



# Guidance on the Methodology for Waste Composition Analysis

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Date: January 2021



**EUROPE & SCOTLAND**  
European Regional Development Fund  
Investing in a Smart, Sustainable and Inclusive Future

## Table of Contents

<b>1</b>	<b>Introduction</b>	<b>5</b>
1.1	Purpose of this guidance	5
1.2	Scope of this guidance	5
1.3	How to use this guidance	6
1.4	Overview of waste composition analysis	6
1.5	Zero Waste Scotland support for household waste composition analysis	7
<b>2</b>	<b>Summary requirements for Zero Waste Scotland-funded studies</b>	<b>8</b>
<b>3</b>	<b>Project scoping prior to procurement</b>	<b>11</b>
3.1	Study objectives	11
3.2	Is new WCA data required?	12
<b>4</b>	<b>Procuring a WCA contractor</b>	<b>12</b>
<b>5</b>	<b>Project management</b>	<b>12</b>
5.1	Project inception	12
5.2	Communication within the project team	13
5.3	The roles and responsibilities of Zero Waste Scotland	14
5.4	The roles and responsibilities of the local authority	14
5.5	The roles and responsibilities of the WCA contractor	15
<b>6</b>	<b>Waste sampling design</b>	<b>16</b>
6.1	Introduction	16
6.2	Factors influencing the composition of kerbside waste	16
6.3	Which households should be sampled?	17
6.4	How many street blocks?	19
6.5	How many households in each street block?	19
6.6	Selection of household street blocks for sampling	20
6.7	Inclusion of multi-occupancy dwellings	21
6.8	How many phases should waste be sampled over?	22
6.9	Which services should be included in sampling?	22
<b>7</b>	<b>The collection and sorting of waste</b>	<b>24</b>
7.1	Planning required before waste is collected	24
7.2	Procedures during waste collection	29
7.3	Procedures during waste sorting	32
<b>8</b>	<b>Reporting and analysis</b>	<b>33</b>

8.1	The roles and responsibilities of the WCA contractor	33
8.2	The roles and responsibilities of local authorities	33
8.3	The roles and responsibilities of Zero Waste Scotland	34
<hr/>		
<b>9</b>	<b>Appendix A: Standard household waste categories</b>	<b>35</b>
<hr/>		
<b>10</b>	<b>Appendix B: Standard household waste sorting protocol</b>	<b>40</b>

## **Acknowledgements**

A previous version of this guidance was produced to support a programme of household waste composition analysis during 2013-15, and was written by Julian Parfitt, Polly Griffiths and Tim Reid.

This revised version was produced during 2020 by Phil Williams, Zero Waste Scotland, to support a new programme of household waste composition analysis starting in 2021.

Thanks to Jon Marshall at Zero Waste Scotland for reviewing this version and Barbara Leach at Magenta Research & Evaluation, for involving Zero Waste Scotland in development of similar guidance for London and the helpful ideas for improvements that came from that process.

## **Notes on revisions to the June 2015 guidance**

- The document focuses heavily on the analysis of kerbside collected waste, with some specific guidance on sampling from multi-occupancy dwellings. If you are interested in conducting analysis of waste from recycling centres, litter, commercial wastes and bulky wastes much of this document may still be applicable (e.g project planning and management). The previous guidance document also contained an Appendix on sampling other wastes streams.
- There is greater emphasis on project planning, management and the typical roles and responsibilities during studies funded by Zero Waste Scotland. This was in response to feedback from some local authorities during the last programme. We hope that local authorities will find these sections useful in supporting planning and delivery.
- The key study requirements are summarised in Section 2 of this document. Many of the basic principles remain the same as the previous version (e.g use of a standardised material category list, number of households to sample waste from). Other areas of the previous guidance have been tightened to improve the outcomes of Zero Waste Scotland support (e.g deriving a household sample using open-source socio-demographic data).
- Each section of this guidance should be read to understand the detail of changes.

This version was finalised in January 2021. Please check the Zero Waste Scotland website for any future updates.

# 1 Introduction

## 1.1 Purpose of this guidance

This guidance document sets out a standardised methodology for conducting waste composition analysis (WCA) of household waste collected at the kerbside. The guidance has been written by Zero Waste Scotland, for waste management professionals working in local government and the contractors who conduct WCA on their behalf.

The requirements in this guidance must be followed by local authorities and their contractors where local authorities are receiving financial and technical support for WCA studies from Zero Waste Scotland. Local authorities are also encouraged to use these requirements when commissioning their own studies. The adoption of a standardised methodology delivers the following benefits:

- Zero Waste Scotland can justify the financial and technical support we provide to individual local authorities if high-quality data is produced. Individual local authority studies form the basis of national estimates of household waste composition. A lack of standardisation between studies makes it much harder for Zero Waste Scotland to use local authority data in national-scale estimates and therefore questions the cost-effectiveness of any financial support we provide.
- Local authorities can specify and procure a high-quality, realistically priced study that meets their needs. Where a project has not been adequately scoped and planned, there is a risk that waste managers unwittingly specify methods or outputs that cannot be delivered by contractors.

WCA contractors have a defined study approach to work to during project procurement and delivery. The market in waste composition analysis is healthy and public procurement processes ensure fair and open competition. A specification that clearly sets out requirements should result in high quality proposals and the best value-for-money bid being selected. A standardised approach is not designed to limit further development of WCA as a research method, in fact we hope it provides the framework to develop further. As future programmes develop Zero Waste Scotland will value the input from WCA contractors.

## 1.2 Scope of this guidance

This guidance focuses on the methodology for sampling the composition of kerbside collected household wastes at the point of collection at the kerbside. Kerbside collected wastes are a priority waste stream as they form a large percentage of overall household waste and incur very significant management costs to local authorities. Individual kerbside studies could include residual waste, dry mixed recycling and bio-wastes.

The study design requirements for analysing household wastes collected from other locations (e.g. recycling centres, bulky collections) and kerbside collected wastes following some form of treatment (e.g. kerbside residual waste immediately prior to landfill or incineration) are beyond the scope of this guidance.

This guidance is not designed to cover all aspects of waste service monitoring and evaluation. Section 1.1 above provides an overview of WCA as one of the tools to monitor waste services. We assume a local authority has judged that a WCA study may be required for their circumstances.

WCA analysis is sometimes used by local authorities to support the development of specifications for services or contracts with waste management facilities. In these circumstance Zero Waste Scotland

would recommend developing a bespoke study methodology, reflecting the potential financial implications of these decisions. This is because the requirements set out in this document are constrained by a reasonable project cost estimate with a significant contribution from Zero Waste Scotland. If a local authority was developing a large value contract, they may choose to increase the available budget and the scope and scale of the study beyond that specified here.

### 1.3 How to use this guidance

The guidance has been structured to go through the key elements of delivering a high-quality kerbside WCA study. It is designed to help local authorities plan projects and support the delivery of quality studies using WCA contractors.

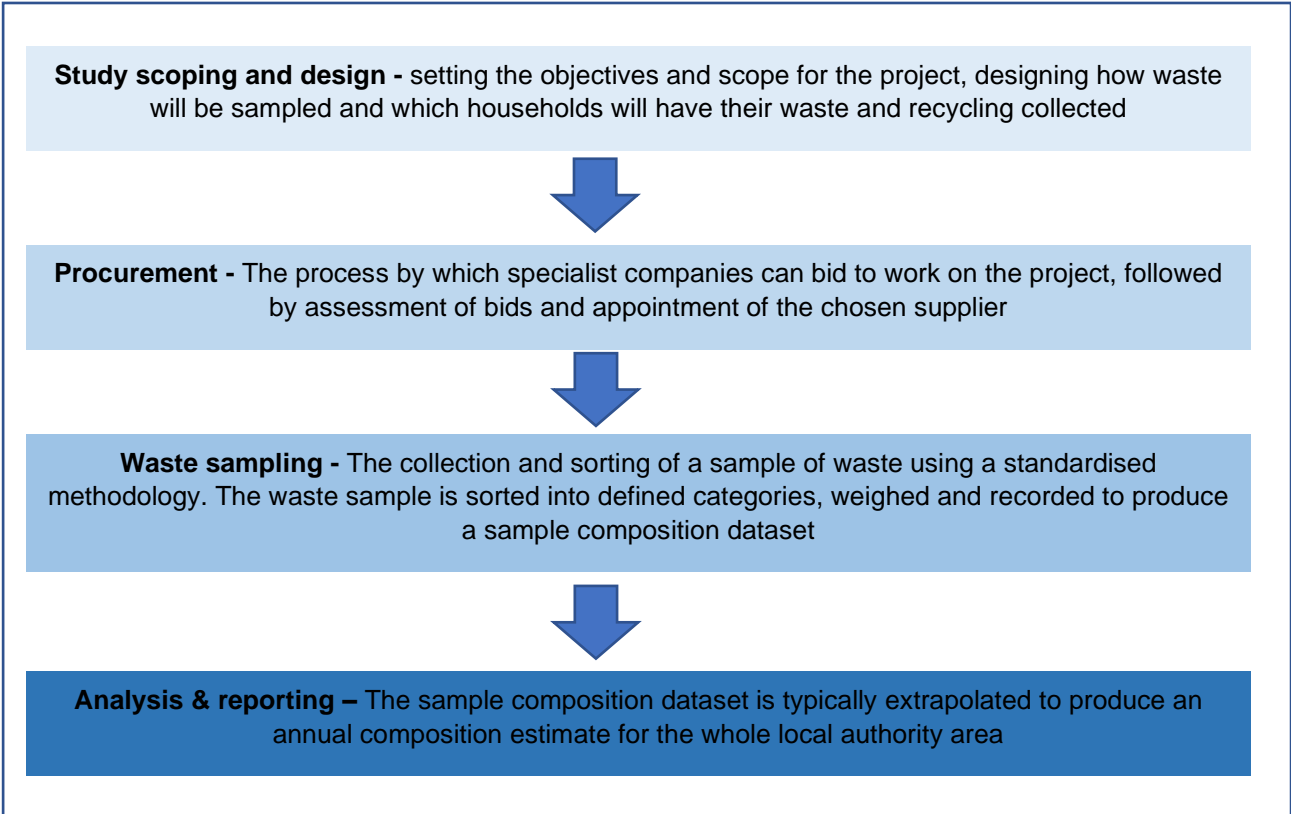
Each section should be read as part of the planning and scoping phase outlined in Section 3. If this guidance is only reviewed once waste sampling is underway it will be of little value.

