Waste Options Appraisal

Document: GACWSR/02 Version: 03

Zero Waste Management Project

Aberdeen City Council

4 February 2012

Halcrow

Waste Options Appraisal

Zero Waste Management Project

Aberdeen City Council

4 February 2012

Halcrow Group Limited
City Park, 368 Alexandra Parade, Glasgow G31 3AU
tel 0141 552 2000 fax 0141 552 2525
halcrow.com

Halcrow

Document history

This document has been issued and amended as follows:

Version	Date	Description	Created by	Verified by	Approved by
01	24/01/12	Draft	Kirsteen Nixon	Doug King	Doug King
02	01/02/12	Draft	Kirsteen Nixon	Doug King	Doug King
03	04/02/12	Issue	Kirsteen Nixon	Doug King	Doug King
04	04/02/12	Issue 2	Doug King & Vicky McGoldrick	Doug King	Doug King

Contents

Appendix

1 Purpose of Appraisal

The purpose of the waste options appraisal is to determine the preferred waste collection and treatment options for Aberdeen City Council.

All Scottish Local Authorities are taking steps to ensure that the waste collection options they propose to offer capture the greatest quantity of recyclable material, therefore preventing valuable resources from being landfilled.

The success of any waste collection system is determined by the active participation of residents within a council's constituency.

In order to maximise participation of residents, any collection system should be made as straightforward and as simple as possible. The easier a system is to use the more likely that residents will participate.

It is also considered that universal services should be employed, wherever possible, to ensure that every resident has an equitable service and has an equal opportunity to participate. Employing varied services across a council area can cause confusion amongst the residents which in turn can lead to a drop in participation rates.

With these issues in mind the waste options appraisal considers the 'point of view' of residents as a central and key issue.

The General Waste Treatment Options Appraisal

The flow chart on the following page shows the stages of the project. The initial and current stages of the project are described in the following sections.

1.1 Option Screening and Development Workshop

1.1.1 Initial Options

An options workshop was held (24th October 2011) with Aberdeen City Council (ACC) and Halcrow staff in order to ascertain all potential options available for the collection and treatment of general refuse (residual) waste, dry recyclables and organic (food & garden/green) waste.

The initial options are identified in Appendix A.

1.1.2 Screening Exercise

Following on from the initial part of the options workshop identified above, a screening exercise was undertaken. This considered each of the options and determined whether these should be taken forward for further consideration or removed, due to how practical, flexible or economically viable they were to Aberdeen City.

The results of the screening exercise are identified in Appendix B.

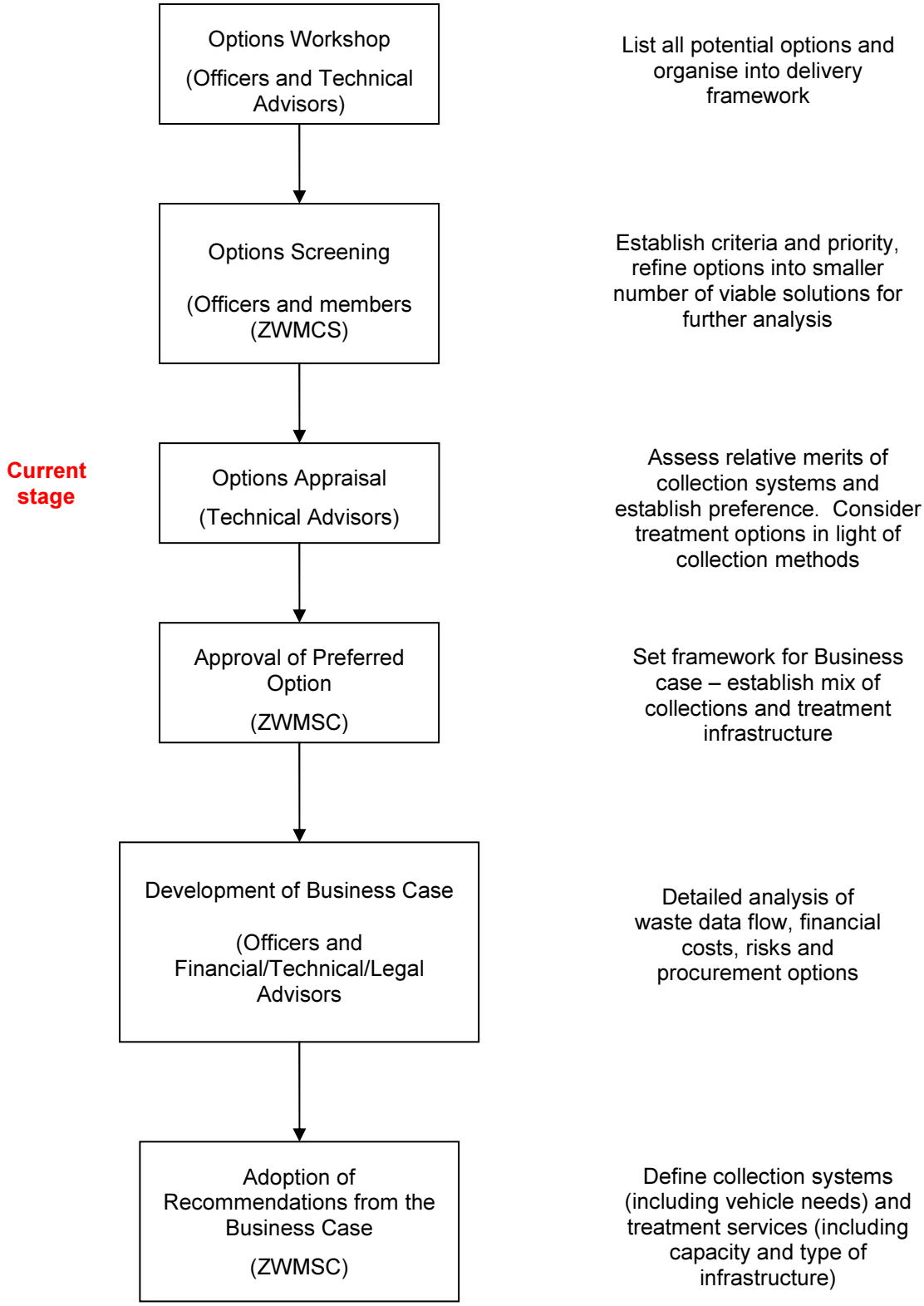
1.2 Options Appraisal

The initial stage of the options appraisal is to compare Kerbside Sort (KS) collection type with Co-Mingled (CM) collection type to establish the best dry recyclable type option for the City.

Following identification of preferred collection option, KS or CM, the chosen collection type options for each waste type will be assessed against agreed assessment criteria.

The assessment criteria were agreed by members of the Zero Waste Management Sub-Committee on the 11 October 2011. A copy of the Sub-committee paper is attached in Appendix C.

Finally, an evaluation will be undertaken to establish the best treatment option for general waste, recyclables, food waste and food & garden waste. At this stage, only general waste is considered. The report will be updated in due course to include an assessment of the treatment options for recyclables, food waste, garden waste and co-mingled food and garden waste.


Options Workshop
(Officers and Technical Advisors)
List all potential options and organise into delivery framework
Options Screening
(Officers and members (ZWMCS)
Establish criteria and priority, refine options into smaller number of viable solutions for further analysis
Current stage
Options Appraisal
(Technical Advisors)
Assess relative merits of collection systems and establish preference. Consider treatment options in light of collection methods
Approval of Preferred Option
(ZWMSC)
Set framework for Business case – establish mix of collections and treatment infrastructure
Development of Business Case
(Officers and Financial/Technical/Legal Advisors
Detailed analysis of waste data flow, financial costs, risks and procurement options
Adoption of Recommendations from the Business Case
(ZWMSC)
Define collection systems (including vehicle needs) and treatment services (including capacity and type of infrastructure)

2 Recyclables Collection Type Assessment

As stated in the introduction section of the report it is considered that universal services should be employed, wherever possible across the city, to ensure that every resident has an equitable service and has an equal opportunity to participate.

Employing varied services across a council area can cause confusion amongst the residents which in turn can lead to a drop in participation rates.

The following section therefore considers the merits of the two broad types of recyclable collections (kerbside sort and co-mingled) with the intention of selecting one of the options to be introduced city wide.

Kerbside Sort (KS) v Co-Mingled (CM)

The provision of recyclable material collection services is mainly to affect high participation rates, maximising recovered tonnage, maximise carbon metric potential and delivering a high quality of recovered materials.

For schemes to be effective, it is essential that a comprehensive service is provided for recyclable materials and that sufficient capacity is provided for the householder to store the materials prior to collection. Many residents are confused by complicated rules applied to some schemes and by the degree of variation between schemes in neighbouring authorities. Recycling schemes should be **as simple as possible** for the users and **clearly communicated to them**.

Local authorities employ various systems and combinations of systems for the collection of recyclable material from domestic properties. These systems however are variations of two main methods of collection namely kerbside sort and co-mingled. The following are recognised definitions of these collection methods:

- Kerbside sort systems are where materials are sorted by material type at the kerbside into different compartments of a collection vehicle.
- Single stream co-mingled systems are where materials are collected in a single compartment vehicle with the sorting of materials occurring at a Materials Recycling Facility (MRF).
- Two stream partially co-mingled systems are where residents are required to separate materials into two categories, usually fibres (paper/card) and containers (glass, cans and plastic bottles). Separate containers are provided for each category, the contents of which are loaded into separate compartments on a twin compartment collection vehicle. It is considered that although this two-stream option can be seen as potentially offering some of the benefits of a kerbside sort system it can suffer from issues such as increased collection times and the efficiency benefits of single stream co-mingled collections. On the basis of establishing a system that provides greater flexibility and efficiency this option is not considered further.

Some of the key issues to be considered when deciding which type of collection system to adopt in a local authority area for recyclable materials are:

- The property types from which the material has to be collected.
- The property mix within a local authority area;

- The range of recyclable materials collected. Particular consideration ought to be given to
  - bulky materials such as plastic bottles and cardboard;
  - high carbon materials (to maximise the ability to satisfy Scottish Government carbon targets)
- The capacity provided to householders to store their recyclables prior to collection, be that in bags, boxes or bins;
- Reliability and quality of the collection services;
- The quality of the recyclable materials being recovered;
- Maximising the tonnage and carbon metric of segregated recyclable materials recovered from the household waste stream and the participation levels achieved; and
- Equality of service provision across the community; and
- Flexibility of service provision to deal with changing requirements.

The following is considered in the assessment of KS v CM collections systems.

1. **Evaluate the practicality of introducing either a KS or CM collection type across the City.**

It is estimated that Aberdeen City comprises the following property types:

- 54,000 single properties
- 58,000 flatted properties (of which 4455 properties are considered 'very' high-rise, meaning 7 storeys or more)

Kerbside sort collection systems are best suited to detached, semi-detached and terraced houses, on the basis that space for the required container types and access for collection vehicles and operatives is generally not an issue. In these types of properties the occupier can present their containers at the kerbside for collection.

Kerbside sort systems however are less efficient for the collection of recyclable materials from flatted properties particularly if the material is collected from each doorstep or landing. If a communal kerbside sort system of collection is provided to flatted properties it can prove costly, inefficient and difficult to accommodate the storage capacity required for the number and capacity of the communal containers required. Storage capacity issues can be mitigated by increased frequency of collection however this has an impact on the overall collection costs.

Access for collection vehicles and operatives can also be problematic when servicing flatted properties particularly if a kerbside sort system is introduced.

Kerbside collection schemes may be suitable for some smaller blocks of flats, such as converted houses however it is not efficient or cost effective to introduce different collection systems for every variation in property type.

For these reasons local authorities mainly provide communal co-mingled collections of recyclable materials to flatted properties. It is recognised that single stream co-

mingled collections may be appropriate in dense urban areas or for high density flats, areas of high transience and multi-occupied properties.

Kerbside co-mingled systems can be combined with multi-occupancy dwellings using larger bins, enabling the same system (and vehicles) across the whole authority area.

Based on the split of property types in Aberdeen City, if one system is to be introduced across the City practicality suggests that this should be a **co-mingled collection.**

2. **Evaluate the flexibility of KS and CM collection types, in particular in relation to their ability to add or remove single recyclables.**

A good scheme should be designed to absorb, or adapt to, increasing quantities of recyclable materials resulting from increased participation and recognition. A good scheme should have the flexibility to add or remove materials at a later date. This will have implications on:

- the number, type and capacity of containers

Co-mingled collection systems tend to utilise wheeled bin containers with a choice of capacities; 140, 180 and 240 litres for kerbside up to 1100 litres for communal collections. Such containers are considered flexible in their use, particularly if the Council requires to add or remove recyclable materials from their system.

Smaller boxes/crates/sacks are regularly used for kerbside sort systems. These types of containers allow contaminants / non-recyclable materials to be rejected and left at the kerbside which is not possible for co-mingled collections within wheeled bins. The size of the containers (with limited capacity) makes them less flexible to adding additional recyclable materials to the kerbside sort system. Adding additional recyclable materials may therefore result in having to change the size and number of containers given to householders.

Wheeled bins are therefore considered more flexible in relation to the addition or removal of recyclables. Householders will find it easier to add or remove recyclables from one container, i.e. wheeled bin as opposed to several containers.

- the number and capacity of vehicles

Two types of vehicle are typically used for KS; Kerbsider or Stillage. Kerbsider vehicles can be less flexible in the type and range of materials that can be collected, with a limited number of compartments available. Stillage vehicles are purpose built and comprise a number of cages or boxes for different materials; however tend to have smaller overall capacities.

