NUI Galway Waste Characterisation Survey Report

The City Bin Co.
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Co. Galway

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DOCUMENT DETAILS

Client:	The City Bin Co.
Project title:	Waste Characterisation Survey
Project Number:	140708
Document Title:	Waste Characterisation Survey Report
Doc. File Name:	WCSR – 140708 – 2016.10.24 – F
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Document Issue:

Rev	Status	Issue Date	Document File Name	Author(s)	Approved By:
1	D1	2016.10.08	WCSR – 140708 – 2016.10.24 - D1	SM	MW
1	F	2016.11.08	WCSR – 140708 – 2016.10.24 - F	SM	MW

Table of Contents

1 INTRODUCTION

A municipal waste characterisation survey was carried out on behalf of NUI Galway by Simon MIlls (B.Sc. Env.) and Owen Cahill (M.Sc. Env.) of McCarthy Keville O'Sullivan Ltd., on the 21st of October 2016.

The City Bin Company (City Bin Co) provide NUI Galway with a 2-Bin (dry recyclables, residual) waste collection system across the majority of the campus buildings. City Bin Co were requested by NUI Galway to undertake this survey to obtain an up to date characterisation of their residual municipal waste stream that is currently sent directly to landfill via the City Bin Co waste transfer station. The purpose of the survey is to establish the content of the residual waste stream generated on the NUIG campus for a period of 5 days (Mon-Fri) and determine the extent of recyclable material which is currently being disposed of as residual waste.

This survey was carried out within the Environmental Protection Agency (EPA) licensed transfer station of The City Bin Co. in Carrowmoneash, Oranmore, Co. Galway (W0148-01).

The survey was carried out using the procedures outlined by the EPA in Section 4 of their publication '*Protocol For The Evaluation Of Biodegradable Municipal Waste Sent to Landfill*'. The survey results are compared to the 2010 EPA commissioned publication '*Surveys of Residual Waste from Businesses provided with Organic Waste Source Separated Collection Systems*'.

2 METHODOLOGY

2.1 Preparation of the Sample

The initial sample was collected by The City Bin Co. from the entire NUIG Campus over a period of five days (Monday 17th of October – Friday 21st of October 2016). Waste was stockpiled at The City Bin Co. waste transfer station in Carrowmoneash, Oranmore, Co. Galway (W0148-01) until the waste characterisation could take place on the Friday 21st of October. The total weights of waste from each day were recorded using the weigh bridge at The City Bin Co. compound. The combined weight for all five days totalled approximately 5.5 tonnes. In order to obtain a representative sample, the waste was mixed thoroughly using a mechanical shovel operated by an employee of The City Bin Co. and the following procedure was carried out to reduce the sample to a workable size:

- The sample was placed in a uniform pile.
- The pile was divided into halves in a straight line down its centre.
- One half of the sample was removed, the remaining waste was mixed using the mechanical shovel.
- This process was repeated five times, as shown in plates 1-5 until the desired sample size was obtained; approximately 150-170kg.

Plate 2.2 Initial Sample

Plate 2.2 Half Sample

Plate 2.3 Quarter Sample

Plate 2.4 One eighth sample

Plate 2.5 Representative sample

2.2 Classifying the Waste Streams

Once a workable sample size had been obtained the following classification procedure was carried out:

- Containers (wheelie bins) were lined up around the sample and labelled for each waste category.
- Larger items, greater than 20mm in size, were sorted into the relevant containers.
- A screened tray was used to separate the material that was smaller than 20mm from the material that was larger than 20mm.
- All unclassified material was then divided between the waste categories depending on the proportion of the sample that had been placed in each container.
- Each container was then weighed using a calibrated digital weighing scales and the weight of each waste category was recorded. The weighing equipment was able to record weights to within 0.1kg.

3 RESULTS

Table 3.1, below, contains the recorded values for each waste category that was extracted from the sample and the percentage of the total weight.

Waste Category	Weight (kg)	% of Total
Organic Waste	16.3	9.9%
Papers	16.4	9.9%
Cardboards	15.65	9.5%
Composites	13.85	8.4%
Textiles	18.2	11.0%
Healthcare Textiles	0	0.0%
Plastics	46.7	28.3%
Glass	13.8	6.0%
Metals	14.65	1.1%
Special Municipal Waste	0	0.0%
Unclassified Combustibles	0.2	0.0%
Unclassified Incombustibles	0	0.0%
Components smaller than 20mm	26	15.8%
Total Weight	165.05	100.0

Table 3.1 Waste Characterisation Results

The results in Table 3.1 above show that the plastics category of waste accounted for almost 30% of the waste stream. The next largest categories of waste were found to be components smaller than 20mm and textiles. However, the excessive weights in the less than 20mm and textiles categories were believed to be anomalies. The higher than expected level of waste which measured less than 20mm can be accounted for by the presence of a large amount of damp sand, which was present in one bag of waste. The excessive amount of textiles can also be attributed to one bag which contained discarded clothes.

