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**Final Report**

# Powys Vehicle and Collection Options Appraisal


A review of options to support the future development of Powys County Council's kerbside recycling collection and material bulking arrangements

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WRAP helps individuals, businesses and local authorities to reduce waste and recycle more, making better use of resources and helping to tackle climate change.

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**Front cover photography:** Powys kerbside containers

# Executive summary

The Welsh Government has set challenging recycling targets to be met by local authorities, underpinned by direction on a preferred kerbside collection model to be adopted based on source segregation of dry recycling and food waste. Powys County Council has committed to adopting this model, but faces a number of significant logistical challenges due to the unique rural geography of the authority and organisational barriers to change.

Powys County Council began the rollout of a recycling-led service to urban properties in 2011, following trials that commenced in 2010. Working from South to North the new scheme comprises the weekly collection of dry recycling (rigid plastics (plus film) and cans, paper and card, mixed glass) and food waste alongside fortnightly refuse. These changes are intended to deliver an increase in recycling levels from 42% in 2011/12 to meet the 2012/13 target of 52%. Longer term the authority is required to achieve the Welsh Government target of 70% recycling and composting by 2024/25.

In the short term the recycling aspects of the scheme have been undertaken using split-bodied RCVs collecting the dry recycling and food waste each week via two property passes. This approach is not sustainable (due to the high lease and operating costs of the fleet) and this vehicle type is not suited to the more rural areas of the authority. As a result a review of vehicle options was required, along with service delivery methods and bulking arrangements across the Authority, to inform a final decision on fleet procurement and enabling full rollout of the scheme into rural areas.

This report presents the findings of a WRAP-funded study into the available recycling vehicle options, based on a review of the current kerbside service and followed by spreadsheet-based cost and resource modelling of a number of different vehicle configurations. The study also incorporated a benchmarking exercise, comparing Powys with authorities operating similar schemes, and research into a range of vehicle options through engagement with a number of vehicle manufacturers. The key stages in the methodology are described in Appendix 1.

Contact with Powys County Council officers was managed through an inception and interim study meeting, walkover of a number of bulking facilities and delivery of a crew workshop - to gain their early views and input on a long list of vehicle options. Existing service data for the refuse and two-pass recycling collections was gathered from a range of sources. This, combined with the benchmarking exercise, led to the following observations on the existing collection arrangements in Powys:

- Average round sizes on both the refuse (c.650 households per day) and current two-pass recycling service (c.600 households per day) appear low. It is acknowledged that on the refuse collections an estimated 20% of collected weight is attributed to commercial waste, however the property counts generating this waste and the time spent collecting from this is source is not quantified;

- The low average property count on the recycling rounds combined with the fact that two vehicles are being deployed per round makes this service very expensive to operate. [A hybrid baseline model was built assuming Powys rolled out the two-pass arrangement across the whole authority, providing a 'worst-case' benchmark against which alternative service delivery options could be compared];

- Managing the waste service via 8 Local Environment areas does not provide sufficient household coverage within individual areas to enable economies of scale (and thus full utilisation of vehicles) to be achieved;

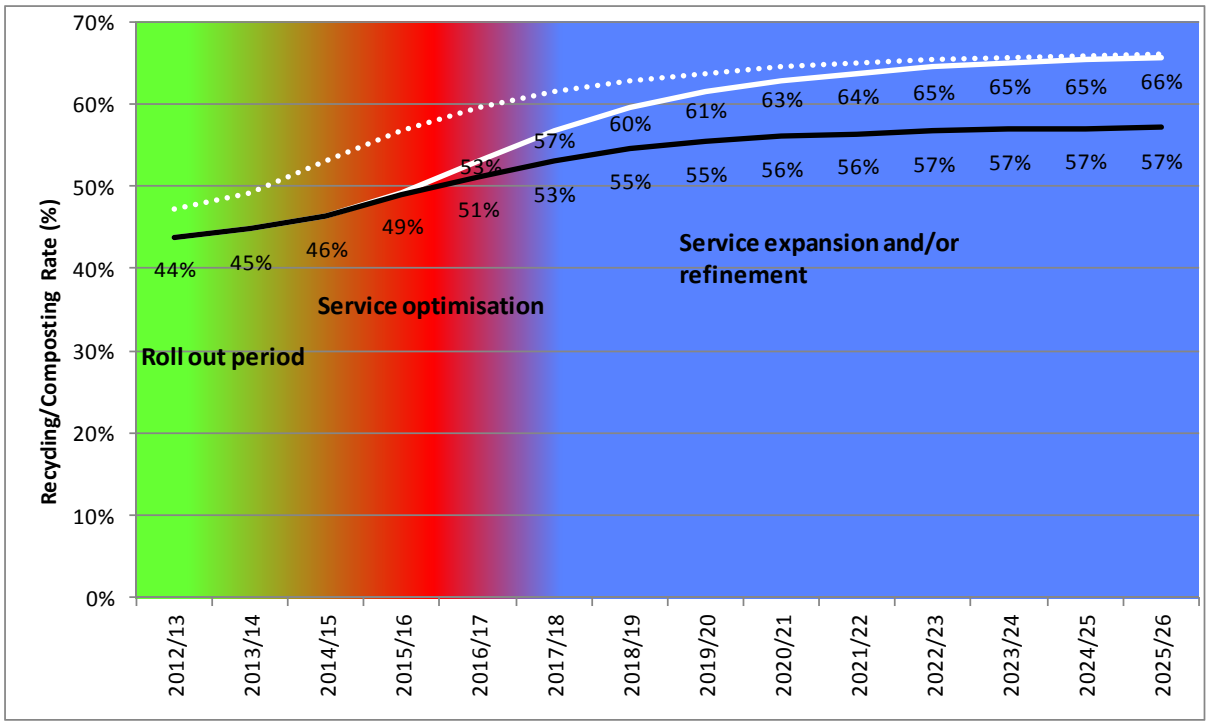
- There exist a number of local authorities that are successfully operating weekly kerbside dry recycling and integrated food waste collections via a one-pass (single vehicle) arrangement, with round sizes not dissimilar to those being achieved by Powys now (but with two vehicles). Authorities such as Conwy, Cheshire West and Chester, the Somerset Waste Partnership and West Oxfordshire all use advanced stillage vehicles and state urban round sizes in the range 450 – 750 households per day. WRAP's IC&P2 study modelled an average round size of 646 households on urban rounds for this collection type in a rural authority setting; and

- At a time when market conditions have seen UK local authorities being offered positive income values for their recyclate (even when collected in a fully co-mingled form), it is unclear how the existing contracted arrangements are delivering market value. The complex arrangements adopted across Powys involves material collected in the south of the County being transported over long distances and handled several times before being sorted and sent to end markets. Further work is required to assess the true cost-benefit of the existing arrangements and whether local baling and (and sorting) would be more efficient.

Against a backdrop of specific health and safety risks, such as the issue of potential overhead cable strikes where vehicles tip above the height of the main body during the loading process, a long list of study vehicle options was generated. This comprised innovative options such as split-body rear end loading RCVs with two front pods, mini kerbsider vehicles and a number of advanced stillage designs. From this list a number of modelling scenarios were agreed. Owing to an uncertain position around numbers of households with restricted access a number of assumptions were applied to inform the hierarchy of vehicle sizes suited to making urban/standard access and rural/narrow collections. Those properties with ultra narrow access constraints were parked outside the model analysis, requiring small box vans (or similar) to collect both refuse and recycling streams.

It was an objective of the study to consider not only the fleet required to deliver household collections now, but also how future Welsh Government recycling and composting targets affect the levels of resources required. In response recent tonnage data was used to generate hypothetical good practice (black line) and ambitious (solid white line) recycling performance projections to 2025/26 (in figure 1 below). The projections incorporate an underlying assumption of increased capture of the existing target materials and a progressive increase in commercial waste recycling. It is from these interventions that increases in key material streams (such as food waste) are produced. Within the main body of the report it is acknowledged that the required increases in recycling tonnage may need to come from the addition of new target materials collected for recycling (such as textiles, small WEEE and AHP's (absorbent hygiene products)). Documented issues with the baseline data constrained the level of rigour that could be applied to this assessment; this is an area that requires improved performance data gathering and monitoring (each year) to ensure that the interventions implemented enable Powys to continue to track ahead of the ambitious projection. By 2024/25 it is assumed that the 70% target would be met through further material recovery from residual waste treatment.

**Figure 1** Intervention timescales for ambitious recycling and composting rate projection

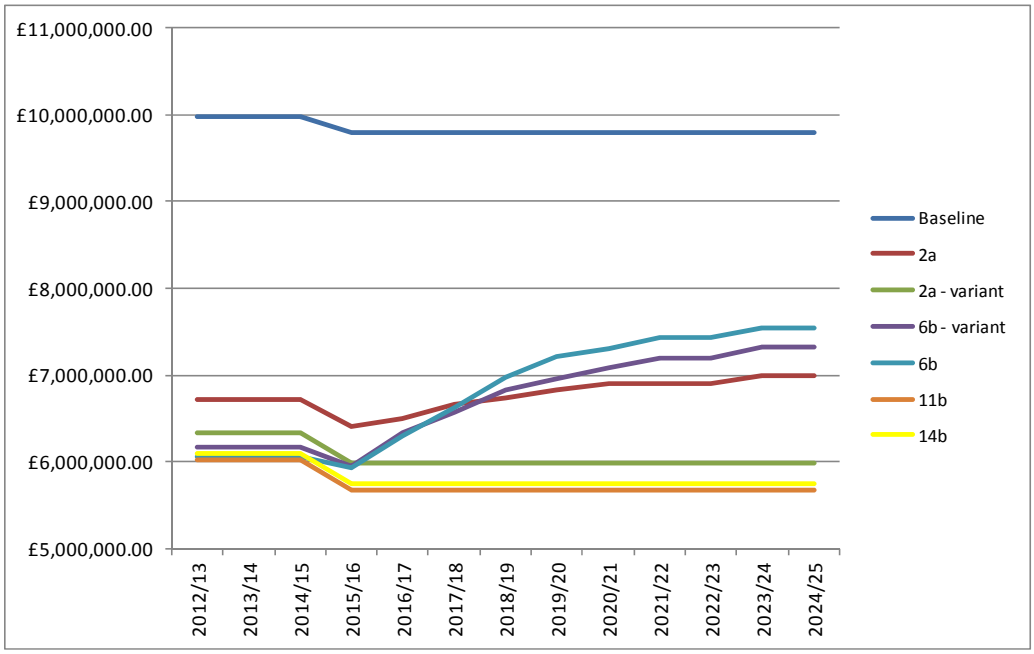



The white dotted line infers Powys' current performance based on provisional 2012/13 recycling rate data (Jan – July) of 47.8%, and continued tracking along the gradient of the ambitious curve. The dotted white line shows that the Council are tracking ahead of the curves generated early on in the study and based upon the best available data at that time. Under this projection Powys are able to meet both the 2015/16 and 2019/20 targets, especially with further material recovery from residual waste treatment and interventions to improve the performance of bring sites and Household Waste Recycling Centres.

A baseline (assuming extension of the existing two-pass arrangement) and six subsequent scenarios were modelled based on the vehicle configurations overleaf. The associated annual operating cost of each scenario is presented in Figure 2, presented against the ambitious performance projection as the line Powys intends to follow.

| Scenario | Standard Access Service | | Narrow Access Service | |
|---|---|---|---|---|
| Baseline |  | 70/30 Split-bodied 26t RCV (2 pass solution) |  | 70/30 Split-bodied 15t RCV (2 pass solution) |
| 2a |  | 26t NTM 4-pod |  | 7.5t mini-kerbsider |
| 2a - variant |  | 26t NTM 4-pod |  | 12t CWS Kerbloader Narrow |
| 6b |  | 18t NTM 4-pod |  | 7.5t mini-kerbsider |
| 6b - variant |  | 18t NTM 4-pod |  | 12t CWS Kerbloader Narrow |
| 11b |  | 12t Romaquip |  | 12t Romaquip Narrow |
| 14b |  | 12t Terberg Kerbloader |  | 12t CWS Kerbloader Narrow |

**Figure 2** Ambitious projection estimated annual scenario collection costs



The annual cost difference between the baseline (two-pass arrangement) and the best performing (advanced stillage) options, at around £4.3m per annum is significant. Comparing the top three scenarios, the difference in costs between the advanced stillage and the best 4-pod option is between £3-4m over the 13 year modelling horizon. It should be noted that these are collection costs only (refuse and recycling) and do not take account of downstream haulage, material revenues and disposal charges. Where the graphed lines show increases over time this is due to additional vehicles being required to cope with increasing recycling. The costs are estimates based on a number of assumptions around achievable pass rates, average proximity to depots and tipping points etc. When a full round design exercise is undertaken these figures may be subject to change, especially when the requirement to factor in whole numbers of vehicles at given depot locations is taken into account.

As a result of the above modelling results and consideration of the important health and safety considerations, this study recommends that **the most appropriate recycling vehicle for Powys is an advanced stillage-type, as either the Romaquip or Terberg/CWS Kerbloader**. The NTM 4-pod vehicle remains unproven in the UK and is subject to greater levels of uncertainty with respect to its ability to access all urban properties.

The advantages and drawbacks of the advanced stillage vehicles are summarized below:

| Vehicle type | | Advantages | Limitations |
|---|---|---|---|
| 12t Romaquip Standard or Narrow Access |  | • No tipping above vehicle height during loading<br>• 5+ compartments supports addition of new materials<br>• Stillage design most likely to limit glass noise impacts within Lower Exposure Limits (with vehicle adaptations)<br>• Automated unloading (hydraulics and 'magic floors')<br>• On board compaction of cans/plastic and cardboard<br>• DAF LF chassis liked by crews with good turning circle<br>• Lowest overall cost of all options modelled | • Requires well designed and managed bulking facilities<br>• Long-term maintenance costs not proven (albeit positive early reliability seen in Conwy)<br>• Some concerns over aperture loading heights<br>• Narrow vehicle same length as standard variant so may still pose access issues (albeit crews advised that width is the key issue with respect to side-loading)<br>• Limited scope for household and commercial / communal recycling co-collection<br>• Lower capacity for the 4 core commodities if restricted to a 1-tip strategy |
| 12t Terberg or CWS Kerbloader Standard or Narrow Access |  <br>  | • No tipping above vehicle height during loading<br>• 5+ compartments supports addition of new materials<br>• On board compaction of cans/plastic and cardboard<br>• Storage boxes for low volume items<br>• DAF LF chassis liked by crews<br>• Stillage design most likely to limit glass noise impacts within Lower Exposure Limits (with vehicle adaptations)<br>• Standard Terberg design allows for 2-colour sort of glass, CWS provides flexibility to split glass compartment up to 3 ways<br>• Second lowest overall cost of all options modelled | • Unloading requires a forklift to remove and tip multiple stillages, introduces H&S risks at bulking facility due to forklift movements<br>• Requires well designed and managed bulking facilities<br>• Some concerns over aperture loading heights<br>• Narrow vehicle same length as standard variant so may still pose access issues (albeit crews advised that width is the key issue with respect to side-loading)<br>• Limited scope for household and commercial / communal recycling co-collection<br>• Lower capacity for the 4 core commodities if restricted to a 1-tip strategy |

A final decision on the exact vehicle type and manufacturer should be based on a trial of each. This forms one of a number of time-based recommendations arising from the study, as summarised below.

| Recommended Action | Timeline | Service Area |
|---|---|---|
| That a trial of the Romaquip, Terberg and CWS vehicles is undertaken, under supervision from WRAP, before a final procurement decision is made. This should also be used to test areas of uncertainty identified through this study, around collection productivities and access.<br><br>Romaquip, Terberg and CWS have all confirmed they have demonstrator vehicles that could be made available (during November 2012) to support this exercise. | November 2012 | Collection |
| Procure new fleet of advanced stillage recycling vehicles, choosing between the Romaquip (standard and narrow) or Terberg/CWS fleets. These vehicle options all deploy the DAF LF chassis, that crews stated a preference for, and are all plated at 12 tonnes Gross Vehicle Weight. All offer comparable payloads.<br><br>The final decision on vehicle variant is dependent upon the trial proposed below and conclusions drawn on:<br><br>• The benefits of automatic ejection of materials as provided by the Romaquip<br>• Whether the elevated rear ejection of the Terberg Kerbloader whereby the cardboard compactor rises 3m when unloading is a concern<br>• The benefits of dealing with a single supplier (in the case of the Romaquip) versus the potential need to deal with two if the Terberg Kerbloader is the preferred standard access vehicle (alongside the CWS narrow version of this vehicle)<br>• Guaranteed build times<br>• Service and support packages | November 2012 | Collection |
| Undertake round design exercise and rollout new vehicles, considering appropriate phasing (e.g. to rural areas first) | April 2013 – December 2013 | Collection |
| Review LE area operating structure as part of new vehicle rollout exercise to ensure that round sizes and resource requirements are not compromised by internal boundaries. Produce vehicle deployment plan considering 'O' licenses. | January 2013 – March 2013 | Management |
| Consider resource requirements to deliver existing commercial and communal recycling collections alongside the rollout of the new vehicles | January 2013 – March 2013 | Commercial Waste Service |
| Make interim improvements to bulking facilities and provide resources, training to support integration of new vehicle types | April 2013 – December 2014 | Infrastructure |
| Initiate cost-benefit analysis of existing bulking arrangements (plus materials income soft-market testing) and the Cae Post MRF commercial arrangement with a view to identifying future investment needs. | January 2013 – March 2013 | Infrastructure and Markets |
| Embed new service and start to gather enhanced operations and performance data, enabling targeting of lower performing areas and identifying opportunities to refine round structures and quantify available spare capacity | April 2013 – March 2014 | Service Optimisation |
| Review commercial waste service offering and delivery of a plan to continue to drive out refuse and move to a recycling-led service, identifying appropriate resources to increase recycling of key materials such as cardboard | 2013/14 – 2014/15 | Commercial Waste Service |
| Undertake a key-stage review of service performance and assess scope to target additional materials on the kerbside service in order to maintain performance ahead of the ambitious projection and meet the 2015/16 target | October – March 2014 | Collection |
| Drive up material capture and add new recycling materials | 2014/15 – 2017/18 | Service Optimisation |

The single most important recommendation made in this report, underpinning all others, is that the Council implements fundamental changes to the way in which the service is managed / monitored and performance data maintained. The lack of reliable service data compromised this study's ability to produce a reliable baseline model and reduces the level of confidence in the modelled results. Although the proposed recycling vehicle meets a large number of the study requirements and minimises key risks (e.g. associated with tipping height restrictions), unless key changes to the management, culture and behavioural elements of the service are addressed then risks remain, both in terms of the level of resource required and total service cost.

# Contents

# 1.0 Introduction

## 1.1 Background

Powys is an extensive, largely upland and extremely rural county covering 2,000 square miles (approximately one quarter of the area of Wales). With only 1 person in every 10 acres (4 hectares) it is one of the most sparsely populated local authority areas in England and Wales. This has significant implications for the delivery of waste collection services and supporting infrastructure. The distances travelled between collection points and vehicle access restrictions limit the logistical efficiency that can be achieved.

Despite the geographical and logistical challenges, Powys County Council is required to deliver a waste management service that meets the 2012/13 target set by the Welsh Government of 52% recycling and composting of waste, rising to 70% by 2024/25. Achieving these targets requires multi materials (including food waste) to be targeted at the kerbside for recycling; doing this efficiently requires the number of passes of each property to be minimised.

In order to achieve the Welsh Government targets in a cost-effective manner Powys County Council is implementing an enhanced kerbside waste and recycling collection service across the c.58,400 households in Powys[1], as part of a wider internal waste management project (Powys Change Plan). The new service comprises weekly recycling collections where four material streams are collected source-separated (plastics and cans; paper and card; mixed colour glass and food waste), alongside fortnightly collection of residual waste. At the time of this report being prepared (September 2012) the new kerbside scheme has been partially rolled out (focusing on the more urban areas) but via a two-pass approach to making the recycling collections – using split-bodied RCVs (leased / on trial). This is not sustainable (either financially or environmentally) in the long term, requiring the identification of a more efficient vehicle and collection configuration upon which procurement decisions can be made.

## 1.2 Study aims

Early in 2012 WRAP commissioned AMEC to undertake a desk-based study with the following aims:

- To benchmark the current operational performance of the household waste and recycling collection service, and consider opportunities to realise efficiencies within the operational services;
- Complete a recycling vehicle options appraisal to identify and appraise future waste collection scenarios. Each appraisal will consider costs and material capture, and the ongoing resource requirements, operational (revenue) cost of the service and revenues from collected materials;
- Tie the findings of the assessment back to the Council's ability to meet the 'Towards Zero Waste' statutory recycling targets;
- Identify a preferred vehicle specification, thus allowing the Council to procure a new fit for purpose "future proofed" recycling fleet;
- Undertake a review of the existing bulking infrastructure and recommend where new infrastructure, or changes to existing infrastructure are necessary (i.e. capacity requirements at transfer stations and sorting/baling/bulking facilities); and
- Consider the options available for material sales, either direct to the market or alternatively through a broker. Higher quality materials are likely to be recognised with top-end market prices, and due to the high demand are likely to be less affected by fluctuations in the global/spot market.

The extent and range of challenges faced by Powys (as detailed throughout this report) have required a focused and flexible approach to the work. Data gaps and uncertainties have been addressed through the development of informed assumptions, supported by sensitivity analysis and commentary on the key risks.

### *1.2.1 Report structure*

Following this short introduction, the structure of the report is as follows:

- Section 2 provides an overview of the changing picture of waste management in Powys, including details of the new kerbside scheme, external parties involved in delivering the service and key challenges;

[1] *2011 census data*

- A summary of the data gathered to inform a baseline assessment of service costs and performance assuming continued rollout of the two-pass arrangement (Section 3);
- Outputs from a benchmarking exercise comparing Powys' waste service (costs and performance) with comparator authorities (Section 4);
- The outputs from research with manufacturers and other local authorities regarding vehicle options that may match Powys' requirements (Section 5);
- Assessment of potential waste flows based on assumed interventions that will move the authority towards the 70% recycling / composting target for 2024/25 (Section 6);
- Consideration of materials bulking infrastructure and end markets (Section 7);
- Modelled vehicle and collection scenarios (Section 8); and
- Conclusions and recommendations (Section 9).

## 2.0 Waste management in Powys – overview

**This section of the report presents a high level summary of the waste and recycling services and supporting infrastructure across Powys.**

### 2.1 Historic perspective

Historically, the waste and recycling services provided across Powys have been inconsistent, both in terms of service design and provision.

Refuse was historically collected weekly, primarily via sacks. Under these arrangements there was no limit on the amount of residual waste each household could present for collection throughout Powys. This encouraged the practice of commercial waste being presented co-mingled with domestic refuse as explained in Section 2.3.1.

Most of the County received a co-mingled kerbside recycling scheme collecting glass, plastic bottles and film, cans, paper and card, and refuse was collected in sacks. The area of Ystradgynlais in the south was an exception as it had a kerbside sort collection in place. In other areas of Powys households received a limited glass-only collection incorporating a basket for kerbside presentation and, in some rural areas, no recycling collection services were in place. Table 2.1 demonstrates the range of historic kerbside recycling arrangements that were in place, as determined from a previous Powys County Council project delivered with AMEC support.

**Table 2.1:** Backdrop of historic kerbside recycling arrangements

| Material Stream | Approx. Household Coverage | Service Summary (pre 2011) |
|---|---|---|
| Dry recycling | 25,000 | Weekly twin stream collection of paper, card, and textiles (bag 1) and plastic bottles, cans and carrier bags (bag 2). Glass collected in baskets from around 13,000 of the 25,000 properties via a 3rd compartment on the collection vehicle |
| Dry recycling | 12,000 | Co-mingled dry recycling co-collected with refuse using survival bags. Materials collected as per the twin stream collection above. |
| Dry recycling | 5,400 | 2-box kerbside sorted collection. Collections undertaken by Cae Post using mini kerbsider / stillage vehicles. |
| Food waste | 7,000 initially, expanded to 15,000 | Initially involved households in Newtown, Welshpool being provided with a weekly food waste collection by Cwm Harry. Has been expanded to include Montgomery, Llanidloes. |

### 2.2 New kerbside service

The new kerbside waste and recycling collection scheme comprises of a fortnightly collection of refuse presented using 180 litre wheeled bins[2] and a weekly kerbside sort of dry recyclables and food waste - based on three kerbside boxes and one caddy per household. Rigid plastics and cans are presented together in a red box, paper and card are collected together in a blue box and mixed glass bottles and jars are presented in an aqua box. Food waste is collected via a small caddy (with liners) for use in the house along with an external lockable container.

Garden waste is not currently recycled via the kerbside service. Residents are able to purchase orange bags and set garden waste out for collection, however these are collected with the refuse and landfilled. Garden waste can be deposited by residents at one of the authority's six Recycling Centres and also at 44 bring sites across the County.

#### *2.2.1 New scheme roll out*

In October 2010 the new kerbside service, as summarised above, was introduced to the south-westerly areas of the County (see SW on Figure 2.1) including Ystradgynlais.

[2] *Approximately 15-20% of properties have requested smaller 120 litre wheeled bins, which are available upon request*

During 2011/12 a bag-based variant of the scheme was introduced to Rhayader and Cwmdauddwr (MW). This trial adaptation of the scheme utilises two recycling bags (one for collecting paper, card and the other for cans and plastic bottles and other rigid plastic packaging), a basket for glass bottles and jars, and a food waste caddy. The scheme remains ongoing but with the intention to incorporate a move to kerbside boxes during 2012/13.

Following feedback from Elected Members, collection crews, members of the public and town and community councils, supported by data regarding tonnages, incomes and costs, the County board approved the expansion of the three-box recycling scheme operating in parts of Ystradgynlais.

During September 2011 the new kerbside box scheme was introduced to the main towns in the central southerly area (SC), like Brecon. The roll out continued into towns in the south east of Powys (SE) in the following month and had reached towns in the mid-east (ME) by February 2012, and the mid-west (MW) by April 2012. The new recycling and refuse service is planned to reach all other major towns in Powys by early 2013 (Welshpool goes live in September 2012). The staged introduction of the new service has required sustained education and engagement with the public and ongoing Officer training; the Powys County Council website provides an area-based summary of when the new services have been (or will be) introduced and usefully feedback on how recycling rates have increased as a result – it also includes a comprehensive recycling guide.

The roll out plan provides for collections being made in most of the main towns but it remains the case that there are no firm plans to expand the scheme into the more rural areas. This is in part due to the way in which the recycling service is being resourced, through a two-pass system where split-bodies RCVs (primarily 26 tonne vehicles) are being sent out to collect two of the four commodities on each round on each day. This system has been adopted in the absence of the identification of suitable vehicle types capable of efficiently collecting all streams in all areas of the County, alongside the provision of an adequate network of reception sites capable of offloading and bulking the materials for onward transfer and reprocessing. As a result the new service is acknowledged as being highly inefficient and expensive to operate; rounds have not been optimised to reflect the new service rollout and resourcing is being managed primarily through the deployment of vehicles on short-term lease arrangements. Further analysis of the service as currently being rolled out is provided in Section 3.

A summary of the new scheme roll out timeline is shown in Table 2.2. A map showing the operational areas referenced in the table is provided later in Figure 2.1. Further information on the evolution of thinking and operational trials of different vehicle types linked to the new service is provided in Section 5 of the report.

**Table 2.2:** Summary of the new service roll out and other collection scheme changes

| Date | Area | Summary of Collection Scheme Changes |
|---|---|---|
| October 2010 | SW | New kerbside box service started in the main towns only (e.g. Ystradgynlais) |
| March 2011 | MW | Trial scheme using bags, basket and caddy in Rhayader |
| September 2011 | SC | New kerbside box recycling service and fortnightly refuse adopted in main towns, like Brecon |
| October 2011 | SE | The new kerbside box recycling service reached the main towns of Hay-on-Wye, Talgarth, and Crickhowell |
| February 2012 | ME | The roll out continues into the mains towns (e.g. Llandrindod Wells) |
| April 2012 | MW | In areas like Llangammarch and Builth the new regime began in the main towns only (e.g. Builth and Llanwrtyd) |
| May 2012 | NW | The new kerbside service started in the main towns of the north-west only (e.g. Machynlleth). |
| July 2012 | NC | New kerbside service started in main towns like Llanidloes and Newtown. |
| September / October 2012 | NE | The new kerbside service reached the main towns in the north-east (e.g. Welshpool) and other villages in the north of the County. |
| Late 2012/13 | MW | Bags used for the trial on Rhayader scheme will be replaced by kerbside boxes |

## 2.3 Current waste service performance

The phased introduction of the new kerbside service (as described in Table 2.2 above) was intended to deliver an increase in recycling levels from 36.6% in 2010/11 to meet the 2012/13 target of 52%. At the time of this report being issued levels had averaged 48% and continue to increase. As each phase of the new service has been introduced there has been clear evidence of increases in recycling and reduced residual waste arisings. By way of example, when the initial move from weekly refuse to alternate weekly collections occurred Powys experienced a 35% drop in the amount of refuse collected per week; whilst the refuse has not continually decreased thereafter, neither has it increased noticeably.

Contributing to the overall recycling and composting rate are six household waste and recycling centres (HWRCs) and 72 Community Recycling (bring) sites. The HWRCs are located in Brecon, Llandegley, Machynlleth, Newtown, Welshpool, Ystradgynlais. In total they contribute around 19,000 tonnes (25%) to the waste stream, of which around 13,000 tonnes is recycled / composted. The Community Recycling sites target solely recyclable materials, which make up around 10% of the total Powys waste stream. All sites are serviced by the Authority and/or material specific agents (e.g. British Glass) apart from the plastics stream which is collected by Cae Post.

### *2.3.1 Commercial waste*

It is acknowledged at all levels in the Council that current approaches to collecting commercial waste are constraining the recycling levels that can be achieved, whilst also meaning that the Council is not fully recovering the full costs of collecting and disposing of this material (or receiving income from commercial recyclate). The extreme rural nature of the authority has created a unique market situation in Powys whereby there are limited operators providing services in many outlying rural areas, leaving the Council as the sole provider. The past culture and practice whereby refuse was effectively operated independent of recycling and through adoption of a 'clear all' policy still remains in some areas; this is exacerbated by the multi-functional role of the teams where joint responsibility for street cleansing / streetscene means crews are reluctant to leave behind side waste (only to be asked to return to clear it (as litter / flytipped waste) later).

Commercial refuse (and to a lesser extent commercial recycling) is largely co-collected with the domestic refuse service. Powys County Council currently service approximately 2,000 commercial customers (including all Council-run buildings and schools) with around 75% of these receiving bin collections[3]. A further 1,000 customers are estimated as purchasing commercial waste sacks sporadically. There are around 6,000 business rated premises in the County, 95% of which are thought to be SMEs (small and medium enterprises). The charge levied to each customer is dependent upon the size of bin required.

Powys County Council are aware that a proportion of those not using the formal commercial waste service are feeding business waste into the household streams thus avoiding charges. It is thought that around 20% of the currently collected refuse comes from commercial waste sources. An in-house 'trade waste survey' report considered collections made in Brecon and Crickhowell to inform the extent of commercial waste being collected on the domestic rounds.

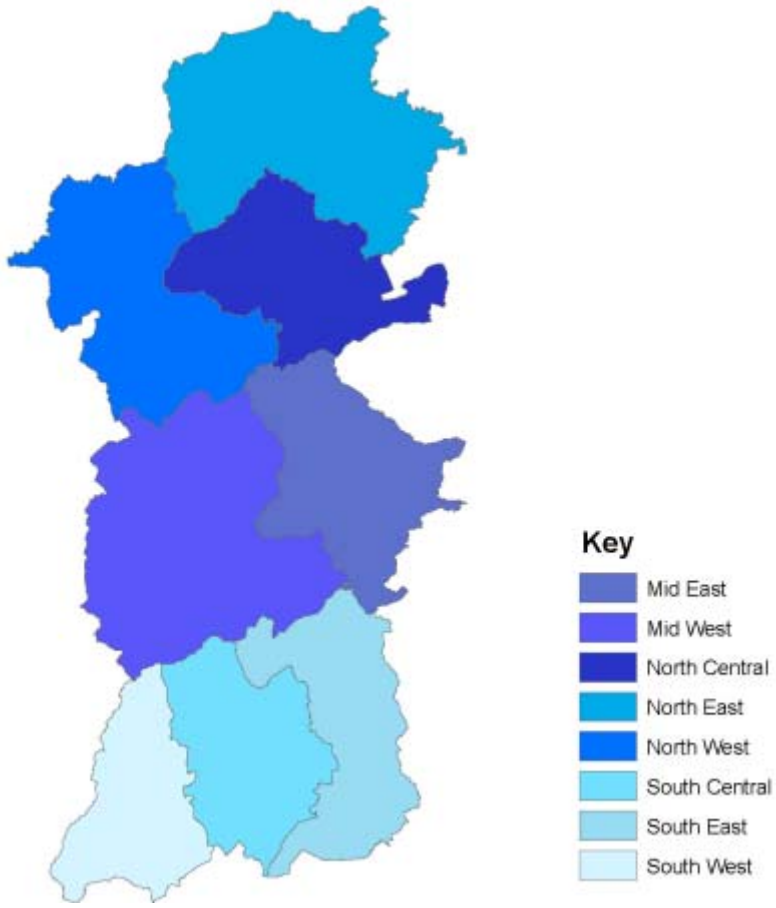
The waste flow projections presented later in the report assume that much of this undeclared commercial waste will be driven out of the system and with a renewed focus on commercial waste recycling, in order to help move the authority towards the long term recycling and composting rate of 70%. Further detail is provided in Section 6 of the report.

## 2.4 Organisational structure

The majority of services are carried out by in-house operational teams on the basis of Local Environment (LE) areas (see Figure 2.1). These teams have shared responsibilities where waste service planning and supervision is often combined (and delivered out of shared infrastructure) with a range of highways operations (e.g. road gritting).

[33] *Cwm Harry collect food waste and Cae Post collect dry recycling from some schools in Montgomeryshire as part of their contracts with the Council.*

**Figure 2.1** Powys County Council Local Environment (LE) Areas.




### *2.4.1 Contractors and end markets*

In selected areas collection services are contracted out. In the north of Powys, **Cae Post** operate a kerbside box collection scheme, collecting rigid plastic, cans, glass, paper and card from Southern Welshpool and adjacent villages. Cae Post use a combination of small kerbsider / stillage vehicles and make recycling collections from around 10% of all Powys households. Cae Post operate a small MRF at a Council-owned site at Trewern, near Welshpool. This facility sorts kerbside collected co-mingled material (from parts of the old and new schemes along with Cae Post's commercial collecti0ons) and cans, plastic material from Community Recycling sites. MRF-separated material is sold through a combination of term contracts and spot market sales with Cae Post being commercially incentivised to get the best price for the material. The commercial arrangement with Cae Post is complex and involves Powys County Council paying their operating costs based on an open book approach (currently around £400k per annum); the authority then receives 92.5% of the income from all recyclable material that goes through the plant regardless of where it came from (equating to around £270k per annum). Hence the materials handling aspect of the contract, which is due to end in 2017, currently costs the Council around £130k per annum; there is also a charge levied by Cae Post for undertaking kerbside collections and servicing bring banks. Further information on waste reception infrastructure and market outlets is provided in Section 7 of the report, including further consideration of the role Cae Post might play in the future.

