



SID 5 Research Project Final Report

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1. Defra Project code
2. Project title
3. Contractor organisation(s)
4. Total Defra project costs (agreed fixed price)
5. Project: start date
end date

6. It is Defra's intention to publish this form.
Please confirm your agreement to do so. YES NO

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Executive Summary

7. The executive summary must not exceed 2 sides in total of A4 and should be understandable to the intelligent non-scientist. It should cover the main objectives, methods and findings of the research, together with any other significant events and options for new work.

Householders produce a range of hazardous wastes, including some types of batteries, garden chemicals, aerosols, and waste oils. These materials may have adverse environmental effects when disposed of within the residual household waste stream. However, if these materials can be separated from residual household waste, their environmental impacts can be managed and minimised.

The separation of household hazardous wastes from the residual waste stream can be achieved by a range of kerbside collection options, including through regular kerbside recycling schemes, 'on request' collections (also known as 'on-demand' collections) and bulky waste collections schemes.

In addition, household hazardous wastes are often separated out for recovery or safe disposal at Household Waste Recycling Centres (HWRCs), and many local authorities utilise this as their preferred handling route. The use of HWRCs is a well understood process for which best practice guidance is available from the Household Hazardous Waste Forum amongst others.

However there is more limited knowledge and guidance on the kerbside collection of household hazardous wastes. Therefore the aim of this project was:

- To review successful household hazardous waste kerbside collection schemes in order to produce a guidance document, suitable for use by local authorities, to share the experiences of these successful schemes and help the local authorities design and implement schemes suitable for their own area.

To achieve the aim the following objectives were identified:

- Objective 1: prepare detailed case studies for six local authorities who have effective methods of dealing with household hazardous waste through kerbside collections.
- Objective 2: evaluate and compare these individual schemes to assess how widely they could be rolled out to other local authorities.
- Objective 3: develop criteria to allow local authorities to assess which approaches may be best suited to their individual circumstances/profile.
- Objective 4: produce a guidance document suitable for use by local authorities in establishing schemes for kerbside collection of household hazardous waste.

The project aim was met by the preparation of a guidance document on the inclusion of hazardous household wastes within both regular kerbside recycling collections and within 'on request' collections. This guidance document was based upon case studies of local authorities who were currently collecting typical household hazardous wastes, together with experience of the research team in interpreting the legal and practical issues around hazardous waste management and household waste collection.

The case studies were prepared following face to face interviews with selected local authorities. The case studies include details of:

- the household hazardous waste collected by each scheme;
- the collection arrangements (including details of collection methods, collection frequencies and contractors); and
- how schemes were developed.

The case studies also examined how the scheme was communicated to the public, what issues were raised or addressed by the separate collection of household hazardous waste and any areas where the local authority felt that the scheme could be improved.

However, within the overall project objectives, Objective 2 was not met in full, as a result of the similarities between the kerbside sort recycling schemes within the case studies. Care was taken during the selection of case study authorities to ensure that the schemes were operated by a range of different waste contractors. However it emerged that most of the identified schemes had originally been instigated by the same contractor, meaning that the schemes were very similar in both the range of materials and operational practices.

Comparison between the two main kerbside collection types; co-mingled and kerbside sort, highlighted the following.

- Kerbside sort schemes rely on collection operatives separating recyclable materials at the kerbside into different vehicle compartments. The materials which can be separated within the scheme are limited by the compartments within the vehicle and the ability of the operatives to identify materials at the kerbside.
- Co-mingled collections collect mixed recyclable materials, which are then separated at a Materials Recovery Facility (MRF). The range of materials which can be included within mixed recyclables is limited to materials that can be separated effectively at a MRF. Currently MRFs are not designed or configured to separate the majority of household hazardous wastes and the inclusion of household hazardous wastes could result in the contamination of other recyclable materials. Therefore modification of the collection element of the scheme would be required to separate household hazardous wastes. Options included the use of a caddy system for easy separation of some materials at the kerbside, or other physical separation means such as 'survival bags' or placement alongside the recycling container.

Kerbside sort schemes are more amenable to the adaptation of the collection of household hazardous wastes than co-mingled collections. However kerbside sort schemes are still limited by the number and volume of compartments on the vehicle.

Both scheme types have been discussed on a material-specific basis to show how hazardous wastes may be included within existing schemes. This is appropriate as most authorities have an existing recycling scheme which is operational and will be able to add to this, rather than designing an entirely new scheme. Some materials such as aerosols can be added easily to any recycling scheme, regardless of type, as they can be included in the bulk ferrous or non-ferrous waste stream for recycling. Other materials such as automotive batteries are captured more easily by kerbside sort schemes. Household batteries may be captured by either type of scheme, provided the co-mingled collection is modified suitably.

For certain waste streams, particularly waste household chemicals, collection can be implemented through the use of an 'on-request' collection service. The 'on request' collection operates in a similar manner to a household bulky waste service with householders requesting the collection of hazardous materials, which are then scheduled for collection, typically by a specialist contractor on behalf of the authority. Such schemes do have cost implications but can benefit from the advice of operators with hazardous waste experience. Existing bulky waste schemes already capture some hazardous wastes, particularly white goods such as fridges and freezers containing CFCs.

It is intended that the guidance document will assist authorities in determining how to introduce the more common household hazardous wastes into their collection scheme. This will allow the separate collection

of these materials, facilitating their recycling or recovery and reducing the environmental impact of the residual waste stream.