Single stream co-mingled collections collect all recyclable material together usually in a single compartment vehicle or sometimes in the same compartment of a split vehicle where the recyclables are co-collected with refuse. These collections can be flexible on round design and can collect from more properties per round as they are not as constrained by stillage or compartment capacities for individual materials and materials are compacted

The most commonly used vehicles for co-mingled collections are standard Refuse Collection Vehicles (RCVs). The advantages of RCVs for co-mingled collection include their flexibility, their ease of hire in the event of breakdown or maintenance

and their quick off-loading times. RCVs also have the ability to be utilised for collecting other wastes, e.g. general refuse and green waste.

Kerbside co-mingled systems can be combined with multi-occupancy dwellings using larger bins, enabling the same system (and vehicles) across the whole authority area.

It is therefore considered that the use of RCVs is more flexible as they can be used for all waste types required to be collected by the Council. Kerbsider/Stillage vehicles are specific to collecting recyclables and therefore are less flexible.

- bulking/sorting requirements

The ability to add materials to a co-mingled collection may be limited by the sorting capabilities of available MRFs as MRFs are designed to accept a specific range and mix of materials.

With kerbside sort, provided there is a market for an additional recyclable material and suitable available reprocessors, bulking /sorting is considered more flexible. With this system sufficient footprint space is required at transfer station(s) with separate bays for bulking the separately collected recyclable materials.

With co-mingled systems often the main difference between systems is whether or not glass is included. If glass is collected in a co-mingled form with other recyclable materials special segregation facilities need to be provided at the MRF to retrieve the glass and segregate the various glass colours. The issue is whether the MRF can accept glass and also separate the different coloured glass sufficiently to send on to reprocessors. It is acknowledged that MRFs can be designed to separate the different coloured glass however that this can be costly. For these reasons glass in normally collected separately.

Kerbside sort collection is considered more flexible than co-mingled collections in relation to bulking/sorting requirements.

- communications

Changing the recycling scheme by adding and removing materials will possibly, for the short-term, result in household confusion, i.e. the wrong materials being presented for collection or participation rates being affected.

With kerbside sort, operatives can communicate directly with the householders when the wrong material has been added. This is generally undertaken by placing stickers on the boxes which informs the householder as to why the material has been left in the container and not collected.

With co-mingled collections it is more difficult to communicate instances where the wrong material has been placed by the householder within the wheeled bin. In particular the wrong material may not be identified until it reaches the MRF, at which point direct communication is more difficult.

It is considered that changes to kerbside sort collection systems are easier to communicate with householders than with co-mingled collection systems, therefore making the system more flexible.

- contractual arrangements

It is important that any contract let by the Council for the collection and/or treatment of recyclates includes a provision to allow flexibility in the materials to be collected and/or treated. This applies equally to both kerbside sort and co-mingled collection systems.

3. **Estimate the likely participation rates for KS and CM collection types across the City.**

High levels of participation and material recovery can only be achieved if the public are engaged using effective communication. Effective communication involves:

- motivating residents to use the scheme - by providing relevant information about the benefits of recycling;
- informing residents how to use the scheme – by providing clear instructions about what, when and how;
- engaging with residents about problems/issues with the service – by including mechanisms for the public to provided feedback; and
- encouraging residents to continue using the scheme – through positive feedback and providing a reliable, high quality service.

It is considered that the frequency of the general refuse collection will impact on the participation rate of recycling; there will be higher participation and therefore greater quantities of recyclables to be collected with a fortnightly refuse collection

A study by WRAP on the performance of kerbside dry recycling in the UK confirms that levels of deprivation are influential in affecting kerbside dry recycling performance, with areas with higher levels of deprivation generally achieving lower performance (once all other factors in the study are taken into account).

There are practicality issues associated with the bags/boxes provided for kerbside sort collections, in particular loss of the bags/boxes is often cited as a reason why people don't continue with recycling. Access to communal commingled recycling containers should be considered when introducing a co-mingled collection.

Estimating likely participation rates for either a kerbside sort or co-mingled collection system is problematic. In order to obtain estimates, it can be beneficial to undertake trials taking account of property types, collection systems and levels of deprivation. No generic information has been identified during this appraisal that can be used to estimate likely participation rates and therefore the impact on the type of collection system.

Notwithstanding this, it is a known fact that recycling schemes should be made as simple as possible for the users in order to maximise participation. To this end co-mingled collections are considered the 'simpler' option, particularly for residents of flatted properties. The logistics of providing a kerbside sort system for flatted properties is far from straightforward. To implement such a scheme would require each resident within a flat to store the recyclables in separate containers, placing them either outside their door on collection days or placing the recyclables within central separate bins. Storing containers outside the doors of flats could result in space issues, untidiness and indeed health and safety hazards (e.g. tripping).

There is more chance of residents of flatted properties placing recyclables in one communal bin outside the building as this is one simple action, it is tidier and removes health and safety hazards.

It is also considered far more efficient to service one communal bin at flatted properties than to service each property within the flats. To service each property would take considerably more time which will markedly increase the costs of collection.

4. **Estimate the likely potential recyclable capture rates for KS and CM collection types.**

Greater weekly equivalent containment capacity is associated with better kerbside dry recycling performance. In particular, this means that for a given volume of dry recycling kerbside collection containment, weekly dry recycling collections perform better than where dry recycling is collected less frequently.

The purpose of this part of the review is to consider which collection system, KS or CM, will deliver the best return to Aberdeen in terms of recycling tonnages.

Estimates of the potential recycling tonnages for Aberdeen City Council could be obtained through suitable and sufficient trials at various property types across the City.

In the absence of such trials relevant information has been obtained from the following available published reports.

WRAP – Kerbside Recycling: Indicative Costs and Performance – June 2008

The report intended to provide a systematic appraisal of the characteristics of the principal kerbside recycling collection systems looking at both their cost and effectiveness. The report was not intended to identify a "best value" or "best" system.

The study focused on three main kerbside collection systems currently operating: kerbside sort; single stream co-mingled and two-stream partially co-mingled. Although it was not the intention of the report to provide a definite answer to the question "which is the best system for me?" by its nature it identified some systematic differences in the options examined. The conclusions which are most relevant to this appraisal are as follows:

- There **is little variation in yields between the three main scheme types** but, within schemes, variants which collect glass and have an alternative weekly collection of refuse exhibit the greatest diversion rates.
- Recycling collections are maximised when customers are provided with adequate capacity through more or larger containers and/or weekly collections of recyclable materials.
- There appears to be no systematic advantage for one recycling system based on the 'urban' or 'rural' nature of the area served.

As part of the research WRAP undertook modelling using the Kerbside Analysis Tool (KAT). The relevant outputs for this part of the review include:

- **The yield of recyclables collected** – presented as kg/household/year (kg/hh/yr)

- **Capture Rate** – presented as percentage of targeted materials collected from served households.

The above stated outputs from the models are summarised in the three tables below:

Kerbside Sort Systems Modelled for Kerbsider and Stillage Vehicle Options - Urban

Ref	Refuse frequency	Recycling container	Recycling Frequency	Materials Collected				Vehicle Type	Yield (kg/hh/yr)	Capture (%)
				Paper	Glass	Cans	Plastic			
KS1	Fortnightly	2 boxes + 1 lid	Weekly	✓	✓	✓		Kerbsider	137	73
								Stillage	137	73
KS2	Fortnightly	2 boxes + 1 lid	Fortnightly	✓	✓	✓		Kerbsider	124	66
								Stillage	124	66
KS3	Fortnightly	2 boxes + 1 lid	Weekly	✓	✓	✓	✓	Kerbsider	147	73
								Stillage	147	73
KS4	Weekly	1 box	Weekly	✓	✓	✓		Kerbsider	109	58
								Stillage	109	58
KS5	Weekly	1 box	Fortnightly	✓	✓	✓		Kerbsider	96	51
								Stillage	96	51
KS6	Weekly	2 boxes + 1 lid	Weekly	✓	✓	✓	✓	Kerbsider	117	58
								Stillage	117	58
KS7	Weekly	2 boxes + 1 lid	Fortnightly	✓	✓	✓	✓	Kerbsider	102	50
								Stillage	102	50

The yields vary between 96 and 147kg/hh/year.

Single Stream Co-mingled Recycling Systems Modelled - Urban

Ref	Refuse frequency	Recycling container	Recycling frequency	Materials Collected				Area type	Yield (kg/hh/yr)	Capture (%)
				Paper & card	Glass	Cans	Plastic			
SSCo1	Fortnightly	240l wheeled bin	Fortnightly	✓	✓	✓	✓	Urban	157	65
SSCo2	Fortnightly	240l wheeled bin	Fortnightly	✓		✓	✓	Urban	119	64
SSCo3	Weekly	Sack	Weekly	✓	✓	✓	✓	Urban	136	57
SSCo4	Weekly	Sack	Weekly	✓		✓	✓	Urban	105	57

The yields vary between 105 and 157kg/hh/year.

The potential yields relating to the collection systems are similar with a slightly higher maximum yields for co-mingled collection systems.

WRAP – Kerbside Collection Options – Wales – January 2011

The overall aim of this study was to identify, with greater certainty, which of the following options for collecting dry recyclables perform relatively better or worse in relation to Welsh Assembly Government's sustainability objectives:

- sorting materials at the kerbside;
- two-stream collection, with material separated into two streams at the point of collection, with further sorting at a materials recovery facility (MRF) required; or;
- single-stream co-mingled collection of materials with sorting at a MRF.

WRAP conclude in this report that co-mingled systems could be expected to **achieve higher yields of collected dry recyclables, relative to kerbside sorting**. However, when material rejected at the MRF, by secondary processors and by reprocessors is taken into account, differences in tonnage actually recycled between the systems appear to be marginal.

There is no information currently from WRAP that provides certainty on whether either kerbside sort or co-mingled collection systems result in higher capture of recyclable material from householders.

WYG – Review of Kerbside Recycling Collection Schemes in the UK in 2009/10 – May 2011

In May 2011, WYG published the above paper as an update to its 2010 report 'Review of Kerbside Recycling Collection Schemes Operated by Local Authorities', which analysed performance of local authorities in England in 2008/09.

The 2009/10 report was expanded to cover the whole of the UK, including Scotland. Yields for each local authority were calculated from WasteDataFlow figures for 2008/09 and 2009/10. Of the 32 local authorities in Scotland, data for 29 are included in the analysis.

The report concludes that the highest dry recycling performances are achieved with:

- **100% co-mingled dry recyclates collected fortnightly in wheeled bins, plus**
- **refuse collections being made fortnightly from wheeled bins, and**
- **at least the five main materials being collected for recycling: i.e. paper, card, cans, glass and plastic bottles.**

In addition the report confirms:

- **Of the Top 30 performing recycling Councils in the UK, 23 collected 75% or more of their materials co-mingled.**

The report confirmed ways of significantly increasing yields by:

- **Collecting recyclate co-mingled**;
- **Increasing the recycling container capacity by use of a wheeled bin**;
- Increasing the range of materials collected at the kerbside, e.g. glass, cardboard, plastic bottles and other plastic containers;

- Reducing the residual waste volume by reducing the frequency or container or both;
- Increasing the recycling collection frequency (for kerbside-sort schemes, there is no advantage for 100% co-mingles schemes).

Estimates of the likely yields of recyclable material for either kerbside sort or comingled collection systems could be obtained through suitable and sufficient trials at various property types across the City.

Of the available reference data, WRAP has concluded that co-mingled systems could be expected to achieve higher yields of collected dry recyclables, relative to kerbside sorting. However, when material rejected at the MRF, by secondary processors and by reprocessors is taken into account, differences in tonnage actually recycled between the systems appear to be marginal.

WYG reports confirm that the highest dry recycling performances are achieved with 100% co-mingled dry recyclates collected fortnightly in wheeled bins, plus refuse collections being made fortnightly from wheeled bins, and at least the five main materials being collected for recycling: i.e. paper, card, cans, glass and plastic bottles.

Taking the conclusions from these reports it would appear that co-mingled collection systems will provide a higher return of recyclables (i.e. higher yield kg/hh/yr) when compared to kerbside sort collection systems however as it cannot be categorically determined that one system will provide significantly higher yields that the other this cannot be considered to be a determining criterion.

5. **Estimate the likely indicative costs of introducing either a KS or CM collection type across the City.**

In order to assess costs for recycling collection systems a number of parameters need to be considered. These parameters include:

Collection

According to available data from WRAP (June 2008) when assessing the cost of co-mingled systems, consideration should be given to all cost elements. The collection only costs of co-mingled collection systems are lower than similar kerbside sort options due to larger round sizes resulting from quicker collections.

This is supported by the WYG findings (May 2010) which confirms that kerbside sort operations generally incur greater collection costs.

MRF Costs

In terms of co-mingled systems there are additional costs associated with the requirement to further treat the collected recyclables at a MRF. In order to estimate these costs location of the MRF and the gate fee associated with the MRF require to be known. The overall net cost of collecting and sorting co-mingled materials is therefore sensitive to the MRF gate fee. Additional costs associated with kerbside sort systems can include bulking and sorting (where some streams are collected together) of the collected materials prior to being sent to reprocessors.

Contamination introduced by the householder can be an issue in co-mingled collections. The additional material being collected will increase running costs, in addition gate fees will be paid on all the material entering MRF. Contamination levels

are likely to be dealt with in any waste management contract procured by the Council.