**Cwm Harry** collects food waste on behalf of the Authority from Montgomeryshire; they also collect food waste, dry recycling and refuse in Presteigne (mid Powys) through a Welsh Government contract, with Powys County Council paying for food treatment and refuse disposal. Whilst Powys County Council are rolling out the new kerbside service in these areas Cwm Harry will continue to collect food waste (until December 2012).

The ongoing role that both Cae Post and Cwm Harry might play in the delivery of Powys' future waste management services is subject to considerable uncertainty. The combination of the ongoing rollout of the new in-house operated kerbside services (which incorporate the commodities targeted by Cae Post and Cwm Harry) with the recent letting of a new partnership contract with Ceredigion (through the Central Wales Partnership) for

the composting of food waste via Anaerobic Digestion (AD) takes these key material streams outwith their control.

The new AD contract with Agrivert requires the food waste to be bulked via 3 interim hubs (small bulking facilities) and ultimately transferred out of Powys via 3 transfer stations (see Table 7.1 for further details). The food waste will be sent to Oxfordshire from 1 November 2012. Cwm Harry currently take food waste to Ludlow's AD plant for treatment.

Local waste management company, **Potters** Waste Management, play a key role in the delivery of Powys' waste and recycling services. The company operates infrastructure (transfer stations and landfill) in the County for the reception and disposal of residual waste. Potters also handle paper and card collected from the area covered by the new roll-out. For the latest phase of service rollout in Welshpool it is intended that Potters will receive the food waste from 1st November 2012 (in the early days of the expansion Cwm Harry have been collecting this material).

### Contract observations

It is evident that there is scope for improvement in the way existing waste services contracts are set up and managed by Powys County Council. Although it has not been within the scope of this study to undertake a formal review and audit of the existing materials collection and handling contracts, it is likely that they are not delivering Best Value for the authority. The management of contractors appears to be reactive and without the benefit of any formally agreed protocols or monitored service level agreements. The uncertain future of both Cae post and Cwm Harry is also likely to have been a considerable distraction to Council Officers at a time when the focus should arguably have been on planning for the future resourcing and delivery of the new kerbside services. As follow-on to this study further work needs to be done by Powys County Council to ensure that the role of staff and assets held by these two organisations are fully considered in the long term delivery plan for the waste management services.

## 2.5 Service infrastructure

A range of in-house and external facilities have historically been used to support the delivery of kerbside collection activities. During the study Powys County Council supplied details of 17 highways registered depots that may have been used as vehicle bases (a subset also act as material bulking facilities) in the past.

Residual waste collected at the kerbside is delivered to a combination of transfer stations (at Brecon (via a Council-leased site operated by Potters under contract) and Welshpool (Potters site) and landfill (Potters site at Bryn Posteg near Llanidloes).

The bulking and transfer of dry recyclables is managed via a 'hub and spoke' logistics arrangement where satellite sites (receiving material form the collection rounds) consolidate material from where it is sent to primary bulking sites. A number of milk rounds are operational in Powys in an attempt to collect waste from recycling areas more efficiently. It is the aim for recyclates to be bulked on sites within a 10 - 15mile radius of the collection round and collected by a lorry and taken to a local depot (primary bulking facility) or reprocessor. Powys have advised that plastic and cans are currently bulked (in large and subsequently small skips) from Ystrad – to Welshpool – to Cae Post at Trewern (over 91 miles away). This level of double handling (required because Cae Post cannot accept large skips) and mileage travelled is considered both expensive and unsustainable.

At one stage it was proposed that a compactor skip would be trialled in Abercrave, however this did not go ahead because overall volumes of material were small; the Cae Post facility is not configured to accept baled cans and plastic; and brown card in the collected loads would need further sorting following baling. This is a good example of an initiative which, on the face of it, would appear to be a sensible way forward but due to the complex logistics and infrastructure arrangements in Powys proved unfeasible.

The introduction of kerbside food waste collections in Powys has led to the procurement of a new Anaerobic Digestion treatment contract for this material, awarded to Agrivert. Under this arrangement the same hub and spoke arrangement applies where three primary facilities will be used to consolidated material from smaller satellite sites.

Within Section 7 of the report we have further explored the proposed recycling and food waste bulking arrangements and considered alternative options that might be explored.

## 3.0 Data gathering and baseline assessment

**This section of the report summarises the data gathered to inform the later options modelling and the outputs from a hybrid baseline model (that assumes Powys continue to roll out the new kerbside service based on a two-pass approach).**

### 3.1 Overview of data requirements and baseline modelling approach

In order to evaluate future operating scenarios it is first necessary to gather underpinning information and data describing the nature of the authority, its customer base (household and commercial waste producers), operating rules and existing waste service performance. It is from this base data that modelling parameters are normally developed (e.g. collection productivities) and approaches to filling gaps in existing knowledge agreed.

Going in to the study it was agreed that a baseline model would be useful to facilitate some form of benchmarking of the authority's waste and recycling services (with comparator authorities and schemes), and to identify local constraints influencing the types of vehicle that might be feasible. At the same time it was acknowledged (from past work undertaken by the project team) that the mix of local approaches to delivering the historic services (with various different designs of service and parties undertaking the collections (as described in Section 2)) and a lack of transparent data would make the development of a 'true' baseline model impractical. It is also important to recognise that the kerbside service has been in a state of flux during the study period (with progressive expansion of the new service design) meaning any model produced at a given point in time would soon be out of data, and based on performance data that does not represent a steady state. As a result of all these considerations it was agreed that a hybrid baseline model would be generated that takes sample performance data from those areas where the new service has been rolled out, combined with views on how it would continue to be rolled out, to present a view of resources and costs should Powys continue with the interim strategy of making recycling and food waste collections from households via two (split body) vehicle passes. As such the baseline could be considered as a worst case position (from a service cost perspective) against which alternative options (modelled later) can be compared.

In support of the baseline model development a data proforma was issued to the Council requesting certain data on aspects including, but not limited to:

- The number of households receiving each service;
- Vehicle numbers and specifications currently deployed;
- Weights collected (which in this case was focused in detail on those areas that had rolled out the new services and at a higher (annual tonnage level) on total tonnages collected via the kerbside, HWRCs and Community recycling sites;
- Operating costs (including vehicles and manpower);
- Depot and reception facility locations and average travel times to / from the collection rounds; and
- Container replacement rates.

A summary of the key baseline model inputs, in terms of both tonnages and model parameters, is included as Appendix 2. This information was distributed at the interim study meeting and amended with updated costs.

At this stage in the study lesser emphasis was placed on gate fees and haulage rates due to the difficulties sourcing transparent data and associated delays. Downstream materials management options are revisited later in the report.

#### Information gathering difficulties

It is appropriate at this stage to reflect on some of the challenges faced securing information to support the baseline modelling, as these need to be addressed if the service is ever to deliver its full efficient operating potential. Irrespective of the final decision on vehicle selection and rollout strategy to the more rural areas of the authority, unless the transparency of operational and performance data is improved then costs are always likely to rise above those theoretically achievable. The lack of accurate data is a legacy issue and is primarily a function of the operating structure and culture, resulting in a lack of centralised management and control.

The following observations demonstrate the challenges faced when the Council was requested to supply critical pieces of service information:

- Basic round information (number of households per round, collection weights and clarity on which vehicles serve which properties) either does not exist or is available to differing extents in each operating area. Limited operational data was supplied for the transformed service rounds (e.g. those that have moved to fortnightly refuse);

- Information describing actual operating lengths (durations) and loadings on daily rounds does not readily exist (e.g. initial data returns showed all rounds working a full 7.4 hours and delivering full loads and household property counts were acknowledged as being topped up with (an unspecified number of) trade collections);

- Fleet data was incomplete, which is partially due to the current situation where there are a large number of hired in and trial vehicles deployed on the service;

- Costs are not centrally held; and

- Multiple internal stakeholders tend to be consulted on each topic, often resulting in differing responses to the same question or the supply of what turned out to be incorrect guidance or data. It is fully appreciated that the decisions that need to be taken as a result of this study and other ongoing work streams are very important, however, it is necessary that the management structure supports those decisions being made.

## 3.2 Data and input parameter clarifications arising from the baseline

A number of data discrepancies and areas of ongoing uncertainty were identified through the review of the baseline model outputs. Those posing the greatest ongoing risk to the study findings are described below.

There remains ongoing uncertainty around the number of properties in Powys that might be considered as 'narrow', requiring access via a non-standard vehicle. Over the course of the study three categories of access were developed: standard, narrow and ultra-narrow. In broad terms:

- Standard access properties were considered by Powys County Council staff as being those in urban areas, serviceable by a 26t vehicle;

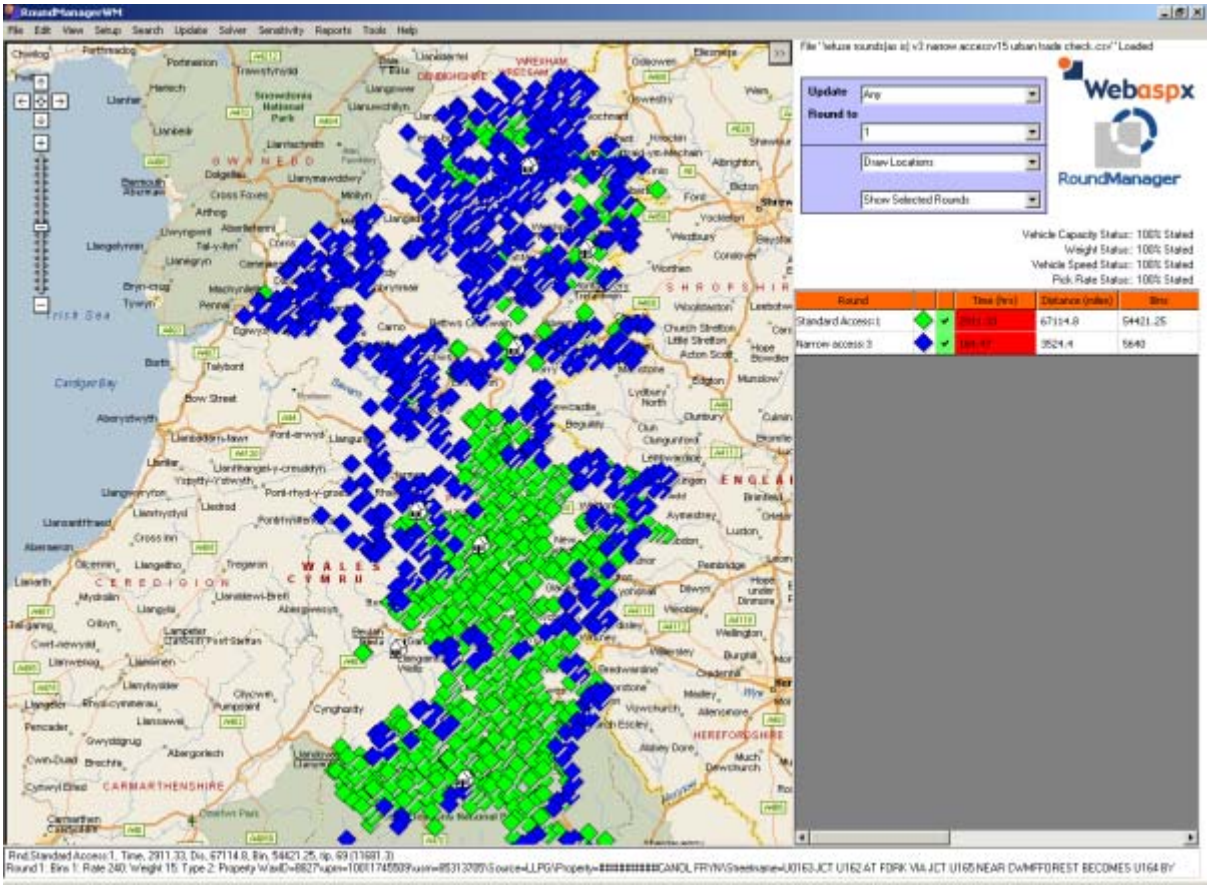
- Narrow access properties represent those rural routes where currently a 15t vehicle is able to access all areas; and

- Ultra narrow properties require very specific approaches to servicing, utilising a box van or similar.

There exists no reliable data held that describes the number of properties falling within each classification, at the same time it is recognised that the true number of properties classified as standard vs narrow vs ultra narrow will change depending on the vehicles selected. This is something we have attempted to address through the later scenario modelling (Section 8). Through an iterative process of discussions with operational staff in the authority it was concluded that the number of rural properties may lie in the range 5,500 – 11,000. The lower figure was derived form a historic mapping exercise undertaken by AMEC staff as part of previous work; the higher figure comes from a set of Council staff assumptions that the proportional split of standard/narrow/ultra narrow may be in the range 75%/20%/5%. For future scenarios (Section 8), where the frontline (standard) recycling vehicle modelled is 26t it was agreed that the higher (c.11,000) figure should be assumed to be rural; where a smaller (e.g. 18t RCV or 12t stillage type) frontline vehicle is considered the number of properties considered truly narrow reduces to c.5,500 due to the greater flexibility this type of vehicle provides.

For future reference Figure 3.1 shows a screenshot from the past access mapping exercise, indicating that the majority of narrow access locations are in the north of the authority.

**Figure 3.1** Properties with restricted access.




It was agreed that the ultra narrow properties would be parked outside of the core modelling analysis. This represents an estimated 1,000 households which would always need to be serviced by a smaller, bespoke vehicle (for refuse and recycling / food) according to where there is greatest need. Any dedicated commercial refuse resources, e.g. required to maintain a weekly collection frequency to commercial customers, are also outside of the scope of the analysis. Powys County Council should be aware of these additional costs[4] which will be consistent across all modelled options.

The issue of vehicle tipping height rules is discussed in Section 5 of the report.

Other key observations on the baseline model inputs are as follows:

- For the purposes of the baseline model and future waste projections the current proportion of the domestic waste tonnage collected on the refuse rounds that comes from commercial sources is assumed to be 20% - this tonnage gets progressively driven out in future years as Powys county Council seek to drive up recycling rates;

- Vehicle rental (and 'on-top' maintenance) costs appeared high when the first baseline model results were generated - at around £60k per vehicle per annum. These were subsequently reduced through contact with the Fleet Manager and incorporated in the results presented in Section 3.3 below and future models; and

- Overall the standard access rounds were modelled based on an average driver plus 3 crew level (driver plus 1 or 2 in more rural areas). This was initially challenged by council operatives in the later crew workshop (Section 5.4) but with the outcome that there was no appetite to delve back into the baseline data – the more important focus was agreed as being on getting crewing levels right in the future.

[4] *At the interim study meeting operational staff cited the need for 2 - 4 ultra narrow box vans would be required, crewed by a driver plus one loader. Dedicated commercial waste service resource requirements have not been quantified.*

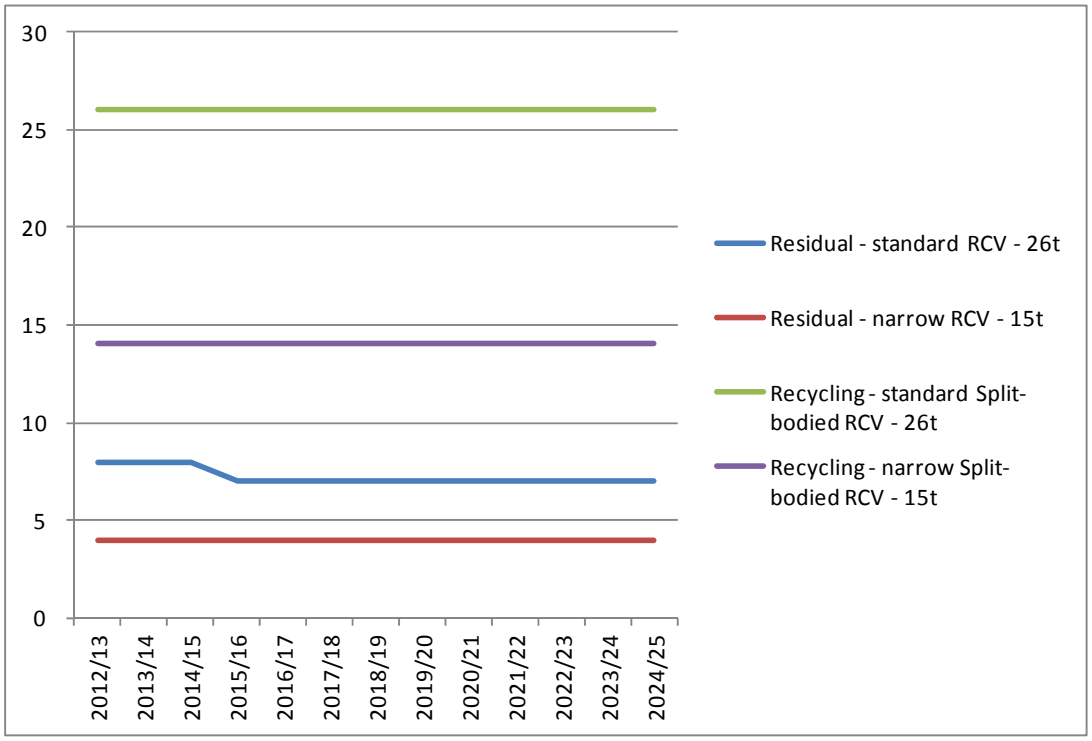
## 3.3 Model outputs

Figure 3.2 presents estimates of the number of vehicles required by waste stream to service standard and narrow access properties in Powys, up until 2024/25 using the current system[5]. There is only one change to vehicle requirements under the modelled conditions, with the number of standard access residual waste vehicles decreasing from 8 in 2014/15 to 7 in 2015/16 as residual waste arisings decrease (see Section 6 describing future waste flow projections for further information). In contrast, 4 narrow access residual waste vehicles are required to service rural (narrow) properties throughout the period examined. In terms of recycling resource requirements, the baseline (2-pass) solution requires 26 standard access and 14 narrow access recycling vehicles. Recycling resource requirements do not change during the period examined primarily because of the excess capacity that this collection arrangement provides; this is consistent with feedback provided by crews where it was identified that many commodities need only to be tipped once every 2-3 days.

Figure 3.3 then shows the equivalent annual collection costs (excluding gate fees / revenues), assuming Powys County Council continue with their interim strategy of making recycling and food waste collections from households via a 2-pass solution using split bodied (70/30) vehicles . Annual costs of the 2-pass solution are estimated to be almost £10.0m per annum, dropping to just over £9.8m from 2015/16 as the number of standard access residual waste vehicles decreases. In total over the period examined from 2012/13 to 2024/25 collection costs (at current prices) of the 2-pass solution are estimated to be over £129m.

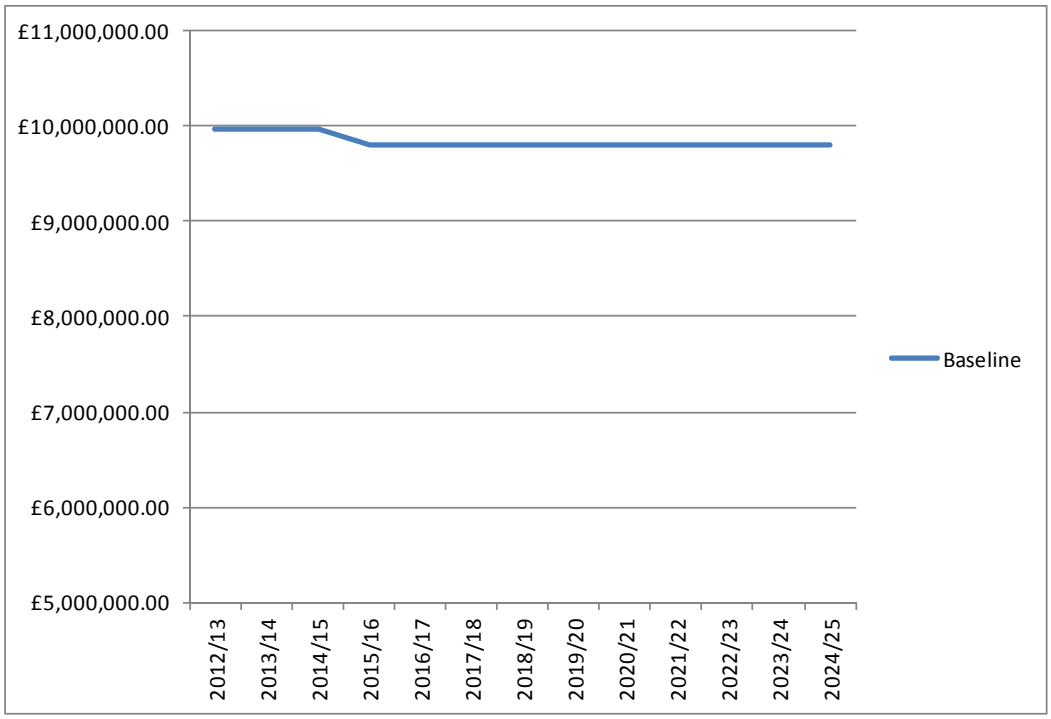
It is important to note, for all of the scenarios modelled in this study, that the resource requirements are estimates based on a number of key assumptions around achievable pass rates, average proximity to depots and tipping points etc. When a full round design exercise is undertaken these figures may be subject to change, especially when the requirement to factor in whole numbers of vehicles at given depot locations is taken into account.

**Figure 3.2** Baseline scenario resource requirements




[5] *Resource requirements in the baseline scenario are the same for both the good practice and ambitious profiles (see section 6)*

**Figure 3.3** Baseline scenario estimated annual costs




## 3.4 Observations

The baseline model findings should be taken as indicative due to the assumptions required to extrapolate the rollout of the two-pass arrangement to rural areas and the gaps in the supporting data. Our headline observations on the data and related productivities are as follows:

- The average urban refuse round size as indicated by the data is around 650 households per day, commonly resulting in daily collected tonnages in the range 6 – 8 tonnes. This is considered to be low when compared with industry-standard round sizes (even when taking the extreme rural nature of Powys into account) but is masked by the time spent co-collecting from undefined numbers of commercial properties;

- The equivalent rural / narrow pass rates are around 350 households per day, with the vans (servicing ultra-narrow properties) achieving counts up to this level as a maximum; and

- In many cases recycling rounds appear to mirror the refuse (based purely on observations of property counts across services in the same LE areas).

In conclusion, were Powys County Council to continue to rollout and operate a two-pass approach to collecting recycling and food waste on a weekly basis (at the productivity levels achieved now), the operational costs would be unsustainably high.

## 4.0 Service benchmarking

**This section of the report presents the findings of a benchmarking exercise that researched service costs, performance and resources across authorities operating similar kerbside recycling services and with similar characteristics to Powys.**

### 4.1 Introduction

It is useful to benchmark Powys with comparable authority and scheme types to give an indication of relative performance comparisons against both the existing and future scheme. Powys' unique situation at the time of this study progressing, whereby the authority was part way through rolling out a new service meant that a 'live' comparison of costs and performance could not be made. As a result certain aspects of the service were benchmarked against other authorities with the comparison on cost grounds being made against the hybrid baseline model results (presented in Section 3) that assumes the two-pass approach to collecting recycling and food waste is expanded to all households.

Our approach to identifying comparator authorities was through a combination of authority indicators (comprising rurality, location and the ONS 'Nearest Neighbour') and service models, i.e. looking at those operating kerbside collections similar to that being rolled out in Powys.

### 4.2 Comparator authority selection

Authorities and schemes to be compared with Powys, and for which research was needed to gather scheme facts, were selected based on consideration of rurality, ONS nearest neighbour classification and those operating services either directly comparable to that being rolled out in Powys or demonstrating particular points of interest.

#### *4.2.1 Rurality*

To help identify authorities with similar demographics to Powys, the 'WRAP rurality categories' were used. There are 3 rurality categories based on population density and the proportion of rural households for English authorities which include;

- Predominantly Urban;
- Mixed Urban/Rural; and
- Predominantly Rural.

These three groups are then sub-divided into high and low deprivation resulting in 6 overall rurality-deprivation categories:

1. Predominantly Urban, higher deprivation
2. Predominantly Urban, lower deprivation
3. Mixed Urban/Rural, higher deprivation
4. Mixed Urban/Rural, lower deprivation
5. Predominantly Rural, higher deprivation
6. Predominantly Rural, lower deprivation

Powys County Council falls in category 6.

#### *4.2.2 WRAP's benchmarking tool*

The Kerbside Dry Recycling Benchmarking Tool created by WRAP uses ONS Area Classifications to assign authorities into groups which have key population characteristics in common such as housing type and age distribution. The tool benchmarks the yield (kg/household) of those local authorities in the same group to establish a rank of performance. It also uses the ONS Nearest Neighbours to find the 4 authorities that are most similar to the selected authority based on key population characteristics.

#### *4.2.3 Service models*

A key consideration informing the selection of comparator local authorities was service type. Authorities operating fortnightly refuse collections (ideally within a smaller bin) alongside weekly source segregated dry recycling and food waste services were targeted, the aim being to understand the levels of recycling performance being achieved, typical vehicle types and crewing levels, and where feasible, round sizes. At the same time we

sought to identify those authorities that have incorporated particular service aspects of interest to Powys, including new approaches to recording commercial waste inputs on domestic rounds.

## 4.3 Comparator authority overview

A summary of the authorities making up a long list to be researched in support of the benchmarking exercise, along with the reason they were selected, is shown in Table 4.1 below.

**Table 4.1:** Benchmark authority long list and criteria for selection

| Authority | Selection Criteria | | | |
|---|---|---|---|---|
| | **Rurality** | **Nearest Neighbour** | **Points of Interest** | **Similar Service Model** |
| West Oxfordshire District Council | ✔ | | | ✔ |
| Somerset Waste Partnership (W.Somerset and Mendip) | ✔ | | | ✔ |
| Cotswold District Council | ✔ | | | ✔ |
| Shropshire Council (South Shropshire) | | ✔ | | |
| Ryedale District Council | | ✔ | | |
| Torridge District Council | | ✔ | | |
| Pembrokeshire County Council | | ✔ | | |
| Herefordshire Council | | ✔ | | |
| Ceredigion County Council* | ✔ | | ✔ | |
| Gwynedd Council* | ✔ | | ✔ | ✔ |
| Conwy County Borough Council | ✔ | | ✔ | ✔ |

* Ceredigion and Gwynedd are respectively the next least densely populated authorities in Wales after Powys, albeit both are approximately twice as densely populated.

For a number of the target authorities (e.g. Ceredigion, Gwynedd and West Oxfordshire) AMEC already held detailed service information, meaning a limited number of data requests and clarifications could be made to each Council. For others an open request for information was issued, resulting in more limited feedback. This meant that in some cases only select information could be used to inform the benchmarking exercise. For certain benchmarking parameters AMEC considered data obtained from studies with authorities outside the formal benchmarking group (listed above), especially where such data was required to inform the Powys waste projection (Section 6) and collection scenario modelling (Section 8).

For those authorities operating similar service models (or comprising particular aspects of interest) to that being rolled out in Powys, summaries of the schemes put in place are provided below. Over time, Powys County Council may choose to track recycling progress against this select group.

### *4.3.1 West Oxfordshire District Council*

May Gurney's Optimal Solution (MaGOS™), used in West Oxfordshire, is closely aligned with that being rolled out across Powys, comprising weekly dry recycling and food waste collections alongside fortnightly refuse (commonly in smaller (180 litre) bins) and a robust no side waste policy. This model also applies in South Somerset, Taunton Dean, Sedgmoor and North Somerset. AMEC has access to detailed information for the service operated in West Oxfordshire which is a district of around 44,000 households. The area is predominately rural with approximately 40% of the population living in towns (Witney and Carterton) in the south of the district. The population density is around 1.4 persons per hectare (compared with 0.25 persons per hectare in Powys).

West Oxfordshire is reported to be on track to achieve around 70% recycling, including a subscription-based garden waste service to approximately 3,000 households (c. 7% uptake). Contributing to this improvement in performance, smaller residual bins were rolled out in West Oxfordshire in advance of any enhancements to the recycling service. This early change alone resulted in the residual waste yields dropping by on average 1.9kg per household per week.

### 4.3.2 Somerset Waste Partnership (SWP)

Somerset Waste Partnership manages waste and recycling services for approximately 239,000 households in Mendip, Sedgemoor, South Somerset, West Somerset and Taunton Deane.

May Gurney provide recycling and refuse collections and Viridor operate the recycling centres, composting facilities and landfill disposal sites.

SWP provide a kerbside collection called SORT-IT Plus to all households. This comprises a weekly kerbside box collection comprising of: Box 1 paper, glass bottles & jars, foil; Box 2 food & drink cans, plastic bottles, cardboard and clothes, shoes and car batteries. Food waste is also collected weekly on the same recycling vehicles. Residual waste is collected fortnightly in a 240 litre wheeled bin and the partnership operates a closed lid policy. Garden waste is collected fortnightly via a subscription service: subscribers are offered a 240 litre wheeled bin or pre paid bags, service charges vary between the different Authorities.

Communal properties, such as flats, are provided with communal wheeled bins of various sizes for both recycling and residual waste. Currently at these points householders can recycle paper, glass bottles & jars, and food & drinks cans. In the future they are looking to expand this service to include cardboard, plastic bottles and food waste. The partnership does not operate a commercial waste collection.

### 4.3.3 Ceredigion County Council

Ceredigion County Council is primarily a rural authority situated to the west of Powys. There are approximately 75,000 residents living in over 32,700 households. Historically, Ceredigion County Council have operated a weekly residual waste collection and a fortnightly co-mingled dry recyclables collection (comprising of plastic bottles, tubs, trays and film; paper; cardboard and steel and aluminium cans). Garden waste was collected fortnightly via a householder paid service and there was no collection of kitchen waste, although a collection was trailed to 3,600 households in 2009/10. Commercial waste and recycling has been co-collected with domestic waste for some time, from approximately 1,300 customers.

Starting at the end of 2010 the County Council implemented a new household collection service comprising of a fortnightly collection of residual waste and garden waste alongside a weekly collection of co-mingled recyclables co-collected with food waste in split-bodied vehicles.

Where commercial waste is collected using wheeled bins the customer purchases bar-coded tickets from the Authority prior to the collection day, and attaches it to the bin at the time of collection. These tickets are retained by collection crews and are cross-matched with a database of the tickets purchased. This enables a record to be maintained of the level of service provided to each customer. Customers that produce smaller quantities of waste are able to pre-purchase commercial waste and recycling sacks and both the number purchased and collected are recorded. This pre-purchase system also allows the customer to have a waste service which suits them as it means that they only pay for what they use.

The bar-coded ticket system means that an accurate record of the use of the pre-paid commercial waste collections can be kept. The use of the tickets and/or sacks is audited, thus any indication of stockpiling by a customer (e.g. prior to an increase in price at the start of the new financial year) is evident.

Once a year the Council reviews the number of tickets and sacks purchased by commercial customers and estimates the weight of commercial waste collected. This is done by applying an average weight for each bin or sack collected.

### 4.3.4 Gwynedd Council

Gwynedd County Council is a mainly rural authority that lies to the north east of Powys. There are approximately 54,000 households within the authority spread over an area of 254,600 hectares.

Gwynedd County Council Direct Services Organisation (DSO) have the waste management contract for the area, operate a fortnightly 240 litre wheeled bin residual waste collection and a weekly dry recycling box collection (comprising of paper, food & drink cans, glass bottles & jars, clean foil, household batteries, aerosols, plastic bottles and cardboard). Each household can request a maximum of 2 boxes. The council provide a mix of fortnightly and weekly food waste collections in different areas.

Garden waste is collected fortnightly in a 240 litre wheeled bin.

The authority operates a chargeable commercial waste service which also includes recycling and food waste collections from businesses. They offer a variety of wheeled bin sizes that are collected on specific days throughout the authority.

### *4.3.5 Conwy County Borough Council*

Conwy County Borough Council is a rural authority that lies to the north of Powys. There are 55,700 households within the authority.

The authority operate a fortnightly wheeled bin residual waste collection and a weekly dry recycling collection using a set of four recycling containers (which comprises of a kerbside caddy for food waste; reusable hessian sack for plastic, cans and cartons; reusable plastic bag for paper; 55litre box for glass and cardboard) A battery pouch for batteries is also supplied that can be attached to the handle of the caddy or hessian sack. Textiles are collected fortnightly in a single use bag by the Crest Co-operative.

Communal households are provided with 240 litre bin recycling points (which comprise of glass; food waste; paper; cardboard; and cans, plastic and cartons). Battery pouches for batteries can be attached to the handle of the communal bins.

The Council also provide a chargeable garden waste collection in reusable hessian sacks or biodegradable single use bags, up to six bags will be collected from each household per fortnight. They collect these from both standard kerbside and communal properties.

Since May 2011 the authority has rolled out Romaquip recycling vehicles. These vehicles reduce the number of passes per household for recycling collections as they collect 8 different waste streams in one pass.

The authority offers a chargeable commercial waste and recycling collection (which comprises of cans, glass, paper, plastics and food waste in various sized wheeled bins or skips).

## 4.4 Benchmarking parameters

A number of benchmarking parameters were identified for which data was sought from comparator authorities, previous AMEC round design studies and wider (e.g. internet) searches. These included:

- Average yield of materials collected;
- Average round sizes;
- Costs of collection per household and per tonne (primarily from WasteDataFlow (WDF));
- Gate fees & revenue received for material collected; and
- Provision of resources (e.g. crewing levels and supervision).

## 4.5 Summary of findings

Although it was not possible to gather data on each benchmarking parameter from every authority, a significant body of information was gathered. An extract of this detail is provided in Appendix 3. Within Table 4.2 below we have provided some example findings from those authorities operating the most similar kerbside recycling services.

In support of the round size research we also reviewed data from WRAP's indicative costs and performance (IC&P2) project. This work has involved extensive KAT-based modelling of different kerbside systems for different authority characteristics. The outputs from IC&P2 include round sizes for both refuse and dry recycling, the focus being on the frontline (urban) collections. For the most rural of the 6 rurality-deprivation categories modelled by WRAP, the average urban round size for a weekly kerbside sort recycling service with food waste collected on a stillage-type vehicle (alongside fortnightly refuse) is 646 households.

