CABINET – 15TH JANUARY 2020

SUBJECT: **WASTE AND RECYCLING COLLECTION SYSTEMS**

REPORT BY: **INTERIM CORPORATE DIRECTOR, COMMUNITIES**

1. PURPOSE OF REPORT

1.1 To advise Cabinet of the findings of the Regeneration and Environment Scrutiny Waste Review Working Group and to seek Cabinet approval for recommendations relating to the Authority's waste and recycling services.

2. SUMMARY

2.1 The Authority has been actively engaged in Welsh Government's Collaborative Change Programme (CCP) since 2015. A series of reviews have been undertaken by Waste Resources Action Programme (WRAP) and their appointed consultants on a key range on waste management services including kerbside collection services, household waste recycling centre provision and waste transfer station/depot infrastructure.

2.2 In 2018 Regeneration and Environment Scrutiny Committee established a cross party Waste Review Working Group to make recommendations regarding the future of waste and recycling services in the county borough. The Working Group findings were reported to the meeting of Regeneration and Environment Scrutiny Committee on 12th February 2019 when the Committee made a number of recommendations to Cabinet. The Committee's recommendations to Cabinet regarding waste collection and recycling systems have been developed further and Cabinet approval is now sought for the Recommendations in section 3 below.

3. RECOMMENDATIONS

3.1 Cabinet are asked to approve the following recommendations:

1. That the current kerbside collection system for co-mingled (mixed) materials be retained (subject to continuous satisfactory performance attainment and market sustainability)

2. That officers bring forward a further report detailing education and enforcement solutions in order to improve the quality of materials and increase participation in recycling services.

3. That the frequency of residual waste collections is reviewed in the light of actual and projected recycling performance following implementation of the Working Group's recommendations noting that there would be a lead-in time to any changes and having regard to the requirement to meet the statutory recycling target of 70% in 2024/2025.

4. That, subject to agreement of a Memorandum of Understanding, the Authority's responsibility for the treatment of dry recyclables be delegated to Rhondda Cynon Taff County Borough Council under Section 101 of the Local Government Act 1972 and section 19 of the Local Government Act 2000 with effect from 1st April 2020 for a period of 10 years.

5. That the Interim Corporate Director for Communities is authorised to enter into a Memorandum of Understanding regarding the treatment of dry recyclables with Rhondda Cynon Taff County Borough Council subject to consultation with the Cabinet Member for Neighbourhood Services, Head of Legal Services and Monitoring Officer, and the Section 151 Officer.

4. REASONS FOR THE RECOMMENDATIONS

4.1 To ensure that the Authority continues to deliver a waste and recycling service that meets the needs and aspirations of our residents whilst continuing to attain the ever more stringent statutory recycling targets.

5. THE REPORT

5.1 The Authority has been actively engaged in Welsh Government's Collaborative Change Programme (CCP) since 2015. A series of reviews have been undertaken by Waste Resources Action Programme (WRAP) and their appointed consultants on a key range of waste management services including kerbside collection services, household waste recycling centre provision and waste transfer station/depot infrastructure. These reviews culminated in a series of reports which have informed a cost benefit analysis process undertaken by consultants appointed by WRAP which are attached at Appendices 1 to 3.

5.2 On March 27th 2018, the Regeneration and Environment Scrutiny Committee agreed to establish a cross party working group of members to discuss and review the initial findings of the CCP. In total, 12 site visits and meetings of the group were held. The Working Group findings were reported to the Regeneration and Environment Scrutiny Committee on 12th February 2019. The Committee also made recommendations to Cabinet in relation to Household Waste Recycling Centres, but this report presents the Working Group's consideration and findings in relation to waste and recycling collection services only, these are:

1. That the current kerbside collection system for co-mingled (mixed) materials be retained (subject to continuous satisfactory performance attainment and market sustainability)

2. Officers develop education and enforcement solutions in order to improve the quality of materials and increase participation in recycling services.

3. That the frequency of residual waste collections is reviewed in the light of

actual and projected recycling performance following implementation of the Working Group's recommendations noting that there would be a lead-in time to any changes and having regard to the requirement to meet the statutory recycling target of 70% in 2024/2025.

4. To review and update Waste Transfer arrangements in the light of any changes to collection systems.

5. Officers to explore the feasibility of developing a working arrangement to take advantage of RCT County Borough Council's 'state of the art' treatment facility.

5.3 The Council's current waste service collection profile is detailed below in Table 1:

Table 1

Service	Frequency	Containers Used	Materials Collected
Dry Recycling	Weekly	240l wheeled bin (approx. 70% of households) Kerbside boxes (to approx. 25% households) Single use sacks (approx. 5% of households)	• Glass • Cans • Plastic Bottles • Mixed Plastic • Paper • Card
Food Waste	Weekly	5 Litre Internal Caddy 23Litre Kerbside Caddy	• All Food Waste
Garden Waste	Weekly	Reusable Sack	• All Garden Waste
Residual Waste (Refuse)	Fortnightly	240l wheeled bin (approx. 98% of households) Plastic sacks	• Residual Waste

5.4 All households receive a weekly co-mingled dry recycling collection. The authority currently uses a fleet of 9 standard Refuse Collection Vehicles (RCVs) to provide this service along with a smaller tipper vehicle to collect from areas of restricted access. The dry recycling vehicles offload at the authority's bulking station prior to material being sent for sorting to a Materials Recycling Facility (MRF). Currently, the Authority has a contract with Newport Paper until April 2020 (with the option to extend until July 2020) and materials are processed in a facility in Warwickshire operated by Pure Recycling Limited. There are risks associated with the current service. These largely relate to the volatility of the market and the quality of the materials being presented by the householder.

5.5 In recent years the Authority has implemented many measures to improve the quality of recycling including the distribution of leaflets, door-stepping campaigns and a programme of warning stickers and bin removals. If the current collection system is to be retained these measures, alongside further enforcement solutions would need to

be explored. There is an associated risk to the short-term processing contract that is in place and longer term cost effective solution will also need to be considered.

5.6 Through the Waste (Wales) Measure 2010, the Welsh Government made the recycling targets statutory for 2012-13 and beyond, giving itself the option to levy financial penalties against councils that fail to achieve them. The statutory recycling target is weight-based and has increased gradually over time. The target was 58% since the start of 2015-16, but increased to 64% in 2019-20, and will increase to 70% in 2024/25. In 2018/19 the Council's recycling and composting performance was 65%.

5.7 Welsh Government is considering increasing the recycling target to 80% in 2034-35 subject to consultation. Welsh Government's collection Blueprint sets out their recommended service profile for the collection of waste from households, including the following central policies:

- Weekly separate collection of dry recyclables via 'kerbside sort' with material being collected separately in boxes and/or in reusable sacks, with two or more boxes provided per household, and recyclables being sorted into separate compartments on the collection vehicle by the collection staff
- Weekly separate collection of food waste
- The use of modern, lightweight, multi-compartment vehicles for a single pass collection of dry recyclables and food waste; and
- Fortnightly collection of residual waste, with reduced residual waste capacity, and 'no side waste' policies are enforced.

5.8 The Blueprint relies on the collection of recyclables that are presented part-segregated by residents. The material is then further sorted by operatives at the point of collection. The 'co-mingled' recycling service currently operated by the Council is not Blueprint compliant, although other key principles have been adopted i.e. weekly separate food waste collection and fortnightly residual waste collection with a no side waste policy. Welsh Government believe that, if applied optimally, its collections Blueprint offers the most cost-effective overall means of collecting waste from households.

5.9 Identifying the number of Local Authorities in Wales adopting collection methods that conform to Welsh Government's collection Blueprint is difficult. This is because there are a number of elements to the collection Blueprint which all local authorities in Wales have adopted to some extent. In terms of dry recycling, it is understood that 15 local authorities operate a multi-stream (i.e. kerbside sort) dry recycling collection service. In 2018/19 Caerphilly's recycling performance was 65%, 6th out of the 22 local authorities. 16 local authorities did not achieve Welsh Government's recycling target of 64% in 2018/19.

5.10 As detailed in Appendix 1, 3 from an initial 7 options of service delivery were taken forward and modelled in more detail:

- **Existing CCBC** range of collection services and recycling;
- **WG Blueprint**. Kerbside sort Dry recycling/food collected weekly by a Resource Recovery Vehicle (RRV). Residual waste and garden waste collected fortnightly by refuse collection vehicles;
- **Multistream**. Twin pack 1 – Fibres/Plastic & Cans. Twin Pack 2 – Food/Glass. Garden waste collected fortnightly in RCVs.