According to the WRAP report (2008) when these additional costs are taken into account the net costs of co-mingled collection systems can be higher once MRF gate fees and the cost of handling contamination are accounted for.

Landfill Cost Savings

On the basis that co-mingled systems provide a higher yield of recyclables, increased diversion from landfill will reduce the overall landfill disposal and associated tax costs.

Cost Estimates

In order to estimate the costs of either a kerbside sort or co-mingled collection system for Aberdeen City, further examination of data is required. This would include likely tonnage yields, vehicle and manpower costs, MRF gate fees, location of MRF/reprocessors, contamination levels and landfill costs including tax.

From the studies considered above the indication is that a co-mingled collection system, although historically perceived to be more expensive when combining collection and sorting costs, has the potential to be the most economical solution for the Council, subject to any contract and MRF costs.

6. **Evaluate the quality of the collected recyclables from both KS and CM collection types.**

The main advantage of sorting the material at the kerbside is that contamination of materials that cannot be recycled is identified and left in the container and that targeted materials are not compacted during the collection process. If the reasons for this rejection are explained to residents there should be an improvement in the understanding of the service resulting in its correct use. More importantly, kerbside sorting ensures a high quality material for market with typical contamination levels of less than 0.5%. In kerbside sort systems, most materials are kept in separate streams on the vehicle and not compacted, though some material streams can be collected mixed, e.g. cans and plastic bottles. This is to reduce the picking time and increase the effective use of space on the vehicle.

Co-mingled collections, particularly single stream collections, face quality problems from three sources: householders putting the 'wrong' materials into the collection, compaction of the waste which breaks glass into small pieces and tends to bind materials together, and the technical and physical capacity of the MRF to separate materials in the volumes delivered to them. Communication with the residents can assist in a reduction of the contamination rates. The case studies presented in the WYG report suggest that intensive publicity and well educated residents in terms of what materials are accepted by the collection scheme have resulted in bringing contamination rates [for co-mingled collections] down.

Good practice for co-mingled collections indicates that materials should not be over compacted during collection as this can impact on material quality and the efficiency of MRF sorting.

Technology for sorting materials is constantly improving meaning that improvements in MRF capabilities are possible where local authorities and MRF providers work together.

Waste rejected at MRFs derive from two sources: contamination of incoming recyclables to the MRF, and the residue resulting from the MRF processing.

The Environment Agency (EA) considered 10.8% to be a typical average reject rate in 2008. There are studies available indicating a wide range of contamination rates in some cases less than the EA average rate of 10.8% potentially as low as 2%.

In addition to MRF reject rates, rejection by processors should be considered. The study undertaken by WYG Environmental (May 2010) indicates that in some cases MRF operators are reporting low levels of rejection by reprocessors (<4% of material). Others however reported high rejection (10-30%); reasons for this are cited as food contamination of cardboard, wet paper and general household contaminated paper. [Note the overall rates refer to inputs derived from a number of sources: partial sort, co-mingled and commercial]

It is commented in the WYG report (2010) that one of the situations which generate high contamination rates [at the Greenstar plant in Aldridge] concerns communal bins at flats, although no specific reasons are given to why this may be the case. This does not mean that these loads are rejected by the facility however will require additional sorting and the authority made aware in order to target the appropriate residents/properties where there may be an issue. It is evident from the study presented by WYG that the technology and inspection processes in place at the MRF play are large part in keeping contamination rates down. The plants included in the study appear to have little difficulty in selling materials recovered to reprocessors. An interesting point raised is that some aspects of contamination such as wet paper as are much applicable to KS collections as to CM collections.

Materials collected via kerbside sort systems are of a higher quality than materials collected via co-mingled systems. The evidence to support this is kerbside sort contamination levels are low (circa <0.5%) whereas contamination of co-mingled systems are higher, between 2 and 10% on average but contamination rates are constantly improving with changing technology. Contamination can include non-targeted materials, residues from MRF sorting process, rejects from reprocessors and general food/water type contamination.

7. **Evaluate KS and CM collection type's ability to comply with both National Regulations and Policy and ACC's Agreed Base Case.**

European Regulations and Policy

The EU Waste Framework Directive 2008 (2008/98/EC) (WFD) is a revision of an earlier Directive (2006/12/EC) and it clarifies key concepts, including new measures in relation to waste prevention, the concept of whole-life-cycle of products and a new focus on reducing the environmental impacts of waste generation and management.

The main issues associated with this Directive include:

- new definition of bio-waste
- requirement for bio-waste to be collected separately

- requirement for separate collections for paper, metal, plastics, glass
- increased responsibility for the producers of waste
- requirement for installations for the recovery of mixed municipal waste
- new preparing for reuse and recycling targets for household waste of 50% by 2020

With regard to recycling, the WFD requires Member States to set up separate collections of waste **where technically, environmentally and economically practicable** and appropriate to **meet the necessary quality standards** for the relevant recycling sectors. Specifically, by 2015 separate collection shall be set up for **at least** paper, metal, plastic and glass. In addition, the WFD requires Member States to take the necessary measures designed to achieve a target of a minimum 50% (by weight) the preparation for re-use and recycling of at least paper, metal, plastic and glass from households, and possibly other origins, by 2020. Reference should be made to participation and recyclables yields discussed earlier in this report. In order to achieve a 50% (tonnage) minimum re-use and recycling target, the most appropriate kerbside collection system should be employed by ACC. Although there is no clear answer as to whether this should be a kerbside sort or co-mingled collection system available data suggests that co-mingled will better enable ACC to meet this 50% target by 2020.

It should be noted that this requirement is UK wide and not directly applicable to ACC. This target is also a minimum and relates to **at least** paper, metal, plastic and glass; it does not necessarily include organic wastes.

The WFD also requires that Member States support the use of recyclates in line with the waste hierarchy and should not support the landfilling or incineration of recyclates whenever possible.

National Legislation and Policy

The following table details the current Scottish Government recycling and composting targets.

Target/Cap	Year	Measure	Derivation
40% recycling/composting and preparing for re-use of waste from households	2010	Tonnage	Scottish
50% recycling/composting and preparing for re-use of waste from households	2013	Carbon	Scottish Government Target
60% recycling/composting and preparing for re-use of waste from households	2020	Carbon	Scottish Government Target
No more that 5% of all waste to go to landfill	2025	Tonnage	Scottish Government Target

Target/Cap	Year	Measure	Derivation
70% recycling/composting and preparing for re-use of all waste	2025	Carbon	Scottish Government Target

In order to achieve the tonnage and carbon targets for the re-use and recycling of household waste, the most appropriate kerbside collection system should be employed by ACC. Although there is no clear answer as to whether this should be a kerbside sort or co-mingled collection system available data suggests that co-mingled will better enable ACC to meet these targets.

In October 2011 the Scottish Government released a policy statement on the proposed Zero Waste Scotland Regulations in response to a consultation on the draft regulations in early 2011. The policy statement sets out various decisions, requirements and deadlines for waste collection. Key aspects of the proposed Regulations, relevant to the collection of recyclables are summarised below:

- The Regulations will introduce measures to ensure the quality of materials collected and processed - any collection system and treatment of dry recyclables will need to be able to comply with the requirements of the Regulations.
- The Regulations will stipulate that co-mingling of dry recyclables will only be permitted where the hierarchy is not undermined and the outputs from the MRF are comparable quality to that collected separately at kerbside - the potential implications of this are that the quality of materials from a co-mingled collection system must be comparable to that of a kerbside sort system; this will rely heavily on the quality of the sorting process at any MRF used.
- There will be a requirement on local authorities to offer separate collection of glass, metals, plastics, paper and card to householders by 2013. In the same way as the current duties on local authorities to offer black bag waste collection services to householders and businesses, this new duty will also apply to householders and businesses.
- Provisions will be made in the Regulations to enable Ministers to issue quality standards (or codes of practice) for recycling. This will allow statutory based standards to be introduced if required.
- Statutory actions of the Regulations will include source segregation and separate collection of the key material recyclable materials; key recycling materials are paper, card, glass, metals and plastics. Food waste is also targeted due the environmental benefits of managing bio wastes separately. Different regulatory requirements for separate collection apply to collection services to householders by local authorities.
- Once recyclable materials have been segregated they must be managed in a way which does not compromise their quality. SEPA will be responsible for ensuring segregated materials are not mixed with other wastes.
- There will be a ban on landfilling the key recyclable materials. This supports the upstream source segregation and separate collection measures taken to

maximise levels of quality recycling by banning those materials from landfill when they are source segregated and separately collected.

The key issue with the revised Directive and the proposed Regulations is the interpretation of "separate collection" in relation to glass, metals, plastics, paper and card. There is currently a review of legislation in England and Wales directly related to this issue - DEFRA, following the adjournment of Judicial Review, is currently seeking further guidance on the interpretation of the Directive and to amend the Waste (England and Wales) Regulations 2011. Further clarity is required of this particular issue with regard to the potential impact on the chosen collection system.

The definition of separate collection in the Directive is "the collection where a waste stream is kept separately by type and nature so as to facilitate a specific treatment".

This "separate collection" issue needs to be considered in line with the current Zero Waste Policy Statement and proposed Regulations. **This issue has the potential to eliminate co-mingled collection systems as an option for all local authorities in Scotland including Aberdeen City.**

Zero Waste Scotland intend to stipulate in the regulations that co-mingling of dry recyclables **will only be permitted where the waste hierarchy is not undermined (e.g. glass separated for re-melt) and the outputs from the materials recycling facility (MRF) are of comparable quality to that collected separately at kerbside.**

The Council should consider the implication of this potential stipulation when determining the specification of co-mingled (glass included), MRFs and definition of materials to be included in a co-mingled collection service.

Kerbside sort collection systems are considered compliant with the relevant National Legislation and Policy provisions and requirements as they relate to "separate collection".

ACC Agreed Base Case

It is agreed that the base case for this Options Appraisal is as follows:

- *Municipal waste growth will be eliminated by 2015*

Waste Growth is not an issue that can be controlled or eliminated by the selection of either a kerbside sort or co-mingled collection of dry recyclables. This issue is therefore not considered further.

- *Source segregated municipal waste recycling and organic waste treatment targets are:*
  - *45% by 2013*
  - *50% by 2020*
  - *56% by 2025*

Reference should be made to participation and recyclable material yields discussed earlier in this report. In order to achieve the above targets for source segregated municipal waste recycling and organic waste treatment target, the most appropriate kerbside collection system should be employed by ACC. Although there is no clear answer as to whether this should be a kerbside sort or co-mingled collection system available data suggests that co-mingled will better enable ACC to meet these targets.

- *Introduce organic waste collection for all households and develop treatment facilities within the Aberdeen area by 2013*

This is not considered a relevant issue for determining the 'best' option for collection of dry recyclable wastes.

- *Municipal residual waste treatment capacity including (Energy from Waste (EfW)) should not exceed 50% by 2020 and 40% by 2025*

This is not considered a directly relevant issue for determining the 'best' option for collection of dry recyclable wastes.

- *No more than 5% of municipal waste should be landfilled by 2025*

This is not considered a directly relevant issue for determining the 'best' option for collection of dry recyclable wastes.

- *That general refuse treatment systems will meet the requirements of the Zero Waste Regulations*

This is not considered a directly relevant issue for determining the 'best' option for collection of dry recyclable wastes.

8. **Evaluate the need for further treatment processes required to separate CM collected recyclables.**

With co-mingled collection systems there is a need to sort the materials collected at a MRF prior to delivering to the reprocessor. This adds to the overall cost of this type of collection system.

With a kerbside sort system, sorting is carried out at the initial collection point and therefore the sorting costs are contained within the "collection" budget of the local authority. It should be noted that there will be a requirement to bulk before sending on to reprocessor.

The following addresses the discussions above against the criteria set by members of ACC's Zero Waste Management Sub-committee.

1 Compliance with Regulations and Policy

Members acknowledged that in respect of collections, there are statutory requirements that **must be adopted** (provision of separate collections) in line with guidance provided by the Government and SEPA.

The "separate collection" issue needs to be considered in line with the current Zero Waste Policy Statement and proposed Regulations. **This issue has the potential to eliminate co-mingled collection systems as an option for all local authorities in Scotland including Aberdeen City.**

Zero Waste Scotland intend to stipulate in the regulations that co-mingling of dry recyclables **will only be permitted where the waste hierarchy is not undermined (e.g. glass separated for re-melt) and the outputs from the materials recycling facility (MRF) are of comparable quality to that collected separately at kerbside.**

The Council should consider the implication of this potential stipulation when determining the specification of co-mingled (glass included) MRFs and definition of materials to be included in a co-mingled collection service.

Kerbside sort collection systems are considered compliant with the relevant National Legislation and Policy provisions and requirements as they relate to "separate collection".

In terms of satisfying the various recycling targets set down by European Directives and Scottish Government Targets, identified in the report, there is no real distinction between kerbside sort and co-mingled other than the potential participation and recyclable collection yields discussed below.

2 Compliance with ACC Base Case

Members accepted the need to comply with the Base Case **as essential.**

In order to achieve the Base Case targets for source segregated municipal waste recycling and organic waste treatment target, the most appropriate kerbside collection system should be employed by ACC. Although there is no clear answer as to whether this should be a kerbside sort or co-mingled collection system available data suggests that co-mingled will better enable ACC to meet these targets.

3 Equality of Service Provision

Members considered this to be a very important criterion and one that goes beyond simple waste policy but reflects the wider responsibility of a local authority. In particular this means that there should be provision of recycling opportunities to all. It was recognised that this does not mean that all households should receive exactly the same services but that ease of systems should be the same across the city.