Zero Waste Scotland recognises the important role WCA contractors play in delivering a WCA study. They are a valuable resource of knowledge and experience for the project to draw on. This guidance is not intended to replace that experience once the project is underway. However, it is our intention to set out a reasonable set of core requirements that all Zero Waste Scotland funded studies must follow, so that Zero Waste Scotland achieves our funding objectives. The remainder of this document is guidance and will need a degree of adaptation to individual local authority circumstances.

### 1.4 Overview of waste composition analysis

Waste composition analysis (WCA) provides information about the types and amounts of the materials that make up mixed waste streams. Data is usually gathered by physically sorting a sample of waste by hand into pre-determined categories. Each category is weighed, and the results provide a breakdown of the composition of sampled waste. WCA is relatively time consuming, labour intensive and expensive (when compared to some monitoring techniques). A clear justification for conducting a WCA study should therefore be developed.

A summary of the key phases of a household WCA study is provided in Figure 1 below.



## Figure 1: the key phases in a household WCA study

A WCA study will provide evidence that other data sources cannot. There is no alternative data source for the detailed composition of kerbside residual waste and mixed recycling<sup>1</sup>. The results from individual WCA studies are used by local authorities to assess their services current performance (e.g. recycling capture, contamination), assess the success of pilots, and inform the development of new services. Zero Waste Scotland uses the results from individual WCA studies to produce national estimates<sup>2</sup> which go on to inform national-scale policy analysis.

The data produced from WCA can be a great investment where reliable and contemporary measurements of composition are desirable. However, WCA is not an appropriate technique for some evidence requirements. For example, many aspects of kerbside recycling performance can be understood through the more frequent monitoring of round tonnages. The data supplied by waste service partners and that reported on waste data flow also has its place in a monitoring toolkit.

WCA studies of kerbside waste are typically delivered by contractors on behalf of local authorities. The measurement phase of WCA is a specialist technique and should be done by experienced organisations with the appropriate health and safety controls in place. The exact roles and responsibilities of contractors and local authorities can vary from study to study. Contractors sometimes take a lead role in the design phase of the study, this guidance places much greater emphasis on the role of the local authority in study design. Contractors deliver the physical analysis of waste and report study findings.

We can only sample a very small portion of the total waste produced by households in a local authority each year. WCA involves a series of trade-off's between factors that impact on study cost and the variability in composition estimates. Conducting analysis during one or two weeks is also a snapshot in time. The nature and quantity of waste set out at the kerbside is also subject to factors such as householder participation, service provision, demographics and materials used in the home. A well-designed study that follows this guidance can smooth out some of this variation and improve our confidence in study findings.

## 1.5 Zero Waste Scotland support for household waste composition analysis

Zero Waste Scotland last supported a co-ordinated programme of household waste composition analysis (WCA) during 2013-15. Our support consisted of a financial contribution to the project and technical advice and support for project delivery. A methodology guidance document<sup>3</sup> was used to support a more consistent approach to study design, which in turn meant that individual studies could be used in national analysis.

At the time of writing (December 2020) Zero Waste Scotland is developing a new WCA programme for household waste starting from April 2021. The programme is likely to include a financial contribution for individual local authorities and targeted technical support. The core requirements identified in this updated version of the guidance will form the basis of grant agreements with local authority partners.

To reduce the burden of individual procurements Zero Waste Scotland plans to develop a contractor framework with Scotland Excel. The technical requirements in the Scotland Excel framework process will also refer to this guidance document.

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<sup>1</sup> The composition of dry mixed recycling collected by local authorities is currently reported under the materials recovery code. However, site inputs are reported as the % target, non-target, non-recyclable, rather than the more extensive material category lists typically used in household waste composition analysis.

<sup>2</sup> [Zero Waste Scotland - The composition of household waste at the kerbside in 2014-15](#)

<sup>3</sup> [Zero Waste Scotland - Guidance on the Methodology for Waste Composition Analysis, 2015](#)

To complete a quality WCA study requires a significant time commitment from local authority staff. Contracting out the physical analysis of waste does not mean there is no input required from the local authority. It is important for local authorities to take the time to understand the requirements described in this document before committing themselves to the funding provided by Zero Waste Scotland.

## 2 Summary requirements for Zero Waste Scotland-funded studies

This section summarises the key requirements for the delivery of WCA studies supported by Zero Waste Scotland. Further details on each topic are provided in the sections indicated.

Project scoping prior to procurement	Section reference
Local authorities are required to carry out a scoping phase prior to any procurement activity.	3

Project management	Section reference
A single person from Zero Waste Scotland, the local authority and the WCA contractor will be identified as the designated point of contact for the project.	5.1
The WCA contractor will organise and attend a project inception meeting	5.5

Waste sampling design	Section reference
Household waste sampling will be based on a stratified design that places individual households into much larger groups of households with broadly similar characteristics (“street blocks”).	6.3
The household sampling design will be based on the Office of National Statistics (ONS) output area classification system (OAC), alongside the local authorities’ own data on households and waste services.	6.3.2
A minimum of five street blocks should be identified in the sampling design. Each street block should initially contain seventy-five households. A minimum of fifty households-worth of residual waste should be collected for each street block and sorted in full.	6.5
Prior to commissioning, local authorities are required to review their round tonnage data and provide a typical weight of residual waste collected per household within a given collection cycle.	6.5
Multi-occupancy dwellings should be considered for inclusion in the household sampling design where they make up a significant proportion of the total housing stock.	6.7
The minimum requirement is for a single phase of sampling to take place during either February to June or September to November.	6.8
Analysis of residual waste and a single dry recycling service are to be included as standard in the project specification	6.9



The collection of waste	Section reference
The WCA contractor will produce a methodology protocol	7.1.1
The WCA contractor will be produce a waste sorting protocol	7.1.2
The WCA contractor will produce a data management plan	7.1.3
The collection of waste and transport to the sort site will be carried out by local authority staff and vehicles, with the support of the WCA contractor fieldwork supervisor	7.1.4
The WCA contractor will work with the local authority to complete suitable risk assessments of all activities	7.1.5
All staff carrying out the collection and sorting of waste must receive appropriate training to ensure they are competent to carry out their appointed tasks safely and according the methodology agreed	7.1.5 & 7.1.7
The local authority will be responsible for any communication with householders and ensuring local authority staff are aware of the study	7.1.7
The local authority will arrange for a suitable sort site for the WCA contractor to work at	7.1.8
Residual waste and recycling will be collected according to a set of standardised procedures	7.2.1

The sorting of waste	Section reference
The WCA contractor will sort waste according the agreed waste sorting protocol	7.3 & Appendix B
For each waste stream analysed the waste from each street block of fifty households will be combined and sorted as a single sample at the sort site by the WCA contractor	7.3
For each waste stream analysed the waste from each street block of fifty households will be sorted and weighed in full by the WCA contractor	7.3
The WCA contractor will sort waste using a standardised category list	Appendix A
The WCA contractor must ensure all their activities are as a minimum in compliance with data protection legislation	7.3
The WCA contractor is responsible for planning and implementing accurate record keeping associated with the waste sort, according to the protocols agreed with the local authority	7.3

The local authority is responsible for visiting the sort site during the study to verify the waste sort is being conducted according to the agreed protocol	<b>7.3</b>
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<b>Reporting and analysis</b>	<b>Section reference</b>
The WCA contractor will provide quality assured, raw, unadjusted (kg) waste composition datasets produced from the sort, for review by the local authority and Zero Waste Scotland	<b>8.1</b>
The WCA contractor will provide supporting data to accompany each waste composition dataset	<b>8.1</b>
The WCA contractor will produce a short (2 pages max) exception report which summarises any exceptions to the methods defined in this guidance	<b>8.1</b>
The WCA contractor should allow for up to two rounds of clarifications and checks of project outputs by Zero Waste Scotland or the local authority	<b>8.1</b>
The WCA contractor is not required to produce a standardised full technical report on the project for the local authority	<b>8.1</b>
The local authority will provide data to Zero Waste Scotland on the target and non-target wastes for their service and annual tonnage data	<b>8.2</b>
The local authority will review the agreed outputs for the project where required providing up to two rounds of comments	<b>8.2</b>
Zero Waste Scotland will review the raw, unadjusted waste composition dataset supplied by the WCA contractor, providing comments for the WCA contractor to respond to.	<b>8.3</b>
Zero Waste Scotland will translate the raw, unadjusted weights of waste into annual estimates of kerbside composition for the local authority, which will be supplied to the local authority in a standard template	<b>8.3</b>

### 3 Project scoping prior to procurement

**Local authorities supported by Zero Waste Scotland must carry out a project scoping and planning phase prior to conducting a procurement exercise. This is by far the most important part of the project and is used to define the study objectives and identify what's required to deliver them.**

This guidance document is designed to support local authorities in the scoping and planning process. Zero Waste Scotland also anticipates being involved in planning phase discussions with local authorities as part of our financial and technical support.

The scoping and planning phase should involve:

- Development of study objectives (Section 3.1 below)
- Reviewing whether new waste composition data is required (Section 3.2 below)

The remaining sections of this guidance should then be reviewed to ensure the projects requirements are clearly understood and specified. These sections are:

- The procurement of a WCA contractor (Section 4)
- Planning how the project will be managed (Section 5)
- Planning the waste sampling design (Section 6)
- Reviewing the requirements for the collection and sorting of waste (Section 7)
- The reporting of study findings (Section 8)
- Reviewing how waste will be categorised (Appendix A).

