A standard methodology for household sampling

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Contents

Glossary

Collection cycle: the period of time, usually either a week or a two week period, in which households have all components of kerbside household waste (residual, dry recycling and any organics collection, including garden and/or food waste) collected at least once.

(Collection) day route: all households collected from which waste is collected a single collection vehicle on a single day of the week.

Council Tax band: the Council Tax splits every "dwelling" into one of eight valuation bands. Further information can be found at http://www.saa.gov.uk/counciltax.html

Confidence interval: describes the amount of uncertainty associated with a sample estimate of a population parameter.

DMR: dry mixed recycling, usually comprised of paper, card, plastics and cans but can include other materials.

Flat: in Scotland's Census 2011 data, **either** a 4-in-a-block style apartment with its own entrance or a multiple occupancy property with shared access

Geo-demographic package: a tool used to classify different area types, usually based on a combination of census, survey and other data sources; a tool used in drawing a stratified sample for WCA.

Household waste: According to SEPA (SEPA, 2011) household waste consists of waste from the following sources: wastes from collection rounds, bulky waste collections, separate collections of household hazardous wastes, drop off/bring systems including reuse centres and HWRCs. It does not include trade waste, street sweepings, litter bins, parks and gardens waste, beach cleaning waste and commercial waste at HWRCs.

Output area classification (OAC): a free and open geodemographic classification of 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 7 supergroups, 21 groups, and 52 subgroups

OAC category: in this guidance, either an OAC supergroup, group or subgroup.

Property type: in this guidance, property type examples include detached, semi-detached, terraced, etc. In Scotland's Census the corresponding variable is named 'Accommodation type' and is defined as "the type of accommodation used or available for use by an individual household."

Recycling Point: publically accessible facilities provided by local authorities for the recycling of certain waste streams; typically these include packaging, paper, glass and textiles.

Sample: in the context of WCA a sample is an amount of waste that is selected for analysis in order to represent arisings within a particular stratum of the target area (which may be a key socio-economic/ demographic group within a Local Authority area), it is chosen to be sufficient to take account of variation in waste arisings whilst also being affordable within the project budget. A sample within a particular stratum in terms of the Zero Waste Scotland methodology is 50 households taken from a street block representing a particular stratum.

Stratification: the process of dividing members of the population into homogeneous subgroups before sampling in a statistical survey.

Stratum/ strata: the term applied to each of the subgroups used to divide up the study area by the stratification process.

Street block: an area belonging to a particular stratum (e.g. 'Constrained Young Families', 'Semi-Detached Suburbia' etc.,) that contains households serviced by the same collection round/ round day (residual and recycling services) from which a sample of waste from 50 households is obtained for WCA.

Scottish urban/rural classification: provides a standard definition of rural areas in Scotland. This classification is updated every two years to incorporate the most recent Small Area Population Estimates (SAPE) produced by National Records of Scotland (NRS) and Royal Mail Postcode Address File (PAF). Further information can be found at http://www.scotland.gov.uk/Topics/Statistics/About/Methodology/UrbanRuralClassification

Unique Property Reference Number (UPRN): a unique alphanumeric identifier for every spatial address in Great Britain and can be found in OS's Address products. It provides a comprehensive, complete, consistent identifier throughout a property's life cycle – from planning permission through to demolition. Further information can be found at https://www.ordnancesurvey.co.uk/about/governance/policies/addressbase-uprn.html

WasteDataFlow (WDF): web based system used for municipal waste data reporting by UK local authorities to government.

Waste arisings: the combined waste generated from residual waste and from any source separated waste streams (dry recycling and organic wastes); the waste arisings for any source of waste is the sum of the reuse/recycled/recovered waste stream and any residual waste stream.

Waste composition analysis (WCA): a study that provides information on the weight of materials that are in a given waste stream and usually involves obtaining samples of these waste streams and sorting them into pre-defined categories which are then weighed.

1 Executive summary

Introduction

This guidance document sets out a standardised approach to selecting households for the purpose of waste composition analysis (WCA). The guidance has been designed for use by waste management specialists working for local authorities and their contractors. Users are likely to be involved in the commissioning and/or technical planning and design stages of a waste composition study. The guidance assumes users are also:

- Familiar with previous guidance on waste composition analysis published by Zero Waste Scotland - this included a more general section on approaches to household sampling; the current document focuses on the use of publicly available data alongside local authority datasets.
- Comfortable working with multiple datasets in Excel, including the use of 'lookup' and 'sumif' formulas and pivot tables – the methodology is reliant on data handling and analysis
- Working for local authorities where waste service information is linked to household address info in datasets held by the local authority; however, the creation of such a dataset is beyond the scope of this guide.

Function of the guidance document

The guidance explains:

- Sources of publicly available information that can be used to construct a household sampling framework;
- How to characterise households in a local authority area using publicly available data;
- How to integrate publicly available data with local authority information on households and waste services;
- How to use public and local authority datasets to draw up a sample of households that are broadly representative of an area;
- Some benefits of using a geographic information systems (GIS) to select samples.

The focus of this guidance is on household waste composition analysis, but the methodology could be adapted for other studies where so-called "cluster" sampling of households is used. As such, the guidance also sets out the range of potential approaches and the benefits and limitations of each.

Important considerations before starting the process

The sampling methodology in this guidance 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.

In addition, and prior to the commencement of the process, users should be aware of the operational considerations which may impact upon the complexity, cost and relevance of the sampling e.g. variation in property and service types, aligned of residual and recycling collection routes and the recording of collected tonnage data.

Structure of the guidance document

The guidance has been structured to take local authorities and contractors through the process of deriving a sampling "framework", from background theory to worked examples at two authorities.

Chapters 7 and 8 outline the general methodological approach of the guidance and describe the format and context of the worked examples used in the guidance.

Users should be aware that two methodological routes are proposed in the guidance. The relevance of each is described in chapter 9.

Step-by-step guidance to derive and interpret data sets and select households to sample can be found in chapters 10 to 12.

2 Introduction

Between 2013 and 2015 Zero Waste Scotland (ZWS) ran a funding programme which supported 19 local authorities to conduct waste composition analysis of their household kerbside waste. One of the outputs from this work was a guidance document on waste composition analysis.

During these studies a range of methods were used to select households, including socio-demographic packages, council tax bands and publicly available datasets linked to the census. For any future waste composition studies ZWS would like to standardise the use of the Office of National Statistics (ONS) output area classification system alongside the authorities' own data on households and services. This will improve comparability and compatibility of individual composition study data over time.

This guidance document was commissioned by Zero Waste Scotland, following the completion of the household kerbside waste composition study. The document was written by Tim Reid, with valued contributions from Simon Jeynes.

3 Purpose and users of the guidance

The guidance sets out a standardised approach to selecting households for the purpose of waste composition analysis. The guidance can be used to identify suitable households to sample in a local authority area. The document is designed to provide a standard sampling "framework" that can be adopted by local authorities and WCA contractors, while still allowing flexibility in meeting the objectives of local authorities and for WCA contractors to add value.

The document has been designed for use by waste management specialists working for local authorities and their contractors. Users are likely to be involved in the commissioning and/or technical planning and design stages of a waste composition study, where the objective is to obtain a broadly representative sample of the whole local authority area.

Users of the guidance should be familiar with the previous guidance on waste composition analysis published by ZWS (*Guidance on the Methodology for Waste Composition Analysis*[1], 2015) and be comfortable working with multiple datasets in Excel, including the use of 'lookup' and 'sumif' formulas and pivot tables. Users should also be aware that the method requires significant planning and the investment of time.

For a broader range of advice on sampling and monitoring for waste services WRAP's monitoring and evaluation guidance[2] is a very useful starting point.

4 Scope of the guidance

As stated above, this document originated from a much broader guidance document for waste composition studies produced by ZWS in 2015 (*Guidance on the Methodology for Waste Composition Analysis)*. The 2015 document includes a more general section on approaches to household sampling (e.g. seasonality, temporal factors, operational considerations etc.), whereas the current document focuses on the specific use of publicly available data alongside local authority datasets to create a sampling framework which is representative of the local authority area.

The focus of this guidance is on household waste composition analysis, but the methodology could be adapted for other studies where so-called "cluster" sampling of households is used (see chapter 13).

The guidance, as presented, is not intended for use for any other research purposes (e.g. recycling rate assessments, intervention evaluations, comparisons of waste between two neighbourhoods, estimations of specific material fractions etc.).

Within the guidance a number of rules of thumb are offered; however, based on the experience of ZWS, each authority will have different characteristics and, hence, no absolutes have been given.

[1] http://www.zerowastescotland.org.uk/sites/default/files/WCAMethodology_Jun15.pdf
[2] http://www.wrap.org.uk/content/monitoring-and-evaluation-guidance

5 Structure of the guidance

The guidance has been structured to take local authorities and contractors through the process of deriving a sampling “framework”, from background theory through to worked examples.

- Chapter 6 covers the minimum internal local authority data requirements for following the methodology and highlights some of the main operational issues to take into consideration before starting the process.
- Chapter 7 outlines the methodological approach used in defining the samples and describes the types of information to be used in the process.
- Chapter 8 describes the use of worked examples in the guidance and provides a description of each example authority in terms of housing stock, rurality and collection services.
- Chapter 9 outlines the two methodological routes demonstrated in the guidance and provides suggestions regarding when either may be appropriate.
- The step-by-step guidance for deriving the sampling framework can be found in chapters 10, 11 and 12.
    - Chapter 10 sets out how to create and format the required data sets, presented in two distinct parts for each methodological route. Part 1 describes the derivation of the data set to be used in profiling the local authority area; Part 2 discusses the derivation and/or formatting of the data set to be used when selecting households to sample. After following the steps in Part 1, the user is required to follow the steps in chapter 11 prior to deriving the data set in Part 2.
    - Chapter 11 discusses the interpretation of the local authority profile data and the definition of sample strata. Assumptions and objectives are clearly set out as well as the necessary steps to follow and worked examples at two authorities.
    - Chapter 12 discusses the process of identifying street blocks of households from which to sample. Assumptions and objectives are clearly set out as well as the necessary steps to follow and worked examples at two authorities.
- Chapter 13 discusses the compatibility of the derived sampling framework and associated data with respect to participation and (doorstep) householder surveys, and assesses the benefits and limitations of a number of potential approaches.
- Chapter 14 outlines some of the potential uses and benefits of using a geographic information system (GIS) when deriving a sampling framework.
- The Appendix contains an index of links to the publically available data used in the guidance as well as tables presenting the OAC at supergroup, group and subgroup level.

6 Before you start - important considerations

6.1 Minimum data requirements

The sampling methodology in this guidance 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.

Route information should cover all collected streams and include the route name/number(s), the collection day, the collection cycle and, where possible, the route order. (The route order will assist with selection of properties but is not necessary for the standard sampling framework.)

In addition, it would be useful for the database to include:

- the accommodation (or property) type e.g. flat, detached, semi-detached, etc.; if not available local knowledge and/or site visits may be required before finalising the sampling framework;

- the Unique Property Reference Number (UPRN)[3] for each address; this is not necessary for the standard sampling regime but allows for the easy identification of duplicated properties and is useful for methodologies using GIS.

6.2 Operational considerations

Table 1 outlines some important issues to consider prior to commencing the process.