5.11 WRAP undertook a comprehensive modelling exercise using their Kerbside Analysis Tool (KAT). The results from the analysis were as follows:

Table 2

Revenue Expenditure	CCBC Existing	WG Blueprint with an extra Loader	Multistream
Annual Capital - Vehicles	633,919	700,067	799,289
Containers	118,582	202,592	301,958
Operating costs	2,572,000	3,305,249	3,313,662
Supervision	370,644	370,644	370,644
Overhead	447,877	447,877	447,877
Restricted Access Collections	303,959	331,448	330,782
Spare Vehicles	244,874	265,604	289,020
Total collection	4,691,855	5,623,481	5,853,232
Bulking Costs	235,000	610,000	610,000
Treatment – Dry	1,520,140	-878,841	-720,651
Treatment – Organic	478,084	478,084	478,084
Disposal – Residual	1,664,932	1,792,201	1,737,019
Income – Trade	-813,000	-813,000	-813,000
Costs - Trade	37,000	37,000	37,000
Total	7,814,011	6,848,925	7,181,685
Variance from CCBC Existing	0	-965,085	-632,326

5.12 The existing service provision had the lowest collection costs by almost £1 Million. However, due to the gate fees for the Material Recycling Facility (MRF) and associated haulage it had the highest treatment costs (in excess of £1.5Million). In comparison, the WG Blueprint and Multistream collection systems have an income of £878,841 and £720.651 respectively from the sale of separately collected dry recyclate. However, this is based on assumptions on market prices and concerns have been raised as to whether this income will be realised. Overall therefore the WRAP modelling indicated that the revenue cost for the WG Blueprint collection system (with a driver and 2 operatives) was £965k less than the existing CCBC collection system. The revenue cost of the Multistream collection system was modelled to be £632k less than the existing CCBC collection system.

5.13 Any changes to the current waste and recycling collection service or infrastructure would require the procurement of:

- New bespoke vehicles
- The purchase of new container systems
- The development of a new waste transfer station and depot facilities.

The modelled costs of the 3 options were updated using 2017 figures for presentation to the Scrutiny Working Group together with e capital and revenue costs of change and these are summarised in Table 3 below with further detail included within Table 4 in the Financial Implications section of this report.

Table 4

	CCBC Existing	WG Blueprint with an extra Loader	Multistream
Annual Revenue Operating Expenditure	£10,662,000	£9,014,000	£9,243,000
Cost of Change – Annual Revenue	0	£500,000 plus £100k if 3 weekly collections are introduced.	£500,000 plus £100k if 3 weekly collections are introduced.
Cost of Change – One-off Capital	£500,000	£9,460,000	£8,390,000

5.14 The Scrutiny Working Group had concerns over many of the key assumptions that were made as part of the modelling exercise, specifically as they are crucial to the achievement of the projected savings from changing collection methods. The modelling assumes the net yield of recyclable material would be the same but the Working Group believed that participation would reduce through customer resistance (as public satisfaction levels with the current dry recycling service are very high). There were also concerns surrounding whether the overall levels of income being projected in the model could be achieved.

5.15 The modelling undertaken by WRAP indicates that the Authority can only meet the 2024/2025 statutory recycling target of 70% by moving to the collections Blueprint and three weekly refuse collections. However, the Council's current recycling performance and the quality of our recycling is better than that assumed in the modelling. The Working Group therefore recommended that the frequency of residual waste collections is reviewed in light of the actual and projected recycling performance following implementation of the Working Group's recommendations. The Working Group also noted that there would be a lead-in time to any changes in collection system and that the timing of the review has regard to that and the requirement to meet the statutory recycling target of 70% in 2024/2025 given that recycling yield would be expected to increase with reduced residual waste collection frequency.

5.16 As part of the review, the Working Group visited a number of neighbouring Authorities who operate a Blueprint source separated system. To this end the Waste Review Group went to Blaenau Gwent, Newport, and Merthyr Tydfil Councils to observe their collection services. What was evident to the group was that source separated collection systems are not as efficient or effective as Caerphilly's collection regime.

5.17 The compartmentalised vehicles used by these Authorities have limited capacity for storage and it is common practice that such vehicles have to return to a tipping depot to offload at least two to three times a day. If Caerphilly CBC operated such a segregated system, particularly given the size of the County Borough in comparison to most of our neighbouring Councils, it would mean even more return trips to offload. These capacity issues at the Blueprint Councils result in a collection service whereby only 500-700 properties are serviced per day. In comparison Caerphilly CBC collection vehicles are averaging between 1100 and 1500 properties a day. A source separated system would require at least double the fleet of vehicles and potentially longer working days for operatives.

5.18 In August 2019 a Waste Service Review reporting to the Team Caerphilly Board was

initiated. Whilst this review is not specifically looking at waste collection systems, the performance, efficiency and resourcing of the service, and ensuring that it is customer focussed are all within scope.

5.19 **Improving Participation in Household Recycling**
As stated above, the Scrutiny Waste Review working Group identified that if the current collection system is to be retained then existing processes to educate and inform residents regarding participation would need to continue alongside additional enforcement solutions. The Scrutiny Committee have therefore recommended that officers develop education and enforcement solutions in order to improve the quality of materials and increase participation in recycling services.

5.20 It is therefore proposed that, should Cabinet approve the retention of the current collection system a new education and enforcement process is introduced to further encourage recycling participation and to reduce contamination of recycling. It is envisaged that the enforcement process would involve a series of escalating interventions ranging from informal to formal. A further report detailing the process can be brought forward for Cabinet's consideration.

5.21 **Materials Recycling Facility**
Rhondda Cynon Taff (RCT) County Borough Council is developing a materials recycling facility only 5 miles from our northern boundary at Llwydcoed. RCT Council has a similar demographic profile to Caerphilly and collects recyclable materials in a co-mingled (mixed) manner too, albeit that the RCT system uses bags rather than wheeled bins. The facility is able to mechanically sort a whole range of recyclable materials using the latest equipment and has sufficient capacity to receive recycling from Caerphilly Council; therefore the possibility of collaboration has been explored.

5.22 The arrangements being explored with RCT to treat the Authority's dry recycling would cost less than current contracts due to reduced haulage costs and the long term nature of the partnership envisaged. This would also be beneficial from a sustainability perspective with much shorter haulage distances for collected materials and retaining public spending and employment within the local area. No significant changes would be required to the Authority's waste transfer infrastructure although the Authority's current Waste Transfer Station (WTS) will require investment to extend life and futureproof. Some CCBC recycling collection vehicles could direct deliver to the RCT operated facility. It is therefore proposed that the treatment and disposal of dry recyclables element of the Authority's waste collection duty (Section 45, Environmental Protection Act 1990) is delegated to RCTCBC under Section 101 of the Local Government Act 1972 and section 19 of the Local Government Act 2000 with effect from 1st April 2020 for a period of 10 years. It is proposed that this delegation is subject to agreement of a Memorandum of Understanding to address details including financial matters, performance, contingencies, disposal of residual waste, and variations etc.

5.23 **Conclusion**
The WRAP modelling indicated that the Authority can only meet the 2024/2025 statutory recycling target of 70% by moving to the collections Blueprint and three weekly refuse collections. However, the Council's current recycling performance and the quality of recycling is better than that assumed in the modelling. The Waste Review Working Group considered there would be an impact upon the participation of residents in the service if the current co-mingled recycling collection system were to change and also had concerns over key assumptions crucial to the achievement of modelled savings from changing collection methods. The Working Group were of the view that the £965k saving noted in the report by moving to blue print is not likely,

given the need to double the fleet size potentially and introduce longer working day operations and assumptions in relation to recycling income generated in the blueprint model.

5.24 The Working Group accepted that some savings could be made, but the Council should not change methods despite this saving, for other reasons/factors (risk to participation and recycling targets), given the ability to achieve 70% recycling using present collection methods. The Working Group therefore recommended no changes to existing collections systems or frequency and that education and enforcement solutions are developed in order to improve the quality of materials and increase participation in recycling services. The frequency of residual waste collections should be reviewed in light of the actual and projected recycling performance in future years.

6. ASSUMPTIONS

6.1 In order to undertake the modelling there were a series of key assumptions that were made by WRAP namely:

- Net yield would be the same for both systems (i.e.: there would be no public resistance to a recycling collection system change).
- Estimated waste transfer station costs were used. These were superseded by more detailed figures in the Cost Benefit Analysis work
- A change to either the Welsh Government Blueprint or Multi-stream collection system would require new waste transfer station infrastructure to deal with separated recycling streams (e.g. separation equipment for plastic and cabs, balers etc.)
- Recycling yield would increase with reduced residual waste frequency
- A range of material values were modelled. Material prices are key as any change to kerbside sort or multi stream collections means that the income from sale of materials is important to offset the additional collection costs. Values used in the modelling reflect the status of the markets in 2015 when the modelling was undertaken. The Council's MRF arrangements have since changed with the gate fee reducing. This fee is subject to quarterly review and predicted to increase due to the fluctuating nature of the market for materials.