#### 3.1 Study objectives

Defining your study objectives is probably best thought of as a set of questions you are trying to answer. Typical questions that WCA is used to inform include:

- How much recyclable and non-recyclable waste is collected in total from kerbside services?
- How much recyclable waste is currently captured for recycling or composting? How much remains in the residual waste bin?
- How much contamination (non-target and non-recyclable) is there in recycling services? What are the most common contaminants?
- For all the above, do these factors vary significantly by geography or service type?
- What is the likely impact of a planned change in service?
- What is the impact of intervention x or y on recycling performance?

Once you have defined these questions, this should help you scope the specific requirements for your project. You will need to revisit these questions as part of scoping to prioritise what's essential versus what's desirable so that you manage study scope and costs.

## 3.2 Is new WCA data required?

You should firstly review the information you have available from previous WCA studies. Do you have previous composition data that likely reflects a current service? Or has the service changed significantly since the last study?

Even if you have no data reflective of current services, not all waste streams might require detailed compositional analysis. For example, because of its highly segregated nature the composition of a kerbside glass box collection might be estimated using data from a previous study.

Where local authorities request funding from Zero Waste Scotland, they will need to identify a clear gap in current WCA data. Assuming new analysis is required, careful prioritisation of which waste streams are sampled and how they are sampled will be required to deliver a cost-effective study.

## 4 Procuring a WCA contractor

As part of developing a new WCA programme for household waste, at the time of writing in December 2020 Zero Waste Scotland is working with Scotland Excel to develop a framework for suppliers of waste composition analysis.

A framework approach supported by clear project specifications and this guidance document should be a more efficient and consistent method for procuring suppliers for individual local authority studies.

The requirements developed under the Scotland Excel framework will lean heavily on this guidance document.

## 5 Project management

Good project management is key to delivering a successful WCA project. For projects supported by Zero Waste Scotland, each project will involve a local authority, a WCA contractor and Zero Waste Scotland. It's important that all partners clearly understand their individual roles and responsibilities.

The section below provides an overview of:

- Project inception
- Communication arrangements within the project team
- Key roles and responsibilities for each project partner

This section is not intended to describe in detail the tasks for each part of a project, that is done elsewhere in this guidance document.

### 5.1 Project inception

The inception meeting should be attended by the Local Authority manager, the WCA contractor manager and other members of the local authority team as required. It is very important to the success of the project that there is good co-ordination between the WCA contractors and the waste service team, so the inception meeting is a good point to establish contact. A representative from the Local Authority waste operations/services team should therefore attend.

The following topics should be covered at project inception:

- Project timescales including sample collection and sorting, data analysis and reporting
- Project team communications including co-ordination between contractors and waste service teams

- Risk assessment and Health and Safety
- Household sampling plan
- Methodology protocol document
- Data management plan
- External communications with householders
- Collection arrangements including determining days of sample collection and normal collection times
- Sort site location, site working practices, arrangements for waste disposal post-sorting, including which waste streams will be recycled.

## 5.2 Communication within the project team

It is important to establish good communication within the project team. A single person from Zero Waste Scotland, the local authority and the WCA contractor will be identified as the designated point of contact for the project. That person will co-ordinate the required input from their organisation to ensure projects are ran smoothly and in good time.

The Zero Waste Scotland designated contact will be responsible for:

- Arranging and attending meetings with the local authority prior to commissioning a contractor to discuss their project and Zero Waste Scotland support
- Arranging for the required input of Zero Waste Scotland staff and contractors at any stage of the project.

The local authority designated contact will be responsible for:

- Providing the WCA contractor with contact details for the local authority project manager including mobile phone and email.
- Providing the WCA contractor with contact details for the facility manager at the sort site.
- Providing the WCA contractor with contact details for the waste operations/service team. The WCA contractor must be able to check the day before collection that the collection crews have been briefed on which households will be involved in the study.
- Providing regular updates to the waste operations/services team.
- Responding to requests from the WCA contractor within an agreed timeframe.

The WCA contractor designated contact will be responsible for:

- Scheduling a project inception meeting and regular project catch-ups with the local authority manager.
- Providing the Local Authority manager with contact details for the contractor project manager and fieldwork supervisors including mobile phone and email.
- Providing regular updates to the Local Authority manager during fieldwork. These should highlight any issues arising and should, at a minimum, be weekly. Daily contact may be necessary to ensure issues are quickly resolved and do not impact on subsequent collections.
- Providing regular updates to the Local Authority manager, e.g. weekly, during the project.
- Responding to requests from the Local Authority manager within an agreed timeframe.

### 5.3 The roles and responsibilities of Zero Waste Scotland

Zero Waste Scotland will provide financial and technical support to local authority commissioned projects. In return for our investment, Zero Waste Scotland will have access to individual local authority datasets that have been produced using a standardised, repeatable methodology. Zero Waste Scotland can then produce reliable national-scale estimates of household waste composition, which we use in subsequent analysis.

Zero Waste Scotland will:

- Arrange and attend meetings with the local authority prior to commissioning a contractor to discuss their project and Zero Waste Scotland support.
- Agree the financial support to individual projects as part of the grant agreement. The grant agreement will refer to the technical requirements set out in this document. This is to ensure that Zero Waste Scotland's objectives are fulfilled. We will also discuss any additional technical support that may be required.
- Provide a designated contact within Zero Waste Scotland. Their role will be to ensure that Zero Waste Scotland objectives are met for each project. They will establish and manage grant agreements and payments. They will also provide a quality assurance role and liaise with the local authority as required throughout the project. They will also arrange for any additional technical support that may be required. They may interact with the WCA contractor on specific topics if this would be beneficial to the project, but the local authority is expected to manage the WCA contractor on a day-to-day basis.
- Provide an analyst to work with the local authority to develop the household sampling design. The analyst will also gather information from the local authority on which materials are targeted in each waste stream to support capture analysis. On completion of waste sorting by WCA contractors, the analyst will collect, and quality assure the data produced by the WCA contractor. They will combine sample data with other waste composition datasets and waste data flow tonnages to produce an annual kerbside waste composition estimate for each participating local authority. This dataset will be supplied back to local authorities in a standard template.

### 5.4 The roles and responsibilities of the local authority

The local authority will be responsible for the overall management of their study. They will commission a contractor to conduct waste analysis, and provide the required logistical support, data and information to support delivery of the project.

The local authority will:

- Provide a single individual within the local authority team who has responsibility for managing the grant agreement with Zero Waste Scotland and the contract with the WCA contractor. They will be responsible for co-ordinating the appropriate staff and resources from within the local authority to support delivery of the project. They should also arrange for the draw-down of grant funding from Zero Waste Scotland and the payment of WCA contractors. They should also be the point of contact for local authority colleagues, Zero Waste Scotland and WCA contractors.
- Work with Zero Waste Scotland to develop a project specification prior to procurement.
- Commission a WCA contractor through an agreed procurement route.
- Work with the Zero Waste Scotland data analyst when producing the household sampling plan, sourcing data and information to help with that process.
- Arrange for the attendance of the required local authority staff at the inception meeting

- Review, comment and sign off the WCA contractor's methodology protocol and data management plan.
- Arrange the use of a suitable local authority waste management site for sorting waste
- Arrange for the collection and delivery of sampled waste to the sort site
- Arrange the disposal and recycling of waste following sorting
- Provide data on target and non-target materials for their service and annual tonnage data to support the production of annual composition estimates
- Review the WCA dataset produced from the study and any other outputs specified.

## 5.5 The roles and responsibilities of the WCA contractor

The WCA contractor will:

- Organise and attend a project inception meeting
- Identify any information that the local authority is required to provide in the form of a data request or similar
- Develop a methodology protocol document
- Develop a waste sorting protocol
- Develop a data management plan
- Mobilise a fieldwork team to conduct physical analysis of kerbside collected waste
- Supply study data to the local authority and Zero Waste Scotland.

## 6 Waste sampling design

### 6.1 Introduction

Waste composition analysis is relatively expensive to carry out at scale, so a cost-effective WCA study relies on a relatively small sample of waste when compared to how much waste is produced each year. Careful consideration is required when designing how waste will be sampled. This is a crucial planning step prior to commissioning and arranging the collection and sorting of waste.

This section describes the key sampling design requirements for studies supported by Zero Waste Scotland. These are:

- Deciding which households to sample waste from
- The number of “street blocks” and number of households in each street block
- The selection of street blocks for waste sampling
- The inclusion of multi-occupancy dwellings
- The number of times waste is sampled in a project
- The waste services to be sampled

The objective of defining these requirements is to deliver a cost-effective and representative sample of waste composition for a local authority and produce data that is suitable for use by Zero Waste Scotland. These requirements should be considered before a local authority commissions a project, as they could influence any specification to potential contractors.

Section 7 goes on to describe the requirements for the collection and sorting waste.

### 6.2 Factors influencing the composition of kerbside waste

A number of key variables will influence the composition of the kerbside waste stream (Table 1 below). These variables will need to be considered (‘controlled for’) in the sampling design. The sampling design should aim to account for as many of the most relevant variables as possible. These variables are related to one another (for example, disposable income and housing type).

Some of these variables will apply across all local authorities. For example, families with young children tend to produce very different types and quantities of waste when compared to a retired household. Other variables such as waste service characteristics tend to be more specific to a given local authority. The sampling design should also consider variables such as season and holiday periods.



**Table 1: Factors that influence the quantity and composition of the kerbside waste stream**

Factor	Examples and notes
Socio-economic	The profile of waste arisings differs depending on a household's disposable income and lifestyle.
Demographic	The age and structure of a household: households with children will have a different waste profile to those without; household size influences waste per capita and waste per household e.g. smaller households typically have more waste per capita.
Housing type	Closely linked to socio-economics, demographics and service provision. High density properties will also present practical challenges for waste sampling.
Season, weather, holiday periods	The seasonality of garden waste, glass during festive season, carbonated drinks containers in warm weather, empty properties during holiday periods.
Waste service characteristics	Services in place, materials targeted, collection frequency, containment capacity, local by-laws and proximity to HWRC and bring sites.

### 6.3 Which households should be sampled?

We cannot analyse the waste produced by all households in a local authority area, so a much smaller sample of households must be selected and assumed to be reasonably representative of the whole local authority area. This is termed the household sampling design. A good household sampling design is essential to delivering a representative sample of waste.

