UBC OKANAGAN

Waste audit report: November 8, 2016
Waste audit date: October 5, 2016

Prepared For: Facilities Management and UBC Okanagan Sustainability Office

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EXECUTIVE SUMMARY

On October 5th, 2016, UBC Okanagan and GreenStep Solutions Inc. partnered to facilitate a waste audit. Three different waste streams (garbage, recycling, and compost) were assessed from 13 different buildings/areas on campus. The 2016 waste audit was the fourth audit that GreenStep has facilitated with UBCO since 2010 and the garbage audit remains the primary focus of the overall audit.

The audit was set up at UBC Okanagan's courtyard at 8:00 am and was facilitated by Andrea Mackintosh and Angela Nagy from GreenStep Solutions and Derek Mahoney from UBC Okanagan.

Tarps were set out in the courtyard with strings designating rows for collected waste to be placed for the audit. Bags of garbage and recycling were placed on the tarps in front of the appropriate signs, which identified the building from which the bags came. The GreenStep team, members from UBC Okanagan staff, and student volunteers dressed in protective clothing and sorted the garbage for six hours.

A total of 3,609 litres of garbage, 3,303 litres of recycling, and 27 litres of compost was audited, totaling 6,939 litres of waste audited.

The garbage audit findings demonstrated that only 22% of the total volume of waste was 'true' garbage, meaning that 78% of the waste had the potential of being diverted from the landfill. The findings of the recycling audit deemed 62% of the contents to be 'true' recycling, with 38% contamination in the recycling stream. The compost audit found 98% of the total volume to 'true' compostable waste, with 2% contamination in this waste stream.

Figure 1. Garbage audit - Percent of total volume of waste by type

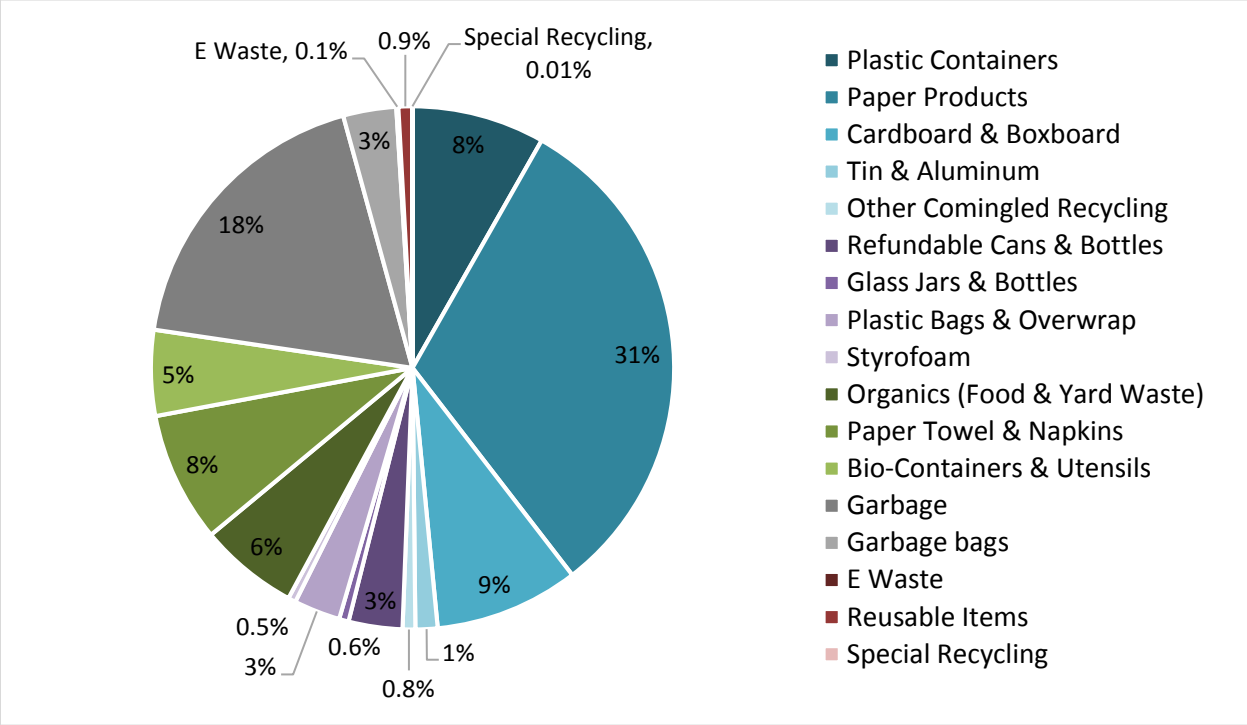


Figure 2. Recycling audit - Percent of total volume of waste by type

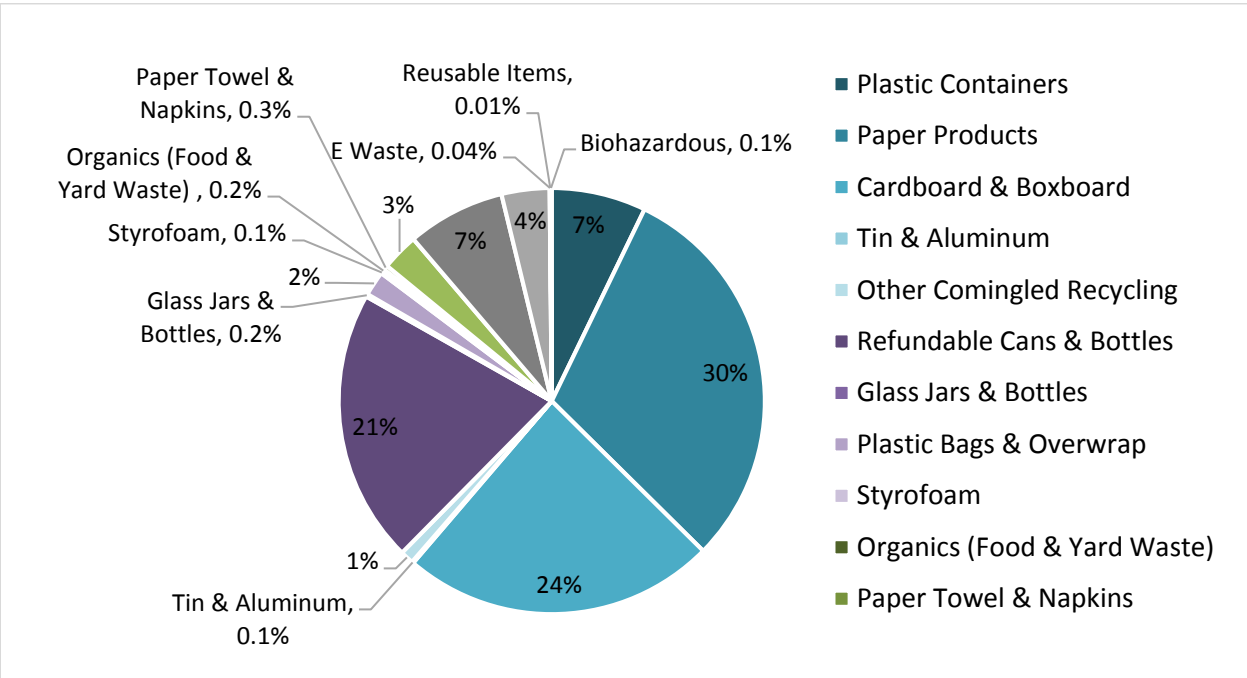
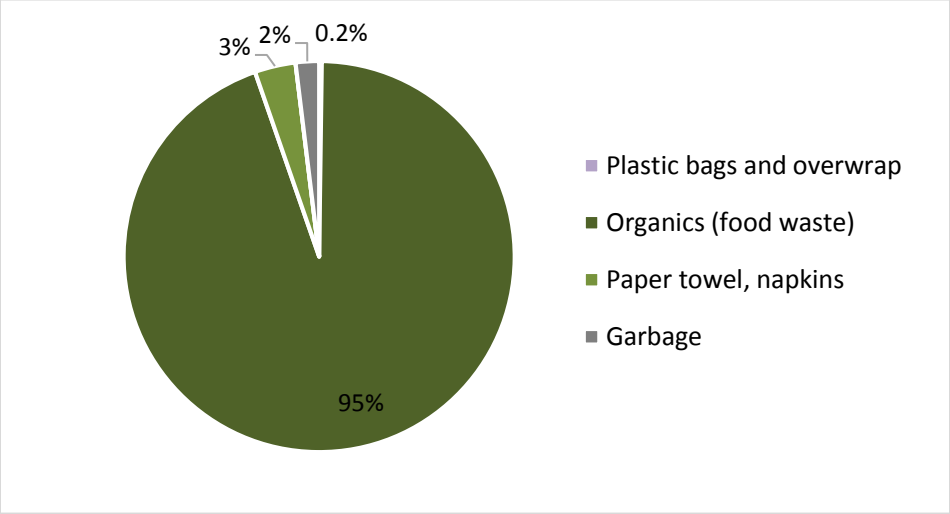


Figure 3. Compost audit - Percent of total volume of waste by type



Key Recommendations include:

COMPOST

- Consider a new or expanded composting system on campus. This could mean replacing the Earth Tub composting system or introducing an additional system on campus to handle more types of organic wastes that are being produced, including paper and disposable coffee cups, paper towel and napkins, and bio-containers and utensils. In addition to the food waste that is produced on campus (6% of total waste, excluding cafeteria kitchens), There is an opportunity to compost an additional 45% or more of the total waste if another system or pick-up service was used. This would contribute to a reduction on UBCO's carbon footprint.