7. LINKS TO RELEVANT COUNCIL POLICIES

7.1 The Community and Leisure Services Divisional Service Plan contains service specific objectives to meet a range of statutory and non-statutory targets, The plan also outlines the divisions contribution to the Authority's medium term financial strategy.

7.2 Towards Zero Waste One Wales: One Planet 2010, is the overarching Waste Strategy for Wales which sets out Welsh Government's long term framework for resource efficiency and waste management including high level statutory recycling targets and outcomes. In 2011, the strategy was supplemented with a series of sector plans including the municipal waste sector plan which outlined the Welsh Government's recommended service profile for the collection of waste from households. (i.e. the collection Blueprint, this being Welsh Government's preferred service model).

7.3 **Corporate Plan 2018-2023.**

Waste and recycling services are an essential element of the Authority's infrastructure and as such supports achievement of the Corporate Well-being Objectives, which are:

Objective 1 - Improve education opportunities for all

Objective 2 - Enabling employment

Objective 3 - Address the availability, condition and sustainability of homes throughout the county borough and provide advice, assistance or support to help improve people's well-being

Objective 4 - Promote a modern, integrated and sustainable transport system that increases opportunity, promotes prosperity and minimises the adverse impacts on the environment

Objective 5 - Creating a county borough that supports a healthy lifestyle in accordance with the sustainable Development Principle within the Wellbeing of Future Generations (Wales) Act 2015

Objective 6 - Support citizens to remain independent and improve their well-being

8. WELL-BEING OF FUTURE GENERATIONS

8.1 The delivery of sustainable waste management services supports the following Well-being Goals:-

- A resilient Wales
- A healthier Wales
- A more equal Wales
- A Wales of cohesive communities
- A globally responsible Wales

8.2 The delivery of a sustainable waste management service to the public is consistent with the five ways of working as defined within the sustainable development principle in the Act. The five ways of working of the sustainable development principle, listed in the Act are:

- Long Term – The Waste Review reflects the fact that the Authority is taking a longer term view of its waste and recycling services, with the aim of delivering services that meet the needs of residents and achieve current and future statutory recycling targets.
- Prevention – the Waste Review has had a focus on promoting recycling and preventing recyclable material being disposed of in residual waste streams as far as practicable.
- Integration – the waste and recycling service has a contribution to make across a number of Well-being Goals.
- Collaboration – the Authority has collaborated with Welsh Government's Collaborative Change Programme to analyse future service requirements and

is seeking to develop further operational partnerships with other Local Authorities in Wales.

- Involvement – the Waste Review Working Group consisted of a cross party group of Members, with geographical spread across the county borough.

9. EQUALITIES IMPLICATIONS

9.1 An EIA screening has been completed in accordance with the Council's Strategic Equality Plan and supplementary guidance. No potential for unlawful discrimination and/or low level or minor negative impact has been identified; therefore a full EIA has not been carried out.

10. FINANCIAL IMPLICATIONS

10.1 At the start of the review (2015) and as part of the CCP work that has been undertaken (see Appendix 1, CBA Report), WRAP undertook a comprehensive modelling exercise using their Kerbside Analysis Tool (KAT). which is an excel based spreadsheet tool which allows users to make projections of kerbside collection infrastructure and associated standardised costs by applying default and user-defined values to key parameters. The projected costs are standardised in order to fairly assess the differences between options. However, it is important to note that KAT modelling is relative and based on current service; if efficiency savings could be made in current services, then they would also be able to be made on all the options considered. Therefore it is the cost difference that is the relevant output of the modelling exercise rather than absolute numbers.

10.2 The results from the KAT analysis in the table at Table 2 above show the revenue cost for the core options modelled based on 2015 data. The Welsh Government Blueprint option, with an extra Loader (i.e. 2 Loaders) was modelled as approximately £965,000 less cost than the CCBC existing service and approximately £330,000 lower than the Multistream collection system.

10.3 The existing CCBC service provision had the lowest collection costs by circa, £1 million. However, due to the gate fees for the Material Recycling Facility (MRF) and associated haulage it had the highest treatment costs (in excess of £1.5Million). In comparison, the WG Blueprint and Multistream options had income of £878,841 and £720.651 respectively from the sale of separately collected dry recyclate. However, this is based on assumptions on market prices and concerns have been raised as to whether this income will be realised.

10.4 Incomes in the Multistream option were lower than those in the WG Blueprint option, this is largely due to the reduced income realised from the sales of mixed paper and card compared to the sale of separately collected paper and card in the WG Blueprint option.

10.5 The modelled costs of the 3 options have been reworked using 2017 figures and these are presented together with the revenue and capital costs of change in Table 4 below. There are further financial risks associated with the achievement of income due to the volatility of markets. Additionally the modelling assumed that there would be no change in yield or public behaviour. If this assumption, was incorrect and public participation and yield decreased as a result of service change there is a significant risk that recycling targets may not be reached and financial penalties could be imposed (at £200 per tonne).

10.6 There are also financial risks associated with retaining our current collection methods largely due to the short term contract that we have in place, the volatility of markets and the importance and reliance on the public to present high quality materials for collection. Our current system does not fully satisfy the collection Blueprint and therefore may not attract Welsh Government funding.

10.7 The revenue and capital costs for each option along with any key assumptions are summarised in Table 4 below (please note that the costs were calculated in 2017 and are likely to have increased).

TABLE 4

OPTION SCENARIOS	MODELLED ANNUAL REVENUE COSTS (includes collection and treatment)	REVENUE COSTS OF CHANGE / PHASED CHANGE	CAPITAL COSTS OF CHANGE	ASSUMPTIONS/CAVEATS/RISKS
EXISTING CCBC **The Existing CCBC range of collection services and recycling/disposal sites**	**£10,662,000**		**Infrastructure - £500,000**	**Current Waste Transfer Station (WTS) would require investment to extend life and future proof.** **Our existing services are enabling the Authority to attain (and exceed) the government recycling targets.** **However, there also financial risks associated with our current collection methods largely due to:** **- the short term contract we have in place** **- the volatility of markets for recyclable materials** **-the importance and reliance on the public to present high quality materials for collection** **-the current system does not fit in with the blueprint template and thus may not attract Government funding**
WG BLUEPRINT (+ EXTRA LOADER) **No 3 weekly collections Without Bryn Quarry post sort**	**£9,014,000**	**£500,000 *** *** estimated for additional revenue costs to support the initial rollout of a new recycling service.** **£100k additional costs if 3 weekly collections are introduced at a later stage.**	**Vehicles – £3,120,000** **Containers – £780,000** **HWRCs - £3,350,000** **WTS - £2,210,000**	**This model assumes that the participation rates will stay the same. However, If it does decrease this could put us at risk of fines as experienced by some practicing "blueprint" Councils.** **Funding from Welsh Government is fully committed up until 2021 and there is no indication as to what if any capital funding would be available after this date but it based on previous support it could be circa £6.75million** **The market for recyclable materials is notoriously volatile and subject to regular and extreme fluctuations. This means a regular income would not be guaranteed (as highlighted in the report).** **The transfer station/HWRC costs outlined could prove to be**

				too low.
<u>MULTISTREAM</u> **No 3 weekly collections Without Bryn Quarry post sort**	**£9,243,000**	**£500,000* * estimated for additional revenue costs to support the initial rollout of a new recycling service. £100k additional costs if 3 weekly collections are introduced at a later stage.**	**Vehicles – £2,280,000 Containers – £640,000 HWRCs - £3,350,000 WTS - £2,120,000**	**Infrastructure – the cost of a new waste transfer station and the rationalising of the HWRCs is assumed the same for both change options. Lower vehicle costs as re-allocation of 9 existing twin-pack vehicles. Waste Transfer Station - lower costs as less Forklifts required. Officers believe that the Waste Transfer Station estimate used is too low, but more detailed work would be required to clarify this. As this system is not fully blueprint compliant it is unlikely to attract Welsh Government funding. This model assumes that the participation rates will stay the same. However, if it does decrease this could put us at risk of non achievement of targets and associated fines. The market for recyclable materials is notoriously volatile and subject to regular and extreme fluctuations. This means a regular income would not be guaranteed (as highlighted in the report).**

10.8 Welsh Government has allocated capital funding to the Collaborative Change Programme which has been increased to £12 million a year until 2021. We are advised that the budget is fully committed over the next 2 years as Welsh Government is supporting a number of Local Authorities moving towards the Collections Blueprint. This funding is being used to meet capital cost associated with change such as vehicles, waste/recycling containers, waste transfer and household waste recycling infrastructure.

