MILTON KEYNES COUNCIL

TECHNICAL COLLECTION OPTIONS APPRAISAL

ISSUE V0.1

5th August 2005

Executive Summary

Milton Keynes Council is obliged to comply with targets including Best Value Performance Indicators (BVPI's) set by the Office of Deputy Prime Minister (ODPM) and the Landfill Allowance Trading Scheme (LATS). This includes the key target years 2009/10, 2012/13 and 2019/2 and additionally a series of targets, that include those from Waste Strategy 2000, those recommended in the Strategy Unit report (2002), the South Eastern Regional Assembly Waste Management Strategy (Draft 2003). As such the Council are required to consider the best way forward with regard to managing Municipal Solid Waste. Jacobs Babtie was instructed on 17th May to undertake an investigation into front end collection and recycling options to assist Milton Keynes in making an informed decision upon the best approach for the long term management of Municipal Solid Waste (MSW).

A review of the current collection provision was undertaken with regard to both residual and recyclable collection systems. From this review, a baseline waste flow model was developed and three basic arrangements for future collection systems were considered that focused on either (1) maximum diversion of biodegradables, (2) targeting heavy recyclables or (3) maximizing overall recycling. For each basic arrangement, 3 options were modelled as follows:

- Base Case - Weekly black sack residual collection
  - Weekly recycling collection
  - Weekly organic waste collection
- Variation a - Fortnightly collection of residual waste
  - Weekly recycling collection
  - Weekly organic waste collection
- Variation b - Weekly black sack residual collection
  - Weekly recycling collection
  - Fortnightly chargeable garden waste collection - 240 l wheeled bin
  - Weekly free kitchen waste collection

Best Value Performance Indicators (BVPIs)

Any contractual arrangement for the collection of waste will require to comply with either BVPI's or locally set targets. Therefore it has been assumed that Front End Recycling Performance is a vital part of choosing a Front End Collection System. Based on the modelling undertaken, option 3a, which collects all recyclables and all compostable materials weekly and residual waste fortnightly, achieves the highest recycling rates in key target years. Option 2a, which collects heavy recyclables (paper, card and glass) and all compostable materials weekly and residual waste fortnightly also achieves 40% recycling in 2015 and 2020.

Landfill Allowance Trading Scheme (LATS)

The results from the assessments have identified that with all nine collection options, there will be a need for some sort technology treatment arrangement in order to meet LATS. The type of technology option has been considered in the initial Milton Keynes Council Waste Management Technical Options Appraisal[1]. Based on the modelling undertaken, option 3a, achieves the greatest diversion of BMW in key target years. Option 2a, achieves the second highest diversion of BMW in key target years.

[1] Buckinghamshire County Council & Milton Keynes Council Waste Management Technical Options Appraisal, Formal Issue, Version 2, 8th February 2005.

Capital and Operational Costs

The nine arrangements include different forms of front-end collection options and consequently the whole life Net Present Value varies significantly. The Net Present Value ranges from £135m up to £259m (figures rounded). Option 2a is the most cost effective if the price of the MRF is included or excluded. When the cost of the MRF is included option 3a is one of the most expensive options (NPV of £230 million) and without the cost of the MRF is of the midrange cost options (NPV of £174 million).

Practicability of Options

When practicability is being considered the views of both the collection operator and the householder should be considered.

The householder is likely to view containment and frequency as principal factors and it is considered that wheeled bins or boxes for recyclables would be preferable with wheeled bins for mixed organic waste collected weekly and with residual waste collected weekly.
Options – 1a, 2, 2a and 3

The collection operator is likely to view productivity and low cost vehicle operation as being principal factors and it is considered that the top loader vehicle provides the most suitable collection for recyclables with the RCV being most practicable for the mixed organic Waste
Options – 2, 2a, 3, 3a

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1 Introduction

1.1 Background

Milton Keynes Council (MKC) is a unitary authority and as such has the responsibility for both waste collection and waste disposal. The rules governing the management of MSW are prescriptive. Every authority is obliged to comply with Best Value Performance Indicators (BVPIs) set by the Government on recycling and composting, for example. The EU Landfill Directive prescribes the amount of BMW that can be landfilled, with the key target years 2009/10, 2012/13 and 2019/20. The Landfill Directive targets are translated in England under the Landfill Allowance Trading Scheme (LATS), which sets maximum allowable levels of BMW to be landfilled for each year from 2005/06. Non-compliance with BVPI targets could ultimately lead to intervention by the Secretary of State. Exceeding landfill allowances means that an authority must secure enough permits from other authorities or face penalties at £150 per tonne. Nationally, failing the Landfill Directive targets is likely to lead to particularly onerous financial penalties in the order of £500,000 per day.

In addition there are a series of targets that include those from Waste Strategy 2000, those recommended in the Strategy Unit report (2002), the South Eastern Regional Assembly Waste Management Strategy (RWMS) (Draft 2003) or locally agreed targets that encourage authorities to aspire to a level of recycling performance that is perceived to be achievable. In order to attract PFI funding DEFRA expects recycling/composting targets to be stretched and that thermal options should not exclude opportunities for recycling/composting.

Hence MKC wanted to be able to make an informed decision upon the best approach for the long term management of Municipal Solid Waste (MSW). This report, jointly with the Waste Management Technical Options Appraisal[2], is intended to assist MKC in this decision making.

The Technology Option Appraisal considered two levels of recycling performance based upon the success of either certain planned initiatives or optimised initiatives. A materials recycling facility (MRF) facility was very much integral to both the planned and optimised initiatives and to some extent prescribed the available recycling parameters. The outcome of front end recycling is twofold. Firstly to improve baseline performance against statutory and local recycling targets, and secondly to contribute to the diversion of Biodegradable Municipal Waste (BMW) from landfill.

1.2 Objectives of the Study

The objectives of this report were to:

- Determine the best approach for the collection and segregation of recyclables to achieve recycling targets of 40% +
- Determine the most favourable balance between recycling targets and BMW diversion.
- Compare the capital and operating costs of different front end recycling options.

1.3 Key Tasks

The objectives of the study were translated into three key tasks; the findings of each task are documented by this report:

(a) Front end recycling performance

[2] Buckinghamshire County Council & Milton Keynes Council Waste Management Technical Options Appraisal, Formal Issue, Version 2, 8th February 2005.

(b) Practicability of collection options

(c) Capital and operational costs

1.4 Methodology

The following methodology was adopted:

1. A background study was conducted on Milton Keynes to identify the current systems in place and to identify the current waste arisings and Best Value Performance Indicators. This information was obtained via background literature and discussions with Milton Keynes Council.

2. Assumptions for waste composition, waste growth, and capture rates were identified.

3. Kerbside collection options for residual waste, dry recyclables and organic waste were provided by Milton Keynes Council and models were developed based on the assumptions identified during the background study.

4. The kerbside collection systems proposed were compared to identify their performance against the recycling target of 40% and the contribution to the Landfill Allowance Trading Scheme.

5. The practicability of the various options was identified taking account of the key aspects of each option. Consideration was given to practicability for householders and waste collection operators.

6. A cost model was developed for each option using the assumptions identified during the background study. The costs are identified as Net Present Value.

2 Limitations and Exclusions

The findings and opinions conveyed via this report are based on information obtained from a variety of sources as detailed within this report and which Jacobs Babtie believes is reliable. Nevertheless, Jacobs Babtie cannot and does not guarantee the authenticity or reliability of the information. No original data gathering work has been carried out by Jacobs Babtie as a part of this commission.

The figures presented in this report are based on published values for the types of items and works anticipated or supplied directly by participating authorities. They are an indication of potential budget costs.

Base line data used for this report was for the year 2004/5 supplied by Milton Keynes Council

3 Background

3.1 Demographics

MKC encompasses an area of 31,000 hectares of predominantly urban character, located in the South East.

The official MKC figure for population in 2001 was 207,057. The population is currently estimated to be 215,710 (June 2003). Milton Keynes has seen an increase in population of over 60% in the past 20 years. Most of this growth is focused in the new city, which continues to be amongst the fastest growing urban areas in the country.

Milton Keynes is expected to experience a high rate of population growth over the next 6 years. Around 21,290 houses are anticipated to be built in the Borough, allowing for a projected growth in population of around 38,910 people. The population of the Borough of Milton Keynes is expected to increase by 38,910 people, to 255,760 by the year 2011, an increase of 18%.

Using households growth assumptions provided by MK it has been assumed that there will be 102,590 households in 2007/year 1.

3.2 Waste Arisings

In 2004/05 the total quantity of household waste collected by MKC amounted to 114,160 tonnes, of which 30,936 tonnes were recycled or composted, generating a combined rate of 27%. This is achieved through a combination of kerbside collection, bring banks and recycling centres.

In 2000/01, the average annual production of household waste per person in the UK was approximately 500kg. MKC's average in 2003/04 was 515kg, which is slightly above the national average.

3.3 Best Value Performance Indicators

The historical performance of Milton Keynes Council for each of the BVPIs for waste between 2001 and 2004 is shown in Table 1 and discussed below.

Table 1: MKC recent performance of BVPI [ODPM, 2005; Milton Keynes, 2005a]

Indicator		2001/02	2002/03	2003/04
BV82a	Household waste - percentage recycled	11.8	13.9	18.2
BV82b	Household waste - percentage composted	1.5	2.4	5.8
BV82d	Household waste - percentage landfilled	86.6	83.6	76
BV84	Kg of household waste collected per head	452.2	526.5	515.9
BV86	Cost of waste collection per household	£36.50	£43.20	£57.60
BV87	Cost of waste disposal per tonne for municipal waste	27.7	28.6	29
BV91	% of pop. served by kerbside collection or within 1km of recycling centre	100	100	100

As can be seen from this data, MKC have increased that the percentage of household waste recycled and composted over this period with a corresponding increase in the cost of waste collection.

3.4 Current Collection Provisions

3.4.1 Residual and Recycling

Milton Keynes currently operate a kerbside refuse and recycling collection system using "onepass" vehicles, which collect both refuse and recyclables at the same time using three separate compartments. Collections are from the front property boundary.