EDUCATION AND COMMUNICATION

- Make education on waste reduction practices a priority on campus. While the student population constantly changes and UBCO welcomes new students from all over the world, good communication and education regarding waste practices is crucial and must be ongoing.

- Upgrade/refresh to the current detailed signage displayed in building lobbies with trio stations plus compost bins.

RESIDENCES

- A full-scale residence waste audit is recommended for 2017 or 2018. The residence audit could take place on alternating years as the UBCO campus audit, or if it occurs in the same year, it should be held on a different day. A residence sample was audited in 2014 and 2016, but a separate audit is recommended to really understand what issues are cropping up in residence and set a proper baseline for future improvements.

INTRODUCTION

In early August 2016, Andrea Mackintosh from GreenStep Solutions met with staff at UBCO including Derek Mahoney (Manager, Landscape and Contract Services), Guy Guttman (Manager, Building Operations & Services), and Roger Bizzoto (Associate Director, Facilities Management) to plan and coordinate the 5th biennial UBCO waste audit to take place in early October 2016. A date of October 5th, 2016 was set to audit one day's worth of waste from 13 different buildings/areas on campus:

- Administration
- Arts
- Arts & Sciences Centre (ASC)
- Creative & Critical Studies (CCS)
- Engineering, Management & Education (EME)
- Fipke Centre
- Gymnasium
- Library
- Outdoor
- Reichwald Health Sciences Centre (RHSC)
- Residences (*Sample)
- Science
- University Centre (UNC)

On the day of the audit, approximately 17 volunteers participated throughout the course of the day, including several UBCO staff. Volunteer recruitment was generated by Derek Mahoney. The cafeteria provided refreshments for volunteers.

Andrea Mackintosh and Angela Nagy facilitated the event by helping to set up, greeting the volunteers, facilitating a safety orientation, explaining the waste audit categories and procedure, answering questions throughout the audit process, collecting the data, and helping to clean up after the audit was finished.

The objectives of the waste audit were to:

- Record the type, volume, and composition of waste generated at UBC Okanagan and break it down by source
- Identify opportunities to improve current waste systems on campus
- Identify buildings to target with additional education
- Raise awareness about waste reduction on campus
- Identify opportunities for improvements and find ways to get students involved

UBC OKANAGAN WASTE REDUCTION PRACTICES

UBC Okanagan has implemented several waste reduction practices over the years, some from the recommendations of the three waste audits conducted by GreenStep in the past. Most recently, UBC Okanagan has completed the following initiatives:

Reduce and Reuse:

- Created and installed recycling messaging specific for coffee cups.
- Provide students with reusable water bottles at the beginning of each year (via Student Union).
- Provide first year students living in residences with reusable food containers that when used in the cafeteria provide them with a $0.50 discount on their meal.
    - In conversation to roll this out further to staff and faculty if they bring their own plates.
- Installed educational inserts in paper towel dispensers promoting reduced use of paper towels.

Recycling:

- Detailed signage (circa 2011) is displayed in building lobbies with trio stations plus compost bins.
- Trio stations added to the library and more signage added to library.
- Most exterior waste stations have recycling option.
- Inside buildings, all stations have waste and recycling, plus refundables (in common space locations). Exterior bins do not have refundable option.

Composting:

- Maintained compost program on campus utilizing Earth Tub system, taking food waste from cafeteria kitchens and compost bins through campus, along with plant material and wood chips from landscaping activities on campus.
- Updated signage information to compost bins in lobbies and kitchens in 2015.
- Composting facilities now available in Purcell Residence Building.

E-waste:

- Improved battery/cell phone containers purchased to replace cardboard shipping boxes in academic building lobbies.
- Large e-waste can be picked up by contacting Facilities or is sorted out by Pathways staff if found in recycling.

Education and Communication:

- Recyclepedia complete and on UBC Sustainability website: http://sustain.ok.ubc.ca/initiatives/powerofyou/resources/Recycle_your_coffee_cup/Recyclepedia.html
- Interior signage reviewed to ensure all stations have signage.

- Big Belly Solar Compactor promotional video filmed. https://www.youtube.com/watch?v=zCXM55uGIN4

Residence:

- New trio waste stations purchased.
- Composting in lobbies available

Additionally, UBCO's new waste provider, Super Save, is providing accurate weights for bins collected. Prior to this Progressive (BFI) only gave a count of bins collected and an average weight.

METHODOLOGY

Just as it has been done in past years, quantities of waste were estimated using volume rather than weight for two reasons: 1) Waste is picked up and disposed of based on how full the bins are, not by weight. 2) Items like paper, plastic film, and Styrofoam weigh significantly less than other items such as food waste.

One day's worth of garbage and recycling was collected from all areas of all buildings on campus (excluding bathrooms), with the exception of the outdoor courtyard area. A sample was taken from this area from one waste and one recycle compacting big belly located near the Tim Horton's in the courtyard. These bins had been last emptied on Sunday morning (Oct 2), creating a sample of 2.5 days. The compost collected from around the campus was a 2-day sample and did not include the cafeteria kitchen compost.

It is important to note that some sorting practice differences emerge between volunteer groups during the sorting process. For example, some volunteers sorted soiled items such as paper or disposable coffee cups into the garbage while other sorted them into the compost. The sorting process is never perfect. However, the auditing process is consistent and reduces the majority of sorting discrepancies.

Clear bags used for sorting during the audit were supplied by both GreenStep and UBCO. This year GreenStep used a new volume estimation method, which means that results may not be directly comparable to previous years, but provides increased accuracy and will be the method used going forward. Rather than using the volume of the large clear bag to estimate the waste volume in each bag, the sorted bags of waste were placed in one of three smaller bins of known volume in order to make the estimation. The three bins used were a 60.6 L blue recycling bin, a 18.9 L bucket, and a 11.4 L pail (see images below).

After the audit was complete, the sorted bags were put into piles corresponding to the type of waste so all waste could be appropriately diverted, ie. recycled, composted, returned for refund, or sent to the landfill.

Volunteers wore protective coveralls, shoe covers, and nitrile gloves. The use of safety glasses was optional.

All waste was physically sorted into the following five categories with 18 sub-categories:

- Recycling
    - Plastic containers
    - Paper products
    - Cardboard & boxboard
    - Tin & aluminum
    - Other comingled recycling
- Returnable
    - Refundable cans & bottles
    - Glass jars & bottles
    - Plastic bags & overwrap
    - Styrofoam
- Compost
    - Organics (food & yard waste)
    - Paper towel & napkins
    - Bio-containers &utensils
- Garbage
    - Garbage
    - Garbage bags
- Other
    - E-waste
    - Reusable items
    - Special recycling
    - Biohazardous

It is important to note that some of these categories have changed slightly since the 2014 audit. These changes include:

- Plastic film is no longer accepted with other recycling items in the blue bin, it is now only acceptable at the local return-it depots. It was moved from “recycling” to “returnable”.
- Disposable cups were included in the “paper” sub-category, under “recycling” but were not counted separately from other paper products.
- More items were added to the “recycling” category and have been captured under the “other comingled recycling” sub-category. This includes: Waxed dairy cartons, aseptic boxes or cartons, frozen food packaging, empty aerosol containers, spiral wound cans, and more. Because of this change, waxed dairy cartons were removed from the “returnable” category.
- Garbage bags were sorted separately in order to see what was inside the garbage bags more clearly, making the auditing process easier.
- Styrofoam was removed from the “other” category and placed in the “returnable” category because is now accepted at local return-it depots.

GARBAGE AUDIT

Each bag of garbage was physically sorted into the five main categories by volunteers, then visually sorted into the sub-categories by GreenStep. A few bags from the admin building were accidentally included in the science building, and the one bag of garbage collected from the Purcell residence building was accidentally included in the library pile by volunteer sorters. The gym had very little garbage and therefore it was not collected or audited.

After the audit was complete, the following data was recorded: waste origin (building), volume of waste (using one of three sorting bins and how full the bin was, by percent), and the percentage of each sub-category of waste within the five main categories.

Waste composition results for the UNC building were unfortunately not collected. In 2014 the UNC accounted for 7% of the overall waste, so a volume estimate of 258 L was used to achieve the same percentage in 2016.