Project Report to Defra

8. As a guide this report should be no longer than 20 sides of A4. This report is to provide Defra with details of the outputs of the research project for internal purposes; to meet the terms of the contract; and to allow Defra to publish details of the outputs to meet Environmental Information Regulation or Freedom of Information obligations. This short report to Defra does not preclude contractors from also seeking to publish a full, formal scientific report/paper in an appropriate scientific or other journal/publication. Indeed, Defra actively encourages such publications as part of the contract terms. The report to Defra should include:
- the scientific objectives as set out in the contract;
 - the extent to which the objectives set out in the contract have been met;
 - details of methods used and the results obtained, including statistical analysis (if appropriate);
 - a discussion of the results and their reliability;
 - the main implications of the findings;
 - possible future work; and
 - any action resulting from the research (e.g. IP, Knowledge Transfer).

The scientific objectives as set out in the contract

The key aim of the project as set out in the contract was:

to review successful household hazardous waste kerbside collection schemes in order to produce a guidance document suitable for use by local authorities, to share the experiences of these successful schemes and help the local authorities design and implement schemes suitable for their own area.

To achieve these aims the following objectives were identified.

- Objective 1: prepare detailed case studies for six local authorities who have effective methods of dealing with household hazardous waste through kerbside collections.
- Objective 2: evaluate and compare these individual schemes to assess how widely they could be rolled out to other local authorities.
- Objective 3: develop criteria to allow local authorities to assess which approaches may be best suited to their individual circumstances/profile.
- Objective 4: produce a guidance document suitable for use by local authorities in establishing schemes for kerbside collection of household hazardous waste.

The overall project aim has been met by the production of a document that provides guidance to local authorities on the options for the collection of hazardous household wastes within their existing regular kerbside recycling collection scheme. Guidance is also provided on the use of 'on request' schemes to capture those hazardous wastes which may not be suitable for inclusion within a regular kerbside collection due to their physical or chemical nature. The guidance is presented in an accessible format, broken down into specific waste streams. It is supported by local authority case studies, together with experience of the research team in interpreting the legal and practical issues around hazardous waste management and household waste collection.

However, difficulties were experienced in fully achieving Objective 2 because:

- it became clear during the development of the case studies that most of the kerbside sort schemes selected for the case studies had the same origins with the collection of certain hazardous wastes offered by an individual contractor during the tendering process; and
- the collection of household hazardous waste within co-mingled collections is limited and often restricted to a single separated material such as household batteries.

These factors made it difficult to compare and contrast different kerbside sort schemes as they were generically the same scheme, and the limited number of case studies did not cover the potential variations possible for co-mingled collections. Although the information gathered did allow a high level comparison of kerbside sort and co-mingled collection, as well as an evaluation of the issues that need to be considered when introducing household hazardous waste to regular kerbside collections.

Method and Results

Approach to meeting Objective 1: preparation of case studies

The project specification required the preparation of six case studies based on local authorities in England who were currently collecting household hazardous wastes, either within regular kerbside collections or via 'on request' collection services.

A number of data sources were utilised to identify local authorities for inclusion within the case studies. These included use of the WRAP 'Online Recycling Information System' (ORIS) tool. This enabled the identification of authorities collecting a variety of wastes within their recycling collections. The collections of interest were those described in ORIS as household batteries, aerosols, and 'other'.

The list of potential local authorities was compared to the verified WasteDataFlow results for 2007, the latest full year data available. The aim was to identify those authorities which may be collecting hazardous wastes within materials described as 'other' on ORIS. Finally the identified potential authorities were checked using their own websites.

For 'on request' schemes, which are more commonly operated by Waste Disposal Authorities (as opposed to Waste Collection Authorities), County Council websites were used to identify authorities that offer collections for hazardous waste such as chemicals. This was to differentiate specific hazardous waste collections from bulky waste collections which will collect some hazardous wastes such as white goods and are offered by the majority of Waste Collection Authorities.

An initial 'long list' of potential authorities was developed, from which a 'short list' of ten potential local authorities was selected for more detailed consideration, with the objective of ensuring that a range of hazardous materials could be covered along with a range of socio-economic and geographical characteristics and collection systems. Attempts were also made to ensure that a range of waste contractors was covered by the long list. This short list was then presented to Defra along with suggestions for prioritisation. Following discussions with Defra, a short list and prioritisation were agreed.

The ten local authorities were contacted initially by telephone, following the agreed priority order and asked if they would participate in the project and to confirm the availability of critical staff for interview on their kerbside collection arrangements. This telephone conversation was followed up by email supplying further details on the project.

A number of the targeted authorities declined to take part in the project. The reasons for not participating in the project included:

- a lack of time due to it being financial year end;
- the impending change of authority status i.e. changing to a unitary authority; and
- a lack of staff knowledge about how their collection scheme had been instigated.

The original long list was then re-evaluated to identify a further four authorities who would be suitable for inclusion within the case studies. While discussing participation with these authorities, the first two authorities contacted agreed to be interviewed. The other two on the additional list became the subject of mini case studies (see later).