**Table 4.2:** Example findings

| Authority (population density – Powys: 0.25 persons/ha) | Number of Households | Estimated Recycling Performance (%) | Collection Structure | Recycling Vehicle | Number of Recycling Vehicles | Round Size | Crew Level | £/household (collection only cost - from WDF) | Additional Notes |
|---|---|---|---|---|---|---|---|---|---|
| West Oxfordshire District Council (1.50 persons/ha) | 45,560 | <66 (2012/13 est.) | Weekly recycling & food (k/s sort)<br>Fortnightly refuse (180l)<br>Fortnightly garden (free) | May Gurney RRV (15t) | 21<br>+ 2 spare | 400 urban (due to co-mingled boxes)<br>220 rural/narrow | D+1 standard<br>D only narrow | 56.53 | 2 supervisors |
| Somerset Waste Partnership (W. Somerset) (0.49 persons/ha) | 210,000 (17,450 W. Somerset) | 57.28 (SWP 2011/12) | Weekly recycling & food (k/s sort)<br>Fortnightly refuse<br>Fortnightly garden (£) | May Gurney RRV (7.5-12t) | 104 across whole of SWP<br>+ 9 spare | 550 urban<br>350 rural<br>125 Exmoor | D+1 (standard crew), some D+2 | 47.79 | Recycling & food collection cost = £35/hh |
| Cotswold District Council (0.71 persons/ha) | 39,360 | 60 (2010/11) | Fortnightly recycling (k/s sort)<br>Fortnightly refuse (180l)<br>Weekly food (free) & garden (£) | Bespoke k/s sort | Not supplied | Not supplied | Not supplied | 95.25 | |
| Gwynedd Council (0.47 persons/ha) | 59,893 | 46.5 (2012/13 est.) | Fortnightly recycling (k/s sort)<br>Fortnightly refuse<br>Mix of weekly and fortnightly food (free)<br>Fortnightly garden (free) | Kerbsider (18t) | 8 | 1,200 urban<br>165 ultra rural<br>(1,400 max) | | Not supplied | 3 days over 6 shift pattern means longer working days and higher round sizes |
| Conwy County Borough Council (0.98 persons/ha) | 55,215 | 51.5 (2011/12 est.) | Weekly recycling & food (k/s sort)<br>Fortnightly refuse<br>Fortnightly garden (£) | Romaquip (12t – standard and narrow) | 17<br>2 spares (1 standard, 1 narrow) | 600 – 750 (depending on number of tips) | D+2 | Not supplied | Large vehicles = 3.7t/load, small = 1.2t |

The modelled baseline costs (presented in Section 3.3) were compared with other Welsh authorities as presented in the WLGA Waste Finance data Report (2010/11). Although this contains data that does not capture some of the most recent kerbside changes that authorities such as Gwynedd and Ceredigion have made, it does provide a useful range of costs being paid elsewhere. Comparing the Powys baseline model costs with this data shows that maintaining the current strategy of the 2-pass approach would make the Powys collection service significantly more expensive than services provided by any other Welsh Authority in 2010/11. For example the WLGA report indicates that the most expensive dry recycling collection costs in 2010/11 were in the range £40-50 per household serviced (net of any income). The equivalent 2012/13 modelled baseline costs for Powys are in the range £101 per urban household and £245 per rural household (allowing for an indicative £60 per tonne for recyclate income based on historic data).

Bearing in mind the scope of the kerbside recycling service Powys County Council is rolling out, and the likely vehicle types applicable to delivering that service, our overall conclusions of the benchmarking exercise are:

- A number of local authorities are making progress towards achieving recycling/composting rates of 70% based on integrated dry recycling and food waste collections, supported by effective restrictions on the volume of residual waste that will be collected. All of the benchmark authorities provide some form of garden waste collection, albeit this is increasingly on a chargeable basis;

- There exist a number of local authorities that are successfully operating weekly kerbside dry recycling and integrated food waste collections using multi-compartment vehicles via a one-pass arrangement. The new generation of kerbloader (stillage-type) vehicles are commonly being adopted for these collections, targeting multiple (5+) streams for recycling at the kerbside. These vehicles are commonly crewed by a driver and just one loader (where the driver also undertakes sorting) on frontline (urban) rounds. Authorities such as Conwy, Cheshire West and Chester, the Somerset Waste Partnership and West Oxfordshire state urban round sizes for these collections in the range 450 – 750 households per day. WRAP's IC&P2 study modelled an average round size of 646 households on urban rounds for this collection type in a rural authority setting;

- There is limited operational experience of the new generation of multi-compartment RCVs, i.e. the Dennis Eagle and NTM 4-pod options. Historically authorities such as Milton Keynes have operated three-compartment 'one-pass' RCVs comprising a split rear body and front pod but these haven't seen wide scale uptake, perhaps because kerbside sort collection rounds have historically been time rather than vehicle weight and volume load limited – promoting use of smaller (stillage and kerbsider-type) vehicles;

- Typical levels of service supervision have been identified across the benchmark group. From this it is possible to calculate an average number of households per supervisor. Applying this metric to Powys would indicate that the authority requires 3 fulltime, dedicated service supervisors. Acknowledging the extreme rural nature of the authority we believe 4 to be a more realistic minimum. Within Section 9 we have provided commentary on how this might inform a potential change in the organisational service delivery structure in Powys; and

- Due to the challenges of being able to produce an accurate baseline cost for Powys' kerbside scheme (which is subject to ongoing transformation) it has not been possible to make an absolute comparison of service costs between Powys and the benchmark group. Preliminary outputs from the baseline Powys model indicate that without a change of service delivery strategy, the Council could be in the position of operating a dry recycling collection service that is more than twice as expensive (on both a £ per household and £ per tonne collected basis) than the Welsh authority average (as reported in 2010/11). Such findings need to be set in context acknowledging Powys as the most sparsely populated authority area in Wales and given the study data limitations.

## 5.0 Vehicle options

**Central to the delivery of this study has been the consideration of recycling vehicle types that meet a combination of performance requirements with regard to capacity, access and health and safety. This section of the report presents the key vehicle considerations and researched options.**

### 5.1 Introduction

Powys County Council requires a recycling vehicle fleet that meets the following key requirements:

- Supports the weekly collection of 4 separate household recycling streams on the same vehicle (comprising rigid plastics and cans; paper and card; mixed glass; food waste) in a single pass. These material streams are to be set out in separate kerbside recycling boxes (with a mix of lids and nets) for the dry recycling fraction and a lidded kerbside box with a handle for the food waste;

- Acknowledges the expected changing profile of dry recyclables and food waste collected over time as the Council makes progress towards the long term 70% recycling/composting target set by the Welsh Government. The 58% target in 2015/16 is a key consideration for the initial fleet procured so flexibility to enable additional materials to be added to the kerbside recycling service is an important consideration;

- Accounts for the unique rural nature of the authority, supporting standard urban (frontline), narrow rural and ultra narrow (restricted access[6]) collections. In broad terms, existing refuse and recycling collections are made from standard urban properties using 26t (GVW) vehicles and from narrow rural properties using 15t compaction RCVs (not narrow bodied);

- Meets the specific health and safety requirements of the authority, linked to an ongoing Health and Safety Executive (HSE) prohibition around vehicle tipping heights in the vicinity of overhead electric cables (see Section 5.2.1 below for detail on this requirement); and

- Enables material to be offloaded into material bays (for dry recycling) or sealed containers (for food waste) at local bulking sites.

The recycling fleet may also be required to accommodate, where appropriate, the co-collection of dry recyclables and food waste from businesses, consistent with the materials targeted on the household scheme. Brown card is a material stream generated in significant quantities by business and which requires further consideration, in terms of whether it is practically and commercially viable to co-collect this stream.

### 5.2 Health and safety considerations and vehicle trials

A key requirement for the Council is that the combination of vehicle and operating procedures eliminates the risk of overhead electric cable strikes, following a previous HSE (Health and Safety Executive) prohibition. Within this subsection we describe the Council's experience with trialling vehicles and how certain vehicle types have been ruled out on the grounds of health and safety-related tipping height.

#### *5.2.1 Vehicle trials*

**Pre-2010**

In 2007 a trial began using Terberg Kerbsiders (shown below in Figure 5.1). Three were hired and introduced to rounds in Ystradgynlais, Brecon and Welshpool. In 20120 a second trial was planned. This was to involve the deployment of a Terberg Kerbsider 2 (with larger payload) in Ystradgynlais for a month, followed by a BMI Kerbsider (Figure 5.2) for a few weeks. The Romaquip Recycler stillage vehicle (Figure 5.3) was trialled for a day.

[6] *At the study interim meeting it was agreed that ultra narrow collections should be parked outside the formally modelled analysis, requiring very specific vehicles (e.g. box vans) to make both refuse and recycling/food waste collections.*

**Figure 5.1** The Terberg Kerbsider[7].


**Figure 5.2** The BMI Kerbsider[8].

**Figure 5.3** The Romaquip Recycler[9].


At this time the old Terberg Kerbsider and also the Kerbsider 2 vehicles caught on a series of overhead electricity cables. The cables were torn from their mounts and the HSE placed a prohibition notice on the Authority against "the raising of bin hoppers on kerbside collection vehicles whilst in the proximity of overhead electric cables".

[7] *Source: http://www.terbergmatec.com/uk/products/dry-recyclable-food-waste-collection-vehicles/55/kerbsider*

[8] *Source: http://www.thebmigroup.com/new-trailers/item/75/recycling-trailers*

[9] *Source: http://www.romaquip.com/main.product.page.175.stainless.steel.398.htm*

After this point the BMI Kerbsider vehicle was never trialled. However, advanced stillage vehicles such as the Romaquip have been observed in Conwy and Bridgend. At the time of the Conwy visit there were concerns over the Romaquip build quality, the technology was unproven at that point and the vehicle could create health and safety issues due to the need to lift kerbside boxes above chest height to empty them. As a result, when the new kerbside service started to be rolled out in 2010, a two – pass configuration remained the primary method of collecting kerbside recycling streams.

### Post-2010

Since 2010 Powys have trialled the use of a 4 – pod RCV in Ystradgynlais. This was a bespoke split-bodied 26t RCV with a 70:30 rear split (used for plastic/cans and paper) and two front pods (for food and glass), purpose built for Powys by Geesink (see Figure 5.4 below).

During the trial operatives claimed that the volume of the front pods was rate-limiting, requiring the vehicle to be tipped 2 - 3 times each day in order to collect the amount of glass and food set out for collection[10]. This was partially due to the fact that the rounds were not redesigned with the vehicle in mind; noise levels generated also contributed to operatives' complaints.

In response, a second kerbside collection vehicle was trialled in that same area. This vehicle was of the same size as the Geesink but with only one large front pod (4m³) instead of two (3 compartments in total). Food waste was collected in the front pod and glass was collected separately in a Transit Pick-Up. At the same time another trial vehicle was provided by NTM with a similar pod structure (1 front pod of 4m³ and two rear) and glass was collected separately in a mini RCV (7.5t). Both trialled solutions meant 2 passes of each household to collect all recycling streams was necessary once again. The trialled vehicles with the 4m³ pods were perceived as more efficient by the operational staff as each only needed to be tipped once per day. During the course of this study NTM have confirmed that they would be able to supply a smaller (18t) variant incorporating two larger (4m³) front pods and the 70:30 rear split. Examples of these vehicle types are provided below in Figure 5.4.

**Figure 5.4** Multi-pod RCVs.


The Fleet Management Team have also recently purchased a Citroen Low Loader (shown in Figure 5.5 below). This is a box van which is specially designed with a low floor to enable easier access in and out of the rear. This type of vehicle would be adapted by installing wheeled bins of various sizes inside the body in order to collect source segregated materials from hard to reach (ultra narrow), rural properties. As discussed in Section 3.2 of the report approximately 1,000 ultra-narrow households have been parked outside the core modelling; it is to these that a box van collection would apply.

[10] *Analysis of weights tipped via the pods on this trial was not undertaken as part of this study. Given the overall weights of material collected on the new scheme it is unclear why the pods were unable to cope with the volumes collected. Other local authorities operating RCVs with pods have been able to achieve payloads that should be adequate. For example, where the London Borough of Richmond upon Thames have used 6x2 narrow track vehicles to access both standard and restricted access properties, the pods can carry a maximum of 1.6 tonnes of food waste. At an average food waste yield of 1.8kg/household each vehicle should be able to pass nearly 900 properties before needing to tip.*

**Figure 5.5** The Citroen Low Loader[11].


### *5.2.2 Tipping height outcomes*

The HSE prohibition notice remains, requiring risk assessments to be completed for each road where the conditions of the notice apply, and importantly revised operating procedures to be adhered to.

For those vehicles that have been deployed subsequent to the HSE intervention that involve some element of tipping above the vehicle height, additional cowling has been fitted so that the standard (fixed) height is not exceeded during the tipping process. There is a cost implication to this and there remain concerns that this may not be adequate as a means of eliminating the risk. Vehicle types affected by this are RCVs with front pods and kerbsider vehicles.

Prior to any scenario modelling Powys County Council staff advised that the lifting of troughs etc. was acceptable subject to an absolute maximum above body tipping height that is 1m less than the lowest hanging overhead cables – stated as being 5.2 - 5.3m. The 1m clearance is necessary to avoid electric arcing risks. The 5.2m minimum is understood to be the statutory minimum height that cables should hang; the Council has concerns that some cables across Powys may hang lower than this, requiring further survey work and engagement with the electricity companies.

Powys County Council, when considering the results of the vehicle options modelling (Section 8), will be required to make a final decision on what is and is not acceptable in this regard as there remains evidence of differing views within the Council.

### *5.2.3 Noise exposure*

Part way through the project WRAP published a report[12] presenting further research on the exposure levels of collection operatives to noise, assessed against a number of kerbside recycling vehicle types. The issue of noise impacts around glass collections has been prevalent in the industry for some time and indeed the report includes a quote "all collection systems have the potential to generate daily noise exposure levels which could potentially exceed the Noise at Work Regulations Lower Exposure Action Value". This is borne out in Powys' own data gathered when their trials resulted in glass being collected in a mini (7.5t) RCV, where the highest personal exposure recorded (loader) was 89.6 dB(A) and the highest peak exposure 143 dB; for reference the Upper Exposure Action Value in the Control of Noise at Work Regulations 2005 is 85 dB. The WRAP research covered a number of vehicle types (including kerbsider and stillage types) and (relevant to this study) concluded:

- That noise levels increase with the number of properties services (boxes emptied) inferring the impact of glass-on-glass noise dominates;
- Noise reduction methods on kerbsider vehicles were all seen to have a limited effect;

[11] *Source: http://supertrucks-uk.com/boxvans/index.htm*

[12] *http://www.wrap.org.uk/sites/files/wrap/Noise%20Report%20REP-1003290-BJ-250712%20(Final).pdf*

- Noise reduction methods on stillage vehicles (brushes on apertures and lined compartments) can be seen to work, even after 500 box sorts (unadapated vehicles were seen to exceed upper limits after 250-300 boxes); and

- A commercial glass collection system was monitored using a top loading vehicle for collections and was found to "generate a noise exposure level in the region of the Lower Exposure Action Value. The noisy activity was mainly due to loading operations where the worker is exposed to noise from the lifting mechanics and then from the emptying operation". The report goes on to state that "systems that use rear end loading vehicles are likely to generate significantly higher noise exposure levels".

The kerbsider vehicle research was carried out on standard size vehicles, exposure levels using mini kerbsider vehicles can only be inferred. Nonetheless, stillage vehicles appear to offer greater scope for compliance. RCV collections where glass is tipped into a top-loading pod are more likely to be compliant than where the material is emptied into the rear of a compacting vehicle. Given the point in time on the study that this research was published these conclusions did not influence the vehicle shortlisting exercise (Table 5.1), they have however been used to inform the selection of a preferred vehicle type (Section 9).

## 5.3 Vehicle research

During the data gathering phase of this project AMEC actively engaged with numerous vehicle manufactures (including NTM, Terberg, Romaquip, CWS, Dennis Eagle, BMI) to identify possible vehicles that meet Powys County Council's requirements. The researched vehicles identified have been split in to two groups, those that do not tip above the body of the vehicle and those that tip slightly above the body of the vehicle. Certain vehicles have been excluded during the research due to the combination of their standard and extended tipping heights (e.g. the Terberg Kerbsider 28 and 26). Other vehicles were also excluded due to their incompatibility with Powys' choice of kerbside containers, an example being the NTM Quattro vehicle which is an RCV type vehicle with a 4-way split rear compartment. This vehicle is required to be operated with a bespoke 360 litre split wheeled bin.

It is important to note that the standard Terberg 12t Kerbloader is very similar in design and specification to the equivalent vehicle manufactured by CWS. CWS offer a narrow version of this vehicle (akin to the Romaquip 12t narrow) whereas Terberg do not. From this point forward the Terberg and CWS standard Kerbloaders can largely be considered as being inter-changeable albeit the modeling is based on a specified type.

## 5.4 Crew workshop

As an extension to the WRAP commissioned study AMEC were asked by Powys County Council to run a half-day workshop with representatives of the collection crews to inform them of the study aims, present the work completed to date (including the findings of the baseline model) and discuss each of the researched vehicle types. This was intended to ensure that the modelled scenarios were selected taking account of crews' views on the practical operation of each vehicle type. These views are captured in Table 5.1 later on in this section. Overall the crews' representatives considered the following criteria as being essential: manual handling, overall vehicle size and tipping arrangements (e.g. time to unload).

Beyond the practical observations made on each vehicle type the crews made a number of other positive observations and contributions to the workshops, summarised as follows:

- Narrow access rules are somewhat distorted by the fact that rear-loading vehicles are currently being used, meaning that all narrow (rural) collections can be made using 15t RCVs. Side loading is more of a problem and overall vehicle width is more important than length;

- An issue flagged with the advanced stillage vehicle options (such as the Romaquip and Terberg Kerbloader) is the potential constraint these introduce in terms of being able to co-collect trade communal recycling bins and communal recycling containers (as this vehicle type does not accommodate bin lifts);

- If using RCVs the preference is for smaller (e.g. 18t) vehicles, however should 26t variants be available with rear steer this would ease some of the access issues. Even in the towns the crews often prefer to take out the currently available 15t split-bodied RCVs as they find these get the job done quicker;

- Crew levels and productivity. Through the discussions the crews advised that broadly speaking 400 households per day should be achievable on rural rounds, based on a Driver + 1 loader;

- Commercial waste recycling. There was a strong consensus of opinion that the authority was missing an opportunity around commercial recycling (assuming a pricing structure and supporting policies could be put in place to further incentivise uptake). Examples of businesses generating significant quantities of cardboard (OCC) and glass were cited that is currently being collected as refuse; and

- Use of slave bins. These are considered a problem operationally and have become necessary due to the current vehicle configuration. Crews would rather not use slave bins where possible.

Once the vehicle options have been further refined down crews would value additional information on practical aspects such as whether they are available with automatic gearboxes, low-entry cabs and with rear-steer (which the driver needs to be able to turn on and off). Drivers also prefer to have a standard door which enables the window to be wound down. The DAF LF chassis is regarded as having a very good turning circle.

## 5.5 Identified options

The vehicles identified through the research (and presented at the study interim meeting and additional crew workshop) are summarised in table 5.1 below.

In addition to the formally researched information (obtained from manufacturers and local authorities) AMEC spoke with delegates from Zero Waste Scotland who recently conducted a vehicle study tour to North Wales and Cheshire. Both the Romaquip and Terberg Kerbloader vehicles were observed, yielding the following points:

- Despite being broadly similar in price (in the range £90-£100k) the Romaquip is considered more high-tech than the Kerbloader as material ejection is hydraulic and less dependent upon a forklift. The dropped food waste unit on the Romaquip does require a forklift to move and empty it but this is the only commodity that this applies to. One theoretical benefit of the Kerbloader is that its standard configuration enables two streams of glass colours to be kept separate (albeit our engagement with Recresco described later in Section 7.4.1 confirms that this is not necessary in Powys' case - with reference to meeting the End of Waste criteria for glass);

- Issues with the Romaquip overrunning tipped glass have been addressed by Conwy through the fitting of two plates on the vehicle that effectively direct the ejected glass out and away from the tyre path;

- On the Terberg Kerbloader material cannot flow across the full width of the vehicle, requiring material to be progressively loaded from both sides to get an even fill rate. On the Romaquip there is an inverted v section running down the length of the vehicle at the base of the compartments that separates material but does not stop it flowing across; and

- Conwy have found the Romaquip to be very reliable in the initial months it has been in operation.

**Table 5.1** Potential recycling vehicles

| Manufacturer and vehicle | Gross vehicle weight (t) | Number of compartments | Compaction | Tipping above vehicle height | Authorities utilising the vehicle | Wider (vehicle-type) considerations |
|---|---|---|---|---|---|---|
| Romaquip Kerb-Sort | 12 (2.5m wide) narrow variant has same plated weight but shorter wheelbase and reduced width (2.25m) | Nominally 6 but state 4-compartment vehicles could be made available | Yes - in top deck and card compartment | No | Conwy, Bryson Recycling (Northern Ireland) | **Advanced stillage variants**<br>These vehicle types provide greater compartment flexibility if material streams are to be split (e.g. glass by colour) or additional materials added (e.g. small WEEE, textiles).<br>They can be manufactured with 4 core compartments but it is important to understand whether they are likely to be volume/payload OR collecting time constrained before a decision is taken on this.<br>All frontline variants are 12t GVW so should be able to access more rural areas than a multi-compartment RCV equivalent.<br>All require well organised reception sites due to multiple tipping / forklift movements when unloading – this is less of an issue if tipping just once per day. |
| Terberg / CWS Kerbloader (May Gurney RRV) | 7.5 – 12 (2.4m wide) | 5 - 8 | Yes – not in all compartments | No | New generation Terberg vehicles deployed by May Gurney in Cheshire West and Chester | |
| Advanced Recycling Systems Ltd Kerby | 7.5 – 12 | 5 compartments (the vehicle has not been used to collect food waste) | Yes – not in all compartments | No | Eastbourne Borough Council | |
| NTM-LinkTip | Various: 3.5 / 7.5+ | Depends on vehicle (3+) | No | No | Unknown | |
| NTM 4-Pod | 26 Manufacturer confirms smaller 18 tonne vehicle available with 4 compartments | 4 | Rear compaction | Yes | Tested vehicle in Powys. None in the UK using this exact specification. Used in Scandinavia. | **Multi-compartment RCV**<br>4-compartments so aligned with Powys' current kerbside requirements.<br><br>Highly engineered and thus expensive assets. Less flexible in terms of compartment adaptation and remains unproven in the UK as a vehicle concept.<br><br>May be difficult to cover during breakdowns but could deploy two-pass RCVs in this role. |
| Dennis Eagle WP0159 + | 26 (smaller 18 tonne vehicle available but limited to 1 front pod) | 4 | Rear compaction | Yes | Currently building a prototype for a new vehicle | |
| Terberg – mini kerbsider- stillage | 7.5 (2.3m wide) – 12 available | 1-5 | No | Yes, but overall height within limits | Cae Post deploy an older version of this vehicle in Powys | |

## 6.0 Waste flow analysis

**The focus of this section is on projecting annual waste flows (based on assumed service interventions and scheme performance improvements) in order to assess compliance with the Welsh Government targets and to inform yields for the collection modelling.**

### 6.1 Introduction

Prior to modelling any potential alternative vehicle options it was necessary to consider the tonnages of material expected to be collected at the kerbside up until 2024/25, allowing comparison with the Welsh Government targets and informing the likely extent of interventions required by Powys County Council if the service is to achieve the required performance levels. As it was not feasible to build a validated baseline model (as described in Section 3) this assessment of waste flows was completed outside of the formal collection model through creation of a bespoke spreadsheet. Outputs from the waste flow projection were then pulled through to a set of calculations of the required volumetric capacity at each of the proposed bulking sites.

### 6.2 Service waste flow and performance projection

At the project inception meeting three possible recycling performance profiles that the authority might follow were presented. These were based on:

- A historical projection generated by Powys County Council;
- What might be considered current good practice performance; and
- An ambitious profile enabling the authority to hit the long-term 70% target.

These projections were subsequently revisited at the interim project meeting and amended through consultation with WRAP. The outcome from this was that both the good practice and ambitious profiles were taken forward to the analysis phase of the work, allowing the combination of meeting (or potentially missing) statutory targets and associated resource requirements to be examined. Powys County Council intends to will follow the trajectory of the ambitious line and meet the Welsh Government targets.

As Powys County Council were only able to supply three years of (partial) historic data and no updated forward looking projection following the interim project meeting, AMEC generated the final waste flow profiles, supported by a set of underlying assumptions; the process of developing these projections is described below.

#### *6.2.1 Good practice vs ambitious projections*

The primary difference between the good practice and ambitious projections is the level of recycling and composting performance Powys is assumed to achieve through the period examined. The ambitious projection indicates that by 2024/25 Powys could have a kerbside recycling and composting rate of 73% and overall recycling and composting rate of 65%; it is this projection that the Council are working towards and represents the default profile underpinning the study. With further material recovery from treatment of residual waste, such as incinerator bottom ash recycling, it has been assumed that under the ambitious projection Powys will meet or exceed the target of 70% recycling and composting by 2024/25.

The basic trajectory of both projections is based on an assumption of continued increases in performance after the phased roll out of the new kerbside waste and recycling collection service. The rollout is assumed to be completed during 2013/14 with the reported benefits of the new service becoming fully apparent from 2014/15, driven by a reduction in the quantity of residual waste (predominantly caused by the adoption of alternate weekly collections and progressive clamp down on side waste across the County) and an associated increase in recycling. After this point the good practice and ambitious projections diverge with Powys managing to maintain ongoing improvements in performance through further interventions in the ambitious projection. In the good practice projection after an initial upsurge the rate at which performance improves declines and then plateaus as householders adapt to the new collection system. Powys County Council have resources in place to ensure this does not happen, including 3 Waste Awareness Advisors who carry out participation studies and interventions, e.g. targeted door knocking and leafleting.

The good practice projection was developed to show what the fallback position might look like, if initiatives to continue to expand recycling services and drive out residual waste (e.g. from commercial sources) do not occur at the intended rate after the new kerbside system rollout is complete. This projection shows Powys achieving a

kerbside recycling and composting rate of 55% by 2024/25 and an overall recycling and composting rate of 56%. Even with further material recovery from treatment of residual waste it is unlikely that under the good practice projection Powys will meet the target of 70% recycling and composting by 2024/25.

In order to meet the 70% recycling and composting target via the ambitious projection, within the design constraints of the new kerbside service, Powys would be required to achieve very high capture rates (up to 95%) for all the materials currently targeted for recycling. While it may not be impossible to achieve this level of capture it is unlikely that Powys (or any other local authority) would be able to practically achieve this, particularly for materials such as rigid plastic and food which are relative newcomers to kerbside recycling collections. Therefore, in order for Powys to reach the performance levels predicted in the ambitious projection further interventions and improvements to the waste and recycling collection system will be required.

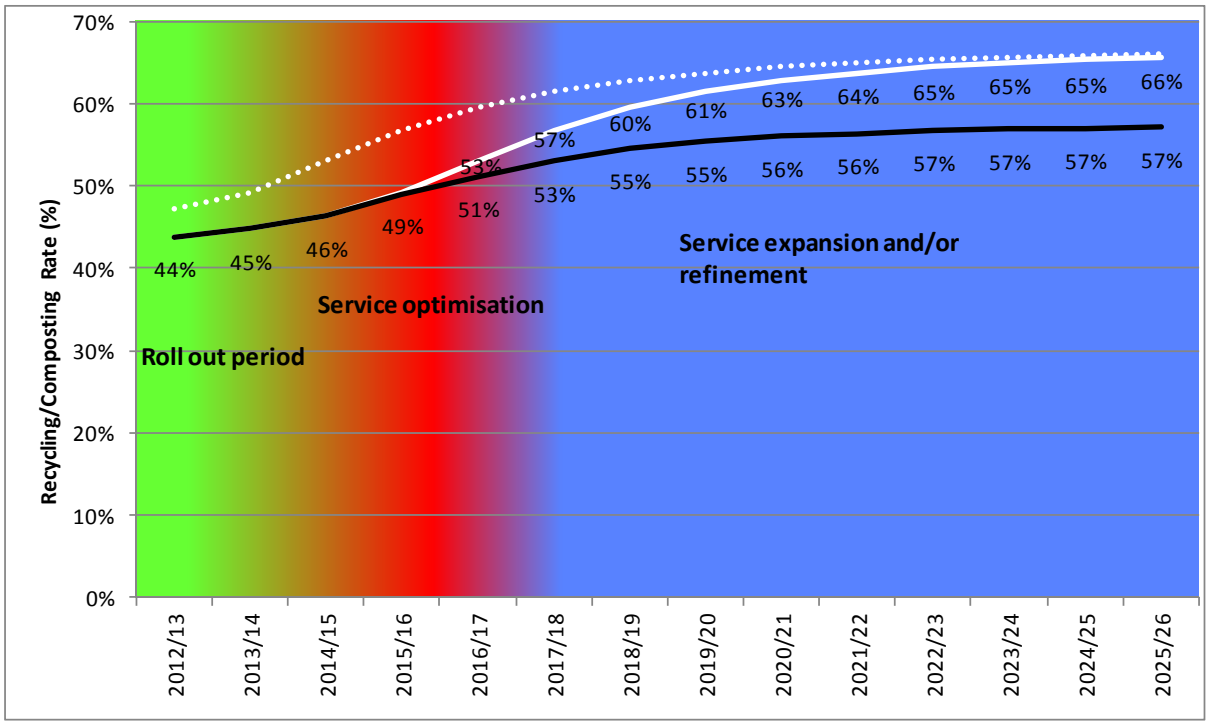
Figure 6.1 provides a representation of key time periods over which current activities and potential future interventions might be made to improve performance from the good practice projection (black line) to meet the ambitious projection (white line). This is intended to provide an initial guide, from which a more formal set of project plans can be developed to include procurement cycles, scheme trials and monitoring / review periods.

As the theoretical projections stand Powys is forecast to miss the 2015/16 target of 58% recycling and composting, even with further material recovery from residual waste treatment. The 2019/20 target of 64% recycling and composting will be missed in the good practice projection however may be reached in the ambitious projection once further material recovery from residual waste treatment is considered. However, if Powys can effectively roll out the new service and implement new policies, services or other interventions faster than the rate initially projected then reaching the interim targets at the required points in time becomes achievable. To illustrate this the white dotted line projects Powys' performance based on their provisional 2012/13 recycling rate (YTD Jan – July) of 47.8% and continued tracking along the gradient of the ambitious curve. The dotted white line shows that the Council are tracking ahead of the curves generated early on in the study and based upon the best available data at that time. Under this projection Powys are able to meet both the 2015/16 and 2019/20 targets, especially with further material recovery from residual waste treatment.

The graphed rates are for the authority as a whole but are based on interventions made to kerbside collection schemes (household and commercial) as these are the parameters that affect the vehicle modelling as a the focus of this study. Powys can take further comfort from the fact that additional increases in recycling performance should be achievable from non-kerbside elements of the service. For example, both the ambitious and good practice projections as presented assume that arising and diversion levels at HWRCs remain constant with the recycling rate set at 67% as is currently achieved. Towards the end of the study Powys advised that internally a target has been set to increase performance at these sites to achieve 75% recycling and composting overall (which would boost the ambitious projection); the good practice projection would also be elevated if the sites could meet 70% recycling and composting – which is considered internally to be readily achievable.

In the initial period Powys County Council will be occupied with the final phases of rollout of the new household waste collection service to rural areas, linked to the introduction of a new recycling fleet – expected to be complete by 2013/14. In parallel to, and following, this is a period of service optimisation where side waste and commercial waste inputs are addressed. Once the roll out is complete is also an appropriate time for targeted interventions such as communication campaigns in traditionally low performing areas to ensure they are aware of what they can and cannot recycle, and to drive continuous improvements in the recycling and composting rate. Powys' Waste Awareness Advisors will play a prominent role identifying, monitoring and engaging with target areas, which requires more robust collection service performance data than has existed in the past.

**Figure 6.1** Intervention timescales for ambitious recycling and composting rate projection




Around 2017/18 on the white line (2014/15 on the dotted white (interim target-compliant) line) Powys County Council will need to consider options to expand or refine services to ensure the longer term targets are met. It is at this point that the ambitious projection diverges from the good practice projection. Underpinning the projection as presented above it is at this point that capture of the existing target materials would need to rise to the 95% level as previously stated. Practically this next phase of improvement gain could be generated through:

- Introduction of a collection service for AHP's (absorbent hygiene products including nappies);
- Addition of textiles and small WEEE / batteries[13] to the existing kerbside collections; and
- Improvements to HWRC and bring bank services (as described previously).

Information underpinning the two kerbside scheme interventions above is presented in Table 6.1, alongside commentary on a range of other interventions or improvements required to move performance along the curve of the ambitious projection. Local authority experience of collecting AHP's is relatively limited in the UK but is increasing[14]; acknowledging the nature of this material it is perhaps unlikely that any vehicle identified in this study would be suited to including this material. Containment and collection requirements may be broadly similar to food waste, but relatively low expected uptake levels and the transient population of households using and then no longer requiring this service suggests this may be better operated along the lines of most existing clinical waste collection services. Dedicating another sealed compartment on the frontline kerbside recycling vehicles may not represent an efficient use of space on vehicles and will depend on spare capacity available at the time and genuine uptake levels. The addition of textiles and small WEEE however is considered viable and is proven on existing kerbside sort schemes operated elsewhere (e.g. in Cheshire West and Chester).