RECYCLING AUDIT

The recycling audit was completed for the second time this year, a newer component to the traditional waste audits that took place in 2012, 2010, and 2008. Following a similar fashion, one day's worth of recycling was placed on the tarps separated by building origin. This year we were able to follow the same procedure for the recycling audit as the garbage audit: the physical sort into five categories followed by the visual sort into the sub-categories.

COMPOST AUDIT

An audit of the existing compost system was also conducted in tandem with the garbage and recycling audit once again this year. The audit was completed on a two-day sample of compost originating from inside all buildings for staff and students; this excluded compost produced by cafeteria kitchens. It was estimated that the audited compost accounted for about 10% of the total compost produced on campus.

The bags of compost were placed on a separate tarp adjacent to the garbage and recycling audit. The bags were sorted using the same categories as the garbage and recycling audit. This audit was conducted to understand the type of organic waste and what percentage of contamination has entered in to the compost system.

RESULTS

Results of the waste audit are presented below and broken down into the three audits: garbage, recycling, and compost. A section at the end summarizes the results of the garbage and recycling audits combined.

GARBAGE AUDIT

The results indicate that of the 3,609 L of garbage audited, 51% was recycling, 7% was returnable, 19% was compostable, 22% was garbage, and 1% was e-waste, reusable items, and special recycling. Specific details and breakdown on the volumes of waste can be found in the tables and figures below.

Table 1 shows the complete breakdown of the garbage audit, including the volume of waste from each building and in each waste category, the percentages of each category, and totals in litres and percent. *Note: semi-total rows occur within the table in darker colours

Table 1. Garbage Audit - Volume of waste (in litres and %) measured by type of waste for each building/area on campus (UBCO Waste Audit, October 5, 2016)

Type of Waste	Origin of Waste																					
	Admin		Arts		Arts & Sciences		CCS		EME		Fipke		RHSC		Library		Outdoor		Science		UNC		Total	
	%	L	%	L	%	L	%	L	%	L	%	L	%	L	%	L	%	L	%	L	%	L	%	L
Plastic Containers	3%	2	5%	0	6%	49	9%	5	8%	38	11%	12	8%	7	9%	83	9%	18	10%	61	n/a	n/a	8%	275
Paper Products	52%	39	29%	2	21%	169	39%	21	36%	180	33%	38	40%	34	33%	295	25%	54	37%	219	n/a	n/a	31%	1,050
Cardboard & Boxboard	6%	5	2%	0	6%	52	6%	3	12%	58	5%	6	5%	5	13%	118	6%	14	7%	39	n/a	n/a	9%	299
Tin & Aluminum	0%	0	0%	0	1%	12	0%	0	1%	4	3%	3	0%	0	2%	22	0%	0	1%	5	n/a	n/a	1.4%	46
Other Comingled Recycling	3%	2	0%	0	1%	8	0%	0	1%	4	0%	0	0%	0	1%	10	0%	0	0%	2	n/a	n/a	0.8%	26
Total Recyclables	64%	48	36%	2	36%	289	53%	28	57%	283	52%	59	53%	45	58%	529	41%	85	54%	326	n/a	n/a	51%	1,696
Refundable Cans & Bottles	3%	2	0%	0	6%	52	1%	1	0%	0	0%	0	0%	0	4%	36	2%	5	3%	15	n/a	n/a	3%	111
Glass Jars & Bottles	0%	0	0%	0	2%	19	0%	0	0%	0	1%	1	0%	0	0%	0	0%	0	0%	0	n/a	n/a	1%	20
Plastic Bags & Overwrap	1%	1	0%	0	6%	50	1%	1	0%	1	0%	0	1%	1	3%	24	1%	2	3%	16	n/a	n/a	3%	96
Styrofoam	0%	0	0%	0	1%	5	0%	0	0%	0	0%	0	0%	0	0%	3	3%	7	0%	2	n/a	n/a	0%	16
Total Returnables	4%	3	0%	0	16%	126	2%	1	0%	1	1%	1	1%	1	7%	64	6%	14	5%	33	n/a	n/a	7%	243
Organics (Food & Yard Waste)	0%	0	18%	1	5%	36	4%	2	5%	24	14%	16	6%	5	5%	46	13%	27	8%	47	n/a	n/a	6%	205
Paper Towel & Napkins	7%	5	0%	0	8%	61	9%	5	14%	69	6%	7	14%	12	10%	91	0%	1	3%	20	n/a	n/a	8%	270
Bio-Containers & Utensils	6%	4	18%	1	6%	45	3%	2	7%	34	11%	13	8%	7	2%	14	13%	27	5%	29	n/a	n/a	5%	177
Total Compostables	13%	10	36%	2	18%	142	16%	8	26%	127	32%	36	28%	24	17%	151	26%	55	16%	95	n/a	n/a	19%	653
Garbage	14%	11	9%	1	30%	240	22%	12	17%	83	13%	14	9%	8	11%	101	24%	50	16%	97	n/a	n/a	18%	616
Garbage bags	5%	3	18%	1	0%	0	6%	3	0%	0	3%	3	9%	8	7%	61	0%	0	5%	30	n/a	n/a	3%	110
Total Garbage	19%	14	27%	2	30%	240	29%	15	17%	83	16%	18	18%	15	18%	162	24%	50	21%	127	n/a	n/a	22%	726
E Waste	0%	0	0%	0	0%	4	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	n/a	n/a	0%	4
Reusable Items	0%	0	0%	0	1%	5	0%	0	0%	0	0%	0	0%	0	0%	0	3%	6	3%	17	n/a	n/a	1%	29
Special Recycling	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	n/a	n/a	0%	0.3
Total Other	0%	0	0%	0	1%	9	0%	0	0%	0	0%	0	0%	0	0%	1	3%	6	3%	17	n/a	n/a	1%	33
Total Waste Volume	2%	75	0%	6	22%	807	1%	53	14%	494	3%	115	2%	86	25%	906	6%	211	17%	598	7%	258	100%	3609

The percentage of waste identified within each category is represented in Figure 1. Note that sub-categories within each of the five main waste categories (recycling, returnable, compost, garbage, and other) are shown in different shades of the same colours (ie. all recycling items are in different shades of blue)

Figure 1. Garbage audit - Percent of total volume of waste by type for all buildings/areas on campus (UBCO waste audit, October 5, 2016)

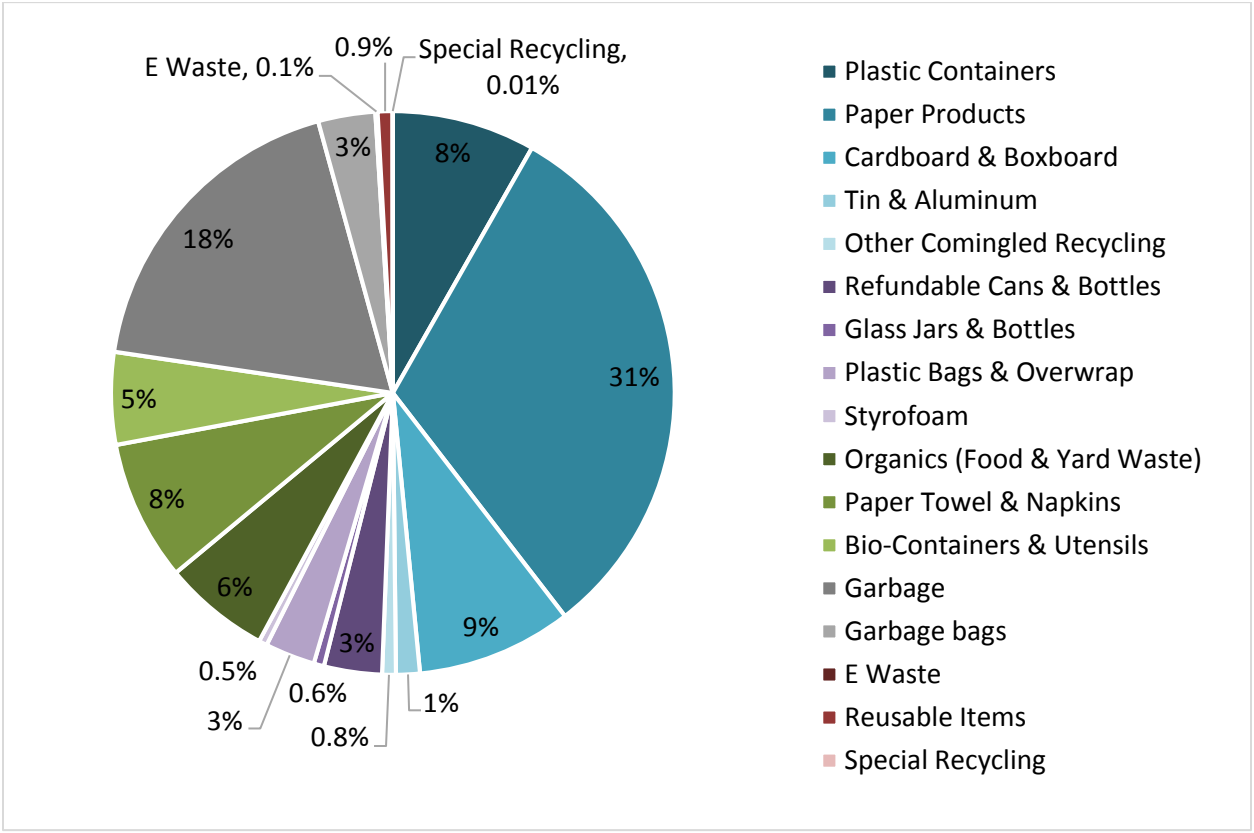


Figure 2 and Table 2 below show the volume of waste collected from each building. The areas that produced the largest quantities of waste were the Library and Arts & Sciences buildings. Even without the one bag from Purcell residence included in the Library waste, it still would have been the largest waste source.