The practicality of introducing a kerbside sort or co-mingled collection system is discussed further below.

It is recognised that providing a co-mingled one wheeled bin to householders to place all of their dry recyclables in is easier than providing several containers where the householder has to undertake a greater level of segregation at source.

This is particularly the case at flatted properties. The provision of one communal recyclable bin to which the householder can place all recyclables is considered far easier than requesting the householder to segregate recyclables, and present them outside their doors or landings on certain days or at a central location within the property.

Co-mingled collection systems could be rolled out across the city, including flats, providing an equitable system to all. There are more difficulties in rolling out a kerbside sort collection across the city due to difficulties at flatted properties, of which there a significant quantity in Aberdeen.

4 Costs

Members considered that cost is essential however it must be balanced against the other **essential** criteria.

In order to estimate the costs of either a kerbside sort or co-mingled collection system for Aberdeen City further examination of data is required. This would include likely tonnage yields, vehicle and manpower costs, MRF gate fees, location of MRF/reprocessors, contamination levels and landfill costs including tax.

From the studies considered above the indication is that a co-mingled collection system, although historically perceived to be more expensive when combining collection and sorting costs, has the potential to be the most economical solution for the Council, subject to any contract and MRF costs.

5 Recyclables Quality & Quantity

Members recognise that it is **important** to ensure that outputs are of high enough quality to find secure and good value markets but this must be achieved at the point of sale from Aberdeen. Quality can be achieved through processing of mixed recyclables as well as through extensive kerbside sort. Quantity is also important and this can be achieved by both participation and expansion of range of recyclables.

Quality

Materials collected via kerbside sort systems are of a higher quality than materials collected via co-mingled systems. The evidence to support this is kerbside sort contamination levels are low (circa <0.5%) whereas contamination of co-mingled systems are higher however are constantly improving. Contamination can include non-targeted materials, residues from MRF sorting process, rejects from reprocessors and general food/water type contamination.

Technology for sorting materials is constantly improving meaning that improvements in MRF capabilities are possible where local authorities and MRF providers both work together.

Kerbside sort collection systems will provide the Council with the highest quality of recyclables that can be sold directly to reprocessors via a bulking operation. To this end kerbside is considered the better of the two options.

Quantity

As detailed earlier in the report studies undertaken by WRAP have shown that the yields of recyclables from kerbside sort and co-mingled collection systems are on a par, when contamination levels from co-mingled systems have been taken into account.

Alternative studies undertaken by WYG on local authorities across the UK have demonstrated that co-mingled systems result in a better recycling performance when compared to kerbside sort systems. Their studies conclude that the highest dry recycling performances are achieved with:

- 100% co-mingled dry recyclates collected fortnightly in wheeled bins, plus
- refuse collections being made fortnightly from wheeled bins, and
- at least the five main materials being collected for recycling: i.e. paper, card, cans, glass and plastic bottles.

Furthermore they validate this conclusion by confirming that:

- Of the Top 30 performing recycling Councils in the UK, 23 collect 75% or more of their materials co-mingled.

The information presented by the WYG studies confirms therefore that co-mingled collection systems are more advantageous than kerbside sort systems.

6 Compatibility with Aberdeen (Practicality)

Members agreed that this criterion should be of **high importance** and recognising the wide range of housing types across the city presents challenges. A preference was expressed for a single collection system/method across the City to ensure equality of provision and allow clear and consistent communications.

The main assessment that has been undertaken to distinguish between kerbside sort collection and co-mingled collection for this criterion is practicality.

Kerbside sort collection systems are best suited to detached, semi-detached and terraced houses, on the basis that space for the required container types and access for collection vehicles and operatives is generally not an issue. In these types of properties the occupier can present their containers at the kerbside for collection.

Kerbside sort systems however are less efficient for the collection of recyclable materials from flatted properties particularly if the material is collected from each doorstep or landing. If a communal kerbside sort system of collection is provided to flatted properties it can prove costly, inefficient and difficult to accommodate the storage capacity required for the number and capacity of the communal containers required.

For these reasons local authorities mainly provide communal co-mingled collections of recyclable materials to flatted properties. Based on the split of property types in the City, if one system is to be introduced across the City, practicality suggests that this should be a co-mingled collection.

7 Flexibility

Members recognised that it will be **essential** to develop a system that can respond to changing needs in the future, especially with the ability to expand the range of materials collected.

Flexibility issues were considered for the number, type and capacity of containers, the number and capacity of vehicles, bulking/sorting requirements and general communications.

In terms of adding additional recyclables, co-mingled collection bins (wheeled bins typically 240 litres) are considered more flexible than kerbside sort containers (namely boxes/crates/bags). Adding additional recyclables to a kerbside sort system may require the Council having to change the size and number of containers to householders. To this end co-mingled systems are considered more flexible.

In terms of the numbers and capacity of vehicles, co-mingled wastes are generally collected in RCVs, whereas kerbside sort wastes are generally collected in either a Kerbsider or Stillage vehicle. The Kerbsider or Stillage vehicle is specific to recycling and cannot readily be used for any other waste types collected by the Council, e.g. general refuse. The use of RCVs in co-mingled collections can be used for collecting commercial wastes, garden wastes and general refuse. The advantage of this is that RCVs can be used to collect refuse one week from householders and then be used to collect recyclables the second week. This makes the co-mingled system far more flexible to the Councils overall needs than kerbside collection vehicles.

In relation to bulking and sorting requirements the ability to add materials to a co-mingled collection may be limited by the sorting capabilities of available MRFs as MRFs are designed to accept a specific range and mix of materials.

With kerbside sort systems, provided there is a market for an additional recyclable material and suitable available reprocessors, bulking /sorting is considered more flexible when compared to co-mingled systems.

With co-mingled systems often the main difference between systems is whether or not glass is included. If glass is collected in a co-mingled form with other recyclable materials special segregation facilities need to be provided at the MRF to retrieve the glass and segregate the various glass colours. The issue is whether the MRF can accept glass and also with the quality of the sorted glass i.e. achieving the quality standard required for remelt applications. For these reasons glass in normally collected separately.

Kerbside sort collection is considered more flexible than co-mingled collections in relation to general bulking/sorting requirements.

In terms of communicating changes to collection systems operatives can communicate directly with the householders when the wrong material has been added. This is generally undertaken by placing stickers on the boxes which informs the householder as to why the material has been left in the container and not collected.

With co-mingled collections it is more difficult to communicate instances where the wrong material has been placed by the householder within the wheeled bin. In particular the wrong material may not be identified until it reaches the MRF, at which point direct communication is more difficult.

It is considered that changes to kerbside sort collection systems are easier to communicate with householders than with co-mingled collection systems, therefore making the system more flexible.

Conclusions

It is necessary to draw the above assessment of kerbside sort v co-mingled to a conclusion.

It is clear from this assessment report that there are advantages and disadvantages to both kerbside sort and co-mingled collection systems.

As indicated above estimated data could be obtained from trials for kerbside sort and co-mingled collections systems undertaken across the City.

In the absence of such trials, reliance has to be placed on studies already undertaken. In relation to these studies and their outputs it is considered that a co-mingled collection system is the best fit when compared to the requirements of the Zero Waste Management Sub-committee. A co-mingled collection system would not be possible however if it does not satisfy Zero Waste Scotland's "separate collection" requirements.

It should be noted that ACC currently provide a kerbside collection scheme to approximately 76,000 properties across the City, using 15 kerbsider collection vehicles.

3 Assessing Recyclable Collection Options

Following stage 1 of the options appraisal which determined that co-mingled collection had the potential to be the better suited option for collecting recyclables for Aberdeen City, the more detailed co-mingled collection options as detailed in Appendix D are considered against the following criteria. These options consider all waste streams generated by ACC.

The various collection options, CM1, CM2 and CM3, are detailed in Appendix D.

Each of the collection type options for each waste type will be assessed against the following criteria:

1. Compliance with Regulations and Policy
2. Compliance with ACC Base Case
3. Equality of service provision
4. Cost
5. Recyclable Quality & Quantity
6. Compatibility with Aberdeen
7. Flexibility

Following the evaluation of the various collection options, against the given criteria, the best collection option for each waste type will be selected.

In summary the main difference between options CM1, CM2 and CM3 is the way food/organic waste is collected, either separate food and garden waste collection or co-mingled food and garden waste collection. In addition different vehicles are proposed to collect general refuse and co-mingled recyclables.

1. **Compliance with Regulations and Policy**

Members acknowledged that in respect of collections, there are statutory requirements that **must be adopted** (provision of separate collections) in line with guidance provided by the Government and SEPA.

General Refuse collection

All of the collection options include the collection of general refuse fortnightly from households (single type properties) and an on demand communal collection (from flatted properties).

Option CM1 proposes to collect general refuse alongside food waste in a split bodied vehicle, the same vehicle would be used to separately collect dry recyclables and food waste in an alternate weekly collection.

Options CM2 and CM3 propose to collect general refuse fortnightly in conventional RCVs.

As a Waste Collection Authority, ACC has certain statutory duties in relation to the collection of general waste. These duties are contained within the Environmental Protection Act 1990 and are detailed below as follows:

Section 45 of The Environmental Protection Act 1990 places a duty of the waste collection authority

(a) to arrange for the collection of household waste in its area except waste—

(i) which is situated at a place which in the opinion of the authority is so isolated or inaccessible that the cost of collecting it would be unreasonably high, and

(ii) as to which the authority is satisfied that adequate arrangements for its disposal have been or can reasonably be expected to be made by a person who controls the waste; and

(b) if requested by the occupier of premises in its area to collect any commercial waste from the premises, to arrange for the collection of the waste.

Comingled Recyclable Collection

All options include the co-mingled collection of dry recyclables fortnightly from households and an on demand communal collection.

Option CM1 proposes to collect dry recyclables alongside food waste in a split bodied vehicle, the same vehicle would be used to separately collect general refuse and food in an alternate weekly collection. Options CM2 and CM3 propose to collect dry recyclables fortnightly in conventional RCVs.

As detailed above as part of the appraisal of co-mingled collections versus kerbside sort collections, the "separate collection" issue needs to be considered in line with the current Zero Waste Policy Statement and proposed Regulations. This issue has the potential to eliminate co-mingled collection systems as an option for all local authorities in Scotland including Aberdeen City.

Zero Waste Scotland intend to stipulate in the regulations that co-mingling of dry recyclables will only be permitted where the waste hierarchy is not undermined (e.g. glass separated for re-melt) and the outputs from the materials recycling facility (MRF) are of comparable quality to that collected separately at kerbside.

The Council should consider the implication of this potential stipulation when determining the specification of co-mingled (glass included) MRFs and definition of materials to be included in a co-mingled collection service.

Food and Garden Waste Collection

The following table details the current Scottish Government recycling and composting targets which are relevant to food/organic waste.

Target/Cap	Year	Measure	Derivation
50% recycling/composting and preparing for re-use of waste from households	2013	Carbon	Scottish Government Target
No more than 1.8 million tonnes of BMW to be sent to landfill	2013	Tonnage	Article 5(2) of the EU landfill directive
60% recycling/composting and preparing for re-use of waste from households	2020	Carbon	Scottish Government Target
No more than 1.26 million tonnes of BMW to be sent to landfill	2020	Tonnage	Article 5(2) of the EU landfill directive
70% recycling and preparing for re-use of construction and demolition (C&D) Waste	2020	Tonnage	Article 11(2)b of the EU Waste Framework directive
70% recycling/composting and preparing for re-use of all waste	2025	Carbon	Scottish Government Target

The requirements of the Scottish Government's policy statement on the proposed Zero Waste Scotland Regulations relevant to the collection of food waste are summarised below:

- The food waste collection roll-out period is to be extended. Local authorities will be given a longer period to roll-out food waste collection to households and will have to have initiated the roll-out of a household food waste collection programme by the end of 2013 and to have completed the roll-out by 2015.
- The Regulations will set criteria establishing where local authorities must offer a food waste collection service to householders and businesses. The Regulations will identify areas of the country based on population density and travel distance between towns where local authorities will be required to offer separate collection of food waste from households and businesses. These areas will be based on the Scottish Government urban rural classification.

  - Large urban areas (population over 125,000)

  - Other urban areas (population of 10,000 to 125,000); and

  - Accessible small towns (with a population of 3,000 to 10,000) and within 30 minutes' drive of a settlement of 10,000 or more)
- **Local authorities will be allowed to co-mingle food and garden waste where similar environmental benefits to separate food waste collection can be demonstrated and achieved.**
- **In situations of high density housing (e.g. high rises greater than four floors) the statutory requirement to collect food waste will be limited to households than can present a bin at kerbside. However, providing food waste collection to areas of high density housing will be important to contribute to achieving Zero Waste Plan targets.**

- Available evidence indicates that separate weekly collection of food waste typically delivers the highest yields, the best environmental outcomes and is likely to be less expensive than systems collecting food and garden waste together on the same frequency (mainly down to the fact that when food waste is collected and managed separately it allows garden waste to be treated using lower cost methods such as windrow composting). It is likely that as the costs of residual waste management increase over time, the benefits of separate food waste collections will also increase. The Scottish Government's preference is therefore for separate collection of food waste from households, businesses and other premises e.g. schools, hospitals.
- In some circumstances where there is access to dry Anaerobic Digestion (AD) facilities, where there is existing In-vessel Composting (IVC) infrastructure and/or where a weekly garden waste collection service is available, a co-mingled bio waste collection may provide a similar environmental outcome to separate foods waste collection.
- For these reasons co-mingled garden and food waste collection services will be permitted where they can be demonstrated to deliver equivalent or better environmental outcomes as determined by similar yields of food waste.