**For studies supported by Zero Waste Scotland, sampling of household waste collected at the kerbside will be based on a stratified design that places individual households into a much larger group of households with broadly similar characteristics.**

Once the most commonly occurring groups have been identified a sample of households that falls into each of the commonly occurring groups will have their waste sampled. We refer to each group of sample households as a "street block", since samples are typically taken from a single street or a small number of adjoining streets.

The advantage of a stratified design is that fewer waste samples should be required overall, as the waste produced by households in each stratum should be less varied than would be the case from a completely random sample of households. A stratified design also means we can produce a reasonable estimate of waste composition for a given group, which can then be used to produce a weighted estimate of whole local authority composition.

#### 6.3.1 Methodology for grouping households

Identifying the most commonly occurring household groupings requires the use of socio-demographic datasets. The previous version of this guidance document did not prescribe a single methodology and described the pros and cons of the various options available.

Zero Waste Scotland does not consider council tax bands as a suitable method for household sampling design. During the last programme, Zero Waste Scotland also experienced significant licensing restrictions for studies based on commercial socio-demographic datasets, which limited the cost-effectiveness of Zero Waste Scotland support.

**For future studies supported by Zero Waste Scotland, the household sampling design will be based on the Office of National Statistics (ONS) output area classification system (OAC)<sup>4</sup>, supported by the local authorities' own data on households and waste services.** This will improve comparability, compatibility, and the cost-effectiveness of Zero Waste Scotland funding. Zero Waste Scotland anticipates providing dedicated analyst support to help local authorities with their household sampling design.

### 6.3.2 *Office for National Statistics-output area classification*

The output area classification (OAC) is a publicly available geo-demographic classification of the Census Output Areas published by the UK Office for National Statistics (ONS). It is based upon the UK Census of Population 2011 and classifies 41 census variables into a three-tier classification of seven supergroups, twenty-one groups, and fifty-two sub-groups.

The data reflects area type and socio-economics and is free to use and not subject to licensing restrictions. It also simplifies waste collection as households are grouped by output area. The eight super-group classifications can however make it hard to identify a smaller number of household groups for waste sampling. The output areas also contain a mix of housing types and it should not be assumed that all properties within the “flatted property” categories are in fact flatted properties.

Some WCA contractors have experience of using OAC for WCA studies, others will be more familiar with the use of commercial socio-demographic datasets. Zero Waste Scotland has previously produced detailed guidance<sup>5</sup> on the use of the OAC system alongside local authority data on services and housing. During any future programme, Zero Waste Scotland also anticipates providing dedicated analyst support to help local authorities with their household sampling design.

The key points to bear in mind with the use of OAC are:

- The OAC methodology should not be used in isolation – the additional local authority data detailed below should be an important component of the overall sampling design.
- The OAC methodology requires an electronic record of collection routes by individual address. This information should be held in one Microsoft Excel file, available as an extract from the routing software/database, where each address has a record of the postcode, collection day and collection route name.
- The OAC methodology requires working with multiple datasets in Excel, including the use of 'lookup' and 'sumif' formulas and pivot tables – the methodology is reliant on good data handling and analysis.

### 6.3.3 *Use of additional local authority data alongside OAC*

Although the OAC methodology represents the best open data source with which to base household sampling, it is largely an indicator of the character of an area and its population. OAC does not fully account for additional variables such as rurality, property type and service provision. These additional variables are summarised below. Further details on practical application through worked examples can also be found in the separate guidance document referred to above.

#### *Rurality*

The description of rurality within the OAC does not align with the Scottish Government classification of rurality, which defines an authority's collection service obligations according to the Waste (Scotland)

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<https://www.ons.gov.uk/methodology/geography/geographicalproducts/areaclassifications/2011areaclassifications/abouttheareaclassifications>

<sup>5</sup> [Zero Waste Scotland - A standard methodology for household sampling, 2017](#)

Regulations. Where such considerations are relevant (e.g. food waste collections) it will be necessary to integrate OAC data with the Scottish Government 6-fold Urban Rural Classification.<sup>6</sup>

#### *Property type*

The OAC categories do not correspond to a particular property type. Given local authority services sometimes vary by property type, this suggests information on property type should also be included in the sampling design.

Publicly available housing type information is available from Scottish Neighbourhood Statistics at data zone level and covers detached, semi-detached, terraced and flatted properties. However, distinctions between multi-occupancy high rise, tenements and 4-in-a-block type properties are not made.

The definition of flatted properties in the Scottish census data makes no distinction between flats with a communal entrance (e.g. tenements) and a four-in-a-block style apartment, each flat with their own door. As the collection service for four-in-a-block style apartments is more likely to correspond to own-door services (e.g. possibly including a garden waste collection) additional local authority data on property type should be used to supplement OAC.

#### *Variation in collection service*

Where a significant proportion of households receive a different collection service, the sampling design should integrate that difference. Rurality and property type often determine the type of services in place. If after considering those two variables you are still left with a significant proportion of households who have a different service, it will be necessary to combine OAC data with local authority service data.

## 6.4 How many street blocks?

During the last WCA programme supported by Zero Waste Scotland, individual studies typically used five street blocks in their sampling design.

There are clear trade-offs between study cost and the number of street blocks used. More street blocks should mean a more representative sample overall, but each additional street block significantly increases the quantity of waste to sort and project costs. Once the most commonly occurring household groups have been included in the sample design, there is also likely to be a decreasing cost benefit from the inclusion of each additional group.

**For studies supported by Zero Waste Scotland, a minimum of five street blocks should be identified in the sampling design.** By exception there may be a justification for using more than five street blocks where there is particularly marked variation in socio-demographics, property type and collection services.

## 6.5 How many households in each street block?

Waste samples should be taken from each street block on a quota basis using a set minimum number of households for each street block. A larger number of households will significantly increase the quantity of waste to sort and the number of operatives required to sort through waste within a given timeframe. A smaller number of households will reduce the quantity of waste to sort but increase the likelihood that sampled households are not representative of the household grouping. The number of households set as a minimum requirement is another compromise between project costs and coverage.

**For studies supported by Zero Waste Scotland, a minimum of fifty households worth of residual waste should be collected and analysed for each street block. This will require a**

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<sup>6</sup> [Scottish Government - Urban Rural Classification, 2016](#)

**minimum of seventy-five individual household addresses to be identified in the sampling plan (to allow for some drop off).**

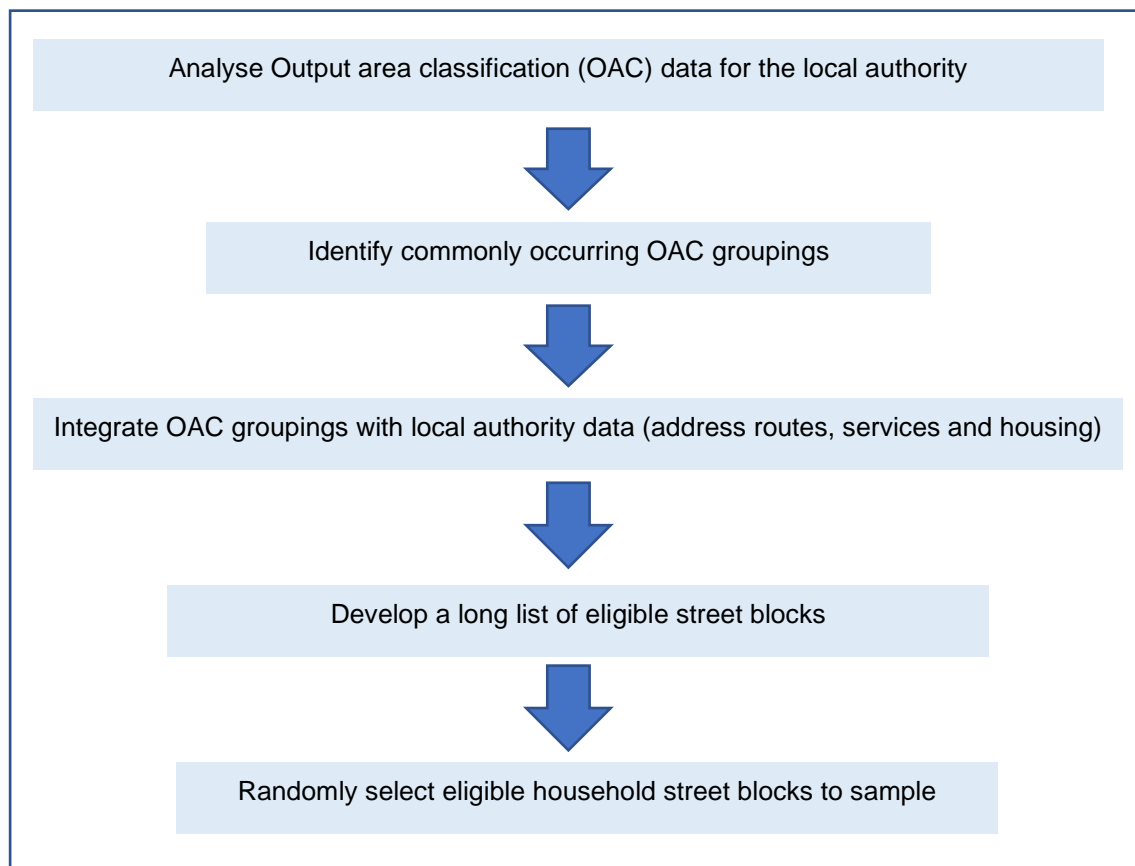
Experience from the last programme supported by Zero Waste Scotland suggests fifty households per street block is a reasonable requirement based on a typical fortnightly residual waste collection. For local authorities operating a three weekly residual waste service or longer, analysis of their service could be more expensive to commission and deliver, due to an increased quantity of residual waste to sort.

All local authorities will have round tonnage data that can be used to estimate a typical weight of residual waste collected per household within a given collection cycle. If this information is provided as part of the procurement exercise, WCA contractors should be able to plan and cost accordingly.