Consideration	Description
Variation in property type and collection service across the LA area	Local authorities where kerbside services vary significantly between areas or property type may require a more complex sampling strategy to ensure representativeness of household type and collection service. If the local authority has large areas where services differ from each other (e.g. no food collection in rural areas) this should be integrated into the profile.
	Incorporation of multiple occupancy properties can be more expensive. Properties often have more frequent collections than own door properties adding to the complexity of the project and the collection requirements. If the local authority has a high proportion of multiple occupancy consideration should be made to taking one or more samples from these properties (see section 11.3 for more details).
Alignment of collected streams to be sampled or weighed	Sampling households where residual and recycling streams are collected on different days of the week is complicated and open to potential error. Where practicable, households to sample should have all streams collected on the same day of the week; this may reduce the number of households within the local authority area which are appropriate for sampling.
WasteDataFlow (WDF) records	The scaling methodology to estimate the waste composition of the whole local authority area is aligned to annual tonnage collected from households for each sampled stream. Accurate annual collected tonnage data will be required for each sampled stream (rather than post-treatment tonnages from the re-processor).
Start date for sampling	The ZWS methodology requires residual waste to be sampled first. Households to sample must be on the correct collection cycle on the proposed day of sampling; this may reduce the number of households that can be sampled if the start date is immoveable.

Table 1 – Operational considerations which may affect the samples

7 Methodological approach

7.1 About stratification

The standardised approach to selecting households set out in this guidance requires a systematic means of classifying area/household types in terms of key factors that influence waste. This approach is termed a 'stratified random sample'.

Stratification is the process of dividing members of the population into homogeneous non-overlapping subgroups ('strata') before sampling in a statistical survey. In the case of waste sampling case, the 'strata' reflect the main variables that influence kerbside waste arisings.

The advantage of stratifying the sample is that fewer samples are required overall, as the waste arisings within each of the strata are less varied than would be the case from a simple random sample. Stratification therefore increases the accuracy of the compositional estimates obtained for the same research resource, provided that the choice of stratification and the way in which it is carried out reflects real differences in waste arisings.

Waste samples should be taken from households selected from each stratum on a quota basis (i.e. a set minimum number of households sampled for each stratum, re-weighted at the analysis stage to

[3] A Unique Property Reference Number (UPRN) is a unique alphanumeric identifier for every spatial address in Great Britain and can be found in OS's Address products. It provides a comprehensive, complete, consistent identifier throughout a property's life cycle - https://www.ordnancesurvey.co.uk/about/governance/policies/addressbase-uprn.html

reflect their proportions in the overall target population) rather than in proportion to their size in the actual population.

7.2 Stratification variables

This guidance sets out a sampling methodology based predominantly on the 2011 Area Classification for Output Areas (2011 OAC).

The 2011 OAC is a free and open geodemographic classification of 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 7 supergroups, 21 groups, and 52 subgroups (see Table 25 in the Appendix).

In standardising this approach using the OAC, ZWS hopes to improve the comparability and compatibility of individual composition study data over time.

Although the OAC represents the best single open data source with which to base sampling frameworks, it is largely an indicator of the character of an area and its population and does not fully take into account all variables which are likely to have a significant effect on kerbside waste arisings. This guidance therefore recommends the integration of one or more additional variables to the stratification process. The exact variables to use will depend on the makeup of the local authority area, its housing stock and it collection services; a few examples can be found below in Table 2.

Variable	Description
Property type	Output areas and, hence, OAC categories do not correspond to homogenous property types. Area definitions can therefore encompass a range of property types e.g. “There is a higher proportion of households living in detached properties when compared with the supergroup and much lower proportions living in terraced properties and flats”. As such, it is recommended to integrate OAC data with additional property type data in order to supplement the profiling of the local authority area, especially where multiple occupancy properties are known to make up more than 10% of the housing stock. This can be done using accommodation type data from Scotland’s Census 2011; however, where available, the use of internal local authority definitions would be preferable – see the note below for further details.
Rurality	The description of rurality within the OAC does not commute to the Scottish Government classification of rurality, which defines an authority’s collection service obligations according to the Waste (Scotland) Regulations. Where such considerations are relevant it will be necessary to integrate OAC data with the Scottish Government 6-fold Urban Rural Classification.
Variation in collection service type	Where variation in service provision is a relevant consideration (i.e. where a significant minority of households receive a different collection service to the majority of households) and not aligned with property type (as defined in the Scotland’s Census 2011 definition of accommodation type) or rurality classifications it will be necessary to integrate OAC data with internal local authority service data.

Table 2 – Description of potentially relevant stratification variables

[NB The definition of flatted properties in Scottish census data makes no distinction between flats with a communal entrance (e.g. tenements) and 4-in-a-block style apartments, each with their own door. As the collection service for 4-in-a-block style flats is more likely to correspond more to own-door services (i.e. including a garden waste collection) caution should be exercised when defining samples using publically available property type data, and local knowledge or internal data should be used, wherever possible.]

8 Worked examples

In order to highlight some possible interpretative steps, the guidance sets out worked examples in chapter 11 (Interpreting the profiles and defining strata) for an ‘urban authority’ and a ‘rural authority’, each with very different priorities:

- The '**urban authority**' has a high proportion of multiple occupancy properties and provides a full kerbside service to own-door properties including DMR, glass and mixed food & garden waste collections. Multiple occupancy households receive a DMR collection plus a segregated food waste collection; glass is collected at neighbourhood bring sites.
- The '**rural authority**' contains a high proportion of rural[4] areas and multiple occupancy properties make up around 6% of the housing stock. Own-door households in urban areas (i.e. categories 1,2 and 3 in the Scottish Government 6-fold Urban Rural Classification) receive a DMR collection and separate food and garden waste collections. In rural areas (i.e. categories 4, 5 and 6 in the Scottish Government 6-fold Urban Rural Classification) households receive a DMR collection but no food or garden waste collections.

There are therefore clear distinctions in service provision at both authorities (one based on property type, the other based on rurality) which the sampling frameworks should aim to reflect.

The guidance also contains a worked example in chapter 12 (Householder selection). As this guidance uses only publically available data, the worked example cannot demonstrate many of the key steps in the householder selection process; as such, a worked example has only been provided for the 'rural authority'.

(**NB** Although the OAC profiles for the worked example authorities are based on actual data some characteristics have been fictionalised in order to easily demonstrate key points.)

9 Methodological routes

The guidance sets out two potential routes for deriving the sampling framework (see Figure 1); the best route to use will depend on the user's existing understanding of the local authority, the data available, and any known project priorities.

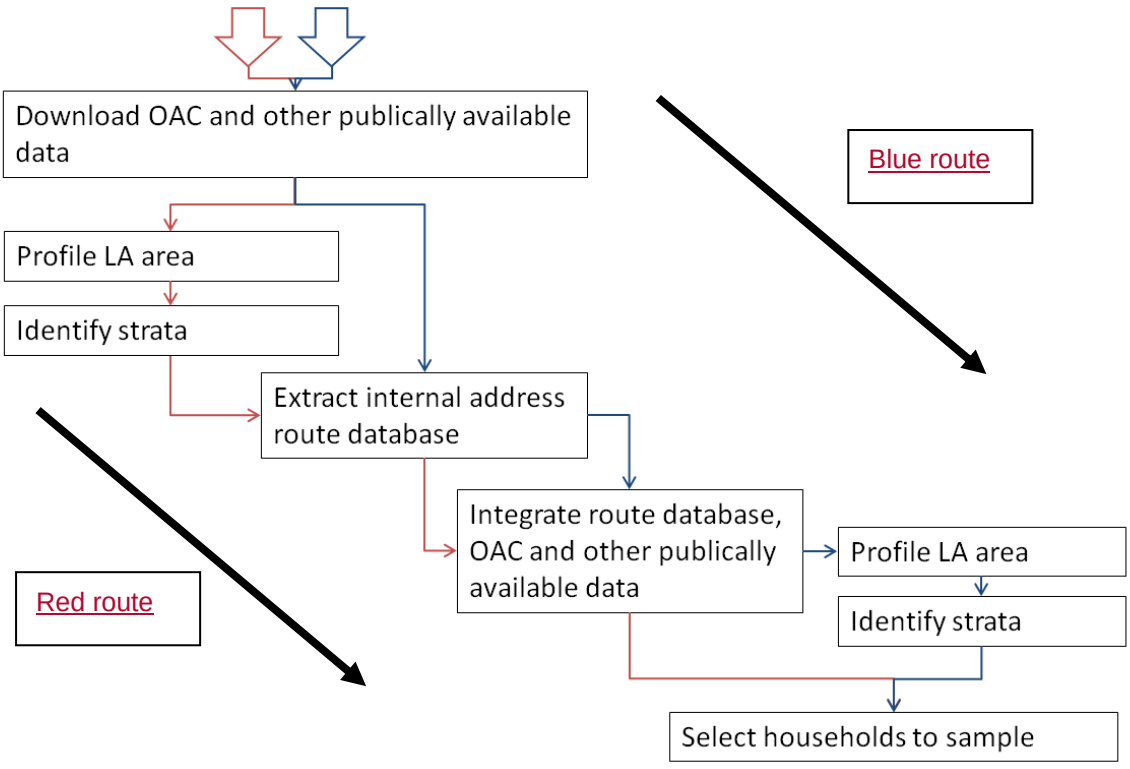

Figure 1 – Comparison of methodological routes

The red route follows a methodology whereby the local authority area is profiled using publically available data. Potential strata are defined using this dataset then, in a separate step, the stratification

[4] As defined by the Waste (Scotland) Regulations

variables are integrated with internal route data for the selection of households to sample. Profiling the local authority area via the red route is not required per se, however, it may be most useful:

- where internally held data does not refer to property type, and:
    - there are known to be a large numbers of multiple occupancy properties, or
    - property type is of general interest, and/or
- where an understanding of population per household by OAC category is of interest[5], and/or
- to consultants for an initial scoping of the local authority area prior to more in-depth discussion with the authority, and/or
- where collection service is not considered fundamental to the local authority profile.

The blue route follows a methodology whereby the local authority area is profiled using OAC and other publically available data integrated with internal route and address data. The dataset derived for profiling can also be used for the selection of households to sample. This approach is most relevant for authorities where:

- multiple occupancy properties are known to make up only a very small percentage of households, and/or
- internal data sources are comprehensive with respect to property type, and/or
- capturing the variation in collection service is thought to be fundamental to the local authority profile.

10 Deriving data sets

This chapter provides instructions on how to create and format the required data sets. The user should follow either the red route **or** the blue route (see chapter 9 for details). Instructions are presented in two distinct parts for each route. Part 1 describes the derivation of the data set to be used in profiling the local authority area; Part 2 discusses the derivation and/or formatting of the data set to be used when selecting households to sample. After following the steps in the Part 1, the user is required to follow the steps in chapter 11 prior to deriving the data in Part 2.

Links to the most recent versions of the files described below can be found in Table 22 in the appendix.

10.1 Red route

10.1.1 Part 1 - Authority profile

Table 3 sets out the required steps to profile the local authority area via the red route.

[5] **NB** Profiling the local authority area by the number of households will suffice in most cases; however, where evidence exists of a large discrepancy between the OAC profile by household and population it may be more appropriate to profile using the population. Profiling by both household and population numbers helps to understand the population characteristics of each OAC category and also acts as a useful sense check in general.