The information for the case studies was obtained by direct interview with key staff in the selected local authorities. Two members of Enviro staff attended the interviews to ensure that all of the information required was captured. The use of 'face to face' meetings was chosen as the most effective means of capturing service detail and of recording the knowledge and experience of those local authorities responsible for the creation and implementation of household hazardous waste kerbside collections. The interviews covered the following areas:

- the profile of the local authority, including its geographic, demographic and socio-economic nature, the type of area it covered, urban/rural split, population and household numbers, specific characteristics of the local community or areas of multiple deprivation;
- the waste collection arrangements and collection frequencies in place for the authority's total municipal waste stream, including how many separate waste streams were collected, what type of collection containers were used, whether dry recyclables were captured through kerbside sort or co-mingled collections, what type of collection vehicles were used;
- who the waste contractor was for the collection of household hazardous waste;
- the waste collection arrangements and collection frequencies in place for household hazardous waste and how these interfaced with the non-hazardous waste collection service, including how many different materials were collected, and how they were segregated from other household wastes;
- whether there was a common level of service for municipal waste collections in general and household hazardous waste collections in particular, including the service provided across the authority's administrative area or if it was only offered to a certain percentage of households or specific communities within the area;
- the background and process whereby household hazardous kerbside schemes were developed and introduced, the reasons behind the choice of particular materials, decision-making and consultation processes and how the scheme has been received by local residents;
- performance data - participation, materials capture, diversion rates and whether collections have become more or less successful over time;
- issues encountered with household hazardous waste collection scheme implementation, barriers, obstacles and how these were overcome, lessons learned for further development of the service, whether there were ongoing difficulties and how a scheme might be improved;
- financial information if available.

During the interview process it became apparent that one of the authorities intended to phase out their hazardous waste kerbside collection. The reason given for this decision related to the harmonisation of collection services in their partnership area and the authority was the only one operating a regular kerbside collection for household hazardous waste. This highlights the issue that partnerships and the formation of Joint Waste Authorities could limit the wider roll out of regular kerbside household hazardous waste collections, as there is a drive to harmonisation of services across partnership areas.

This resulted in a shortfall in case studies which was overcome, with the agreement of Defra, by sending a questionnaire to the two remaining authorities on the supplementary list. Telephone interviews were used to clarify the information provided in the questionnaires. These two authorities are therefore marked as mini case studies in Table 1 below. The case studies are provided as Appendix 2 of the guidance document.

Approach to meeting Objective 2: evaluation and comparison of schemes and potential for roll out to other authorities

Case studies prepared within Objective 1 are summarised in Table 1. There are three main types of scheme covered. Five authorities operate kerbside sort schemes, one a co-mingled collection scheme and the final authority an 'on request' scheme for hazardous materials, including household chemicals.

Table 1: Case Study Authorities and Scheme Types

Authority	Scheme Type
Doncaster Council (mini-study)	Kerbside sort
London Borough of Barnet	Kerbside sort
South Gloucestershire District Council (mini study)	Kerbside sort
Teignbridge District Council	Kerbside sort
Warwick District Council	Kerbside sort
North Tyneside Metropolitan Borough Council	Co-mingled with caddy
Northumberland County Council	'On demand' hazardous waste collection

Under this objective, the intention was to evaluate and compare the different types of household hazardous waste collection schemes against the following criteria:

- i. the similarities and differences between the authorities;
- ii. the similarities and differences between their schemes;
- iii. the reasons behind the choice of wastes targeted;
- iv. how the scheme was rolled out;
- v. any public relations issues;
- vi. service performance, including quantities diverted;
- vii. contractual issues and potential constraints, including the time remaining on collection contracts; and
- viii. vehicles used for collection and remaining length of service under present contracts.

However, as highlighted above, the similar nature of the kerbside sort schemes and the limited collection of household hazardous waste through co-mingled collections meant that comparison under criteria i. and ii. was limited. The information gathered did however allow a high level comparison of kerbside sort and co-mingled collection, as well as an evaluation of the issues that need to be considered when introducing household hazardous waste to regular kerbside collections.

As part of this evaluation process and to assist in preparation of the guidance document, the project team identified any aspects of household hazardous waste collection that might have been difficult to implement in the case study authorities, or any aspects of the service that might have been improved.

North Tyneside MBC was included as an example of an authority who were operating a co-mingled collection, in this case using an additional caddy to capture certain materials. This case study highlights a fundamental issue for co-mingled collection, which is the need to keep the household hazardous wastes separate from the co-mingled materials because:

- the contamination of the recovered materials by household hazardous waste will affect the quality and value of the recovered recyclates and could lead to rejections by reprocessors; and
- Materials Recovery Facilities (MRFs) are designed to sort specific input streams utilising a mixture of mechanical and manual techniques and the majority of household hazardous wastes would be difficult to remove using the techniques currently employed.

Therefore as separation at MRFs is not currently practical, alternative approaches at the point of collection can be considered such as:

- the use of a “caddy” system,
- the placement of hazardous materials alongside the main recycling container for separate collection (as utilised by some kerbside sort schemes as discussed below); and
- the placement of hazardous wastes within ‘survival bags’ (a toughened bag which remains sealed during transport) in co-mingled mix for separation at the pre-sort stage. It is likely that this option would be limited as a result of operational factors at MRFs. No authorities were identified to be using this approach.

In comparison, for kerbside sort schemes the key issues are the presentation of the household hazardous wastes to ensure they can be easily identified by collection operatives and the provision of separate storage on the vehicle.

During the evaluation of the case studies for kerbside sort collections, an unexpected issue arose. Although care had been taken with the choice of authority in order to include collection schemes operated by a number of companies, no consideration was given to who had *previously* operated the collection services. All of the authorities using kerbside sort collections, with the exception of Doncaster, had used the contractor ECT (later May Gurney). The schemes had been set up by this contractor, and the authorities had made continuation of the existing recycling collection scope part of their tendering requirement for their current contractor. The choice of hazardous materials collected had been at the contractor’s suggestion, rather than being requested by the authorities. The original choice of materials by the contractor was partly driven by the value of specific hazardous waste streams. In addition, the authorities’ decision to select this scheme originally was partly because of the range of materials being collected within the scheme. The historic connection of these schemes makes a detailed comparison between the different authorities (in terms of the materials collected and the reasons for their selection) difficult, as the schemes were basically the same, even though some are now operated by different contractors.