When these anomalies are excluded, the next highest categories of waste were organic waste, papers, cardboards and composites. All of which were of a similar volume. Table 3.2 below displays the results of this waste characterisation survey when these anomalies have been adjusted in line with previous waste characterisation studies.

Waste Category	Weight (kg)	% of Total
Organic Waste	16.3	12.4%
Papers	16.4	12.5%
Cardboards	15.65	11.9%
Composites	13.85	10.5%
Textiles	2.6	2.0%
Healthcare Textiles	0	0.0%
Plastics	46.7	35.5%
Glass	13.8	7.5%
Metals	14.65	1.4%
Special Municipal Waste	0	0.0%

Unclassified Combustibles	0.2	0.0%
Unclassified Incombustibles	0	0.0%
Components smaller than 20mm	8	6.1%
Total Weight	131.45	100.0

Figure 3.2 Adjusted Waste Characterisation Results

4 ANALYSIS

The largest proportion of the waste stream sample is recyclable material with plastics being both the heaviest and most abundant component of the sample waste stream requiring three containers compared to one container for every other waste category.

The majority of the plastics within the waste stream comprised drinks bottles, plastic packaging and soiled plastic refuse bags. It was noticeable during the study that a large portion of bottles within the sample contained some liquid which contributed to an increased weight for that waste stream which would not necessarily be reflective of the true weight of the plastic component. The plastic stream also had a minor component of laboratory consumables such as pipettes, plastic vials and sampling containers.

While plastics did contribute significantly to the overall volume of waste, the results were in line with what has previously been recorded for NUIG. A comparison of the current study to previous studies carried out for NUIG is provided below in Table 4.1. This table also displays the results of an EPA commissioned study from 2010. The purpose of this survey was to provide biodegradable and packaging factors for residual waste from a 3-bin collection system for a variety of commercial origins. The study provided a breakdown of the waste composition for a school, college or training centre or a university.

Waste Category	NUIG			EPA
	July 2014	October 2014	October 2016 (Adjusted)	2010
	% of Total	% of Total	% of Total	% of Total
Organic Waste	15.5	14.1	12.4	26.0
Papers	13.6	14.9	12.5	24.0
Cardboards	3.8	9.4	11.9	0.5
Composites	19.1	11.4	10.5	0.7
Textiles	1.2	2.7	2.0*	4.7
Healthcare Textiles	6.6	0	0.0	24.0
Plastics	28.6	37.9	35.5	5.4
Glass	1.6	2.3	7.5	2.2
Metals	2.8	2.0	1.4	0.1
Special Municipal Waste	0.0	0.0	0.0	7.5
Unclassified Combustibles	2.6	0.5	0.0	0.0
Unclassified Incombustibles	1.4	2.3	0.0	2.3
Components < 20mm	3.0	2.4	6.1**	2.8
Total Weight	100.0	100.0	100.0	100.0

*Adjusted to account for one bag of clothes
**Adjusted to account for one bag of sand
Table 4.1 Waste Characterisation Comparison

It is apparent from the comparison above that most of the waste fractions are similar to that which was recorded previously.

The majority of the papers waste category was made up of a combination of newspapers and magazines along with waste paper associated with food packaging. The paper waste stream did not contain academic printed material or waste paper associated with printers and photocopiers which may be expected considering the source of the waste. The fraction of paper observed in the current waste characterisation study is similar to that of the previous studies.

Composites are generally packaging materials containing multiple components e.g. plastic and cardboard composite. The vast majority of this waste stream consisted of coffee cups. Following a reduction in the fraction of composite materials during 2014 the level of composites has remained consistent.

Most of the weight and volume in the cardboard category consisted of large cardboard boxes which had been crushed by hand and folded into refuse sacks. This cardboard would haven suitable for bailing and recycling using a mechanical crusher, as opposed to being disposed of as residual waste. It is apparent from Table 4.1 that the fraction of cardboard within the residual waste stream has increased.