Order	Step	Description
1	Download required data	• An Excel file containing 2011 OAC clusters and names data can be accessed from the Office for National Statistics (ONS) website. (File 1 in Table 22) • An Excel lookup file which relates individual postcodes to 2011 Output Areas (with household and population numbers per postcode) can be found on the National Records of Scotland (NRS) website in the 2011 Census Index. (File 2 in Table 22)
2	Download optional data	• Excel files containing details of population (QS401SC) and households (QS402SC) by accommodation type and Output Area can be found in the Data Warehouse on the Scotland's Census website. (Files 3 and 4 in Table 22) • An Excel lookup file relating 2011 Output Areas to Scottish Government Urban Rural Classifications can be found on the NRS website (File 5 in Table 22)
3	Combine OAC and other required data	• In the Excel 'OAC Clusters and Names' file select the local authority in question using the relevant filter then copy and paste the filtered rows to a new Excel workbook. Save the new workbook as e.g. 'LA OAC profile'. Name the worksheet e.g. 'Profile of OAs'. • Copy the POSTCODE_TO_OA lookup file into the Excel workbook as a new worksheet and copy the OutputArea2011Code column and insert as the first column in the worksheet. Apply population and household numbers to each Output Area in the 'Profile of OAs' worksheet using a SUMIF formula and the POSTCODE_TO_OA worksheet. • Copy files QS401SC and QS402SC (containing accommodation type information) into the Excel workbook as new worksheets and apply the population and household numbers for each accommodation type to each Output Area in the 'Profile of OAs' worksheet using a VLOOKUP formula.
4	Combine OAC and required data with optional data	• Copy file Excel Urban Rural Classification file to the Excel workbook as a new worksheet and apply the 6-fold Urban Rural Classification number to each Output Area in the 'Profile of OAs' worksheet using a VLOOKUP formula.
5	Profile the LA area for the three OAC tiers	• In a separate worksheet paste the OAC in three formats: 1. As supergroups (see Table 23 in the appendix) 2. As groups (see Table 24 in the appendix) 3. As subgroups (see Table 25 in the appendix) • Using the SUMIF function, apply the numbers of households and population and each individual property type to each OAC category. Be sure to apply only the mutually exclusive property type categories. • Using the newly added columns, derive indicators for each OAC category: ○ the corresponding % of households, the corresponding % of the population, the population per household – see Table 8 for these figures at supergroup level at the two example authorities ○ the % breakdown of households and population for each property type – see Table 9, Table 26 and Table 27 for example formats at supergroup level ○ % breakdown of households and population for Urban/Rural categories – see Table 13 for an example for households at supergroup level
6	Paste contents	• Once happy with all the data, in order to reduce the size of the Excel workbook, copy all cells with formulae and paste values.

Table 3 – Creating a local authority profile via the red route

Once the local authority area has been profiled it will then be possible to interpret the data and define sample strata (see chapter 11). Thereafter the dataset for householder selection (see section 10.1.2 below) can be created.

10.1.2 Part 2 - Presenting household numbers by route and stratum characteristics

Once strata have been defined the next step (if following the red route) is to derive the dataset which enables householder selection. This involves the integration of the internal local authority route database with the OAC and the other variables used to define the strata.

Order	Step	Description
1	Extract route file	• Extract the route database from the routing software in Excel file format – this will form the basis of the dataset. Save the workbook as 'LA route profile' and rename the active worksheet 'Addresses'.
2	Merge with 'LA OAC profile'	• Import all worksheets from the 'LA OAC profile' workbook and save.
3	Combine the route database with OAC and other required data	• In 'Addresses', using the VLOOKUP formula, assign the 2011 Output Area Code to each address using the postcode and POSTCODE_TO_OA worksheet. • In 'Addresses', using the VLOOKUP formula, assign all OAC attributes (i.e. supergroup code, supergroup name, group code, group name, subgroup code and subgroup name) to each address in separate columns using the 2011 Output Area Code and the 'Profile of OAs' worksheet.
5	Integrate optional data to the dataset	• Where relevant, using the VLOOKUP formula, assign the 6-fold Urban Rural classification to each address using the 2011 Output Area Code and Urban Rural Classification worksheet.
6	Present household numbers by route and stratum characteristics	• Create three pivot tables (i.e. one for each OAC tier: supergroup, group and subgroup) using the dataset created above in 'Addresses' with: ○ OAC categories and additional stratification variables as columns ○ Route names and days as rows ▪ Where collection routes to sample are not aligned (e.g. where residual waste is collected on a different day from the recycling) the collection day and route for all relevant streams should be included as row labels ○ Unique Property Reference Number (UPRN) as 'values'. (As a value field setting select 'Count of UPRN') [If no UPRN is available any other countable variable attributed to each address could be used.] • Where only households on a particular collection cycle are to be identified (i.e. only those households presenting residual waste in the first week of sampling) these should be filtered using the 'Report filter' pivot table function. • In order to create a clear layout, it is advised to use 'Tabular Form' for the report layout and select 'Do not show subtotals'.
7	Filter out OAC categories of no relevance	• In order to make pivot tables as concise as possible, filter out any OAC categories not represented in the defined strata.

Table 4 - Presenting household numbers by route and stratum characteristics

Once household numbers have been presented by route and stratum characteristics see chapter 12 for guidance on householder selection.

10.2 Blue route

10.2.1 Part 1 - Authority profile

Table 5 sets out the required steps to profile the local authority area via the blue route.

Order	Step	Description
1	Download required data	• An Excel file containing 2011 OAC clusters and names data can be accessed from the Office for National Statistics (ONS) website. (File 1 in Table 22) • An Excel lookup file which relates individual postcodes to 2011 Output Areas (with household and population numbers per postcode) can be found on the National Records of Scotland (NRS) website in the 2011 Census Index. (File 2 in Table 22)
2	Download optional data	• Excel files containing details of population (QS401SC) and households (QS402SC) by accommodation type and Output Area can be found in the Data Warehouse on the Scotland's Census website. (Files 3 and 4 in Table 22) • An Excel lookup file relating 2011 Output Areas to Scottish Government Urban Rural Classifications can be found on the NRS website (File 5 in Table 22)
3	Extract route file	• Extract the route database from the routing software in Excel file format – this will form the basis of the dataset. Save the workbook as 'LA route profile' and rename the active worksheet 'Addresses'.
4	Combine the route database with OAC and other required data	• In the Excel 'OAC Clusters and Names' file select the local authority in question using the relevant filter then copy and paste the filtered rows in a new worksheet in 'LA route profile'. Name the worksheet e.g. 'Profile of OAs'. • Copy the POSTCODE_TO_OA lookup file into the Excel workbook as a new worksheet. In 'Addresses', using the VLOOKUP formula, assign the 2011 Output Area Code to each address using the postcode and the POSTCODE_TO_OA worksheet. • In 'Addresses', using the VLOOKUP formula, assign all OAC attributes (i.e. supergroup code, supergroup name, group code, group name, subgroup code and subgroup name) to each address in separate columns using the 2011 Output Area Code and the 'Profile of OAs' worksheet.
5	Integrate optional data to the dataset	• Where relevant, import the Urban Rural Classification file into the 'LA route profile' workbook as a new worksheet and, using the VLOOKUP formula, assign the 6-fold Urban Rural classification to each address in 'Addresses' using the 2011 Output Area Code and Urban Rural Classification worksheet.

6	Profile the LA area for the three OAC tiers	• Create three pivot tables (i.e. one for each OAC tier: supergroup, group and subgroup) using the dataset created above in 'Addresses' with:
		  ○ OAC categories as rows
		  ○ Unique Property Reference Number (UPRN) as 'values'. (As a value field setting select 'Count of UPRN' and show values as '% of Grand Total') [If no UPRN is available any other countable variable attributed to each address could be used.]
		  ○ Where relevant, one or more of the additional variables (e.g. property type, U/R classification, service type etc.) as column labels.
		  ○ (See Table 9 for an example profile of households by OAC supergroup and property type)
		• In order to create a clear layout, it is advised to use 'Tabular Form' for the report layout and select 'Do not show subtotals'.

7	Paste contents	• Once happy with all the data, in order to reduce the size of the Excel workbook, copy all cells with formulae and paste values.

Table 5 – Creating an LA profile via the blue route

Once the local authority area has been profiled it will be possible to interpret the data and define sample strata (see chapter 11). Thereafter the existing dataset can be reformatted for the householder selection process (see section 10.1.2 below).

10.2.2 Part 2 - Presenting household numbers by route and stratum characteristics

This process does not require the creation of an additional dataset; rather it involves the representation of the dataset created in Table 5 to show household numbers by route and stratum characteristics. The required steps (detailed below in Table 6) should only be carried out once appropriate strata have been defined (see chapter 11).

Order	Step	Description
1	Create pivot tables for household numbers by route and stratum characteristics	• Using the dataset created above in 'Addresses' (see Table 4), create three pivot tables (i.e. one for each OAC tier: supergroup, group and subgroup) with: ○ OAC categories and additional stratification variables as columns ○ Route names and days as rows ▪ Where collection routes to sample are not aligned (e.g. where residual waste is collected on a different day from the recycling) the collection day and route for all relevant streams should be included as row labels ○ Unique Property Reference Number (UPRN) as 'values'. (As a value field setting select 'Count of UPRN') [If no UPRN is available any other countable variable attributed to each address could be used.] • Where only households on a particular collection cycle are to be identified (i.e. only those households presenting residual waste in the first week of sampling) these should be filtered using the 'Report filter' pivot table function. • In order to create a clear layout, it is advised to use 'Tabular Form' for the report layout and select 'Do not show subtotals'.
2	Filter out OAC categories of no relevance	• In order to make pivot tables as concise as possible, filter out any OAC categories not represented in the chosen strata

Table 6 - Presenting household numbers by route and stratum characteristics

Once household numbers have been presented by route and stratum characteristics see chapter 12 for guidance on householder selection.

11 Interpreting the profiles and defining strata

The actions in this section of the guidance should only be carried out once the local authority profiling exercise has been completed (see sections 9.1.1 and 9.2.1 above)

11.1 Assumptions

ZWS's *Guidance on the Methodology for Waste Composition Analysis* states that, as a minimum requirement, between 4 and 5 strata should be used; however, if fewer than 5 strata are used then justification will be required in the sampling protocol. As such, this methodology assumes the use of 5 strata; however, situations where more or fewer strata may be appropriate are also discussed.

11.2 Objectives

From the assumptions stated above, the default objective of this exercise is to identify 5 strata, each of which represents (very approximately) around 20% of the total number of households; however, some flexibility may be appropriate where there are issues of specific relevance to the authority.

It should be noted at the outset that this is not an exercise in proportionally representing the whole population in 5 samples. Any supergroups that contain only a small % of households (e.g. less than 10%) should, in general, not be included in the sampling framework; however, each case will vary and no absolutes can be given with respect to the omission of supergroups.

By the end of the process the following objectives should be met:

- Strata should be based on OAC categories but, where relevant, should incorporate one or more additional variables particular to the local authority in question. Some examples of variation to capture in the sampling framework include:
    - Collection service (i.e. materials collected at the kerbside)
    - Property type (e.g. own-door vs multiple occupancy properties), especially if collection method varies significantly (i.e. kerbside vs back court vs on-street collections).
- The identified strata should represent a sufficiently high percentage of households in the local authority area (e.g.at least 80%).
- Strata should be defined alongside an understanding of their weighting in the overall sample.
    - No single stratum should represent too high a percentage of the households or population in the local authority area (e.g. 30% in a five stratum sampling regime).
    - The weighted samples should be approximately proportionally representative in terms of OAC categories **and** the additional variables.
- In general, strata will be based on OAC supergoups; however, in some instances strata may be based on lower level tiers of the OAC. Where possible, strata corresponding to more than one OAC supergroup should be avoided.

11.3 Actions and considerations

Based on the objectives above, the steps below outline the general required approach to defining strata. Using the local authority profile data:

1. Identify the 5 stand-out OAC supergroups
2. Consider the stand-out OAC supergroups with respect to property type, collection service and rurality. Some considerations include:
    - Is more than one stratum required for the largest supergroups (see worked example pages 20-24)?
    - Should any of the smaller supergroups (e.g less than 10%) be omitted from the sampling regime?
    - Should any of the strata be sampled from multiple occupancy properties or rural areas?
    - Should any of the supergroups be split with respect to the collection service (see worked example pages 25-27)?
    - Should any strata be defined at OAC group level or lower?
3. Finalise the definition of strata according to the above considerations.
4. Determine the contribution of each stratum to the overall weighting e.g. by removing from the profile the OAC categories not represented in the defined strata.
5. Where necessary, adjust the weighting so that the overall sample is largely representative in terms of both the OAC **and** the additional variables.