Figure 2. Garbage Audit - Percent of total volume of waste by source (UBCO waste audit, October 5, 2016)

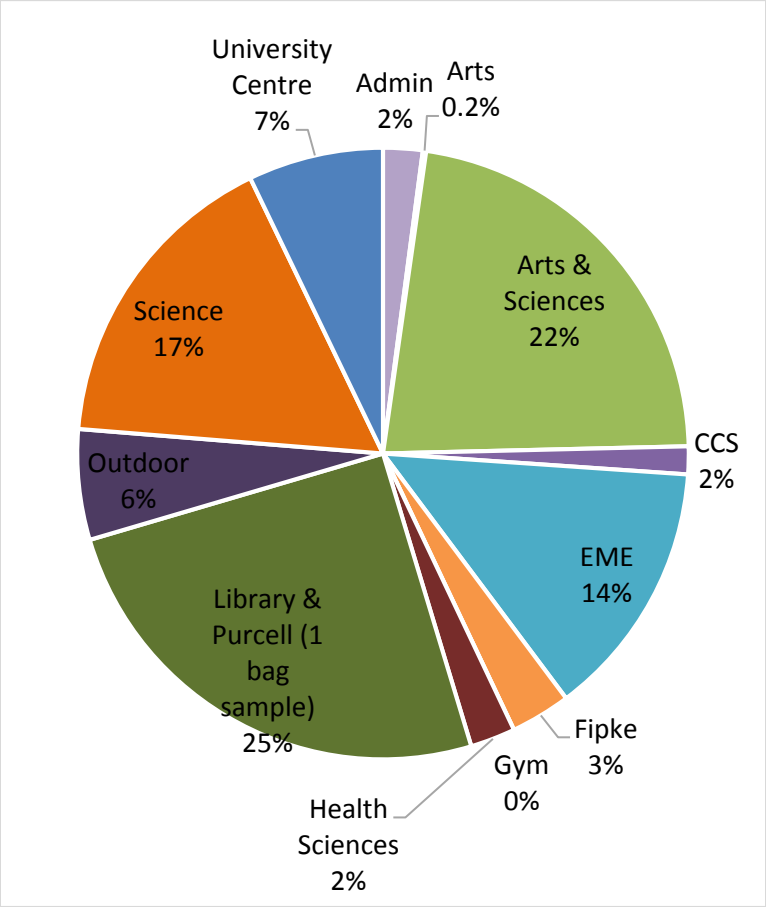


Table 2. Garbage Audit – Percent of total volume of waste by source, in descending order (UBCO waste audit, October 5, 2016)

Source	Percent of total waste
Library & Purcell (1 bag sample)	25%
Arts & Sciences	22%
Science	17%
EME	14%
UNC	7%
Outdoor	6%
Fipke	3%
RHSC	2%
Admin	2%
CCS	1%
Arts	0.2%
Gym	0%

RECYCLING AUDIT

The results of the recycling audit indicate that of the 3,303 L of waste audited, 62% was recyclable, 23% was returnable, 3% was compost, 11% was garbage, and less than 1% was e-waste, reusable items, and biohazardous items. Specific details and breakdown on the volumes of waste can be found in the tables and figures below.

Table 3 shows the complete breakdown of the recycling audit, including the volume of waste from each building and in each waste category, the percentages of each category, and totals in litres and percent. *Note: semi-total rows occur within the table in darker colours

Table 3. Recycling Audit- Volume of waste (in Litres and %) measured by type of waste for each building/area on campus (UBCO Waste Audit, October 5, 2016)

Type of Waste	Origin of Waste																									
	Admin		Arts		Arts & Sciences		CCS		EME		Fipke		Gym		Library		Outdoor		Purcell		RHSC		Science		UNC		**Total**	
	%	L	%	L	%	L	%	L	%	L	%	L	%	L	%	L	%	L	%	L	%	L	%	L	%	L	%	L
Plastic Containers	11%	7	8%	45	8%	9	16%	28	6%	64	8%	31	0	3	4%	7	11%	8	5%	6	10%	3	6%	11	4%	15	7%	237
Paper Products	40%	24	28%	159	31%	35	46%	79	31%	309	40%	144	0	15	29%	58	50%	38	4%	5	62%	19	37%	64	14%	49	30%	999
Cardboard & Boxboard	19%	11	27%	152	5%	6	16%	28	30%	302	16%	58	0	15	4%	7	11%	8	29%	36	25%	8	16%	27	38%	131	24%	788
Tin & Aluminum	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0	2	0%	0	0%	0	2%	2	0%	0	0%	0	0%	0	0%	4
Other Comingled Recycling	0%	0	0%	0	2%	2	0%	0	2%	19	1%	5	0	0	0%	0	0%	0	0%	0	0%	0	3%	5	0%	2	1%	33
Total Recyclables	70%	42	63%	356	46%	51	78%	135	70%	695	65%	238	0	35	37%	73	71%	55	39%	49	96%	30	62%	106	57%	197	62%	2061
Refundable Cans & Bottles	0%	0	19%	109	41%	45	10%	18	14%	144	13%	49	1	56	46%	91	18%	14	45%	56	0%	0	20%	35	20%	69	21%	686
Glass Jars & Bottles	0%	0	0%	0	0%	0	0%	0	1%	5	0%	0	0	0	0%	0	0%	0	1%	1	0%	0	0%	0	0%	0	0%	7
Plastic Bags & Overwrap	0%	0	2%	12	1%	1	4%	7	3%	31	1%	3	0	0	0%	0	0%	0	0%	0	0%	0	1%	2	2%	6	2%	62
Styrofoam	0%	0	0%	0	0%	0	0%	0	0%	2	0%	0	0	0	0%	0	0%	0	1%	2	0%	0	0%	0	0%	0	0%	4
Total Returnables	0%	0	22%	121	42%	47	14%	25	18%	182	14%	52	1	56	46%	91	18%	14	47%	59	0%	0	21%	36	22%	76	23%	759
Organics (Food & Yard Waste)	0%	0	0%	1	0%	0	0%	0	0%	3	0%	2	0	0	1%	1	0%	0	0%	0	0%	0	0%	0	0%	1	0%	8
Paper Towel & Napkins	0%	0	0%	3	0%	0	1%	2	0%	3	0%	0	0	0	0%	0	0%	0	0%	0	0%	0	1%	1	1%	2	0%	11
Bio-Containers & Utensils	4%	2	3%	14	3%	3	0%	0	0%	3	8%	28	0	0	1%	2	2%	2	7%	9	0%	0	5%	8	6%	21	3%	93
Total Compostables	4%	2	3%	18	3%	3	1%	2	1%	9	8%	29	0	0	2%	3	3%	2	7%	9	0%	0	5%	9	7%	24	3%	112
Garbage	24%	15	9%	50	6%	6	2%	3	7%	73	8%	30	0	0	11%	21	6%	5	2%	3	4%	1	5%	9	9%	30	7%	246
Garbage Bags	3%	2	3%	18	3%	3	3%	5	4%	36	4%	15	0	0	5%	10	1%	1	4%	5	0%	0	5%	9	5%	16	4%	120
Total Garbage	27%	16	12%	68	9%	10	4%	8	11%	110	12%	45	0	0	16%	31	7%	6	6%	7	4%	1	11%	18	14%	47	11%	366
E Waste	0%	0	0%	0	0%	0	1%	1	0%	0	0%	0	0	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	1
Reusable Items	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0.4
Biohazardous	0%	0	0%	0	0%	0	2%	3	0%	0	0%	0	0	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	3
Total Other	0%	0	0%	0	0%	0	3%	5	0%	0	0%	0	0	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	5
Total Waste Volume	**2%**	**61**	**17%**	**563**	**3%**	**110**	**5%**	**174**	**30%**	**996**	**11%**	**364**	**3%**	**91**	**6%**	**198**	**2%**	**77**	**4%**	**125**	**1%**	**31**	**5%**	**170**	**10%**	**343**	**100%**	**3303**

The percentage of waste identified within each category is represented in Figure 3. Note that sub-categories within each of the five main waste categories (recycling, returnable, compost, garbage, and other) are shown in different shades of the same colours (ie. all recycling items are in different shades of blue)

Figure 3. Recycling audit - Percent of total volume of waste by type for all buildings/areas on campus (UBCO waste audit, October 5, 2016)