[13] *Please refer to the WEEE and Batteries Directives for regulations on the funding of collection services for these materials. For example a kerbside WEEE collection would require the involvement of a Producer Compliance Scheme to allow evidence to be issued for the recycling of the materials collected.*

[14] *Cheshire West and Chester Council recently reported on their weekly nappy collection trial. Highlights: 3% take-up by households (1,500 from 56,000); 93% participation; yielding an average 6.33 tonnes/week (6.35kg per participating household per week).*

**Table 6.1** Potential improvements to or interventions in Powys' waste and recycling collection system

| Improvement / Intervention | Time Period(s) | Description | Impact |
|---|---|---|---|
| Communication campaign | Roll out | County-wide communication campaign to explain new service to residents, how to use the containers provided to them and which materials to recycle. | The purpose of a communication campaign during the roll out of a new service is to ensure residents have the necessary information to participate in the new services and enable a smooth transition. The impact of such campaigns has not been quantified. |
| Side waste policy | Service optimisation | A robust side waste policy could contribute to Powys' recycling and composting rate by reducing the total quantity of residual waste collected. However, it is not enough to stop crews collecting side waste for streetscene operatives to then do so, as this will still be included in household waste figures (as 'other household residual') and recycling and composting rate calculations. Leaving side waste uncollected for a period may encourage some householders or businesses to stop this behaviour, however to truly prevent side waste the policy must be enforced alongside a proactive and targeted approach to communications and education (which in turn requires good data identifying thoses areas / properties where side waste is a persistent problem[15]). | The impact of side waste bans have not been quantified generally because they are often implemented with or near to other new policies or serices. A WIN survey in 2008 acknowledges that a well enforced side waste policy has a genuine 'minimising' effect on household residual waste. However, it is the degree to which the poicy is reigourously enforced that determines the sucess or otherwise of such measures[16]. |
| Commercial waste | Service optimisation | Both the good practice and ambitious projection assume that Powys County Council is able to reduce the amount of commercial waste entering the household residual waste stream, which is currently estmated at approximately 20%, albeit the extent to which it is driven out is substantially improved in the ambitious projection. A robust side waste policy will continue to help identify business abuse of the service, however the Council may wish to consider further enforcement actions. For example businesses must retain waste transfer notes (WTNs) for a period of two years, Powys should use the powers available to local authorities to demand WTNs from businesses suspected of abusing household waste collections. Although the absence of WTNs does not prove abuse of a household waste services it does indicate a failure by business in Duty of Care for which they can be fined. Effective enforcement is likely to be an effective deterrent to potential | It is estimated that approximately 20% of the household residual waste stream is composed of commercial waste. The eradication of comercial waste from the household residual waste stream could potentially improve recycling and composting performance by 3% in the good practice projection and 1% in the ambitious projection. |

[15] *Council is in the process of installing a barcode system on all containers which will allow the crew to record problems.*

[16] *Resource Futures, WR0121 – Understanding Waste Growth at Local Authority Level Final Report to Defra, October 2009*

| | | | |
|---|---|---|---|
| | | abuse of household waste collections by traders, alongside an enhanced commercial waste and recycling service offering. Feedback from the crew workshop (Section 5.4) identified significant potential to improve commercial recycling services, as such the ambitious projection assumes ongoing increases in capture of commercial streams for recycling, including cardboard and food waste. Effective pricing of the commercial waste service is required to incentive this change in behaviour and service uptake, alongside enforcement. To do this efficiently will require the level of business recycling to reach a scale whereby additional dedicated recycling resource can be assigned (capable of lifting recyclables in wheeled bins from larger businesses) and outlying businesses are aligned as closely as possible with the household service (supporting efficient co-collection). | |
| Targeted interventions | Service optimisation | Recycling performance varies by area according to a number of factors including housing type, affluence and age. Identifying the areas in Powys which are low performing in terms of waste generation and recycling has the potential to cost effectively improve performance. Targeted communication campaigns in low performing areas are likely to be more cost effective and have a greater impact per pound spent than a County-wide campaign. Moving to a situation whereby round structures are stable and data (weights) are consistently gathered over time will help. | Measuring the impact of communication campaigns on performance is fraught with difficulties (not least separating out the effects of other influences on household performance) and hence it is rarely quantified. GMWDA have recently won LIFE+ funding from the EU to evaluate the impact of targeted communication campaigns however it is to take place over the next two to three years. |
| Target new materials for kerbside recycling | Service expansion and/or refinement | Introducing new materials to recycling collections after the roll out of the new collection service could contribute to maintaining the rate of performance improvements. New materials for kerbside recycling could include textiles, batteries, small WEEE or absorbent hygiene products (e.g. nappies). Where the procured vehicles are at capacity or are unsuitable for the new materials targeted, consideration should be given to the enhanced role that a reconfigured network of bring facilities might play in targeting new materials.<br>Alongside proposals to target new materials should come an assessment of the residual waste capacity provided (volume/frequency) and future measures to continue to drive recycling by limiting this capacity quantified – this may help to drive down disposal side costs as ongoing investment is required in recycling. | According to the 2009 Powys waste composition analysis 3.1% (0.37 kg/hh/wk) of household waste was composed of nappies and sanitary products and 0.6% (0.08 kg/hh/wk) was composed of WEEE. The capture of 25% of AHP's and 50% capture of WEEE would divert approximately 400 tpa from disposal, contributing 1.4% to the kerside recycling and composting rate and 0.6% to the total rate in 2024/25. Textiles comprise approx. 4.5% of the residual waste. The capture of 50% of this material would contribute up to 2.8% to the kerside recycling and composting rate and 1.2% to the total kerbside recycling and composting rate in 2024/25. |

### 6.2.2 Assumptions and observations

In developing the good practice and ambitious waste flow and associated recycling performance projections a number of key assumptions and observations have been made by AMEC. These can be summarised as:

- No household growth has been applied. It will be necessary for Powys to reassess how increases in household numbers may impact future resource requirements;

- After the roll out of the new household waste collection system in 2013/14 and linked targeting of commercial waste inputs (prompting a shift to a recycling-led commercial waste offering) Powys will experience a substantial step change in performance in the medium term caused by reducing kerbside residual waste arisings and increasing recycling; and

- The rate of performance improvement will decrease over time without further interventions by Powys. Changes to collection systems and new vehicles alone will only drive performance in the short term producing a step change in performance which will tail off unless complemented with further actions. The challenging targets set by the Welsh Government will only be achieved through a programme of continuous improvement which must include a regular review of current practices and appraisal of potential options by Powys. In particular, the ambitious food waste yields (rising from a base level of 1.3kg/hh/week to 2.4kg/hh/week) have been set on the premise that the Council is able to progressively offer food waste collections to commercial customers. These yields have been applied in the vehicle modelling (Section 8) but it is acknowledged that in many cases commercial material would need to be collected on separate vehicles (due to constraints around binlifts, use of slave bins etc.). As such the yields applied in later years could be viewed as representing the worst case scenario (from a vehicle fill rate perspective) resulting in a small amount of contingency being built into the analysis. The performance landscape and view of what may be politically acceptable is increasingly less certain in the medium to long term, meaning the modelling results should be viewed with an increasing level of caution. Service innovations such as further reductions in the collection frequency of residual waste me become commonplace within a few years (where local authorities have introduced comprehensive food and AHP schemes) which would have the effect of further increasing the rate of climb along the ambitious projection curve.

### 6.2.3 Waste flow and performance projection process

Individual service waste flow and performance projections have been calculated using waste stream growth (or reduction) profiles. Baseline tonnage data (2012/13) was derived from historic data provided by Powys County Council and forecast for 2012/13 based on the number of households receiving different services and the roll out of new services in that year. Baseline tonnages were then projected forwards using waste growth or reduction projections associated with good practice or ambitious levels of performance. It is here that the difference in phasing between the white (projected) line on Figure 6.1 and the currently tracked (dotted white) line came in, as the initial data from the Council showed performance to be some way behind where it was actually confirmed to be towards the end of the study. Other factors, such as the total waste and total kerbside waste growth and probable quantities of material available for capture, were considered in the projections and used to constrain waste stream growth (or reduction). This was done on an approximate basis, acknowledging the starting position in terms of limited base data availability.

The profiles were estimated based on an assumption of significant performance improvements in the medium term (to 2018/19) but with declining performance improvements over the longer term (2019/20+). Housing levels were retained constant over the projection period so that within the later modelling the impact of proposed material yield changes is assessed. The data available at the time of the analysis limited the extent to which the impact of multiple variants could be modelled with any confidence. Hence the outputs should be taken as indicative of how performance might change over time and the sorts of interventions that might help drive these changes.

As would be expected the kerbside collected household residual[17] and household recycling display an inverse relationship with household residual projected to decrease with time as household recycling increases. In contrast, for non-kerbside collected streams, namely HWRC residual, HWRC recycling and bring banks these have been simply projected forward until 2025/26, acknowledging the study focus on the kerbside services. As the new kerbside recycling service is optimised it is reasonable to expect bring tonnages to reduce, creating an opportunity to review the range of materials targeted at these sites and their geographical spread.

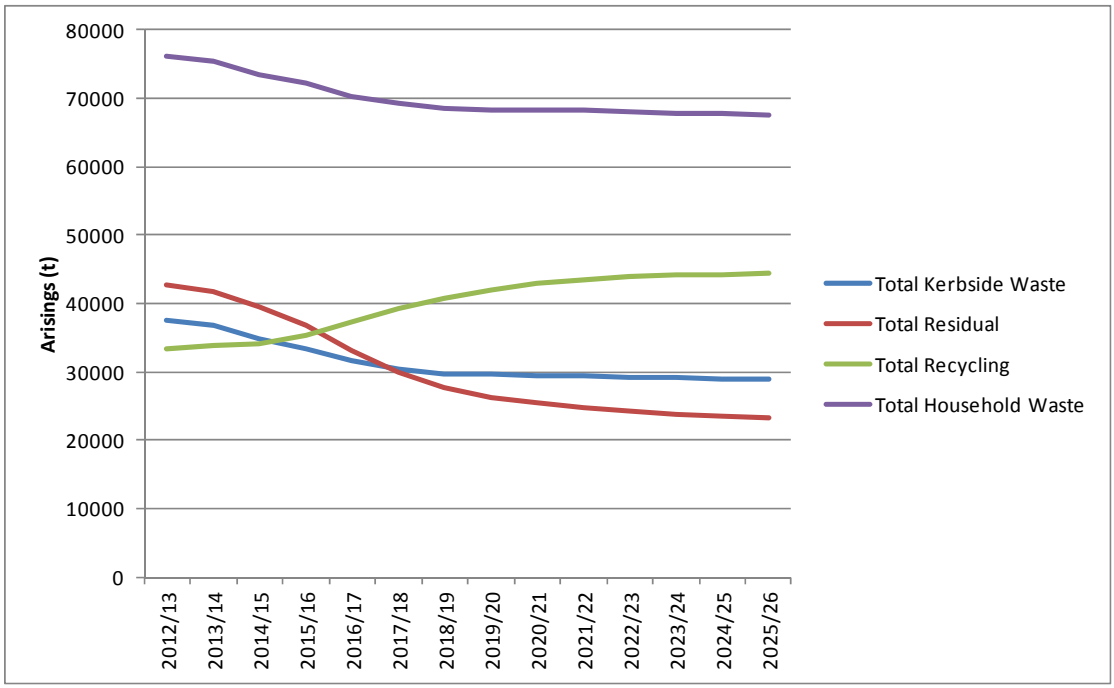
## 6.3 Waste projections

The following figures present waste arising and recycling / composting rate projections for both the good practice and ambitious waste projections. Tonnage projections are presented in Appendix 4. It is important to remember (referring back to Figure 6.1) that the authority is currently tracking ahead (on the dotted white line) of both of these projections so in essence the outcomes presented below could be achieved earlier in time.

### *6.3.1 Total waste projections*

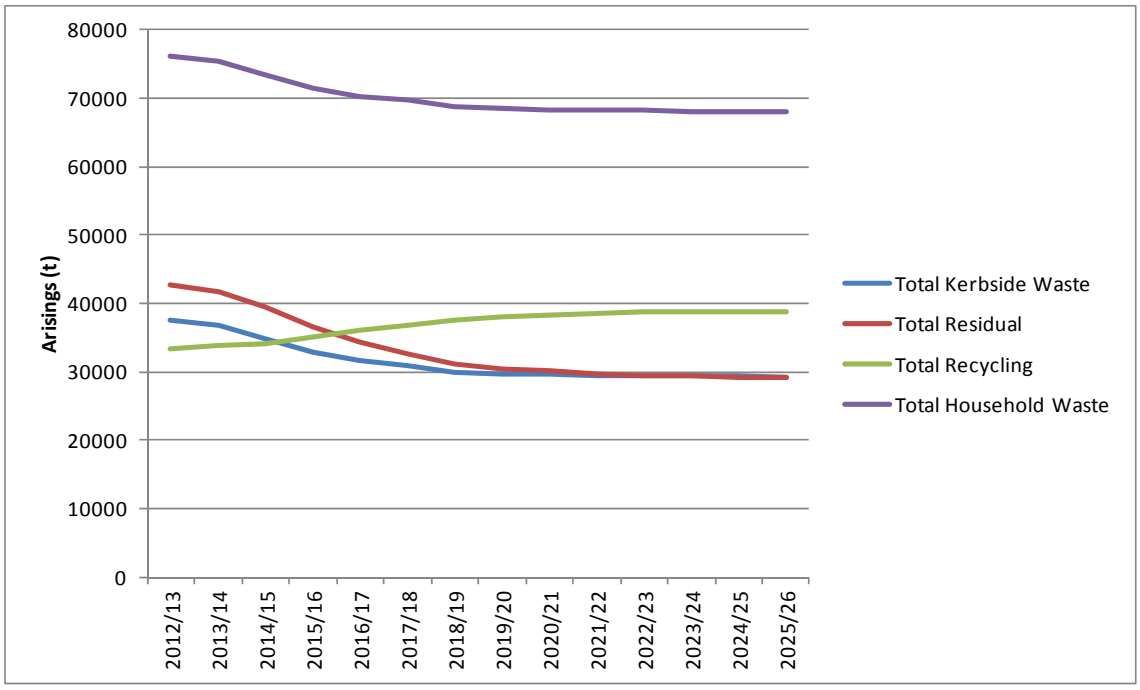
Overall, as shown in figures 6.2 and 6.3, within both performance projections the total kerbside household waste is forecast to decrease during the period examined, from approximately 36,000tpa in 2012/13 to less than 30,000tpa in 2025/26. As non-kerbside streams have been kept constant throughout the projection the reduction in total household waste is due to decreasing kerbside waste arisings. The most significant differences between the good practice and ambitious projections are the relative changes to total residual and total recycling arisings. Within the ambitious projection recycling increases, and residual waste decreases, at a faster rate than within the good practice projection. In addition, improvements in the ambitious projection also continue beyond 2020/21, albeit at a slower pace, whereas in the good practice projection improvements are starting to plateau by 2020/21.

**Figure 6.2** Ambitious total waste and recycling projections, 2012/13 – 2025/26




[17] *Please note household residual excludes commercial waste suspected of being present in the residual stream.*

**Figure 6.3** Good practice total waste and recycling projections, 2012/13 – 2025/26




### *6.3.2 Recycling and composting rates*

Figure 6.4 and 6.5 present the recycling and composting rates associated with the good practice and ambitious waste projections above. Overall in the good practice projection the household waste recycling rate is projected to increase from 44% in 2012/13[18] to approximately 57% by 2024/25. In the ambitious projection the household waste recycling rate is projected to increase to approximately 65% by 2024/25. As discussed in section 6.2.1 with the assumption of further material recovery from treatment of residual waste, such as incinerator bottom ash, the ambitious projection is expected to meet the statutory recycling and composting target of 70% by 2024/25 whereas the good practice projection does not.

It should be noted that improvements in HWRC performance or reductions in other household residual waste would contribute to increasing the forecast recycling and composting rates in both projections. In contrast a reduction in material deposited at bring banks (due to the introduction of new kerbside services) has the potential to negatively impact on forecast performance.

[18] *Acknowledged on the dotted white line in Figure 6.1 to actually be closer to 48%*

**Figure 6.4** Ambitious recycling and composting rate projections, 2012/13 – 2025/26

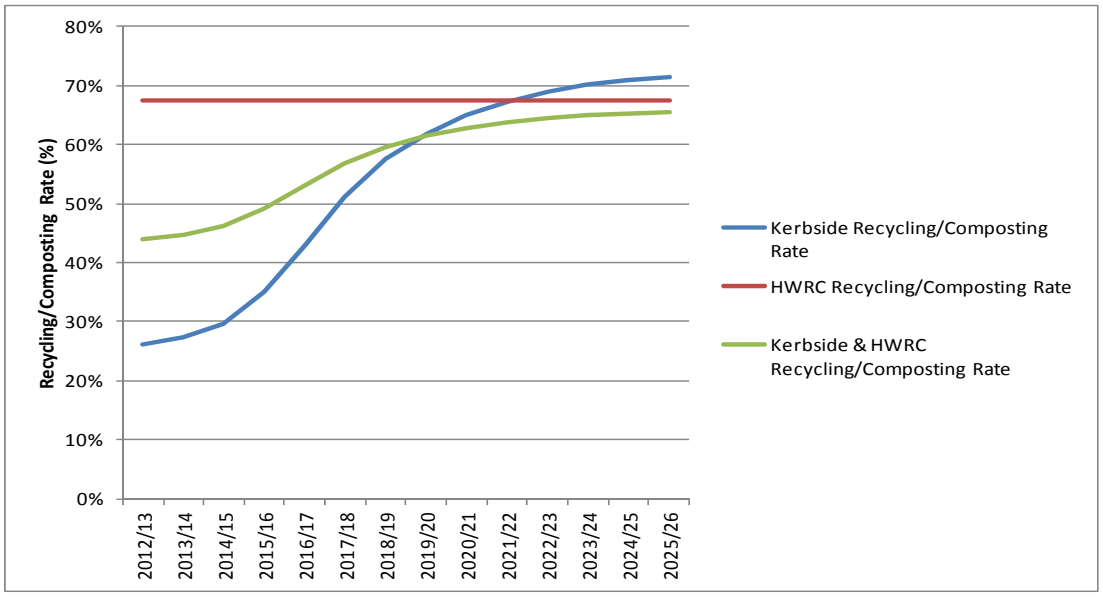
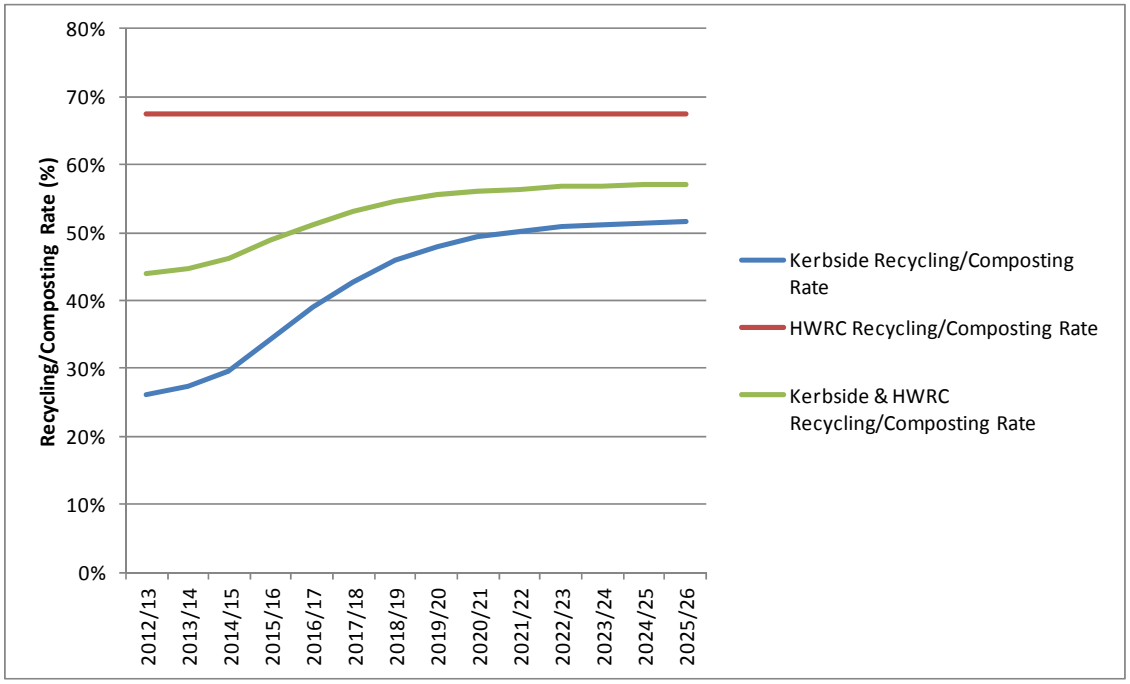



**Figure 6.5** Good practice recycling and composting rate projections, 2012/13 – 2025/26



## 7.0 Bulking facilities

**Prior to any modelling and key decisions being taken on vehicle selection, it is important to consider the available network of material bulking facilities. This section introduces the available facilities (with a focus on recycling and food waste) and their potential future development and use.**

### 7.1 Overview

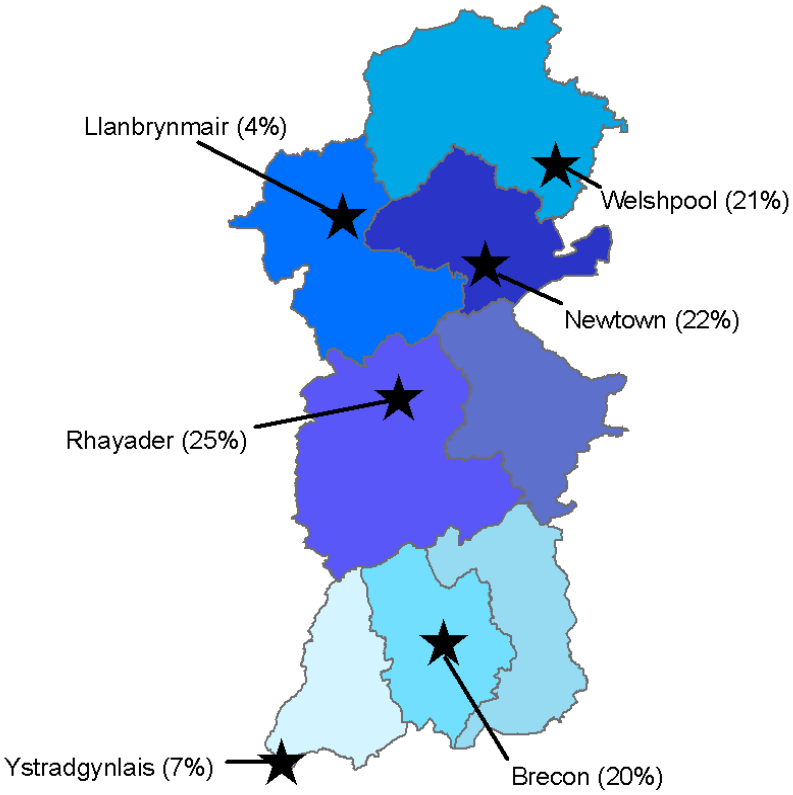
Powys County Council supplied details of the facilities earmarked to service the new kerbside recycling scheme (Table 7.1) and their expected household catchments.

**Table 7.1** Bulking facilities

| Facility | Households served (% split) | Location | Materials to be bulked under new service | Food waste arrangements |
|---|---|---|---|---|
| Abercrave depot, Ystradgynlais | 7 | South West | Loose dry recyclate x3 (paper/card, mixed glass and cans/plastic) and food waste (with a bespoke permit). | Satellite - food waste to be bulked in Abercrave depot, then transferred to Brecon. |
| Llanbrynmair | 4 | North West | Loose dry recyclate x3 (paper/card, mixed glass and cans/plastic) and food waste (with a permit). | Satellite - food waste to be bulked and transferred to Aberystwyth. |
| Brecon | 20 | South Central | Residual waste, white goods, loose dry recyclate x3 (paper/card, mixed glass and cans/plastic) and food waste (with a permit). | One of the three identified food waste transfer stations. |
| Rhayader | 25 | Mid West | Loose dry recyclate x3 (paper/card, mixed glass and cans/plastic) and food waste (with a permit). | One of the three identified food waste transfer stations. |
| Newtown Vastre | 22 | North Central | Loose dry recyclate x3 (paper/card, mixed glass and cans/plastic) and food waste (with a permit). | Satellite - food waste to be bulked and transferred to Welshpool. |
| Welshpool | 21 | North East | Residual waste, white goods, loose dry recyclate x3 (paper/card, mixed glass and cans/plastic) and food waste (with a permit). | One of the three identified food waste transfer stations. |

The location (and associated material throughput percentages) of these facilities is shown in Figure 7.1.

**Figure 7.1** Bulking facilities




## 7.2 Throughput calculations

The tonnage throughput by material stream for each bulking facility has been calculated by apportioning projected waste arisings by the approximate number of households serviced by each depot (see column 3, Table 7.2). Tonnage throughputs have then been converted to volume estimates using material specific bulk densities sourced from WRAP's Kerbside Analysis Tool (KAT). This has allowed for daily throughput in terms of volume (m3) to be estimated which, depending upon the actual size of the bays in each facility, will allow the authority to estimate the level of capacity for different waste streams at each site. In turn, capacity estimates may be used by Powys County Council to predict how frequently bulk haulage and transfer services will be required at each site.

Table 7.2 presents estimates of daily throughput ($m^3$) by facility and material stream for the ambitious projection and table 7.3 for the good practice projection. Please note only Brecon and Welshpool facilities are expected to accept residual waste. Residual waste apportioned to Ystradgynlais is assumed to be deposited at Brecon and residual waste apportioned to Llanbrynmair, Rhayader and Newtown Vastre is assumed to be deposited at Bryn Posteg.

**Table 7.2** Ambitious projection daily throughput estimates ($m^3$)

| Year | Bulking Site | Split | Residual | Glass | Cans & Plastic | Paper & Card | Food Waste | Total Kerbside Waste |
|---|---|---|---|---|---|---|---|---|
| 12/13 | Abercrave depot | 7% | - | 2 | 17 | 2 | 2 | 23 |
| 12/13 | Llanbrynmair | 4% | - | 1 | 9 | 1 | 1 | 12 |
| 12/13 | Brecon | 20% | 78 | 5 | 45 | 5 | 6 | 139 |
| 12/13 | Rhayader | 25% | - | 7 | 57 | 6 | 8 | 78 |
| 12/13 | Newtown Vastre | 22% | - | 6 | 50 | 6 | 7 | 68 |
| 12/13 | Welshpool | 21% | 206 | 5 | 48 | 5 | 6 | 271 |
| 15/16 | Abercrave depot | 7% | - | 2 | 21 | 2 | 3 | 28 |
| 15/16 | Llanbrynmair | 4% | - | 1 | 12 | 1 | 2 | 15 |
| 15/16 | Brecon | 20% | 61 | 5 | 57 | 6 | 7 | 136 |
| 15/16 | Rhayader | 25% | - | 7 | 72 | 8 | 10 | 96 |
| 15/16 | Newtown Vastre | 22% | - | 6 | 63 | 7 | 8 | 84 |
| 15/16 | Welshpool | 21% | 162 | 5 | 60 | 6 | 8 | 242 |
| 24/25 | Abercrave depot | 7% | - | 2 | 39 | 6 | 4 | 51 |
| 24/25 | Llanbrynmair | 4% | - | 1 | 21 | 3 | 2 | 28 |
| 24/25 | Brecon | 20% | 24 | 5 | 103 | 16 | 11 | 160 |
| 24/25 | Rhayader | 25% | - | 7 | 131 | 21 | 14 | 173 |
| 24/25 | Newtown Vastre | 22% | - | 6 | 115 | 18 | 12 | 151 |
| 24/25 | Welshpool | 21% | 63 | 6 | 110 | 17 | 12 | 208 |

**Table 7.3** Good practice projection daily throughput estimates ($m^3$)

| Year | Bulking Site | Split | Residual | Glass | Cans & Plastic | Paper & Card | Food Waste | Total Kerbside Waste |
|---|---|---|---|---|---|---|---|---|
| 12/13 | Abercrave depot | 7% | - | 2 | 17 | 2 | 2 | 23 |
| 12/13 | Llanbrynmair | 4% | - | 1 | 9 | 1 | 1 | 12 |
| 12/13 | Brecon | 20% | 78 | 5 | 45 | 5 | 6 | 139 |
| 12/13 | Rhayader | 25% | - | 7 | 57 | 6 | 8 | 78 |
| 12/13 | Newtown Vastre | 22% | - | 6 | 50 | 6 | 7 | 68 |
| 12/13 | Welshpool | 21% | 206 | 5 | 48 | 5 | 6 | 271 |
| 15/16 | Abercrave depot | 7% | - | 2 | 21 | 2 | 3 | 28 |
| 15/16 | Llanbrynmair | 4% | - | 1 | 12 | 1 | 1 | 15 |
| 15/16 | Brecon | 20% | 60 | 5 | 57 | 6 | 7 | 135 |
| 15/16 | Rhayader | 25% | - | 7 | 72 | 7 | 9 | 95 |
| 15/16 | Newtown Vastre | 22% | - | 6 | 63 | 6 | 8 | 83 |
| 15/16 | Welshpool | 21% | 161 | 5 | 60 | 6 | 7 | 240 |
| 24/25 | Abercrave depot | 7% | - | 2 | 32 | 4 | 3 | 40 |
| 24/25 | Llanbrynmair | 4% | - | 1 | 17 | 2 | 2 | 22 |
| 24/25 | Brecon | 20% | 40 | 5 | 84 | 10 | 8 | 147 |
| 24/25 | Rhayader | 25% | - | 7 | 107 | 12 | 11 | 137 |
| 24/25 | Newtown Vastre | 22% | - | 6 | 94 | 11 | 9 | 120 |
| 24/25 | Welshpool | 21% | 106 | 6 | 90 | 10 | 9 | 220 |

## 7.3 Site development and investment needs

A detailed assessment of individual site development needs was not included within the scope of this study. However, AMEC staff did participate in a walk over of some of the identified bulking sites and have provided commentary on development opportunities and constraints below. As this was not contracted work these should be taken as observations rather than firm recommendations.

The sites visited over a two day period were as follows (AMEC were in attendance at those marked *):

- Rhayader;
- Llanbrynmair*;
- Newtown (Vastre)*;
- Welshpool (Powys depot)*;
- Welshpool (Potters transfer station)*;
- Llanfyllin*;
- Cae Post MRF*;
- Abercrave (Ystrad); and
- Brecon (Potters transfer station).

There was general consensus from those involved in the site visits that no site was considered fundamentally unsuitable to receive and bulk up the three dry recycling streams and food waste. Lack of covered storage and vehicle access were common issues but it was felt that these could be overcome. It is also the case that only the larger (waste transfer) sites have weighbridges which introduces some constraints around being able to monitor round weights, durations etc. It is recommended that a protocol be introduced (perhaps based on use of mobile weigh pads, periodic running of rounds through a facility with a weighbridge or specification of a limited number of vehicles with onboard weighing) in order to capture this information on a rolling basis. This is all part of a wider strategy that is required to introduce greater management and control of the collection operations so that any potential efficiency gains introduced from investment in new vehicles and a round redesign exercise are retained over time.

Of all the sites, Llanbrynmair in the northwest is perhaps subject to the greatest public and (potentially) political opposition as a receiving site. As a result we have summarised the issues at this site in more detail within the sections below, supported by some preliminary site layouts in Appendix 5.

### *7.3.1 Rhayader*

The site is jointly utilised for highways, waste, grounds and street cleansing activities and is permanently manned. At the centre of the site is a historic building (formerly related to the railway) which causes some limitations. However, overall the site is considered more than capable of dealing with the projected throughputs. Recyclate and food waste is already handled at the site and whilst there may be some issues from neighbours (the site is overlooked by a small number of properties, even though the site pre-dates these), it is perfectly feasible to construct a suitable facility to effectively manage the necessary amount of materials to meet the authority's requirements.

### *7.3.2 Llanbrynmair*

This site was historically used solely by Highways and is not permanently manned. It is, however, currently being used to store collected dry recyclables (co-mingled sacks in Ro-Ro cages) under an Exemption. Three new bays are under construction to accept the three dry recycling streams targeted by the new kerbside service, to operate alongside a sealed skip for food waste. Construction of the bays is currently on hold due to local resistance to the formal adoption of this site as a waste management facility. There is an existing shed on site which appears to have limited uses, other than for the storage of a snow plough and related highways equipment.

There is plenty of space on site to house the existing salt pile and to provide new covered storage for recyclable material. Appendix 5 shows schematic diagrams of how the site is configured now (with supporting photographs) and how it might be further developed to provide a perfectly serviceable bulking facility. This is a strategic site

for the service as it is approximately 45 mins to 1 hour from the nearest adjacent facility, thus having a significant impact on collection logistics and vehicle tip run times. Given the relatively small household catchment (3,000 – 3,500) it is envisaged that this site would only ever represent a vehicle base, tipping point for upto two narrow access recycling vehicles (most likely making just one tip per day each) and so vehicle movements and local impact will be limited.

The primary development issues are expected to be:

- Securing planning / permitting as a formal site intended for the receipt and storage of recyclables and food waste. Recyclable waste is already stored at the site however there is significant opposition and Powys planners are unconvinced of the site's classification for industrial use. With limited redevelopment (to include new site screening down the eastern boundary) the site could be considerably improved, both from a waste service and local amenity perspective; and

- The existing shed on site is likely to contain asbestos cladding which could influence its future use and the costs of removal should this be considered.

### *7.3.3 Newtown (Vastre)*

The Vastre site in Newtown is located on an industrial park. The site is accessed via a relatively narrow route that runs directly past commercial units used by a range of business types. Once on site there is ample storage and vehicle turning space. There are four existing dry recycling materials bays and additional storage is provided through the use of covered containers.

Looking ahead the waste team have better control of this site as it does not have a combined Highways role and could easily accommodate a baler. The main issues are the lack of covered storage for materials reception and storage and site access constraints past parked cars.

It is worth noting that Cwm Harry operate their food waste transfer facility on the other side of the industrial estate.

### *7.3.4 Welshpool (Powys depot)*

Although not intended to operate as the primary recycling bulking facility in Welshpool (the Potters site below represents first choice in this regard) this Council-owned site could have a potential role to play. Being a shared site with Highways (and dominated by the covered salt barn) the current layout is not ideal, with vehicles having to navigate a tight area in the corner of the site alongside parked cars. The site has an existing self-contained area that could be further developed to accommodate materials storage and transfer; four recycling bays already exist in this area but none are under cover. A possible solution to this would be to extend the adjacent shed to provide a fully covered reception area. As an industrial site there are no sensitive neighbours but the main constraints would be associated with vehicle movements and parking.

### *7.3.5 Welshpool (Potters transfer station)*

An unscheduled visit was made to the Potters waste transfer station on the same industrial estate as the Council-owned site. This is a large site that is earmarked by Potters for redevelopment, to include a covered waste transfer building and 3MW WID-compliant CHP unit. Current reception and transfer activities appear to take place largely in the open. At the time of the visit it was unclear how and where the Powys recyclate and food waste from the Welshpool phase of the service (commencing 3rd September 2012) would be managed on site.

### *7.3.6 Llanfyllin (North of Welshpool)*

The Llanfylling site has not been earmarked as one of the six proposed bulking facilities. It was, however, included in the scheduled site visits. This site is used by Highways to store salt (in one shed) and vehicles, items of plant (in another). The layout of the site is not ideal with the area behind the salt store being difficult to access. There are a number of small uncovered material storage bays in one corner of the site, which has a number of residential and light commercial neighbours. Access from the main road is restricted albeit currently used by large highways vehicles.

### 7.3.7 Cae Post MRF (Trewern, North East of Welshpool)

The Cae Post MRF was visited as an existing facility that handles collected dry recycling materials from a range of sources, including bring banks, Cae Post's own collection rounds and also from intermediate bulking sites accepting other kerbside-collected material.

The main building comprises office accommodation, meeting and mess rooms, a covered reception hall, first floor picking hall and ground floor baling and materials storage facilities. Two basic sorting lines are operated targeting fibres and containers. The materials reception hall has a holding capacity of just over 100m$^3$ and appeared (over) full at the time of the visit. As a walking floor articulated vehicle would deliver around 90m$^3$ of material, as currently configured the site is not able to receive loads of this size[19]. Access to the tipping area is on an incline which makes vehicle access difficult. The facility includes a number of balers, fed by chutes from the sorting hall above.

The facility is having to deal with lots of film coming through and relies upon two manual picking lines to undertake sorting. The facility had a contamination rate of 8.75% in 2011/12.

Powys County Council owns the site upon which the MRF sits and the equipment within it.

### 7.3.8 Abercrave (Ystrad)

The site is located on the main trunk road between Swansea and Brecon. Being shared with other LE function and used to park a large number of vehicles outside working core hours presents some problems, however there is nothing to suggest that the site could not be used. Indeed, materials from the surrounding area already go through the site with only a small number of rural properties yet to be provided with kerbside recycling. Space limitations do cause some issues – particularly around the movement of full containers. During the visit movements were observed: they appeared to be ad hoc and without structure. A full review of emptying activities and times would help make things more safe and efficient.

As well as this depot, an opportunity exists to develop a bulking area as part of a new Household Waste Recycling Centre. This would provide a blank canvas so that activities can be conducted in a safe and efficient manner. Costs and legislative arrangements (permits, licensing etc.) would need to be considered but this is certainly an option. One major drawback would be the lack of direct supervision at the site (senior officers are based at the Abercrave depot) and this would require consideration.