As indicated above, at this time it is the **Scottish Government's preference that food waste is collected separately due to higher yields, better environmental outcomes and lower costs**. It is accepted that high density housing (flatted properties for example) pose difficulties in the collection of waste therefore it is intended that the statutory requirement will be limited to households that can present a bin at kerbside (properties of four floors or less), however providing food waste collection to areas of high density housing will be important to contribute to achieving Zero Waste Plan targets. In order to be able to collect co-mingled food and garden waste, local authorities will be required to demonstrate that similar environmental benefits to separate food collection can be achieved.

Each of the collection options includes the collection of food and garden waste from all properties (household and communal).

Options CM1 and CM2 include separate collections of food and garden waste.

Option CM3 is the collection of co-mingled food & garden waste from households, plus collection of food from communal properties.

For these reasons collection options CM1 and CM2 with separate food collection would be the preferred options unless similar environmental outcomes from the co-mingled collection of food and garden waste can be demonstrated.

Demonstration of "similar environmental outcomes" may include consideration of the Scottish Government carbon targets as shown in the table above.

Carbon weighting allocations have been issued by Zero Waste Scotland and relate to the waste type being recycled/composted and the treatment technology being operated. The current carbon weightings for organic wastes are as follows, it should be noted that the actual weightings are subject to change.

Food and Drink Waste to Wet AD	4.35
Food and Drink Waste to Composting	3.48
Garden Waste to Dry AD	2.35
Garden Waste to Compost	1.81
Mixed Food and Garden Waste to Dry AD	2.70
Mixed Food and Garden Waste to Composting	2.10

Collecting and treating garden and food waste separately will achieve the optimum carbon results; specifically treating food waste via Wet AD and garden waste via open windrow composting.

If food and garden waste are collected co-mingled, treatment via AD will provide better results in terms of reaching the carbon targets, when compared to treatment via IVC.

2. **Compliance with ACC Base Case**

Members accepted the need to comply with the Base Case **as essential.**

General Refuse collection

- *Municipal waste growth will be eliminated by 2015*

Waste growth is not an issue that can be controlled or eliminated by the collection options for general refuse. Furthermore the method and frequency of the general refuse collection is the same in each of the proposed options. This issue is therefore not considered further.

- *Source segregated municipal waste recycling and organic waste treatment targets are:*
  - *45% by 2013*
  - *50% by 2020*
  - *56% by 2025*

The above targets are not relevant to the collection options for general refuse. This issue is therefore not considered further.

- *Introduce organic waste collection for all households and develop treatment facilities within the Aberdeen area by 2013*

This is not considered a relevant issue for determining the 'best' option for the collection of general refuse. This issue is therefore not considered further.

- *Municipal residual waste treatment capacity including (Energy from Waste (EfW)) should not exceed 50% by 2020 and 40% by 2025*

This is target relevant to the treatment of general refuse not collection. This issue is considered in the next stage of the appraisal.

- *No more than 5% of municipal waste should be landfilled by 2025*

This is a relevant issue in relation to diversion of waste from the residual waste stream but not in the manner in which it is collected.

- *That general refuse treatment systems will meet the requirements of the Zero Waste Regulations*

This is target relevant to the treatment of general refuse not collection. This issue is considered in the next stage of the appraisal.

Comingled Recyclable Collection

As detailed above as part of the appraisal of co-mingled collections versus kerbside sort collection, in order to achieve the Base Case targets for source segregated municipal waste recycling and organic waste treatment target, the most appropriate kerbside collection system should be employed by ACC. Although there is no clear answer as to whether this should be a kerbside sort or co-mingled collection system available data suggests that co-mingled will better enable ACC to meet these targets. All collections options propose collection of recyclables in a co-mingled form fortnightly from households and an on demand communal collection.

Food and Garden Waste Collection

The Base Case also includes the following targets, which are relevant to food and garden waste:

- *Source segregated municipal waste recycling and organic waste treatment targets are:*
  - *45% by 2013*
  - *50% by 2020*
  - *56% by 2025*

In order to achieve the above targets for source segregated municipal waste recycling and organic waste treatment target, the most appropriate collection system of organic waste should be employed by ACC. Available evidence indicates that separate weekly collection of food waste delivers the highest yields. Predictions by ACC as part of a separate study indicate that food waste yields are higher from single properties than flats, most likely related to differences in participation rates and storage requirements. Furthermore, studies analysing the performance of food and garden waste collections have shown that a fortnightly co-mingled food and garden waste collection will generate less food waste than a weekly collection and that a fortnightly residual waste collection will capture more than a weekly residual waste collection

- *Introduce organic waste collection for all households and develop treatment facilities within the Aberdeen area by 2013*

ACC currently provides a fortnightly co-mingled food and garden waste collection to over 54,000 properties. In line with Scottish Government proposed policy and the above target, ACC propose to extend food waste collection to all properties.

The proposed collection options for food and garden waste are as follows:

- Options CM1 and CM2 - separate collection of food waste, weekly from households and on demand communal collection, and fortnightly collection of garden waste from households.
- Option CM3 - fortnightly co-mingled collection of food & garden waste from households and weekly collection of food waste from communal properties.

The difference between option CM1 and CM2 is the way the food waste would be collected from single properties (detached, semi-detached and townhouses). With Option CM1 food waste would be collected in a split bodied vehicle alongside general refuse or recyclables. With CM2 food waste would be a separate collection in a dedicated food waste vehicle.

All of the options will provide every property within ACC, with the exception of high rise flats, with an organic waste collection.

In relation to the Base Case requirements, what distinguishes the collection options is the potential to collect a greater quantity of food waste. Both CM1 and CM2 provide separate food waste collection for all properties within ACC.

3. **Equality of Service Provision**

Members considered this to be a **very important** criterion and one that goes beyond simple waste policy but reflects the wider responsibility of a local authority. In particular this means that there should be provision of equal recycling opportunities to all. It was recognised that this does not mean that all households should receive exactly the same services but that ease of systems should be the same across the city.

A combination of kerbside sort and co-mingled collection methods to suit the varying property types in Aberdeen City was did not satisfy the requirement to provide equality of service provision.

The co-mingled collection systems rolled out across the city will provide general refuse, recyclables and food collections to all properties including flats. Although there may be some minor differences in the specific services provided, it is considered that all of the options will provide an equality of service across ACC.

4. **Costs**

Members considered that cost is **essential** however it must be balanced against the other **essential** criteria.

The following are considered relevant when assessing the cost of collecting refuse, recyclables and organic waste:

- vehicle and manpower costs,
- treatment facility gate fees,
- location of MRF/reprocessors/treatment facility,
- landfill costs including tax.

Different collection vehicles are proposed in each of the collection options as detailed below

- Split bodied vehicles are proposed for CM1 to collect general refuse, recyclables and food waste
- Conventional RCVs are proposed for CM2 and CM3 for the collection of both general refuse and recyclables
- Dedicated food waste collection vehicles are proposed in the case of CM2
- Food and garden waste from households will be collected co-mingled in the case of CM3 which can be done using RCVs
- It is proposed that there will be a separate communal food collection in all options; the vehicle to be used for this will need to be confirmed.

There would be relatively little change to the general refuse collection with these options as the Council currently collects its general refuse via RCV on a fortnightly basis or in the case of communal collections by RCV as required. The main consideration is the cost of CM1 which uses a split bodied vehicle.

Manpower costs for the current system include the drivers/loaders for the combined food and garden waste collection which would continue as part of CM3. Options CM1 and CM2 would require separate dedicated vehicles and operatives for the rounds collecting separate food waste, although it is noted that for option CM1 the only dedicated vehicle for food waste collection would be for the communal properties as food waste from households would be collected alongside other waste streams. Therefore as CM2 would have increased cost implications from additional vehicles, fuel, operatives and routes compared to option CM1.

Although not considered in detail here, a key cost in deciding the appropriate food and garden collection service is the treatment cost. Collecting garden waste separately allows this waste to be treated at cheaper open windrow composting facilities. Co-mingled food and garden waste must be treated at more expensive Animal By-product (ABPR) compliant facilities.

In addition The Controlled Waste Regulations 1992, allow local authorities to be able to charge for separate garden waste collection. Charging for this service may result in reduced participation and yields of garden waste.

5. Recyclables Quality & Quantity

Members recognise that it is **important** to ensure that outputs are of high enough quality to find secure and good value markets but this must be achieved at the point of sale from Aberdeen. Quality can be achieved through processing of mixed recyclables as well as through extensive kerbside sort. Quantity is also important and this can be achieved by both participation and expansion of range of recyclables.

Quality

Contamination of co-mingled dry recyclable collection systems vary depending on the MRF used to sort the material, as discussed earlier in the report these can be as low as 2% however an average contamination was considered to be circa 10% by the EA in 2008. With improved technology at MRFs and well educated residents the contamination rates of co-mingled collections are improving. Contamination can include non-targeted materials, residues from MRF sorting process, rejects from reprocessors and general food/water type contamination.

Technology for sorting materials is constantly improving meaning that improvements in MRF capabilities are possible where local authorities and MRF providers both work together.

All collection options include the co-mingled collection of dry recyclables either fortnightly from households or via as required communal collections.

A co-mingled food and garden waste collection limits the potential treatment options to those treatment methods that are acceptable for the treatment of food waste. If garden waste is collected separately it can be treated by Open Windrow Composting rather than the more expensive Anaerobic Digestion (AD) and In-Vessel Composting (IVC).

There are no obvious differences in the quality of materials collected when the three options are compared.

Quantity

The quantities or yields of recyclable material collected (both dry recyclables and organic waste) are linked to the participation of the householders in the schemes. Ensuring effective communication and introducing a system that this simple and easy to understand will result in high levels of participation and material recovery.

Comingled Recyclable Collection

As detailed earlier in the report, studies undertaken have shown that the yields of recyclables from co-mingled systems may result in a better recycling performance. In all options the collection of dry recyclables will be via fortnightly household collection or communal co-mingled collection as required.

The available capacity of the proposed collection vehicles should ensure the highest yields can be achieved; this is particularly relevant when considering the proportion split of the split bodied vehicle for CM1.

Food and Garden Waste Collection

Evidence is also available that separate food waste collection will result in higher yields.

WRAP – Performance analysis of mixed food and garden waste collection schemes - February 2010

The overall aim of this project was to "explore the effectiveness of mixed food and garden waste kerbside collection schemes in diverting food waste for recycling". The analysis compared the amount and types of food and garden waste and at the impact of residual waste collection frequency on performance.

Key findings of the study include:

- Almost twice as much food waste was thrown away in the residual waste stream where these collections were weekly
- Overall more food and garden waste (combined) was set out where these collections were fortnightly, however in terms of the food content almost double the amount of food waste was present where containers were collected on a weekly basis.

- Lower food total waste for disposal appears to be related to alternate weekly collections of residual waste and food and garden waste.

In June 2009 WRAP published a report (Evaluation of the WRAP Separate Food Waste Collection Trials) highlighting the effectiveness of separate food waste collection trials, **one of the key points observed during this study was that separate food waste collections taking place alongside fortnightly (as opposed to weekly) residual waste collections achieve a higher weekly yield of food waste.** This will occur in options CM1 and CM2. However in CM3 food and garden waste will be collected co-mingled and fortnightly.

Although there appears to be no difference between option CM1 and CM2, the way the food waste would be collected varies. With Option CM1 food waste would be collected in a split bodied vehicle alongside general refuse or recyclables. With CM2 food waste would be a separate collection in a dedicated food waste vehicle.

Given the evidence presented in recent studies, to achieve the highest yields of food waste it should be collected separately from garden waste and weekly alongside a fortnightly general refuse collection - thus making CM1 and CM2 the more preferable options.

6. **Compatibility with Aberdeen**

Members agreed that this criterion should be of **high importance** and recognising the wide range of housing types across the city presents challenges. A preference was expressed for a single collection system/method across the City to ensure equality of provision and allow clear and consistent communications.

For the reasons provided above in the assessment of co-mingled versus kerbside sort collection, local authorities mainly provide communal co-mingled collections of recyclable materials to flatted properties. Based on the split of property types in the City, if one system is to be introduced across the City, practicality suggests that this should be a co-mingled collection.

In all options the collection of general refuse will be via fortnightly household collection or as required communal collection.

In all options the collection of dry recyclables will be via fortnightly household collection or communal co-mingled collection as required.

The main variation between the collection options is the collection of food and garden waste. It is intended that all properties, with the exception of high rise flats, will be provided with a food waste collection, either a weekly separate collection or a fortnightly co-mingled in the case of households and a separate communal collection as required. The criteria indicates a preference for a collection system with "clear and consistent communications"; in the case of option CM1 householders will only have to remember one collection day per week as food waste will be collected alongside the general refuse or recyclables compared to CM2 and CM3 which will have different collections for food waste from refuse and recyclables.

The three collection options are considered compatible with Aberdeen.

7. **Flexibility**

Members recognised that it will be **essential** to develop a system that can respond to changing needs in the future, especially with the ability to expand the range of materials collected.

Flexibility issues include the number, type and capacity of containers, the number and capacity of vehicles, bulking/sorting requirements and general communications.

Garden waste quantities are subject to seasonal variation, making a separate garden waste collection more flexible as the collection can be altered to suit potential yields independently of any other collection.