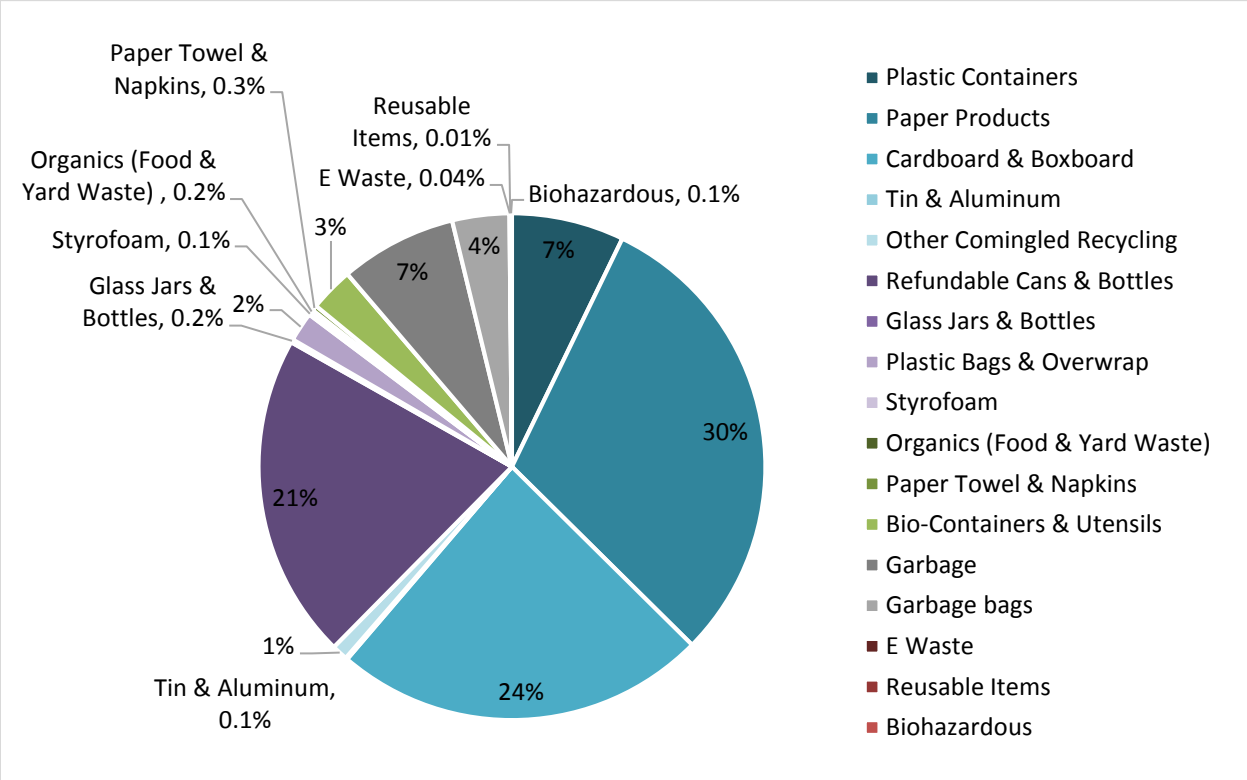


Figure 4 and Table 4 below show the volume of waste collected from each building. The areas that produced the largest quantities of recycling were the EME and Arts buildings.

Figure 4. Recycling Audit - Percent of total volume of waste by source (UBCO waste audit, October 5, 2016)

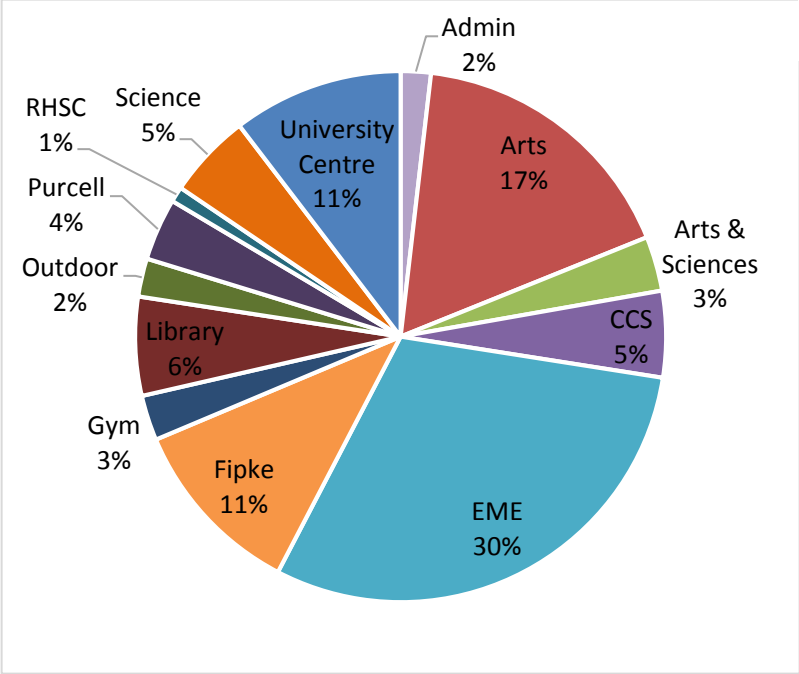


Table 4. Recycling Audit – Percent of total volume of waste by source, in descending order (UBCO waste audit, October 5, 2016)

Source	Percent of total recycling
EME	30%
Arts	17%
Fipke	11%
UNC	10%
Library	6%
CCS	5%
Science	5%
Purcell	4%
Arts & Sciences	3%
Gym	3%
Outdoor	2%
Admin	2%
RHSC	1%

Source	Percent of total waste
Library	17%
EME	16%
Arts	11%
Science	11%
Courtyard	9%
ASC	8%
UNC	7%
Admin	7%
Fipke	6%
CCS	5%
Gym	3%
Total	**100%**

COMPOST AUDIT

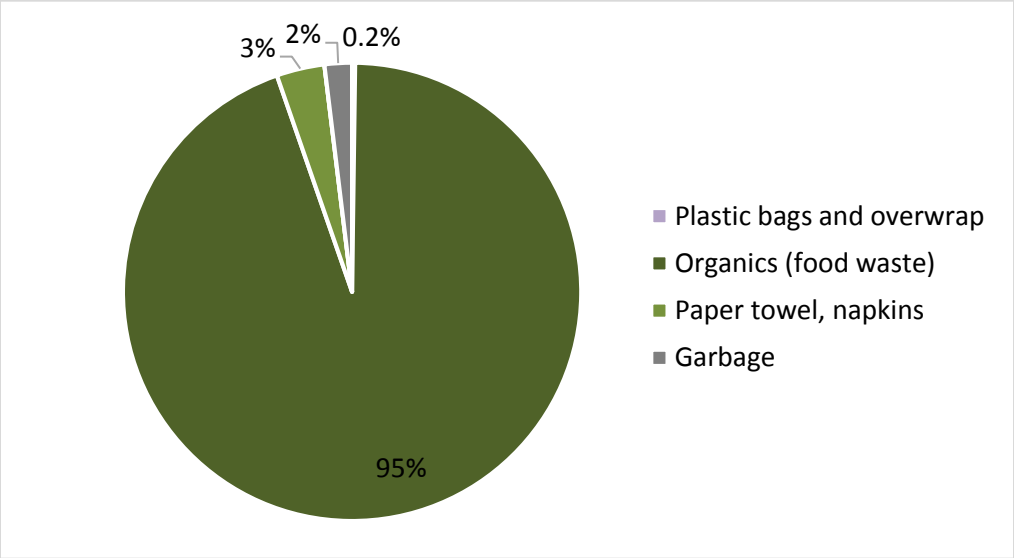
The results of the compost audit indicate that of the 26.5 L of compost waste audited, 98% was compost, 2% was garbage, and less than 1% was plastic bags and overwrap. Specific details and breakdown on the volumes of waste can be found in Table 5 and Figure 5 below.

For the purpose of this audit, paper towel was included in the compost category, even though it is not currently included in the composting program at UBCO.