A number of previous waste characterisation studies were carried out for NUIG. These included three surveys in 2014 and one survey in 2013. Table 4.2 below displays the results of the 2014 surveys. The previous studies were carried out over a shorter period (1-2 days) and therefore the current study can be considered more robust in comparison.

Waste Category	16/04/2014		25/07/2014		17/10/2014	
	Weight (kg)	% of Total	Weight (kg)	% of Total	Weight (kg)	% of Total
Organic Waste	22.86	15.0	21.1	15.5	23.9	14.1
Papers	16.36	10.7	18.5	13.6	25.2	14.9
Cardboards	7.76	5.1	5.2	3.8	15.8	9.4
Composites	22.8	14.9	26.0	19.1	19.2	11.4
Textiles	2.96	1.9	1.7	1.2	4.6	2.7
Healthcare Textiles	6.66	4.4	9.0	6.6	0	0
Plastics	43.62	28.6	38.8	28.6	64.1	37.9
Glass	2.54	1.7	2.2	1.6	3.9	2.3
Metals	5.56	3.6	3.8	2.8	3.4	2.0
Special Municipal Waste	0	0.0	0	0.0	0	0
Unclassified Combustibles	0.64	0.4	3.6	2.6	0.9	0.5
Unclassified Incombustibles	0.72	0.5	1.9	1.4	3.8	2.3
Components < 20mm	20.22	13.2	4.1	3.0	4.0	2.4
Total Weight	152.7	100.0	135.8	100.0	169.0	100.0

Table 4.2 2014 Waste Characterisation Results

5 DISCUSSION

As mentioned previously, a number of anomalies were observed in categories which, based on previous experience, would be expected to be much lower. These categories were adjusted according to previous studies carried out at the site. It is not believed that these adjustments have had a significant effect on the overall results of the survey.

The purpose of the 2-Bin system implemented by NUI Galway is to divert potentially recyclable wastes (cardboard, plastics and paper in particular) from landfill. It is accepted that the residual waste stream will contain a certain amount of potentially recyclable materials however the objective is to reduce these to a minimum acceptable level.

It is apparent from the results that plastics represent a significant portion of the residual waste stream. As mentioned before, a large portion of the plastics fraction consisted of drinks bottles with liquid still inside. Therefore, the weights presented here may not be truly reflective of the plastic component of the residual waste stream. Soiled refuse sacks are also likely to have contributed to a significant fraction of the plastics component.

Soiling was also found to be an issue in the paper and cardboard fractions of the waste stream which would have led to elevated results for these fractions also. This soiling would also result in some of the cardboard and paper fraction being unsuitable for recycling.

Due to the level of organic material soiling across virtually all of the waste fractions it can be assumed that the measured organic material fraction has been under represented in relation to that which was actually present in the residual waste stream.

In comparing the adjusted results of the present survey with previous surveys, no significant differences can be observed. The most significant change can be seen in the glass category which was observed to be 5.2% higher (when adjusted) than the previous study. This cannot be accounted for other than the fact that a higher number of glass bottles were observed to be present in this waste sample than previous surveys.

Observationally, it was thought that the level of soiling was higher in the present survey than in previously conducted surveys. This, however, may be due to the length of time which the waste was stockpiled before classification i.e. first collection on Monday and classification on Friday.

The survey carried out by the EPA in 2010 was completed relatively soon following the roll out of the 3-Bin collection system in Ireland. It is considered likely that improvements in the volume of recyclables present in the residuals waste stream have been achieved as awareness and better implementation of the system has occurred between 2010 and 2016. The results do however provide the only benchmark against which to compare the NUI Galway results.

6 CONCLUSIONS

It can be concluded that the plastics fraction of the residual waste stream remains to be the most problematic in terms of potentially recyclable materials being treated as residual waste. It is thought that plastic drinks bottles contribute significantly to this fraction of the waste stream and is something which may be addressed through measures such as awareness programmes.

While the levels of organic waste in the sample could not be determined accurately it is assumed that this fraction of the waste stream is significant. Segregation of this component of the waste stream would not only reduce the overall volume of residual waste but make further waste characterisation studies more accurate due to the potentially decreased level of soiling within other waste fractions.

References

Environmental Protection Agency (2010). *'Survey of Residual Wastes from Businesses provided with Organic Waste Source Separated Collection Systems'* EPA, Wexford.

Environmental Protection Agency (2011). *'Protocol for the Evaluation of Biodegradable Municipal Waste sent to Landfill'* EPA, Wexford.