Table 7 contains some of the scenarios, conclusions and actions that may be relevant to the decision making process in step 2 above. The actions need not be followed in any particular order and some trial and error may be required to derive the most appropriate strata.

Variable	Scenario	Conclusion / actions
OAC supergroups	5 stand-out supergroups each representing at least 10-15% of households or the population	These will form the basis of the 5 strata. Verify if these strata are representative in terms of the additional variables.

	More than 5 stand-out supergroups	• Where the smallest supergroup in question represents less than (e.g.) 10%, consider omitting it from the sampling framework.
		  ○ Where the omitted supergroup could be considered similar in nature to one of the sampled supergroups, it may be appropriate to attribute the households represented by the omitted supergroup to the weighting of the similar sampled supergroup
		• Where there are 6 or 7 stand-out supergroups at a larger local authority, each of equal size (and where resources are available) it may be appropriate to sample more than 5 strata.
		• Where neither of the above options is appropriate consider combining two supergroups to form one stratum. Ideally, the two supergroups would:
		  ○ represent at least 15% of households; however, there would be no strict rule
		  ○ be relatively similar in nature
		  ○ correspond to households receiving the same collection service.
		(NB Combining two OAC supergroups to form one stratum will increase the difficulty of sampling as households from at least two separate output areas will need to be sampled. As such, this should only be done where no other solution is preferable.)

	Fewer than 5 stand-out supergroups	Consider splitting the largest supergroup into two to form two strata; it may be possible to split the supergroup by OAC group or subgroup or by an additional variable e.g. collection service, property type etc. Where no opportunities to split supergroups are apparent (e.g. where each stand-out supergroup represents around 25% of households) 4 strata may suffice at a small authority.
	One supergroup contains a very high proportion of households or population (e.g. over 30%)	Consider splitting the largest supergroup into two to form two strata; it may be possible to split the supergroup by OAC group or subgroup or by an additional variable e.g. collection service, property type etc.
	One of the stand-out supergroups represents households on two different collection services	• Where there is a clearly predominant service type, sample only from households on this service. • Where there is no predominant service, and where the supergroup is sufficiently large, divide the supergroup by collection service to form two strata.
Additional variables (general) e.g. MO properties, alternative service, etc.	Multiple occupancy properties / rural households (where affecting service) / alternative collection service correspond to more than 20% of households or population	At least one stratum will be required for multiple occupancy properties / rural households / alternative service, etc.

Variable	Scenario	Conclusion / actions
	Multiple occupancy properties / rural households (where affecting service) / alternative collection service correspond to between 10% and 20% of households or population	A multiple occupancy / alternative service / rural household stratum may be required but the decision should be made in the context of other factors
Multiple occupancy properties	In any stand-out supergroup a high percentage of households (or the population) are in multiple occupancy properties (e.g. > 50%)	Consider sampling multiple occupancy properties for this supergroup/stratum (especially if the collection service differs from own-door properties); however, the decision should be made in the context of the other strata to ensure that multiple occupancy properties in the overall weighted sample are not disproportionally represented. (**NB** Scotland's Census data does not distinguish between shared entrance properties and 4-in-a-block type properties. Local knowledge and/or internal property type data should therefore be used to confirm strata.)

Table 7 – Potential scenarios when defining strata

(**NB** There is no one definitive method to weight the strata – each case will be different depending on the households not represented by the defined strata. In addition, weighting may need to be altered later in the calculations relevant to the sampled data e.g. in the case of corrupted samples, weighting can be revised to reduce the magnification of error in samples deemed to be of diminished quality. In general, it is recommended to weight the strata, as accurately as possible, corresponding to any difference in materials collected as this is likely to have the greatest impact on the kerbside composition.)

11.4 Worked examples

11.4.1 Simple profiles using OAC supergroups

Table 8 compares the OAC supergroup profile of each authority in terms of both household and population[6] numbers.

For the 'urban authority' five stand-out groups can be observed (supergroups 2, 5, 6, 7 and 8), representing over 95% of households; and over half of households are classified as 'Cosmopolitan' or 'Constrained City Dwellers'. It would therefore appear reasonable to base the required 5 strata on these supergroups.

For the 'rural authority' there are also five stand-out groupings (supergroups 1, 5, 6, 7 and 8) representing almost 99% of households; however, in this instance supergroup 1 ('Rural Residents') represents almost 40% of households whereas supergroup 5 ('Urbanites') represents just over 8% of households. It would therefore appear reasonable to derive the required 5 strata from supergroups 1, 6, 7 and 8, with two strata representing supergroup 1.

[6] The population profile is only possible if following the red methodological route.

Super-group Code	Supergroup Name	Urban authority			Rural authority		
		OAC profile by no. of households	OAC profile by population	Population per household	OAC profile by no. of households	OAC profile by population	Population per household
1	**Rural Residents**	1.1%	1.5%	2.85	39.6%	40.6%	2.33
2	**Cosmopolitans**	26.2%	23.7%	1.95	1.0%	0.8%	1.75
3	**Ethnicity Central**	2.7%	2.7%	2.11	0.0%	0.0%	
4	**Multicultural Metropolitans**	0.5%	0.6%	2.59	0.1%	0.1%	2.36
5	**Urbanites**	14.9%	15.6%	2.25	8.4%	8.1%	2.19
6	**Suburbanites**	16.5%	19.2%	2.51	14.1%	15.2%	2.45
7	**Constrained City Dwellers**	25.2%	23.0%	1.97	12.9%	11.2%	1.97
8	**Hard-Pressed Living**	12.9%	13.8%	2.32	23.9%	24.0%	2.29
TOTAL		**100%**	**100%**	**2.16**	**100%**	**100%**	**2.27**

Table 8 – OAC supergroup profiles for the 'urban' and 'rural' authorties

As a general observation, households are, on average, slightly larger in the 'rural authority' than in the 'urban authority' (2.27 compared to 2.16 people per household). In addition, households in supergroups 1 ('Rural Residents') and 6 ('Suburbanites') are, on average, the largest. This can be relevant when collecting samples as larger households are more likely to generate more waste.

11.4.2 Detailed profiles

For both worked examples an additional level of analysis is required. For the 'urban authority', which is known to have a large proportion of multiple occupancy properties, a better understanding of property type is required, whereas at the 'rural authority', which is known to contain only a small number of multiple occupancy properties, a better understanding of the split between urban and rural collection services is required.

11.4.2.1 Urban authority

Step 1: Choose Stratum

Table 9 shows the 'urban authority' households profiled by OAC supergroup and property type.

The 'TOTAL' column at the far right had side reflects the simple OAC supergroup profile presented in section 11.4.1 where 5 stand-out supergroups were identified. The TOTAL row at the bottom of the table shows that just under half of households at the authority are in 'purpose-built blocks of flats or tenements'. This suggests that **at least** two strata should represent flats, at least one corresponding to each of supergroup 1 ('Cosmopolitans') and 7 ('Constrained City Dwellers'), where purpose built flats make up 83% and 71% of households respectively (see Table 27 in the Appendix). By profiling the

‘urban authority’ population by OAC supergroup and property type (see Table 10) it can be seen that only 41% of the population live in ‘purpose-built blocks of flats or tenements’.

It would therefore seem reasonable for only two strata to represent flats.

[**NB** The definition of ‘flats’ in Scotland’s Census data makes no distinction between flats with a communal entrance (e.g. tenements) and 4-in-a-block style apartments (each with their own entrance). For ease of demonstration, at the example ‘urban authority’ it has been assumed that the housing stock contains no 4-in-a-block flats; however, this is unlikely to be the case in real life. As 4-in-a-block flats are more likely to receive the same collection service as other own-door properties, when following this process in the real world it will be necessary to confirm the appropriateness of flats strata using local knowledge or internal property type data.]

Super-group Code	Supergroup Name	Whole house or bungalow			Flat, maisonette or apartment			Caravan or other mobile or temporary structure	Shared dwelling	TOTAL
		Detached	Semi-detached	Terraced (incl. end-terrace)	Purpose-built block of flats or tenement	Part of a converted or shared house (incl. bed-sits)	In a commercial building			
1	Rural Residents	1%	0%	0%	0%	0%	0%	0%	0%	**1%**
2	Cosmopolitans	0%	1%	1%	22%	2%	0%	0%	0%	**26%**
3	Ethnicity Central	0%	0%	0%	2%	0%	0%	0%	0%	**3%**
4	Multicultural Metropolitans	0%	0%	0%	0%	0%	0%	0%	0%	**1%**
5	Urbanites	2%	4%	3%	4%	1%	0%	0%	0%	**15%**
6	Suburbanites	7%	8%	1%	1%	0%	0%	0%	0%	**16%**
7	Constrained City Dwellers	1%	3%	3%	18%	0%	0%	0%	0%	**25%**
8	Hard-Pressed Living	1%	4%	7%	1%	0%	0%	0%	0%	**13%**
TOTAL		**11%**	**21%**	**16%**	**48%**	**3%**	**0%**	**0%**	**0%**	**100%**

Table 9 – ‘Urban authority’ household OAC supergroup profile with property type

Super-group Code	Supergroup Name	Whole house or bungalow			Flat, maisonette or apartment			Caravan or other mobile or temporary structure	Shared dwelling	TOTAL
		Detached	Semi-detached	Terraced (incl. end-terrace)	Purpose-built block of flats or tenement	Part of a converted or shared house (incl. bed-sits)	In a commercial building			
1	**Rural Residents**	1%	0%	0%	0%	0%	0%	0%	0%	**1%**
2	**Cosmopolitans**	0%	1%	1%	17%	1%	0%	0%	0%	**22%**
3	**Ethnicity Central**	0%	0%	0%	2%	0%	0%	0%	0%	**3%**
4	**Multicultural Metropolitans**	0%	0%	0%	0%	0%	0%	0%	0%	**1%**
5	**Urbanites**	3%	5%	4%	3%	1%	0%	0%	0%	**16%**
6	**Suburbanites**	9%	9%	1%	1%	0%	0%	0%	0%	**20%**
7	**Constrained City Dwellers**	1%	3%	4%	16%	0%	0%	0%	0%	**24%**
8	**Hard-Pressed Living**	1%	5%	8%	1%	0%	0%	0%	0%	**14%**
TOTAL		**15%**	**24%**	**18%**	**41%**	**3%**	**0%**	**0%**	**0%**	**100%**

Table 10 – ‘Urban authority’ population OAC supergroup profile with property type

Step 2: Identify weighting

Columns 1 and 3 of Table 11 show, respectively, the percentage of households and population represented by the defined strata. Both stratum 1 ('Cosmopolitans') and stratum 4 ('Constrained City Dwellers') represent a lower percentage of the population than they do households; this is due to the higher number of flats in these supergroups and, hence, the smaller average household size (see Table 8 above). As it has been decided to sample from multiple occupancy properties for these two strata it would seem reasonable[7] to weight the chosen strata in terms of population to capture the variation in household size (see column 4). In doing so, this reduces the weighting of the flats strata to 48% (which corresponds to the percentage households that are purpose built flats), allowing for a more even distribution of stratum weighting and, hence, reducing the overreliance on any one stratum in the overall sample.

If it had not been decided to sample from multiple occupancy properties then it would be advisable to weight the strata in terms of % of households represented omitting the unrepresented households (column 2),

Stratum no.	OAC code	OAC name	1	2	3	4
			% of households represented	Strata weighting omitting unrepresented households	% of population represented	Strata weighting omitting unrepresented population
1	**2**	**Cosmopolitans**	26%	27%	22%	23%
2	**5**	**Urbanites**	15%	16%	16%	16%
3	**6**	**Suburbanites**	16%	17%	20%	21%
4	**7**	**Constrained City Dwellers**	25%	26%	24%	25%
5	**8**	**Hard-Pressed Living**	13%	13%	14%	15%
TOTAL			**96%**	**100%**	**95%**	**100%**

Table 11 – Representativeness and weighting of strata at the 'urban authority'

Table 12 below shows the final profile of the chosen strata.