Table 5. Compost Audit - Volume of waste (in Litres and %) measured by type of waste (UBCO Waste Audit, October 5, 2016)

Type of Waste	Volume (L)	%
Plastic bags and overwrap	0.1	0.2%
Organics (food waste)	25.0	94%
Paper towel, napkins	0.9	3%
Garbage	0.5	2%
Totals	26.5	100%

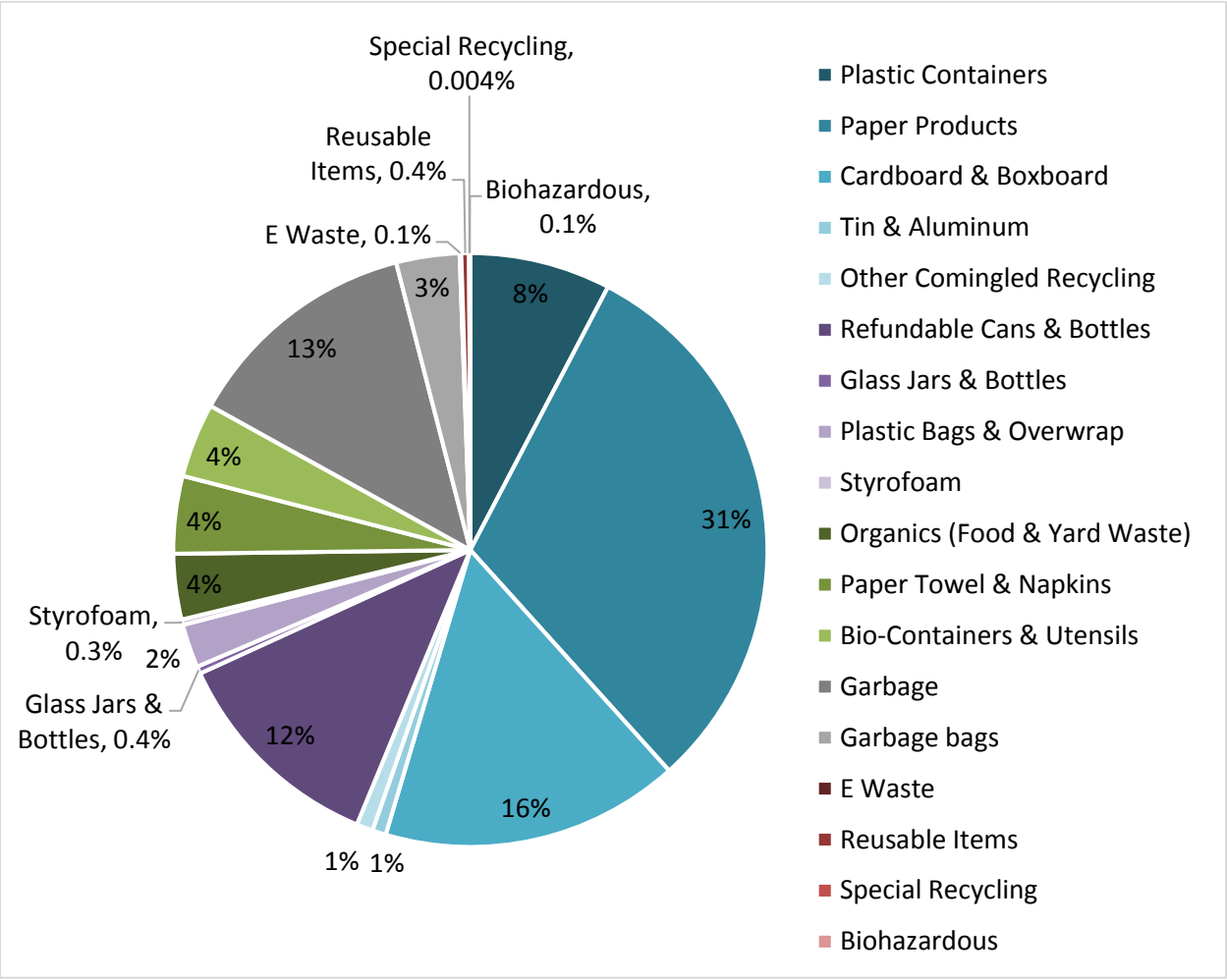
Figure 5. Compost audit - Percent of total volume of waste by type (UBCO waste audit, October 5, 2016)



ALL AUDITS

Figure 5 below shows the results from the garbage, recycling, and compost audits combined, giving an indication of the overall composition of waste created at UBCO.

Figure 5. Garbage, recycling, and compost audits combined - Percent of total volume of waste by type for all buildings/areas on campus (UBCO waste audit, October 5, 2016)


Special Recycling, 0.004%
Reusable Items, 0.4%
Biohazardous, 0.1%
E Waste, 0.1%
3%
8%
13%
4%
4%
4%
31%
Styrofoam, 0.3%
2%
Glass Jars & Bottles, 0.4%
12%
16%
1%
1%
Plastic Containers
Paper Products
Cardboard & Boxboard
Tin & Aluminum
Other Comingled Recycling
Refundable Cans & Bottles
Glass Jars & Bottles
Plastic Bags & Overwrap
Styrofoam
Organics (Food & Yard Waste)
Paper Towel & Napkins
Bio-Containers & Utensils
Garbage
Garbage bags
E Waste
Reusable Items
Special Recycling
Biohazardous

OBSERVATIONS BY TYPE OF WASTE

The observations presented in this section are focused on the garbage audit results only.

RECYCLING

Of all the garbage bags collected, recycling accounted for 51% of the waste. For the purpose of this audit and report, recycling is defined as those items which are accepted in the blue bin (plastic containers, paper products, cardboard & boxboard, tin & aluminum, and other comingled recycling).

Of the 51% in recyclable materials, the largest sub-category was paper products, which includes disposable cups (31%), followed by cardboard and boxboard (9%), plastic containers (8%), tin and aluminum (1%), and other comingled recycling (less than 1%).

The buildings on campus with the highest percentage of recycling found in the garbage were Administration (64%) the Library (58%), and EME (57%).

In 2014, 42% of the total garbage audited was comprised of recyclable materials. This indicates a 9% increase in the volume of recycling found in the garbage on campus.

RETURNABLES

Of all the garbage bags collected, returnables accounted for 7% of the waste. For the purpose of this audit and report, returnables are defined as those items which are accepted at the return-it depots (refundable cans & bottles, glass jars & bottles, plastic bags & overwrap, and Styrofoam).

The 7% in returnable materials was composed of refundable bottles and cans (3%), plastic bags and overwrap (3%), glass jars and bottles (1%), and Styrofoam (less than 1%).

The buildings on campus with the highest percentage of returnables found in the garbage were Arts & Sciences (16%), the Library (7%), and the outdoor courtyard (6%).

In 2014, 3% of the total garbage audited was comprised of returnable materials. This indicates a 4% increase in the volume of returnables found in the garbage on campus.

COMPOST

Approximately 19% of the total waste audited was compostable. This included paper towel and napkins (8%), organic food and yard waste (6%) and bio-containers and utensils (5%).

The buildings on campus with the highest percentage of compost found in the garbage were Arts (36%), Fipke (32%), and RHSC (28%).

In 2014, 39% of the total garbage audited was comprised of compost. This indicates a 20% decrease in the volume of compost found in the garbage on campus.

One big change to the audit in 2016 was that bathroom waste (composed primarily of paper towel) was not included in the audit. This accounts for the 21% decrease in paper towels found in the audit in 2016 (8%) compared to 2014 (29%), and the overall decrease in the amount of compost found in the garbage.

GARBAGE

Garbage accounted for approximately 22% of the waste audited.

The buildings on campus with the lowest percentage of garbage found in the garbage were Fipke (16%), EME (17%), and the Library (18%).

In 2014, 15% of the total garbage audited was comprised of garbage. This indicates a 7% increase, or improvement, in the volume of garbage found in the garbage on campus.

OTHER

Other divertible items accounted for 1.0% of the garbage audited. This included reusable items such as travel mugs, Tupperware, and canvas bags (0.9%), electronic and hazardous waste such as batteries and earbuds (0.1%), and special recycling such as prescription and non-prescription drugs (0.01%).

The buildings on campus with the highest percentage of other divertible items found in the garbage were the Outdoor Courtyard (3%), Science (3%), and Arts & Sciences (1%).

In 2014, 1.6% of the total garbage audited was comprised of other divertible items. This indicates a 0.6% decrease in the volume of other divertible items found in the garbage on campus.

OVERALL

60% of the non-garbage waste found in the garbage could be diverted into an existing program on campus (ie. recycling, refundables, e-waste), while 18% has the potential to be diverted if new systems were set up (ie. other depot items, compostable paper towel and biowares, reusable items, etc).

YEAR OVER YEAR COMPARISON FROM 2008 TO 2016

The four figures and tables below show comparisons in garbage audit results from 2008 to 2016.