### 7.3.9 Brecon (Potters transfer station)

Planning is currently in process for the Brecon site which is leased by Powys County Council from a local farmer and operated under contract by Potters Waste Management. The site has sufficient space to manage all collected materials from the surrounding area with the new proposals making provision for a covered waste transfer building and new weighbridge arrangement.

## 7.4 Potential future operating scenarios

Many of the existing bulking facilities have three bulking bays in-situ (or in construction) along with space to store sealed food waste skips, which in the short term (to 2013/14) supports the authority-wide expansion of the current 4-stream recycling service. Within Section 2.5 of the report a number of examples of practice which do not make logistical sense have been cited, including double handling of material (through it being bulked and then de-bulked) prior to processing through Cae Post. More work is needed to get to the bottom of what a sensible network management plan might look like once accurate tonnage waste flow data is captured. At present a wide range of interim bulking / transfer and market distribution routes appear to be used (reported by shire area), meaning the Council probably is unlikely to be benefitting from the economies that consolidation of these arrangements would deliver.

### 7.4.1 Colour separation of glass

During the study the question was raised whether the splitting out of glass into two colour streams could add overall service value (albeit is not necessary from the perspective of compliance with the End of Waste criteria). Approximate calculations based on the projected kerbside glass arising levels and 2012 average prices indicate that a positive swing in income of around £50k may be achievable by moving from a mixed colour feed (which

[19] *The impact of this site operating constraint is seen in the current practice whereby bulked plastic and cans from Ystradgynlais and Brecon have to be transferred into smaller skips at Welshpool prior to receipt at Cae Post – resulting in double/triple handling.*

typically incurs a gate fee of around £5/tonne) to a separate clear and green/brown mix. Whether this justifies the additional investment in bulking infrastructure and transport costs and vehicle loading / unloading times requires further examination once the tonnages and performance of the rounds are better quantified.

### *7.4.2 Targeting additional materials*

As discussed in Section 6 it may be necessary to target additional materials in order to ensure that performance tracks along/ahead of the ambitious curve. Although these materials may not require new bays to be constructed at bulking facilities (AHP's, textiles and small WEEE can all be accommodated in bespoke containers) they will add to the infrastructure and level of site management resource required.

### *7.4.3 Future role of Cae Post*

It is clear that the Cae Post MRF plays a valuable supporting role across a number of aspects of the Powys service, e.g. in further improving the quality of bring bank material and has provided flexibility against the backdrop of a range of locally-defined historic collection arrangements. Commercially, the flexibility that the MRF service provides comes at a relatively high price (c.£130k per annum overall) with the structure of the agreement appearing to incentivise the Council to send as much material as possible through the facility, when in fact it may make more logistical sense for material to be bulked and sent direct to end markets (especially in the south of Powys and with respect to materials such as paper and card). More detailed work is needed to fully assess the cost-benefits of the facility and the service Cae Post provide, acknowledging that there are important social benefits affecting the triple bottom line. The facility has design limitations with respect to waste reception layout and capacity, limiting the type of vehicles that can deposit material; it also lacks a weighbridge which would support accurate throughout data analysis and is unable to process baled material.

It would appear sensible, at least in the short term, for the facility to continue to play a role handling bring site material. As a handler of kerbside-collected material the facility does have a useful role to play separating out the cans and plastics, and importantly plastic film, in order to maximise unit revenues for these streams. With this in mind, the Council is advised to work with organisations such as Alupro (alongside Cae Post) to maximise capture of high value streams such as aluminium cans, aerosols and foil. Whether this is the most cost-effective approach remains uncertain. Through our background research on the study we engaged a number of reprocessors (e.g. Avanti) to enquire about the estimated revenue associated with delivering mixed cans and plastics. The proportional split is a key determining factor on price and the Council would be advised to send samples of material to a number of companies in order to receive accurate quotations. A common commercial model is for the reprocessor to default to the price paid for the lowest value commodity, they then offset their material sorting costs against the higher revenues paid for materials such as the aluminium. Avanti indicated that this would result in a potential income level of £90 per tonne (summer 2012 prices), based on the value of the steel. However, what is likely to limit the ability of Powys to realise this level of income and the attractiveness of the material to the market is the presence of plastic film. WRAP's local authority guidance on the collection of non-botttle rigid plastic packaging identified film as being the most problematic material at MRFs and downstream PRFs. Hence, should the Council seek to distribute the mixed cans and plastic material direct to the market it may be necessary to instruct collection operatives to remove film at the point of loading (where vehicle design permits) and to retain this as a separately collected stream.

From a purely logistical perspective although the Cae Post MRF is not ideally located (when compared with Welshpool and/or Newtown) it would seem sensible to continue to send material from north (and possibly mid-Powys) through this facility, subject to a review of the way in which the operation of the facility is paid for. For material not managed via Cae Post there may be a cost-benefit of investing in baling facilities, with many facilities having sufficient space to accommodate these. Again, quantifying that cost benefit requires further work and has not been feasible here.

## 7.5 Waste treatment and recycling costs / revenues

The combination of complex arrangements for inter-site haulage of materials (including double handling in some cases) and the unique payment mechanism for material handled by Cae Post has meant it has not been possible to undertake an assessment of post-collection costs as part of this study. In essence the costs will be comparable across all of the modelled vehicle options as the quantity of material collected is a constant. Where the downstream economics start to change is in the medium to long term once Powys have taken a decision on how to deliver the middle phase of performance improvement (along the ambitious line) and the mix of interventions that might be made to bring/HWRC and kerbside schemes (including the potential targeting of new materials for recycling, including AHP's, textiles and small WEEE/batteries).

This is an area requiring further consideration as part of the Council's overall service budgeting process.

### *7.5.1 End of Waste criteria for glass*

In addition to the noise issues associated with kerbside glass collections (discussed in Section 5.2.3) the question was raised during the study regarding the potential impact of the EC's adoption of End of Waste criteria for glass and whether it was necessary to choose a vehicle facilitating collection of different colour fractions (nominally clear and green/brown mixed). The End of Waste criteria require glass to be reprocessed into higher value applications (such as via remelt into new glass containers or other products such as fibreglass) in order to be counted as recycling. 'Down-cycling' into lower grade products such as aggregate replacement does not qualify as recycling under the criteria, which are due to come into force in the UK in 2013. Should this apply to Powys' collected glass the impact could be a failure to meet Government recycling targets and potential fines for the Council.

In response to the question posed above the AMEC team made contact with Recresco (an offtaker of Powys' glass) to research these issues. Recresco confirmed that the type of scheme operated by Powys County Council generates the best quality glass which is easily sorted (as a mixed colour stream) and reprocessed into high quality products. The majority of Powys' glass is currently handled through Recresco's Ellesmere Port facility, with some going to Cwmbran. Optical sorting of the glass leads to 95% recovery and subsequent closed loop recycling via remelt. The balance represents what are primarily very small shards of material that are screened off in the process and typically go to either fiberglass or aggregate applications. As such close to 100% of all glass goes to applications that qualify as recycling under the criteria.

Recresco confirmed that with the optical sorting technology they have there is no need for the authority to further colour-sort the material on the vehicle. When received at Recresco facilities the material is batch-fed into the process, whereby it may be mixed with material from other similar schemes, but under no circumstances with MRF-derived glass (which typically has a much higher ceramic content which the container manufacturers do not want). Based on this feedback the collection modelling assumes that glass continues to be collected on the vehicles colour-mixed.

## 7.6 High-level action plan

Given that this study has only been able to go so far in terms of assessing post-collection arrangements and costs, we have proposed below a list of possible actions to be taken forward by Powys County Council and forming what might be considered a 'materials handling and markets route map'.

- Instigate a short-term plan to bring each of the six bulking facilities upto a standard required to accommodate the preferred vehicle type and to maximise material quality. At the very least efforts should be made to provide dry materials storage and implement a process whereby sample round weights (for each commodity stream) are recorded – see below. Depending on the final choice of recycling vehicle, manning and skill levels at the more remote sites should be reviewed, to include consideration given to multi-skilling operatives through, for example, forklift truck training;

- As the new vehicles are rolled out the Council should put in place a process of either periodically directing each round to the nearest facility with a weighbridge (and weighing off each commodity) or (as a potentially less time consuming and costly exercise) investing in a mobile weigh pad(s) that is rotated across sites and used to gather this data. These material specific weights (supported by stillage fill levels where possible) should be time/date-stamped and used to populate an audited collection round performance database. Over time this can be used to inform refinements to round structures, resource levels (e.g. crewing levels) and decisions around the viability of adding new materials to the kerbside collection; and

- Within the constraints of existing contract end points, initiate a programme of soft-market testing to determine whether better value can be achieved for the materials arising. Once this is complete the cost-benefit of making supporting changes to key sites such as Brecon (e.g. in terms of installing balers and some preliminary sorting) can be assessed. It may be that significant value is being lost to contractors and warrants the Council investing in equipment at its own sites and ensuring they retain the full value of the resources being collected. This is likely to be an outcome that cannot be realised in the short-term, but is certainly a realistic target over the period 2014/15 – 2016/17. Part of this review should include a more

thorough assessment of the costs and benefits of the Cae Post MRF, to inform decisions on investment at the facility (e.g. to improve materials reception) and whether the existing commercial arrangement remains appropriate as kerbside collection arrangements are harmonised through the Council-run service.

## 8.0 Scenario modelling

**This section introduces the modelled vehicle scenario results, including the baseline.**

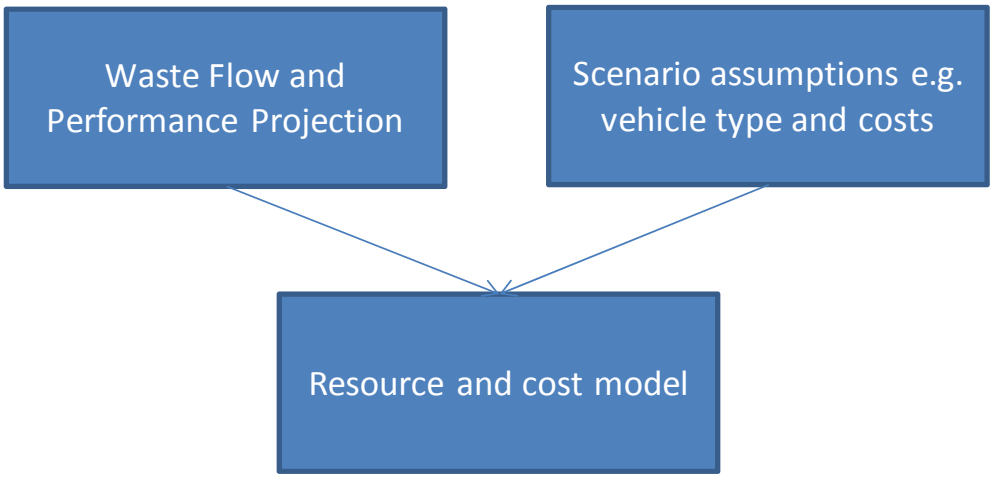
### 8.1 Approach

Scenario modelling was undertaken using an in-house model developed and adapted by AMEC for this project. The approach to modelling different vehicle options is based upon forecasting the level of resources required to service the projected levels of waste and recycling arisings from households that can be accessed by each classification (size) of vehicle. Inputs to the model are the good practice or ambitious waste flow and performance projections (see Section 6) and scenario-specific assumptions. It should be noted that although baseline assumptions were based on data provided by Powys County Council there are a number of uncertainties associated with the information. For example, there is uncertainty about the actual number of standard, narrow and ultra narrow access households and the information on current waste and recycling rounds was limited partly because Powys were rolling out new services as the data gathering exercise was being undertaken. Please see Section 3.1 for more on information gathering difficulties.

Waste flows from the projection are converted into volume estimates using bulk density conversion factors from WRAP's Kerbside Analysis Tool (KAT). Volume estimates are in turn used to estimate the number of scenario-specific vehicles which would be required to collect the projected waste and recycling arisings taking into account factors such as compaction ratios (where applicable) and pass rate (the average number of households that can be collected from in one day, which varies depending on the urban / rural nature of the round).

Figure 8.1 summarises how the different data are incorporated into the resource and cost model.

**Figure 8.1** Resource and cost model




#### *8.1.1 Waste flow and performance projection*

The study approach to forecasting waste flows is described in Section 6, and was influenced by the challenges establishing a reliable baseline position as discussed in Section 3.

#### *8.1.2 Model inputs and assumptions*

All model inputs are based on data provided by Powys County Council, updated with scenario-specific information such as vehicle type and cost, vehicle load capacities, maintenance costs and compaction ratios. Other data provided by the Council and included in the scenario assumptions include operational and financial information. Operational assumptions include average pass rates, vehicle staffing levels and the average time taken to tip. Financial inputs and assumptions include average wage costs, fuel costs and new container costs. The majority of the data comes from parameters agreed with Powys in the baseline model plus information from vehicle manufacturers. Appendix 2 presents the types of input data required by the model and the baseline assumptions. For each scenario baseline data was changed to reflect the capabilities and operation of different vehicle types including vehicle costs, pass rates, time to tip, crew levels and fuel consumption.

In cases where the data required by the model was unclear, incomplete or non-existent it was necessary to estimate certain parameters. The following bullet points identify two key parameters which have been estimated:

- Pass rate: Different vehicles are capable of passing more or less households depending upon factors including the vehicle size, type of collection (sacks vs wheeled bins and level of vehicle-based materials segregation), number of loaders and type of location (urban vs rural). The majority of the vehicles modelled in the scenarios are relative newcomers to the UK market and as such reliable data is not yet available. Given that pass rates are such a critical parameter in the modelling AMEC's supporting research used to inform collection productivities applied to the modelling is presented in Appendix 6. The optimum vehicle selection requires careful consideration and analysis of whether rounds are expected to be limited by the time available in the working day or the weight / volumetric carrying capacity – these issues are explored further throughout this section; and

- Average time at tip: Different vehicles are capable of completing tipping operations faster than others. Our approach to estimating the average time at tip was to consider the operations over and above those completed by the split bodied (70/30) RCV baseline vehicles. The NTM 4-pod and Romaquip vehicles utilise automated material ejection systems (albeit a forklift is still required to empty the ejected Romaquip food stillage), similar to the baseline vehicle, however as they will be tipping at least two additional materials the average time at tip was increased by 5 minutes over the baseline time for both standard and narrow vehicles. In contrast the Kerbloader-type vehicles require up to eight stillages to be emptied by forklift, therefore the average time at tip was increased by 15 minutes over the baseline time for both standard and narrow vehicles.

It was agreed with Powys County Council at the interim meeting that all scenarios would be run on the basis of a standard 5 day working week. All models were set up based on collection of 4 core recycling streams (thus testing their capabilities to deliver the service 'as-is') and yet recognising that certain vehicle options, having more than 4 compartments, provide flexibility to collect higher than expected yields or additional target materials (such as textiles). Gate fees and other treatment/disposal costs make up the whole system costs but as these costs will be constant under each respective projection for all scenarios modelled they have been excluded.

### *8.1.3 Resource and cost model*

The resource and cost model brings together waste flow and performance projections and operational scenario assumptions to estimate the number of vehicles required in each scenario. Cost data and other assumptions associated with each scenario are then used to estimate the following:

- Container replacement costs;
- Maintenance costs;
- Annualised vehicle capital costs;
- Manpower costs; and
- Fuel costs.

Total resource and capital costs of each collection system are calculated and used as the basis for assessing different scenarios.

## 8.2 Long list of potential collection scenarios

Table 8.1 presents a summary of the weekly 'one pass' recycling collection options presented to Powys County Council. A total of 16 potential vehicle configurations were initially drawn up, consisting of different variations of vehicles capable of collecting four recycling streams simultaneously. Each option identifies two types of vehicle, one of which is capable of collecting from properties with restricted access i.e. rural and narrow access collections. As different vehicles have different capabilities in terms of accessing roads, variations in the number

of households serviced by the 'standard access' and 'narrow access' service were incorporated into the final scenario options. As described in Section 3.2.1 ultra narrow access properties (assumed to equal 1,000 households) were excluded from the core model. Other long listed scenarios, such as Scenario 9, were discounted straight away due to a concern that the proposed narrow vehicle was too large to practically access all rural areas.

**Table 8.1** Vehicle scenario long list

| Scenario | Scenario Title | Frontline Standard Access<br>Frontline vehicle | Rural Narrow Access Service<br>Rural vehicle |
|---|---|---|---|
| 1 | NTM with Kerbloader | 26t NTM 4-pod | 12t CWS Kerbloader Narrow |
| 2 | NTM with mini Kerbsider | 26t NTM 4-pod | 7.5t Mini Kerbsider |
| 3 | NTM with Kerby | 26t NTM 4-pod | 7.5t Kerby |
| 4 | NTM with Romaquip | 26t NTM 4-pod | 12t Romaquip Narrow |
| 5 | Small NTM with Kerbloader | 18t NTM 4-pod | 7.5t Terberg kerbloader (MG RRV-type vehicle) |
| 6 | Small NTM with Kerbloader | 18t NTM 4-pod | 12t CWS Kerbloader Narrow |
| 7 | Small NTM with Kerby | 18t NTM 4-pod | 7.5t Kerby |
| 8 | Small NTM with Romaquip | 18t NTM 4-pod | 12t Romaquip Narrow |
| 9 | NTM Fleet | 26t NTM 4-pod | 18t NTM 4-pod |
| 10 | Dennis Eagle WP | 26t Dennis Eagle WP | 7.5t Mini Kerbsider |
| 11 | Romaquip Fleet | 12t Romaquip | 12t Romaquip Narrow |
| 12 | Core Romaquip | 12t Romaquip | 7.5t Terberg kerbloader (MG RRV-type vehicle) |
| 13 | Romaquip with Mini KS | 12t Romaquip | 7.5t Mini Kerbsider |
| 14 | Kerbloader Fleet | 12t Terberg Kerbloader | 12t CWS Kerbloader Narrow |
| 15 | Kerbloader with Mini KS | 12t Terberg Kerbloader | 7.5t Mini Kerbsider |
| 16 | Kerby Fleet | 12t Kerby | 7.5t Kerby |

## 8.3 Collection scenarios modelled

Table 8.2 summarises the recycling collection scenarios selected to be modelled by the Council. These were selected to provide a broad spread of vehicle types and loading methods. As discussed in Section 3.2 the number of households assumed to require servicing via standard or narrow access vehicles changes according to the sizes and capabilities of the vehicles modelled. It should also be noted that for residual waste collection the same vehicle types are used in all scenarios. The following sub-sections briefly describe each scenario and the level of resources required to collect from the households in Powys. Consistent with the baseline model, dedicated commercial waste collection resources have been excluded from the analysis; commercial waste and recycling tonnages are included in the earlier projections though so where this material is co-collected the modelling takes account of this additional material loading on the vehicles.

For scenarios 2a and 6b two variations have been modelled. Originally the NTM 4-pod standard vehicles in these scenarios were paired with 7.5t mini-kerbsider vehicles. However, concerns over the tipping height of the kerbsider vehicle and also noise levels generated while collecting glass (see Section 5) led to a request from Powys to also model a stillage type vehicle with the NTM 4-pod options. These are presented as variants to each option in the table below and the results that follow.

**Table 8.2** Modelled scenario vehicles

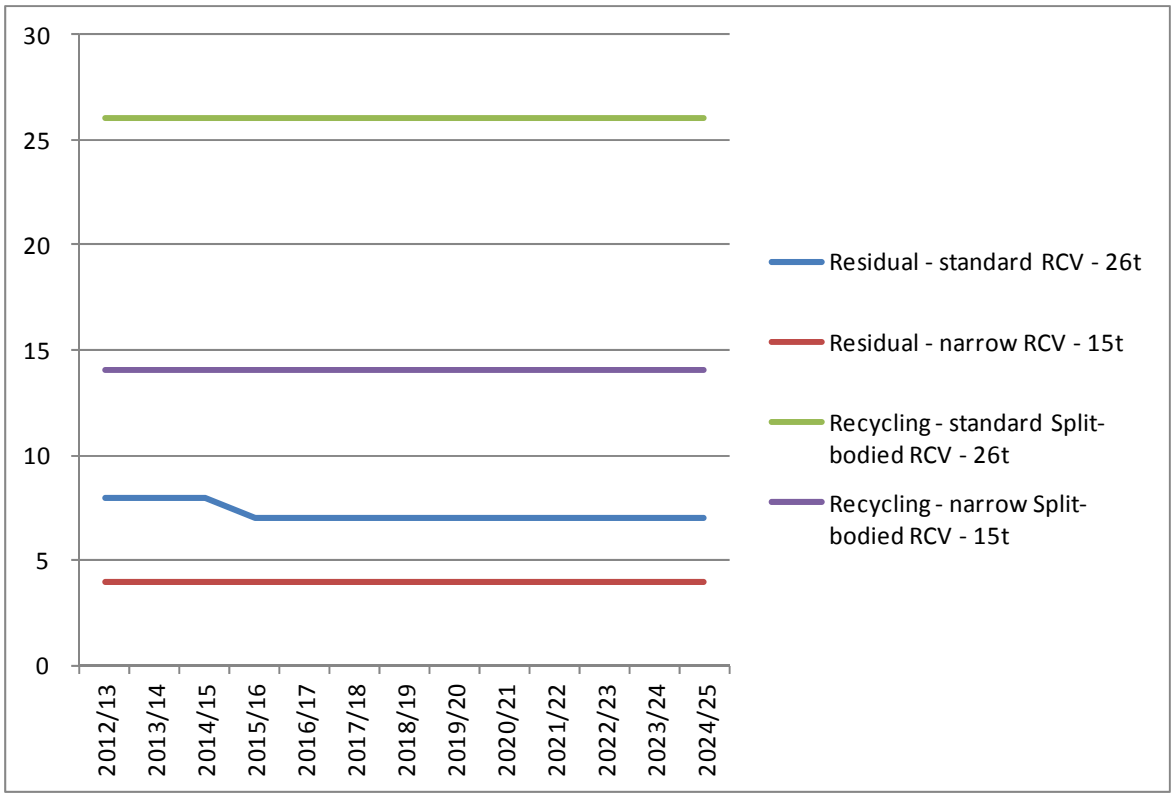
| Scenario | Standard Access Service | | Narrow Access Service | |
|---|---|---|---|---|
| Baseline |  | 70/30 Split-bodied 26t RCV (2 pass solution) |  | 70/30 Split-bodied 15t RCV (2 pass solution) |
| 2a |  | 26t NTM 4-pod |  | 7.5t mini-kerbsider |
| 2a - variant |  | 26t NTM 4-pod |  | 12t CWS Kerbloader Narrow |
| 6b |  | 18t NTM 4-pod |  | 7.5t mini-kerbsider |
| 6b - variant |  | 18t NTM 4-pod |  | 12t CWS Kerbloader Narrow |
| 11b |  | 12t Romaquip |  | 12t Romaquip Narrow |
| 14b |  | 12t Terberg Kerbloader |  | 12t CWS Kerbloader Narrow |

### *8.3.1 Baseline scenario*

The baseline scenario estimates the resources and costs which would be required should Powys continue with their interim strategy of making recycling and food waste collections from households with a two-pass solution using split bodied (70/30) vehicles (see Section 3). As such the baseline could be considered a worst case position (from a service cost perspective) against which alternative options can be compared. Figure 8.2 shows the estimated number of vehicles which would be required to collect from households in Powys between 2012/13 and 2024/25 in the baseline scenario. Resource requirements in the baseline scenario are the same for both the good practice and ambitious profiles. There is only one change to vehicle requirements during the period examined with the number of standard access residual waste vehicles decreasing from 8 in 2014/15 to 7 in 2015/16 as residual waste arisings decrease. In contrast 4 narrow access residual waste vehicles are required to service narrow access properties throughout the period examined. [Please note: as the type of residual waste collection vehicles do not change in the subsequent scenarios, residual waste collection vehicle requirements remain the same in each scenario. Hence discussion of individual scenario results below is focused on recycling resource requirements only].

In terms of recycling resource requirements, the baseline scenario two-pass solution requires 26 standard access and 14 narrow access recycling vehicles to service Powys. Recycling resource requirements do not change during the period examined, reflecting the level of vehicle spare capacity that this service configuration provides.

**Figure 8.2** Baseline scenario resource requirements




### *8.3.2 Scenario 2a*

Scenario 2a considers the resource requirement and cost implications of using a combination of 26t NTM 4-pod and 7.5t (mini) Kerbsider vehicles, with the Kerbsider servicing a larger number of households classified as rural due to the larger (26t) frontline vehicle. Figure 8.3 and 8.4 shows the estimated number of scenario 2a vehicles required to collect food waste and recycling from households in Powys between 2012/13 and 2024/25 under the good practice and ambitious projections respectively. For the recycling services 13 standard access (NTM 4-pod) are required in both the good practice and ambitious projections. At first 7 narrow access vehicles (7.5t mini-kerbsider) are required to collect from all the households in Powys increasing to 10 in the good practice profile and 14 in the ambitious profile by 2024/25. This reflects the impact of compartment capacity restrictions on this vehicle which becomes more acute in the ambitious projection where recycling yields increase at the greater rate. The modelling results perhaps bear out the views expressed by operatives' representatives during the crew workshop that the 7.5t (mini) Kerbsider would make a viable alternative to the low loader vans for ultra-narrow collections.

**Figure 8.3** Scenario 2a resource requirements – good practice projection

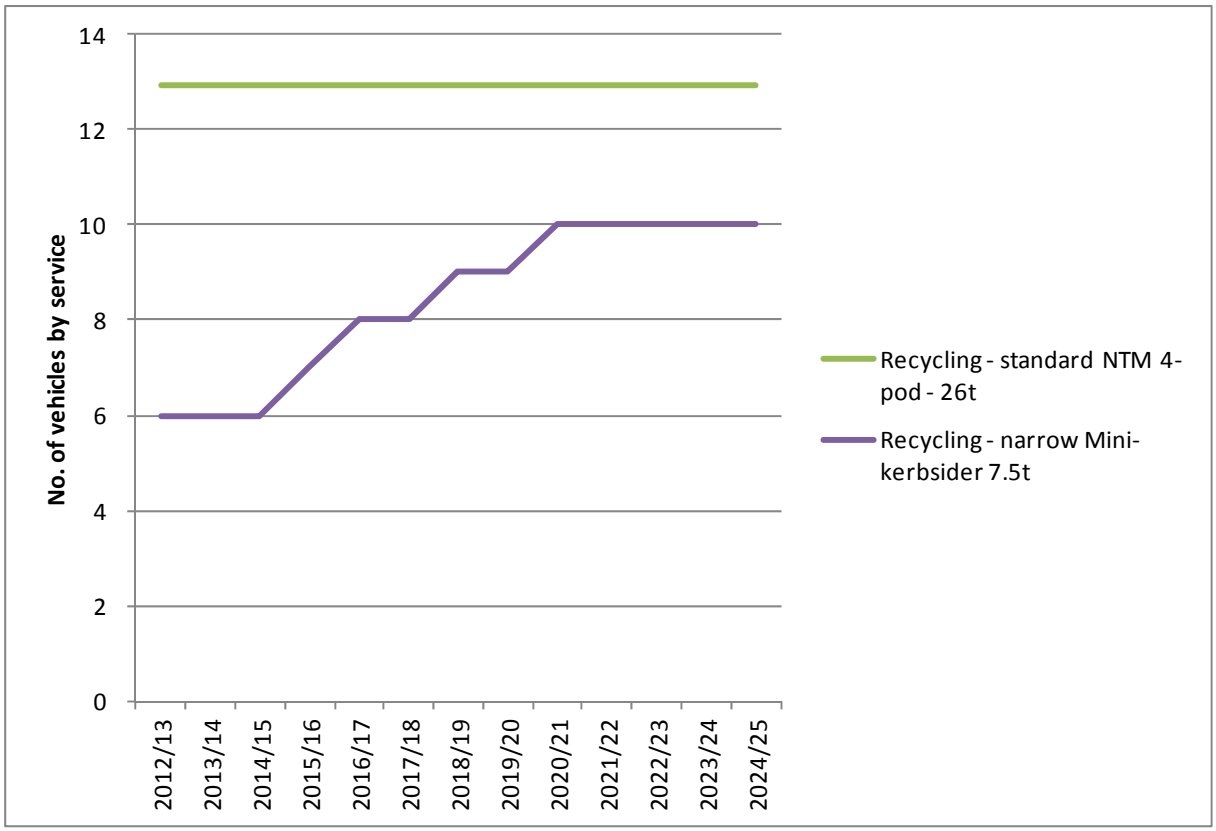
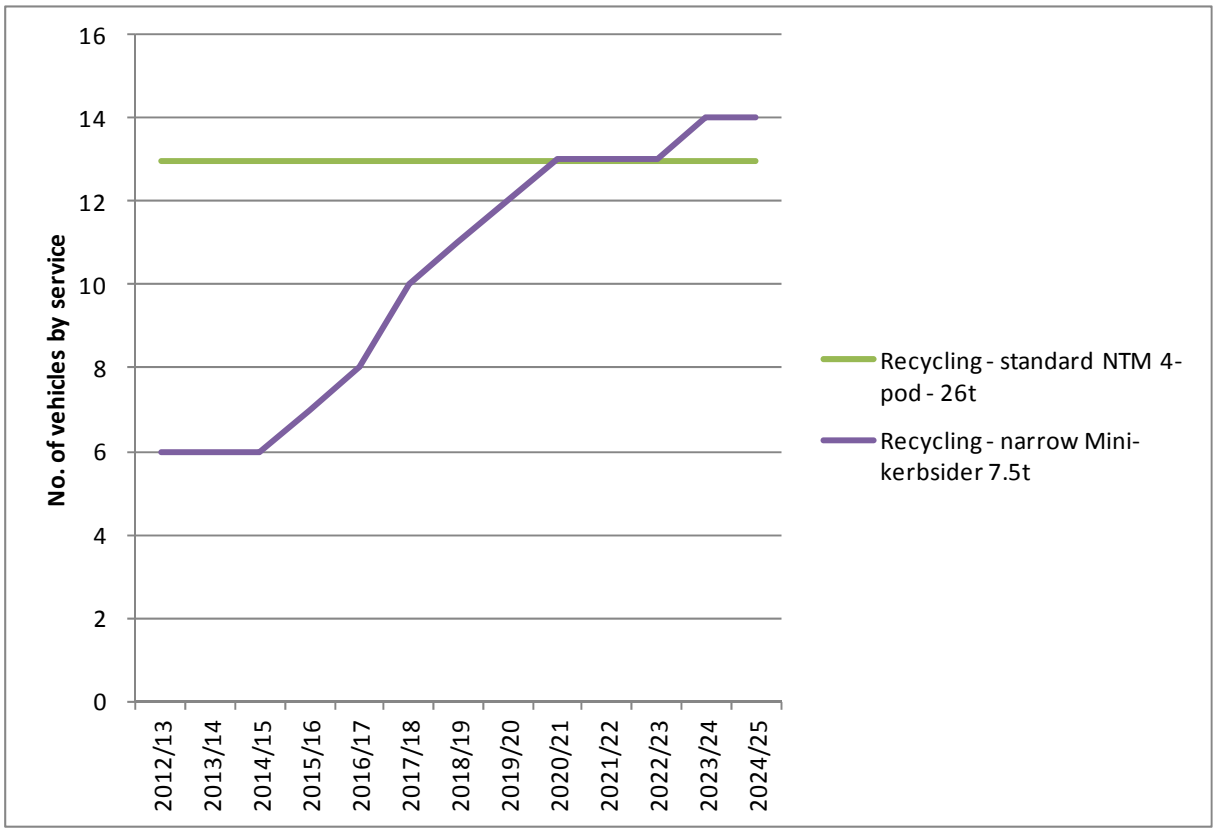



**Figure 8.4** Scenario 2a resource requirements – ambitious projection

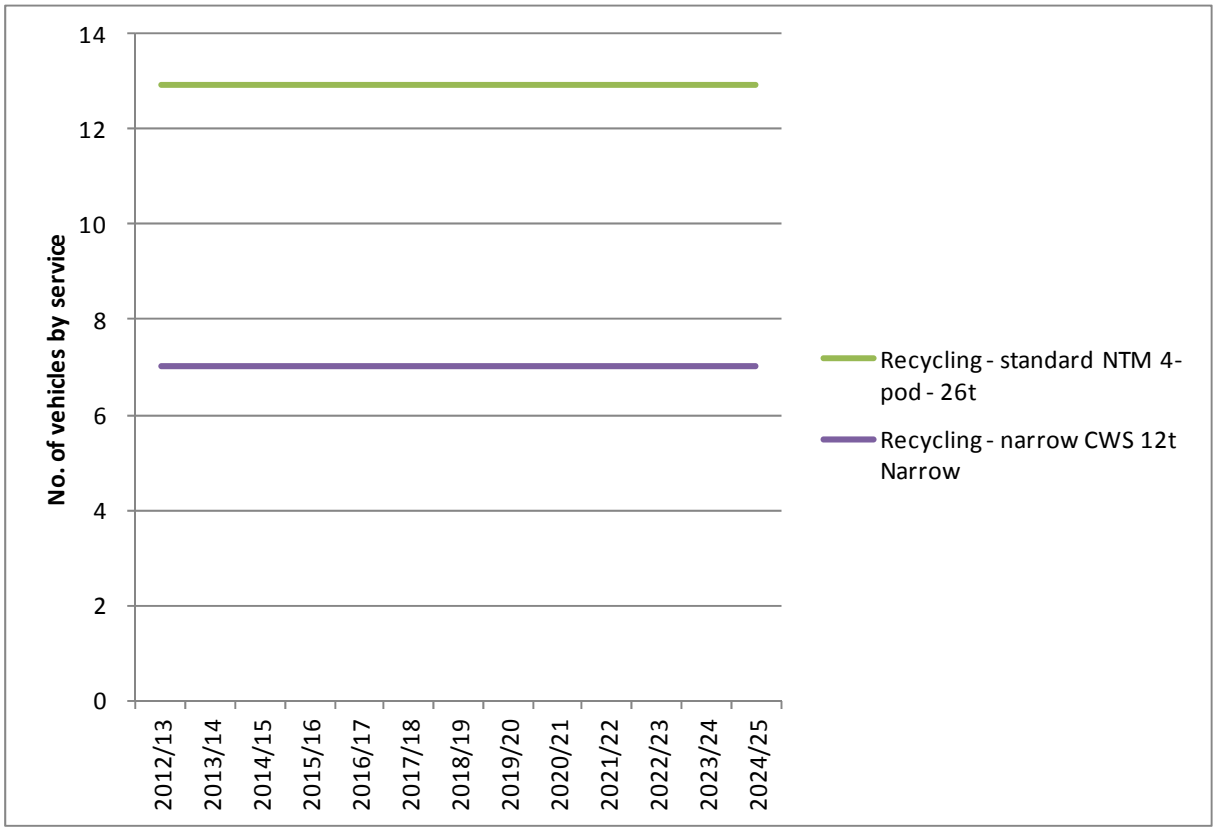


### *8.3.3 Scenario 2a - Variant*

Scenario 2a - variant considers the resource requirement and cost implications of using a combination of 26t NTM 4-pod and 12t narrow Kerbloader vehicles, with the kerbloader servicing a larger number of households classified as rural due to the larger (26t) frontline vehicle. Figure 8.5 shows the estimated number of scenario 2a - variant vehicles required to collect food waste and recycling from households in Powys between 2012/13 and 2024/25. Please note resource requirements in scenario 2a - variant are the same for both the good practice and ambitious profiles. For the recycling services 13 standard access (NTM 4-pod) and 7 narrow access vehicles (12t kerbloader) are required to collect from all the households in Powys.