Refuse is collected in a black sack. Dry recyclables (paper, cans and plastic bottles) are collected in pink sacks and glass in a blue box. Black sacks, pink sacks, and blue boxes are all now collected weekly.

3.4.2 Green waste collection

Garden waste is collected fortnightly. This is on a chargeable basis, for 9 months. Garden waste may not be put in the refuse sacks. Currently around 25,000 houses participate in the garden waste collection service. Residents currently pay £13 per year to hire a green wheeled bin from the Council and use a fortnightly collection service which runs from March to November inclusive

3.4.3 Bulky collection

Milton Keynes Council provides a free collection service for bulky household items. Only residents wishing to book a specific appointment for collection are asked to pay a small charge

3.4.4 Other collections

In some flats and sheltered housing wheeled bins are used instead of sacks for the collection of either or both refuse or recycling. Whether wheeled bins are used depends on local factors such as the layout and number of properties. In these cases, the onepass vehicle is unsuitable for collection as it has no bin lift. An ordinary refuse vehicle with binlift is used to collect the refuse, and the vehicle which empties the recycling banks is used to collect the recyclables.

3.4.6 Materials Recycling Facility (MRF)

The mixed recyclables collected from households in MKC were sorted at a MRF in Milton Keynes. This MRF has recently suffered severe fire damage and has been closed. Since the closure of the MRF it is understood that the pink bags containing the dry recyclables are being temporarily stored by the MKC contractor, Cutts Brothers.

4 Baseline Assumptions and Modelling Methodology

4.1 Overview

To consider suitable MSW collection technology options it is necessary to model waste generation, with respect to a multitude of factors such as new houses, population, waste minimization and collection methods which may all impact upon the quantity and quality of waste arisings.

In order to achieve this, a two stage waste and cost modelling exercise was undertaken as follows:

- **Baseline Waste and Front End Collection Model**
  A baseline waste flow model was prepared that accounts for data specific to Milton Keynes such as population, waste composition and anticipated growth in waste arisings. The baseline waste model was then developed for a number of front end collection options to provide an assessment of the performance of the Options against Milton Keynes strategic objectives

- **Capital and Operational**
  An outline cost model was prepared to present the capital and operational costs of the different collection options modelled above.

4.2 Qualification

Both modelling stages are based on three underlying assumptions:

- **The waste composition:**
  The waste composition used in the waste model was based on recent waste compositional studies undertaken by MKC[3].

- **How much waste there will be**:
  Future waste arisings were based on actual waste tonnages extrapolated for future years using assumptions on waste arisings growth and population growth forecasts provided by MKC.

- **The success of the strategy initiatives:**
  This is termed the capture rate and is described in MKC Waste Management Technical Options Appraisal[4]. The capture rate refers to the amount of a particular waste stream that is diverted by an initiative.

  These assumptions are explained in more detail in the following sub sections.

4.2.1 Waste Composition

The composition of household waste has been evolving with materials types and consumer habits. Discussion about what is now in the waste stream and what could be present in the future is therefore subject to considerable caveats. A household waste compositional analysis was

[3] Household Waste Compositional Study April and November 2000 for Milton Keynes
[4] Buckinghamshire County Council & Milton Keynes Council Waste Management Technical Options Appraisal, Formal Issue, Version 2, 8th February 2005.

undertaken in April and November 2000; this data has been used to develop a baseline waste flow model.

Table 1: Waste Composition of MSW Used in the Model.

Waste Composition	% of total
Paper/Card	25.01%
Plastic Film	2.67%
Dense Plastic	3.05%
Textiles	2.30%
Misc. Combustible	18.47%
Misc. Non Combustible	2.94%
Glass	7.12%
Organic (kitchen/garden)	30.84%
Ferrous Metal	2.79%
Non Ferrous Metal	0.85%
Fines	3.96%
TOTAL	**100.00%**

Source: Household Waste Compositional Study April and November 2000 for Milton Keynes

It is emphasised that waste composition is unlikely to remain stable because of the influence of factors such as waste growth and variations in consumer trends over time. However, there is currently no accepted method of predicting or modelling future changes in composition with any degree of accuracy and this has not been considered in the model.

Waste composition data is used as the basis for the development of the collection and cost models it should be noted that certain treatment technologies are also dependant upon composition consistency to maintain functionality and reduce input specification risks i.e. thermal treatment technologies are dependant on calorific value.

4.2.2 Waste Growth

Milton Keynes Council has undertaken an independent assessment of future waste trends, which incorporates local factors such as increased population and higher historic trends at Community Recycling Centres (CRC). The MKC growth rate has been applied in the Jacobs Babtie waste flow and outline cost models.

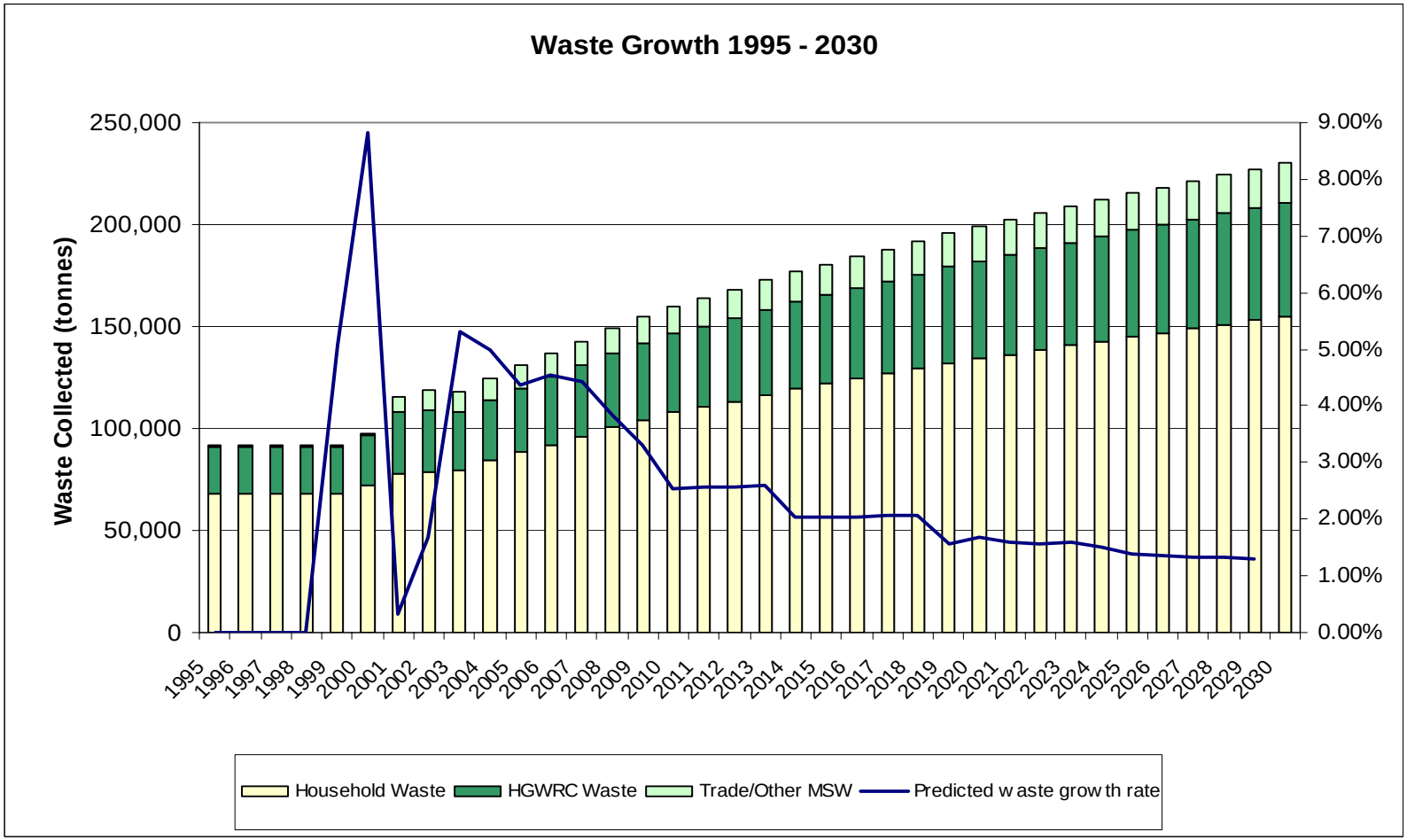
The average MSW growth per year over the next 25 years used in the model is 2.33% based on population growth and waste growth per person projected by the Council identified in Table 2. Table 2 also identifies the total annual waste growth rate associated with these projections and applied in the Jacobs Babtie waste flow and outline cost models. The MSW tonnages associated with the waste growth scenario in Table 2 are identified in Figure 1.

Table 2: Assumed Waste Growth used in Baseline Waste and Front End Recycling Model

Year	Population Growth (%)	Waste growth per person (%)	Total Waste Growth (%)
2005	3.4	1.5	4.9
2006	2.8	1.5	4.3
2007	3.0	1.5	4.5
2008	2.9	1.5	4.4
2009	2.3	1.5	3.8
2010	2.3	1.0	3.3
2011	1.5	1.0	2.5
2012	1.5	1.0	2.5
2013	1.6	1.0	2.6
2014	1.6	1.0	2.6
2015	1.5	0.5	2.0
2016	1.5	0.5	2.0
2017	1.5	0.5	2.0
2018	1.6	0.5	2.1
2019	1.6	0.5	2.1
2020	1.5	0.0	1.5
2021	1.7	0.0	1.7
2022	1.6	0.0	1.6
2023	1.6	0.0	1.6
2024	1.6	0.0	1.6
2025	1.5	0.0	1.5
2026	1.4	0.0	1.4
2027	1.4	0.0	1.4
2028	1.3	0.0	1.3
2029	1.3	0.0	1.3
2030	1.3	0.0	1.3

Waste growth provided by MKC.