Figure 6. Comparison of waste sample sizes (volume in litres) from 2008 to 2016. Does not include residence sample for 2014 audit. (UBCO waste audit, October 5, 2016)

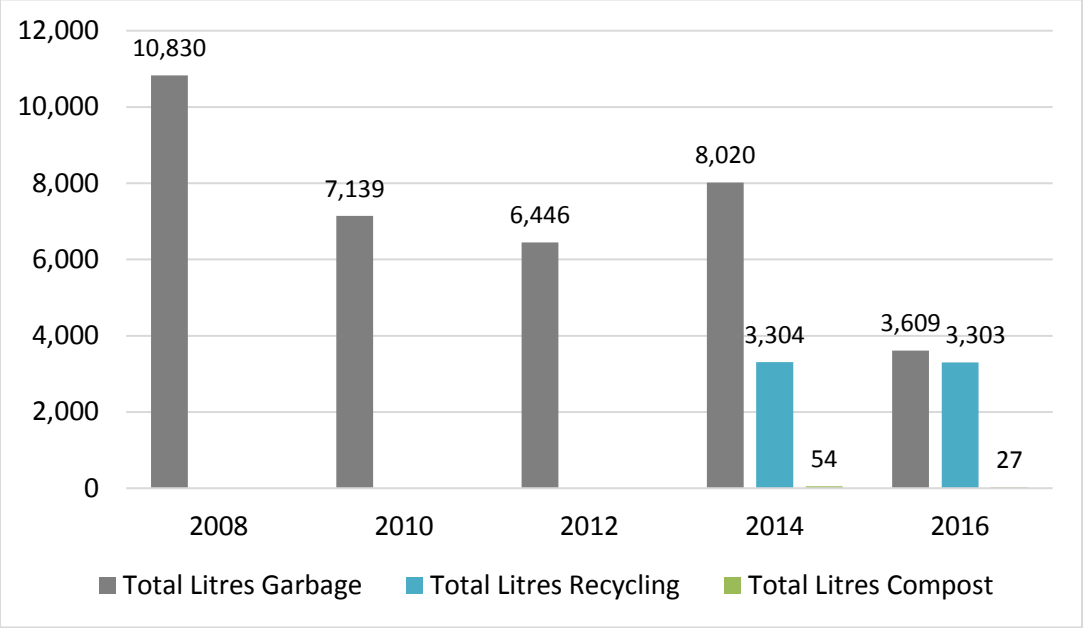


Figure 7. Comparison of percent of total volume for waste categories from 2008 to 2016. (UBCO waste audit, October 5, 2016)

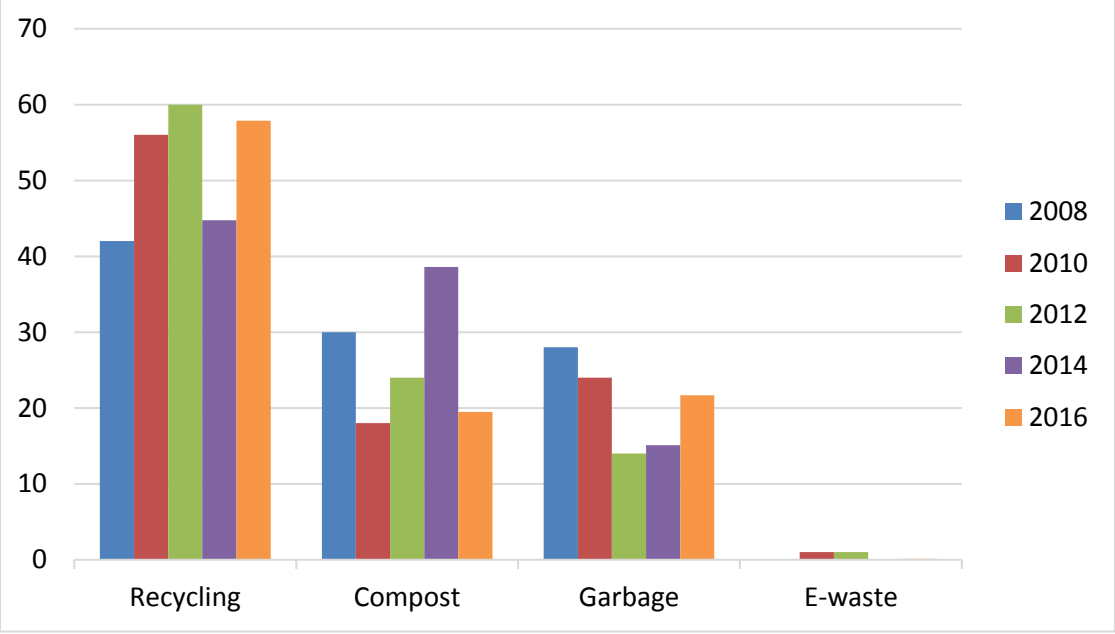


Table 6. Year over year comparison of percent of total volume of waste by type. (UBCO waste audit, October 5, 2016)

Volume of Waste by Type (%)	2008	2010	2012	2014	2016	Change (2014 to 2016)
Plastic	18%	15%	24%	12%	11%	Better, needs improvement
Paper Products & Disposable Cups	27%	37%	32%	25%	31%	Worse, needs improvement
Cardboard & Boxboard	6%	2%	2%	5%	9%	Worse
Tin & Aluminum	0.0%	2.0%	0.2%	0.4%	1.4%	Worse
Other Comingled Recycling	-	-	-	-	0.8%	Baseline Set
Refundable Bottles & Cans	4%	0%	3%	2%	3%	Worse
Glass	0.3%	0.0%	0.0%	0.0%	0.6%	Worse
Waxed Dairy Containers	-	0.0%	0.3%	0.4%	-	n/a (now included in comingled recycling)
Wet Organics	10%	13%	6%	5%	6%	Worse
Paper Towel & Bioware	21%	5%	18%	33%	13%	Not comparable, needs improvement
E-Waste	-	1.0%	0.7%	0.1%	0.1%	Static (trace found in garbage)
Styrofoam	3.6%	1.0%	2.0%	1.4%	0.5%	Better
Reusable	-	-	-	0.1%	0.9%	Worse
Garbage	11%	23%	13%	15%	22%	Better, needs improvement

*Note: Bathroom garbage (composed of mainly paper towel) was not included in the waste audit in 2016. This is the main reason why paper towel percentage is down by 20%.

Note: The low number in the case of garbage indicates a need for improvement because the goal is to have 100% garbage in the garbage audit. An overall improvement would be more actual garbage and less of everything else.

Table 7. Year over year comparison of percent total volume of waste by source in the garbage audit only. (UBCO waste audit, October 5, 2016)

Source Building	Year				
	2008	2010	2012	2014	2016
Admin	18%	1%	1%		2%
Arts	20%	25%	11%	12%	0.2%
ASC	-	3%	7%	5%	22%
CCS	6%	6%	4%	4%	1%
Courtyard	-	-	-	10%	6%
EME	-	-	12%	18%	14%
Fipke	6%	6%	6%	11%	3%
Gym	28%	1%	2%	2%	-
Library	12%	18%	10%	20%	25%
Offices	-	38%	35%		-
RHSC	-	-	1%	2%	2%
Science	10%	3%	8%	8%	17%
UNC	-	-	4%	8%	7%

RECOMMENDATIONS FOR IMPROVEMENT

The following recommendations are intended to help guide improvements in the collection and disposal of recyclable, returnable, compostable, and hazardous waste material. Each section is aimed at creating programs, policies, or pilot projects to reduce waste heading to the landfill. Education and communication are a key component to the success of every recommendation.

REDUCING AND REUSING

- Create an on-campus "free store" where students can drop off unwanted items that are in good condition. Other students can take items for free if they are needed.
    - This could be a student project or taken over by an ongoing club or group.
    - Could also be adapted for residence, especially during turnover time when many items that would be useful for arriving students are discarded by departing students.
- Expand the use of compostable food utensils and plates into all food service areas on campus
- Consider or revisit the feasibility of installing automatic hand dryers in bathrooms to cut down on paper towel waste

RECYCLING

- Create a drop off location on campus for returnable depot items other than refundable cans and bottles. This includes Styrofoam, plastic bags and overwrap, and glass bottles and jars. Coordinate transportation of these items to a recycler.
- Eliminate all stand-alone garbage bins – either remove the bin, or add at LEAST a recycling option and where possible, the 4-stream option (garbage, recycle, refundable, compost). Use big belly solar compactors wherever possible (outdoors). Remove the stand-alone 8-ft garbage bin embedded in the concrete outside Tim Horton's in the courtyard area. This space could be capped or repurposed as a planter.
- Investigate the recycling receptacle set up to determine if there is a problem in the following buildings:
    - Arts & Science (contributes 22% to garbage, but only 3% to recycling)
    - Library (contributes 25% to garbage, but only 6% to recycling)
- Consider adding signage or including a piece in educational outreach about what to do with leftover liquids before recycling coffee cups – to avoid liquid contamination of recycling stream.
- Inquire or meet with SuperSave to see what happens post-pick up of your recycling bins. Find out if a tour is possible, if all the waste is actually being diverted, and what happens when there is contamination.
- Re-evaluate the placement of waste stations and the signage being used in Fipke, EME, and the Library. These were identified as a high problem areas, where approximately 82-84% of the garbage audited from these buildings had the potential to be diverted from the landfill.