The urban or rural nature of an authority did not appear to affect the decision to collect household hazardous waste at the kerbside (either kerbside sort or co-mingled). The coverage is dictated by the coverage of the kerbside recycling service. The kerbside schemes are offered to most households within an authority’s area, the main exception being multi-occupancy dwellings. One authority did not have full coverage for their scheme because there were a large number of terraced houses without front gardens in their area. These properties could recycle most of the full scheme’s hazardous wastes, with the exception of oil and automotive batteries.

For multi-occupancy dwellings, most authorities used a similar system of communal recycling bins for the large volume non-hazardous waste streams, such as paper and card, glass and cans. Within these communal schemes, all authorities included aerosols within the ferrous and non-ferrous waste stream. One authority had, in addition, provision for collecting some smaller hazardous wastes, such as household batteries from a number of multi-occupancy dwellings, where the communal bins are securely stored. No authority interviewed collected a full range of recyclates from multi-occupancy dwellings.

None of the authorities studied had introduced their household hazardous wastes collection in response to public pressure or demand for a particular household hazardous waste material to be included within the kerbside service. None of the authorities reported any specific public relations issues associated with the hazardous materials they collected. Within scheme publicity materials, none of the authorities highlighted the hazardous nature of the wastes collected within the regular kerbside collections. Northumberland County Council did however advertise their “on request” scheme as a hazardous household waste collection scheme.

Although it was intended that the study would identify the costs of providing a kerbside household hazardous waste collection and, if possible, the costs of collecting particular materials, comparative cost data could not be obtained from the case study authorities. It was found that the household hazardous waste collection element of a service could not be isolated from the service cost for the regular kerbside collection scheme. The local authorities interviewed provided indicative costs for the overall dry recycling collections in the region of £15 – 20 per household, with green waste and residual waste collections being closer to £10 – 15 per household. However these costs are indicative only and will vary depending on the authority involved. No breakdown of the costs for the individual material within a dry recyclate collection scheme was available from the local authorities.

WasteDataFlow data for 2007 was examined to determine the collection levels of household hazardous wastes within the regular kerbside collections. During the interviews more recent data for some wastes were provided by authorities. The quantities of certain materials can not be separated within the data, for example aerosols are reported within ferrous and non-ferrous arisings. The tonnage ranges for the different materials collected by the authorities are summarised in Table 2.

Table 2 Hazardous Materials Collected within regular Kerbside Collections

Material	Annual Tonnage Range (tonnes)	Kg per Household	Comment
Household Batteries	4 to 171	0.07 to 1kg	Upper figure appears to be a high level of arising
Automotive Batteries	7 to 52		Similar levels of arising to at HWRC sites
Mobile Phones	Below 1 tonne	<1	Low levels of arising but valuable waste stream
Used Engine Oil	1 to 10		
Aerosols	Unknown	Unknown	Not separated out from bulk ferrous and non-ferrous waste stream.

Northumberland County Council were included as an example of an authority operating a monthly 'on request' collection of household hazardous materials, including asbestos and household chemicals. The scheme is operated countywide and collects a wide range of materials many of which, owing to their chemical nature, would not be suitable for collection within regular kerbside recycling collections. The average breakdown of materials within the collections is in the region of 80% asbestos to 20% household chemicals, with around 30 collections per calendar month. In 2007 approximately 46 tonnes of asbestos and 10 tonnes of household chemicals were collected. In particular this scheme, owing to its more targeted nature, is able to segregate chemicals and transport them in compliance with the relevant transport legislation, which may not be possible within regular kerbside collections. Indicative costs for this scheme were around £90 per collection, plus an additional cost based upon the nature and volume of the material collected. Overall the costs were about £35-40,000 per annum for the scheme. However, one of the justifications for the scheme is the fact that the costs of removing these materials if they were flytipped would be in the region of £300 – 400 per incident.

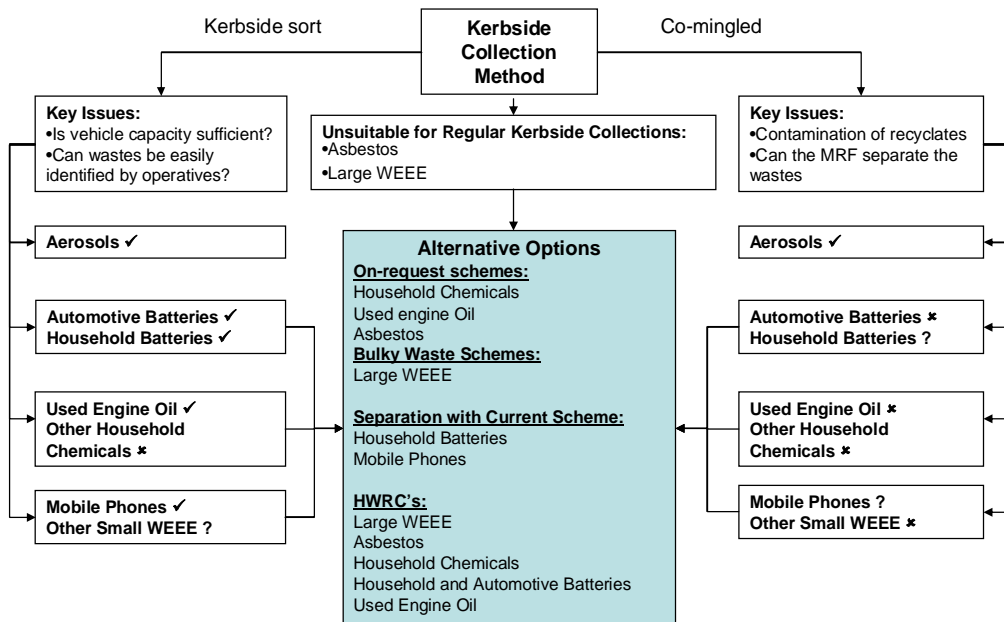
Bulky wastes schemes were covered within the interviews. Most of the authorities used such schemes to collect certain types of hazardous wastes, such as fridges and freezers containing CFCs and older CRT television sets. For the authorities interviewed bulky wastes schemes were generally operated in-house separately to the regular kerbside recycling scheme. All of the interviewed authorities apply some collection charge, generally in the region of £10 – 25 per collection. Some authorities had additional costs per item collected and many also placed a restriction on the maximum number of items that could be collected. Costs however were influenced by the item type in several cases; larger, heavier items such as chest freezers or pianos (which are not hazardous waste) in particular attracted a premium for collection. It should be noted that a number of authorities across the country offer free bulky wastes collections.

