostables stream – that diversion rates have not improved since the last waste audit suggests that another major upgrade would be beneficial, if not essential.

11.1 Recommendations for Improving the Recycling/Waste Diversion System

One of the biggest issues is that since the original stickers and posters were printed, there have been vast changes to the recycling industry as to what can be accepted. Of the 14 items shown in the recycling section of the original poster design (Fig. 37) only 5 can still be recycled (cans, plastic bottles, milk bottles, glass bottles, and tins) and they have to be *clean*. Even the most recent update of the recycling signage (Fig. 38) is now out of date, as supermarket bags are no longer recyclable. Despite the nationwide ban on that particular item, it risks sending the message that soft plastics can go to that bin. In addition, the PLA/compostables stream, while a great initiative, is not being used properly and those items are being found in all streams.

Figure 37 Detail from Poster design 2011 (Above)

Figure 38 More recent recycling signage that is now out of date (Right)

As such I make the following recommendations for the comingled recycling and the waste diversion system in general:

- Upgrade the signage for the 240l and 120l bin sets to match that used on the PLA/compostables stream. Add back boards for better visibility and clarity.
- Upgrade the signage for the indoor bins/poster to match current recycling standards and use the data in this audit to the inform the design.
- Remove the plastic containers from the recycling signage to remove the confusion about those items.
- Work with milk suppliers to take back empty milk bottles for all cafés on campus. Removing these items from the waste stream altogether will reduce volumes and contamination.
- There are already plans by the UC Sustainability Office to make videos featuring myself and Jacob Stapleton from Envirowaste to help explain the system and processes required. Distribute these on social media, and on the screens in lecture theatre foyers to teach people which bin these items go to.
- Regular training sessions with the Property Services staff who sort the recycling to ensure they are following current best practice diversion.
- Offer incentives to sustainability groups to stand in front of recycling stations and educate bin users during Orientation events and the first week of semester.
- Include regular recycling and other waste diversion tips in *Canta* and other UC print and online publications, including social media.
- Work with the current sustainability/environmental programmes and courses to include content based on the UC's waste outputs. This could include guest lectures or workshops by Dr. Matt Morris,

myself, and other practitioners in the field. Educating those students already interested in the subject will enable them to become better change agents across campus and beyond.

- Work with the other waste removal providers on campus (contracted for the UCSA and halls of residence) to try and streamline the individual systems and the messaging so that there are not conflicting systems adding to the confusion.

11.2 Recommendations for Improving the Diversion of PLA/Compostables and Organics Streams

As shown above the biggest problem with regards to these streams is getting the items into their respective bins in the first place. That they need to be separated into the two different streams will be adding to the confusion, but Envirowaste and ODW are currently working with a private professional composter who may be able to take both streams together and turn them into compost at a community site. This would reduce the cost of the two streams going to different places, and there is even the potential for it to be composted on campus if a suitable area could be found. Such a scheme would meet the requirements of a true closed circle solution and generate excellent PR that would hopefully encourage bin users to put these items into the right bins. The resulting product could then be used on the campus gardens, or packaged and sold to the UC community, ensuring full circle diversion, and helping to offset some of the costs of processing it.

If the two streams are able to be combined into one, there is the risk of that information being carried over into the CCC's kerbside collections, where the organics must remain free from PLA/compostable items. However, this could potentially be avoided by using different colours/terminology to the CCC's system (eg: blue/Compostables rather than green/Organics).

Regardless of whether the above stream merger can take place, I make the following recommendations to attain better diversion and processing of organics and PLA/compostables streams:

- Work with the UCSA and café owners to offer a range of organics bins to the kitchens, so that they can choose one that best suits their space and requirements.
- Ensure that all the cafés have adequate PLA/compostables bins for their customers so that there is at least an option for these items, rather than all the streams being collected in the same bin as at the Otto café.
- Ongoing staff training in all the cafés on campus to ensure the staff understand how to sort their kitchen waste. Talk to the UCSA PK to find out how they have succeeded in turning their waste diversion figures around and use this as a basis for education.
- Add napkins, paper bags, and paper towels to the PLA/compostables stream so that they can be diverted away from landfill. Because this stream is being sorted by Envirowaste there would be less risk of contamination than if they went to the organics stream, which is operating well in its current form.
- There are currently a lot of different individual items that can be categorised as PLA or compostable, and some of them (such as the cups) look very similar to non-compostable items. One solution is for the UCSA to purchase a range of foodware for the cafés (they could also sell it to non-UCSA businesses) that are printed with a design that indicates that they can be composted and which bin they go to. A similar scheme was used by the CCC for the first Composting Food Packaging at Events (CFPE) trial undertaken in 2017 (Figs. 39, 40). ODW provided sorting services for many of those events, and the branding sped up the sorting considerably, not least because bin users were putting them into the organics

Figure 39 Branding for CFPE trial 2017

Figure 40 Branding on items for easier identification

stream. Since then, the CFPE programme has approved more than 130 different items to be accepted for composting, none of which have the original branding or any other easily identifiable labelling. Bin users are more confused than they were with the branded items, so they go to all the streams, and the difficulty of identifying them has almost doubled our sorting times for events signed up to the programme.