COMPOSTING

- Consider a new or expanded composting system on campus. This could mean replacing the Earth Tub composting system or introducing an additional system on campus to handle more types of organic wastes that are being produced, including paper and disposable coffee cups, paper towel and napkins, and bio-containers and utensils. In addition to the food waste that is produced on campus (6% of total waste, excluding cafeteria kitchens), there is an opportunity to compost an additional 45% or more of the total waste if another system or pick-up service was used. This would certainly contribute to a reduction on UBCO's carbon footprint.
    - Based on the 2014 and 2016 waste audit results, it was calculated that approximately 43-107 tons of compostable material is produced per year (43-63% of the total waste stream)
        - This does not include soiled items that were sorted into the garbage category that could have also been composted.
        - This does not take into account the behaviour shift that would be needed to divert all of these waste types into the compost system.
    - Oklin provides food waste solutions utilizing microbial technology that are available in many different sizes. Their composting machines reduce waste volume by up to 90%, decrease disposal costs, and create a nutrient-rich, reusable end product.
        - The GG50s system has an input capacity of 125 kg/day (50 tons/year)
            - This size could be appropriate if the current composting program was expanded to include paper towel and napkins, plus compostable foodwares.
            - A larger size could be utilized in the future if the compost program is expanded to include all items that that system can process (ie. paper, disposable coffee cups, etc)
            - Cost of the GG-50s is approximately $36,500 (does not include freight and installation costs)
    - Spa Hills Compost offers commercial composting to businesses and buildings in the Columbia-Shuswap-North Okanagan area.
        - Worth exploring the possibility of inviting them to pick up waste from UBCO, with a possible partnership of another organization on the area.
        - Weekly pick up service
        - Details can be found at www.spahillscompost.ca

E-WASTE

- Ensure there is at least one drop off location for e-waste in every building.

EDUCATION AND COMMUNICATION

- Make education on waste reduction practices a priority on campus. While the student population constantly changes and UBCO welcomes new students from all over the world, good communication and education regarding waste practices is crucial and must be ongoing.
    - Waste reduction guidelines integrated into student orientation
        - GreenStep can draft this for you upon request
    - Have student ambassadors (potentially from the sustainability club) stationed periodically at waste stations to educate users (like "green police") on a regular consistent basis.
    - Leverage the Student Union and professors where possible to talk to students about school policies such as waste reduction.
    - Organize a landfill tour and/or Cascades Recovery tour to help students understand the impacts of there waste behaviours.
    - Create a mind map about all the ways that things get communicated to students at UBCO (this could be a student project). Understand what the opportunities are, and which ones would make sense to use to communicate recycling/waste guidelines and best practices.
- Upgrade/refresh to the current detailed signage displayed in building lobbies with trio stations plus compost bins.
- Engage with students on waste reduction, go above and beyond just making educational resources available for them (ie. The Recyclepedia). Resources such as this are wonderful to have but will only be used by those few students who choose to go out of their way to look something up. Student must be reached out to and engaged with on a larger scale to make a true impact on waste reduction on campus.

RESIDENCES

- A full-scale residence waste audit is recommended for 2017 or 2018. The residence audit could take place on alternating years as the UBCO campus audit, or if it occurs in the same year, it should be held on a different day. A residence sample was audited in 2014 and 2016, but a separate audit is recommended to really understand what issues are cropping up in residence and set a proper baseline for future improvements.

2018 WASTE AUDIT & PARTICIPATION

- Include in the audit waste from all areas of all buildings, including from the bathrooms (exclude feminine wastes). It is important that the audit captures all waste produced on campus to get the whole picture that is as accurate as possible for a 1-day sample.

- To avoid bags from different buildings getting mixed up by sorters, add one or two separate "audit area" tarps slightly away from the piles of waste, where an entire building's waste can be brought over, sorted, then put back.
- Continue to provide custodians with white sticker labels for waste bags being collected for the audit. Encourage labeling with building name and waste type, ie. "Arts Recycling", "Fipke Garbage") OR provide pre-printed labels for this purpose.
- Reserve the A-frame signs for waste audit signage. They worked better than the delineators with paper signs. Continue to use the rope nailed into the ground to show rows clearly. This worked well.
- Get the big picture. To really understand waste produced by UBCO, data from other waste sources on campus should be collected, such as: large items (appliances), other metals, wood (pallets), laboratory waste, and any other special waste. This is especially important when calculating your carbon footprint as it related to your waste production.
- Consider organizing a longer sample period (ie. two days) for buildings with very little waste, in order to get a better sample. Based on results from 2014 and 2016, these areas include: Gymnasium, RHSC, and CCS.
- Increase efforts for volunteer coordination including starting earlier and reaching out to the SUST 100 class and other student groups or classes.

A list of relevant recommendations from 2014 that are still applicable to UBCO campus are available in Appendix A

CONCLUSION

The 5th biennial UBCO garbage audit showed some improvements and some declines. While contamination within the garbage stream decreased, there were many recyclable and compostable items found in the garbage in higher percentages than the last audit, and there is still room for improvement.

UBCO has been making many changes, additions, and improvements to waste reduction efforts on campus including some of the recommendations from the last waste audit report, but the main area that needs attention now is education and communication. With a student population that is constantly changing over and coming from different cultures all over the world, it is important to provide education that is understandable and meaningful to everyone. This means going above and beyond signs on waste bins to say what goes where; it includes helping people to understand *why* they are being asked to take certain actions around waste reduction, and inspiring a desire within them to do what's right.

The data collected in this year's waste audit shows that there is still a large percentage of waste found in the waste stream that has the potential to be composted. Since the current composting system at UBCO is not set up to accept these items (primarily paper products such as disposable coffee cups), an alternative or additional compost system is definitely worth considering.

Evaluate which of the recommendations in this report are within the scope of UBC Okanagan's financial and human resources and use these as opportunities to showcase UBCO as a forward thinking green campus. In order for sustainability practices to be successful, the concept and practices need to be integrated into every aspect of campus life. Empowering and supporting the students and staff to act in accordance with the sustainability values that UBCO embodies will sustain behavior towards effective and efficient waste diversion practices.

MORE RESOURCES

GreenStep is available as a local resource to help UBC Okanagan establish or implement any of the recommendations and action items in this report. We are also available to solve issues that may arise and answer any questions.

GreenStep Solutions Inc
Ph 250-862-8941
www.greenstep.ca

Regional Waste Reduction Office
Ph 250 469-6250
www.regionaldistrict.ca
recycle@cord.bc.ca

Local Recycling Directory
http://www.regionaldistrict.com/media/21318/2004_recycle_dir.pdf

Zero Waste Campuses (GrassRoots Recycling Network)
http://www.grrn.org/page/zero-waste-campuses

Zero Waste Campus (Concordia University)
http://sustainable.concordia.ca/working-groups/r4-rethink-reduce-reuse-recycle/projects/zero-waste-campus/

Report: Life Cycle Assessment of Hand Dryers (MIT)
http://msl.mit.edu/publications/HandDryingLCA-Report.pdf

APPENDIX A

Relevant recommendations from 2014

REDUCING AND REUSING

- Connect with the major food services suppliers (GFS, Sysco) and ask them to provide food with reduced packaging. Bulk items or larger shipments on dry goods can substantially reduce the amount of cardboard/boxboard that is being produced.
- Start an anti-disposable coffee cup campaign to reduce the amount being consumed and disposed of on campus. This could include a cost savings incentive at each coffee outlet for students who bring their own mug, or could be a campus-wide reusable mug program where a deposit is paid and mugs can be dropped off and picked up at students' convenience to avoid carrying them around all day and washing it themselves. Student surveys will be needed to properly assess the readiness and feasibility of implementing such a program.
- Garner support from food service establishments on campus and encourage them to provide discounts or incentives for students and facility that bring their own mug, cutlery, or food containers to pick up food or coffee. Ensure this is properly advertised.
- Create a campus-wide policy to eliminate single serving items such as creamers, sugar packets, plastic stir sticks, ketchup, mustard, butter, and any other single serving items.
- Create and implement a Zero Waste Policy to eliminate disposable products during meetings and conferences. Only reusable items can be used such as coffee urns, water jugs, reusable coffee cups, and water glasses. Research policies at other universities/organizations.

RECYCLING

- Ensure there are no stand-alone garbage cans on campus, as this encourages people to dispose of their waste because of its convenience. A recycling container, at minimum, should accompany every single garbage can on campus.
- Create a separate container for refundable items in support of a year-round campus-wide bottle drive where students and staff can donate their refundable bottles towards a college group, charity, or other good cause.

COMPOSTING

- Implement Green Champions to take responsibility of office compost bins. This should be embedded into the stewardship component of a position's job description. This way if there is employee turnover, the responsibility for the compost remains within the job.

EDUCATION AND COMMUNICATION

- Work with the Student Union and other clubs on campus. The results of this waste audit in conjunction with effective signage and presentations can help generate a buzz about the need for better waste diversion practices and help motivate students to choose wisely.
- Engage sustainability champions, likely the Sustainability Coordinator or Green Team leader, to lead the implementation strategy and oversee the measurement and monitoring of the success of each recommended action.
- Organize a recycle, reduce, and reuse flash mob where students can creatively express and educate the importance of reducing waste on campus in a fun and creative way. Work with the Student Union or other creative groups on campus.

PARTICIPATION

- Have a booth at the Volunteer Fair at the beginning of the year. This is something GreenStep could spearhead.

RESIDENCES

- Signage about what can and cannot be recycled, composted, and placed in the garbage should be consistent to what is located on campus.