The number of recycling vehicles remains constant indicating that the rounds are time rather than weight/volume constrained under this vehicle configuration, with the narrow-bodied Kerbloader vehicle appearing to deliver good material payloads.

**Figure 8.5** Scenario 2a – variant resource requirements




### *8.3.4 Scenario 6b*

Scenario 6b considers the resource requirement and cost implications of using a combination of 18t NTM 4-pod and 7.5t (mini) Kerbsider vehicles, with the Kerbsider assigned to a lesser number of rural properties due to the 18t frontline vehicle being able to reach further out into rural areas. Figure 8.6 and 8.7 shows the estimated number of scenario 6b vehicles required to collect food waste and recycling from households in Powys between 2012/13 and 2024/25 under the good practice and ambitious projections respectively. At first just 14 18t NTM 4-pod recycling vehicles are required to collect from all the standard access households in Powys, however as recycling rates improve and recycling arisings increase, more and more vehicles are required to collect recyclables. In the good practice projection the number of standard access vehicles required reaches a total of 19 in 2021/22 (by which point yields plateau), however in the ambitious projection the number of standard access vehicles required reaches a total of 26 by 2023/24.

A similar pattern is repeated for the narrow access vehicle (7.5t mini-kerbsider). At first just 3 vehicles are required to collect from all the narrow access households in Powys, however as recycling rates improve and recycling arisings increase, more and more vehicles are required to collect recyclables. In the good practice projection the number of narrow access vehicles required reaches a total of 5 in 2018/19, however in the ambitious projection the number of narrow access vehicles required reaches a total of 7 by 2021/22.

**Figure 8.6** Scenario 6b resource requirements – good practice projection

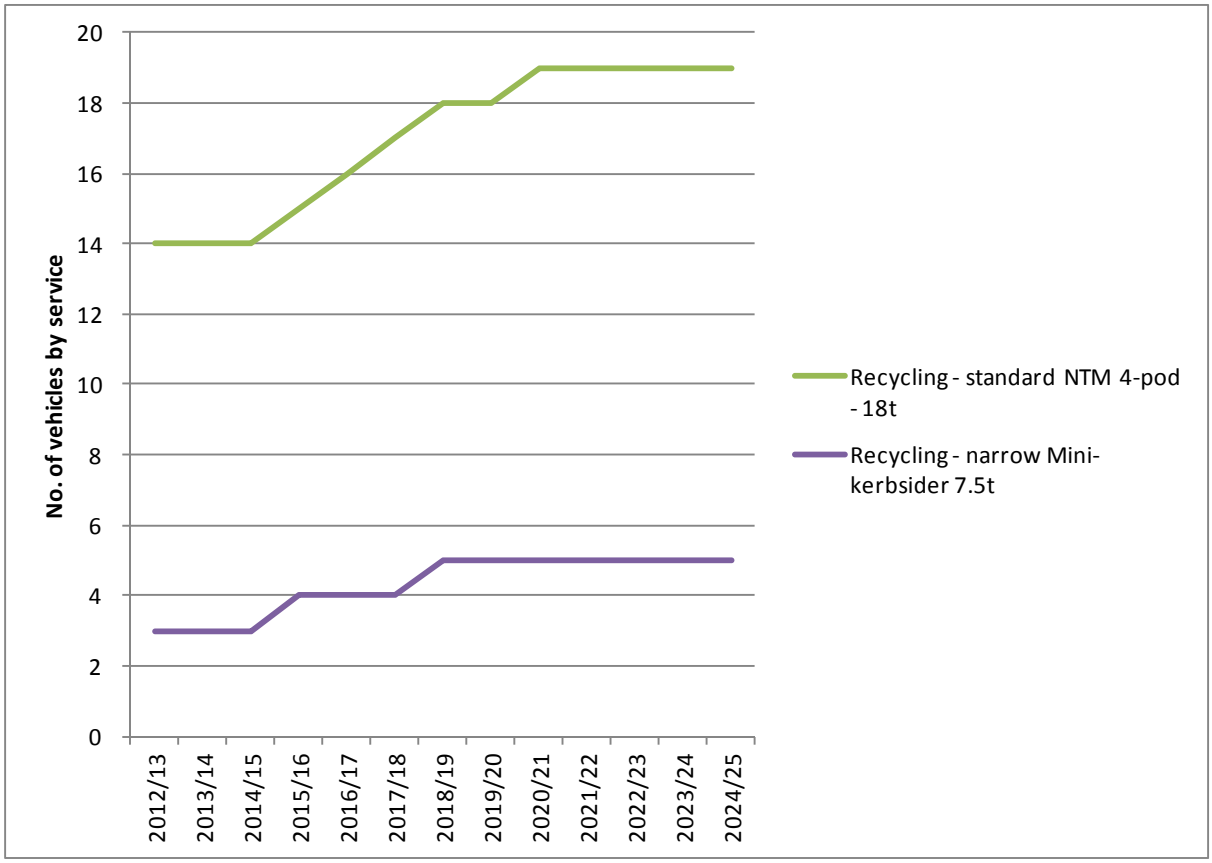
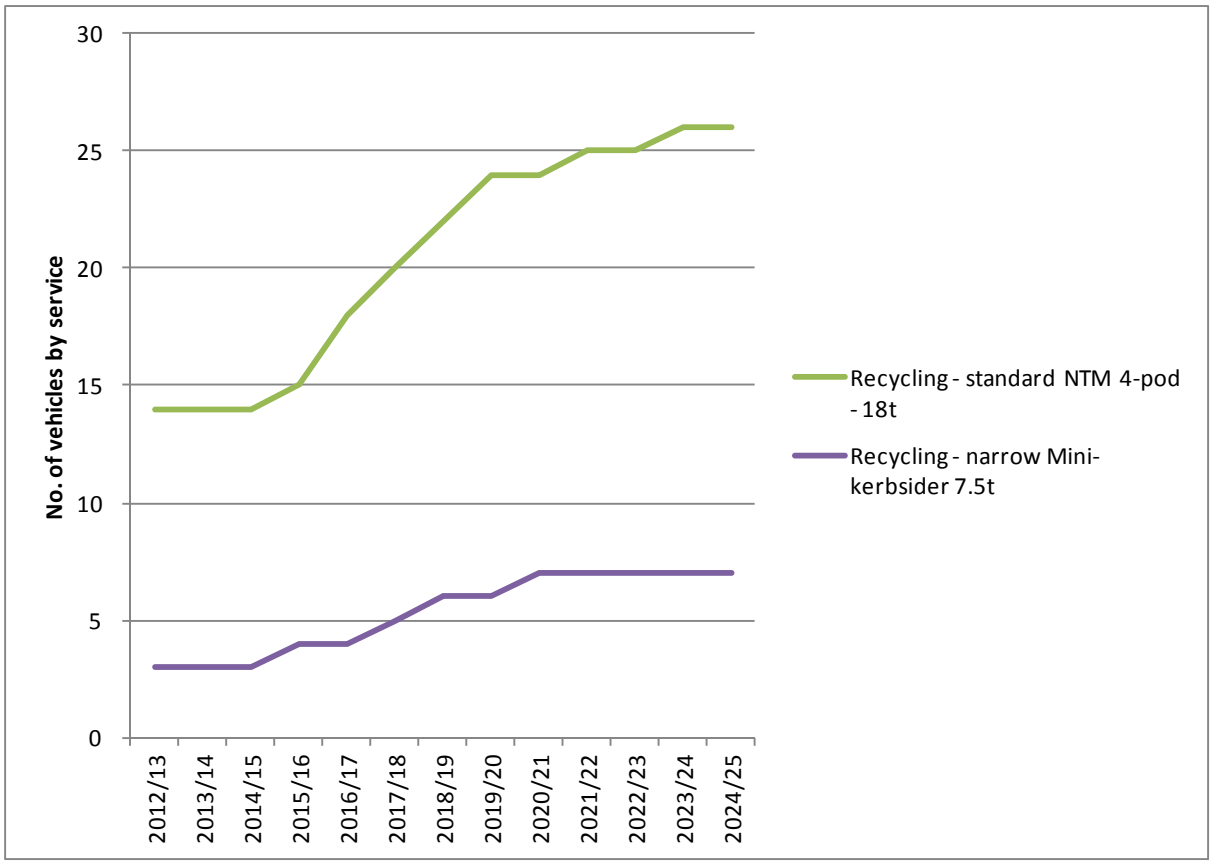



**Figure 8.7** Scenario 6b resource requirements – ambitious projection

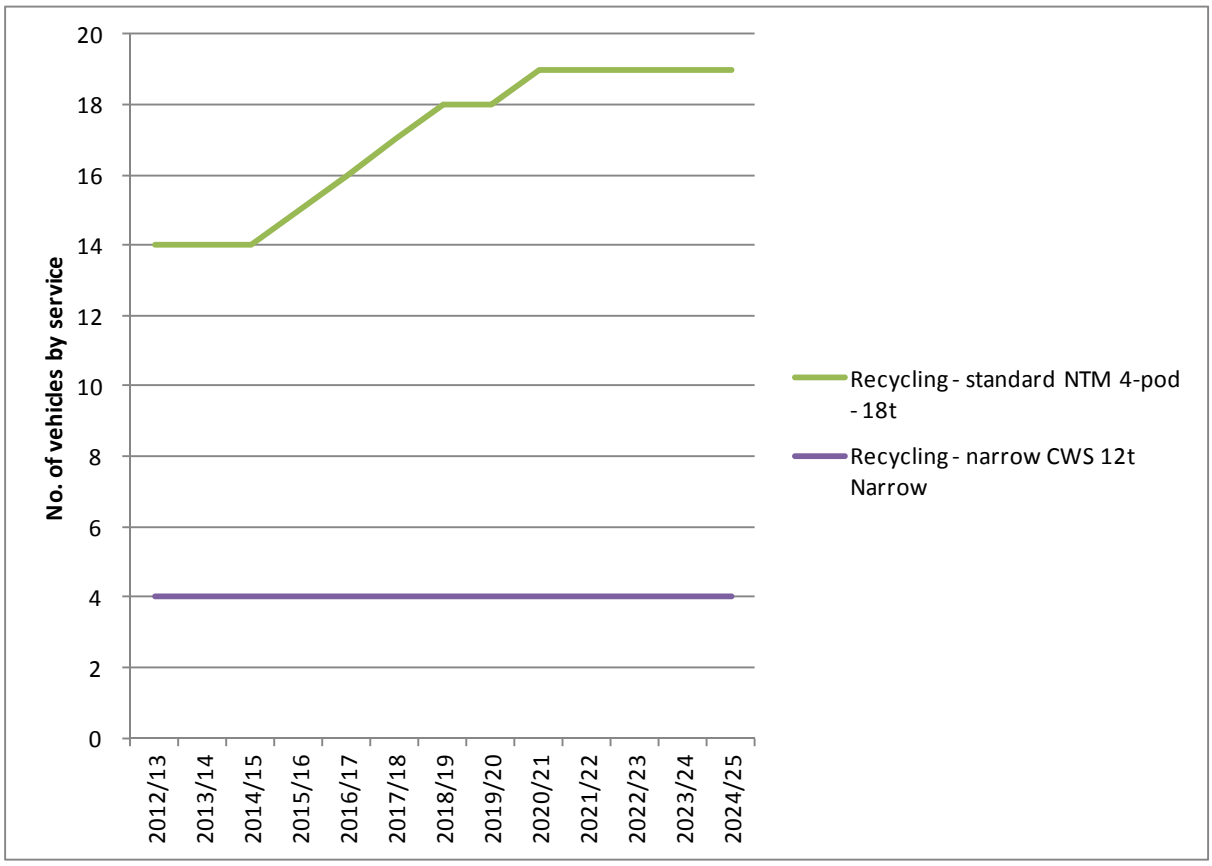


### *8.3.5 Scenario 6b - Variant*

Scenario 6b examines the resource requirement and cost implications of using a combination of 18t NTM 4-pod and 12t narrow kerbloader vehicles, with the kerbloader assigned to a lesser number of rural properties due to the 18t frontline vehicle being able to reach further out into rural areas. Figures 8.8 and 8.9 show the estimated number of scenario 6b vehicles which would be required to collect food waste and recycling from households in Powys between 2012/13 and 2024/25 under the good practice and ambitious projections. For both projections 4 kerbloader vehicles are required to collect from narrow access households, however requirements differ for standard access vehicles. At first 14 recycling vehicles are required to collect from all the standard access households in Powys, however as recycling rates improve and recycling arisings increase, more and more vehicles are required to collect recyclables. In the good practice projection the number of standard access vehicles required reaches a total of 19 in 2021/22, however in the ambitious projection the number of standard access vehicles required reaches a total of 26 by 2024/25. These substantial and on-going increases are predominantly due to the low payload of the 18t NTM 4-pod[20] vehicle. As levels of food waste and recycling increase more vehicles become overweight necessitating the purchase of additional vehicles.

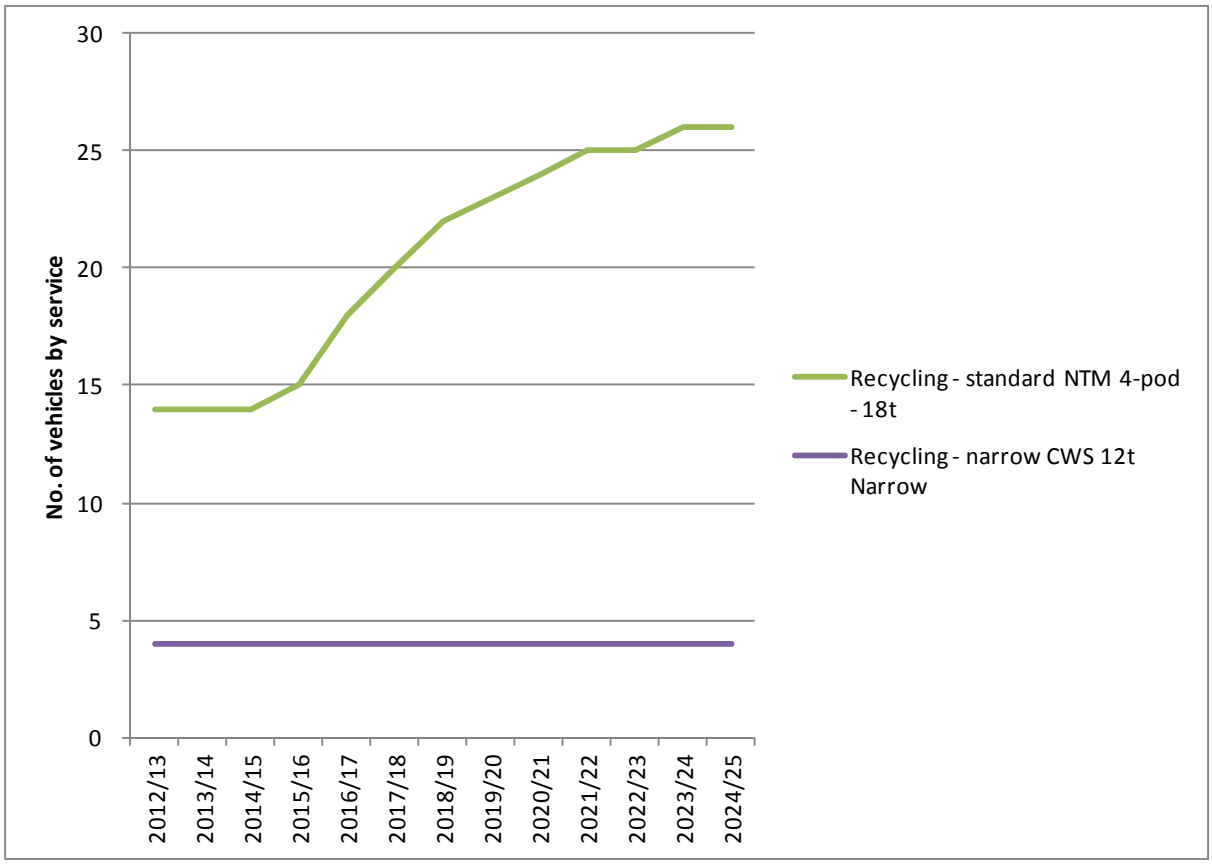
The assumption around the 18t NTM 4-pod vehicle being able to access a greater proportion of properties does represent a risk with this scenario. In reality, tests may conclude that a larger number of the kerbloaders would be required, and the proportional split between frontline and narrow vehicles revised.

**Figure 8.8** Scenario 6b resource requirements – good practice projection




[20] *The specification for this vehicle was prepared by NTM as a direct response to a request made by AMEC for this project. As such the vehicle is untested and on paper appears to have a very low carrying capacity, presumably due to the weight of the lifting and compaction equipment required across all 4 compartments, which is prohibitive when plated at 18 tonnes.*

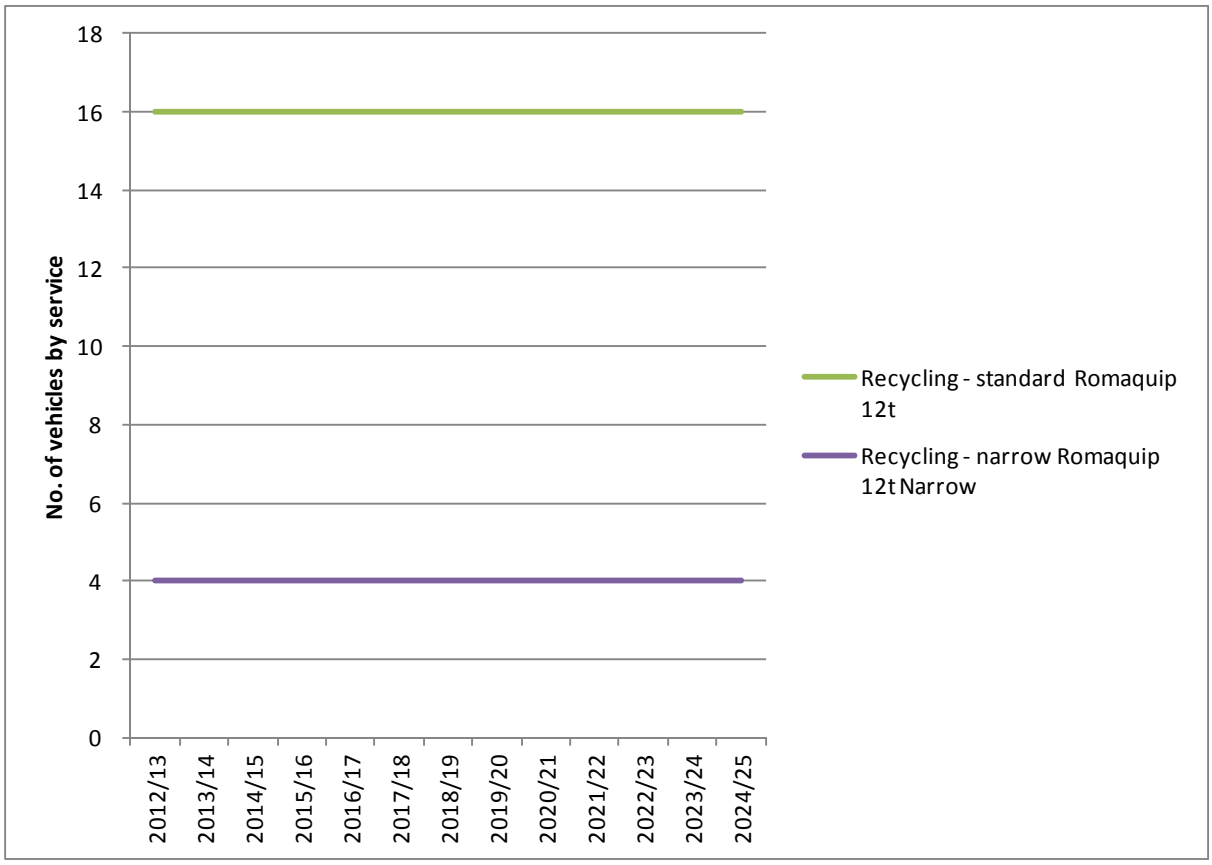
**Figure 8.9** Scenario 6b resource requirements – ambitious projection




### *8.3.6 Scenario 11b*

Scenario 11b considers the resource requirement and cost implications of using a combination of 12t Romaquip and 12t Romaquip Narrow vehicles, with the narrow vehicle assigned to a lesser number of rural properties due to the standard 12t frontline vehicle being able to reach further out into rural areas. Figure 8.10 shows the estimated number of scenario 11b vehicles required to collect food waste and recycling from households in Powys between 2012/13 and 2024/25. Please note resource requirements in scenario 11b are the same for both the good practice and ambitious profiles indicating that the rounds are time rather weight/volume constrained. For the recycling services 16 standard access (12t Romaquip) and 4 narrow access vehicles (12t Romaquip Narrow) are required to collect from all the households in Powys.

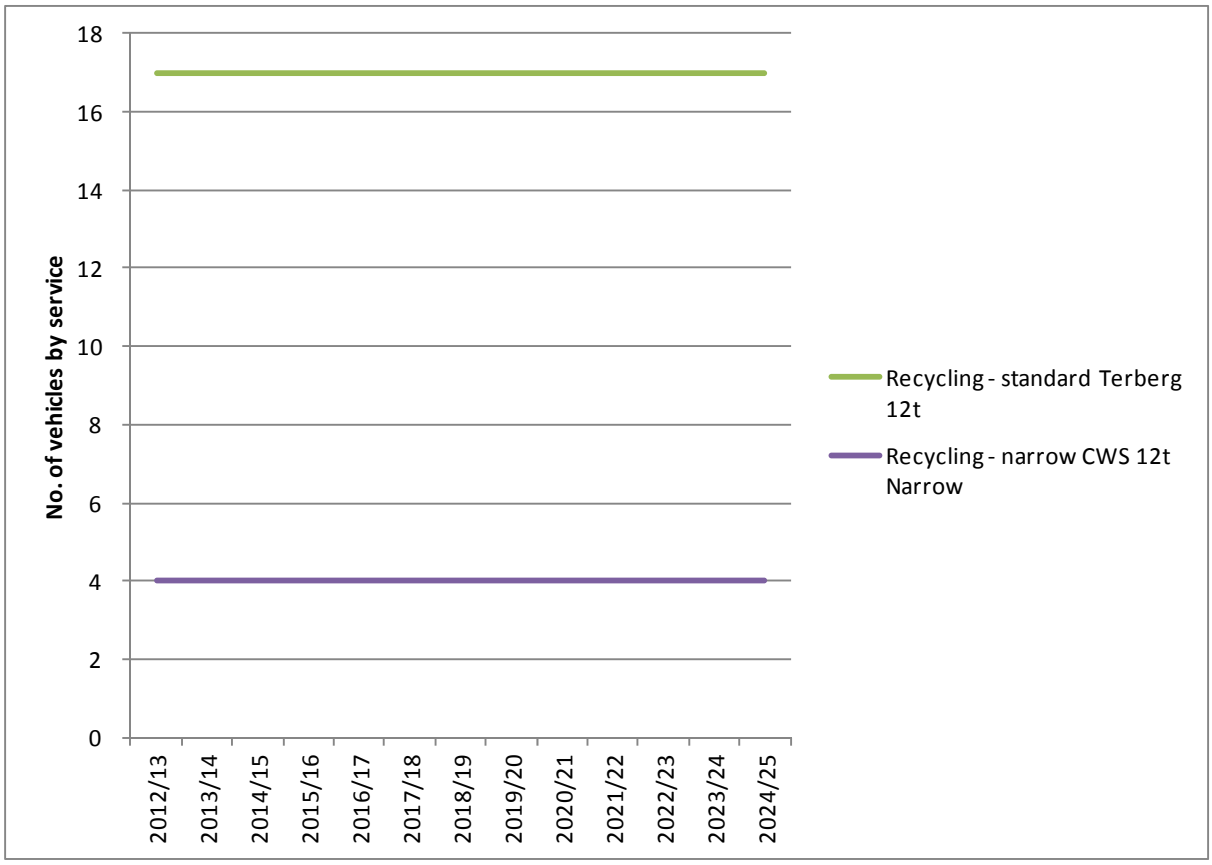
**Figure 8.10** Scenario 11b resource requirements




### *8.3.7 Scenario 14b*

Scenario 14b considers the resource requirement and cost implications of using a combination of 12t Terberg Kerbloader and 12t CWS Kerbloader Narrow vehicles, with the narrow vehicle assigned to a lesser number of rural properties due to the 12t frontline vehicle being able to reach further out into rural areas. Figure 8.11 shows the estimated number of scenario 14b vehicles required to collect food waste and recycling from households in Powys between 2012/13 and 2024/25. Consistent with Scenario 11b the resource requirements in Scenario 14b are the same for both the good practice and ambitious profiles. For the recycling services 17 standard access (12t Terberg Kerbloader) and 4 narrow access vehicles (12t CWS Kerbloader Narrow) are required to collect from all the households in Powys.

**Figure 8.11** Scenario 14b resource requirements




## 8.4 Results summary

Total resource and capital costs of each collection system are used as the basis for assessing different scenarios. Please note only costs directly associated with each collection system are assessed i.e. vehicle costs and manpower costs. Disposal or treatment costs have not been included, however as each scenario uses the same waste projections, disposal and treatment costs will be the same for each scenario/projection combination. It should also be noted that in addition to the stated resources (and costs) provision should be made for spare vehicles, the (four) box van-type vehicles assumed to service c,1,000 ultra narrow access properties and also for those additional resources required to service dedicated commercial waste rounds.

### *8.4.1 Caveat*

The results of the scenario modelling are indicative and dependent upon baseline cost assumptions and collection round performance parameters. As previously discussed, the study suffered from a lack of reliable collection performance data so some level of additional contingency may need to be assigned to the modelled resources, or the preferred vehicles trialled in order to confirm access and productivity assumptions.

In addition, given the timeframe of the model and the dynamic nature of costs and recycling performance in general, confidence in the results of each individual scenario necessarily decreases with time. Therefore the potential for additional costs (or savings) in the medium to long term are uncertain and as such flexibility in how and when Powys can modify their collection fleet may be paramount to maximising cost savings and performance, as well as minimising risk.

### *8.4.2 Estimated annual collection system resource and capital costs*

**Ambitious projection**

Figure 8.12 presents a comparison of the estimated annual costs for the scenarios modelled in this study. Figure 8.13 presents the total costs of the different scenarios under the ambitious performance projection between 2012/13 and 2024/25. Overall, scenarios 11b and 14b (the advanced stillage vehicle options) have the lowest total collection system costs over the 12 year period, at approximately £75m and £76m respectively. Scenario 6b and 6b – variant (the smaller NTM 4-pod scenarios) have the highest total costs at £88m and £87m respectively, largely due to the limited payload capacity of this vehicle.

**Figure 8.12** Ambitious projection estimated annual scenario costs

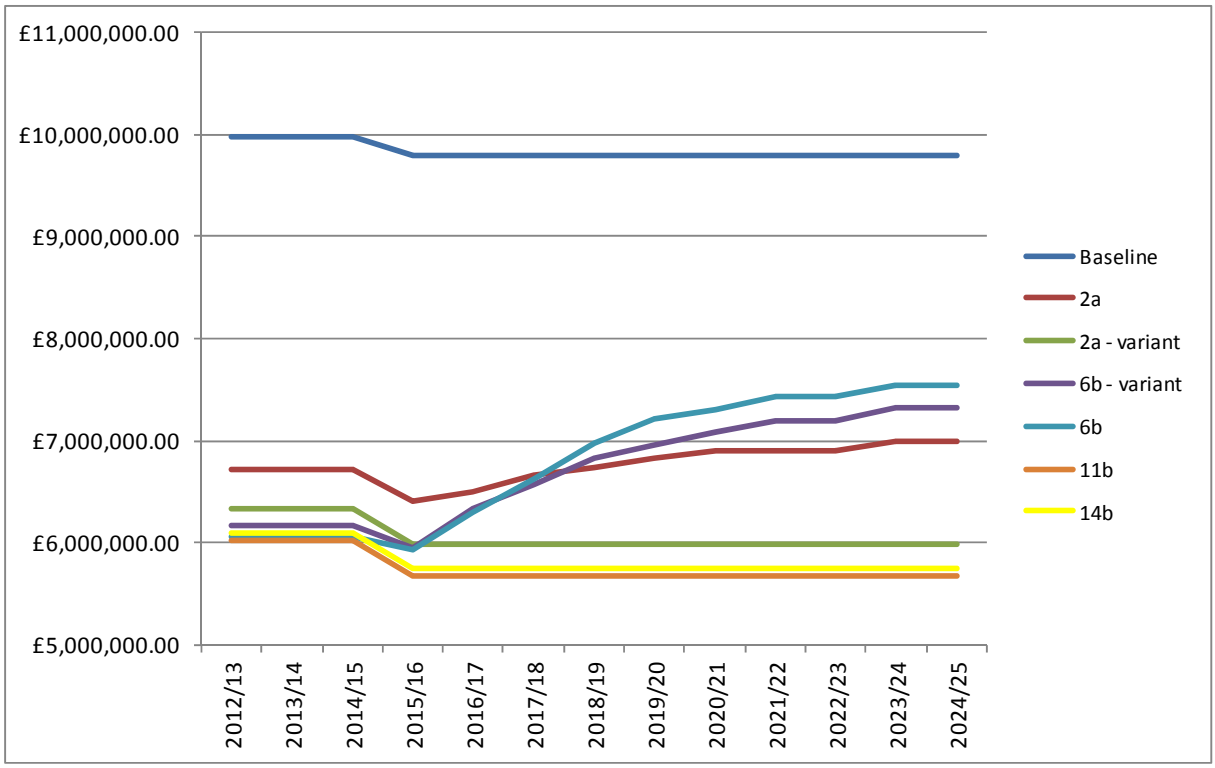
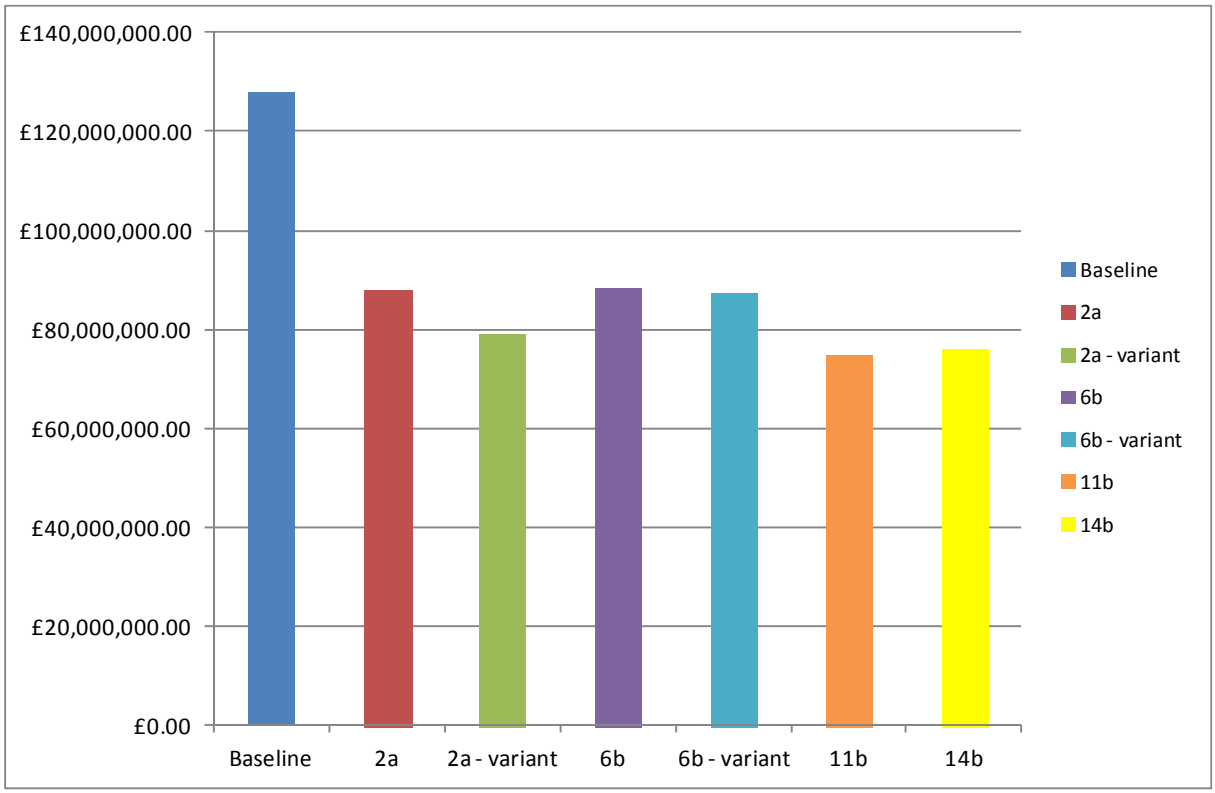



**Figure 8.13** Ambitious projection estimated total scenario costs




### Good practice projection

Figure 8.14 presents a comparison of the estimated annual costs and Figure 8.15 the total costs of the different scenarios under the good practice performance projection between 2012/13 and 2024/25. Scenarios 11b and 14b have the lowest total collection system costs for the period 2012/13 to 2024/25 at approximately £75m and £76m respectively. Scenario 6b and 6b – variant have the highest total costs at £83m and £82m respectively.