**For studies supported by Zero Waste Scotland, prior to commissioning, local authorities are required to review their round tonnage data and provide a typical weight of residual waste collected per household within a defined collection cycle.**

## 6.6 Selection of household street blocks for sampling

Section 6.3 provided an overview of the process for developing household street blocks from which to sample waste, which is covered in much greater detail in the accompanying guidance document on household sampling<sup>7</sup>. To avoid repeating the contents of that guidance document only key principles are provided below. Figure 2 below summarises the steps that are required to get to a final list of addresses for waste sampling.



<sup>7</sup> [Zero Waste Scotland - A standard methodology for household sampling, 2017](#)

## Figure 2: key steps in the methodology for selecting households

Each street block should be selected to represent the most commonly occurring OAC groups. The OAC analysis should then be integrated with additional data on housing and waste services.

Once the most commonly occurring household groupings have been identified, there will be many of that grouping that could be selected for waste sampling. A selection process is therefore required to get to a minimum of five street blocks.

To avoid creating an impractical sampling plan, selecting the household street blocks to sample waste from must balance a truly random selection process with practical considerations. For example, a random process might select individual households for allocation to a larger street block where their waste is collected on different days. This scenario would mean waste from a single street block would have to be collected and analysed on different days, which is impractical. The selection process must therefore use additional selection criteria, which are detailed below:

- Each eligible street block should be sufficiently large for samples of fifty households residual waste to be achieved. The final list of addresses for sampling should contain at least seventy-five properties in a street block, to allow for a residual set out rate significantly less than 100%.
- Each eligible street block should contain households serviced by the same collection round/round day (residual and recycling services).
- Each eligible street block should be sampled on a different day of the week.
- Each eligible street block should be an operationally manageable area, a single street or streets adjoining one another.

There are however opportunities to incorporate an element of random selection of the street blocks for sampling and this should be adopted in Zero Waste Scotland studies. Further details of how this should be done are provided on page 30 of the household sampling methodology guidance.

## 6.7 Inclusion of multi-occupancy dwellings

Multi-occupancy dwellings should be considered for inclusion in the household sampling design where they make up a significant proportion of the total housing stock in a local authority. However, the diverse nature of how waste is stored, collected and transported for different types of multiple-occupancy dwellings can present significant challenges to delivering a reliable and cost-effective WCA study.

For the purposes of this WCA guidance we separate “multi-occupancy dwellings” into 4-in-a-block type properties, tenements and purpose-built blocks of flats (the latter varying in the number of storeys).

Four-in-a-block type properties contain four homes, two upper and two lower level, each with their own external door. They are usually provided with the same individual bins and collection rounds as detached, semi-detached and terraced properties and can usually be integrated into a kerbside sampling design with minimal adjustment.

The variation in collection services provided to tenements in Scotland and the impact of that variation when it comes to sampling for WCA requires a bespoke project plan to be developed.

Purpose built flats also present some unique challenges to conducting WCA (e.g. container sizes and collection frequency). For both tenements and purpose-built flats services may be that different from own door properties that they merit a separately commissioned project. However, some of the standardised requirements elsewhere in this document will still apply (e.g. scoping stage, sampling design, material categorisation).

If local authorities wish to include multi-occupancy dwellings in their sampling design this should be considered at the scoping stage in order to identify any additional requirements. Some of the key

practical challenges for different types of multi-occupancy properties and mitigation measures are described in Section 7.2.3.

This guidance cannot cover every possible permutation of housing and service. Individual local authority data on housing stock and collection routes, and the knowledge and experience of operational staff will be critical in determining the type of adjustments that might be required.

## 6.8 How many phases should waste be sampled over?

Some waste types show marked seasonal variation in how much is produced by households. Examples include garden waste, food waste, drinks containers and DIY waste.

During the last Zero Waste Scotland programme, ten of the eighteen studies used in final national estimates used two distinct phases of waste sampling (see Table 2 below). Christmas and summer holiday periods were avoided. However, the use of two phases also increases the cost of individual studies and will reduce the overall budget available for a national programme.

During the last Zero Waste Scotland programme, there was relatively little variation in the quantity of residual waste between phases (Table 2 below), which would suggest that a single sampling phase during a spring or autumn period could be adopted. We also know there is significant variation in waste composition *between* local authorities, reflecting several local factors that influence waste composition. For a national programme it may be better to prioritise completing a greater number of local authority studies, when compared to completing two phases of sampling within each study.

**For future studies supported by Zero Waste Scotland, the minimum requirement is for a single phase of sampling to take place during either February to June or September to November.**

**Table 2: the quantity of residual waste analysed (kg/hhld/week) during two distinct sampling phases of WCA during the previous programme supported by Zero Waste Scotland.**

	February	March	May	June	September	October	November
Angus		5.0					4.6
East Ayrshire		6.9		7.6			
Edinburgh, City of		5.9					6.8
Glasgow City		8.9					10.4
Highland				9.9		9.0	
Midlothian	9.7				9.1		
Perth & Kinross		7.5					7.0
South Ayrshire		9.1					9.6
South Lanarkshire			12.0				10.8

## 6.9 Which services should be included in sampling?

The decision over which services to analyse should be driven by the study objectives (see Section 3.1). For example, if you wanted to understand the current capture of glass bottles at the kerbside, you would need composition analysis of residual and dry recycling services. Alternatively, if you were interested solely in the degree of contamination in a recycling service, you might choose to sample only that service.

The waste streams you wish to sample will be influenced by the design of your services, which varies significantly across Scottish local authorities (and sometimes within individual local authorities). It is beyond the scope of this guidance to illustrate every possible variant of kerbside services in Scotland.

In practice it is not cost-effective to conduct waste composition analysis of every service a local authority operates.

**For studies supported by Zero Waste Scotland, a residual waste and dry recycling service should be included in the sampling design.** This is to ensure that enough local authority residual waste and dry recycling streams are sampled during the Zero Waste Scotland programme to produce reliable national estimates. This also means the local authority can evaluate kerbside dry recycling performance. Zero Waste Scotland will consider funding the analysis of additional recycling services, subject to a review of available data.

For local authorities running a commonplace fortnightly residual and single dry mixed recycling bin this is reasonably straightforward to implement. For local authorities that provide more than one dry recycling collection or wish to include additional recycling services this will add complexity to the sampling design.

Zero Waste Scotland will discuss the specific requirements with each local authority as part of developing the project specification.

Section 7 below provides further requirements and guidance for the collection and sorting of waste.

## 7 The collection and sorting of waste

### 7.1 Planning required before waste is collected

Between project inception and when waste is collected and analysed a significant amount of preparation is required to ensure waste collection and analysis runs smoothly. This section describes the preparation required and the roles and responsibilities of each project partner.

#### 7.1.1 *Methodology protocol*

The WCA contractor will draft a methodology protocol document that is circulated and signed off by the local authority. Ideally a draft should be circulated prior to the inception meeting, but alternatively can be circulated after the inception meeting after aspects of project delivery have been agreed. The protocol must be finalised well in advance of any waste collection and analysis.

The minimum requirements for projects supported by Zero Waste Scotland are:

- Communication arrangements including contact information
- Confirmation of project aims and objectives
- Waste streams being collected
- Sample collection details
- Confirmation of waste categories
- Waste sorting protocol -
- Health and Safety procedures

#### 7.1.2 *Waste sorting protocol*

**The protocol for sorting waste should be agreed between the local authority and WCA contractor, prior to the collection of waste.** A standard sorting protocol is provided in Appendix B: Standard household waste sorting protocol.

The local authority will work with the WCA contractor to agree the waste sorting protocol. The WCA contractor will be responsible for producing the sorting protocol and finalising with the local authority.

#### 7.1.3 *Data management plan*

The WCA contractor will draft a data management plan that is circulated and signed off by the Local Authority. The plan must contain a clear statement on the following points:

- Compliance with the Data Protection Act
- How datasets collected will be stored
- How datasets will be transferred between the WCA contractor, Local Authority and Zero Waste Scotland
- Confirmation of dataset format and content

#### 7.1.4 *The collection and transport of waste*

**The collection of waste and transport to the sort site will be carried out by local authority staff and vehicles, with the support of the WCA contractor fieldwork supervisor.**



The local authority will be required to arrange staff and vehicles and liaise with the WCA contractor fieldwork supervisor.

If an individual local authority requires the WCA contractor to collect and transport waste, the procedures for waste collection set out in Section 7.2.2 are the same regardless of who does it and must be specified in any procurement exercise.

**Waste must be transported to the sort site separately from the normal refuse collection vehicles.** Individual studies in the past have sometimes sampled household waste from bulk loads of waste, at the point where a refuse vehicle is emptied. This approach is cheaper but unsuitable for studies supported by Zero Waste Scotland. This is because it is hard to know which households have produced the waste, trade waste can be included, and compacted waste cannot be effectively sorted.

To support the planning for the collection of waste the WCA contractor will:

- Work with the Local Authority to produce a collection schedule detailing the addresses to be used, the number of households and collection times, details of the size or number of bins used by the household and reserve households.
- The collection schedule should be designed to record information on the day of collection (e.g. set out, household type and bin fill level).

To support the planning for the collection of waste the local authority will:

- Work with the WCA contractor to produce a collection schedule
- Carry out a site visit prior to waste collection to establish suitable collection routes, gather information on potential access issues (e.g. shared driveways, location of service buzzers to access bin storage areas) and confirm collection points.
- Ensure that the normal waste collection crews are aware the study is taking place and the routes on which it is taking place.
- Provide the WCA contractor with details of the size and number of bins used by each household in the sample (including the reserve households).
- Provide the WCA contractor with details of any households within the sample that receive an assisted lift and the usual collection points.

### 7.1.5 *Health & safety procedures*

The local authority will be responsible for carrying out a suitable risk assessment of all planned activities, in accordance with internal protocols and procedures, prior to conducting the WCA.

The WCA contractor will be responsible for providing the following:

- Their health and safety policy
- Work with the local authority to complete suitable risk assessments of all activities
- Generate a health and safety procedure specific to the project covering at a minimum:
  - PPE
  - vaccinations
  - hygiene procedures
  - provisions for lifting and emptying containers
  - waste handling
  - sorting waste
- Circulate the Health and Safety procedure to the sort team. All sort operatives should sign a document to indicate they have read and understood the health and safety procedures.
- Provide written incident reports to the local authority within 24 hours.

