1 Data Collection and Collation

WRAP's Kerbside Analysis Tool (KAT) uses a combination of actual data from our existing collection service, such as vehicle and resourcing levels, unit costs, and material yields, and combines them with evidence-based assumptions drawn from reliable data sets from other local authorities. KAT is an established and widely used tool which has supported many councils to assess and implement changes to waste collections.

Prior to the project commencing, we completed a number of KAT baseline data sheets. These provided as much of the key information required for KAT modelling as possible.

The data can be categorised into three themes: operational data, cost data, and material yield data. Categorisation of what data was supplied in each theme is:

Operational Data

The operational data supplied includes:

- Number and type of vehicles operated.
- Crewing levels.
- Mass of material collected.
- Length of working day.
- Tipping locations.
- Garaging locations.

Cost Data

The cost data supplied includes:

- Staff costs including operatives and supervision.
- Vehicle capital costs.
- Vehicle operating costs (standing and running cost).
- Waste transfer / infrastructure costs (staff, plant, operation and maintenance, consumables, energy etc.).
- Treatment cost for collected materials – residual waste and food waste.
- Material incomes from recyclables.
- Haulage (if applicable).
- Overheads.

Yield Data

Yield data was extracted from WasteDataFlow (WDF) and supplied for the financial year 2022/23**.** This includes:

- Kerbside residual waste
- Kerbside dry recycling

- Kerbside food waste
- Kerbside green waste
- HRC wastes (used for impacts on HRC's, rather than directly impacting collections modelling)

Additional Collection Data

In addition to that in the KAT proformas, further operational data was captured including a list of collection rounds and areas worked each day to give a much clearer picture of how current collections are arranged and resourced.

Of paramount importance when creating a service baseline is the measurement of productive time, i.e., the time during the working day when crews are actively collecting materials, and non-productive time, i.e., driving to the point of first collection, breaks, driving to offload materials, tipping times, return to collections, and return to depot. These are defined in the model using a number of parameters:

- Length of working day – taking into account breaks and other periods where vehicles not engaged in collection;
- Time spent travelling to first pick up;
- Time spent travelling from collection area to tipping point;
- Time spent travelling from tip to garaging location; and
- Time spent at the tip.

To maximise accuracy a 4-week sample (November 2023) of GPS data for the whole collection fleet was supplied as evidence and analysed using the model to produce a set of accurate, real-time parameters for the baseline model. This approach has been successfully employed in modelling projects undertaken in Wales by members of the project team and has been seen to produce reliable and realistic modelling outputs, where projected resource levels closely align with real world resource levels post implementation.

2 Modelling Assumptions

Yield uplifts, as a result of service changes, are key to the modelling process. As well as directly impacting recycling rates, changes to yields will affect the rate at which collection vehicles are filled and can therefore have a considerable influence on the resources required.

To accurately predict the changes from the options to be modelled, a detailed benchmarking exercise was undertaken drawing upon yields seen in other authorities across Wales.

Two types of residual waste collections were benchmarked to provide predicted yield uplifts:

- Authorities collecting via wheelie bins with weekly containment of 70 litres or less: Blaenau Gwent, Cardiff, Conwy, Neath Port Talbot, Newport, Powys, Torfaen, and Rhondda Cynon Taf.
- Authorities collecting the equivalent of one black bag of residual waste per week: Bridgend, Monmouthshire, Pembrokeshire, Vale of Glamorgan.

The two collection types were assessed because sack-based residual collections consistently exhibit the lowest residual waste yields, as well as the highest dry and food yields.

Yield uplifts were varied depending on the amount of weekly residual capacity, as well as the frequency of collection. The yields for each of the modelled options were agreed to be:

- For Option 1a, with residual capacity of 60L/week, dry and food yields are predicted to be at the median yield of bin authorities.
- For Option 2a, with a residual capacity of 45L/week, dry and food yields are predicted to be just below the median of sack authorities – this is due to an apparent tendency for sack-based collections to out-perform bin-based collections with similar nominal weekly residual volumes.
- For Option 3a, with a residual capacity of 60L/week, is predicted to realise the same dry yields as option 1a, but with more frequent residual collections (fortnightly as opposed the three weekly) food waste yield is projected to be slightly lower than Option 1a.

The agreed yield assumptions were:

Option	Description	Residual volume per week (l)	Yield - kg/hh/yr		Dry set out %
			Dry	Food	
Baseline	180l Fortnightly - 6 day working	90	168	62	80%
Enhanced Baseline	180l Fortnightly - 5 day working	90	168	62	80%
Option 1a	180l 3 Weekly - 5 day working	60	186	99	85%
Option 2a	180l 4 Weekly - 5 day working	45	190	110	90%
Option 3a	120l Fortnightly - 5 day working	60	186	96	85%

3 Carbon Assessment

Methodology

An assessment of the carbon impacts related to our current collection service and the modelled options was undertaken as part of the overall project. WRAP's Carbon

Waste and Resource Metric (Carbon WARM) factors were used to underpin the assessment.

The standard WARM conversion factors allow greenhouse gas emissions (in tonnes CO2e) relative to landfill, to be calculated based on the mass of materials collected for each part of the service modelled. From the KAT modelling, the mass of each material stream collected for each service configuration was determined, and was used in conjunction with the relevant WARM factors to calculate greenhouse gas emissions for each option modelled.

With landfill disposal largely replaced by treatment of material via Energy from Waste (EfW) in Wales, the factors were modified to express greenhouse gas emissions relative to EfW.

In addition, we were keen to understand the contribution made by their collection fleet to overall emissions. The published Carbon WARM factors include an element of emissions attributed to the collection of material from the kerbside. However, the KAT modelling and our own data provide a more accurate measure of actual fuel usage.

The Carbon WARM factors were therefore modified to remove the collection emissions element, with the fuel data produced by KAT used to calculate the collections emissions instead. UK government (BEIS) emission factors for road fuel were used for the calculation.