[7] There is some anecdotal evidence to suggest that waste arising per capita is higher in smaller households. Waste arisings in smaller households may therefore not be proportionally smaller with respect to the number of inhabitants. As such, it may be preferable to weight according to the average of the figures presented for households and population.

Stratum no.	OAC code	OAC name	'Flats' sample	Final weighting for local authority composition
1	**2**	**Cosmopolitans**	No	23%
2	**5**	**Urbanites**	Yes	16%
3	**6**	**Suburbanites**	No	21%
4	**7**	**Constrained City Dwellers**	Yes	25%
5	**8**	**Hard-Pressed Living**	No	15%

Table 12 – Profile of chosen 5 strata at the 'urban authority'

11.4.2.2 Rural authority

Step 1: Choose strata

Table 13 shows the 'rural authority' household OAC supergroup profile split by the Scottish Government Urban Rural Classification; 'urban' and 'rural' areas are as defined[8] for the Waste (Scotland) Regulations.

As discussed in section 11.4.1, the 5 strata are to be derived from supergroups 1, 6, 7 and 8, with two strata coming from supergroup 1 ('Rural Residents').

As only a small percentage of households in supergroup 1 are situated in 'urban areas' (as would be expected), it would not be appropriate to sample from these 'urban' households; as such, it is necessary to investigate an alternative way to define the two strata i.e. at OAC group level.

[8] http://www.gov.scot/Publications/2012/03/5755

Super-group code	Supergroup name	Urban Rural 6-Fold 2013/4 Code		
		1-3 ('Urban')	4-6 ('Rural')	TOTAL
1	Rural Residents	3%	37%	40%
2	Cosmopolitans	1%	0%	1%
3	Ethnicity Central	0%	0%	0%
4	Multicultural Metropolitans	0%	0%	0%
5	Urbanites	6%	2%	8%
6	Suburbanites	8%	6%	14%
7	Constrained City Dwellers	8%	5%	13%
8	Hard-Pressed Living	8%	16%	24%
TOTAL		35%	65%	100%

Table 13 – Profile of 'rural authority' households by OAC supergroup and Urban Rural classification

Table 14 shows the local authority area households profiled by rurality and OAC group (as opposed to OAC supergroup).

Representing 22% of all households in the local authority area, group 1 ('Farming Communities') stands out as an appropriate strata. Representing 13% of all households in the local authority area, group 2 ('Rural Tenants') stand outs as another appropriate stratum.

OAC group code	OAC group name	Urban Rural 6-Fold 2013/4 Code		
		1-3 ('Urban')	4-6 ('Rural')	TOTAL
1a	Farming Communities	1%	21%	**22%**
1b	Rural Tenants	1%	12%	**13%**
1c	Ageing Rural Dwellers	1%	4%	**5%**

Table 14 – Profile of 'Rural Residents' households by OAC group and Urban Rural classification

Step 2: Identify weighting

Table 13 also shows that 35% of households are located in 'urban' areas (i.e. 35% of households receive a food and garden waste collected at the kerbside). It should therefore be endeavoured to define strata with a food and garden collection from supergroups 6, 7 and 8 which correspond to around 35% of households in the overall weighted sample.

Column 1 in Table 15 shows that, as they stand, the proposed strata represent approximately 85% of all households in the local authority area. Column 2 shows how the strata would be weighted once the unrepresented households are omitted; however, no single stratum or combination of strata from strata 3, 4 and 5 correspond to 35% of households in the weighting

By choosing supergroups 6 ('Suburbanites') and 7 ('Constrained City Dwellers') as food and garden strata, food and garden households would represent around 31% of households in the overall weighted sample. By proportionally increasing the contribution of these strata to 35% in the final weighting, thereby slightly decreasing the influence of the three other strata (see Column 3), the strata are adjusted to be approximately representative of both the OAC supergroup profile and the variation in collection service across the local authority area. This solution has the added advantage of having food and garden service strata representing two different levels of deprivation.

Stratum	OAC code	OAC name	1	2	3
			% of households represented	Strata weighting omitting unrepresented households	Adjusted weighting for representative food and garden service
1	**1a**	**Rural Residents - Farming Communities**	22%	25%	**24%**
2	**1b**	**Rural Residents - Rural Tenants**	13%	15%	**14%**
3	**6**	**Suburbanites**	14%	16%	**18%**
4	**7**	**Constrained City Dwellers**	13%	15%	**17%**
5	**8**	**Hard-Pressed Living**	24%	28%	**27%**
TOTAL			**85%**	**100%**	**100%**

Table 15 – Weighting of proposed strata at the 'rural authority'

Table 16 therefore shows the final profile of the chosen strata.

Stratum no.	OAC code	OAC name	'Urban'(i.e. with food & garden waste collection)	Final weighting for local authority composition
1	1a	Rural Residents - Farming Communities	No	24%
2	1b	Rural Residents - Rural Tenants	No	14%
3	6	Suburbanites	Yes	18%
4	7	Constrained City Dwellers	Yes	17%
5	8	Hard-Pressed Living	No	27%

Table 16 – Profile of chosen 5 strata at the 'rural authority'

12 Householder selection

Once the strata have been defined, the next step in the process is to identify households to sample for each stratum; this is often an exercise in balancing sample representativeness with operational practicality.

12.1 Assumptions

ZWS's *Guidance on the Methodology for Waste Composition Analysis* states that:

- each stratum should be represented by a minimum street block sample on a quota basis, with a sample size of 50 households per street block
- as set-out is unlikely to be 100%, the householder selection process should include the creation of a 'reserve' list of at least 20-30 households per street block,

where a street block is an area belonging to a particular stratum that contains households serviced by the same collection round/round day (residual and recycling services) from which a sample of waste is obtained.

12.2 Objectives

Following on from the assumptions stated above, the objective of this exercise is to identify sufficiently large street blocks for samples of 50 households to be achieved for each stratum (with a minimum of operational difficulty). As such, the following objectives should be met:

- Each stratum should be sampled on a different day of the week.
- Street blocks of 70-80 households should be identified for each stratum.
- Street blocks should, where possible:
  - be randomly selected from within the stratum
  - contain only households on the same collection day route for residual waste and recycling
  - be as representative as possible of the stratum
  - correspond to single or neighbouring[9] output areas
  - correspond to the appropriate property type (where relevant).

[9] Where combining two supergroups it would be advantageous to identify a street block where households from the two supergroups form one neighbouring area.

12.3 Actions and considerations

*12.3.1 Id*entifying the household types to prioritise

As stated above, the process of building the sample should consider the make-up of each stratum in order to make each sample as representative of the stratum as possible.

As a preliminary step, it is therefore useful to review the profile of each stratum at the OAC tier below that which identifies the stratum e.g. if a stratum is characterised as OAC supergroup 1 it should be reviewed in terms of the households or population in OAC groups 1a, 1b and 1c. This will highlight the predominant household type (in this example the predominant OAC group) within the stratum and, hence, which household type(s) to prioritise for sampling. This will ensure that the households sampled are as representative as possible of the parent OAC category.

12.3.2 Identifying appropriate street blocks

Table 17 shows the necessary steps to follow in order to identify appropriate street blocks for sampling.

In addition to the highlighted steps there are a number of other operational elements to consider when selecting households to sample which can be found in ZWS's *Guidance on the Methodology for Waste Composition Analysis*.

[**NB** For multiple occupancy properties waste from at least 50 households 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 e.g. for closes containing six households all waste from nine closes must be uplifted (i.e. 9 x 6 = 54 households) rather than from eight closes (48 households). Where sample sizes of greater than 50 households are envisaged it would be prudent to increase the size of the identified street block to beyond 70-80 households.]

Step	Evaluation	Associated action
1	Using the pivot table created in Table 4 or Table 6, identify all day routes that have at least 70-80 households corresponding to the required characteristics for each stratum; in this guidance these will be called the 'eligible cells' in the pivot table.	Highlight the 'eligible cells' in the pivot table in light green
2	At random, for each stratum select only one 'eligible cell' so that each selected 'eligible cell' is on a different day of the week	1. Highlight the selected 'eligible cells' in dark green. 2. Double click on each selected 'eligible cell' to export a table of the corresponding addresses to a new worksheet
3	Review the address list for each selected 'eligible cell' to ensure that it contains at least 70-80 addresses:	
	a) that are generally representative of the stratum in terms of household type (see section 12.3.1 above)	
	b) of the appropriate property type[10]	This should be checked either on-site, using local knowledge or using Google Street View.
	c) within an operationally manageable area; ideally this would be in one street/output area or contiguous streets/output areas	This can be checked using local knowledge. Alternatively, output area boundaries can be mapped by: • importing OAC shape files into GIS, or • importing OAC shape files into Google Earth Professional, or • entering a query into the Census Scotland Standard Output generator[11] (**NB** A query must be made regarding one or more output areas for an indicator available at output area level e.g. 'QS402SC Accommodation type – Households' referenced above.)
4	Where all requirements in step 3 cannot be met repeat steps 2-3 until this is the case. These are now the 'confirmed cells'. (**NB** In some cases it will not be possible to find a permutation of 'eligible cells' which meets all requirements. In such cases it is permissible to select cells containing non-priority household types.)	
5	At random, from each 'confirmed cell' select street blocks of 70-80[12] households which meet the criteria in step 3.	Copy and paste the 'confirmed cell' address lists for each stratum and remove the address rows not selected for the street blocks. (**NB** It may also be relevant to remove from the lists any households where uplifting all waste may not be practicable e.g. those with assisted lifts or AHP uplifts.)

Table 17 – Process for identifying street blocks

[10] This is only relevant for authorities where no property type information is held in the internal database. It is anticipated that this verification process will largely be carried out to distinguish between shared entrance flats and 4-in-a-block flats.
[11] http://www.scotlandscensus.gov.uk/ods-web/standard-outputs.html
[12] There is no strict limit to the number of households that can be identified for each street block.

12.4 Worked example

12.4.1 Identifying the household types to target

Table 18 shows the households within each stratum at the ‘rural authority’ profiled at the tier below that which identifies the stratum, along with conclusions reached with respect to the household types to target when sampling.

Although the conclusions reached are aimed at making the sample as representative as possible, it may not always be operationally possible to sample the most desirable households. In these cases, sampling any households in the OAC category that defines the stratum will suffice.