The roll-out of the additional materials within an existing scheme may be affected by a number of considerations such as the duration of the existing recycle collection contract and vehicle life within that contract, as well as the suitability of the scheme type for the specific waste stream. Most of the authorities interviewed stated that the lifespan of their existing vehicles and the space for additional materials within them constrained them from adding new materials in the short to medium term. However, one authority did state that they had requested contractors tendering for their contract to include an additional waste stream based upon the end point of that hazardous waste being the same as one as the existing collected hazardous wastes. Therefore, the addition of new materials to an existing scheme may be easier to introduce when contracts are up for renewal.

A flow chart was developed, Figure 1, based on the information gathered through the case studies and knowledge of kerbside collection options. This diagram shows that kerbside sort schemes may accommodate a wider range of household hazardous wastes (without major modification) and highlights the potential limitations within co-mingled collections and the alternative options available. Aerosols may be added to any recycling scheme within the ferrous and non-ferrous waste stream. Some other materials such as household batteries may be added to co-mingled collections by modifying the existing scheme. 'On request' collection services, such as that operated by Northumberland CC, are not constrained at all in what materials can be

collected and may be a valuable method to capture this waste stream, particularly for chemicals which are difficult to identify and segregate at the kerbside.

Figure 1 Suitability of Different Collection Methods for the Collection of Household Hazardous Waste



Key:

- ✓ Can be collected via this method
- * Unlikely to be suitable via this method
- ? May be unsuitable for collection via this method

The ability of local authorities to roll-out regular kerbside collection of household hazardous waste depends on a range of factors which are mainly linked to the type of collection operated. According to the WRAP report 'Kerbside Recycling: Indicative Costs and Performance' in 2007, approximately 44% of local authorities in England operated kerbside sort schemes and 46% co-mingled collections. The remaining 10% is unstated.

In the short to medium term the factors that limit most the roll-out of household hazardous waste collection will relate to contractual arrangements and the limitations of the existing vehicle fleet. The average length of a collection contract is 7 years, often with the potential for a 1 to 3 year extension. Vehicle renewal and replacement is often linked to contract renewal. Therefore in the short term, options that can be achieved by minor vehicle modifications have the potential to be rolled-out. Effectively this means that they will be limited to a proportion of kerbside sort schemes. In reality, local authorities are likely to focus efforts on collection of high volume non-hazardous recyclable materials, such as plastic and cardboard, before investing in systems to collect household hazardous wastes.

Summarised below are the key issues that need to be considered for each collection type.

Kerbside Sort

Approximately 150 local authorities operate kerbside sort schemes using a range of vehicles and the ability to include hazardous materials will depend on the vehicle type currently used. Most vehicles could accommodate a secure container in the cab for household batteries and mobile phones. The following points relate to other potentially suitable hazardous waste.

- 'Kerbsider' vehicles, which use troughs mounted to the nearside of the vehicle that are hydraulically loaded into compartments in the body of the vehicle, would be difficult (and costly) to adapt or retrofit with a banded compartment on the underside of the vehicle for the storage of used engine oil and automotive batteries. Therefore such changes would need to be considered at contract renewal or when new vehicles are procured.

- Stillage vehicles, which are purpose built using a series of cages or boxes for the different materials collected, are more flexible and it may be possible to adapt them to allow for the collection of used engine oil and automotive batteries, as well as household batteries and mobile phones with-in a secure box within the cab.

Co-mingled

Approximately 160 local authorities operate co-mingled collection schemes. The majority use a standard refuse collection vehicle, which could accommodate a secure container in the cab for household batteries and mobile phones. However authorities would need to provide a means of storing other hazardous materials, separate from mixed co-mingled material, at the kerbside e.g. using caddies or bags. As with 'Kerbsider' vehicles, a standard refuse collection vehicle would be difficult (and costly) to adapt or retrofit with a banded compartment on the underside of the vehicle for the storage of used engine oil and automotive batteries.

There are currently 81 MRFs in England and Wales, many of which accept materials from a number of local authorities. In the short and medium term, it is unlikely that MRF operators would invest in equipment specifically to separate hazardous materials. Some may consider the separation of 'survival bags' but this is considered unlikely, as improving material quality at MRFs is the current priority.

On-request Schemes

There are no specific operational barriers to the roll-out of "on-request" schemes; the key barrier is funding such a service.