10.9 It is understood that in supporting Local Authorities through the Collaborative Change Programme Welsh Government are funding approximately 75% of capital costs. As an indication, the modelled capital costs of scenarios 4 and 5 (both full Collections Blueprint) in the cost benefit analysis at Appendix 1 are approximately £9 million pounds at 2017 figures. There is no indication as to what, if any, capital funding would be available beyond 2021, but at current levels of support the Authority might expect approximately £6.75 million of capital funding from WG to move to the Collections Blueprint which would require a capital contribution from the Authority of circa £2.5m.

10.10 The arrangements being explored with RCT to treat the Authority's dry recycling would cost less than the existing contract with Newport Paper due to the reduction in haulage costs.

11. PERSONNEL IMPLICATIONS

11.1 There are no personnel implications arising from the recommendations in this report.

12. CONSULTATIONS

12.1 The report has been sent to the consultees listed below and all consultations responses have been incorporated in the report.

13. STATUTORY POWER

13.1 Local Government Act 1972, Environmental Protection Act 1990, and the Local Government Act 2000.

14. URGENCY

14.1 This decision is not urgent and therefore may be subject to the "call-in" procedure.

Author: Rob Hartshorn, Head of Public Protection, Community & Leisure Services

Consultees: Councillor Nigel George, Cabinet Member for Neighbourhood Services
Cllr. D.T. Davies – Chair of Environment & Sustainability Scrutiny Committee
Cllr. A. Hussey - Vice Chair of Environment & Sustainability Scrutiny
Mark S. Williams, Interim Corporate Director of Communities
Hayley Jones, Waste Strategy and Operations Manager
Rhodri Lloyd, Principal Waste Management Officer

Rob Tranter, Head of Legal Services and Monitoring Officer
Stephen Harris – Interim Head of Business Improvement Services & S.151 Officer
Ian Evans, Procurement and Information Manager
Anwen Cullinane – Senior Policy Officer – Equalities and Welsh Language
Mike Eedy, Finance Manager
Shaun Watkins, HR Manager

Background Papers: Report to Regeneration and Environment Scrutiny Committee, "Waste Review Working Group", 12th February 2019.

Appendices:

APPENDIX 1: Cost Benefit Analysis Report (WRAP Nov 2018)

APPENDIX 2: The All Wales Local Authority Information on Types of Collection Service (November 2018)

APPENDIX 3: Caerphilly KAT (Collections) Modelling Results (December 2015)

APPENDIX 4: All Wales Recycling Performance Data (2018/19)

Appendix 1

Draft Report

Caerphilly County Borough Council CBA Report

A report detailing the outcomes of the Cost Benefit Analysis modelling for Caerphilly County Borough Council's Waste future waste and recycling options.

Project code: CCP100-056
Research date: May – December 2017 **Date:** February 2018

WRAP's vision is a world in which resources are used sustainably.

Our mission is to accelerate the move to a sustainable resource-efficient economy through re-inventing how we design, produce and sell products; re-thinking how we use and consume products; and re-defining what is possible through re-use and recycling.

Find out more at www.wrapcymru.org.uk

Written by: Emma Tilbrook, Mark Cordle and Alex Davies

Executive summary

In 2017, Eunomia Research & Consulting Ltd (Eunomia) were commissioned by the WRAP Cymru to undertake a Cost Benefit Analysis (CBA) of the future options for Caerphilly County Borough Council (CCBC) to deliver their waste and recycling services.

The role of the CBA tool within the Welsh Government Business Planning Toolkit (BPT) is to support authorities in making balanced and sustainable decisions regarding the future of their waste and recycling services. To do this, the CBA compares the performance of each future scenario across four areas:

- Cost of service delivery;
- Performance of the service;
- Environmental impact of the service; and
- Employment generated by the service.

The CBA modelling undertaken as part of this project was carried out in two phases:

Phase A – Five initial scenarios were modelled, with each of the scenarios assuming that Full Moon was to be used as the depot and WTS for waste and recycling collections. In scenarios 3, 4 and 5 this meant the closure of Full Moon as an HWRC. Following a meeting in July 2017, it was agreed that the closure of Full Moon HWRC was not politically or operationally acceptable and that modelling should be updated to reflect the depot and WTS being located in Trehir. Additionally, as the initial 5 scenarios did not offer CCBC savings significant enough to warrant change, Eunomia were also asked to explore how additional modelled savings could be generated from the detailed outputs provided as part of previous collections modelling work undertaken by WRAP and HWRC and depot analysis carried out by Resource Futures. The detailed results of Phase A modelling can be found in Section 2.0 of this report.

Phase B - Within Phase B, 4 additional scenarios were modelled, taking into account the movement of the waste and recycling transfer station (WTS) to Trehir (from Full Moon) and also focussing on the impact of changing recycling collection systems. Within all of these scenarios the HWRC, WTS and commercial waste options remained the same, allowing the impact of changing the recycling service to be isolated. Scenarios 1 and 3 used the blueprint recycling service as a basis for operations and Scenario 2 and 4 the multi-stream recycling service. Scenarios 3 and 4, then overlay two further changes:

- Bryn Quarry no longer used to post-sort HWRC waste
- Black bag ban introduced to increase recycling from HWRCs

These scenarios were then modelled with two weekly refuse collections (as current) or three weekly refuse collections.

The detailed results of Phase B modelling can be found in Section 3.0 of this report.

Cost of Service Delivery

The annualised Phase B scenario costs (compared to the baseline 2016/2017 budget) are summarised in Table 1.

Table 1: Annualised Phase B Scenario costs (compared to the baseline)

Scenario	Two Weekly Refuse Collections (as current)	Three Weekly Refuse Collections
1	- £1.134m	-£1.285m
2	-£905k	-£966k
3	-£1.648m	-£1.862m
4	-£1.419m	-£1.608m

All scenarios modelled generate savings for CCBC against the baseline position, with blueprint recycling services generating larger savings than the equivalent multi-stream option in all cases. This is largely driven by the income received for the collected materials within the market place, offsetting additional vehicle and staffing costs in this option.

It is recognised that material revenues are subject to fluctuation. Sensitivities were run on material revenues as part of the original WRAP collections options modelling, ensuring that fluctuations in material revenues did not significantly change the order or magnitude of savings modelled. The processing cost paid for the current dry recycling stream is a significant cost in the baseline and therefore the main source of savings when switching to the blueprint or multi-stream recycling collection system.

The savings provided for three weekly collections within Table 1 are lower than those normally associated with a move to a more restricted refuse service, however, all of the three weekly scenarios also include the cost of the provision of a weekly Absorbent Hygiene Products (AHP) service. This service costs approximately £300k per annum and has thus reduced the potential savings from this change in the amount shown in Table 1.

In addition to the savings provided in Table 1, it is also likely that if CCBC was to move to the Welsh Government's Collections Blueprint, capital funding may be available to support this transition. When applied to Scenario 3 with three weekly collections, this could save CCBC £2.177m per annum, against current service costs (when an assumption of £2m of capital funding is applied).

Performance of the Service

In analysing CCBC's current recycling performance in more detail, with the aim of understanding if any further increases in performance could be made, we have made two adjustments to the current baseline position:

1. We have included a baseline MRF reject rate 25%, reflecting reported issues with the current co-mingled material. This has an approx. 1.5% impact on baseline recycling rates.
2. Where Bryn Quarry is used, the reported recycling rate of 77% has been replaced by the maximum estimate of 42% in the baseline and 30% in options 1 and 2.With increasing pressure on the wider industry to produce high quality outputs, there is a risk that the contribution of the sorting undertaken by Bryn Quarry is reduced, which has been accounted for in the Phase B modelling. This adjustment has resulted in a 4% reduction in the baseline position.

Although this adjustment to baseline position represents a worst case scenario for CCBC, it is important that this risk is taken into account as part of any assessment of a future 'no change' baseline scenario.

A summary of the modelled recycling performance for each future Scenario can be found in Table 2.

Table 2 – Phase B Scenarios Recycling Rate Performance

Scenario	B/L	1	2	3	4
Recycling Rate – Fortnightly Residual Waste	62%	65%	65%	67%	67%
Recycling Rate – Three Weekly Residual Waste	-	68%	68%	70%	70%
NB: AHP Recycling (rather than disposal) under 3W collections could increase recycling rate by further 1%					

Based upon the more conservative baseline position used in Phase B, in all scenarios CCBC still meet the 2019/2020 target of 64%. However, as within Phase A the modelling demonstrates that 2024/2025 statutory recycling targets of 70% can only be met by moving to three weekly refuse collections.