**Figure 8.14** Good practice projection estimated annual scenario costs

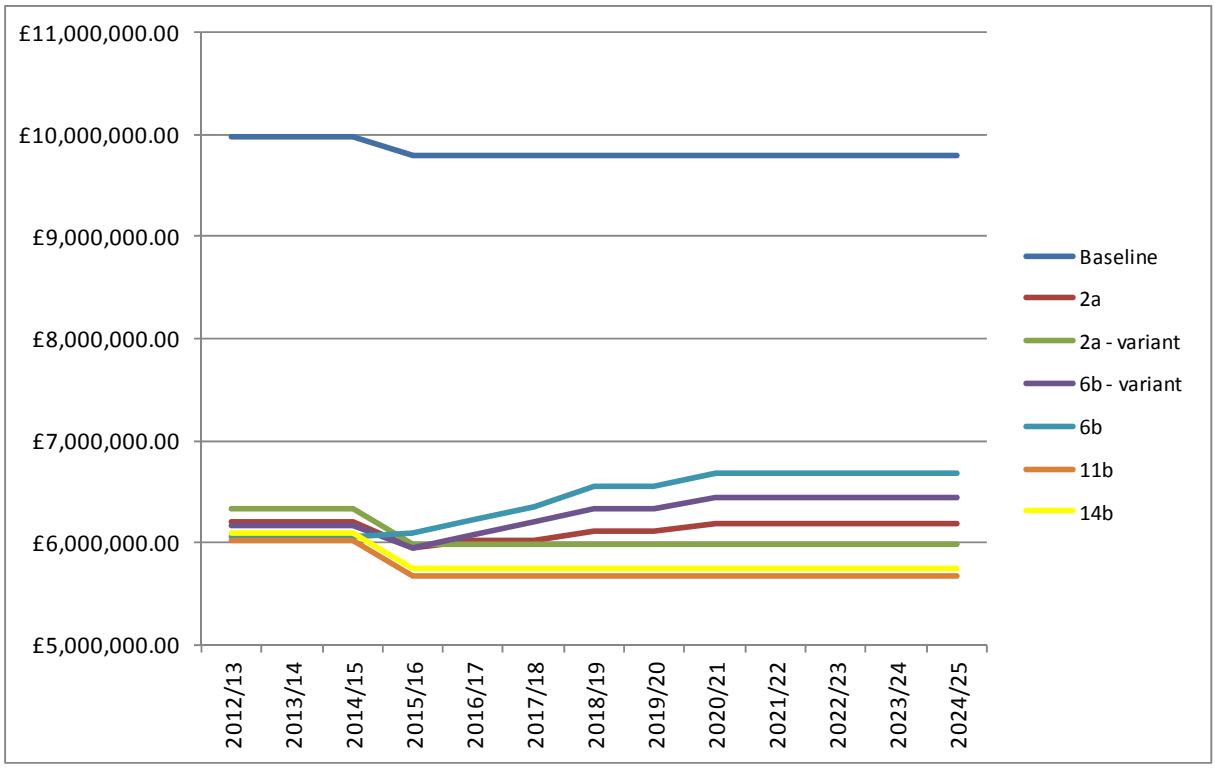
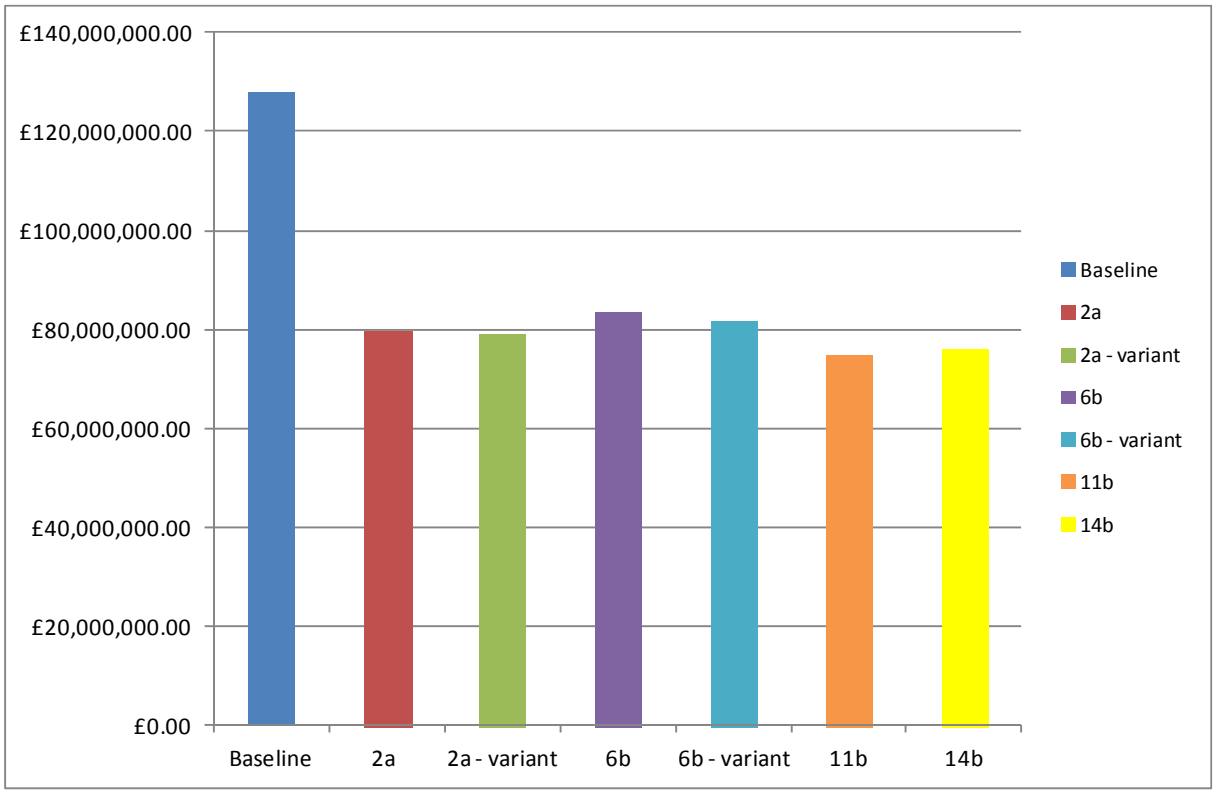



**Figure 8.15** Good practice projection estimated total scenario costs




## 8.5 Sensitivity analysis: One tip per day limit

The scenarios above incorporates the baseline assumption on the average number of tips per day by standard access recycling and food waste vehicles, which is approximately 1.4 tips per day (see Appendix 2). This assumption, with the exception of scenario 6b, is instrumental in maintaining the number of vehicles required constant after 2015/16 for scenarios 11b and 14b. Overall this is consistent with the view presented in Appendix

6 that a proportion of the higher density recycling rounds that are within close proximity of depots / bulking facilities will be able to accommodate an interim tip during the working day if required.

Figure 8.16 presents estimates of the annual costs to service recycling and food waste collections in Powys under the ambitious projection (the path Powys intend to follow) if standard access vehicles were limited to just one tip per day. It shows costs increasing from 2018/19 for scenario 11b and 2021/22 for scenario 14b. As recycling yields per household increase under the ambitious projection the compartments in the Romaquip and Kerbloader fill up more quickly and the 1-tip strategy requires additional vehicles to be procured. In contrast the costs for scenarios 2a and 2a – variant (the best performing of the NTM 4-pod options) with a 1-tip limit are the same as scenarios 2a and 2a – variant with the freedom to tip on average 1.4 times per day. This indicates that the stillage type vehicles are more sensitive to changes in yield than the 26t NTM 4-pod and hence more prone to increasing vehicle numbers as recycling yields per household improve.

**Figure 8.16** Ambitious projection estimated annual scenario costs – standard access recycling vehicles restricted to 1 tip

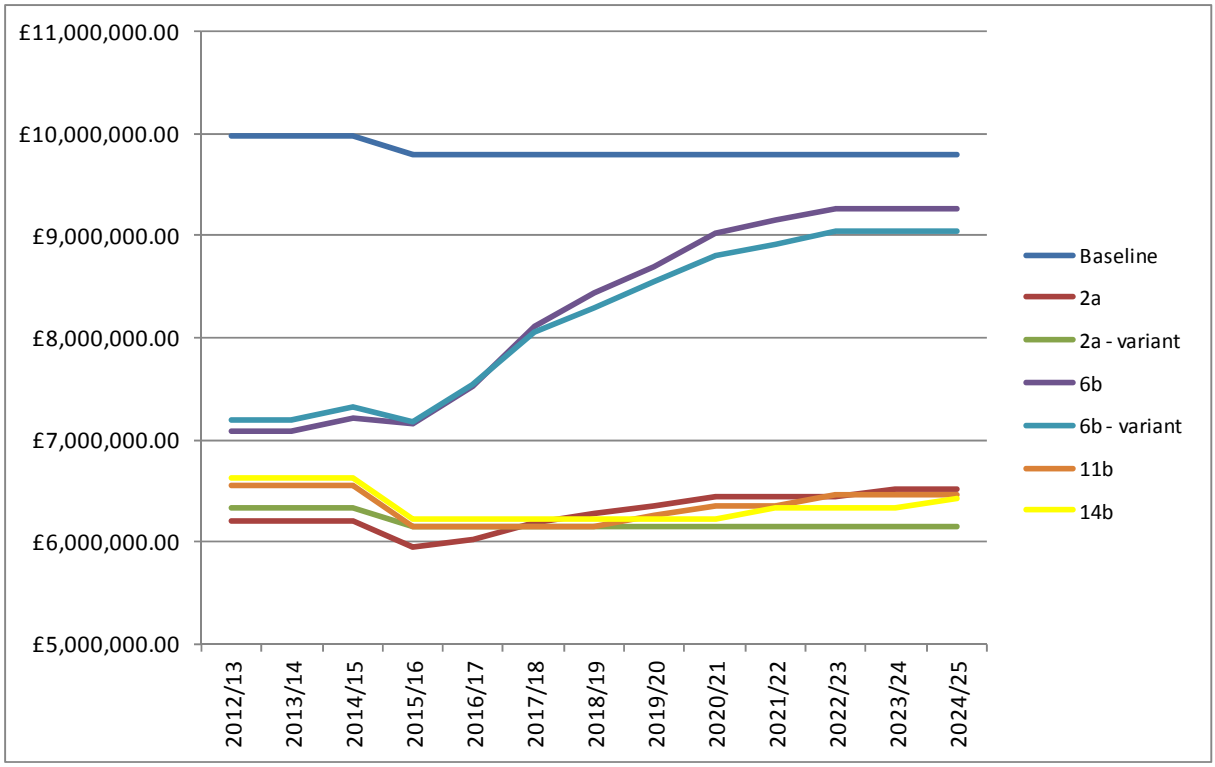



Table 8.3 below presents the year standard access vehicles are estimated to need to tip more than once per day on average plus the factor or material which causes the vehicles to reach capacity. Whilst considering these findings it is important to remember that the projected yields include assumed uplifts linked to increased commercial waste recycling. In reality a number of the modelled vehicle options may not be suited to co-collecting household and commercial recycling (unless businesses are able to accommodate the same type of recycling containers as households), so these figures should only be taken as a preliminary guide.

**Table 8.3** Waste material bulk density conversion factors

| Scenario | Vehicle Types | Year vehicle type reaches capacity in model | Limiting factor or material |
|---|---|---|---|
| 2a | 26t NTM 4-pod with Kerbsider | 2015/16 | Kerbsider vehicle payload (t) |
| 2a – variant | 26t NTM 4-pod with Kerbloader | n/a | n/a |
| 6b | 18t NTM 4-pod with Kerbsider | 2013/14 | 18t NTM 4-pod and kerbsider vehicle payload (t) |
| 6b – variant | 18t NTM 4-pod with Kerbloader | 2013/14 | 18t NTM 4-pod vehicle payload (t) |
| 11b | 12t Romaquip with Romaquip Narrow | 2018/19 | Food waste |
| 14b | 12t Terberg Kerbloader with CWS Kerbloader Narrow | 2020/21 | Food waste, paper & card |

## 8.6 Vehicle options appraisal: advantages and limitations

Table 8.4 presents a summary of the main advantages and limitations associated with each vehicle modelled in the above scenarios. The Romaquip and Kerbloader type vehicles appear to offer the types of advantages which should be beneficial to Powys. Firstly a Romaquip or Kerbloader fleet should have sufficient capacity to collect Powys' recycling in different performance scenarios without the need to purchase large numbers of additional recycling vehicles as arisings increase. Secondly, some Kerbloader options have the capability to collect additional streams (such as textiles AHPs and small WEEE) in the future should Powys choose to target new materials. Other advantages include lower noise levels from glass collections and no requirement to tip material into the vehicle hence negating health and safety concerns about overhead cables in some locations in Powys.

**Table 8.4** Vehicle options appraisal

| Vehicle type | | Advantages | Limitations |
|---|---|---|---|
| 26t NTM 4-pod Standard Access |  | • Large capacity capable of handling increasing yields and with material compaction<br>• Automated unloading with no need for forklift trucks<br>• May accommodate co-collection of household and commercial recycling | • Tips above standard vehicle height, requiring vehicle adaptations to reduce risk of overhead cable strike<br>• Limited to 4 compartments<br>• High capital cost<br>• Uncertain ability to access 100% of urban properties<br>• No UK track record |
| 18t NTM 4-pod Standard Access |  | • Smaller and more manoeuvrable than 26t version, thus enabling it to achieve enhanced collection productivities<br>• Automated unloading with no need for forklift trucks<br>• May accommodate co-collection of household and commercial recycling | • Tips above standard vehicle height, requiring vehicle adaptations to reduce risk of overhead cable strike<br>• Low payload (2.08t) gives rise to more vehicles being required over time and thus high scenario costs over the modelled period<br>• Limited to 4 compartments<br>• Unproven concept at this size<br>• High capital cost |

| | | | |
|---|---|---|---|
| 7.5t Terberg Kerbsider Narrow Access |  | • Highly manoeuvrable and able to access all areas<br>• Enhanced payloads over box van equivalents | • Low overall height but requires tipping above vehicle body during loading<br>• Potential noise issues from glass collections<br>• Compartment capacity limited when compared with 12t equivalents<br>• Limited scope for household and commercial / communal recycling co-collection |
| 12t Romaquip Standard or Narrow Access |  | • No tipping above vehicle height during loading<br>• 4+ compartments supports addition of new materials<br>• Stillage design most likely to limit glass noise impacts within Lower Exposure Limits (with vehicle adaptations)<br>• Automated unloading (hydraulics and 'magic floors')<br>• On board compaction of cans/plastic and cardboard<br>• DAF LF chassis liked by crews with good turning circle<br>• Lowest overall cost of all options modelled | • Requires well designed and managed bulking facilities<br>• Long-term maintenance costs not proven (albeit positive early reliability seen in Conwy)<br>• Some concerns over aperture loading heights<br>• Narrow vehicle same length as standard variant so may still pose access issues (albeit crews advised that width is the key issue with respect to side-loading)<br>• Limited scope for household and commercial / communal recycling co-collection |
| 12t Terberg or CWS Kerbloader Standard or Narrow Access |  <br>  | • No tipping above vehicle height during loading<br>• 4+ compartments supports addition of new materials<br>• On board compaction of cans/plastic and cardboard<br>• Storage boxes for low volume items<br>• DAF LF chassis liked by crews<br>• Stillage design most likely to limit glass noise impacts within Lower Exposure Limits (with vehicle adaptations)<br>• Standard Terberg design allows for 2-colour sort of glass, CWS provides flexibility to split glass compartment up to 3 ways<br>• Second lowest overall cost of all options modelled | • Unloading requires a forklift to remove and tip multiple stillages, introduces H&S risks at bulking facility due to forklift movements<br>• Requires well designed and managed bulking facilities<br>• Some concerns over aperture loading heights<br>• Narrow vehicle same length as standard variant so may still pose access issues (albeit crews advised that width is the key issue with respect to side-loading)<br>• Limited scope for household and commercial / communal recycling co-collection |

## 9.0 Conclusions and recommendations

**This section provides a summary of the key recommendations arising from the study (as bullet points) along with supporting considerations designed to deliver improved efficiency and an enhanced network of bulking facilities.**

### 9.1 Recycling vehicle recommendation

The primary objective of the study was to make recommendations for a new recycling fleet to support the Council-wide rollout of the kerbside recycling service in Powys. Acknowledging key selection criteria of cost, flexibility (including ability to accommodate changes enabling Powys to meet Welsh Government targets) and health & Safety (accounting for vehicle tipping height and noise) our recommendation is to procure a fleet of advanced stillage vehicles based on either the 12t Romaquip (standard and narrow) or the Terberg or CWS 12t Kerbloader. All of the vehicles researched and proposed by manufacturers in response to our requests have drawbacks, however the advanced stillage vehicles avoid the critical health and safety issues affecting the multi-compartment RCVs (such as the NTM 4-pod) and Kerbsiders. The main challenges with the proposed vehicle are expected to be linked to the revised method of loading (which is relevant to all of the modelled vehicles and the proposed move to a one-pass solution) and unloading.

The minimum number of recycling vehicles considered necessary to deliver the service is as follows:

- 16 (Romaquip) or 17 (Terberg Kerbloader) standard access vehicles (+ 2 spare[21]); and
- 4 narrow access vehicles (+ 1 spare).

This recommendation comes with a caveat linked to the study uncertainties resulting from a lack of robust service and performance data. Questions remain over vehicle access rules and collection productivities. In order to address these uncertainties we recommend that the Council trial each vehicle type, under supervision from WRAP, before making a final procurement decision. Romaquip, Terberg and CWS have all confirmed they have demonstrator vehicles that could be made available (during November 2012) to support this exercise. At the same time final checks on property numbers should be made in order to validate the figure of 58,000 used throughout this study.

The final choice of vehicle / supplier will be dependant on factors including:

- Findings from demonstrator trials and an overall preference for automated ejection (on the Romaquip) vs forklift emptying (Terberg / CWS);
- Any volume-based discounts manufacturers are prepared to offer and their ability to deliver the required number of vehicles over the proposed timeframe. Given the high cost of the existing two-pass RCV fleet it will be a priority to introduce the new vehicles as soon as possible. To inform a final proportional split of narrow to standard width vehicles to be purchased, further thought should be given to the feasibility of rolling out the smaller vehicles first (to rural areas not yet covered by the new service). This has the added benefit of driving recycling performance up as soon as possible, ensuring Powys track ahead of the ambitious projection, whilst allowing the Council to confirm whether additional narrow bodied vehicles may be needed to serve all restricted access locations; and
- Sales and service support arrangements.

Other recycling vehicle resources required but not directly modelled through the study comprise:

- Box vans (or equivalent) to service an estimated 1,000 ultra narrow properties. It was suggested during the interim meeting that 4 such vehicles would be needed in total; and
- Vehicles making dedicated collections from commercial properties and communal recycling bins.

#### Collecting commercial / communal recycling

The above recycling vehicle choice, whilst addressing the most important selection criteria (Health and Safety compliance and operational flexibility), is less well suited to a significant expansion of commercial waste recycling

[21] *Numbers of spare vehicles have been derived based on an indicative ratio of 1 spare vehicle to every 8 frontline vehicles.*

and the practice of co-collecting this with household recyclables. This is because larger businesses may set out significant quantities of bulky material such as brown cardboard (affecting the fill rates of the vehicles) and requiring alternative containment that cannot be emptied into this vehicle type. The modelled performance projection (Section 5) assumes that the commercial waste service is reviewed in order to drive down residual waste arisings and increase opportunities for businesses to recycle. In order to achieve this aim the Council should consider whether investment in a smaller number of vehicles such as the NTM 4-pod (as modelled in this study), and deployed in the more urban areas, would enable them to offer a more inclusive recycling service. An alternative would be to retain a number of the existing split-body RCVs and target two streams of commercial recycling (e.g. fibres and containers or food waste and a co-mingled mix), subject to this being compliant with national and local policy. Some co-collection on the modelled recycling rounds is expected to be feasible, e.g. where smaller businesses such as guesthouses can accommodate the same range of containers (including food waste) as households. This makes logistical sense, particularly on rural rounds, in order to avoid multiple passes and excessive manpower and fuel costs. The baseline model includes a proportion of commercial waste (estimated at 20% by weight), however it has not been within the scope of the study to model dedicated commercial waste collection resources, including those required to fulfil existing obligations to provide weekly residual waste uplifts. This requires additional work on the part of the Council with a view to the modelled interventions ensuring the recycling performance projection is achieved, especially with the 2015/16 interim target in mind.

## 9.2 Service implementation and infrastructure

Subject to Powys' outturn 2012/13 recycling performance, and where this places them with respect to the ambitious projection (Figure 6.1), our initial recommendation would be to rollout the new recycling vehicles based on the 4 commodity streams currently targeted. The proposed vehicle type is sensitive to compartment fill rates and given the current lack of reliable processes for monitoring round weights and performance it makes sense to bed the rounds in with the existing streams. The Romaquip and the Terberg/CWS kerbloader vehicles come with 5-6 compartments as standard. When rolled out the 4 primary compartments should be assigned to the 4 material streams, and crews advised that (with the exception of food waste) additional compartments provide flexibility on an individual round basis for filling with excess materials (of course always keeping individual compartments dedicated to a single material stream). Once the vehicles and rounds are bedded in and the whole authority is covered by the new service the Council should analyse the level of spare capacity on the rounds and consider plans to target additional material streams. Future Priority materials to be added to the kerbside service would be textiles and small WEEE, AHP's on separate vehicles.

Rolling out a standardised fleet of recycling vehicles across Powys will help to deliver more consistent flows of materials through receiving bulking infrastructure and provide the Council with economies of scale should material be transported direct to reprocessors rather than via the Trewern MRF. Ensuring that those vehicles are deployed efficiently and that the integrity of the materials collected is maintained requires effective management and investment in bulking infrastructure. These issues are discussed below.

### *9.2.1 Bulking and materials handling arrangements*

Powys is in the fortunate position of having a good spread of facilities under Council control that are capable of receiving collected recyclables. Each of the 6 proposed recycling and food waste bulking facilities has sufficient space for further development. Access is an issue in some cases (e.g. at Newtown (Vastre)) and all sites are in need of dedicated covered storage. Development issues at Llanbrynmair have been explored within the report (Section 7.3.2); despite having a small household catchment this site is strategically located and failure to secure permissions for its ongoing development would result in increased travel distances and times, which could result in additional collection vehicles being required. It will be important to demonstrate investment in the sites as part of the overall 'sell' to crews who had reservations about the advanced stillage type vehicles and their ease of loading and unloading.

Existing arrangements for the onward bulking and processing of collected materials could be simplified and improved. The current Trewern MRF operating contract with Cae Post leads to a number of logistical arrangements that are sub-optimal, with materials arising in the south of the County being double-handled and transported over large distances. Each shire area has a mix of processing arrangements and we can only conclude that because the MRF capacity has been paid for there is an incentive to use it. The limited data supplied during the study would indicate that overall there is a net cost to processing material through the MRF (totalling £130k per annum). It is acknowledged that there are other social benefits to the operation, however the financial position needs to be assessed at a time when elsewhere local authorities are receiving positive revenues for fully co-mingled dry recycling streams. The valuable resources Powys collects should generate positive incomes. This is an area where more work is required to assess the cost-benefit of existing arrangements versus returns that might be gained from investment in satellite baling and sorting lines.

### *9.2.2 Operating structure*

The resource-based modelling undertaken in this study is at a relatively high level, based on average times for vehicles to get from depots to their rounds and then to tipping points. No internal operating boundaries are applied meaning the results assume vehicles are fully utilised to make collections 100% of the time. Due to the difficulties experienced sourcing data from each LE area and evidence that each is resourced and managed independently we recommend that consideration be given to replacing the current approach to organizing and deploying collection rounds by LE area with an approach based on larger operating areas. Subject to local consideration of working practices and management structures (not part of the scope of this study) our high level recommendation would be to move to either 2 or 3 operational areas. The reasons for this are as follows:

- The LE structure creates artificial management and operational boundaries that limit the ability of the authority to optimize round structures and efficiently manage resources. By planning waste and recycling collection rounds within zones that serve on average just 7,250 households there is limited scope to optimize round sizes and ensure vehicles are fully utilised. This is likely to be a contributory factor to the observed small round sizes in the baseline model; and

- It is difficult to see how sufficient waste service knowledge is retained across 8 areas. Having dedicated waste service supervision is will lead to county-wide dissemination and uptake of good practice and consistent data capture, which is a fundamental requirement if the overall performance of the service is to increase in line with targets.

The benchmarking exercise presented in Section 3 indicated that Powys, taking account of its large rural nature, should most likely operate with 4 service supervisors. If going with 3 operating zones our suggestion would be to combine the three southern LE areas around a central organizational base in Brecon, the two mid LE areas around Rhayader and the three northern LE areas around Newtown (or Welshpool). Each could then be assigned a dedicated waste services supervisor along with a single floating recycling service supervisor or more senior manager with an overview of the recycling-led service (and able to drive adoption of good practice across the whole authority).

Linked to points 3 and 4 above the existing productivity levels on the refuse rounds should be reviewed and the benefits that deploying smaller vehicles examined. As Powys tracks along the target performance projection line the unit residual waste yields progressively decrease (readily reaching levels below 10kg/hh/collection) meaning that a round serving 800 properties per day would on average yield just 8 tonnes per day of waste. Current refuse round sizes appear to be below this and commonly collect less than 8 tonnes per day, indicating there may be a benefit to deploying a higher proportion of smaller vehicles. The contribution of co-collected commercial residual waste is a complicating factor in this regard (and is currently not quantified at an individual round level) but benchmarking would indicate that larger round sizes should be feasible and the crews have stated that they are able to complete the rounds faster when they take out smaller (e.g. 15 tonne) RCVs.

## 9.3 Study challenges

The study faced a number of challenges, linked primarily to delays securing reliable service data, resulting in the need for a number of modelling assumptions. Whilst these have been researched and supported by an extensive benchmarking exercise, the combination of a lack of current accurate collection performance and vehicle access data reduces the accuracy of the waste projection and subsequent vehicle modelling exercise. The study has not been able to consider detailed material captures by service due to a lack of weighbridge records, which in turn casts doubt over stated round durations. Investment in a new fleet of multi-compartment recycling vehicles brings with it the need for new working practices (supported by training), giving rise to an opportunity to change aspects of the existing operating structure and culture that has held the service back. Powys is currently tracking ahead of the ambitious projection generated in this study, this is a trend it must maintain if the next interim recycling target is to be met in 2015/16. Maintaining accurate round information and monitoring collection performance is essential. Now is the time to move forward and deliver positive change.

# Appendix 1: Study methodology

The study was delivered via seven core tasks as summarised below:

**Inception meeting**
AMEC met with Officers and Management from the Council including members of the Operational Team. Information was collected on the existing and new service roll-out, potential constraints and key objectives were identified.

**Data gathering and vehicle research**
Detailed data was requested on the current vehicle fleet, collection performance, commercial waste and bulking facilities. Where data was unavailable or incomplete it was necessary to use surrogate data and apply assumptions; these are described in Section 3 of the main report. Each substitute was derived from our experience working with a number of other local authorities and treatment facility operators, or through consultation with Powys County Council / WRAP. Further research was conducted to enable a comparison between the authority's performance and other local authorities with similar demographics.

As part of the data gathering process AMEC engaged with recycling vehicle manufacturers in order to provide the authority with a range of vehicles that may be tailored to suit their needs. The information gathered included vehicle capacities, compaction rates, achievable payloads and dimensions, re - engineering options and purchasing costs.

**Development of a service baseline**
It was agreed with Powys County Council and WRAP that in this phase of the work AMEC would review select aspects of the newly rolled out kerbside collection services in order to produce a hybrid baseline scenario, reflecting the cost and resource implications of rolling out the new service to all households based on a 'two-pass' recycling collection strategy. The development of this baseline enabled comparison with potential alternative vehicle options and costs. The baseline (and later alternative scenarios) was created using AMEC's bespoke waste collection performance and financial model.

The baseline modelling was completed to demonstrate service performance, the levels of resource deployed to operate the service, and a breakdown of baseline capital and revenue costs.

**Service benchmarking**
The current performance of the Powys services, considering productivity and material capture (i.e. yields of materials collected per household), was benchmarked against councils with similar demographics to Powys County Council. The target criteria for comparison comprised of (subject to data availability):

- Average round sizes;
- Average yield of material collected/captured;
- Productivity levels i.e. payloads achieved, crew levels, route equality, vehicle performance/ management ;
- Service quality measures (i.e. customer satisfaction, number of missed bins, service accessibility & reliability, number of complaints, range of materials collected, is the frequency reasonable, is the capacity sufficient);
- Cost of collection service per household and per tonne; and
- Unit gate fees, haulage costs and revenues.

The benchmarking was undertaken drawing on a number of information sources including WRAP's benchmarking tool[22], AMEC's comprehensive database of scheme performance characteristics, direct engagement with comparator local authorities, WRAP's 2011 Gate Fees Report[23] to support any required benchmarking of gate fees and AMEC's recent work supporting the benchmarking of round sizes in support of the IC&P2 (England).

[22] http://labenchmark.wrap.org.uk

[23] http://www.wrap.org.uk/downloads/Gate_Fees_Report_2011.bdf58bfd.11007.pdf

As agreed with the WRAP, specific parts of the benchmarking output were selected that were genuinely regarded as being usefully comparable.

**Interim meeting and follow-up crew workshop**

Two meetings were delivered by AMEC at the mid point of the study. The first, held with the core project team, involved a presentation on the findings of the baseline analysis, service benchmarking and vehicle research. It also served to identify existing data gaps and actions to fill these (e.g. around vehicle lease costs) and to agree certain rules applying to the scenarios, such as the decision to base all scenarios on a standard five day working week.

As an addition to the original WRAP scope of work Powys County Council funded a half-day workshop to run through the long list of vehicle options with a number of representatives. This served to identify operational concerns with the various vehicle types and to help secure some level of buy-in to the study and the change process being pursued by the Council.

**Depot/Bulking Facility site visits**

Two days of site visits were undertaken by representatives from WRAP, Powys County Council and AMEC. These covered the recycling and food waste bulking facilities earmarked by Powys County Council as serving the new kerbside scheme, along with Llanfyllin and the Cae Post MRF.

**Scenario shortlisting and modelling**

The outcomes of the Vehicle Research, Baseline Model results, Crew Workshops and Bulking Facility site visits informed the alternative vehicle scenarios that were offered to Powys County Council. Through an iterative process of considering the viability of each vehicle type against criteria such as tipping height and noise impact a shortlist of 5 scenarios were modelled and the results analysed, including sensitivity analyses.

# Appendix 2: Baseline model input data and parameters

| | Standard Access | | Narrow Access | |
|---|---|---|---|---|
| | **Residual** | **Recycling / Food** | **Residual** | **Recycling / Food** |
| **Set Out Rate (%)** | 100% | 80% | 100% | 80% |
| **Collection Frequency (no. of weeks)** | 2 | 1 | 2 | 1 |
| **Container size (litres)** | 180 | 48.2 | 180 | 48.2 |
| **Proportion of containers replaced per year (%)** | 5% | 5% | 5% | 5% |
| **Cost per container (£)** | £18.40 | £3.50 | £18.40 | £3.50 |
| **Average number of households passed per day (pass rate)** | 657 | 684 | 290 | 329 |
| **Average weight per load (t)** | 6.0 | 1.8 | 6.0 | 1.8 |
| **Average number of tips per day** | 1 | 1.41 | 1 | 1 |
| **Hours per working day** | 7.4 | 6.9 | 6.4 | 7.9 |
| **Number of collection weeks per year** | 26 | 52 | 26 | 52 |
| **Number of collection days per collection week** | 5 | 5 | 5 | 5 |
| **Maximum number of tips per vehicle per day** | 1 | 3 | 1 | 1 |
| **Number of vehicles** | 5 | 8 | 3 | 2 |
| **Vehicle type** | RCV 26t | Split-bodied RCV 26t | RCV 15t | Split-bodied RCV 15t |
| **Maximum fill policy (%)** | 100% | 100% | 100% | 100% |
| **Carrying capacity (t)** | 10.19 | 8.50 | 5.00 | 3.00 |
| **Carrying capacity ($m^3$)** | 16.0 | 15.2 | 16.0 | 15.2 |
| **Cost (£)** | £44,200 | £65,000 | £36,400 | £65,000 |
| **Compaction** | 3 | 4 | 3 | 4 |
| **Average time from depot to run (mins)** | 10.00 | 12.50 | 10.00 | 10.00 |
| **Average time from run to unloading point (mins)** | 10.00 | 15.00 | 45.00 | 45.00 |
| **Average time at tip (mins)** | 30.00 | 37.50 | 25.00 | 25.00 |
| **Average time taken from unloading point to depot (mins)** | 10.00 | 5.00 | 40.00 | 40.00 |
| **Number of loaders per vehicle** | 1.82 | 2.23 | 1.13 | 2.23 |
| **Maintenance costs per vehicle (£)** | £31,500 | £31,500 | £31,500 | £31,500 |
| **Average distanced covered per vehicle per week (km)** | 300 | 300 | 450 | 450 |
| **Average distance per litre of fuel (km/l)** | 2.112 | 2.112 | 2.112 | 2.112 |
| **Price of fuel (£/l)** | 1.20 | 1.20 | 1.20 | 1.20 |
| **Driver wage (£/yr)** | £32,669 | £27,917 | £32,669 | £27,917 |
| **Loader wage (£/yr)** | £32,669 | £27,917 | £32,669 | £27,917 |
| **Supervisor costs (£/yr)** | Included above | Included above | Included above | Included above |