Figure 1: MKC Predicted Waste Growth and Associated MSW Arisings



4.2.3 Capture Rates

The Capture Rate refers to the amount of a particular waste stream that is diverted by an initiative. There are four components as outlined below:

Percentage Targeted:	The percentage of the waste stream that the Council targets for recycling/composting actually be recycled.
Percentage Roll Out:	Percentage of households that the Council provides a service to.
Percentage Participation:	Percentage of households offered a service that chooses to use it (average over year).
Percentage Recognition	A combination of: Percentage of participating householders who know what materials can be set out for recycling/ composting Percentage of participating householders who remember to put materials out for recycling/ composting on correct days/times? Percentage of participating householders that are bothered/or able to set out materials for recycling/ composting at that particular time i.e. the hassle factor of placing materials in the correct box/ receptacle.

Multiplying these four factors together gives the percentage of the waste stream that will be diverted by the initiative.

Example Capture rate calculation
The Paper and Card fraction of bin waste includes dirty food packaging, tissues and coated materials, which are not suited to recycling and therefore only about 80% of the paper and card is Targeted. A new kerbside recycling service is introduced by a Council, but because of difficult access areas and flats etc, only 95% of households are included in the Roll Out of the service. Among these households there are those who flatly refuse to participate, who drop out over time or use the service very infrequently (termed the set-out rate). Overall, say the equivalent of 70% of potential households regularly Participate in the new service. The final factor is that even among these participants, it is rare to find someone who separates all the correct items all of the time. The Recognition rate reflects the times that a person remembers (or can be bothered) to separate a recyclable waste from their mixed refuse; in this example say an ambitious 90% recognition rate is reached.
The Overall Capture rate of paper and card is therefore 80% (Targeted) * 95% (Roll Out) * 70% (Participation) * 90% (Recognition) = 48% [i.e. less than half of the paper and card fraction is recycled]

Having the most up to date assessment of these factors enables a truer picture of the quantities of waste the various collection initiatives could divert, and in turn the cost-benefit of each.

Identification of previous capture rates (2000/01 to 2004/05)

The Capture Rates for the past four years (2000/01 to 2004/5) have been back calculated using the current waste tonnages. Participation Rates used were supplied by MKC.

Identification of current capture rates 2004/2005

Current capture rates identified are based on the predicted tonnages given by Milton Keynes County Council. Table 3 identifies current capture rates used in the model. Current percentage target, roll out and participation where all provided by MKC. Recognition could then be calculated.

Table 3: Current Capture Rates Used in the Models.

Current Collection		2004/05 Targeted	2004/05 Roll-out	2004/05 Participation	2004/05 Recognition	2004/05 Capture Rate
K/S Recycling	Paper	84%	100%	62%	94%	49%
	Plastic	53%	100%	62%	65%	21%
	Glass	98%	100%	62%	85%	52%
	Cans Fe	89%	100%	62%	35%	19%
	Cans Non-Fe	89%	100%	62%	20%	11%
Bring Banks	Paper	84%	100%	7%	90%	5.2%
	Plastic	53%	100%	2%	70%	0.7%
	Glass	98%	100%	24%	90%	21.4%
	Cans Fe	89%	100%	2%	70%	1.3%
	Cans Non-Fe	89%	100%	2%	70%	1.2%
K/S Organics[5]	Garden	49%	45%	100%	100%	22%
	Food	0%	0%	0%	0%	0%

Identification of future capture rates

It was assumed that capture rates will be slowly increased to predicted maximums with the exception of the following:

- Bring bank capture rates which have been kept at present levels
- The paper waste stream was reduced to 69% from April 2008 as only news and pams will be collected.

In addition, food waste will be trialled From Sep 2005 to Sep 2006 in 1000 homes. It is assumed that a full-scale collection of food waste will commence following the trial and therefore, capture rates have been assumed for organics (food) waste from October 2007 onwards.

The maximum rates can be seen in most streams by 2015. We have modelled the capture rates such that they do not exceed rates given in the Strategy Unit Report (2002) – Recycling Participation Report. Table 4 identifies the maximum capture rates used in the models.

[5] Organic waste is worked out as one stream with a 50/50 split, taken from the compositional analysis. Therefore the maximum percentage targeted for garden waste and food waste as individual streams is 50%.

Table 4 Maximum Capture Rates Used in the Models.

Current Collection		Targeted	Roll-out	Participation	Recognition	Capture Rate
K/S Recycling	Paper	69%	100%	80%	90%	44%
	Plastic	53%	100%	80%	70%	30%
	Glass	98%	100%	80%	90%	71%
	Cans Fe	89%	100%	80%	70%	50%
	Cans Non-Fe	89%	100%	80%	70%	50%
K/S Organics	Organics	49%	100%	70%	90%	34%
	Organics (food)	49%	100%	60%	70%	21%

Some of the current and future rates assumed in the models have been modified to take into account specific characteristics of each of the 9 collection options assessed in the report (e.g. Option 1 does not include the collection of glass, but is collected in bring banks, therefore the participation assumed at glass bring banks for this collection option has been increased from 7% to 35% by 2015). The modified rates identified for each specific collection options and associated assumptions are identified in Section 5.2

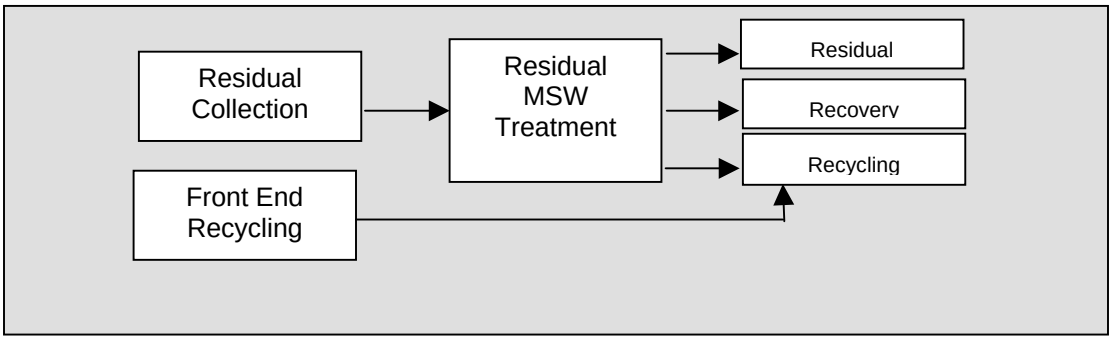
5 Change to collection options

5.1 Background

This section discusses alternative ways in which kerbside collection systems can be implemented and the costs associated with these options.

The approach taken for the collection of recycling to a large extent determines the approach taken to subsequent stages of the MSW management process (Figure **2**). For example a kerbside collection with a high degree of manual kerbside sorting will require only a simple MRF or bulking facility to prepare the materials for onward transport to a reprocessor. Conversely, a fully co-mingled collection will require a complex MRF to separate the materials into a form suitable for onward transport.

Figure 2: Typical MSW Management Process.



There are many possible combinations of collection and treatment arrangements but for the purposes of this study Milton Keynes Council have identified 3 basic arrangements with 3 variations in each option, giving a total of 9 modelled options. The options were selected on the basis of their contribution towards the authority's statutory targets and/or recycling targets.
The evaluated options were:

- Option 1 – Maximum biodegradables
- Option 2 – Heavy recyclables
- Option 3 – Maximum recycling

For each option the following variations were modelled:

- Base Case
  - Weekly black sack residual collection
  - Weekly recycling collection
  - Weekly organic waste collection
- Variation a
  - Fortnightly collection of residual waste
  - Weekly recycling collection
  - Weekly organic waste collection
- Variation b
  - Weekly black sack residual collection
  - Weekly recycling collection
  - Fortnightly chargeable garden waste collection - 240 l wheeled bin
  - Weekly free kitchen waste collection

The detailed assumptions for each option are provided in appendix 1

The performance of these options against recycling and composting, and against biodegradable diversion targets is outlined in Section 6.2.

5.2 Assumed Capture Rates Specific to Each Collection Option

Some of the current and future capture rates assumed for the model calculations identified in section 4.2.3 have been modified to take into account specific characteristics of each of the 9 collection options identified in sections 5.1.

The modified capture rates specific to each collection option are identified in the following sections.

5.2.1 Option - 1

In Option 1, glass is no longer collected in the kerbside collection but is collected in bring banks. Here the participation at glass bring banks has been increased to 35% by 2015.

5.2.2 Options – 1a, 2a and 3a

These collection options are based on variation (a) which assumes an alternate weekly collection of residual waste. It is assumed that these collections will increase the participation rate for segregated kerbside collections of dry recyclables and organics by 5% compared to a weekly collection.

5.2.3 Options – 1b, 2b and 3b

Variation (b) assumes that the current free of charge collection of garden and kitchen waste will be undertaken on a chargeable basis, for garden waste and free of charge for kitchen waste, which will be collected in a separate caddy.

The capture rate changes assumed for these options are:

- Roll-out – It has been assumed that the roll-out rate will stay at current roll-out figures (45%) for garden instead of 100% roll-out given in options 1, 2 and 3. Food waste will be rolled out to 100%.

- Participation and recognition - It has been assumed that the participation and recognition rates to be achieved for garden waste collected on a chargeable basis will be 100% participation 100% recognition. These rates are greater than the rates assumed for a free collection option with participation rates starting at 60% and go up to 70% and 90% recognition.

- Resulting capture rates – Due to the changes in roll-out rates and participation and recognition rates identified above, the overall capture rate for collections of garden waste on a chargeable basis is 22%. This rate is lower than the overall capture rate identified for free collections of garden waste (34%)

5.3 Option 1 - Maximum Biodegradables

The emphasis in this option is to maximise the amount of organic material collected so as to achieve maximum diversion of biodegradable municipal waste from landfill.

All vehicles are assumed to be manned by a driver and two loaders.

5.3.1 Option 1 – Base Case

Collection	Residual	Mixed Paper and Card	Garden & Kitchen Waste
Frequency	Weekly	Weekly	Weekly
Collection Location	Kerbside	Kerbside	Kerbside
Containment	Plastic Sack	Plastic Sack	240 l wheeled bin
Treatment		Simple MRF Bulking Facility	ABPO compliant Composter
Vehicle	Standard RCV	Split back RCV	

Residual Collection

Residual collections are carried out weekly using a standard RCV. Householders will be provided with a black plastic sacks. A driver plus two loaders would man the vehicle.