Options CM2 and CM3, with respect to collection of refuse and recyclables, are more flexible to frequency changes due to vehicle type proposed - conventional RCVs rather than split bodied vehicles.

Having an entirely separate collection of food waste as is proposed in CM2 lends itself to greater flexibility in terms of growth of yields of food waste – a separate vehicle fleet for food waste can factor in an allowance for growth.

Of the collection options CM2 is considered to be the most flexible followed closely by CM1.

Conclusions

This stage of the options appraisal has considered the proposed co-mingled collection options for general refuse, recyclables, food and garden waste.

In order to comply with regulation and policy the co-mingled collection of recyclables require to be treated to a standard that is comparable to that achieved with separate collection. The Scottish Government's preference is for the separate collection of food unless local authorities can demonstrate that similar environmental benefits to separate food collection can be achieved. Of the collection options CM1 and CM2 are considered to be the preferred options in terms of compliance with regulation and policy.

An element of the Council's Base case is the targets for source segregated municipal waste recycling and organic waste treatment. To achieve maximum yields of recyclables and organic waste, it is considered that collection options CM1 and CM2 will provide higher yields due to the co-mingled collection of recyclables and the separate weekly collection of food waste. All of the options will provide every property within ACC, with the exception of high rise flats, with an organic waste collection. Of the collection options CM1 and CM2 are considered to be the preferred options in terms of compliance with the Base Case.

The co-mingled collection systems rolled out across the city will provide general refuse, recyclables and food collections to all properties including flats. Although there may be some minor differences in the specific services provided, it is considered that all of the options will provide an equality of service across ACC.

In terms of quality and quantity of recyclables, there are no obvious differences in the quality of materials collected when the three options are compared.

Studies undertaken have shown that the yields of recyclables from co-mingled systems may result in a better recycling performance. The available capacity of the proposed collection vehicles should ensure the highest yields can be achieved; this is

particularly relevant when considering the proportion split of the split bodied vehicle for CM1. To achieve the highest yields of food waste it should be collected separately from garden waste and weekly alongside a fortnightly general refuse collection - thus making CM1 and CM2 the more preferable options.

The three collection options are considered compatible with Aberdeen.

Of the collection options CM2 is considered to be marginally more flexible followed closely by CM1. It is not considered significant enough to distinguish CM1 and CM2 in terms of flexibility.

Overall the assessment points towards either CM1 or CM2 as the preferred option with CM3 the least preferred option.

CM1 is considered a more efficient way of collecting the councils waste from householders. One vehicle will service each household each week, collecting either general waste and food waste or recyclables and food waste.

With option CM2, two vehicles would be required to service the householders' waste streams.

The obvious inefficiency is that four separate visits to the householders are required (over 4 weeks) under CM1 whereas eight visits (over 4 weeks) are required under CM2.

CM1 is also considered a simpler option than CM2. With CM1 householders' will present general waste and food waste on the same day one week and recyclables and food waste on the same day the following week.

With CM2 householders will require to present food waste on a separate occasion and separate day in addition to presenting the other wastes. The key to a successful collection scheme is reliant on the simplicity of service and the active participation of the residents within Aberdeen City.

Overall and taking account of the efficiency and simplicity of service CM1 is preferred to CM2.

The following table provides a summary of the criteria assessment process for comparing KS and CM.

Key

✓ Considered more beneficial

X Considered less beneficial

0 Considered neutral benefit

Criteria	Collection Option		
	CM1	CM2	CM3
Compliance with Regulations and Policy	✓	✓	X
Compliance with ACC Base Case	✓	✓	X
Equality of Service Provision	0	0	0
Cost	0	0	0
Recyclable Quality & Quantity	0	0	0
Compatibility with Aberdeen	✓	✓	✓
Flexibility	✓	✓	X

4 Evaluate Best Treatment Option – General Waste Only

Introduction

Having established the preferred collection options for the waste streams (CM1) the best treatment option requires to be assessed for general waste.

The treatment options to be evaluated are detailed in Appendix E and include:

Option 1- No Change to current disposal – Landfill (NC)

The No Change option is to continue to dispose of general waste to landfill without any pre-treatment.

Option 2 - Mechanical and Aerobic Biological Pre-treatment to Landfill and fuel for export (LF1)

Option 2 is to is to treat the general waste by Mechanical and Aerobic Biological pre-treatment to landfill which includes export of a waste derived fuel.

Mechanical Biological Treatment (MBT) is used to describe not one specific process, but rather an amalgamation of different technologies brought together in an integrated process.

An MBT plant combines mechanical processes to recover materials of value with biological processes to stabilise the organic-rich fraction of the incoming waste.

Biological Mechanical Treatment, as the word-ordering suggests, carries out the treatment processes the other way round. **The process is normally used for treating residual waste, that is, the waste put out by householders after their recycling and/or compostable materials have been collected.**

There are a number of purpose-built MBT plants in Europe, where the mechanical and biological processes are integrated into a single process system, and which incorporate sophisticated environmental control systems.

These plants are located mainly in Austria, France, Germany and Italy with capacities ranging from a few thousand tonnes per annum up to 200,000 tpa. They mainly process source segregated residual waste. The number of MBT plants in the UK is increasing, with a number of local authorities considering employing the technology.

Each MBT system produces different outputs, some focus on producing a high quality fuel and discard organic materials while others maximise the biological processes to stabilise waste before sending to landfill or for use a land restoration material.

A mechanical process uses a series of conveyor belts, magnets, screens and density separators to sort materials by size, weight, magnetic properties, etc and recover any materials of value.

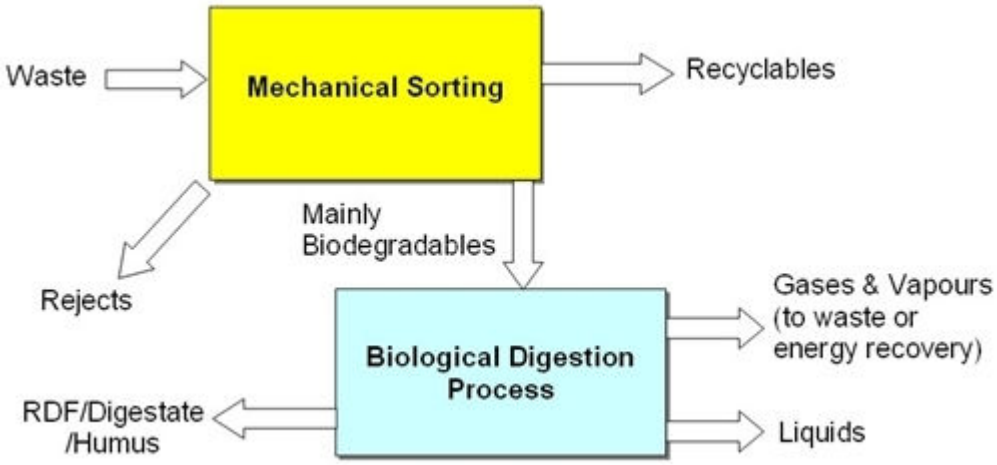
The biological treatment process is either aerobic (similar to composting) or anaerobic. **Aerobic processes, which is the option to be considered by ACC,**

biologically digest the organic waste in the presence of oxygen to produce carbon dioxide, water and **a stabilised digestate suitable for landfill or landfill cover.**

Typical material streams an MBT plant can be designed to produce are:

- **Dry recyclables**
- **An energy-rich refuse derived fuel (RDF) comprising paper, plastics and other combustible fractions, that can be combusted in an energy from waste plant or in an industrial furnace;**
- **A stabilised organic-rich fraction; and**
- **A residual that can only be landfilled**

The organic rich fraction, depending on the type of treatment employed, is typically landfilled but with a much reduced biological content and capacity to generate landfill gas. The diagram shows the Inputs and Outputs of a typical MBT process.



MBT can contribute to delivering targets for reducing the amount of **biodegradable municipal waste (BMW)** sent to landfill. The technology can be of help to local authorities in meeting their **recycling targets**, even where kerbside recycling schemes are in operation.

MBT is not a complete solution, its viability as an alternative to technologies such as direct incineration of residual waste will depend on how markets develop for the outputs of MBT.

Option 3 - Pre-Treatment to Energy from Waste (EFW1)

The purpose of any pre-treatment process, prior to sending to Energy from Waste (EfW) Plant is to recover further recyclables within the general waste which has not been removed at source by the Householders via the chosen kerbside recycling scheme; in ACC's case a co-mingled recycling scheme is considered the preferred option.

The process of removing marketable materials can be undertaken either on site, immediately before being treated at an EfW Plant or off-site with the residual element subsequently transported to the EfW Plant for treatment.

There are choices to be made on the type of pre-treatment of general waste to be undertaken prior to sending the residual to an EfW Plant.

The options for pre-treatment are further discussed below

Dirty MRF – This treatment technology combine a number of screening/sorting techniques to divide the general waste into a recyclable material stream and a non-recyclable stream. A Dirty MRF will typically recover around 10-15% of material as recyclables (depending on the residual amount left in the general waste after householders have separated out recyclables within the co-mingled system). The remaining non-recyclable stream in this option would then be treated at the EfW Plant and the recyclables sold on where possible to reprocessors.

Refuse Derived Fuel Units

The production of Refuse Derived Fuels involves the mechanical processing of general waste using screens, shredders and separators to recover recyclable materials and to produce a combustible product. Systems involve the removal of inert and compostable materials followed by pulverisation to produce a feedstock which can be incinerated in powers stations, or EfW Plant.

Energy from Waste Plants

Energy from Waste (EFW) Plants combust waste under controlled conditions in order to generate electricity and/or heat and to reduce waste volume.

Electricity generated from a typical 100,000tpa facility can be equated roughly to the electricity usage of 10,000 houses. Any excess heat can be used in industrial or district heating schemes, known as Combined Heat and Power Schemes (CHP). EFW Plants utilise various technologies including Incineration (Moving Grate or Fluidised Bed Combustion, Rotary and Oscillating Kilns), Pyrolysis, Gasification and Plasma Arc Technologies.

Treatment Options Appraisal Criteria

Each of the treatment options for general waste will be assessed against the following criteria:

1. Compliance with Regulations and Policy
2. Compliance with ACC Base Case
3. Technical Reliability
4. End Product Reliability
5. Cost
6. Environmentally Sustainable Solutions
7. Proximity/Compatibility with Aberdeen
8. Flexibility of Solution.

Note – Option 1 has been screened out (see below) following the assessment of it against Compliance with Regulations and Policy and Compliance with ACC's Base Case.

1 Compliance with Regulation and Policy

Members agreed that ***it is essential*** *that any system is able to comply with treatment regulations. The forthcoming Zero Waste Regulations are likely to introduce additional*

statutory controls on treatment operations and that this options appraisal should take these into account.

It is the overall **intention** of the Zero Waste Plan and Regulations to:

- maximise the amounts of material available for recycling;
- minimise the need for residual waste management capacity; and
- ensure that only those materials that can't be recycled require some form of
- residual treatment/management.

There will of course always be a requirement for some form of residual waste treatment, but the measures being taken forward through the Zero Waste Regulations will significantly reduce both the volume and type of materials that will require residual waste treatment.

The first two options, NC and LF1 are reliant on landfill as the disposal option for general waste, whereas EFW1 is reliant on Energy from Waste as the disposal option for general waste.

General Waste – NC, LF1 and EFW1

Zero Waste Scotland Plan

One of the most significant factors, which limits the continued reliance on landfill as a disposal option, is the Scottish Governments intention **to effectively end the disposal to landfill by 2025.** The Zero Waste Scotland Plan provides the target as no more than 5% of Scotland's waste can go to landfill beyond 2025.

The Zero Waste Regulations – Relevant Requirements

The Scottish Government proposes to introduce a landfill ban on biodegradable material. The purpose of this landfill ban is:

- To reduce the volumes of waste being landfilled by directing unsorted waste to pre-treatment.
- To extract remaining resource value from the unsorted waste stream.
- To protect the environment from the climate change impacts of landfilling biodegradable waste.

The intention of the regulations is to ban biodegradable general waste going to landfill by 2020. The ban will be implemented through the application of low biodegradability limits on waste sent to landfill. Industry soundings suggest that current MBT processes may find it difficult to achieve the standards requiring further technological innovation

In addition to the ban on biodegradable material to landfill, a ban is being introduced on separately collected dry recyclables and food waste going to landfill.

This ban is universal and applies regardless of the source of the waste. Banning these materials from landfill does not mean that they must be removed from mixed/unsorted waste prior to disposal in landfill sites. The ban will however ensure that materials that have been collected for recycling remain available for recycling.

There will not necessarily be a specific requirement to pretreat residual waste prior to landfill to remove key recyclates, as the intention of the ban on biodegradable waste going to landfill is to drive the residual waste stream into some form of pre-treatment to minimise the environmental impact of disposal. It is understood, however that the regulations will introduce a provision requiring pre-treatment to also remove further recyclables as is the case with EFW.

The regulations will revoke most of the requirements set out in the Landfill Allowance Scheme (Scotland) Regulations 2005. The Landfill Allowance Scheme (LAS) was introduced to deliver the landfill diversion targets set out in the EU Landfill Directive. Under this scheme each local authority were given an annual allowance on the quantity of Biodegradable Waste that they could dispose of to landfill.

EU Landfill Directive Requirements

In addition to Zero Waste Regulations the UK requires to comply with the requirements of the EU Landfill Directive. The Landfill Directive sets targets and timescales for reducing the amount of BMW sent to landfill. These targets and timescales are set out in the table below.