# Appendix 3: Benchmarking information summary

**Summary of Benchmarked Information**

| | Ceredigion County Council | Conwy CBC | Cotswold District Council | Gwynedd Council | Herefordshire Council | Mendip District Council | Powys County Council | Ryedale District Council | Shropshire | Torridge District Council | West Oxfordshire District Council | West Somerset District Council |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Authority Information** | | | | | | | | | | | | |
| Dwelling Stock | 33,953 | 55,215 | 39,360 | 59,893 | 81,640 | 48,520 | 62,167 | 24,130 | 132,418 | 30,290 | 45,560 | 17,450 |
| Population of Authority | 78,047 | 112,032 | 83,900 | 118,207 | 179,100 | 109,100 | 132,598 | 53,600 | 290,900 | 65,300 | 102,500 | 35,400 |
| Collection Structure | weekly residual and fortnightly co-mingled dry recyclables collection. Garden waste collected fortnightly via a paid service. No kitchen waste | fortnightly residual and weekly separate dry recycling collection. Garden waste collected fortnightly via a paid service. Kitchen waste collected with dry recycling | fortnightly residual and fortnightly separate dry recycling collection. Garden waste collected fortnightly via a paid service. Kitchen waste weekly | fortnightly residual and weekly separate dry recycling collection. Garden waste collected fortnightly at no cost Kitchen waste collected fortnightly, however in a few areas kitchen waste is collected weekly. | weekly residual and fortnightly co-mingled dry recycling collection. Garden waste collected fortnightly via a paid service. No kitchen waste | fortnightly residual and weekly separate dry recycling collection. Garden waste collected fortnightly via a paid service. Weekly kitchen waste collection. Recy and food collected on same vehicle in single pass. | fortnightly residual and weekly separate dry recycling collection. Weekly kitchen waste collection. No garden waste collection | fortnightly residual and fortnightly separate dry recycling collection. Garden waste collected fortnightly at no cost. Food collected in garden waste in 2 areas only. No kitchen waste collection | fortnightly residual and fortnightly separate dry recycling collection. Garden waste collected fortnightly at no cost. Food collected in garden waste in 2 areas only. | weekly residual and weekly separate dry recycling. Fortnightly co-mingled kitchen waste, cardboard and garden waste | weekly dry recycling and food waste collections and fortnightly refuse (180 litre bins) | fortnightly residual and weekly separate dry recycling collection. Garden waste collected fortnightly via a paid service. Weekly food collection. Recy and food collected on same vehicle in single pass. |
| **Hhds offered the following containment methods for dry recyclables?** | | | | | | | | | | | | |
| Kerbside box <35 litres | | | | | | | 11,500 | | | | | |
| Kerbside box >50 litres | | 45,500 | | 54,213 | 11,500 | 47,635 | | 24,420 | 20,800 | 30,048 | 45,149 | 17,450 |
| Kerbside box 35-50 litres | | | 39,154 | | | | 6,067 | 68 | 110,473 | | | |
| Non Reusable Sacks | 29,000 | | | | 48,800 | | 36,742 | | | | | |
| Reusable Sacks | | 48,000 | | | 14,161 | | 3,250 | | | 30,048 | | |
| Wheeled bin 120-180 litres | | | | | 5,794 | 1,100 | | | | | | |
| Wheeled bin 181-240 litres | | 2,500 | | | 59,051 | | | 72 | | | | |
| Wheeled bin 241litres + | | | | | 3,498 | | | | | | 2,336 | |
| **What was the net cost of waste collection** | | | | | | | | | | | | |
| Notes | | fuel £700/mth<br>Romaquip = £100,000 ea replacement program every 7 yrs but manufacturure said would last 10yrs (shassie before body)<br>run own bulking station<br>paper - UPM Shotton<br>cans - Northern Trading<br>card and plastic - Eurokey | | | | | | Income per tonne - Glass & cans £5, Paper £45 | | | Household = 50p per collection (inc food) | Cost is approx £35 per hh which is net of all costs |
| £/hhd | | | £ 95.25 | £ - | £ 51.54 | £ 54.49 | £ - | £ 52.18 | £ - | £ 53.62 | £ 56.43 | £ 47.79 |
| **Performance** | | | | | | | | | | | | |
| % recycling and Composting Rate | | 11/12 performance - Q2 from 44% to 54%, Q4 from 42% to 52%, total expected 51-52% | 2010/11 = 60% | | 41% (est) | 2010/11 = 41% | 2011/12 = 37% | Recy = 17%; 4771 tonnes;<br>Green = 34%; 6,779 tonnes<br>2010/11 = 51% | Recy 21%<br>Green waste only - 21%<br>Mixed Organic - 10%<br>2010/11 = 53% | | Rec/composting rate = 28%<br><br>2010/11 = 42% | West Somerset = 28%<br>SWP = Recy 27.72%, Food 14.82%, Green 14.74%<br>SWP 2011/12 = 57.28 |
| Tonnage per annum | 5700 tns/yr | | | | 31,500 t (est) | | | | Recy 30000<br>Green waste only - 30000<br>Mixed Organic - 14000 | | 12,500 | Recy 44816.17<br>Food 17325.82<br>Green 14673.28 |
| **Vehicle Information** | | | | | | | | | | | | |
| Type | 6 large split bodied 4 small for narrow access | Stillage vehicle - Sides = source seg paper/card, food, glass, card; Top Deck = mixed light plastics and tetra; Small Storage Compartment = batteries, textiles, sometimes general epuipment storage (e.g.bags).<br>12T DAF LF chassis cab | | | Single Compartment and Split bodied | | | Terberg Toploader | | | RRV | 12T DAF/REC, 7.5T DAF/REC, 7.5T MITSU/REC, 14T MERC/REC (12T DAF predominant vehicle. 7.5t vehicles used for narrow areas.) |
| Size | 26 ton RCVs and 4 12ton RCVs | Standard vehicle = 5m wheelbase, 2.5m wide 9m long<br>Small vehicle = 3.5m wheelbase, 2m(ish) wide 6m long | | | 5 x 26t single comp<br>1 x 15t single comp<br>2 x 7.5t support vehicles<br>5 x 26t split bodied<br>7 x 15t split bodied | | | 23 tonne GVW | | | 15t | |
| Tonnes per vehicle/tips of Recyclates | | large load = 3.7t<br>small load = 1.7t | | | 4.8 t (largest) | | | 7 tonnes per vehicle | | | | |
| Number of Tips | | | | | | | | | 1 or 2 tips | | 1 to 2 | 2.1 |
| Pass rate | | Pass rate - 600 (one tip) - 750 (two tips) - tip twice if close to depot. | | | | | | | | | | |
| Pick rate | | Pick rate - 600hhds = rural - 100-150bins/hr = 40sec/hhd (capped)<br>Pick rate - 750hhds = semi-detached, dense - 135bins/hr = 30sec/hhd<br>(e.g. 3-4hrs of pick time rural @ 600hhds = 5-6hrs of pick time urban @ 750 = diff down to tipping point)<br>Constraints - distance to the depot. If it's too far it's not worth tipping twice. | | | | | | | | | | |
| Collection days per wk | | | | 6 | 5 | | | | 5 | | 5 | 5 |
| Operational Hours | 7.5 hour day | 7.4 (45min total break) - on round for 6.7hrs | | | 6:30am start till finish | | | | hrs 8 | | 8 | 06:43 |
| Round design | route optimised with a 7.5 hr day but as balance of recycling/residual changes need to optimise again | rounds designed for min of 2 tips used Webaspex to model rounds | | | Service is outsourced, round changes must be approved by council | | | | rounds maximised | | maximised rounds | maximised rounds, but some could collect more |
| Fleet Size, spares | 21 vehicle fleet | 1 standard and 1 small spare - rarely used<br>driver + 2 | | | 28 | | | 4 vehicles; 1 spare | fleet = 32 | | 21 plus 2 spare | 104 to cover SWP and 6 spares |
| Notes | 1 load per day rural 2 loads per day urban. Two supervisors running service | driver drops crew off before tipping to extend day length and keep costs down | | | Loaders 1-2<br>Outsourced<br>Supervisors 3-4 | | | 2 Supervisors | 6 supervisors | | Loads = 1-2<br>supervisors = 2 | 9 supervisors in whole SWP |

# Appendix 4: Waste projections

Table A4.1 presents good practice waste projection tonnages and Table A4.2 the ambitious waste projections for 2012/13 to 2025/26. It is important to note that the projections incorporate an underlying assumption of increased capture of the existing target materials and a progressive increase in commercial waste recycling. It is from these interventions that increases in key material streams (such as food waste) are produced. Within the main body of the report it is acknowledged that the required increases in recycling tonnage may actually come from the addition of new target materials (such as textiles, small WEEE and AHP's). Documented issues with the baseline data constrained the level of rigour that could be applied and this is an area that requires improved performance data gathering and monitoring (each year) to ensure that the interventions implemented will take Powys along the ambitious projection.

**Table A4.1 Good practice waste projection**

| | 2012/13 | 2013/14 | 2014/15 | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 | 2020/21 | 2021/22 | 2022/23 | 2023/24 | 2024/25 | 2025/26 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Household residual | 27690 | 26674 | 24431 | 21549 | 19254 | 17686 | 16211 | 15446 | 15010 | 14709 | 14484 | 14333 | 14229 | 14155 |
| Household dry – glass | 2001 | 2001 | 2001 | 2021 | 2061 | 2082 | 2092 | 2097 | 2100 | 2101 | 2102 | 2102 | 2102 | 2103 |
| Household dry – cans | 338 | 352 | 366 | 410 | 459 | 509 | 546 | 572 | 591 | 603 | 612 | 618 | 622 | 625 |
| Household dry – plastic | 1487 | 1563 | 1643 | 1895 | 2185 | 2408 | 2544 | 2640 | 2707 | 2752 | 2775 | 2787 | 2793 | 2799 |
| Household dry- paper | 2063 | 2104 | 2146 | 2361 | 2597 | 2857 | 3061 | 3217 | 3334 | 3421 | 3485 | 3531 | 3564 | 3589 |
| Household dry – cardboard | 68 | 74 | 89 | 125 | 225 | 315 | 378 | 429 | 467 | 493 | 509 | 518 | 523 | 525 |
| Household food waste | 3901 | 3980 | 4059 | 4465 | 4784 | 5028 | 5199 | 5317 | 5397 | 5448 | 5477 | 5491 | 5496 | 5497 |
| **Total kerbside household waste** | **37548** | **36747** | **34735** | **32824** | **31565** | **30884** | **30031** | **29719** | **29605** | **29528** | **29443** | **29381** | **29330** | **29293** |
| HWRC – residual | 7069 | 7069 | 7069 | 7069 | 7069 | 7069 | 7069 | 7069 | 7069 | 7069 | 7069 | 7069 | 7069 | 7069 |
| HWRC – recycling | 14600 | 14600 | 14600 | 14600 | 14600 | 14600 | 14600 | 14600 | 14600 | 14600 | 14600 | 14600 | 14600 | 14600 |
| Bring banks | 8940 | 9119 | 9119 | 9119 | 9119 | 9119 | 9119 | 9119 | 9119 | 9119 | 9119 | 9119 | 9119 | 9119 |
| Other household residual | 7966 | 7966 | 7966 | 7966 | 7966 | 7966 | 7966 | 7966 | 7966 | 7966 | 7966 | 7966 | 7966 | 7966 |
| **Total household waste** | **76123** | **75501** | **73489** | **71578** | **70318** | **69637** | **68785** | **68472** | **68359** | **68281** | **68197** | **68134** | **68083** | **68046** |

**Table A4.2 Ambitious waste projection**

| | 2012/13 | 2013/14 | 2014/15 | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 | 2020/21 | 2021/22 | 2022/23 | 2023/24 | 2024/25 | 2025/26 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Household residual | 27690 | 26674 | 24431 | 21714 | 18028 | 14883 | 12647 | 11280 | 10356 | 9657 | 9113 | 8715 | 8447 | 8262 |
| Household dry – glass | 2001 | 2001 | 2001 | 2021 | 2061 | 2082 | 2092 | 2097 | 2100 | 2101 | 2102 | 2102 | 2102 | 2103 |
| Household dry – cans | 338 | 352 | 366 | 410 | 483 | 579 | 655 | 713 | 755 | 784 | 805 | 819 | 828 | 835 |
| Household dry – plastic | 1487 | 1563 | 1643 | 1895 | 2330 | 2686 | 2915 | 3080 | 3197 | 3277 | 3318 | 3339 | 3350 | 3360 |
| Household dry- paper | 2063 | 2104 | 2146 | 2361 | 2715 | 3326 | 3825 | 4207 | 4488 | 4687 | 4826 | 4922 | 4986 | 5030 |
| Household dry – cardboard | 68 | 74 | 89 | 161 | 418 | 752 | 1053 | 1334 | 1571 | 1746 | 1860 | 1928 | 1965 | 1983 |
| Household food waste | 3901 | 3980 | 4059 | 4871 | 5567 | 6135 | 6552 | 6849 | 7056 | 7190 | 7265 | 7303 | 7316 | 7319 |
| **Total kerbside household waste** | **37548** | **36747** | **34735** | **33432** | **31602** | **30443** | **29740** | **29562** | **29523** | **29443** | **29290** | **29129** | **28995** | **28893** |
| HWRC – residual | 7069 | 7069 | 7069 | 7069 | 7069 | 7069 | 7069 | 7069 | 7069 | 7069 | 7069 | 7069 | 7069 | 7069 |
| HWRC – recycling | 14600 | 14600 | 14600 | 14600 | 14600 | 14600 | 14600 | 14600 | 14600 | 14600 | 14600 | 14600 | 14600 | 14600 |
| Bring banks | 8940 | 9119 | 9119 | 9119 | 9119 | 9119 | 9119 | 9119 | 9119 | 9119 | 9119 | 9119 | 9119 | 9119 |
| Other household residual | 7966 | 7966 | 7966 | 7966 | 7966 | 7966 | 7966 | 7966 | 7966 | 7966 | 7966 | 7966 | 7966 | 7966 |
| **Total household waste** | **76123** | **75501** | **73489** | **72185** | **70356** | **69197** | **68493** | **68315** | **68277** | **68196** | **68043** | **67882** | **67748** | **67646** |

# Appendix 5: Llanbrynmair site plans

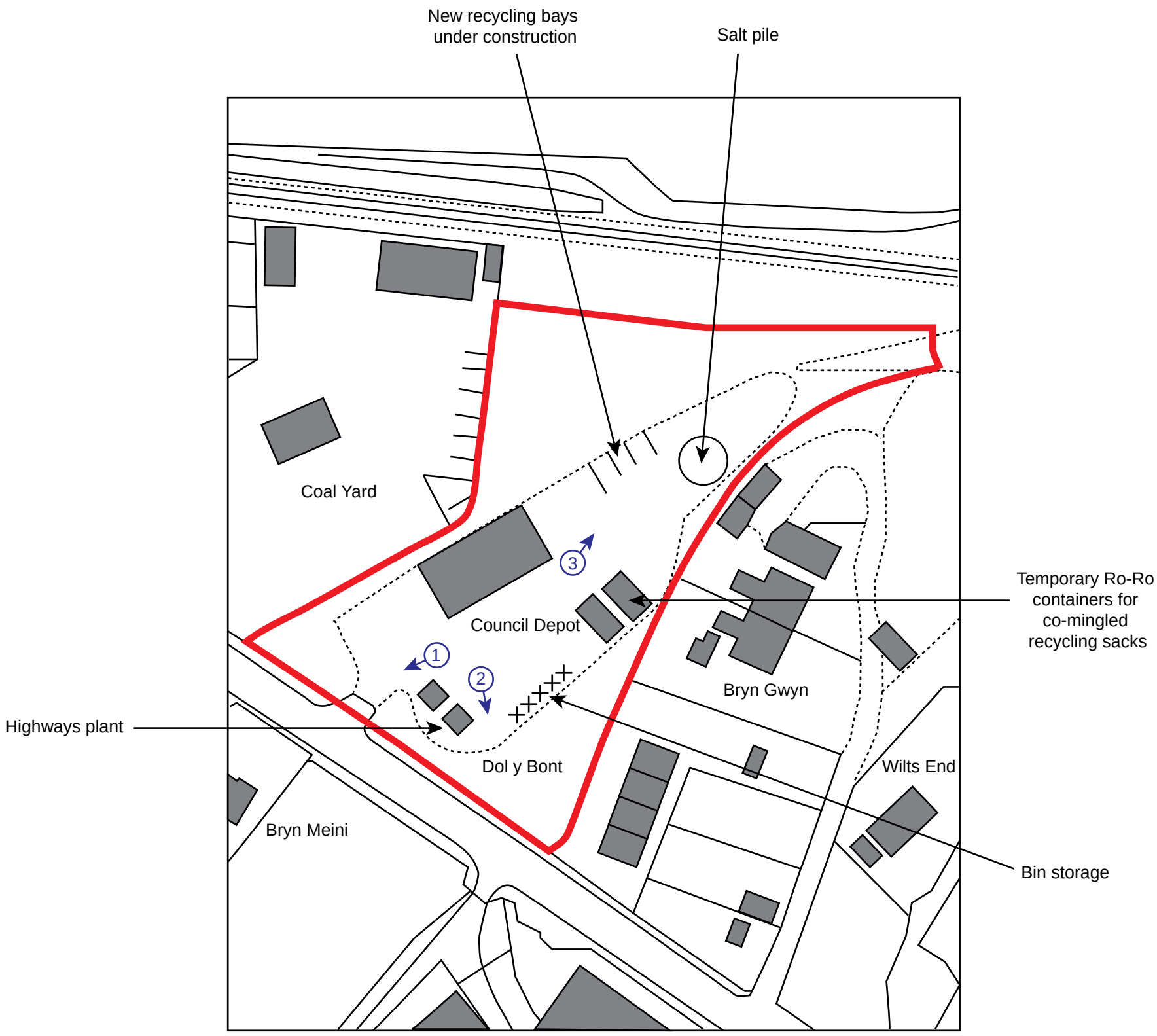



Photo 1

Photo 2

Photo 3

**Key**

Site boundary

Photo number and direction

Waste and Resource Action Programme
Powys Vehicle and Collection Options Appraisal

**Figure A1**
**Llanbrynmair Existing Site Layout**

September 2012
32179-N01.ai squij

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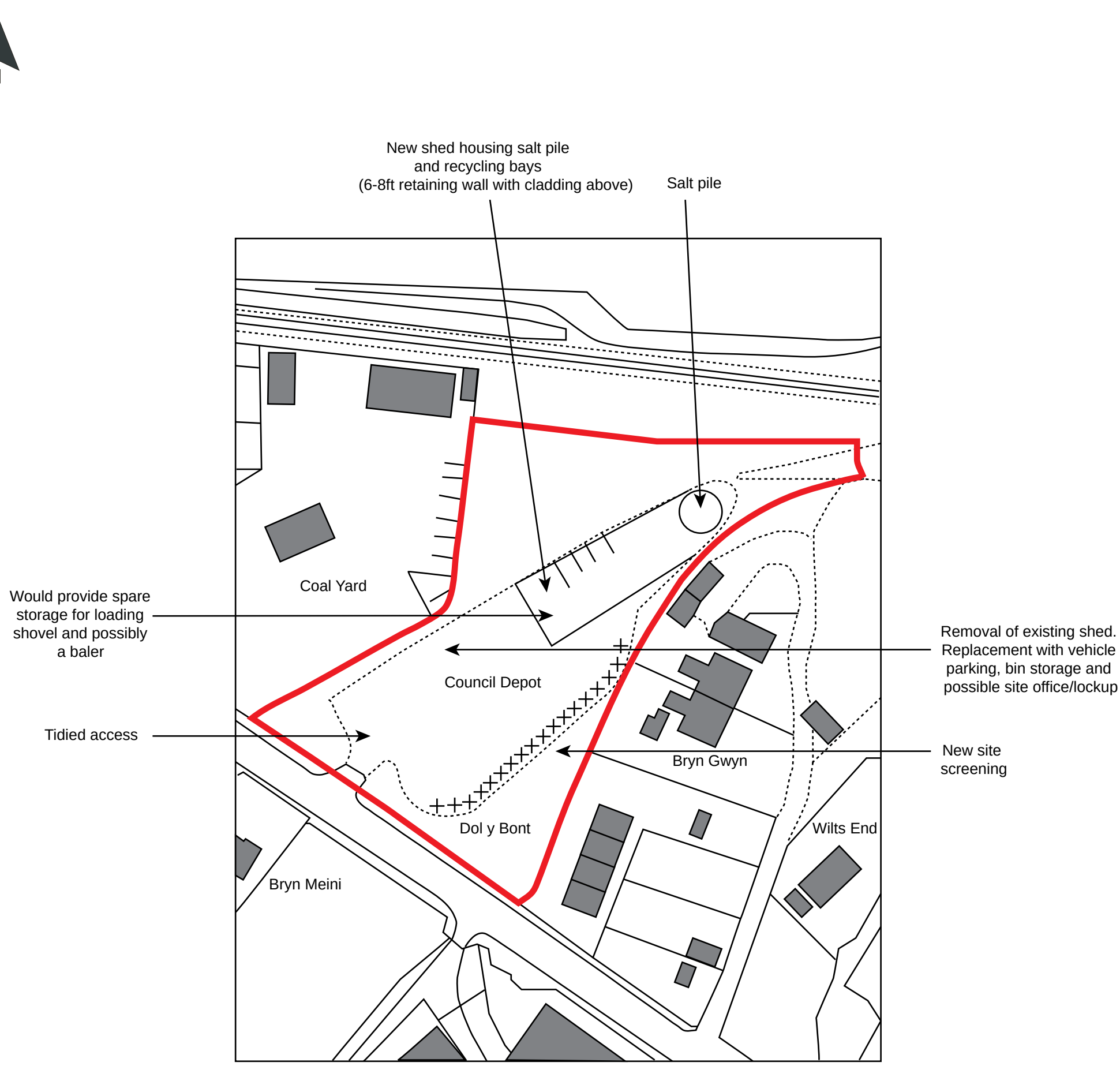


**Key**

Site boundary

Waste and Resource Action Programme
Powys Vehicle and Collection Options
Appraisal

**Figure A2**
**Llanbrynmair Proposed Site Layout**

September 2012
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# Appendix 6: Collection productivities discussion paper

**Collection productivity overview and study context**

The rate at which containers can be collected on the rounds, which is a function of variables such as set out, housing type, the urban / rural nature of the collections, crew number, vehicle access and proximity to depots / tipping points, is an important consideration when modelling resources.

This Appendix contains supporting information around the collection productivities (pass rates) used in the scenario modelling.

The aim at the start of the study was to build a calibrated baseline model from which revised productivities (linked to alternative vehicle types) could be developed. However, as described in Section 3 of the main report, it was necessary to build a hybrid baseline model for this study, owing to the evolving coverage of the two-pass recycling collections across Powys and limited or unclear round performance data. As a result, a greater number of assumptions have been needed, supported by additional research into productivities achieved elsewhere.

It is useful to set out productivity considerations alongside those associated with vehicle carrying capacity, as ultimately a balance needs to be struck between these two key rate-limiting factors on achievable round sizes. If urban collection rounds were operated for a given commodity, with the same level of set-out, then as a general rule the speed of collection would be greatest for single-use sacks (where there is no need to return to the property), followed by a single wheeled bin, and followed reusable boxes / caddies (where multiple trips to and from the vehicle are required). The more rural the round becomes then the overall (daily) productivities achievable for these different types of collection tends to converge, as the performance of the round becomes increasingly dominated by driving time. Considering the second rate-limiting factor, the more commodities that are collected within multiple compartments on a vehicle then the more the round size tends to become limited by the payload and volume capacity of each compartment. Striking the optimum balance between pass rate and weight/volume is essential when specifying the correct numbers of vehicle and crew. It is interesting to note that May Gurney's approach to striking this balance has been to reduce crew levels, from a more traditional diver + 2 loaders to a driver +1, and to set overall property counts at lower levels that are better aligned with the vehicle's capabilities. For certain vehicle types such as the RCVs with two front pods as considered in this study, the optimum crewing level is likely to swing more towards a driver + 2 loaders, due to the need for operatives to unload at opposite ends of the vehicle.

**Vehicle types**

The main vehicle types considered in this study comprise:

- 4-pod RCVs, comprising 2 front pods and split compartments with compaction at the rear;
- Advanced stillage vehicles such as the Romaquip and Terberg Kerbloader allowing multiple streams to be loaded via apertures along both sides of the vehicle (and also at the rear); and
- A mini kerbsider vehicle with side-loaded hopers that tip into the main body of the vehicle.

**Reference pass rates**

Acknowledging that the vehicle configurations modelled represent a significant departure from the 2-pass kerbside recycling configuration rolled out across Powys since 2010, it has been necessary to research reference data to inform the pass rates to be applied. A number of challenges have been faced in this regard, which can be summarised as follows:

- The 4-pod RCV is a relatively new vehicle to the UK, and nowhere is it operated on a fulltime basis. Powys themselves have trialled variants of this vehicle type, leading to the proposed configuration with two larger front pods but there is a lack of formal collection productivity data available to inform the modelling;
- Advanced stillage vehicles are being deployed on contracts but with true productivity data not readily available. On May Gurney's West Oxfordshire contract productivities have been slowed by additional sorting of materials between boxes and on longer running contracts such as in Somerset the transition from historic

crew levels based on a driver + 2 to a driver + 1 has taken time. None of the latest generation of vehicles has been subject to filing and time recording in order to populate WRAP's KAT model with timing data; and

- The extreme rural nature of Powys making it difficult to confidently benchmark productivities with authorities operating similar schemes.

Table A6.1 below includes reference weekly multi-material round size information from a range of sources, including that formally gathered through the benchmarking exercise.

**Table A6.1:** Reference round sizes on multi-material kerbside sort collections

| Authority | Selection Criteria | | | |
|---|---|---|---|---|
| | **Service Type** | **Vehicle Type** | **Crew Level** | **Round Size (hh/day)** |
| Conwy | Main | Romaquip standard | Driver + 2 | 600 – 750<br>135 hh/r and 5-6hrs picking |
| | Narrow | Romaquip narrow | Driver +1 assumed | 400 – 600<br>100-150 hh/hr, 3-4 hrs picking |
| West Oxfordshire | Main | RRV | Driver + 1 | 400 |
| | Rural | RRV | Driver only | 220 |
| Somerset | Main | RRV | Driver+1 | 550 |
| | Rural | RRV | Driver + 0/1 | 350 |
| | Ultra-Narrow | RRV | Driver only | 125 |
| East Devon (1st generation stillage vehicles) | Main | 7.5/12t stillage | Driver + 2/3 | 624 |
| | Narrow | 3.5t stillage | Driver + 1 | 200 |
| Cheshire West & Chester | Main | 12t RRV | Driver + 1 | 597 (contract design size) |
| | Narrow | 7.5t SPOV | Driver only | 223 (contract design size) |
| | | | | |
| WRAP IC&P2 | Main | Not specified | Driver + 2 | 646 |

The above data provides a useful set of reference data and indicates some consistent output round sizes achievable in different operating urban / rural contexts. It is worth noting that most of the above schemes target more than 4 commodities (including food waste and some glass colour separation).

**Timed data**

In addition to the round size data above AMEC have monitored a limited number of recycling rounds undertaken by May Gurney on the new Cheshire West & Chester contract. These collections are undertaken with the latest generation Terberg Kerbloader (12t) vehicles with a Driver + 1 loader.

A range of productivities have been observed as follows:

- Single property: vehicle adjacent to estate-type property = [32s/hh]. This rate would also apply to smaller rural properties from the point of arriving at the property. Clearly for these households additional point to point driving time then needs to be included;

- Vehicle servicing 4 cul-de-sac properties (average 100% setout but only food from 50%) = [45s/hh]

- Vehicle servicing 8 restricted access cul-de-sac properties (average 80% setout): = [57s/hh]

This data would indicate an hourly pass rate in the range 63 – 112 hh/hr. Assuming 5-6hrs of picking on urban rounds this would equate to 616 hh/day on urban and 220 in restricted access areas based on 3-4hrs of picking, which is consistent with the target levels stated above.

**Tipping-off Times**

Of the advanced stillage-type vehicles the Romaquip should be quicker to unload than the Terberg Kerbloader due to less reliance on a forklift (the Romaquip has automatic materials ejection); Conwy experience indicates an average 15 minutes unloading time in a well organised bulking facility. A similar tipping time is considered to apply to the 4-pod RCV where the ejection/emptying process is automatic (without the need for a forklift) and is limited by vehicle movement times between tipping bays / sealed containers. For those vehicles emptied by forklift an average in the range 20-25 mins is perhaps appropriate; this is the range May Gurney state when aligned with their purpose-built bulking facilities

### Vehicle capacities

In advance of modelling, for each vehicle type, AMEC assessed the volumetric capacity of each material compartment against the ambitious recycling projection. This exercise was undertaken to inform our understanding of the likely balance between collection rate and vehicle capacity as the primary rate-limiting factor. Projected yields for each year (based on an average kg/hhd/collection) were converted into volumes through use of bulk density data and mapped onto compartment volumes. We have assumed that the standard commodities are targeted and primary compartments on the vehicle are utilised. The figure below shows the capacity of each compartment by material stream by year (hh/compartment) and the average number of tips per vehicle per day for a given pass rate (Tips) for the standard Romaquip vehicle over the modelling horizon.

What this analysis usefully does is show that as the recycling and food waste commodity yields increase up to the maximum at the end of the modelling horizon (2024/25, c.70% recycling) in the region of 400-500 households would be expected to be passed before the vehicle is full and needs to tip. In the early years it would appear that food waste is likely to become rate-limiting first, with perhaps the need to tip becoming more important than pass rate in around 2017/18.

| | | 2012/13 | 2013/14 | 2014/15 | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 | 2020/21 | 2021/22 | 2022/23 | 2023/24 | 2024/25 | 2025/26 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | |
| Stream1 | cans | 338 | 352 | 366 | 410 | 483 | 579 | 655 | 713 | 755 | 784 | 805 | 819 | 828 | 835 |
| | kg/hh/wk | 0.11 | 0.12 | 0.12 | 0.14 | 0.16 | 0.19 | 0.22 | 0.24 | 0.25 | 0.26 | 0.27 | 0.27 | 0.27 | 0.28 |
| | plastic | 1487.29 | 1563.19 | 1642.98 | 1894.54 | 2329.65 | 2686.36 | 2914.86 | 3080.16 | 3196.61 | 3277.18 | 3318.47 | 3339.38 | 3349.90 | 3360.46 |
| | kg/hh/wk | 0.49 | 0.52 | 0.54 | 0.63 | 0.77 | 0.89 | 0.97 | 1.02 | 1.06 | 1.09 | 1.10 | 1.11 | 1.11 | 1.11 |
| | m3/hh/wk | 0.015 | 0.016 | 0.016 | 0.019 | 0.023 | 0.027 | 0.029 | 0.031 | 0.032 | 0.033 | 0.033 | 0.034 | 0.034 | 0.034 |
| | hh/compartment | 1177 | 1122 | 1069 | 931 | 761 | 657 | 602 | 567 | 545 | 530 | 523 | 519 | 516 | 514 |
| | Tips | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1.04 | 1.08 | 1.10 | 1.11 | 1.12 | 1.12 | 1.13 |
| | | | | | | | | | | | | | | | |
| Stream2 | paper | 2063 | 2104 | 2146 | 2361 | 2715 | 3326 | 3825 | 4207 | 4488 | 4687 | 4826 | 4922 | 4986 | 5030 |
| | kg/hh/wk | 0.68 | 0.70 | 0.71 | 0.78 | 0.90 | 1.10 | 1.27 | 1.40 | 1.49 | 1.55 | 1.60 | 1.63 | 1.65 | 1.67 |
| | card | 68 | 74 | 89 | 161 | 418 | 752 | 1053 | 1334 | 1571 | 1746 | 1860 | 1928 | 1965 | 1983 |
| | kg/hh/wk | 0.02 | 0.02 | 0.03 | 0.05 | 0.14 | 0.25 | 0.35 | 0.44 | 0.52 | 0.58 | 0.62 | 0.64 | 0.65 | 0.66 |
| | m3/hh/wk | 0.003 | 0.003 | 0.003 | 0.004 | 0.006 | 0.008 | 0.010 | 0.012 | 0.014 | 0.015 | 0.016 | 0.016 | 0.016 | 0.017 |
| | hh/compartment | 2305 | 2241 | 2153 | 1803 | 1249 | 871 | 689 | 581 | 516 | 477 | 454 | 441 | 434 | 430 |
| | Tips | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1.01 | 1.13 | 1.19 | 1.23 | 1.25 | 1.26 | 1.27 |
| | | | | | | | | | | | | | | | |
| Stream3 | glass | 2001 | 2001 | 2001 | 2021 | 2061 | 2082 | 2092 | 2097 | 2100 | 2101 | 2102 | 2102 | 2102 | 2103 |
| | kg/hh/wk | 0.66 | 0.66 | 0.66 | 0.67 | 0.68 | 0.69 | 0.69 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 |
| | m3/hh/wk | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 |
| | hh/compartment | 1758 | 1758 | 1758 | 1741 | 1706 | 1690 | 1681 | 1677 | 1675 | 1674 | 1673 | 1673 | 1673 | 1673 |
| | Tips | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | | | | | | | | | | | | | | | |
| Stream4 | food | 3901 | 3980 | 4059 | 4871 | 5567 | 6135 | 6552 | 6849 | 7056 | 7190 | 7265 | 7303 | 7316 | 7319 |
| | kg/hh/wk | 1.29 | 1.32 | 1.35 | 1.62 | 1.85 | 2.03 | 2.17 | 2.27 | 2.34 | 2.38 | 2.41 | 2.42 | 2.43 | 2.43 |
| | m3/hh/wk | 0.003 | 0.003 | 0.003 | 0.004 | 0.004 | 0.005 | 0.005 | 0.005 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 |
| | hh/compartment | 860 | 843 | 827 | 689 | 603 | 547 | 512 | 490 | 476 | 467 | 462 | 460 | 459 | 459 |
| | Tips | 1 | 1 | 1 | 1 | 1 | 1.07 | 1.13 | 1.17 | 1.19 | 1.21 | 1.22 | 1.22 | 1.22 | 1.22 |

### Proposed rates

Table A6.2 presents initial target output round sizes (by scenario) based on the evidence summarised above. Key assumptions and observations on the figures are as follows:

- We have assumed a blended target crew level on the standard rounds using the advanced stillage-type vehicles of a driver + 1.5 loaders. This strikes a compromise between the positions adopted by Conwy and May Gurney and acknowledges that some rounds may be designed to be larger (where they are in close proximity to the depot / bulking facilities) and as such the additional (albeit marginal) productivity gain that 2 loaders provides enables some rounds to operate against a 2-tip strategy;

- On rural rounds we have assumed a driver + 1 loader, in line with Powys' preference against lone working. This has the effect of marginally increasing the productivity on these rounds against those reference authorities cited in table 2.1 which commonly deploy a driver only. It is also important to note that ultra-narrow properties have been parked outside the Powys analysis. The round sizes listed in Table A6.1 will include many of these properties which will have the effect of pulling down the average round size achievable; and

- The rural target round sizes converge towards a similar figure as driving time dominates over the speed with which the vehicle can be loaded. In this case the vehicle size and population of properties classified as rural becomes most important.

### Watch points

The resource modelling undertaken in this study is done at a tactical level, i.e. it is not based on collection round designs and vehicle routing algorithms, and as such should be viewed as indicative.

Particular attention is drawn to the baseline refuse collection productivities which are considered low (as a result of incomplete data and the masking effect of unspecified levels of commercial waste co-collection). We have not attempted to recalibrate these rates in the model (as the study focus has been on the recycling fleet) meaning the predicted resource levels (and thus budget) on this service may be overstated. The target refuse service

productivities should be revisited as part of the wider strategy to improve round monitoring, performance data capture and as the commercial waste service is re-engineered. Acknowledging the rural nature of Powys an overall urban area average round size in the region of 850-950 households per day may be considered more appropriate, which in many cases would require just 1 tip per day on frontline vehicles and at the expected yield levels (<10kg/household/fortnight).

The lack of comparator productivity data for the 4-pod RCV also represents a risk, reducing our confidence in the stated target round sizes for the scenarios involving these vehicles.

**Table A6.2:** Scenario target round sizes

| Scenario | Std Vehicle | No households | Crew level | Round Size | Narrow Vehicle | No households | Crew level | Round Size | Comments |
|---|---|---|---|---|---|---|---|---|---|
| 2a | 26t NTM 4 pod | 46,000 | D+2 | 650 | 7.5t mini kerbsider | 11,000 | D+1 | 400 | The average narrow target round size is higher than the equivalent scenario with the same small vehicle because the pool of properties assigned as rural is much higher – meaning many are actually suburban with lesser access constraints |
| 6b | 18t NTM 4 pod | 51,500 | D+2 | 680 | 7.5t mini kerbsider | 5,500 | D+1 | 350 | In this variant of the above scenario the smaller frontline vehicle facilitates a higher pas rate. The downside is that as the yields increase over time the compartment sizes become more rate-limiting and additional vehicles are needed to cope with the weight / volume of waste set out. Similarly, the mini-kerbsider (which crews felt could make a viable replacement for the vans) is expected to facilitate higher productivity levels in restricted access rural areas over the equivalent 12t platforms modelled in the scenarios below. |
| 11b | 12t Romaquip | 51,500 | D+1.5 | 590 | 12t Romaquip narrow | 5,500 | D+1 | 300 | Larger standard rounds with 2 loaders expect output round sizes in range 600 – 700 per day (lower than Conwy acknowledging increased rurality). Rounds with driver + 1 average 500 – 575 per day (consistent with Somerset levels). |
| 14b | 12t Terberg Kerbloader | 51,500 | D+1.5 | 575 | 12t CWS narrow | 5,500 | D+1 | 295 | Collection rates on these vehicles are expected to be equivalent to the Romaquip. The slightly longer tipping off time has the impact of marginally reducing the overall average round size achievable on standard collections. This will become more apparent when more rounds move into 2 tips per day (i.e. later in the modelling horizon). |

www.wrap.org.uk/relevant link

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