Where local authorities use a three or four-weekly residual waste service additional health & safety considerations apply:

- Consideration of the collection frequency must be included in the risk assessment procedure
- Contractor sort team members should be provided with suitable mask protection during collection and sorting
- Contractors should consider the need for exhaust air extraction depending on local circumstances.

Further information can be found in the research report 'The potential health impacts of reducing the frequency of non-recyclable waste collections'<sup>8</sup>.

### 7.1.6 *Staff training and supervision*

All staff carrying out the collection and sorting of waste must receive appropriate training to ensure they are competent to carry out their appointed tasks safely and according to the methodology agreed.

The WCA contractor will provide an experienced fieldwork supervisor for each sort team. A ratio of one supervisor to two sort team operatives is typical. A lower level of supervision may be acceptable in some circumstances e.g. when collecting waste from large containers.

The WCA supervisor will provide an appropriate level of supervision for the sort team and keep levels of supervision under review. The supervisor will be responsible for ensuring their sort team is aware of the health and safety procedures.

The WCA supervisor should provide the sort team with copies of the methodology protocol and ensure the completion of any documentation required by the local authority site manager e.g. register of attendance.

The WCA supervisor will conduct a briefing for the sort team prior to fieldwork commencing, which should cover:

- Reasons for the study
- The importance of high-quality data
- Health and safety procedures
- Collection arrangements
- The methodology protocol including waste classifications

### 7.1.7 *Communication with householders and crews*

The local authority will be responsible for:

- Deciding whether residents should be informed in advance of fieldwork being undertaken (see box 1 below).
- Briefing local authority call centre staff and providing a set of 'frequently asked questions' to help answer questions from householders
- Informing collection crews on which routes are going to be included in the analysis.
- Informing other local authority staff
- Informing local police of where and when the study is taking place.

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<sup>8</sup> [Zero Waste Scotland - The potential health impacts of extending the frequency of non-recyclable waste collections, 2014](#)

- Providing the WCA contractor with letter headed paper authorising the collection and explaining the study. This letter can be given to householders in case of queries during collection.

The WCA contractor will be responsible for:

- Ensuring crews wear appropriate clothing including identification badges and high visibility jackets. The uniform should be like that used by the normal collection crew.
- Ensuring collection staff and vehicles (if applicable) carry clear identification markings.
- Ensuring collection staff respect any householder who approaches them and does not wish their bin to be included in the study.
- Providing a supervisor for each collection crew who is briefed to answer questions from householders.

### 7.1.8 *Arranging the sort site*

**For projects supported by Zero Waste Scotland we require the local authority to arrange for a suitable sort site for the WCA contractor.**

During the last WCA programme supported by Zero Waste Scotland local authorities typically arranged a site for the sorting of waste by the contractor. This approach is standard practice for most household waste studies in Scotland and should be familiar to both local authorities and contractors. This approach reduces overall project cost when compared to the WCA contractor arranging a site and is therefore better value for public funds.

A suitable site is one in which the sort team can work efficiently and safely by adopting the following guidance. Local authorities should review the requirements set out below prior to a procurement exercise. Zero Waste Scotland will consider by exception a local authority which cannot provide a sort site, which will need to be specified in the procurement process so bidders can cost accordingly.

#### *Site selection*

The site should have a current waste management license and be licensed to receive the waste type to be sorted. The closer the site is to where the waste is collected from the better, as this maximises sorting time for the contractor and minimizes driving time. The sort area should be easily accessed by the vehicle used to transport the waste samples. The site location must allow for easy disposal and recycling, according to Local Authority's available services.

#### *Site layout and facilities*

The site should have enough space available for safe and efficient sorting of waste and storage before disposal/recycling. The space required will vary by contractor and project requirements, with contractors generally requesting a space between 36 and 100 square metres. The site should have a covered and enclosed sorting area to protect the sort team from birds, insects and the weather. This will stop waterlogging of waste, protect the weighing scales and prevent the waste blowing away and causing litter. The sort area should have a sealed concrete floor, facilities for cleaning the sorting area (water supply, hoses) and adequate natural light or electric lighting. The specification should say if it is not lit so temporary lighting can be included in costings. The site should provide use of a loading shovel.

#### *Working practices on site*

The sort area should be cordoned off from other heavy vehicles on site. The sort team should be provided with access to toilet and hand washing facilities. The sorting area and associated working areas should be well ventilated. The sort area and associated working areas should have suitable site security in place. The WCA contractor should be provided with the name of the site manager to ensure the required health and safety procedures are adopted

### **Box 1: Informing households about the planned study**

If a local authority decides to inform households in advance of the study this should take the form of a letter informing residents of the purpose of the study, how the data will be used, the arrangements in place to ensure security of personal information, and the timeframe within which fieldwork will take place.

It is important to highlight that results are anonymous and never linked back to individual households.

It may also be helpful to highlight that all waste collected for the study is subsequently dealt with responsibly (e.g. recycled waste is recycled).

Providing advance notice should reassure householders about the aims of the study and when they see waste being collected in a different way to normal.

However, providing advance notice will extend project timelines and increase costs and this should be planned for. Advance notice should be sent at least three weeks before fieldwork, preferably longer. The process for opting out should be simple and clear.

Both the local authority and the WCA contractor must ensure they have an appropriate procedure in place to avoid sampling households that choose to opt out.

From a research perspective, it is sometimes suggested that advance notice can change householder behaviour, and thus change WCA results. In practice, this is unlikely to make a significant difference in a well-designed and scheduled study.

## 7.2 Procedures during waste collection

### 7.2.1 *Collecting waste from own-door properties*

This section describes the waste collection procedures that should be adopted during studies supported by Zero Waste Scotland.

Waste collection and transport to sort site will be carried out by the local authority waste services team, under the supervision of the WCA contractor fieldwork supervisor.

**Residual waste will be collected in the first week of fieldwork regardless of the collection service in place.** The set-out for residual waste is generally higher than for dry recycling and organics, so this is the logical starting point for sampling.

**Residual waste and dry recycling must be collected from the same set of fifty households making up each street block.** This is to ensure a reliable capture rate can be calculated. In practice this could mean less than fifty households worth of dry recycling is collected and analysed if individual households do not set out their recycling bin. The set-out rate must be recorded so this can be controlled for during analysis. Collection of recycling may be on the same day as residual waste, or in one of the following weeks. In the latter case, the collection schedule should clearly record the households that were sampled for residual waste.

**The waste sample should be collected on the same day at a similar time as the normal collection.** The collection must include all side waste.

The collection schedule will be used to visit the first property on the schedule and then work forward until fifty households of residual waste has been picked up. Only genuine concerns about staff health and safety can justify missing out properties.

**The exact addresses and postcodes that are sampled should be recorded.** This ensures that the same households are collected in multi-week sampling. Additionally, accurate record keeping ensures that where households opt out of a study, they are indeed excluded. All address data recorded for this purpose should be handled in line with data protection rules.

**The set-out rate should be recorded for all collection services.** This is to ensure we know how many household's worth of waste the sample on any given day represents.

**The waste sample from each household street block should be clearly identified and kept separate** using a waterproof labelling so that it can be attributed to the appropriate household street block by the sort team at the sort site.

**Samples should be identified using a reference number and not the householder address,** to ensure the confidentiality of the household. The WCA contractor must ensure anonymity of households when sampling and recording.

**Any anomalies or significant events during sample collection should be recorded** e.g. bulky/HWRC type waste, unusually large numbers of bins, evidence of party waste, bin misuse from passers-by, side waste, and potential commercial waste.

If specified by the Local Authority, record the weight of any waste streams set-out that will not be sorted (e.g. food waste) so that the weight of the total waste stream can be calculated.

## 7.2.2 'What if' scenarios during waste collection

Box 2 below highlights some of the common 'on the ground' scenarios that WCA teams will encounter and details how these should be managed.

### Box 2: What if scenarios during waste collection

**What if side waste is presented?** All side waste should be collected along with the waste presented in the collection containers.

#### **What if the recycling is contaminated and would not normally be accepted by the Local Authority?**

Own-door: all recycling should be collected even if contamination is present.

Multi-occupancy - Contaminated bins should not be uplifted if according to collection policy they would not normally be collected i.e. would be collected as residual waste. Sampling crews should ensure during the residual uplift week that residual waste is only collected from blocks where the recycling containers are not excessively abused.

**What if a householder approaches the collection crew with an enquiry?** The collection team should be fully briefed on the study and have a letter on local authority headed paper to give out to any householder with questions about the study.

**What if a householder does not wish to take part in the study?** If householders have been given the choice of opting out prior to fieldwork a substitute household can be selected from the 'reserve' list in advance (see Section 6.5). However, if on the day of the fieldwork a householder approaches the collection crew and does not want to take part in the study their waste should be left on the kerbside, or returned to them if already collected, and the local authority's normal collection crew contacted to request that they collect the waste. A letter about the study, containing contact details of the local authority and/or the project team, should be given to them in case they wish to contact anyone later. The collection team should select a replacement household from the 'reserve' list.

**What if target waste stream for sampling e.g. residual waste, dry recycling, garden and food waste, has not been presented to kerbside at the time of collection?** During the first week of residual waste collection this household should be ignored, and a replacement selected off the 'reserve' list. During subsequent weeks if the waste stream is not presented a record should be made on the collection sheet; no replacement should be selected i.e. the aim is to collect all waste presented by the same set of 50 households per sample of which all have had residual waste collected. WCA contractors should not go onto private property to collect bins, unless this reflects how bins are normally collected by the local authority (e.g. an assisted collection).

**What if there are not enough 'reserve' households to make up for the households who have not presented their waste at kerbside?** This should be recorded on the collection schedule. Waste must not be taken from any households that have not been listed. Expected set-out rates should be taken into consideration during the creation of the sampling plan and the number of reserves selected should reflect set-out rates.