Recycling Collection

Householders are provided with one sack for paper and card and a 240l wheeled bin for garden and kitchen waste. The collection is based on a split back compaction vehicle. Garden and Kitchen waste is collected together and compacted in one compartment; paper and card in the other.

The vehicle would be manned by a driver plus two loaders.

Treatment

The waste collected would be taken for disposal to landfill or energy recovery.

The recyclables would be taken to simple bulking MRF for onward transport to a reprocessor.

The compostable organic material would be taken to a suitable Animal By-Products Order (ABPO) compliant facility.

Cost

Table 5 identifies the Capital and Operational expenditure for this option. Further details on the costs are provided in section 6 and the associated assumptions are provided in appendix 1.

Table 5: Option 1 - Base Case, Summary Costs

Collection	Residual	Mixed Paper and Card and Garden & Kitchen Waste	Management	MRF
Capital Expenditure £p.a.	898,000	816,000	0	39,000
Operational Expenditure £p.a.	2,722,000	2,550,000	348,000	424,000
Total £p.a.	3,620,000	3,366,000	348,000	463,000
Cost per Household £p.a.	27.11	25.45	2.64	3.15

Over a 24 year period the net present value[6] (NPV) of this option is equal to £187 million, which equates to a NPV cost per annum of £7.49 million and a NPV cost per tonne of £40.96

5.3.2 Option 1 - Variation (a)

Collection	Residual	Mixed Paper and Card	Garden & Kitchen Waste
Frequency	Fortnightly	Weekly	Weekly
Collection Location	Kerbside	Kerbside	Kerbside
Containment	240 l wheeled bin	Plastic Sack	240 l wheeled bin
Treatment		Simple MRF Bulking Facility	ABPO compliant Composter
Vehicle	Standard RCV with bin lift	Split back RCV with bin lift	

Residual Collection

Residual collections are carried out fortnightly using a standard RCV with bin lift. Householders are provided with a 240l wheeled bin.

Recycling Collection

As in the Option 1 base case, the materials are collected weekly by a split back compaction material. Householders are provided with one sack for paper and card and a 240l wheeled bin for garden and kitchen waste. The major difference in this scenario is that residual collection is fortnightly and previous experience elsewhere has indicated that this has resulted in an increase in the overall quantities of recyclable materials collected.

Treatment

The residual waste collected would be taken for disposal to landfill or energy recovery.

[6] Details of NPV is given in section 8

The recyclables would be taken to simple bulking MRF for onward transport to a reprocessor.

The compostable organic material would be taken to a suitable Animal By-Products Order (ABPO) compliant facility.

Cost

Table 6 identifies the Capital and Operational expenditure for this option. Further details on the costs are provided in section 6 and the associated assumptions are provided in appendix 1.

Table 6: Option 1 – Variation (a), Summary Costs

Collection	Residual	Mixed Paper and Card and compostable	Management	MRF
Capital Expenditure £p.a.	551,000	816,000	0	47,000
Operational Expenditure £p.a.	2,106,000	2,550,000	348,000	429,000
Total £p.a.	2,657,000	3,366,000	348,000	476,000
Cost per Household £p.a.	19.99	25.45	2.64	3.32

Over a 24 year period the net present value (NPV) of this option is equal to £165 million, which equates to a NPV cost per annum of £6.86 and a NPV cost per tonne of £36.06.

5.3.3 Option 1 - Variation (B)

Collection	Residual	Mixed Paper and Card	Garden	Kitchen Waste
Frequency	Weekly	Weekly	Fortnightly - Chargeable	Weekly - Free
Collection Location	Kerbside	Kerbside	Kerbside	Kerbside
Containment	Black Sack	Plastic box	240 l wheeled bin	Kitchen Caddy and small outside bin, e.g. 40l
Treatment		Simple MRF Bulking Facility	Composter	ABPO compliant Composter
Vehicle	Standard RCV with bin lift	Toploader	Standard RCV	Standard RCV

Residual collection

Residual collections are carried out weekly using a standard RCV. Householders will be provided with a black plastic sacks.

Dry Recyclable Collection

Householders are provided with 55 l boxes for mixed paper and card which is collected weekly. Top loading vehicles are recommended due to the high productivity that can be achieved with such vehicles and the ease of off-loading. A compacting vehicle is not required as no significant compaction is possible with paper and the weight of the paper will compact the card.

The recyclables would be taken to simple bulking MRF for onward transport to a reprocessor.

Garden & Kitchen waste Collection

Garden Waste is collected fortnightly on a chargeable basis for 9 months of the year. This should be offered to the entire borough but it is estimated that take-up will be approximately 25,000 households. Participating households will be provided with a 240 l wheeled bin.

Kitchen waste is collected weekly free of charge. Householders are provided with a kitchen caddy and a small outside container.

Separate vehicles are used for these collections. A standard RCV is recommended for both.

Treatment

The residual waste collected would be taken for disposal to landfill or energy recovery,

The recyclables would be taken to simple bulking MRF for onward transport to a reprocessor.

The compostable organic material would be taken to a suitable Animal By-Products Order (ABPO) compliant facility. It should be noted that with this option the garden waste could be sent to a cheaper non-ABPO compliant facility.

Costs

Table 7 identifies the Capital and Operational expenditure for this option. Further details on the costs are provided in section 6 and the associated assumptions are provided in appendix 1.

Table 7: Option 1 - Variation (b), Summary Costs

Collection	Residual	Mixed Paper and Card	Garden	Food	Management	MRF
Capital Expenditure £p.a.	898,000	977,000	236,000	286,000	0	39,000
Operational Expenditure £p.a.	2,857,000	2,102,000	507,000	1,481,000	348,000	426,000
Total £p.a.	3,755,000	3,079,000	744,000	1,767,000	348,000	465,000
Cost per Household £p.a.	28.64	23.48	5.67	13.48	2.64	3.54

Over a 24 year period the net present value (NPV) of this option is equal to £244 million, which equates to a NPV cost per annum of £10.16 and a NPV cost per tonne of £53.13.

The income from the fortnightly garden collection has not been included in this analysis.

5.4 Option 2 – Heavy recyclables

This option and its variations focus on providing the maximum contribution to the recycling targets, which are weight based, by collecting the denser recyclables.

All vehicles are assumed to be manned by a driver and two loaders.

5.4.1 Option 2 - Base Case

Collection	Residual	Paper/Card and Mixed Glass	Garden & Kitchen Waste
Frequency	Weekly	Weekly	Weekly
Collection Location	Kerbside	Kerbside	Kerbside
Containment	Plastic Sack	Plastic Box	240 l wheeled bin
Treatment		Simple MRF Bulking Facility	ABPO compliant Composter
Vehicle	Standard RCV	2 Compartment Toploader	Standard RCV with bin lift

Residual Collection

Residual collections are carried out weekly using a standard RCV. Householders will be provided with a black plastic sacks.

Recycling Collection

Householders are provided with plastic boxes, e.g. 55 l, for a weekly co-mingled collection of paper and glass. Both materials have a high bulk density and there is no need for compaction. Therefore a two compartment top-loading vehicle with bin lifts is recommended. Each loader would have a slave bin to collect one material from each box. Up to 10 properties can be collected before the bin is tipped at the vehicle. This would minimise the number of trips required to the vehicle and reduce the issues associated with manual handling of heavy plastic boxes.

Garden & Kitchen Waste Collection

Householders are provided with 240 l wheeled bins for the weekly collection of mixed green and kitchen waste. A standard RCV with bin lift is recommended for this collection.

Treatment

The residual waste collected would be taken for disposal to landfill or energy recovery.

The recyclables would be taken to simple bulking MRF for onward transport to a reprocessor.

The compostable organic material would be taken to a suitable Animal By-Products Order (ABPO) compliant facility.

Costs

Table **8** identifies the Capital and Operational expenditure for this option. Further details on the costs are provided in section 6 and the associated assumptions are provided in appendix 1.

Table 8: Option 2 - Base Case, Summary Costs

Collection	Residual	Paper/Card and Mixed Glass	Garden & Kitchen Waste	Management	MRF
Capital Expenditure £p.a.	898,000	330,000	449,845	0	51,000
Operational Expenditure £p.a.	2,722,000	1,682,791	1,329,000	348,000	683,000
Total £p.a.	3,620,000	2,012,791	1,778,845	348,000	734,000
Cost per Household £p.a.	27.11	15.08	13.44	2.65	5.07

Over a 24 year period the net present value (NPV) of this option is equal to £204 million, which equates to a NPV cost per annum of £8.49 and a NPV cost per tonne of £44.61.

5.4.2 Option 2 - Variation (a)

Collection	Residual	Paper/Card and Mixed Glass	Garden & Kitchen Waste
Frequency	Fortnightly	Weekly	Weekly
Collection location	Kerbside	Kerbside	Kerbside
Containment	240 l wheeled bin	Plastic Box	240 l wheeled bin
Treatment		Simple MRF Bulking Facility	ABPO compliant Composter
Vehicle	Standard RCV with bin lift	2 Compartment Toploader	Standard RCV with bin lift

Residual Collection

Residual collections are carried out fortnightly utilising standard RCV. Householders are provided with a 240 l wheeled bin.

Recycling collection

As per Option 2 - Base Case

Garden & Kitchen waste Collection

As per Option 2 - Base Case

Treatment

The residual waste collected would be taken for disposal to landfill or energy recovery.

The recyclables would be taken to simple bulking MRF for onward transport to a reprocessor.

The compostable organic material would be taken to a suitable Animal By-Products Order (ABPO) compliant facility.

Costs

Table 9 identifies the Capital and Operational expenditure for this option. Further details on the costs are provided in section 6 and the associated assumptions are provided in appendix 1.