11.3 Recommendations for Waste Minimisation/Prevention

With the volume of landfill bags currently being disposed of by the UC already greater than the number of skips provided for them, there is an urgent need to reduce the volume of all streams, but especially landfill. Some of this could be achieved through better diversion of the comingled recycling, organics, and PLA/compostables streams but there is also the opportunity for greater waste prevention overall.

These recommendations include:

- Continue working with Love Food Hate Waste NZ to reduce consumer food waste.
- Make it a requirement that departments have plans in place to divert leftover function food to attendees or others who can take it.
- Reinstall dishwashing facilities in cafés so that there are more reusable options.
- Ban plastic bottles on campus and replace with glass bottles or cans.
- Introduce reverse vending machines that take back bottles and cans for an incentive such as vouchers or phone/app top ups. This would also reduce the time required to sort the recycling.
- Ban plastic cutlery at all cafes and replace with wooden.
- Ban single-serve sauces and condiments across campus, and work with cafés to provide alternatives such as sauce bottles and sugar bowls on counters and tables.
- Work with departments to find more sustainable options for tea rooms such as removing individually wrapped tea bags and sugar sachets from purchases.
- Encourage the use of reusable cups, takeaway containers, and cutlery, by including them as giveaways during orientation etc.
- If they are not already doing so, make it a requirement for cafés to offer discounts to customers bringing reusable cups, takeaway containers, and cutlery.
- Assist people in using reusables by indicating on maps and other media where there are student hubs with kitchen sinks to rinse them. Consider implementing/opening up more of these spaces.

11.4 Long-term Solutions

ODW provides a practical approach to waste minimisation. We start with a client's bins and then ascertain what is required to reduce the waste across all streams, and at all levels. Our services include audits, customised signage, workshops, procurement advice, and ongoing education. Recently, ODW has adapted the hand-sorting model that we use at events to provide similar services for businesses, and one of our clients is saving more on waste fees than it costs to have our staff sorting waste on site. Whilst the UC Property Services staff are doing an admirable job of sorting the comingled recycling not all staff were fully trained in what can be diverted and there was limited time. In addition, as the above figures show, more onsite sorting, especially of landfill, would result in a serious reduction of landfill and the associated costs.

With regards to a possible combined organics/PLA/compostables stream ODW could assist the UC and Envirowaste with setting it up and making the necessary adjustments to the waste diversion system. Given

our reputation for providing clean recycling, organics, and composting streams, with ODW sorting it, the composter would be confident that the feedstock would be contamination-free.

In addition, we would consider hiring students from the UC for the roles and pay them Living Wage. For those studying in environmental fields such a position would also provide valuable hands-on knowledge to support their academic learning.

Were the UC or Envirowaste to contract ODW to provide such services the advantages would include:

- Having waste streams sorted by dedicated staff, fully trained in H&S and current best practice, who will ensure that maximum diversion takes place.
- The option of rinsing unclean items to increase recycling diversion.
- Identifying reusable streams in the waste and finding organisations to take them.
- The opportunity to get daily weight data for all streams, and monthly reports informed by close observation of the waste from all areas.
- Glass could be sorted into colour streams so that it can be recycled back into glass, rather than ground up for roads etc.
- Staff would also be required to keep the waste area clean and tidy, and litter free, and report or act on any hazards.
- Staff could advise Envirowaste when pickups are required to reduce unnecessary trips.
- Staff could also be contracted to pick up litter from across campus and provide data.
- The opportunity to use such sorting practices for educational purposes, such as videos, class visits, regular Canta reports etc.
- ODW uses reusable leather gloves for the safety value, but because they can also withstand repeated washing and they are composted at end of life. Our Hi-Vis aprons are made from materials sourced second-hand, so even our PPE is as sustainable as possible and would not be included in the UC's waste stream.

Aside from the saving in waste costs, the greatest value of such a service is that staff would provide ongoing information about the waste diversion system that could then inform the 'top' approach to waste minimisation at the UC – the education, procurement advice, and a signage upgrade. We would envisage that as the education resulted in better classification at source by the bin users, that the time taken for our staff to sort the waste would gradually reduce, with the ultimate goal of our sorters no longer being required.

12. CONCLUSION

The dedication the UC has put into maintaining the waste diversion system is to be commended, and it remains one of the few public recycling systems to operate effectively in Canterbury. However, as the decade since the last major overhaul has shown, keeping up to date with current requirements such as the phasing out of plastic recycling, and the introduction of the PLA/compostables stream (items which have yet to be integrated into the CCC's kerbside recovery programme) requires a significant investment in dedication and resources so it is essential that they work.

With landfill levies and transport costs set to rise considerably over the next few years, the UC needs to maintain this level of attention to ensure that at least some of the items that can be diverted away from landfill go to the right stream. As this audit shows however, the diversion of landfill has decreased since the last one in 2017 so the current level of maintenance is not enough to reduce the UC's waste output. Hence, both the disposal fees, and the carbon footprint associated with increased landfill, are set to grow. In order to see a positive difference in the next decade, along with long-term financial savings, I strongly advise the

UC to address at least some of the recommendations made above, if not all, so that the university will continue to be a leader in waste minimisation and prevention.

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