The potential annualised financial liability to CCBC of the 2024/2025 recycling targets not being met are provided in Table 7.

Table 3 – Phase B Scenarios - Potential Rate Fines

Scenario	B/L	1	2	3	4
Fortnightly Residual Waste	£1.7m	£1m	£1m	£650k	£650k
Three Weekly Residual Waste	£1.7m	£430k	£430k	-	-

Environmental Impact of the Service

The environmental impact of each scenario has been calculated using details from various life-cycle studies and takes into account the details of materials collected, the fate of this material (recycling, refuse, organic treatment etc.) and also emissions for collection and onward transportation of material. As Phase B focuses on a point in time, Table 4 draws upon the results from a point at which all proposed changes to the service have been made. Changes would then be incremental over time following any significant changes in the approach to the way waste and recycling is collected and reprocessed/disposed of.

Table 4 – Environmental Saving of Each Scenario Expressed as Tonnes per CO_2 Equivalent Compared to Baseline

Scenario	No Three Weekly	With Three Weekly
Scenario 1	-9,270	-10,148
Scenario 2	-10,856	-11,922
Scenario 3	-14,793	-15,670
Scenario 4	-16,379	-17,443

Unsurprisingly, all of the scenarios perform better when three weekly collections are introduced.

Employment Generated by the Service

To support CCBC meeting the requirements of the Well-being of Future Generations Act (2015) and improve the employment opportunities through the delivery of waste and recycling services within Caerphilly, the employment generated within each Phase B Scenario has been analysed.

Table 19 shows the maximum amount of people employed within each Phase B following rollout of the new service.

Table 5 – Employment Generated Following Rollout of Services – 2021/2022 Used as Reference Year

Scenario	No Three Weekly	With Three Weekly
Baseline	269	269
Scenario 1	291	291
Scenario 2	273	274
Scenario 3	283	286
Scenario 4	267	268

It is clear in Table 19 that the highest levels of employment are highest from the Collections Blueprint scenarios (1 and 3), this largely driven by the greater number of vehicles and crew require to deliver these services.

Conclusion

In conclusion all scenarios modelled will allow CCBC to make significant savings on their baseline budget position. However, the decision to make such substantial changes to the way in which services are delivered is not purely financial, other issues such as operational and delivery risks need to be considered. With the right planning and support (potentially funded via the WRAP CCP programme), most of these risks can however be largely controlled and/or mitigated.

CCBC do however, need to be cognisant of risks outside of their control such as the risk of fines from Welsh Government and the ever changing materials reprocessing markets, all of which will have an impact on the medium to long term sustainability of a 'do nothing' approach.

In terms of next steps, we would recommend that CCBC undertake a full analysis of the risks associated with all scenarios, examining the potential impact of those both inside and outside of the authority's control, allowing a balanced approach to be taken to the opportunities for the future development of the authority's waste services.

Contents

Tables and Figures

Acknowledgements

A report detailing the outcomes of the Cost Benefit Analysis modelling for Caerphilly County Borough Council's Waste future waste and recycling options.

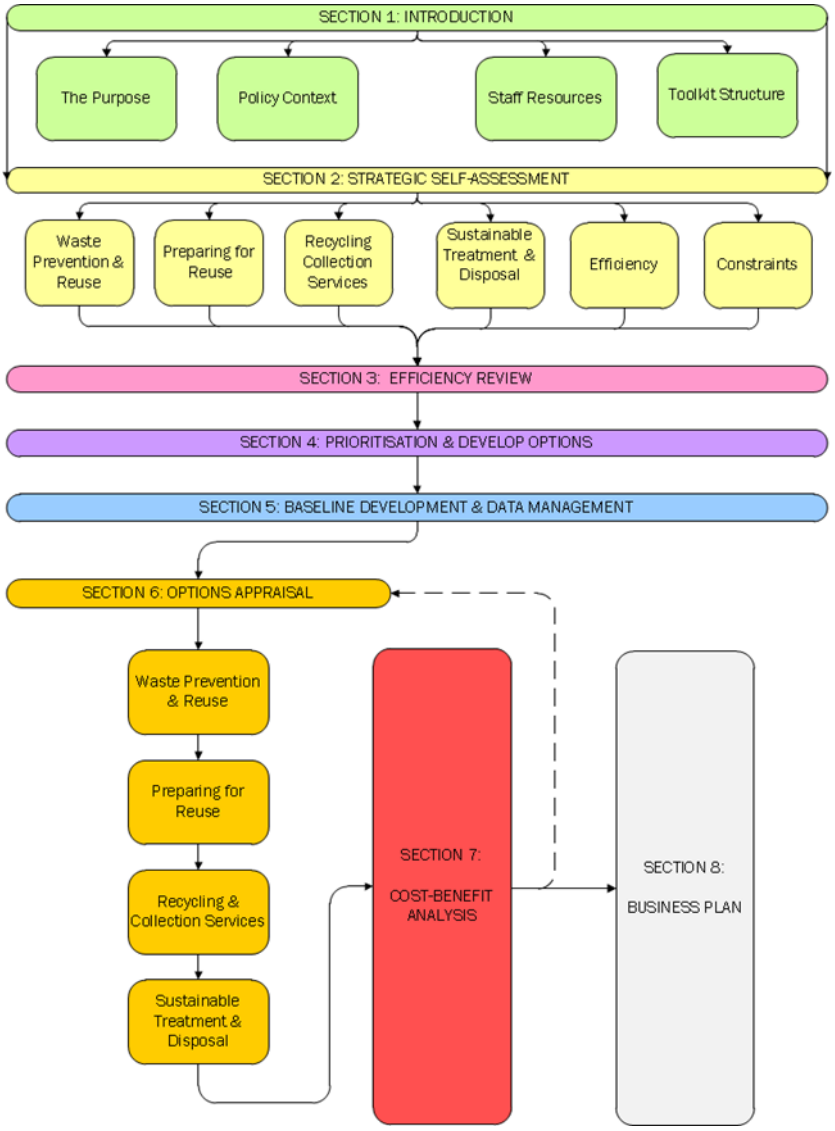
1.0 Introduction

In 2017, Eunomia Research & Consulting Ltd (Eunomia) were commissioned by the WRAP Cymru to undertake a Cost Benefit Analysis (CBA) of the future options for Caerphilly County Borough Council (CCBC) to deliver their waste and recycling services.

1.1 The Business Planning Toolkit

The Business Planning Toolkit (BPT) was developed to provide Welsh authorities with a consistent method for analysing existing service performance, alongside the impacts of potential service changes. The intention is that the outputs of the toolkit will enable authorities to develop a fully costed business plan. This business plan will set out a clear, long-term path to sustainably meet both the authority's statutory 70% recycling target by 2024/25 (as well as interim statutory targets), and the non-mandatory targets associated with waste prevention and re-use, preparation for re-use and sustainable treatment and disposal set out in the Municipal Sector Plan[1]. The overall structure of the Business Planning Toolkit can be seen in Figure 1.

Figure 1 - Business Planning Toolkit Process



[1] *Welsh Assembly Government (2011)* Municipal Sector Plan - Part 1: Collections Blueprint*, March 2011,* *http://wales.gov.uk/topics/environmentcountryside/epq/waste_recycling/publication/municipalsectorplan/?lang=en*

Throughout 2015 and 2016, CCBC has received significant support from the WRAP Collaborative Change Programme (CCP) to undertake Section 6 of the BPT process. As part of this work WRAP have commissioned options appraisals for the following recycling and collection services:

- Kerbside waste and recycling collections;
- HWRC operations; and
- Trade waste and recycling collections.

This project uses the outputs of these Section 6 commissions and additional analysis, to deliver Section 7 of the BPT process, the Cost Benefit Analysis (CBA).

1.2 Section 7 - The CBA

As shown in the BPT process in Figure 1, the CBA is designed bring together the baseline position and the outputs of options appraisal modelling for the four main BPT elements.

- Prevention and Re-use;
- Preparation for Re-use;
- Recycling and Collection Services (including all options appraisals commissioned by WRAP); and
- Sustainable Treatment & Disposal.

These elements reflect the waste hierarchy and the structure of the WG Municipal Sector Plan:

As part of the CBA, up to six scenarios (the baseline and up to five alternative scenarios) can be compared. Within the CBA process a scenario is defined as a combination of development options for each of the BPT elements.