Table 9: Option 2 - Variation (a), Summary Costs

Collection	Residual	Paper and Glass	Garden & Kitchen Waste	Management	MRF
Capital Expenditure £p.a.	528,000	330,000	304,000	0	62,000
Operational Expenditure £p.a.	2,106,000	1,682,000	695,000	348,000	658,000
Total £p.a.	2,634,000	2,012,000	999,000	348,000	720,000
Cost per Household £p.a.	19.82	150.8	7.63	2.65	4.88

Over a 24 year period the net present value (NPV) of this option is equal to £161 million, which equates to a NPV cost per annum of £6.71 and a NPV cost per tonne of £35.26

5.4.3 Option 2 - Variation (b)

Collection	Residual	Paper	Garden	Kitchen Waste
Frequency	Weekly	Weekly	Fortnightly - Chargeable	Weekly - Free
Collection Location	Kerbside	Kerbside	Kerbside	Kerbside
Containment	Black sack	Plastic Box	240 l wheeled bin	Kitchen Caddy and small outside bin, e.g. 40l
Treatment		Simple MRF Bulking Facility	Composter	ABPO compliant Composter
Vehicle	Standard RCV with bin lift	2 Compartment Toploader	Standard RCV with bin lift	Standard RCV

Residual Collection

As per Option 2 base case.

Recycling collection

As per Option 2 base case

Garden & Kitchen waste Collection

Garden Waste is collected fortnightly on a chargeable basis for 9 months of the year. This should be offered to the entire borough but it is estimated that take-up will be approximately 25,000 households. Participating households will be provided with a 240 l wheeled bin.

Kitchen waste is collected weekly free of charge. Householders are provided with a kitchen caddy and a small outside container.

Separate vehicles are used for these collections. A standard RCV is recommended for both.

Treatment

The residual waste collected would be taken for disposal to landfill or energy recovery.

The recyclables would be taken to simple bulking MRF for onward transport to a reprocessor.

The compostable organic material would be taken to a suitable Animal By-Products Order (ABPO) compliant facility. It should be noted that with this option the garden waste could be sent to a cheaper non-ABPO compliant facility.

Costs

Table 10 identifies the Capital and Operational expenditure for this option. Further details on the costs are provided in section 6 and the associated assumptions are provided in appendix 1.

Table 10: Option 2 - Variation (b), Summary Costs

Collection	Residual	Paper and Glass	Garden Waste	Kitchen Waste	Management	MRF
Capital Expenditure £p.a.	898,000	333,000	250,000	412,000	0	51,000
Operational Expenditure £p.a.	2,722,000	1,681,000	507,000	1,481,000	348,000	686,000
Total £p.a.	3,620,000	2,014,000	743,000	1,767,000	348,000	737,000
Cost per Household £p.a.	27.11	15.07	5.83	14.33	2.65	5.59

Over a 24 year period the net present value (NPV) of this option is equal to £216 million, which equates to a NPV cost per year of £8.66 and a NPV cost per tonne of £47.18.

The income from the fortnightly garden collection has not been included in this analysis.

5.5 Option 3 - Maximum Recyclables

This option focuses on capturing the maximum possible percentage of recyclable material from the MSW, thereby maximising performance against both recycling and statutory diversion targets.

5.5.1 Option 3 - Base Case

Collection	Residual	Mixed Dry Recyclables	Garden & Kitchen Waste
Frequency	Weekly	Weekly	Fortnightly - Chargeable
Collection Location	Kerbside	Kerbside	Kerbside
Containment	Black sack	Plastic Box	240 l wheeled bin
Treatment		Complex MRF	ABPO Compliant Composter
Vehicle	Standard RCV	3 Compartment Toploader	Standard RCV with bin lift

Residual Collection

Residual collections are carried out weekly using a standard RCV. Householders will be provided with a black plastic sacks

Recycling collection

Householders are provided with a plastic box for the co-mingled storage of all recyclable materials. The recycling collection carried out weekly utilising 3 compartment top loaders manned by a driver plus three loaders. This system would seek to collect paper/ cardboard drinks cartons, glass, cans and plastic bottles. We would suggest paper and card in one compartment; glass in another and the remaining in the third.

Each loader takes the commodities for one compartment from the box and places it into a slave bin and offloads this at the vehicle when full. A similar operation to this scenario is carried out in Stevenage where they collect mixed glass, newspaper and magazines and cans. Each vehicle there passes 2000 properties per day and collects from 1600 with a driver and 3 loaders in an urban location.

Garden & Kitchen Waste Collection

Householders are provided with 240 l wheeled bins for the weekly collection of mixed green and kitchen waste. A standard RCV with bin lift is recommended for this collection.

Treatment

The residual waste collected would be taken for disposal to landfill or energy recovery.

The collected recyclables will be taken to a complex MRF for separation and bulking before onward transport to reprocessors.

The compostable organic material would be taken to a suitable Animal By-Products Order (ABPO) compliant facility.

Costs

Table 11 identifies the Capital and Operational expenditure for this option. Further details on the costs are provided in section 6 and the associated assumptions are provided in appendix 1.

Table 11: Option 3 - Base Case, Summary Costs

Collection	Residual	Mixed Dry Recyclables	Garden & Kitchen Waste	Management	MRF
Capital Expenditure £p.a.	860,000	280, 000	450,000	0	160,000
Operational Expenditure £p.a.	2,514,00	2,063,000	1,329,000	348,000	1,946,000
Total £p.a.	862,514	2,634,000	1,779,000	348,000	2,106,000
Cost per Household £p.a.	25.25	17.70	13.44	2.65	14.46

Over a 24 year period the net present value (NPV) of this option is equal to £244 million, which equates to a NPV cost per annum of £10.15 and a NPV cost per tonne of £53.34.

5.5.2 Option 3 - Variation (a)

Collection	Residual	Mixed Dry Recyclables	Garden & Kitchen Waste
Frequency	Fortnightly	Weekly	Fortnightly - Chargeable
Collection Location	Kerbside	Kerbside	Kerbside
Containment	240 l wheeled bin	Plastic Box	240 l wheeled bin
Treatment		Complex MRF	ABPO Compliant Composter
Vehicle	Standard RCV with bin lift	3 Compartment Toploader	Standard RCV with bin lift

Residual Collection

Residual collections are carried out fortnightly utilising a standard RCV with a bin lift. Householders are provided with a 240 l wheeled bin.

Recycling collection - 3 compartment top loaders

As per Option 3 base case.

Garden & Kitchen waste Collection

As per Option 3 base case.

Treatment

The residual waste collected would be taken for disposal to landfill or energy recovery.

The collected recyclables will be taken to a complex MRF for separation and bulking before onward transport to reprocessors.

The compostable organic material would be taken to a suitable Animal By-Products Order (ABPO) compliant facility.

Costs

Table 12 identifies the Capital and Operational expenditure for this option. Further details on the costs are provided in section 6 and the associated assumptions are provided in appendix 1.

Table 12: Option 3 - Variation A, Summary Costs

Collection	Residual	Mixed Dry Recyclables	Garden & Kitchen Waste	Management	MRF
Capital Expenditure £p.a.	786,000	399, 000	450,000	0	146,000
Operational Expenditure £p.a.	2,129,000	2,148,000	1,329,000	348,000	1,840,000
Total £p.a.	2,915,000	2,148,000	1,779,000	348,000	1,986,000
Cost per Household £p.a.	21.82	19.14	13.44	2.65	13.66

Over a 24 year period the net present value (NPV) of this option is equal to £230 million, which equates to a NPV cost per annum of £9.57 and a NPV cost per tonne of £50.29.

5.5.3 Option 3 - Variation (b)

Collection	Residual	Mixed Dry Recyclables	Garden	Kitchen Waste
Frequency	Weekly	Weekly	Fortnightly - Chargeable	Weekly - Free
Collection Location	kerbside	kerbside	kerbside	kerbside
Containment	Black Sack	Plastic Box	240 l wheeled bin	Kitchen Caddy and small outside bin, e.g. 40l
Treatment		Complex MRF	Composter	ABPO compliant Composter
Vehicle	Standard RCV with bin lift	3 Compartment Toploader	Standard RCV with bin lift	Standard RCV

Residual Collection

As per Option 3 - Base Case

Recycling collection

As per Option 3 - Base Case

Garden & Kitchen waste Collection

Garden Waste is collected fortnightly on a chargeable basis for 9 months of the year. This should be offered to the entire borough but it is estimated that take-up will be approximately 25,000 households. Participating households will be provided with a 240 l wheeled bin.

Kitchen waste is collected weekly free of charge. Householders are provided with a kitchen caddy and a small outside container.

Separate vehicles are used for these collections. A standard RCV is recommended for both.

Treatment

The residual waste collected would be taken for disposal to landfill or energy recovery.

The collected recyclables will be taken to a complex MRF for separation and bulking before onward transport to reprocessors.

The compostable organic material would be taken to a suitable Animal By-Products Order (ABPO) compliant facility. It should be noted that with this option the garden waste could be sent to a cheaper non-ABPO compliant facility.

Costs

Table 13 identifies the Capital and Operational expenditure for this option. Further details on the costs are provided in section 6 and the associated assumptions are provided in appendix 1.

Table 13: Option 2 - Variation B, Summary Costs

Collection	Residual	Paper and Glass	Garden Waste	Kitchen Waste	Management	MRF
Capital Expenditure £p.a.	898,000	399, 000	236,000	286,000	0	160,392
Operational Expenditure £p.a.	2,722,000	2,146,000	507,000	1,481,000	348,000	1,946,087
Total £p.a.	3,620,000	2,146,000	744,000	1,767,000	348,000	2,106,479
Cost per Household £p.a.	27.61	19.41	5.67	13.48	2.65	16.07

Over a 24 year period the net present value (NPV) of this option is equal to £259 million, which equates to a NPV cost per year of £10.78 and a NPV cost per tonne of £56.41.

The income from the fortnightly garden collection has not be included in this analysis.

6 Collection Options Performance Assessment

This section describes the performance of the nine collection options with regard to:

- Recycling Performance and;
- LATS Performance

6.1 Contract Timing

A 25-year contract for waste management services to treat waste from MKC has been modelled in this options appraisal.

Contract year one is assumed to commence on October 2007 and run until September 2032. The first Landfill Directive target year finishes on 31 March 2010. As such, it is desirable for appropriate kerbside collection schemes to be operational in time to divert enough waste in order to help meet this first target. The financial implications for the UK of not meeting this target are likely to be considerably onerous and every effort must be made nationally to ensure that penalties are averted.