EU landfill Allowance Targets for BMW

Year	EU Landfill Directive Target for BMW	Tonnage Reduction relative to 1995 levels
2010	Reduce BMW to landfill to 2.7 million tonnes	75%
2013	Reduce BMW to landfill to 1.8 million tonnes	50%
2020	Reduce BMW to landfill to 1.26 million tonnes	35%

Landfill Tax

Landfill Tax is rising year on year and is set to reach £80 per tonne by 2014.

Further Discussion

The Council could continue to landfill its general waste until 2020 without the need to pre-treat its waste. As stated above, the ban on disposing of biodegradable waste to landfill will be effective from 2020. The 2020 date therefore provides ACC with the time to introduce an alternative general waste treatment technology as a substitute for landfill disposal.

The Scottish Governments also intends **to effectively end the disposal to landfill by 2025.** The Zero Waste Scotland Plan provides the target as no more than 5% of Scotland's waste can go to landfill beyond 2025. The 5% limit is a recognition that landfill will always be required for certain waste types as a final disposal option.

The landfill ban should not be considered in isolation, as the Council will still need to take steps to meet the recycling and composting carbon metric % targets as set out by the Scottish Government, and summarised in the table below.

Target	Year	Measure	Derivation
50% recycling/composting and preparing for re-use of waste from households	2013	Carbon	Scottish Government Target
60% recycling/composting and preparing for re-use of waste from households	2020	Carbon	Scottish Government Target
70% recycling/composting and preparing for re-use of all waste	2025	Carbon	Scottish Government Target

Note on Carbon measure - The Carbon Metric Reporting System for Recycling Performance is intended to inform waste policy and to promote a reduction in the environmental impact of resource use. It has been developed by the Scottish Government as an alternative to recycling tonnage performance. The carbon metric system is currently being reviewed. It should be noted that these targets are not currently a legal requirements on local authorities.

Continuing to landfill its general waste without further pre-treatment will therefore significantly restrict the Aberdeen City's ability to meet these targets.

Landfill disposal in itself is not a long-term option for ACC as it will ultimately not comply with the Zero Waste Regulations and Policy and therefore should not be considered as a 'compliant' option.

It is the of the intention to include a provision within the Zero Waste Regulations requiring best available techniques to be used to remove marketable recyclate from residual waste (general waste) prior to both landfill and incineration.

This requirement will be introduced in a way that will allow the materials that are considered 'marketable' to be reviewed over time to reflect market trends and the viability of technology to extract materials. The initial focus will be on metals and dense plastics.

The process of removing marketable recyclate can be done either on-site immediately before incineration or off-site with the residual element subsequently transported to the thermal treatment facility.

The requirement to pre-treat residual waste at existing EfW facilities will be from 2015, with any new facilities require to comply on commencement of the regulations.

Option 1 (NC) cannot be relied upon for long-term treatment of Aberdeen City Councils general waste.

Option 2 (LF1) is still reliant on landfill as a disposal option and therefore the regulations and policy may restrict this as a long-term disposal option. This will be very much dependant on the quantity and biodegradability of residual stabilised waste that requires to be landfilled. As stated above the Zero Waste Plan intends to limit the continued reliance on landfill as a disposal option by effectively banning it

by 2025. The Zero Waste Scotland Plan provides the target as "no more than 5% of Scotland's waste can go to landfill beyond 2025."

Option 3 (EFW1) – This is considered the most compliant option in relation to satisfying the requirements of the regulations and policy.

2 ACC Base Case – Relevant Requirements

Members considered that it **is essential** that any option achieved this criterion. It was agreed that the capacity of infrastructure and services should be defined as a range (for example, between 40,000 and 60,000 tonnes per annum for residual treatment capacity) to take account of the inevitable uncertainty in outcomes of any modelling exercise and future changes in circumstances. This is considered the best method of ensuring our needs are met but giving the Council flexibility to achieve the best value solutions for the city over time.

General Waste – NC, LF1 and EFW1

ACC's Base Case compliments the requirements of the Regulations and Policy, by stating:

- General refuse treatment systems will meet the requirements of the Zero Waste Regulations
- Municipal Residual Waste Treatment capacity (including Energy from Waste) should not exceed 50% by 202 and 40% by 2025.
- No more than 5% of municipal waste should be landfilled by 2025.

The Base Case statements do not assist in the differentiation of the type of waste treatment technology that the Council should ultimately select as its preferred option.

Option 1 is not considered further in this waste options appraisal due to the conclusions given above.

3 Technical Reliability

Members agreed that **it is essential** that proven and reliable solutions are adopted but that the Council should strive for the most advanced technology possible. The reasons expressed for this were:

- the Council cannot stop waste production and that we must have a system that can ensure continuity of collection services
- it is recognised that external funding is likely to be required and that this will be easier to access and at better terms if the technology is proven.

General Waste – LF1 and EFW1

LF1

As stated above there are a number of purpose-built MBT plants in Europe, where the mechanical and biological processes are integrated into a single process system, and which incorporate sophisticated environmental control systems.

These plants are located mainly in Austria, France, Germany and Italy with capacities ranging from a few thousand tonnes per annum up to 200,000 tpa. They mainly

process source segregated residual waste. The number of MBT plants in the UK is increasing, with a number of local authorities considering employing the technology.

EFW1

Pre-Treatment prior to EFW

In terms of the pre-treatment element of EFW1, there are examples of working plant in the UK and Europe, in particular Dirty MRF's.

A full assessment of the pre-treatment element of this option is not possible until the specific treatment technology is selected.

EfW Treatment

In 2007 (updated 2009) Juniper Consultancy Services Ltd undertook an assessment of small-to-medium scale EFW systems for processing Municipal Solid Waste. As part of the assessment Juniper grouped their assessments of the systems as, fully proven, proven, demonstrated, conceptual and not rated. A copy of the Report can be provided by Halcrow on request.

Juniper considers small scale = 20-75kTpa and medium scale as 75-250kTpa.

ACC's general waste treatment requirements would be adequately served by a small scale system.

Only small scale systems that have been rated as fully proven or proven are detailed below:

Fully Proven Systems

Systems are rated as fully proven if there is more than one full commercial reference site that has been operating for at least 2 years, on a given feedstock. In addition operational performance is consistent with International standards and has met the client's expectations.

The following small scale systems are rated fully proven:

- Oscillating kiln incineration
- Fluidised bed incineration
- Fluidised bed gasification
- Gasification and close coupled combustion
- Pyrolytic gasification and combustion
- Slagging gasification

Proven Systems

Systems are rated as proven if they have been proven in sustained commercial operation but in a more time limited fashion.

The following small scale systems are rated proven:

- Circulating fluidised bed incineration
- Gasification and close coupled combustion
- Rotary Kiln Pyrolysis
- Rotary Kiln Pyrolysis

It should be noted that the Juniper Assessment was initially undertaken in 2007 and updated in 2009.

From the information gained, small scale EFW systems are in place and include Incineration, Gasification, and Pyrolysis.

LF1 or EFW1 – Technical Reliability

In terms of technical reliability there is insufficient data available to categorically distinguish between LF1 and EFW1 as the preferred option, nor is there any data available to suggest that either of the options are not technical reliable.

Notwithstanding this EfW Plants have been in existence for many years and as detailed above there are plants that have been fully proven on a commercial scale.

The issue of technical reliability is a matter that can be considered at the procurement stage of Aberdeen City Councils Waste Strategy Development. As part of the procurement assessment process a full technical due diligence can be undertaken on the tenderer's submissions.

4 End Product Reliability

Members considered that it is **very important** to design a system that produces quality products with secure end markets. Particular emphasis was placed on the quality of recyclables produced through a Materials Recycling Facility.

LF1 and EFW1 will both generate further recyclables from the 'pre-treatment' element of the processes. The quality of these recyclables will inevitably be far less than the quality of the recyclables generated via the kerbside co-mingled collection system.

If there is no market place for material of this quality it would require to be landfilled under the LF1 option. With the EFW1 option the recyclables could be treated via the EFW Plant with additional energy benefits. This makes the EFW1 option more reliable.

In addition the LF1 Option produces a stabilised digestate suitable for landfill or landfill cover. If the digestate is not fully stabilised in accordance with the regulations on biodegradable content a disposal route may not be available.

General Waste – LF1 and EFW1

5 Cost

There was an understanding that no solution will be cheap but that the best value solution that achieves all the necessary requirements must be ensured. Issues concerning Capital v Revenue expenditure will be examined during the Business Case stage.

General Waste – LF1 and EFW1

Until the final specification of the given technologies LF1 and EFW2 are known it is not possible to provide specific cost information. Notwithstanding this reference is made to WRAP's annual gate Fees Report (2011).

WRAP's annual Gate Fees Report (2011) presents a summary of gate fees charged for a range of alternative waste treatment, recovery and disposal options. The report summarises indicative gate fee information and analyses the factors likely to

influence future gate fees. The information in the report allows local authorites to make better informed decisions regarding waste management options.

Gate fees for similar waste management options vary substantially both across and within regions. For example, spot and contract gate fees can differ depending on spare capacity and local market conditions (markets are localised to some extent by haulage costs).Indeed, the factors which determine specific gate fees at a particular facility are complex, ranging from the size of the facility, the nature of and the duration of contracts to technology, the age of a facility and the way in which revenues from the sale of recovered materials are shared.

Notwithstanding these variations, the summary information from the survey indicates that Landfill gate fees including the landfill tax are (currently) broadly comparable to gate fees for EfW and MBT. It should be noted however that the comparison is based on a landfill tax fee of £46 per tonne. Landfill Tax will rise each year to a maximum of £80 in 2014. As the landfill tax rises the gate fees for EfW and MBT will become cheaper.

The table below provides a summary of the relevant gate fees (per tonne) for 2011.

Treatment	Grade/Material/Type of Facility	Median	Range
Landfill	Including landfill Tax of £56 per tonne 2011 prices.	£76	£68 - £111
MBT	No Information given	£84	£57 - £100
EfW	Pre-2000 facilities	£54	£35 - £79
EfW	Post-2000 facilities	£73	£54 - £97
MRF	All	£15	Not Given
MRF	Contract starting in 2010 or later	£4	Not Given

It is clear from the above information that MBT and EFW are comparable in terms of costs. The median MBT cost per tonne is £84 and the median EFW (post 2000 facilities) is £73 per tonne. Adding on the potential additional costs of a MRF as a pre-treatment prior to EFW (£15) provides a total of £88 per tonne.

As stated above it is not possible to provide accurate costs for LF1 and EFW1 however the above analysis of the gate fees suggests that the costs are comparable; with neither option being considered preferred in terms of the appraisal.

The information does however clearly show that landfill costs are continuing to rise and will reach a median of at least £100 a tonne in 2014 when the landfill tax rises to £80 per tonne. This reinforces the need to move away from landfill.

5 Environmental Sustainable Solutions

Members agreed that **it is desirable** to achieve the most environmentally sustainable solution.

General Waste – LF1 and EFW1

Waste is considered a resource and it is beneficial to obtain as much value from the waste. In terms of EFW the main benefit of such a treatment technology is the electricity that can be generated and the heat that can be potentially utilised for industrial or district heating schemes. This combination of energy is commonly referred to as combined heat and power. If an EFW Plant is located within Aberdeen City, the benefit would be a local benefit.

Although energy may be generated from LF1 in the form of Gases and Refuse Derived Fuel production, it is considered that EFW1 is preferred to LF1 as an option for generating energy.

In addition the LF1 option as stated above is reliant on landfill disposal. Landfill disposal is considered the least preferred waste option in terms of the waste hierarchy.

6 Proximity/Compatibility

Members expressed support of local delivery of infrastructure including Energy from Waste. The criterion was considered to be a high priority but not absolute – for example, if there is a significantly cheaper solution to deal with the city's waste elsewhere, this would take priority over a local solution.

General Waste – LF1 and EFW1

It is difficult to establish whether LF1 or EFW1 is preferred when assessed against the proximity and compatibility requirements. The location of the treatment plant, which is not known at this time, will better inform the assessment of proximity and compatibility.

8 Flexibility of Solution

Flexibility of capacity and the ability of the solution to cope with a broad range of input materials are essential.

General Waste – LF1 and EFW1

LF1 is considered less flexible than EFW1 as it is reliant on landfill as part of the treatment solution. If landfill capacity ceases to become available alternative disposal options would need to be sought.

Treatment of general waste, whether via LF1 and EFW1, can be designed to ensure that changes in the outcome requirements can be accommodated. As the final specification of the treatment options are not known it is difficult to fully assess whether LF1 or EFW1 is preferred when compared to flexibility of service.

During the procurement process consideration should be given to the flexibility of the proposed solutions and the contract arrangements that will ultimately be in place.

Conclusions

Overall EFW1 is considered the most preferred option for the treatment of Aberdeen City Councils general waste.

Technical Reliability, Costs, Proximity/Compatibility and Flexibility are considered of neutral benefit for LF1 and EFW1.

LF1 is still reliant on landfill as a disposal option and therefore the regulations and policy may restrict this as a long-term disposal option. This will be very much dependant on the quantity of residual stabilised waste that requires to be landfilled.

As stated above the Zero Waste Plan intends to limit the continued reliance on landfill as a disposal option by effectively banning it by 2025. The Zero Waste Scotland Plan provides the target as "no more than 5% of Scotland's waste can go to landfill beyond 2025." There are no such concerns for EFW1 and for this reason EFW1 is considered more beneficial when assessed against compliance with regulations policy and ACC's Base Case.