**What if damage is caused to a property during collection?** All contractors must have adequate insurance. All incidents must be reported to the local authority within 24 hours.

**What if waste has already been collected by the collection crew?** Every effort should be made to avoid this situation. Collection crews should be contacted the day before collection, by the WCA contractor or local authority project manager, to confirm details. The collection team should collect the sample 30 mins-1 hour before normal collection times. During the first week, if collection mistakes do arise, replacement households can be selected off the 'reserve' list.

**What if HWRC/bulky waste is presented at kerbside or in a bin shed?** HWRC/bulky waste should not be collected as part of WCA that is being carried out on kerbside residual and recycling collections. Local authority protocols can be followed on what constitutes acceptable kerbside residual waste.

**What if it is not possible to associate the bin to an address e.g. shared driveway?** During the first week of residual waste collection this household should be ignored, and a replacement selected off the 'reserve' list.

### 7.2.3 *Collecting waste from multi-occupancy dwellings*

The inclusion of multi-occupancy properties in the sampling design introduces some specific challenges to producing cost-effective and reliable data. Some of these challenges and potential mitigation measures are detailed below. The diverse nature of services in place for multi-occupancy properties means that it is hard to define in this guidance the degree of additional adjustments that would be required in a single local authority study. For this reason, Zero Waste Scotland assumes that the inclusion of multi-occupancy properties, their type and services in place will be clearly specified during project development and procurement.

#### ***The frequency of waste collections***

Some multi-occupancy properties have more frequent collections than own door properties, which increases the complexity of when to sample waste and the waste collection and sorting requirements.

#### ***The size of containers in place***

During a kerbside WCA study waste is manually emptied from wheelie bins, tipped into bulk bags and transported to the sort site separately. Manual emptying is not possible for the larger containers used in some tenements and in most high-rise flats. Under these circumstances to deliver an uncompacted sample of waste that is attributed to a set of flats will require a dedicated refuse collection vehicle, which will significantly increase study costs.

More generally, WCA contractors should be aware of the higher likelihood of heavy items where there are larger shared bins and take this into account (particularly during data collection and analysis).

#### ***Normalising waste quantity to the number of households***

Most WCA studies normalise waste quantities sampled to kg per household. A reliable assessment of how many household's worth of waste a sample represents is required to do this. Sampling waste from situations where containers are shared (formally or informally) makes this more difficult, or in some cases impossible. For example, some local authorities use on-street communal containers to service multi-occupancy dwellings. On-street containers may also be used by commercial premises. The waste presented cannot be reliably attributed to an exact number of households. However, local authorities may consider it important to understand the composition of waste, regardless of whether an accurate kg/household figure can be estimated.

For WCA studies including larger tenements, waste from the minimum required number of households (i.e. 50) should be included in the sample. Depending on the number of households per close it may be necessary to take waste from more than 50 households. The exact number of households making up the sample should be established. As bins are often shared between properties, all the waste and recycling set out on the day of collection should be sampled. Care should also be taken to select closes where the waste is easily distinguishable from the neighbouring closes.

For flat and tenement type properties household addresses should be compiled in terms of close address and individual household address within the close. Unoccupied properties should not count towards the required sample numbers and this should be recorded in the sample notes.

Where possible, data analysis should make use of separate tonnages for multi-occupancy and own door properties where these are available.

#### ***The value of site visits before sampling waste***

Site visits prior to the fieldwork day are strongly recommended where local authority staff aren't familiar with the collection areas. Visits should be carried out at the same time of day as the planned waste uplift will take place. Site visits may be used to assess whether bins are likely to be shared with adjoining properties and whether the household sampling design has selected say sheltered housing instead of regular flatted properties. Site visits will also identify locations with secure entry or access issues, which should probably be removed from the study.

Local authorities should also ensure that all waste collection points in multiple occupancy schemes are cleared of all waste and recycling on the scheduled collection day prior to sampling – this ensures that the waste sampled represents that which is generated over the cycle.

#### ***Can a sample of recycling be collected?***

Calculation of material capture rates relies on sampling both residual and recycling. Sampling crews should ensure during the residual uplift week that residual waste is only collected from locations where the recycling containers are not excessively abused in order to ensure the selection of households where an adequate recycling sample can be obtained.

### 7.3 Procedures during waste sorting

This section summarises the key requirements for sorting waste during studies supported by Zero Waste Scotland. The standard household waste sorting protocol (see Appendix B) provides a greater level of detail on waste sorting procedures and should be referred to alongside this section. Appendix A also provides a greater level of detail on household waste categorisation.

#### ***Summary of the key requirements during waste sorting***

**For each waste stream analysed the waste from each street block of fifty households will be combined and sorted as a single sample at the sort site.** This will produce a single composition dataset for each street block and waste stream analysed, for each phase of analysis.

**For each waste stream analysed the waste from each street block of fifty households will be sorted and weighed in full.** The waste sample should not be split into smaller quantities at the sort site and only partially sorted. This approach reduces the number of households contributing to the sample. Prior to procurement, local authorities will review round tonnage data for the selected areas and estimate a typical quantity of waste per household. Potential contractors should then be able to identify the resources required to sort through that waste. Three or four-weekly residual waste services will likely produce larger quantities of waste and requires clear specification by local authorities during procurement.

**Waste must be sorted to the standard categories provided in Appendix A.** These categories have been built on Zero Waste Scotland's experience from the previous WCA programme. The use of a standardised category list across all studies supported by Zero Waste Scotland ensures all study data can be reliably used in national analysis. If individual local authorities would like to use additional categories this should be discussed during the planning phase of the project, as this would need to be specified during procurement.

**The WCA contractor must ensure compliance with data protection legislation.** This includes anonymity of households when sampling and recording. The WCA contractor must ensure they deal appropriately with any confidential waste (e.g. documents) during sorting.

**The WCA contractor is responsible for planning and implementing accurate record keeping associated with the waste sort, according to the protocols agreed with the local authority.**

**The local authority is responsible for visiting the sort site at least once during the study to verify the waste sort is being conducted according to the agreed protocol.** The visit should include:

- Confirming the standard sort categories are being used
- Confirming that the sort team are segregating waste according to waste categories agreed.
- Confirming all sort staff have access to the sorting protocol and guidance on how to apply the sort categories.
- Confirming the level of supervision and training of the sort team is as agreed.
- Confirming with the supervisor data recording and storage arrangements
- Confirming with the supervisor any issues arising



## 8 Reporting and analysis

This section describes the roles and responsibilities of WCA contractors, Local authorities and Zero Waste Scotland during the reporting and analysis phase of WCA studies supported by Zero Waste Scotland. The requirements set out below build on Zero Waste Scotland's experience from the last household WCA programme during 2013-15.

### 8.1 The roles and responsibilities of the WCA contractor

- To carry out final data checks on the raw, unadjusted weights of waste recorded during the waste sort.
- To provide the raw, unadjusted (kg) waste composition dataset produced from the sort, to the local authority and Zero Waste Scotland. Raw data should be provided in an agreed template provided by Zero Waste Scotland. The raw data file should be submitted to the local authority and Zero Waste Scotland. WCA contractors should allow for up to two rounds of clarifications and checks by Zero Waste Scotland or the local authority.
- To provide supporting data to accompany each raw unadjusted waste composition dataset. As a minimum this should include:
  - Sampling Phase
  - Waste Stream sampled
  - Date of sampling
  - Number of households that produced the sample
  - Street block number
  - Street block name
  - OAC Stratification group
  - Postcodes(s) from the final collection schedule
- The WCA contractor is not required to carry out further analysis or translation of raw data into annual estimates or similar.
- To produce a short (2 pages max) exception report which summarises any exceptions to the methods defined in this guidance. For example, seasonal factors, weather conditions, special local events, or any other methodological issues that arose during waste collection and sorting. WCA contractors should allow for up to two rounds of clarifications and checks by Zero Waste Scotland or the local authority.
- WCA contractors are not required to produce a standardised full technical report on the project for the local authority. If local authorities require a written report, this will be specified during the individual procurement for the project so that WCA contractors can cost accordingly. Zero Waste Scotland will not be involved in reviewing any full technical reports.

### 8.2 The roles and responsibilities of local authorities

- To provide data to Zero Waste Scotland on the target and non-target wastes for their service. This will support the analysis of recycling capture rates and contamination of recycling streams.
- To provide data to Zero Waste Scotland to support the production of annual estimates for the local authority. Examples of supporting data include the most recent annual data on waste

management if that data is more up to date compared to what is publicly available on waste data flow.

- Review the agreed outputs for the project as detailed above and below, where required providing up to two rounds of comments.

### 8.3 The roles and responsibilities of Zero Waste Scotland

- To review the raw, unadjusted waste composition dataset supplied by the WCA contractor, where required providing requests for clarifications and checks for the WCA contractor to respond to.
- To translate the raw, unadjusted weights of waste into annual estimates of kerbside composition for the local authority.
- Annual estimates will be produced using waste composition datasets and waste data flow tonnages.
- The annual dataset will be supplied back to local authorities in a standard template. Annual estimates will be provided for the following (expressed as % weight and as mean kg per household per week):
  - Annual estimates of overall kerbside waste, residual waste and recycling composition
  - Summary of capture rates
  - Summary of non-recyclable and non-target materials within dry recycling

## 9 Appendix A: Standard household waste categories

Table 3 below sets out the approach to household waste categorisation for future studies supported by Zero Waste Scotland.

The list below has been developed from Zero Waste Scotland's experience of running the previous household programme, subsequent data requests and the use of data in various analysis.

As part of preparing this guidance, Zero Waste Scotland reviewed the category list used during the last programme (see 2015 guidance document). During our review categories that were either rarely occurring or not used in subsequent analysis have typically been combined. This should allow greater focus on the categories that are most important to most stakeholders.

Some of the previously used categories have also been revised based on anticipated data needs. The notes for each category either describe what each category might contain or provide context to revisions.

We have consulted with some stakeholders on this list and would welcome more feedback as the programme mobilises during 2021. Every category list involves compromises. We believe the list is cost-effective and realistic to deliver during a waste sort, provides useful information to local authorities, Zero Waste Scotland and wider stakeholders for WCA.