Approach to meeting Objective 3: development of criteria to allow local authorities to assess the best approach for their circumstances

Approach to meeting Objective 4: production of a guidance document for local authorities seeking to introduce household hazardous waste collection

These two objectives were carried out in parallel as the criteria for the assessment of scheme approaches, were included within the overall guidance document.

The research and case study findings, scheme evaluation and criteria development, were brought together in a guidance document "Guidance on the Kerbside Collection of Household Hazardous Waste". The document is structured to address the following aspects.

- **Introduction**
 - The benefits of separating HHW from residual waste
 - What is HHW?
 - Application of the Hazardous Waste Regulations 2005 as amended
 - Typical levels of arisings
- **Kerbside collection options**
 - Collection considerations
 - Suitability of HHW to different collection methods
 - Multi occupancy properties
 - Permitting of reception facilities
 - Health and safety
- **Aerosols**
- **Batteries**
- **Household chemicals**
- **Mobile phones and other small WEEE**
- **On-request and bulky waste collections.**

Within Appendix 1 is a list of hazardous properties and EWC codes for household hazardous waste streams. A second appendix contains the five full cases studies and the two mini case studies.

Using the findings of the case studies, alongside reference to the relevant legislation and guidance, a series of collection options were developed to assist local authorities determine how to expand or implement household hazardous waste collections. The first stage in this process compared the suitability of the two main regular recycling collection types, kerbside sort and co-mingled and identified specific considerations in materials collection, transport or sorting for these two systems. This first section was illustrated using the diagram developed in Objective 2. The second stage examined specific material streams and the issues associated with collecting these within both regular collection systems. Discussion on the use of 'on request' and bulky waste schemes for those materials not suitable for regular kerbside collection, is also included.

In a kerbside sort collection, operatives separate materials into various compartments on the collection vehicle and it is therefore relatively straightforward to keep household hazardous waste separate from other materials. This prevents recyclate cross contamination and the introduction of new waste streams is relatively easy, provided there is storage on the collection vehicle. However, household hazardous waste needs to be easily identifiable by the collection operatives. Kerbside sort systems can be constrained by the number and size of compartments on the collection vehicle, and collection times per household can increase as the range of wastes collected becomes more complex. These factors can be mitigated by requiring householders to present items in a designated container (e.g. household batteries in a collection bag) by asking them to use original packaging where possible (e.g. for waste household chemicals) and by specifying where an item is to be placed for collection (e.g. waste engine oil to be left beside a recycling box). Rather than compromising dry recyclables collection capacity, banded compartments on the underside of a vehicle or secure storage within the vehicle cab, can be used to accommodate household hazardous waste. Several authorities reported the use of secure boxes within vehicle cabs for the transport of small items of household hazardous waste, such as household batteries and mobile phones.

In co-mingled systems, recyclable materials are collected mixed and sorted using a variety of mechanical and manual techniques at a MRF. For authorities operating co-mingled collections, the first step in deciding whether to roll-out household hazardous waste at the kerbside would be to consider if this is practical, given the separation technologies and techniques at the receiving MRF, whether there are pre-sort stages at the MRF, and whether contamination of collected recyclates by household hazardous waste can be avoided. For some materials such as aerosols there is no need to separate these, so they may be included within the mixed recyclables. The other identified household hazardous waste streams would require separation from the mixed recyclables. The alternative to MRF alterations is to modify the collection system itself, and three potential options emerged for this:

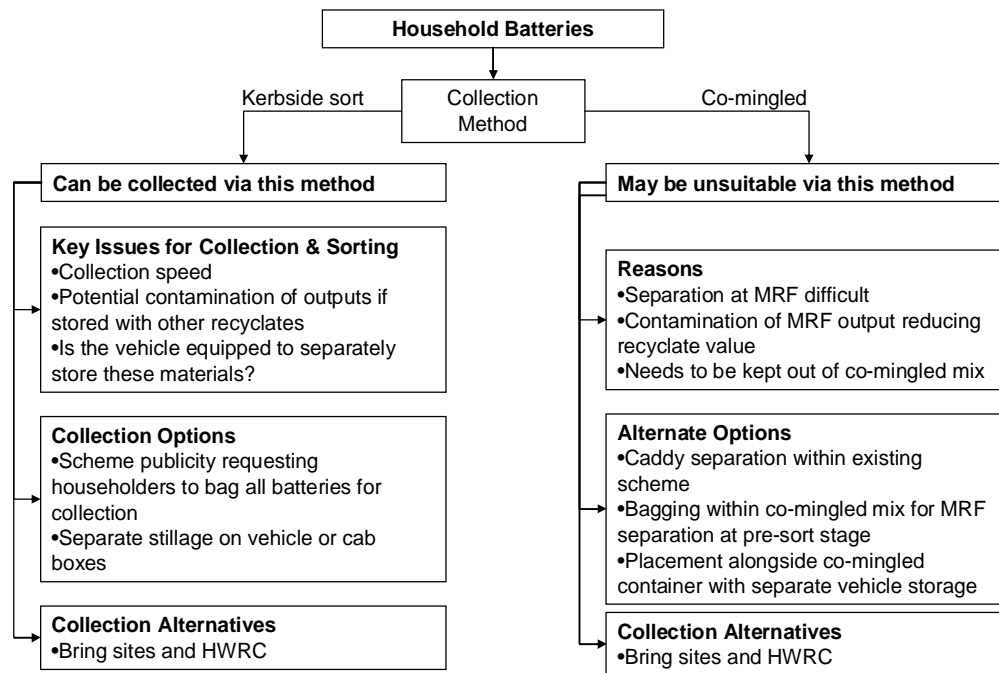
- use of a “caddy system” to collect household hazardous waste separately from the co-mingled mix, in a similar manner to that currently used by some local authorities to keep glass separate from other recyclates;
- separate placement of household hazardous waste beside the main recycling container. This is likely to be appropriate only for smaller items that can be stored securely in the vehicle cab; and
- placement of household hazardous waste in “survival bags” in the co-mingled container for removal from the mixed recyclables, which could be an option where the MRF has a manual pre-sort stage.