Stratum	OAC code	OAC name	'Urban'	'Rural'	TOTAL	Sample type	Conclusions
1	1a1	Rural Workers and Families	0%	12%	12%	'Rural'	Subgroup 1a1 is the stand-out subgroup within the group 1a stratum and should be prioritised for sampling.
	1a2	Established Farming	0%	1%	1%		
	1a3	Agricultural Communities	0%	4%	4%		
	1a4	Older Farming	1%	3%	4%		
2	1b1	Rural Life	1%	4%	4%	'Rural'	1b3 is the stand-out subgroup and should be prioritised for sampling.
	1b2	Rural White-Collar Workers	0%	1%	1%		
	1b3	Ageing Rural Flat Tenants	1%	7%	7%		
3	6a	Suburban Achievers	5%	3%	**8%**	'Urban'	There is no great discrepancy in size of groups 6a and 6b overall. Either would be appropriate to sample; however, where operationally practicable, households from group 6a would be most appropriate as these are most representative of the households in 'urban' areas.
	6b	Semi-Detached Suburbia	3%	2%	**6%**		
4	7a	Challenged Diversity	4%	2%	**5%**	'Urban'	Groups 7a and 7c are the stand-out groups. As such, it would be preferable to sample from these households. Where operationally practicable, households from group 7a would be most appropriate as these are most representative of the households in 'urban' areas.
	7b	Constrained Flat Dwellers	1%	0%	**2%**		
	7c	White Communities	2%	2%	**5%**		
	7d	Ageing City Dwellers	1%	1%	**1%**		
5	8a	Industrious Communities	2%	7%	**9%**	'Rural'	Groups 8a and 8c are the stand-out groups. As such, it would be preferable to sample from either of these groups.
	8b	Challenged Terraced	3%	1%	**4%**		
	8c	Hard-Pressed Ageing	2%	6%	**8%**		
	8d	Migration and Churn	1%	2%	**3%**		

Table 18 – Within-stratum profiles and household types to target ('rural authority')

12.4.2 Identifying appropriate street blocks

Table 19 shows a mocked-up pivot table that could be created for the 'rural authority' from the integration of internal route data with OAC and rurality variables, as discussed in Table 4 and Table 6. For ease of display, OAC categories from different tiers (i.e. supergroup and group) have been presented together; however, the creation of two separate pivot tables would normally be required to derive the information presented.

In this example, there are 15 collection day routes in the appropriate collection cycle. These day routes are carried out on an alternate weekly basis for residual waste and dry recycling and can contain a mixture of 'urban' households (which receive food and garden collection services) and 'rural' households (which do not).

The light green cells correspond to the identified 'eligible cells' of households (i.e. those with over 70 households in the appropriate OAC category and rurality group) and the darker green cells correspond to the 'confirmed cells' from which the street blocks would be selected.

In this example, stratum 1 can only be assigned to Tuesday as the only day route containing at least 70 'rural' households in OAC group 1a is route TU1. This reflects a scenario often encountered in 'random' sample selection whereby the number of possible permutations of assigning strata to collection days is limited based on operational restrictions and, hence, samples cannot truly be selected at random.

Stratum		**1**		**2**		**3**		**4**		**5**	
OAC code		1a		1b		6		7		8	
OAC name		**Rural - Residents Farming Communities**		**Rural - Residents Rural Tenants**		**Suburbanites**		**Constrained City Dwellers**		**Hard-Pressed Living**	
Day	**Route / UR**	**'Urban'**	**'Rural'**	**'Urban'**	**'Rural'**	**'Urban'**	**'Rural'**	**'Urban'**	**'Rural'**	**'Urban'**	**'Rural'**
Mon	**M1**		50		65	124		250		92	32
Mon	**M2**				500	148	46		64	94	118
Mon	**M3**					147	33	45	26		124
Tue	**TU1**	51	323		713			82	28		
Tue	**TU2**		46	103	269	56			12	13	16
Tue	**TU3**		48	5	371	105		79			65
Wed	**W1**		60			83			81		42
Wed	**W2**	32	24	119	4	172				10	1
Wed	**W3**		39		341	183		155			20
Thu	**TH1**			107		7				111	51
Thu	**TH2**			26	96	742		306			88
Thu	**TH3**		98	60		132	102	120	5	236	174
Fri	**F1**					2	89	82	10		
Fri	**F2**					75		84		24	
Fri	**F3**			282	152	50	56	68			72

Table 19 - Example pivot table for selecting 'eligible cells' and street blocks

Figure 2 depicts a screenshot from the Scotland's Census standard output generator showing how the output areas corresponding to a 'confirmed cell' of 'Suburbanite' households might look.

The legend in the screenshot shows the options and variables selected in order to derive the map. (**NB** The table selected in the query corresponds to 'accommodation type' data used earlier in this guidance; however, any data table available at output area level could be selected for the purposes of generating the map. Output area codes in the screenshot have been anonymised.)

For operational simplicity, combinations of output areas 'a & b' or 'c & d' would be acceptable street blocks, as each combination consists of groups of geographically clustered whole streets; this allows for simple instructions to be conveyed to both the team sampling the waste and the normal collection crew (instructed to leave the waste). In both cases the defined street block would be over 80 households.

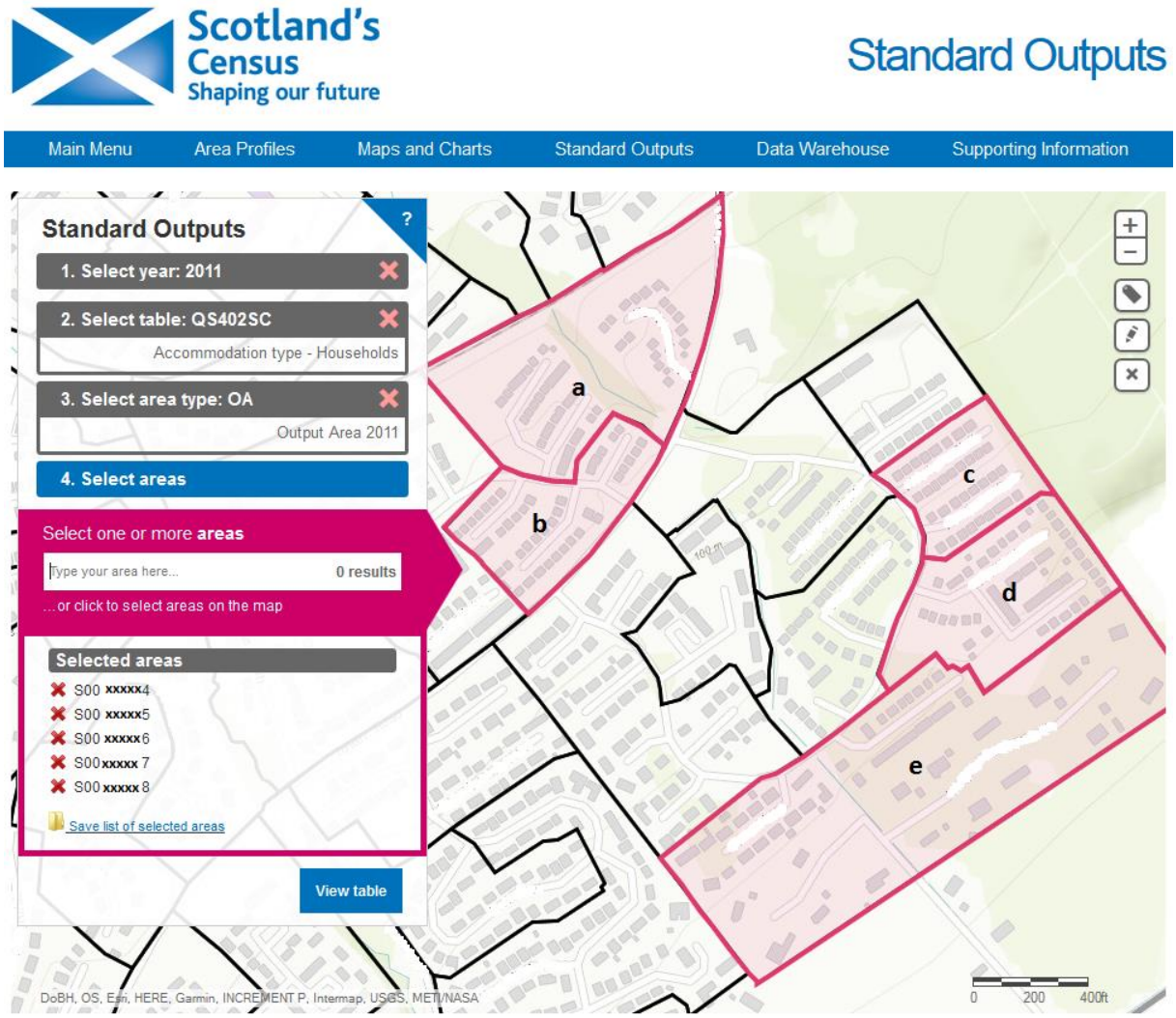

Figure 2 – Screenshot of Scotland's Census standard output generator showing 'Suburbanite' OAs

13 Compatibility of sampling process with other studies

This chapter discusses the possibility of adapting the WCA sampling framework in order to conduct participation monitoring and householder surveys.

Table 20 shows a comparison of the minimum sample sizes and operational considerations relating to the three study types.

In the standard ZWS WCA methodology 5 samples of 50 households are required from 5 separate collection day routes, whereas in the standard WRAP methodology for participation studies it is recommended, at a minimum, to sample (monitor) 1,100 households across two different collection day routes. WRAP's householder survey guidelines also recommend the sampling of at least 1,100 households; however, in practical terms, it would be implausible for all households on a collection

route to be surveyed. As such, there is no specific limit on the number of collection routes in which sampled households would be located; however, operational practicality would dictate that some geographical clustering of the samples would take place.

	ZWS WCA methodology	WRAP participation[13] study	WRAP householder survey (at the doorstep)
No. of households to sample	250	1,100 (for each reported figure)	1,100 (for each reported figure)
No. of collection routes	5	At least 2	No specific limit
Sampling approach[14]	Cluster sampling Stratified random sampling	Round-based sampling	Cluster sampling

Table 20 - Comparison of sampling WCA studies vs participation and householder surveys

Table 21 shows a summary of potential methodologies that could be developed from the WCA sampling approach, each with their own benefits and limitations.

Option 1 involves monitoring the participation of all households on the collection day routes from which households are sampled; this allows for a yield per participating (or setting-out) household to be calculated in each of the sampled day routes; however, the aggregation of all households on these day routes may not be representative of the local authority area.

Option 2 builds on this approach by proportionally quota sampling only from the relevant strata within each WCA-sampled collection route; this would allow for sampling which relates to the WCA households as closely as possible and would provide a better understanding of set-out, participation and householder attitudes at WCA stratum level; however, it may not be possible to identify sufficiently large numbers of households to sample within each collection day route, especially for householder surveys (where response rates are unlikely to be very high). If planning to use this approach it would be necessary to identify 'eligible cells' of appropriate households of, on average, 220 households (1,100 ÷ 5) per stratum. This would increase to 330 households for strata weighted at 30% and would be even greater if conducting householder surveys. (**NB** Weighted stratum samples of 220 households may be an acceptable approach if sufficiently large 'eligible cells' cannot be found; however, this would not allow for the calculation of confidence intervals.)

Option 3 presents potentially the best option for householder surveys, whereby quota samples for each defined stratum, proportionally representative of the local authority area, would be taken from any relevant household in the local authority area. Although not necessarily from the same households sampled in the WCA, this approach allows for a representative understanding of attitudes across the local authority area in line with the WCA stratification and is not restricted in having to be conducted solely within the five collection day routes from which waste was sampled. Option 4 potentially improves the representativeness of this approach by forgoing the five identified strata and proportionally sampling more in accordance with the local authority profile derived in sections 10.1.1 and 10.2.1. As with all surveys that cut across collection routes, it would not be possible in options 3 and 4 to associate responses with yields (except for at local authority level), and neither option would be ideal for participation monitoring (which is best done at the point of waste collection).

Option 5 requires 6,600 samples per stratum and would allow for results to be presented at stratum level; however, this would be of limited value as, according to the methodology described above, the WCA has been designed to report results at local authority level only.