For the purposes of developing the Scotland Excel contractor framework during winter 2020-21, WCA suppliers should assume the fifty-three categories in Table 3 below forms the standard sort requirement.

The category list includes some recyclable and non-recyclable categories. However, Zero Waste Scotland assumes that comprehensive analysis of target, non-target and non-recyclable materials (e.g capture analysis) will be conducted after waste sorting using the categories below and local authority information on target and non-target materials.

**Table 3: Standard household waste categories**

Waste type level 1	Waste type level 2	Guidance Notes
Glass waste	Drinks bottles	Glass colour split removed to enable split by bottle and jar format, as this is the primary data requirement. Standard colour split for each format could be applied if needed.
Glass waste	Other glass packaging	Includes jars, sauce bottles, cosmetics packaging and air fresheners. Contamination of jars can be a significant issue when they are found in residual waste.
Glass waste	Glazing, mirrors and houseware	
Paper	Newspaper, magazines and directories	Different market value for 'News and Pams' from office paper.
Paper	Other recyclable paper	Paper which is easily recycled. Letter/writing paper, computer paper, loose leaf paper, photocopies; unused wall paper, mail in an envelope, envelopes, posters, travel tickets, non-glossy pamphlets, yellow pages, envelopes with plastic windows.
Paper	Recyclable paper packaging	Paper bags, to distinguish from "other recyclable paper" that is packaging. Likely very small quantities.
Paper	Non-recyclable paper and card	Includes books, waxed paper, pringles-type tubes, paper contaminated with food (which can only be based on the state of paper within the sample, regardless of when contamination occurred), paper products intended for disposal (napkins, hand towels, wall paper removed from walls, facial and toilet tissues, kitchen paper). Likely to contain a quantity of paper packaging.
Cardboard	Thin (Grey) Card Packaging	Split of grey and brown card as different market values. Boxes and packets for pre-prepared foods, cereal, washing powder, eggs, tissues, powdered milks, washing soda, biscuits, ice cream.
Cardboard	Thick (Brown) corrugated cardboard packaging	Cardboard boxes and lightly contaminated pizza boxes and similar.
Cardboard	Cartons and other card/plastic laminate packaging	Tetrapak, disposable hot and cold drink cups (latter included to differentiate from mixed non-recyclable paper and card category).
Cardboard	Other recyclable card	Greetings cards and stationery

Waste type level 1	Waste type level 2	Guidance Notes
Metal	Steel drink cans	Ferrous is heavier than non-ferrous. Worth splitting due to different values. Easy to split using a magnet.
Metal	Other ferrous packaging	Food tins, Pet food tins
Metal	Aluminium drink cans	
Metal	Aluminium packaging	Aluminium foil sheet, tops and trays. During sort food and foil separated as much as possible.
Metal	Aerosols	Ferrous and non-ferrous combined. A standard split could be applied if required.
Metal	Scrap metal (exc. WEEE)	Keys, cutlery, bike locks, paper clips, safety pins, tools, car parts, oil filters, biscuit tins, radiators, metal shelving units, copper pipe, stainless steel sink unit, saucepans, bike parts.
Dense plastic	HDPE bottles	Tend to be dominated by milk and fruit juices, not really seen as "drinks" by producers.
Dense plastic	PET drink bottles	Still and carbonated drinks, milkshakes
Dense plastic	Other plastic drink bottles	
Dense plastic	Non-drinks bottles	Oils, soaps, cleaning products etc. Clear PET, various colours of HDPE and clear HDPE.
Dense plastic	Pots, tubs and trays	
Dense plastic	Non-recyclable plastic packaging	Expanded polystyrene (EPS), Triggers
Dense plastic	Non-packaging dense plastic	Disposable cutlery , vending cups, seed trays, plastic coat hangers, buckets, rigid pipes, crates, garden furniture & flower pots; pipes & fittings, credit cards, synthetic leather products, large moulded products such as battery casings.
Plastic films and flexibles	Plastic/foil laminate pouches	Pet foods, sauces
Plastic films and flexibles	Plastic film packaging	Wide range of flexible plastic packaging including thick and thin carrier bags.
Plastic films and flexibles	Bin Bags	household bin bags, rubble bags
Plastic films and flexibles	Non-packaging plastic film	Stationery, cling film

Waste type level 1	Waste type level 2	Guidance Notes
Garden waste	Mowing, cutting and pruning garden waste	Green or woody garden waste
Garden waste	Soil	If bagged easy to separate, if loose will end up in fines.
Food wastes	Food and drink (avoidable) – in packaging	All food likely edible at point of disposal e.g. sandwich in packaging. Includes weight of packaging and drink in containers where the food and drink is the clear majority of the weight.
Food wastes	Food and drink (avoidable) – loose	All edible food found loose.
Food wastes	Inedible parts of food	Bones, skin, stones, cores, tea bags, coffee grinds including coffee pods (latter to clarify ambiguity on food waste or packaging).
Food wastes	Cooking oil	In packaging but where oil is the bulk of the weight. Found rarely but keep as distinct.
Wood	Wooden packaging	Likely very rare.
Wood	Non-packaging wood	All wood wastes that are not packaging
Electrical and electronic items	Small domestic appliances and cables	Kettles, toasters, radios, electric toothbrushes, computers
Electrical and electronic items	Batteries	All non-automotive batteries (A/AA/C/D batteries, rechargeable or alkaline batteries, button cell batteries, laptop batteries)
Electrical and electronic items	Light bulbs and tubes	Intact fluorescent tubes, low energy light bulbs, other light bulbs
Electrical and electronic items	Ink and toner cartridges	
Electrical and electronic items	Other WEEE and associated consumables	
Textiles	Clothing	Trousers, t-shirts, skirts, dresses, underwear, socks, hats, gloves.
Textiles	Shoes, bags, belts and other textile accessories	

Waste type level 1	Waste type level 2	Guidance Notes
Textiles	Non-clothing fabric and textiles	Including curtains, duvets, pillows
Textiles	Carpet & underlay	
Absorbent hygiene products	Disposable Nappies	Will include wipes
Absorbent hygiene products	Other absorbent hygiene products	Incontinence products, wipes and feminine hygiene products.
Other	Potentially hazardous healthcare wastes	Potentially hazardous including dressings, stoma, catheter bags, medical equipment, unused medicines, condoms.
Other	Pet excrement, bedding, dead animals and cat litter	
Other	Miscellaneous combustible	Rubber, Tyres, Soft furniture, Wooden furniture, Video tapes, CD/DVD's, Bric-a-brac, Mattresses, Other combustible materials not otherwise specified.
Other	Miscellaneous non-combustible	Rock, stones, Rubble, Ceramics, Pottery, Plasterboard, Other construction and demolition waste, Other non-combustible materials not otherwise specified.
Other	Miscellaneous hazardous	Fire extinguishers, Gas bottles and canisters, Ink & toner cartridges, Paint, Pesticides, varnish, inks and other chemicals, Mineral Oil, auto batteries.
Unclassified	Sorting residues less than 10mm ('fines')	

## 10 Appendix B: Standard household waste sorting protocol

### Waste sort procedures

The waste sample should be sorted as soon as possible after collection; normally this will be on the same day as collection. The sort team supervisor should provide guidance for the sorting team to help in the identification of materials (see Appendix A).

Empty bags into the sorting area a few at a time. A complete sample can be emptied into the sorting area if there is both space and the time to sort the material in a working day. Open bags adhering to the health and safety protocol.

Waste should be screened to separate waste with less than 10mm particle size. Material should not be forced through screen holes.

Sort waste into the pre-defined waste categories adhering to the health and safety protocol. Sharps (hypodermic needles etc.) should be placed in the sharps bin provided using litter-pickers. Do not separate paint and other potentially hazardous liquids from its packaging; it should be classified in the appropriate category together with its packaging.

For heavier fractions it is acceptable to sort directly into Level 2 categories with the sum of the weights being used for the Level 1 category. For lighter fractions, e.g. plastic film, waste should be sorted to the Level 1 category first. Where two materials are inseparable the item should be allocated to the material category contributing the greatest weight.

Separate out the liquid in glass bottles. The liquid should be weighed separately and included in the food waste category. A magnet should be used to distinguish between ferrous and non-ferrous metals.

The sort team should refer to guidance on material categories and the sort team supervisor if unsure which category to allocate. The sort team supervisor should regularly check sorted waste, remove any incorrectly sorted material and transfer to the correct container.

### Record keeping

The WCA contractor will use a suitable method for data recording that will minimise risk of data loss e.g. no carbon required forms (NCR) or electronic data entry. Data should be recorded using pre-prepared data sheets. If data sheets are posted during the study, copies must be taken.

The WCA site supervisor will conduct checks of all data sheets to ensure the sample weight matches the sum of the sort category weights. A running total for the sample weight should be maintained to help identify errors. The WCA site supervisor should check all data sheets before any of the sort team leave the site.

A record should be kept of any anomalies during the waste sort. For example, evidence of commercial waste, large quantities of one type of material or large quantities of hazardous waste.

### Weighing and disposal

The whole waste sample should be weighed using scales. Weighbridge data should be used as a cross-check only. The WCA contractor should arrange a range of scales with different sensitivities for weighing large and small weights. Smaller range scales are required for weighing lighter fractions e.g. plastic film. Scales should be calibrated using known weights.

Weigh the weight of each sorting container, tare weights should be obtained for each sort container and checked daily. All staff should be trained to use scales and be able to zero scales correctly.

Weighing should be carried out twice to check weights. If any differences are noted, then the sample should be re-weighed. This procedure should be followed throughout when recording weights. If any errors are found re-measurements should be made, or if this is not possible, data excluded from study.

Containers will need to be weighed and emptied before they become too heavy to safely lift onto the scales, at the end of each day and at other times as deemed necessary for cleanliness/health and safety purposes.

Record the weight of the container contents on an appropriate form or handheld device. Care should be taken to ensure that writing is legible, and the decimal point is in the right place.

Empty containers into disposal or recycling facilities provided by the local authority. Continue until all the waste collected has been analysed.



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