Some authorities commented that their collection vehicles were customised for the materials collected within their kerbside recycling scheme and had no additional space within them for new materials. This issue could only be addressed when the vehicles were up for renewal, which would be 5 – 7 years from their purchase.

For certain waste streams, particularly waste household chemicals, kerbside collection can be implemented through the use of an “on-request” collection service rather than using regular kerbside sort or co-mingled collections. The ‘on request’ collection operates in a similar manner to a household bulky waste service but requires householders to provide more detail on materials and volumes when the collection is booked. Such collection schemes are typically provided by a specialist contractor on behalf of the authority, rather than by an in house team, due to the necessity to identify and segregate chemicals correctly. A key consideration in deciding whether to roll out an ‘on-request’ collection would be the availability and extent of household hazardous waste facilities at HWRC sites in the area, householder access to these HWRC sites and cost.

The guidance document has been based upon these differences between the two main regular kerbside collection schemes. It is unlikely any authority would be approaching the collection of household hazardous waste from a completely fresh start; instead authorities will be looking to include these wastes within their existing collection schemes.

Materials specific considerations were presented as a series of collection option flowcharts. An example of flowchart is shown below, in this case for the collection of household batteries:



The materials specific flowcharts took into account:

- the experiences of the case study authorities;
- the requirements of relevant waste management and health and safety legislation;
- the type of collection system into which a hazardous waste stream might be introduced;
- key collection issues;
- the most effective method of regularly collecting at the kerbside;
- what alternative methods of collection might be considered.

Where handling considerations apply to either members of the public or collection operatives, these were highlighted in the relevant materials section. The study recommends that publicity materials include information on secure packing of HHW (ideally using the original packaging) so that HHW could be presented in a way that allowed clear and safe recognition by the collection operatives but that public information should also highlight the environmental risks of incorrect disposal (this might also encourage participation in a scheme). For collection operatives, no specific precautions should normally be needed other than safe handling of car batteries (weight issues) and avoidance of spillages of waste oil or other household chemicals.

Authorities considering introduction of HHW collections also need to ensure that they can comply with regulations governing Carriage of Dangerous Goods and have sought guidance from their Health and Safety Advisor.

The identified wastes discussed within the main guidance document were based upon those being collected by authorities within the case studies. Some household chemicals in particular are unsuited to kerbside collection as part of a normal recyclate collection, due to issues of chemical compatibility, difficulties in operative identifying them correctly when presented for collection and Carriage of Dangerous Goods considerations. These materials, as well as all of the materials discussed, could be collected within 'on request' type schemes or within bulky waste schemes.

A discussion of the results and their reliability

The guidance examines current legislation and relevant guidance governing household hazardous waste management and the issues surrounding separate collection of these materials at the kerbside, whether on a regular or on a targeted 'on request' basis. Typical levels of household hazardous waste arisings are considered, using compositional data as developed for the Environment Agency's WRATE model, which is an established and recognised life cycle analysis tool. The report looks at kerbside collection systems and the suitability of kerbside sort and co-mingled schemes for the collection of different types of household hazardous

material. As not all household hazardous waste is suitable for inclusion within regular kerbside collection schemes these materials were considered in the context of 'on request' or bulky wastes collections.

Case study information is highly reliable, being obtained directly from the local authorities studied, although the sample size was small. Data on arisings and number of households has come from validated data sources, such as WasteDataFlow and the Office of National Statistics.

The main implications of the findings

The main implications from the project are that:

- aerosols may be collected within any regular kerbside collection scheme which includes ferrous and non-ferrous wastes;
- more hazardous waste streams are likely to be suitable for regular collection within kerbside sort schemes, without scheme modification;
- where authorities operate a co-mingled collection, modification of existing practices to collect additional hazardous wastes may be possible. These modifications may include the use of caddies for collection of some materials, requiring householders to place items next to their recycle receptacle, or use of 'survival bags' for some wastes, although evidence was only found for the first approach;
- 'on-request' collections can be a viable alternative to inclusion of household hazardous waste within a regular kerbside service, particularly where HWRC provision is limited for these materials or where the aim is capture of household chemicals;
- bulky waste collections may also provide an option for the collection of certain hazardous materials such as household chemicals, large WEEE and asbestos;
- there is no great public demand at present for the collection of more hazardous waste streams from the kerbside. Public pressure tends towards larger volume waste streams such as plastic bottles and cardboard;
- authorities need to consider the contractual implications and vehicle limitations of introducing HHW collection, particularly for a recently awarded contract or where there are several years of contract life remaining;
- the cost of household hazardous waste kerbside collection could not be isolated from the service cost for the regular kerbside collection scheme.