[13] For 'true' participation studies, set-out rate must be monitored for three consecutive collection cycles.
[14] http://www.wrap.org.uk/sites/files/wrap/WRAP%20ME%20Guidance%20-%20CHP%203.pdf

Option	Methodology	Relevance	Sample size	Benefit	Limitation
1	**Sample all households on each stratum collection route**	• Participation survey only • (Too onerous for householder survey)	Up to around 6,000	• Opportunity to calculate average yield per participating household using route tonnage	• More resource intensive • Households may not be representative of the LA area
2	**Proportionally quota sample for each stratum within the WCA-sampled collection routes**	• Participation survey • Householder survey	1,100	• Surveys will relate to WCA results as closely as possible • A representative understanding of participation and attitudes across the LA area in line with the WCA stratification	• May not be possible to identify sufficiently large street blocks to sample • Participation monitoring most accurate at the time of collection
3	**Proportionally quota sample for each stratum from any eligible household in the LA area**	• Householder survey • (Participation survey may prove too logistically complicated if monitoring at time of collection)	1,100	• A representative understanding of attitudes across the LA area in line with the WCA stratification • Not restricted to five collection routes	• May be slightly less relevant to the WCA than option 2 • Not possible to calculate yield per participating household • Participation monitoring most accurate at the time of collection
4	**Proportionally sample according to a more detailed stratification regime using the LA profile derived for the WCA**	• Householder survey • (Participation survey may prove too logistically complicated if monitoring at time of collection)	1,100	• A representative understanding of participation and attitudes across the LA area in line • Potentially more representative of the LA area • Not restricted to five strata approach	• May be less relevant to the WCA than option 2 • Not possible to calculate yield per participating household • Participation monitoring most accurate at the time of collection
5	**Conduct a separate study for each stratum from any eligible household in the LA area**	• Not ideal for either survey • (Participation survey may prove too logistically complicated if monitoring at time of collection) • (Too onerous for householder survey)	6,600 (1,100 per stratum)	• Provides a reportable figure for each stratum • Weighted results may provide a more robust estimate of overall participation	• More resource intensive • Not possible to calculate yield per participating household • Of limited value unless more extensive WCA sampling is conducted for each sample

Table 21 – Developing a methodology for participation and householder surveys

14 Opportunities using GIS

14.1 What is GIS?

A GIS is a geographic information system, which allows users to visualise, question, analyse and interpret data to give a spatial understanding of large, complex and dynamic data. A GIS is often used in the waste and resources industry for determining key issues such as routing, identification of suitable sites for waste facilities and managing large groups of data related to waste arisings, management and cost.

14.2 How to use GIS in WCA?

Using GIS in waste compositional analysis depends on what data is being used, and what GIS system is at your disposal. Almost all local authorities will use either ESRI or Quantum GIS packages, and this guidance is relevant to both.

1. **Create data:** The first task in using GIS for WCA is the creation of datasets that relate to the households in your Authority. The easiest way to do this is to use the “join and relate” function with existing datasets that use spatial referencing such as UPRN’s.
2. **Create a profile plan:** From the data being used, identify what the specific profile variables of WCA participants will be. This can be done objectively using OAC data.
3. **Select data:** In the GIS package, using the functions of “select by attribute” or the “classification” tools available on most packages, these large datasets can be manipulated to produce the outputs desired (selected households, visual representation of OAC and other variables, maps and Excel output tables for contractors).

14.3 What are the benefits of using GIS?

Using GIS in waste compositional analysis offers these four main benefits:

1. By using functions such as “selection by attribute”, and “classification” users can quickly and visually illustrate complex data quickly for an entire local authority. This can also be exported to Excel. This will make identifying households differentiated by stratum variables both quicker and easier.

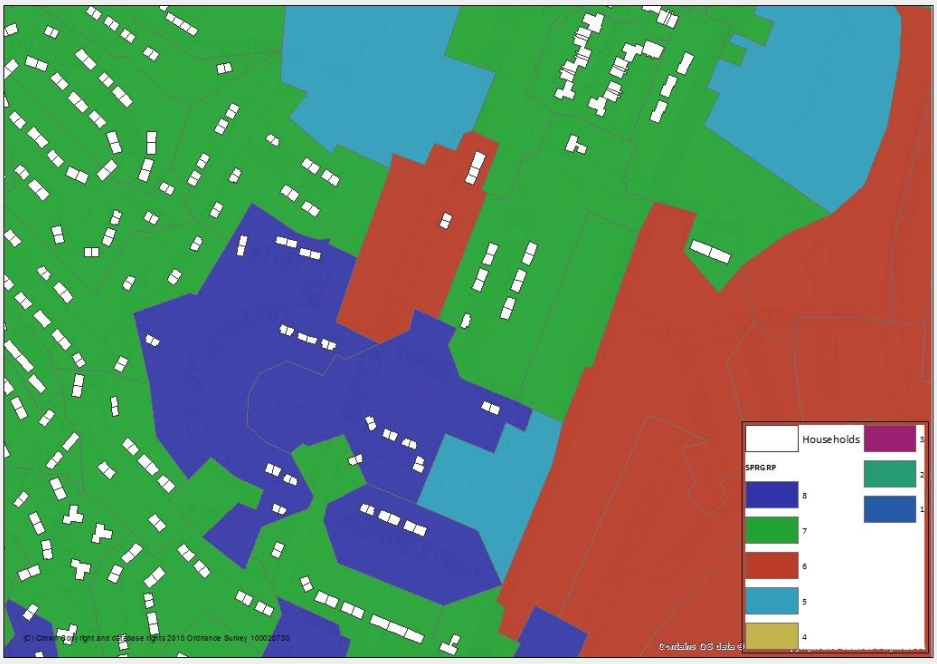

Figure 3 - Process of stratifying households by OAC supergroup

2. Additionally, using GIS, large and complex datasets can be quickly and reliably interrogated to determine which households to select based on a series of predetermined criteria and relationships between different datasets.

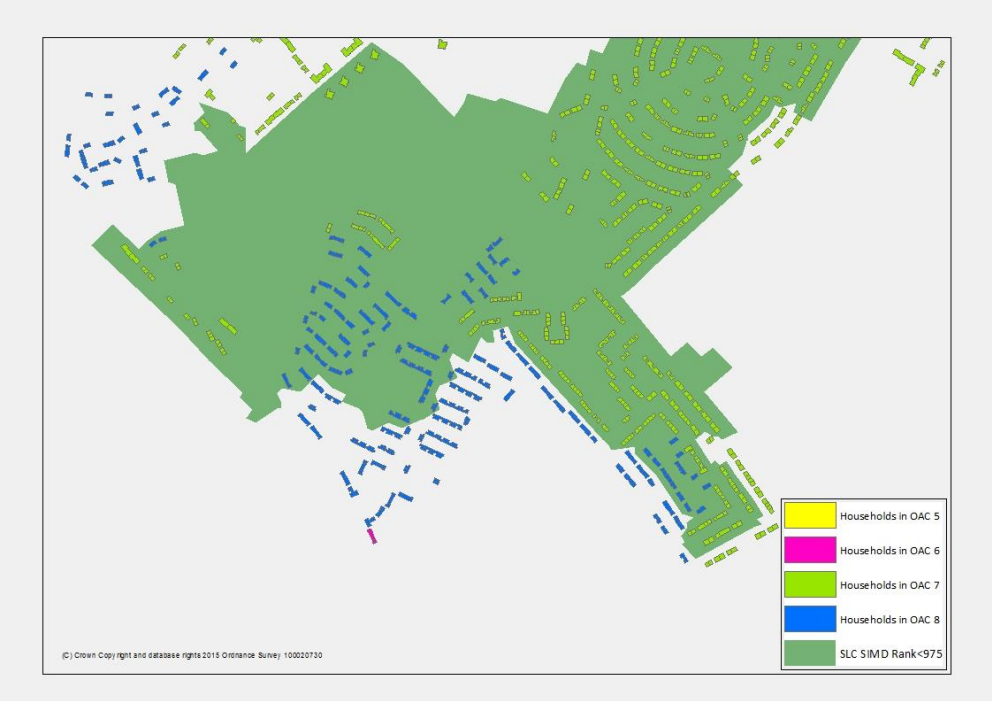

Figure 4 – Process of selecting households for sampling by OAC and SIMD rank

3. The spatial datasets produced by interrogation of a GIS also allow the user to export all the data selections quickly and easily to Microsoft Excel, allowing quick selection and export of instructions to third party contractors.

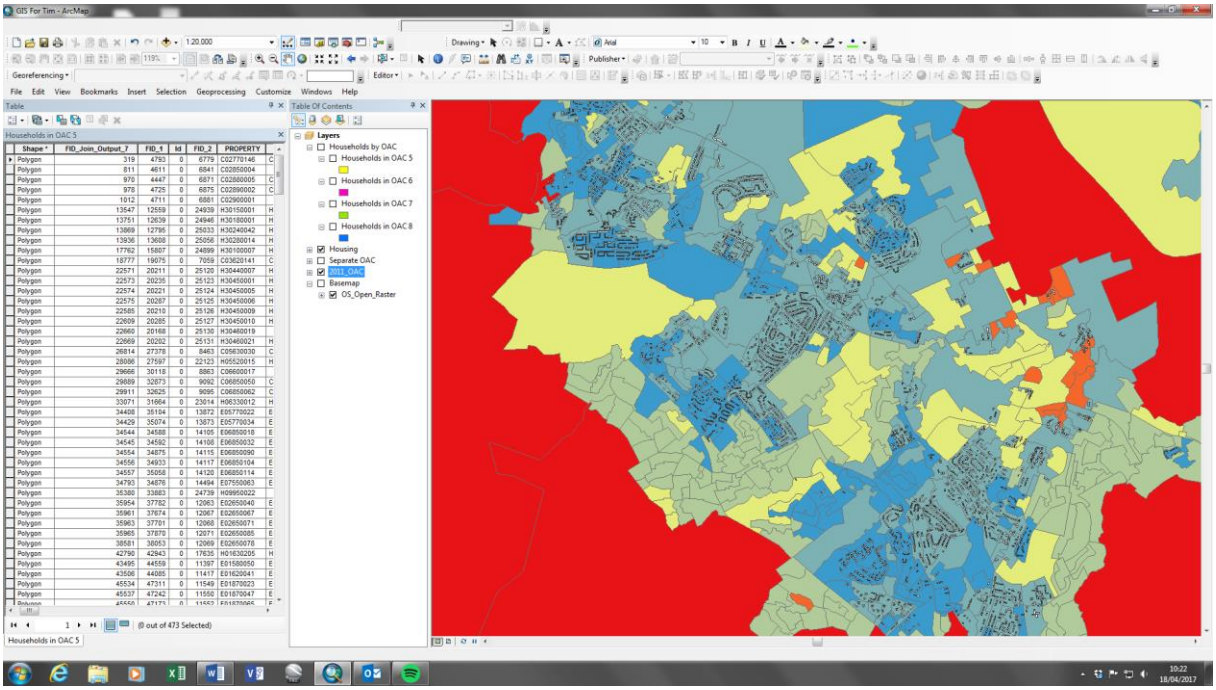

Figure 5 - Attribute table data for specific selections (left of screen) being prepared for export to Excel

4. Once the waste compositional analysis is complete, and based on the relationship of the results to specific aspects of the sampled households (e.g. OAC, SIMD, property type, Urban

Rural classification, etc.) results can be input into the GIS and then managed over time with further compositional analyses to determine the impact of service changes at an “all local authority” level. If all local authorities were to use the same methodology for this, then it is also possible for an “all Scotland” map to be created that illustrates over time the impact of service changes on specific household volumes and compositions.