Information was collated and analysed from the following reports and utilised within the CBA modelling:

Waste and Recycling Collections

- KAT Modelling results including Further analysis, December 2015, WRAP

Depot, WTS and HWRCs

- HWRC review for Caerphilly County Borough Council, November 2016, Resource Futures
- A Review of Caerphilly County Borough Council Waste Transfer Stations and Household Waste Recycling Centres, July 2017, Resource Futures

Commercial Waste

- Data from the June 2017 commercial waste analysis carried out by Amec Foster Wheeler

The CBA modelling undertaken for Caerphilly County Borough Council (CCBC) was carried out in two phases:

Phase A: Five initial scenarios were modelled and theses have been detailed in Table 6. Each of these scenarios assumed that Full Moon was to be used as the WTS for waste and recycling collections. In scenarios 3, 4 and 5 this meant the closure of Full Moon as an HWRC. Following a meeting in July 2017, it was agreed that the closure of Full Moon HWRC was not politically or operationally acceptable and that modelling should be updated to

reflect the WTS being located in Trehir. Additionally, as the initial 5 scenarios did not offer CCBC savings significant enough to warrant change, Eunomia were also asked to explore how additional modelled savings could be generated from the detailed outputs provided as part of previous collections modelling work undertaken by WRAP and HWRC and WTS analysis carried out by Resource Futures.

Within Phase A and Phase B scenarios, the following definitions apply:

Multi-Stream – Recycling collections are made using two split bodied RCVs on a weekly basis. The first RCV will collect food waste in one compartment and glass in the other compartment. In the second RCV paper and card will be collected in one compartment and plastic and cans in the other compartment. Residents will present their paper, card, plastics and cans in two re-useable sacks, glass will be presented in kerbside recycling box and food waste in a caddy.

Blueprint Collections - Recycling collections are made using a modern Resource Recovery Vehicles (RRV) on a weekly basis. The RRV will collect all material paper, card, glass and food waste in separate compartments, with plastics and cans being mixed for separation upon return to the WTS. Residents will present their paper, card, plastics, cans and glass in three kerbside recycling boxes and food waste in a caddy.

Table 6 - Summary of Phase A CBA Scenarios

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Kerbside Refuse and Recycling Services	• **No change** in recycling or garden waste service • **Policy enforcement** work commencing **April 2018**	• **No change** in recycling or garden waste service • **Policy enforcement** work commencing **April 2018** • **Three weekly refuse** collections commencing **April 2023**	• **Policy enforcement** work commencing **April 2018** • Multi stream recycling service commencing **October 2019** • **Three weekly refuse** collections commencing **April 2023**	• **Policy enforcement** work commencing **April 2018** • Collections Blueprint recycling service commencing **October 2019** • **Three weekly refuse** collections commencing **April 2023**	• **Policy enforcement** work commencing **April 2018** • Collections Blueprint recycling service commencing **October 2023** • **Three weekly refuse** collections commencing **April 2023**
HWRCs	• **No change** to the current service • **Pre-Sort Materials** at HWRC in **2018/19** • **Upgrade Full Moon** HWRC and WTS to be complete **October 2019**	• **Pre-Sort Materials** at HWRC in **2018/19** • **Upgrade Full Moon** HWRC and WTS to be complete **October 2019** • **Expansion of Aberbargoed** HWRC to be complete **July 2019** • **Expansion of Trehir** HWRC to be complete **July 2020**	• **Pre-Sort Materials** at HWRC in **2018/19** • **Expansion of Penmaen** HWRC to be complete **October 2018** • **Close Full Moon** in **April 2019** • **Expansion of Aberbargoed** HWRC to be complete **July 2019** • **Expansion of Trehir** HWRC to be complete **October 2021**	• **Pre-Sort Materials** at HWRC in **2018/19** • **Expansion of Penmaen** HWRC to be complete **October 2018** • **Close Full Moon** in **April 2019** • **Expansion of Aberbargoed** HWRC to be complete **July 2019** • **Expansion of Trehir** HWRC to be complete **October 2021**	• **Pre-Sort Materials** at HWRC in **2018/19** • **Improvement work** to **Full Moon** • **Expansion of Aberbargoed** HWRC to be complete **October 2020** • **Expansion of Trehir** HWRC to be complete **October 2021** • **Expansion of Penmaen** HWRC to be complete **October 2021** • **Close Full Moon** in **October 2022**
Commercial	• **No change** to the current service	• **No change** to the current service	• **New service** commencing **April 2019**	• **New service** commencing **April 2019**	• **New service** commencing **April 2019**

Phase B: Within Phase B, 4 additional scenarios were modelled, taking into account the movement of the WTS to Trehir and also focussing on the impact of changing recycling collection systems. Within all of these scenarios the HWRC, WTS and commercial waste options remained the same, allowing the impact of changing the recycling service to be isolated. Within these scenarios, the multi-stream and blueprint recycling services were taken from Phase A for additional analysis. Scenarios 1 and 2 take the analysis carried out within Phase A and use Trehir as the new waste and recycling waste transfer station (WTS). Scenarios 3 and 4, then overlay two further changes:

- Bryn Quarry no longer used to post-sort HWRC waste
- Black bag ban introduced to increase recycling from HWRCs

Table 7 - Summary of Phase B CBA Scenarios

	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Kerbside Refuse and Recycling Services	Collections Blueprint Recycling Three weekly refuse introduced in 2023	Multi Stream Recycling Three weekly refuse introduced in 2023	Collections Blueprint Recycling Three weekly refuse introduced in 2023	Multi Stream Recycling Three weekly refuse introduced in 2023
HWRCs and Depots	• Upgrade Full Moon HWRC to Super HWRC • Expansion of Penallta and Aberbargoed HWRC • Rhymney and Penmaen to close • New HWRC at Trehir • New WTS at Trehir			
			Bryn Quarry no longer used to sort HWRC waste Black bag ban introduced to increase recycling from sites	
Commercial	• New commercial waste service commencing April 2019			

Table 8 provides a summary of the outputs provided by the CBA for each scenario.

Table 8 - CBA Scenario Outputs

CBA Output	Description
Cost of Service Delivery	The comparative cost to CCBC of delivering different future service scenarios
Performance of the Service	The comparative recycling performance of different future service scenarios and their contribution to the achievement of the statutory targets as set out in the Welsh Government Strategy '*Towards Zero Waste*'.
Environmental Impact of the Service	The comparative environmental impact of different future service scenarios, as expressed in tonnes of CO_2. Environmental costs expressed as £s are also taken into account.
Employment Generated by the Service	The comparative number of people employed as a direct result of the future service scenario.

Within the CBA, environmental cost results are reflected both in terms of CO_2 equivalent and monetised using unit environmental damage cost calculations. These are then combined with the financial cost analysis to generate a net financial and environmental cost for each scenario. The performance and employment generated by each scenario against the Welsh Government 'Towards Zero Waste' targets is also calculated. Financial costs are presented in net present value (NPV) terms for ease of comparison with existing medium term financial plans, but annual budget data can also be extracted in terms of annual capital and revenue costs.

2.0 **Phase A CBA Modelling Results**

2.1 Cost of Service Delivery

2.1.1 Revenue Costs

In calculating the cost of service delivery, we have transposed the costs of the scenarios and aligned this with the 2016/2017 budget. By doing this, we can relate savings and costs associated with the service to CCBC's budget lines.

Figure 2 to Figure 6 illustrate the financial costs of the baseline and Phase A Scenarios 1 to 5 broken down by budget area; a detailed breakdown of these costs can be found in Appendix C.