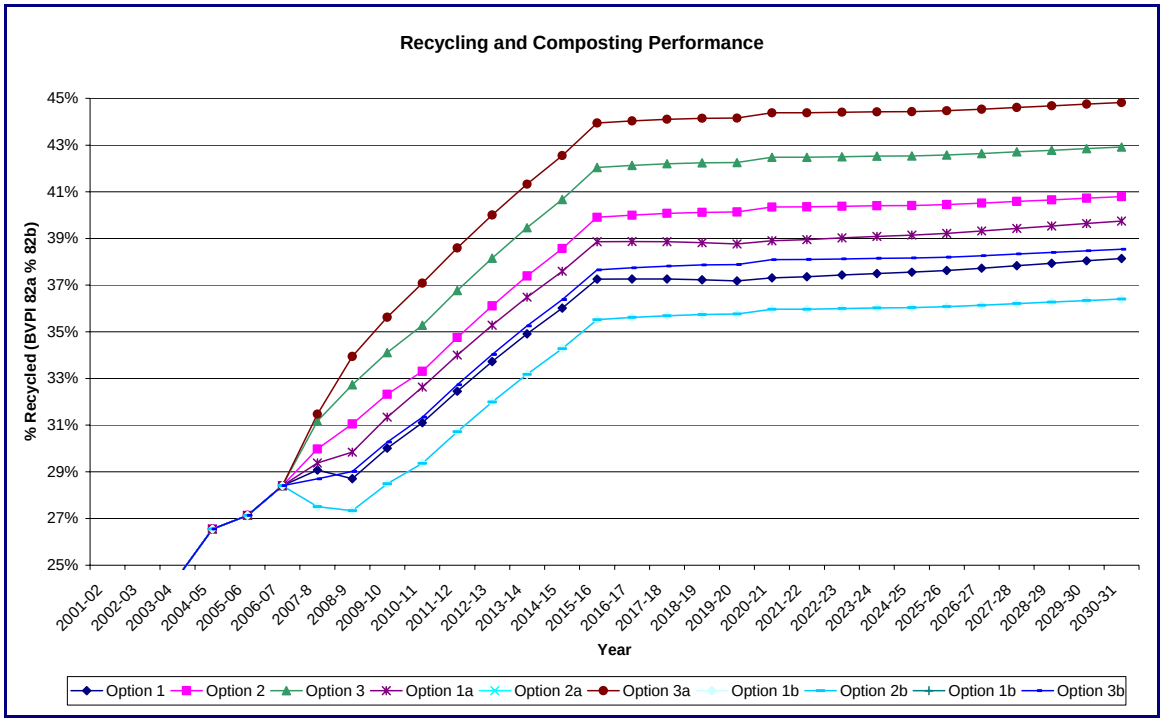
6.2 Recycling and Composting Targets

One of the key objectives of this report was to determine the best approach for the collection and segregation of recyclables to achieve recycling and composting target of 40% +.The table below shows the recycling and composting performance of each collection option in key years. These figures also include the recycling/composting percentage seen at CRC's taken from the Waste Management Technical Options Appraisal [7].

Table 14: Front End Recycling and Composting Targets Achieved

Recycling & Composting		2010	2013	2015	2020
	Option 1	31%	34%	37%	37%
	Option 2	33%	36%	40%	40%
	Option 3	35%	38%	42%	42%
	Option 1a	33%	35%	39%	39%
	Option 2a	34%	37%	40%	40%
	Option 3a	37%	40%	44%	44%
	Option 1b	27%	30%	33%	33%
	Option 2b	28%	31%	34%	34%
	Option 3b	31%	34%	38%	38%

Figure 3: Front end Recycling and Composting targets achieved



[7] Buckinghamshire County Council & Milton Keynes Council Waste Management Technical Options Appraisal, Formal Issue, Version 2, 8th February 2005.

As it is shown in table 5 the percentage of MSW recycled and composted is below 40% for all options in 2009/2010. In 2013 only option 3a achieves the target of 40%. In 2020 this increases to 4 out of the 9 options (options 2, 2a, 3 and 3a)

6.3 LATS Targets

6.3.1 BMW Content Assumptions

Table 15 identifies the assumed BMW content of the MSW based on MKC waste composition studies.

Table 15: BMW Content of the MSW

Waste Composition - Categories	MSW % of total	%BMW per category	BMW % Total
Paper/Card	25.01%	100%	25%
Plastic Film	2.67%	0%	0%
Dense Plastic	3.05%	0%	0%
Textiles	2.30%	50%	1%
Misc. Combustible	18.47%	50%	9%
Misc. Non Combustible	2.94%	0%	0%
Glass	7.12%	0%	0%
Organic (kitchen/garden)	30.84%	100%	31%
Ferrous Metal	2.79%	0%	0%
Non Ferrous Metal	0.85%	0%	0%
Fines	3.96%	60%	2%
TOTAL	**100.00%**		**68.61%**

The overall BMW content assumed by the EA for England and Wales is 68% which is slightly lower than the percentage assumed for Milton Keynes based on MKC waste composition identified in table 6. Therefore the BMW content based on Milton Keynes composition has been used in the model.

The BMW content of the residual waste has been calculated after the recyclable fraction has been removed via the kerbside collections.

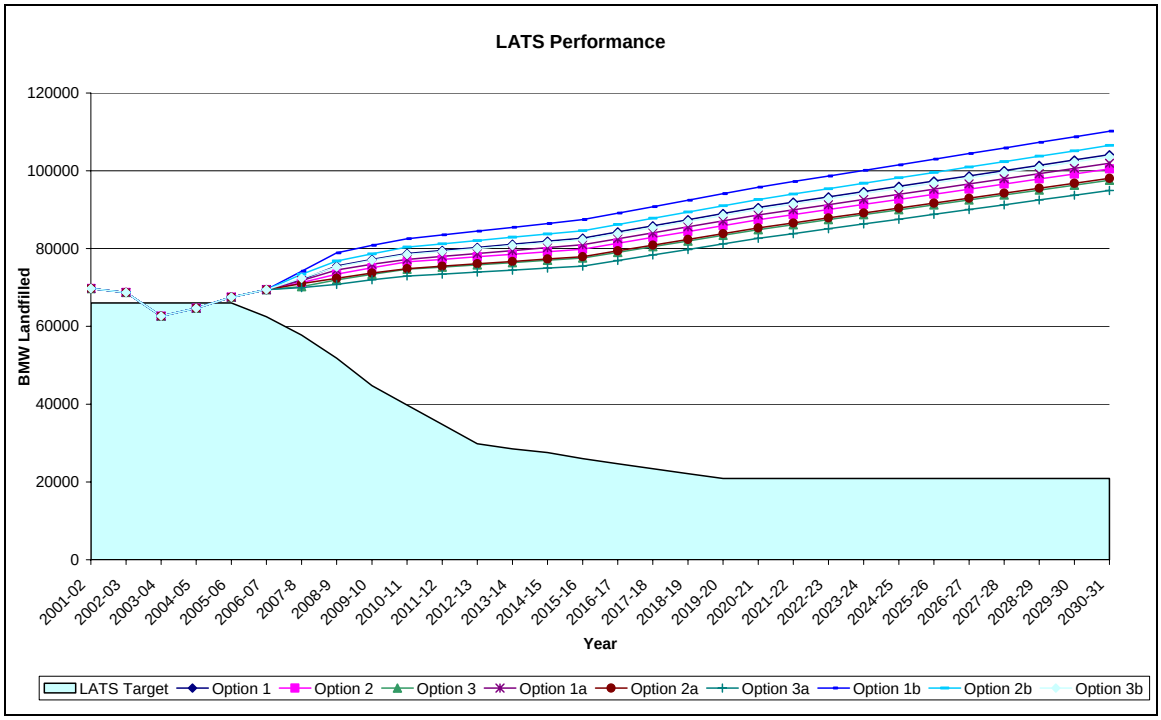
6.3.2 Options Performance Against the LATS Targets

Whilst the primary purpose of front end recycling is to maximise the amount of recycling and composting, the very nature of the waste managed by these additional initiatives contributes towards BMW diversion and consequently LATS targets, as shown below in Table 16.

Table 16: Front End LATS Targets Achieved

LATS		2010	2013	2015	2020
	BMW Allowance	**32,792**	**24,578**	**21,415**	**17,198**
Option 1	Total BMW Diverted	41,750	47,655	56,514	61,817
	Total BMW to Landfill	78,717	80,310	82,699	90,562
	Target Achieved?	No	No	No	No
	BMW further diversion required	28,237	37,971	41,464	53,847
Option 2	Total BMW Diverted	41,718	47,624	56,482	62,672
	Total BMW to Landfill	76,593	77,892	79,840	87,413
	Target Achieved?	No	No	No	No
	BMW further diversion required	28,268	38,003	41,496	52,991
Option 3	Total BMW Diverted	42,243	48,168	57,055	63,303
	Total BMW to Landfill	74,680	75,826	77,545	84,886
	Target Achieved?	No	No	No	No
	BMW further diversion required	27,744	37,459	40,923	52,360
Option 1a	Total BMW Diverted	43,918	49,973	59,056	64,617
	Total BMW to Landfill	77,243	78,733	80,969	88,657
	Target Achieved?	No	No	No	No
	BMW further diversion required	26,069	35,653	38,922	51,046
Option 2a	Total BMW Diverted	44,048	50,040	59,027	65,475
	Total BMW to Landfill	74,855	76,085	77,930	85,309
	Target Achieved?	No	No	No	No
	BMW further diversion required	25,938	35,587	38,951	50,188
Option 3a	Total BMW Diverted	44,404	50,479	59,590	66,095
	Total BMW to Landfill	72,935	73,958	75,492	82,624
	Target Achieved?	No	No	No	No
	BMW further diversion required	25,582	35,148	38,388	49,568
Option 1b	Total BMW Diverted	36,156	41,518	49,561	54,159
	Total BMW to Landfill	82,521	84,483	87,426	95,769
	Target Achieved?	No	No	No	No
	BMW further diversion required	33,830	44,108	48,417	61,504
Option 2b	Total BMW Diverted	36,125	41,487	49,530	55,015
	Total BMW to Landfill	80,397	82,065	84,568	92,620
	Target Achieved?	No	No	No	No
	BMW further diversion required	33,862	44,140	48,448	60,648
Option 3b	Total BMW Diverted	36,650	42,031	50,103	55,646
	Total BMW to Landfill	78,483	79,999	82,273	90,093
	Target Achieved?	No	No	No	No
	BMW further diversion required	33,337	43,596	47,876	60,018

Figure 4 Front End LATS Targets Achieved



As it is shown in Table 16, none of the collection options divert enough BMW to meet the BMW landfill allowance. Therefore, additional treatment for residual waste will be required to increase the diversion of BMW and therefore meet the BMW allowance.