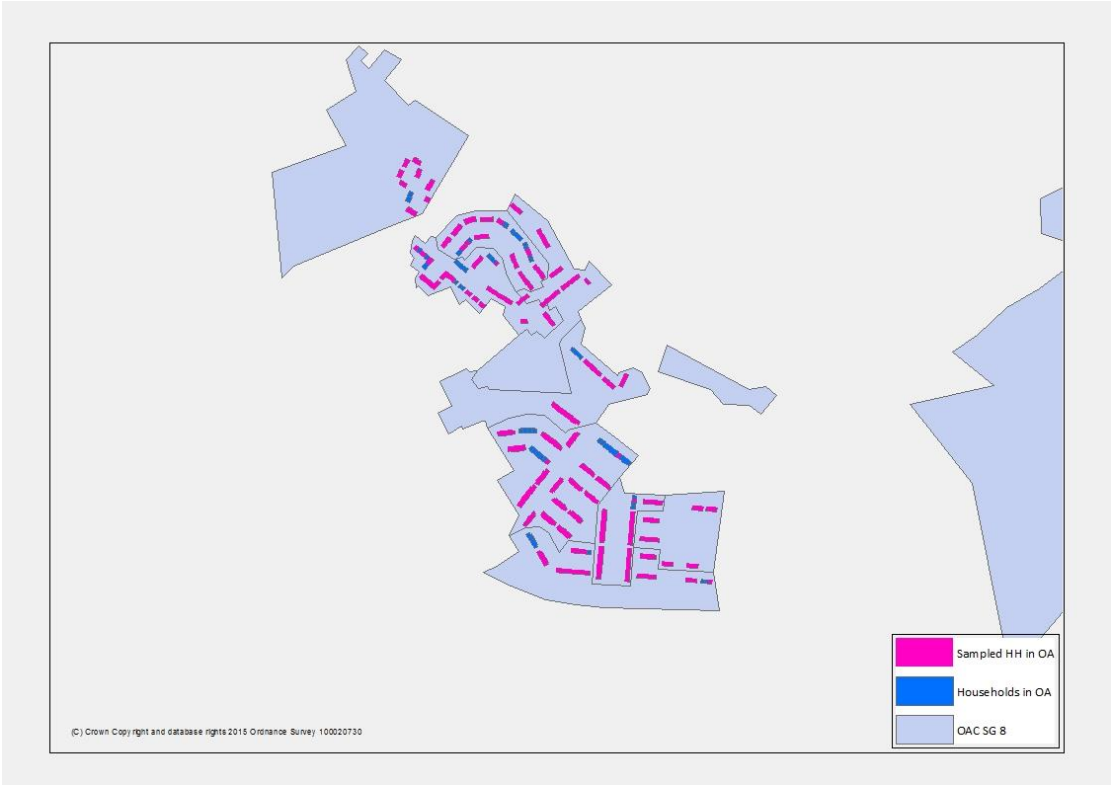

Figure 6 - Households sampled in a single output area for ongoing sampling management

Appendix

File no.	File	Source	URL
1	2011 OAC Clusters and Names Excel	Office for National Statistics	http://www.ons.gov.uk/ons/guide-method/geography/products/area-classifications/ns-area-classifications/ns-2011-area-classifications/datasets/2011-oac-clusters-and-names-excel.zip
2	Postcode to Output Area lookup within: 2011 Census Index	National Records of Scotland	POSTCODE_TO_OA.csv within: https://www.nrscotland.gov.uk/files//geography/2011-census-indexes-csv.zip
3	Accommodation type – Population (Table QS401SC)	Scotland's Census 2011 - National Records of Scotland	http://www.scotlandscensus.gov.uk/ods-web/download/getDownloadFile.html?downloadFileIds=Output%20Area%20std (**NB** The required files are contained within a zip file of 520MB.)
4	Accommodation type – Households (Table QS402SC)		
5	Output Area 2011 to Urban Rural Classification 2013-14	National Records of Scotland	https://www.nrscotland.gov.uk/files//geography/products/OA2011_to_UrbRur1314.xlsx

Table 22 – Index of relevant files

Supergroup Code	Supergroup Name
1	Rural Residents
2	Cosmopolitans
3	Ethnicity Central
4	Multicultural Metropolitans
5	Urbanites
6	Suburbanites
7	Constrained City Dwellers
8	Hard-Pressed Living

Table 23 – OAC by supergroup

Supergroup Code	Supergroup Name	Group Code	Group Name
1	Rural Residents	1a	Farming Communities
		1b	Rural Tenants
		1c	Ageing Rural Dwellers
2	Cosmopolitans	2a	Students Around Campus
		2b	Inner-City Students
		2c	Comfortable Cosmopolitans
		2d	Aspiring and Affluent
3	Ethnicity Central	3a	Ethnic Family Life
		3b	Endeavouring Ethnic Mix
		3c	Ethnic Dynamics
		3d	Aspirational Techies
4	Multicultural Metropolitans	4a	Rented Family Living
		4b	Challenged Asian Terraces
		4c	Asian Traits
5	Urbanites	5a	Urban Professionals and Families
		5b	Ageing Urban Living
6	Suburbanites	6a	Suburban Achievers
		6b	Semi-Detached Suburbia
7	Constrained City Dwellers	7a	Challenged Diversity
		7b	Constrained Flat Dwellers
		7c	White Communities
		7d	Ageing City Dwellers
8	Hard-Pressed Living	8a	Industrious Communities
		8b	Challenged Terraced Workers
		8c	Hard-Pressed Ageing Workers
		8d	Migration and Churn

Table 24 – OAC by group

Super-group Code	Supergroup Name	Group Code	Group Name	Subgroup Code	Subgroup Name
1	Rural Residents	1a	Farming Communities	1a1	Rural Workers and Families
				1a2	Established Farming Communities
				1a3	Agricultural Communities
				1a4	Older Farming Communities
		1b	Rural Tenants	1b1	Rural Life
				1b2	Rural White-Collar Workers
				1b3	Ageing Rural Flat Tenants
		1c	Ageing Rural Dwellers	1c1	Rural Employment and Retirees
				1c2	Renting Rural Retirement
				1c3	Detached Rural Retirement
2	Cosmopolitans	2a	Students Around Campus	2a1	Student Communal Living
				2a2	Student Digs
				2a3	Students and Professionals
		2b	Inner-City Students	2b1	Students and Commuters
				2b2	Multicultural Student Neighbourhoods
		2c	Comfortable Cosmopolitans	2c1	Migrant Families
				2c2	Migrant Commuters
				2c3	Professional Service Cosmopolitans
		2d	Aspiring and Affluent	2d1	Urban Cultural Mix
				2d2	Highly-Qualified Quaternary Workers
				2d3	EU White-Collar Workers
3	Ethnicity Central	3a	Ethnic Family Life	3a1	Established Renting Families
				3a2	Young Families and Students
		3b	Endeavouring Ethnic Mix	3b1	Striving Service Workers
				3b2	Bangladeshi Mixed Employment
				3b3	Multi-Ethnic Professional Service
		3c	Ethnic Dynamics	3c1	Constrained Neighbourhoods
				3c2	Constrained Commuters

Super-group Code	Supergroup Name	Group Code	Group Name	Subgroup Code	Subgroup Name
		3d	Aspirational Techies	3d1	New EU Tech Workers
				3d2	Established Tech Workers
				3d3	Old EU Tech Workers
4	Multicultural Metropolitans	4a	Rented Family Living	4a1	Social Renting Young Families
				4a2	Private Renting New Arrivals
				4a3	Commuters with Young Families
		4b	Challenged Asian Terraces	4b1	Asian Terraces and Flats
				4b2	Pakistani Communities
		4c	Asian Traits	4c1	Achieving Minorities
				4c2	Multicultural New Arrivals
				4c3	Inner City Ethnic Mix
5	Urbanites	5a	Urban Professionals and Families	5a1	White Professionals
				5a2	Multi-Ethnic Professionals with Families
				5a3	Families in Terraces and Flats
		5b	Ageing Urban Living	5b1	Delayed Retirement
				5b2	Communal Retirement
				5b3	Self-Sufficient Retirement
6	Suburbanites	6a	Suburban Achievers	6a1	Indian Tech Achievers
				6a2	Comfortable Suburbia
				6a3	Detached Retirement Living
				6a4	Ageing in Suburbia
		6b	Semi-Detached Suburbia	6b1	Multi-Ethnic Suburbia
				6b2	White Suburban Communities
				6b3	Semi-Detached Ageing
				6b4	Older Workers and Retirement
7	Constrained City Dwellers	7a	Challenged Diversity	7a1	Transitional Eastern European
				7a2	Hampered Aspiration
				7a3	Multi-Ethnic Hardship

Super-group Code	Supergroup Name	Group Code	Group Name	Subgroup Code	Subgroup Name
		7b	Constrained Flat Dwellers	7b1	Eastern European Communities
				7b2	Deprived Neighbourhoods
				7b3	Endeavouring Flat Dwellers
		7c	White Communities	7c1	Challenged Transitionaries
				7c2	Constrained Young Families
				7c3	Outer City Hardship
		7d	Ageing City Dwellers	7d1	Ageing Communities and Families
				7d2	Retired Independent City Dwellers
				7d3	Retired Communal City Dwellers
				7d4	Retired City Hardship
8	Hard-Pressed Living	8a	Industrious Communities	8a1	Industrious Transitions
				8a2	Industrious Hardship
		8b	Challenged Terraced Workers	8b1	Deprived Blue-Collar Terraces
				8b2	Hard-Pressed Rented Terraces
		8c	Hard-Pressed Ageing Workers	8c1	Ageing Industrious Workers
				8c2	Ageing Rural Industry Workers
				8c3	Renting Hard-Pressed Workers
		8d	Migration and Churn	8d1	Young Hard-Pressed Families
				8d2	Hard-Pressed Ethnic Mix
				8d3	Hard-Pressed European Settlers

Table 25 – OAC by subgroup

Super-group Code	Supergroup Name	Whole house or bungalow			Flat, maisonette or apartment			Caravan or other mobile or temporary structure	Shared dwelling
		Detached	Semi-detached	Terraced (incl. end-terrace)	Purpose-built block of flats or tenement	Part of a converted or shared house (incl. bed-sits)	In a commercial building		
1	Rural Residents	7%	1%	1%	0%	1%	1%	22%	0%
2	Cosmopolitans	3%	4%	7%	46%	49%	69%	2%	57%
3	Ethnicity Central	0%	0%	1%	5%	2%	3%	0%	3%
4	Multicultural Metropolitans	0%	1%	1%	0%	0%	0%	0%	0%
5	Urbanites	18%	21%	19%	9%	31%	10%	55%	16%
6	Suburbanites	62%	38%	5%	1%	3%	3%	2%	0%
7	Constrained City Dwellers	5%	13%	21%	37%	13%	12%	15%	25%
8	Hard-Pressed Living	5%	21%	45%	1%	1%	3%	3%	0%
TOTAL		100%	100%	100%	100%	100%	100%	100%	100%

Table 26 – ‘Urban authority’ household OAC supergroup profile by property type

Super-group Code	Supergroup Name	Whole house or bungalow			Flat, maisonette or apartment			Caravan or other mobile or temporary structure	Shared dwelling	TOTAL
		Detached	Semi-detached	Terraced (incl. end-terrace)	Purpose-built block of flats or tenement	Part of a converted or shared house (incl. bed-sits)	In a commercial building			
1	Rural Residents	67%	17%	8%	4%	2%	0%	3%	0%	**100%**
2	Cosmopolitans	2%	3%	4%	83%	6%	1%	0%	0%	**100%**
3	Ethnicity Central	1%	3%	3%	90%	2%	1%	0%	0%	**100%**
4	Multicultural Metropolitans	3%	30%	30%	34%	3%	0%	0%	0%	**100%**
5	Urbanites	14%	29%	20%	29%	7%	0%	1%	0%	**100%**
6	Suburbanites	43%	48%	5%	3%	0%	0%	0%	0%	**100%**
7	Constrained City Dwellers	2%	11%	14%	71%	2%	0%	0%	0%	**100%**
8	Hard-Pressed Living	5%	34%	56%	5%	0%	0%	0%	0%	**100%**

Table 27– 'Urban authority' household property type profile by OAC supergroup

01786 433930 zerowastescotland.org.uk @ZeroWasteScot