Figure 2 - Baseline Financial Costs 2016/2017 to 2029/2031

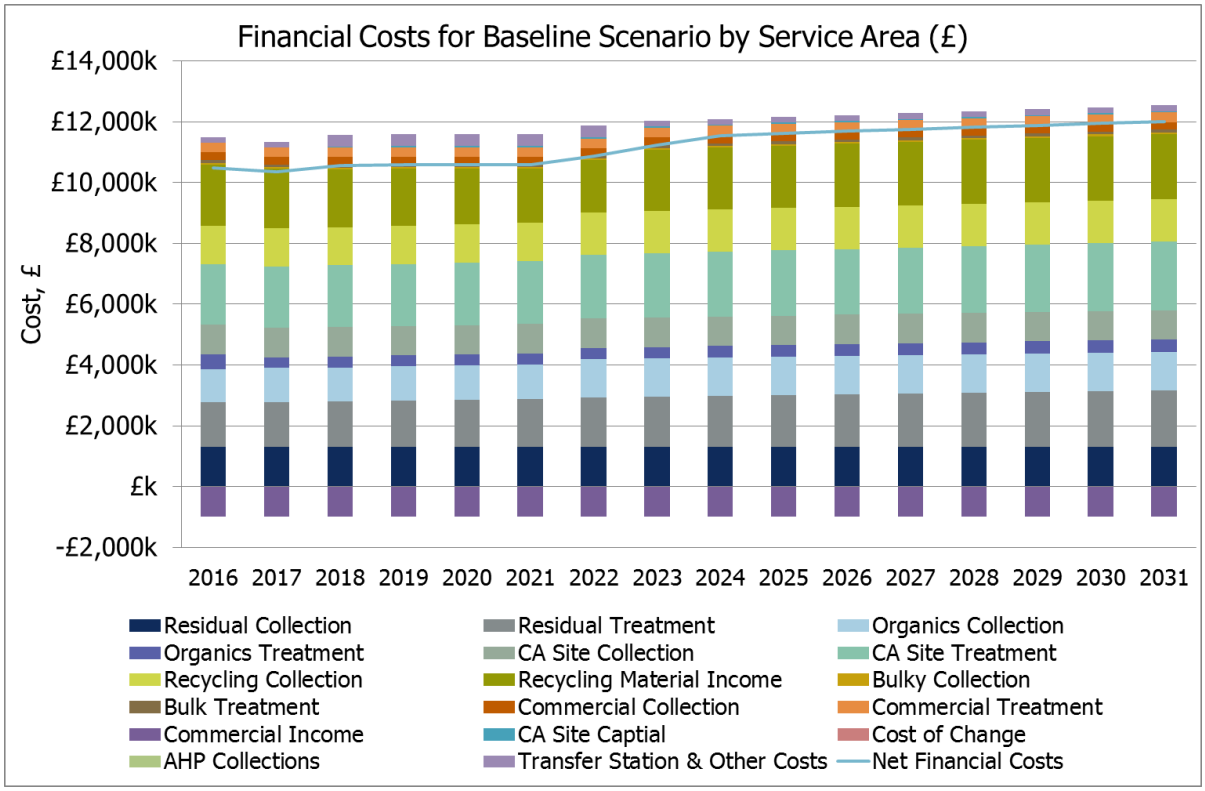


Figure 3 – Phase A Scenario 1 Financial Costs 2016/2017 to 2029/2031

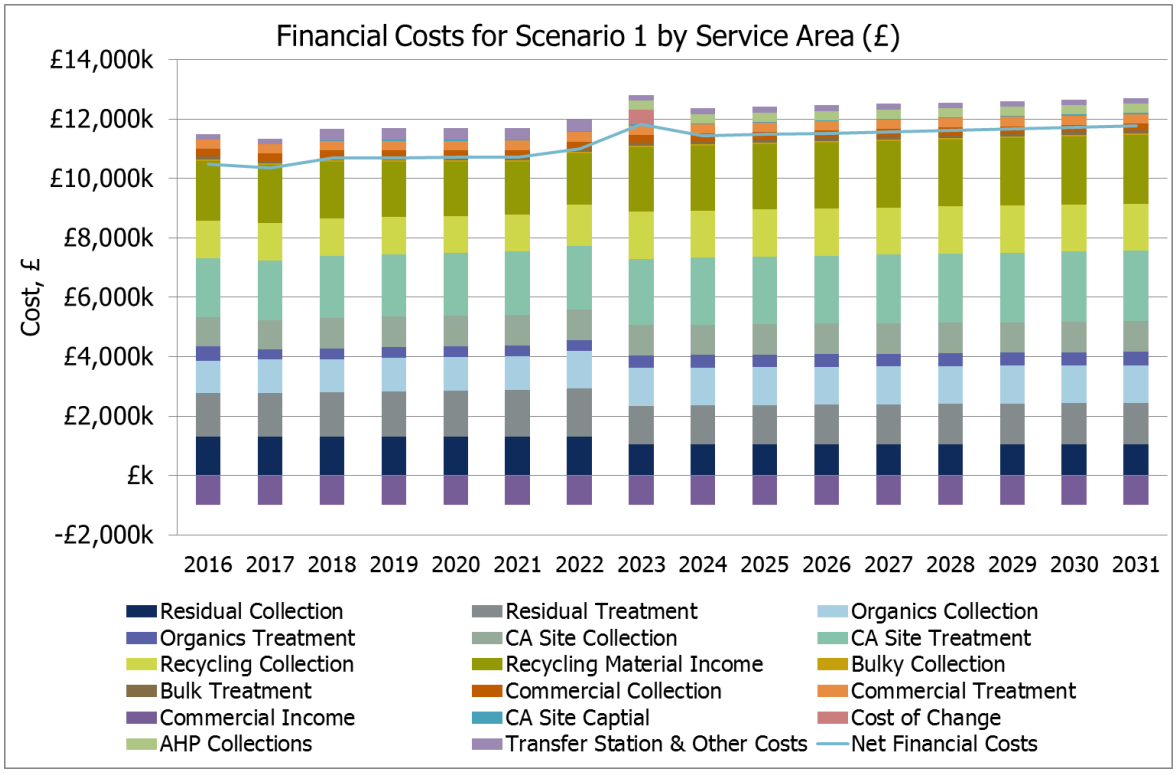


Figure 4 - Phase A Scenario 2 Financial Costs 2016/2017 to 2029/2031

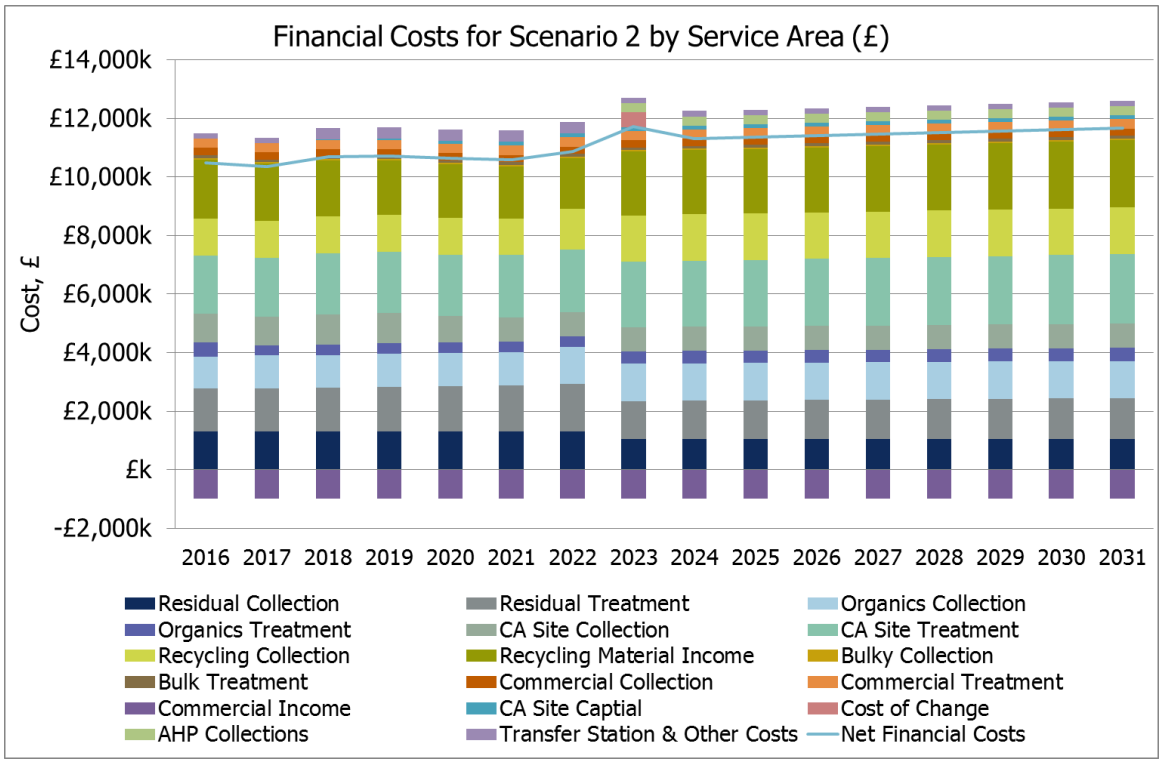


Figure 5 – Phase A Scenario 3 Financial Costs 2016/2017 to 2029/2031