7 Practicability of Options

This section identifies some of the key practicabilities associated with the collection options. The variables in the systems are discussed below and their applicability to each option is identified. The key variables identified for residual, organic and recyclables are:

- Collection frequency
- Vehicle Type
- Containment
- Materials Collected

7.1 Collection Frequency

Residual Collection

Fortnightly collections may result in a higher proportion of recyclable material being collected. This frequency is also likely to require fewer vehicles and crew than a comparable weekly collection. Due to the greater volume of residual waste that will be generated over a fortnight, this frequency of collection is only really suitable with a wheeled bin containment system (not bag) which has the benefit of minimising health and safety issues associated with bag collections. A fortnightly collection however requires wheeled bins which will result in significantly higher initial costs.

A fortnightly collection is used in Options 1a, 2a and 3a

A weekly residual collection is currently employed in MKC using black bags., There are health and safety implications with handling these bags

A weekly collection is used in Options 1, 1b, 2, 2b, 3, 3b

Recyclables Collection

All options are weekly collections which may maximise the proportion of recyclable material being collected.

Organic Waste Collections

Fortnightly collections of organic waste may result in a higher proportion of green waste being collected. However, it is not recommended that such a collection frequency is used to collect garden waste co-mingled with kitchen waste due to odour issues.

A fortnightly collection of organic waste is used in Options 1b, 2b and 3b for garden waste.

A weekly collection of organic waste would fit in with the current system operating in MKC for garden waste. A weekly collection is also recommended for garden waste collected co-mingled with kitchen waste to minimise complaints due to odour. A weekly collection however will require a high number of vehicles with associated cost implications.

A weekly collection of organic waste is used in Options 1, 1a, 2, 2a, 3, 3a for garden waste (kitchen waste weekly for all options).

7.2 Vehicle Type

Residual Collection

A standard RCV is recommended for residual waste collection and is used in all options considered.

Recyclables Collection

A split back vehicle is anticipated to minimise the number of vehicles and passes required to collect the recyclable materials. It is also the current system operated in MKC. However, split back vehicles generally have higher maintenance costs than toploader vehicles. They are also dependant upon the bulk density of the materials collected and as a result of this the vehicle can be slightly unbalanced when loaded. Compartments also need to be sized correctly to maximise efficiency (i.e. an incorrectly sized compartment could result in the vehicle filling up with one material, e.g. cardboard before another, e.g. green waste compartment is full).

A split back vehicles is used in options 1 and 1a.

A single compartment top loader vehicle can have lower capital and operating costs compared to a standard RCV and mechanical lifting reduces manual handling, however such vehicles require sufficient height clearance to operate their lifting devices which may restrict their use in some circumstances.

A single compartment toploader is used in Option 1b.

A multi-compartment toploader, in addition to the benefits listed for a single compartment top loader, allows partial sorting to be performed at the kerbside so that materials can be taken direct to the reprocessor or bulking station and offloaded separately. These vehicles also report similar productivity to residual collection and can surpass residual collection if slave bins are used. These vehicles however require sufficient height clearance to operate their lifting devices which may restrict their use in some circumstances.

A 2 compartment toploader is used in options 2, 2a and 2b.
A 3 compartment toploader is used in options 3, 3a and 3b.

Organic Waste Collections

Split back vehicle offers the same benefits and challenges detailed above.

A split back vehicle is used in options 1, 1a.

A standard RCV is recommended for organic waste collection (garden and kitchen waste) and is used in options 1b, 2, 2a, 2b, 3, 3a and 3b.

It is considered that the toploader vehicles offer the most practicable vehicle type for the recyclables collection with the standard RCVs being the most appropriate for the organic waste and residual waste collections.

7.3 Containment

Residual Collection

Black sacks are currently used in MKC and are practicable for use in options identified as weekly collections. These have a low cost; however they do not allow flexibility of moving to a fortnightly collection.

Black Sacks are used in options 1, 1b, 2, 2b, 3, 3b.

240l Wheeled bins are suitable for larger quantities of material and are considered practicable for use in fortnightly collection options identified, however they result in higher costs.

Wheeled bins are used in Options 1a, 2a, 3a.

Recyclables Collection

Plastic sack containment for recyclables will have a low cost for MKC; however plastic sacks are not appropriate for the collection of heavy or mixed recyclables. The plastic sack containment proposed will need to be removed and separated from the recyclable material within. This will require an additional process.

Plastic Sacks are used in Options 1, 1b

Wheeled bin containment will reduce health and safety implications for operators and is suitable for fortnightly recyclable collections. However, wheeled bins can have high initial cost and are likely to take up space for householders which may not be popular.

Wheeled Bins are used in option 1a.

Plastic boxes can be sized to reflect expected volume of recyclables. Additionally, if used with slave bins, they can result in high productivity of collection. However, boxes can be heavy when full and are difficult for the elderly or infirm to move to their doorstep which may cause problems for some householders to use. The weight of full boxes is also likely to slow operations and can cause back injuries if manual handling guidelines are not followed

55 litre plastic boxes are used in options 2, 2a, 3, 3a and 3b.

7.4 Materials Collected

Combined Garden and Kitchen Waste Collection

All organic material collected in a combined garden and kitchen waste collection must be taken to an ABPO compliant composting facility. If this collection is free of charge, then take-up will be high and will be sufficient to keep the collection operating during the winter months when the volumes of garden waste reduce.

A combined organic waste collection arrangement is used in options 1, 1a, 2, 2a, 3 and 3b.

Separate Garden and Kitchen Waste Collections

Garden waste collected separately to kitchen waste does not need to be processed at an ABPO complaint facility. This would serve to reduce treatment costs. In addition, garden waste collected through a chargeable collection tends to be of high quality with less contamination from

non-organics. It can be used to produce higher quality compost. Ceasing the garden waste service during the winter months makes operational sense as the utilisation is low during this period. However renewed publicity is required each year to continue high rates of public participation.

An additional collection round would be required to collect the small kitchen caddy from all the households adding significantly to the cost. The productivity would be low and it is highly likely that a high number of caddies would be misplaced and lost.

A separate garden and kitchen waste collection is used in option: 1b, 2b and 3b.

It is considered that the separate garden waste and kitchen waste collections are the least practicable options. The collection rounds would increase the number of vehicles and crew required; would reduce the volume of waste for each collection (particularly the kitchen waste collection) round and reduce the productivity. Although the treatment costs may be reduced this will not outweigh the additional costs required to operate the service.

Dry Recyclables
The types of material collected will depend on a number of factors including cost, contribution to recycling and LATS targets, ease of collection. A limited recyclable collection such as that identified in options 1, 1a and 1b is likely to maximise the capture rate of those material as the householder only has to consider a limited material type. This collection has limitations on expansion, particularly in options 1 and 1a where the vehicle type is constrained by the split of the RCV.

With the paper and mixed glass collection care needs to be taken to ensure that contamination of the paper does not occur as a result of broken glass. With a limited recyclables collection it could be expected that the capture rate of the materials would be reasonable high.

7.5 Summary

When practicability is being considered the views of both the collection operator and the householder should be considered.

The householder is likely to view containment and frequency as principal factors and it is considered that wheeled bins or boxes for recyclables would be preferable with wheeled bins for mixed organic waste collected weekly and residual waste collected weekly.
Options – 1a, 2, 2a and 3

The collection operator is likely to view productivity and low cost vehicle operation as being principal factors and it is considered that the top loader vehicle provides the most suitable collection for recyclables with the RCV being most practicable for the mixed organic waste
Options – 2, 2a, 3, 3a

8 Capital and Operational Expenditure Assessment

The study so far has determined the performance of Front End Recycling options. Whilst local Waste Strategy, BPEO and land use constraints will contribute to the final decision making process, the overarching 'costs' of the assessed technology solutions will provide a useful means for either eliminating or including certain collection options.

Using confidential bidder's data, industry reports, market reports, and Environment Agency data, Jacobs Babtie have determined the Opex and Capex of processing and treatment with each collection option.

Capex is the capital cost of the facility including construction but not land costs. OPEX is the operating cost of the facility.

This assessment has considered the Net Present Value (NPV) of each of the nine collection options.

Net Present Value

Net Present Value compares the value of a £ today versus the value of that same £ in the future, after taking inflation and return into account. This assumes that money values change with time because they are affected by interest rates i.e. £10 today has more value than £10 next year, and therefore in future years one would have to spend more to obtain the same value, or in this case to spend more to process the same quantity of waste. The NPVs shown, therefore, are the expenditure on specific options, adjusted back through the 24 year contract period to show the true £value in today's terms required to ensure the same level of value is achieved throughout the contract.

Opex and Capex costs have been inflated at a straight 2.5% Retail Price Index (RPI) where appropriate.

The costs provided exclude:

- Operator's profit margin
- Cost of buying, renting or leasing land
- Fluctuations in construction costs, for example, any change in the price of steel, labour etc.
- Costs for obtaining necessary consents (including planning permissions, EIA, licensing, IPPC etc)
- Delays in construction and commissioning due to unforeseen circumstances, Force Majeure, planning delay, material shortages etc.
- Revised core discount rates
- Repayment of capital loans
- Insurance costs
- Structural tax impacts
- Optimism bias

The results of the Capex and Opex assessments are detailed in the tables and graphs below. Further details of the Capital and Operating costs are detailed in Appendix Assumptions sheet: Collection Costs and Assumptions sheet: MRF and Management Costs.