With specific reference to kerbside sort collections the project found that:

- the introduction of household hazardous waste collection was as a result of services offered by a contractor as opposed to a requirement specified by local authorities;
- when hazardous wastes are collected, they need to be easily identifiable by operatives – this may require that some waste streams are packaged in a specific manner or placed for collection outside the recycle container;
- collection vehicles that have dedicated compartments or stillages for hazardous wastes, particularly for kerbside sort collections, may be limited in non-hazardous waste collection capacity;
- some hazardous waste streams may have specific health and safety considerations, such as automotive batteries due to their weight and acid content;
- the inclusion of additional wastes within a kerbside sort scheme may affect the sort time per household, although this issue may be overcome by requiring householders to package some materials to speed up their separation;
- source separation may reduce cross contamination of other recycles. This is particularly important when collecting liquid wastes such as used engine oil or using a co-mingled scheme, to prevent materials being rejected at reprocessing sites;

- the quantities of hazardous material available for kerbside collection are typically small, and on some collection days there may be no hazardous materials left out for collection. Rather than lose vehicle collection capacity for non-hazardous recyclable materials, some of the case study authorities used a banded compartment on the underside of a vehicle or stored small items (e.g. mobile phones) in sealed boxes within the vehicle cab;
- where excess materials have been left out for collection (i.e. more than vehicle storage capacity) it is important to maintain public confidence in the collection scheme. Some of the case study authorities for example used either vehicle cab storage for smaller hazardous items or a support vehicle to 'mop up' extra hazardous waste items.

With specific reference to co-mingled collections the project found that:

- where hazardous wastes do not need to be separated from similar items prior to reprocessing (e.g. aerosols) these materials may be captured via co-mingled collection;
- materials which are difficult to separate mechanically at a MRF (e.g. household batteries) or which could compromise material quality if inadequately separated (e.g. liquid wastes) may not be suitable for inclusion within the normal co-mingled collection;
- there are three potential modifications to co-mingled systems that could be used to develop collection of household hazardous materials – use of a separate caddy system, placement of materials within 'survival bags' in the bulk recyclates, or placement of hazardous items beside the main collection container.

For residents in multi-occupancy housing who have access to communal recycling containers, aerosols can be included with metals. Where communal containers are in a secure area, a smaller caddy can be provided for residents to place hazardous materials such as household batteries and mobile phones.

As an alternative approach to regular kerbside collections, hazardous wastes, such as waste chemicals, may be included within an 'on request' collection service. Some authorities refer householders to commercial waste contractors that are working in partnership with or on behalf of the authority.

Where hazardous wastes are added to an existing collection scheme, authorities need to confirm with their contractors that the transfer station (kerbside sort) or MRF (co-mingled collections) are permitted to accept these materials. This will be covered by the site Environmental Permit (formerly waste management licence) issued by the Environment Agency.

Health and safety issues mean that comprehensive risk assessments for the collection, handling, transportation and storage of the collected wastes streams will need to be prepared prior to the implementation of any hazardous waste collection. Advice needs to be sought from an authority's safety officer during design and operation of a collection scheme.

When developing waste handling procedures, environmental protection should be considered as well as health and safety and should extend to the public as well as to operatives. The project findings included that:

- the public should have clear information on how to present materials for collection and ensure these are safely packaged and easily identifiable;
- waste handling considerations for operatives are very much as for any other materials collected, however specific care needs to be taken with lifting heavy items such as automotive batteries and with potential spillage from used engine oil;
- environmental protection measures include safe packaging that allows proper materials identification, sealed on-vehicle storage to prevent spillage, and spillage clean-up equipment available at the point of collection and the receiving facility.

The project guidance document also advises service providers to consider whether Carriage of Dangerous Goods Regulations might apply to their household hazardous waste collection

Possible future work

An assessment of local authority approaches to dealing with household hazardous waste and associated production of the guidance document was a self-contained project and was not linked with other Defra

research work streams. As part of the project process and emerging from the project findings however, there may be opportunities to consider the following aspects of household hazardous waste collection:

- trials of different separate techniques within comingled collections;
- building on the work of the WRAP battery collection trials to look at different types of material;
- a followup survey of local authorities to establish how the guidance has been implemented.

It also emerged that the majority of the authorities collecting a wide range of materials had at some point during their collection service history utilised the same contractor. Consideration should be given to the approach taken by different waste management contractors nationally to household hazardous waste collection and whether this presents any particular constraints or opportunities.

References to published material

9. This section should be used to record links (hypertext links where possible) or references to other published material generated by, or relating to this project.

The following sources of information, guidance and legislation have been referenced within the project report.

The Haz Guide 2008. National Household Hazardous Waste Forum
http://www.hazguide.co.uk/pdf%20downloads/Haz_Guide_2008_PDF-Full.pdf

Environment Agency Technical Guidance WM2: Interpretation of the definition and classification of hazardous waste.
<http://www.environment-agency.gov.uk/business/topics/waste/32200.aspx>

The Waste Framework Directive
Directive 2008/98/EC on waste and repealing certain Directives
<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:312:0003:0030:en:PDF>

The Hazardous Waste (England and Wales) Regulations 2005
http://www.opsi.gov.uk/si/si2005/uksi_20050894_en.pdf

The List of Wastes (England) Regulations 2005
http://www.opsi.gov.uk/si/si2005/uksi_20050895_en.pdf

The Hazardous Waste (England and Wales)(Amendment) Regulations 2009
http://www.opsi.gov.uk/si/si2009/pdf/uksi_20090507_en.pdf

The Waste Batteries and Accumulators Regulations 2009
http://www.opsi.gov.uk/si/si2009/pdf/uksi_20090890_en.pdf

Waste and Resources Action Programme (WRAP)
http://www.wrap.org.uk/local_authorities/batteries/battery_recycling_information/index.html

British Aerosols Manufacturers' Association (guidance webpage)
http://www.bama.co.uk/household_recycling/

HSE Carriage of Dangerous Goods (guidance webpage)
<http://www.hse.gov.uk/cdg/>