In terms of end product reliability these are concerns over the disposal route for low-quality recyclables and stabilised digestate. EFW1 does not produce a stabilised digestate and any low-quality recyclables can be treated in the EFW Plant if required (no market) providing an energy benefit. EFW1 is therefore considered more beneficial when assessed against the end product reliability.

The overall energy benefit from EFW1 (heat and power) is considered a better environmental sustainable solution than the energy benefit obtained from LF1.

LF1 relies on landfill which is the least preferred waste hierarchy option. EFW1 is therefore considered more beneficial when compared to

Summary of Assessment Criteria

Key

✓ Considered more beneficial

X Considered less beneficial

0 Considered neutral benefit

Criteria	General Waste Treatment Option		
	NC	LF1	EFW1
Compliance with Regulations and Policy	X	X	✓
Compliance with ACC Base Case	X	X	✓
Technical Reliability	N/A	0	0
End Product Reliability	N/A	X	✓
Cost	N/A	0	0
Environment Sustainable Solutions	N/A	X	✓
Proximity/Compatibility with Aberdeen	N/A	0	0
Flexibility	N/A	0	0

5 Reference Documents

- Choosing the right recycling collection system, WRAP, June 2009
- Kerbside Recycling: Indicative Costs and Performance (and Technical Annex), WRAP, June 2008
- Analysis of Kerbside Dry Recycling Performance in 2008/09, WRAP, September 2010
- Review of Kerbside Recycling Collection Schemes Operated by Local Authorities, WYG Environment, May 2010
- Review of Kerbside Recycling Collection Schemes in the UK in 2009/10, WYG Environment, May 2011
- Kerbside Collections Options: Wales, WRAP, January 2011
- EU Waste Framework Directive 2008 (2008/98/EC) (WFD)
- MRF Quality Assessment Study, WRAP, 2009
- Food Waste Collection Guidance, WRAP, 2009
- Performance analysis of mixed food and garden waste collection schemes, WRAP, 2010
- Aberdeen City Council – Waste Strategy Plan (April 2010)
- Juniper Ratings Report – small-to-medium scale EfW systems for processing MSW
- WRAP – 2011 Waste Gate Fees Report
- An Introduction to Waste Technologies – Steve Last January 2012.

Appendix A

Initial Options

Appendix A Initial Options

A.1 Collection Options

Waste Stream	Collection	Options
General Waste	Communal - dependent on household mix - dedicated collection based on demand	Bin Bag/Sack Combined mix based on housing type Underground - Piped system - Hydraulic chamber
	Household	Bins - 240 litre - 160 litre Bag/Sack Communalised individual collections Collection Frequency - Weekly - Fortnightly - Four weekly
Organics	Household Business case options - Green only - Food/ garden mixed - Food & garden separate - Mixed collection based on housing type	Bins - Individual - Communal - Underground Home composting Stop/charge organic collection service Bin exchange

Waste Stream	Collection	Options
Food waste only	Individual household & communal	Bins - kitchen caddy/ 27 litre bin - kitchen caddy/ green 240 litre bin - kitchen caddy/ communal bin Survival bag with refuse Pneumatic system – In-Vac No collection with individual macerators Vehicle size and compaction - Split vehicle with recycling - Dedicated 2 axial vehicle with limited compaction - RCV - Bin exchange system
Recyclables	Household	Kerbside Sort - five/ six streams - seven/eight streams Co-mingled - glass in - glass out - survival bag No collection recover from refuse system (“dirty MRF”)
	Communal	Commingled recycling Near entry (recycling point style) segregation

A.2 Treatment Options

Waste Stream	Collection	Options
General Waste	Pre-treatment	Aerobic Biological - fuel - stabilise to landfill Anaerobic Biological Mechanical Biological & Mechanical Heat Treatment - fuel - recyclables No Pre-treatment
	Treatment	Landfill Energy from Waste* - Incineration - Gasification/ Pyrolysis - Plasma Arc *Energy from waste product options - No combined heat and power (CHP) - CHP - Electricity Generation - Inert APCR residues
Garden waste	Treatment	In-vessel composting Open windrow composting
Food Waste	Treatment	Anaerobic digestion - wet - dry - co-digestion In-vessel composting
Recyclables	Treatment* * this is market lead	Bulking Complex sorting & bulking - MRF

Appendix B

Option Screening

Appendix B Option Screening

Waste Stream	Collection/ Treatment	Option	Justification
General Waste	Collection - Communal	Bag/Sack	Hygiene, amenity, street cleanliness and unpopular
		Underground - Piped system - Hydraulic chamber	Cost prohibitive, unsuitable for many parts of the city
	Collection - Individual Household	Bag/Sack	Hygiene, amenity, street cleanliness and unpopular
		[Communalised individual collections - remain an option but limited application]	
		Collection Frequency - Four weekly	Alternative services not developed enough (leading to street cleanliness issues) and unpopular
	Treatment	Energy from Waste - Plasma Arc	Technological unproven un Europe, inefficient, high energy demand
		No CHP	Inefficient, regulatory issues (SEPA thermal treatment guidelines)
		Electricity only	Inefficient, regulatory issues (SEPA thermal treatment guidelines)
		Anaerobic Biological	Unproven in UK, no guarantees on outputs to land/landfill
Food &/or Garden Waste	Collection	Survival bag with refuse	Regulatory implications, questionable market for compost product
		Pneumatic system – Envac	Cost prohibitive
		No collection with individual macerators	Cost, regulations will require a collection
		Bin exchange	Inefficient

Waste Stream	Collection/ Treatment	Option	Justification
Recyclables	Collection – Individual household	Co-mingled with glass separate	
		Survival Bag	Trust, blurs lines between recycling and waste, participation
		No collection	Regulatory issues, medium – long term cost implications, unsustainable
	Collection - all households	Combination of kerbside sort & co-mingled collections	Equality of provision, requires differing technologies for treatment, different vehicle and associated costs. Two collection systems may affect the economics of output value
	Collection – all households	Two stream co-mingled collection	Reduced efficiency compared to single stream, increased collection times
	Treatment	"Dirty" MRF (reclaim from mixed unsorted waste)	Regulatory issues, poor quality of some materials, low recovery rate

Appendix C

Zero Waste Management Sub-Committee Report

Appendix C Zero Waste Management Sub-Committee Report

ZWMSC – Options Appraisal Workshop

In attendance:

Councillors McCaig, Dunbar, Greig, Malone

Peter Lawrence, Mark Reilly, Andrew Win, Laura Blair

Apologies:

Councillor Corral

Pete Leonard

Purpose and Process

The purpose of the workshop is to provide Members of the sub-committee with an overview of the criteria which will be used to assess different waste management collection and treatment options and to establish members' views on the relative importance of each criterion.

The selection of the Criteria was considered by Members at the Zero Waste Management Sub-Committee of 11 October 2011.

Collection Criteria

1) Compliance with Regulations and Policy:

Members acknowledged that in respect of collections, there are statutory requirements that must be adopted (provision of separate collections) in line with guidance provided by the Government and SEPA.

There are other targets set within regulation and policy that do not specifically apply at an authority level, for example, Recycling Targets. For these areas it was agreed that Aberdeen City Council should make every effort to achieve the Scottish Government's recycling targets but it was accepted that, as this is not a statutory requirement, it should be considered a highly desirable criterion rather than essential. This allows the adoption of a service system that meets the needs of all Aberdeen citizens, recognises the unique mix of housing types and enables a best value solution to be achieved.

2) Compliance with Base Case

Members accepted the need to comply with the Base Case as essential. In particular, the need to design recycling collection systems that achieve the levels of source separation set in the base case is considers essential. It was recognised that this means city-wide collections of a wide range of recyclables will be required.

3) Equality of service provision

Members considered this to be a very important criterion and one that goes beyond simple waste policy but reflects the wider responsibility of a local authority. In particular, this means that there should be provision of recycling opportunities to all. It was recognised that this does not mean that all households should receive exactly the same services (e.g. garden waste collections in high-rise developments) but that ease of use of systems should be the same across the city.

There was discussion on whether provision of Recycling Points would be satisfactory in some areas however the view was that more localised provision is required, for example communal or "near entry" points rather than just Neighbourhood Recycling Points. The principle underlying this was that it should just as easy for a resident in multi-occupancy areas to present their waste for recycling as it is for refuse.

4) Cost

Essential to ensure best possible value to the Council however cost must be balanced against the other essential criteria and considered in connection with treatment costs to achieve overall best value. It was recognised that for collection costs will be biased towards revenue rather than capital.

5) Recyclables Quality & Quantity

It is recognised that it is important to ensure that outputs are of high enough quality to find secure and good value markets but this must be achieved at the point of sale from Aberdeen. Quality can be achieved through processing of mixed recyclables as well as through extensive kerbside sort. Quantity is also important and this can be achieved by both participation and expansion of range of recyclables.

6) Compatibility with Aberdeen

Members agreed that this criterion should be of high importance and recognising the wide range of housing types across the city presents challenges. A preference was expressed for a single collection system/method across the city to ensure equality of provision and allow clear and consistent communications.

7) Flexibility

Members recognised that it will be essential to develop a system that can to respond to changing needs in the future, especially with the ability to expand the range of materials collected.

Treatment Criteria

1) Compliance with Regulations and Policy

Members agreed that it is essential that any system is able to comply with treatment regulations. The forthcoming Zero Waste Regulations are likely to introduce additional statutory controls on treatment operations and that this options appraisal should take these into account

2) Compliance with Base Case

Members considered that it is essential that any option achieved this criterion. It was agreed that the capacity of infrastructure and services should be defined as a range (for example, between 40,000 and 60,000 tonnes per annum for residual treatment capacity) to take account of the inevitable uncertainty in outcomes of any modelling exercise and future changes in circumstances. This is considered the best method of ensuring our needs are met but giving the Council flexibility to achieve the best value solutions for the city over time.

3) Technical Reliability

Members agreed that it is essential that proven and reliable solutions are adopted but that the Council should strive for the most advanced technology possible. The reasons expressed for this were:

- the Council cannot stop waste production and that we must have a system that can ensure continuity of collection services
- it is recognised that external funding is likely to be required and that this will be easier to access and at better terms if the technology is proven.

4) End Product Reliability

Members considered that it is very important to design a system that produces quality products with secure end markets. Particular emphasis was placed on the quality of recyclables produced through a Materials Recycling Facility.

5) Cost

There was an understanding that no solution will be cheap but that the best value solution that achieves all the necessary requirements must be ensured. Issues concerning Capital v Revenue expenditure will be examined during the Business Case stage.

6) Environmentally Sustainable Solutions

Members agreed that it is desirable to achieve the most environmentally sustainable solution.

7) Proximity/Compatibility with Aberdeen

Members expressed support of local delivery of infrastructure including Energy from Waste. The criterion was considered to be a high priority but not absolute – for example, if there is a significantly cheaper solution to deal with the city's waste elsewhere, this would take priority over a local solution.

8) Flexibility of solution

Flexibility of capacity and the ability of the solution to cope with a broad range of input materials are essential.

Appendix D

Screened Collection Options

Appendix D Screened Collection Options

Option	Waste Stream	Collection	Frequency
No Change	All	Current collection	Current frequency
CM1 Split bodied vehicles	General waste & food	Dedicated household collection (food waste collected via split)	Fortnightly (Food weekly)
		Dedicated communal collection	As required
	Recyclables & food waste	Dedicated co-mingled household collection (food waste collected via split)	Fortnightly (Food weekly)
		Communal - co-mingled collection	As required
		Communal food waste	As required
	Garden waste	Dedicated household collection	Fortnightly
CM2 RCV with separate food collection	General waste	Dedicated household collection	Fortnightly
		Dedicated communal refuse collection	As required
	Recyclables	Dedicated co-mingled household collection	Fortnightly
		Dedicated communal co-mingled collection	As required
	Garden waste	Dedicated household collection	Fortnightly
	Food waste	Dedicated food waste collection - light vehicle	Weekly
		Dedicated communal food waste collection	As required
CM3 RCV with food/organic waste collection	General waste	Dedicated household collection	Fortnightly
		Dedicated communal refuse collection	As required
	Recyclables	Dedicated co-mingled household collection	Fortnightly
		Dedicated co-mingled communal collection	As required
	Food & garden waste	Dedicated household collection	Fortnightly
	Food waste	Dedicated communal food waste collection	As required

Appendix E

Screened Treatment Options

Appendix E Screened Treatment Options – All Waste Types

Waste Stream	Options
General Waste	NC - No change to current disposal LF1 - Mechanical & Aerobic Biological Pre-treatment to Landfill and fuel for export EFW1 - Pre-treatment to Energy from Waste
Recyclables	NC - No change to current treatment KSST1 - Limited sorting and bulking CMT1 - Bulk comingled recycling - export CMT2 - Complex local sorting (MRF) - export
Food Waste	NC - No change to current treatment AD1 - Anaerobic Digestion Wet AD2 - Anaerobic Digestion Dry AD3 - Anaerobic Digestion Co-digestion IVC1 - In-vessel composting
Food & Garden Waste	NC - No change to current treatment AD1 - Anaerobic Digestion Wet AD2 - Anaerobic Digestion Dry AD3 - Anaerobic Digestion Co-digestion IVC1- In-vessel composting Food NP - No preference, best market offer
Garden Waste	NC - No change to current treatment OWC1 - Open Windrow composting