A comparison of NPV (in £ million over the entire length of the contract) for each collection option modelled is detailed in the Tables below. It shows the NPV, and analyses that NPV as an

average NPV per annum during the 25 year contract and as an average NPV per tonne of MSW processed throughout the duration of the contract. This assessment considered the NPV of each of the nine technology solutions;

- Including a MRF and,
- Excluding a MRF

Table 17: Table: 7 NPV £/t including MRF:

Option	NPV £M	NPV £M pa	NPV £/t
2a	161	6.71	35.26
1a	165	6.86	36.06
1	187	7.49	40.96
2	204	8.49	44.61
2b	216	8.66	47.18
3a	230	9.57	50.29
1b	244	10.16	53.13
3	244	10.15	53.34
3b	259	10.78	56.41

Figure 5: NPV £/t including MRF:

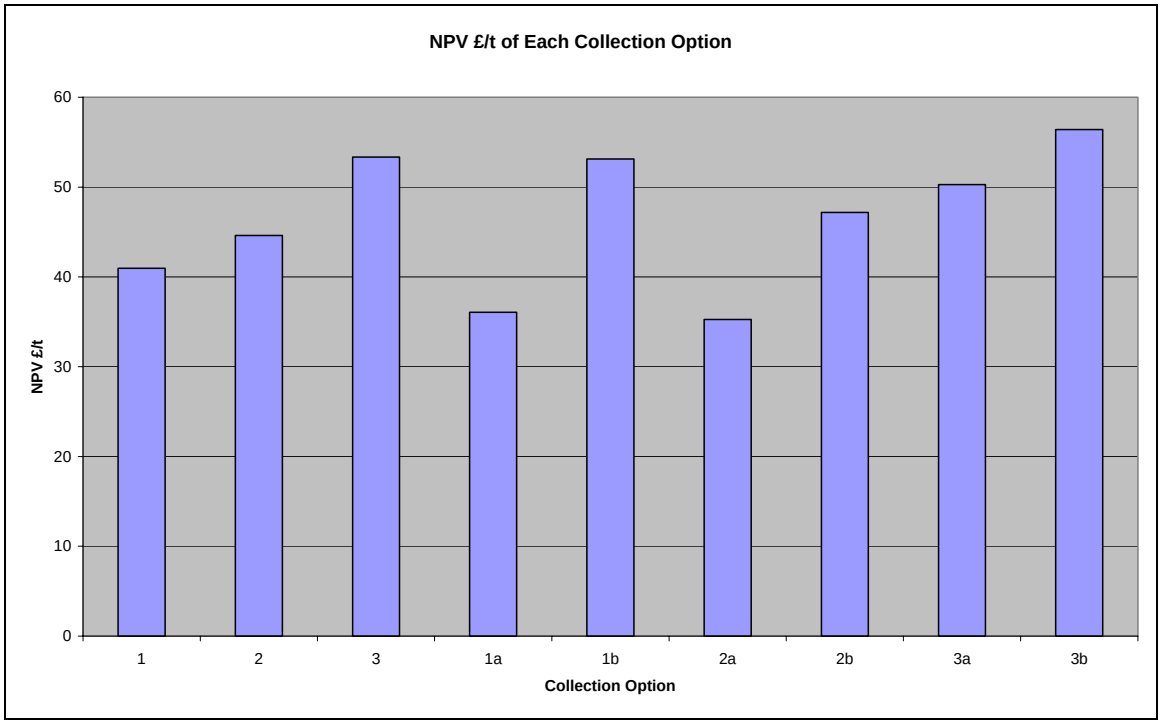
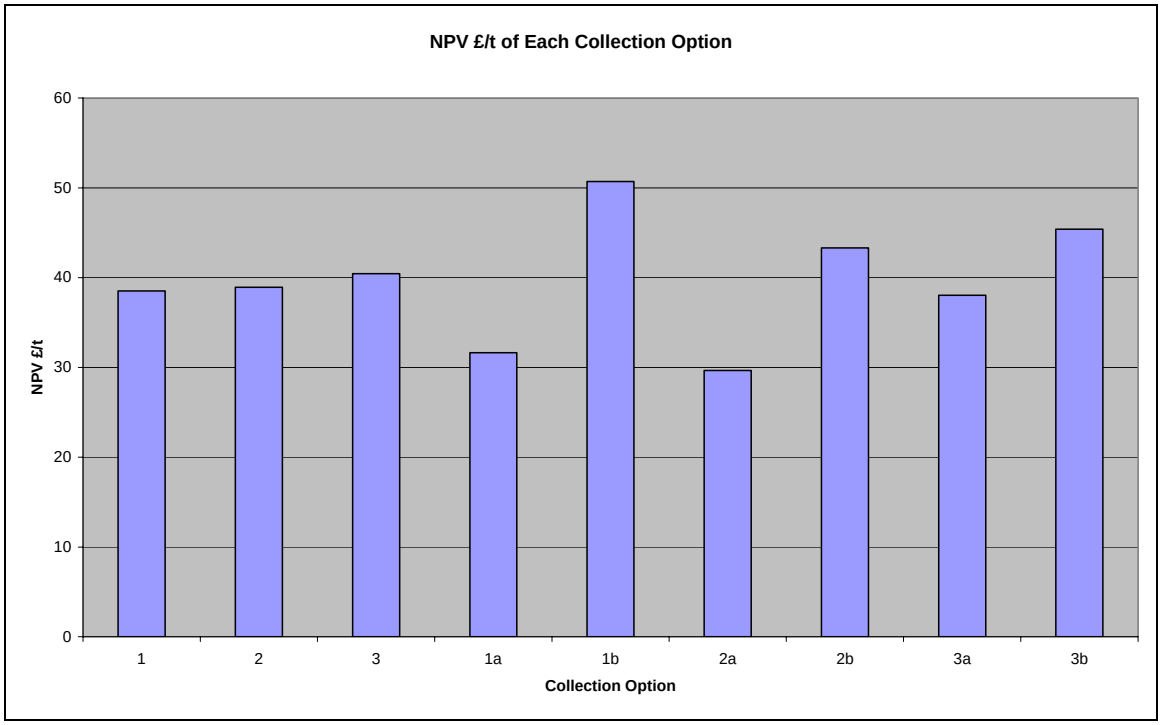


Table 18: NPV £/t Excluding MRF:

Option	NPV £M	NPV £M pa	NPV £/t
2a	135	5.42	29.65
1a	145	5.78	31.64
3a	174	7.24	38.03
1	176	7.04	38.53
2	178	7.11	38.93
3	185	7.70	40.45
2b	199	7.95	43.32
3b	208	8.68	45.39
1b	233	9.69	50.70

Figure 6: NPV £/t Excluding MRF



8.1 Performance

As can be seen from Table 17 and Table 18 Option 2a is the most cost effective if the price of the MRF is included or excluded. It collects recyclables (paper, card and glass) and all compostable materials weekly and residual waste fortnightly.

9 Conclusion

Table 19 presents a summary of the performance of each option modelled against strategic recycling and LATS targets as well as the NPV total cost for each option.

Table 19: Summary of Option Performance against Targets and Costs in 2010, 2013 and 2020

		Anticipated Recycling Performance (%)				Anticipated LATS Achieved				Cost of Option Total NPV (£m)	
Basic Option Arrangement	Modelled Option	2010	2013	2015	2020	2010	2013	2015	2020	Incl. MRF	Excl MRF
Maximum Biodegradables	**Option 1**	31%	34%	37%	37%	No	No	No	No	187	176
Heavy recyclables	**Option 2**	33%	36%	40%	40%	No	No	No	No	204	178
Maximum Recycling	**Option 3**	35%	38%	42%	42%	No	No	No	No	244	185
Maximum Biodegradables	**Option 1a**	33%	35%	39%	39%	No	No	No	No	165	145
Heavy recyclables	**Option 2a**	34%	37%	40%	40%	No	No	No	No	161	135
Maximum Recycling	**Option 3a**	37%	40%	44%	44%	No	No	No	No	230	174
Maximum Biodegradables	**Option 1b**	27%	30%	33%	33%	No	No	No	No	244	233
Heavy recyclables	**Option 2b**	28%	31%	34%	34%	No	No	No	No	216	199
Maximum Recycling	**Option 3b**	31%	34%	38%	38%	No	No	No	No	259	208

Key

	Best Performance (3a)
	Lowest Cost (2a)

Best Option to achieve recycling targets of 40% + (BVPI Targets)

Option 3a gives the best recycling and LATS performance of all options. In 2015 and 2020 Option 3a exceeds 40% recycling. None of the Options achieve the LATS diversion targets in the years specified (see Table 21), however Option 3a achieves the largest BMW diversion and therefore results in the smallest additional BMW tonnage still requiring diversion.

Option 3a collects all recyclables and all compostable materials weekly and residual waste fortnightly.

Best Option for balance between recycling targets and BMW diversion (LATS Targets)

Option 3a gives both the best recycling performance and LATS performance of all the options. Option 2a is anticipated to achieve 40% recycling in 2015 and 2020 and a review of LATS tonnages still requiring diversion (Table 21) indicates that Option 2a has the second highest diversion of BMW against LATS targets.

Option 2a collects heavy recyclables (paper, card and glass) and all compostable materials weekly and residual waste fortnightly.

Comparison of Capital and Operating Costs for each Option

Option 2a is the most cost effective if the price of the MRF is included or excluded. When the cost of the MRF is included option 3a is one of the most expensive options (NPV of £230 million) and without the cost of the MRF is of the midrange cost options (NPV of £174 million).

Based on the options reviewed, Option 3a is estimated to provide the greatest contribution towards meeting recycling and LATS targets in Milton Keynes. Option 2a offers an advantage over Option 3a in that it is estimated to achieve some recycling targets and the second highest LATS diversion at the lowest overall cost. It is therefore considered that Option 2a represents the best balance between recycling targets and BMW diversion.

Practicability of Options

When practicability is being considered the views of both the collection operator and the householder should be considered.

The householder is likely to view containment and frequency as principal factors and it is considered that wheeled bins or boxes for recyclables would be preferable with wheeled bins for mixed organic waste collected weekly and residual waste collected weekly.
Options – 1a, 2, 2a and 3

The collection operator is likely to view productivity and low cost vehicle operation as being principal factors and it is considered that the top loader vehicle provides the most suitable collection for recyclables with the RCV being most practicable for the mixed organic Waste
Options – 2, 2a, 3, 3a