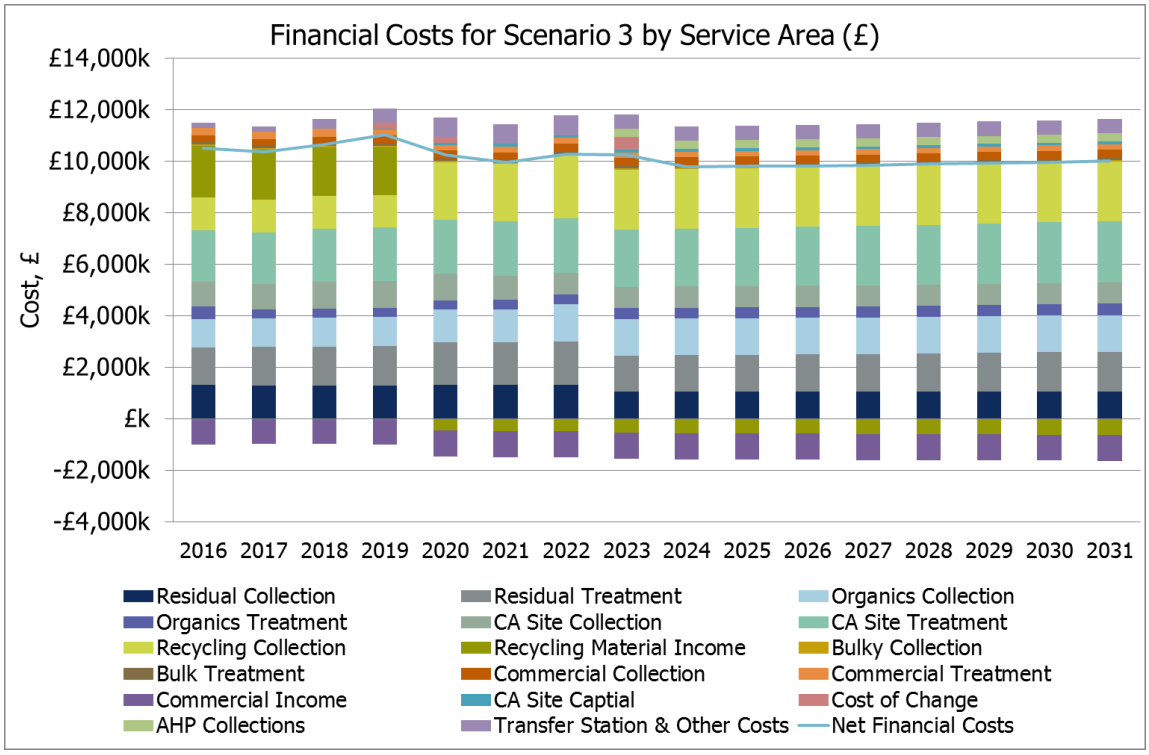


Figure 6 – Phase A Scenario 4 Financial Costs 2016/2017 to 2029/2031

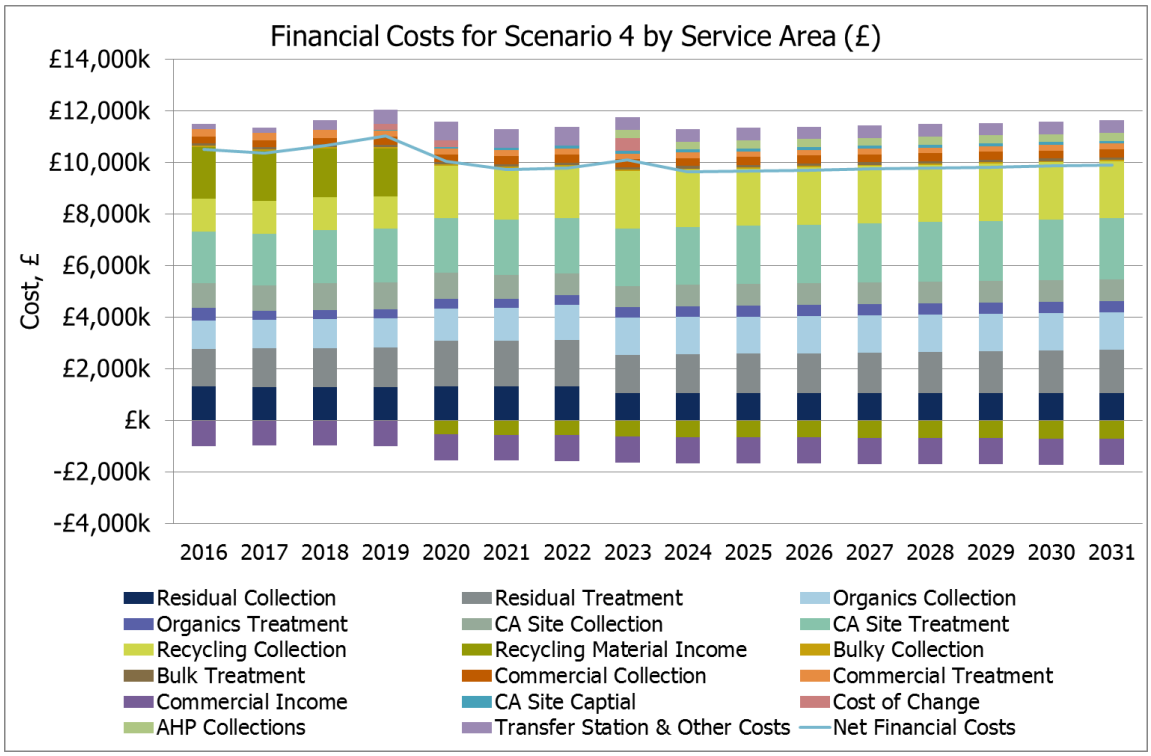


Figure 7 – Phase A Scenario 5 Financial Costs 2016/2017 to 2029/2031

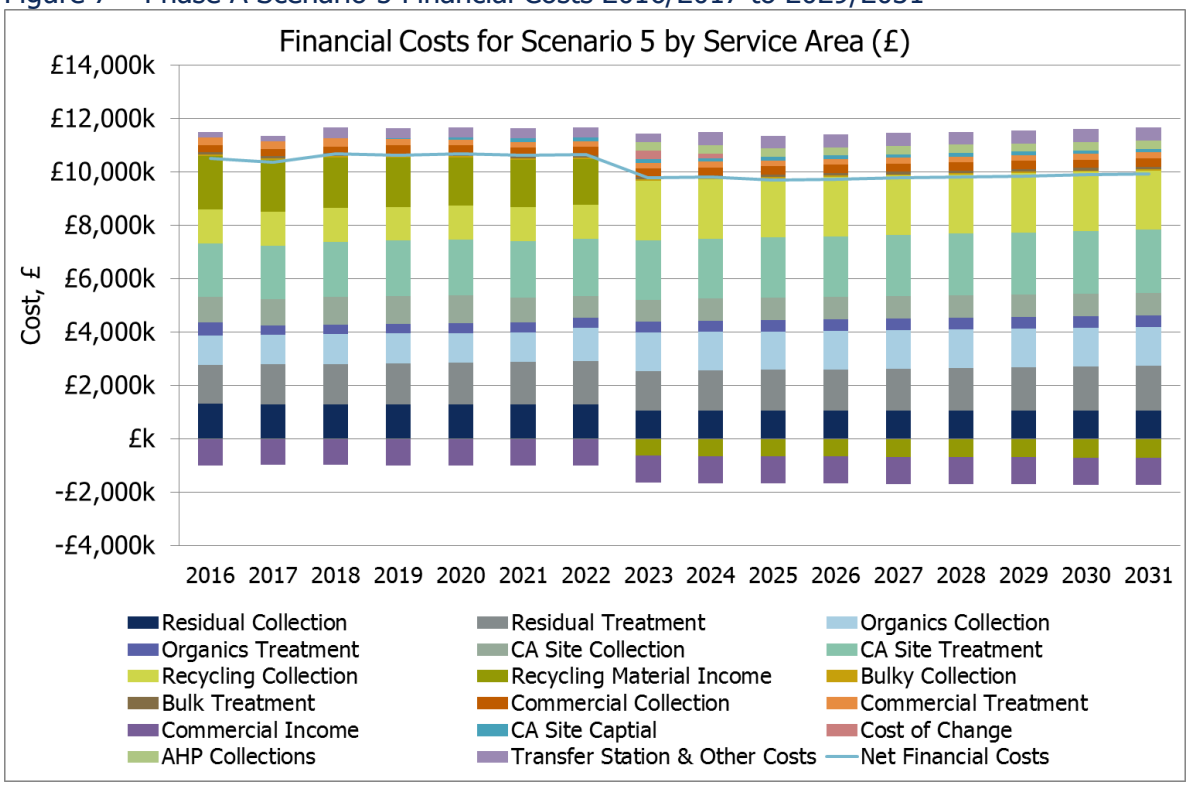


Figure 8 compares the net financial cost of each Phase A scenario over 15 years between 2016/17 to 2031/32.

Figure 8 - Comparison Net Financial Costs over Time

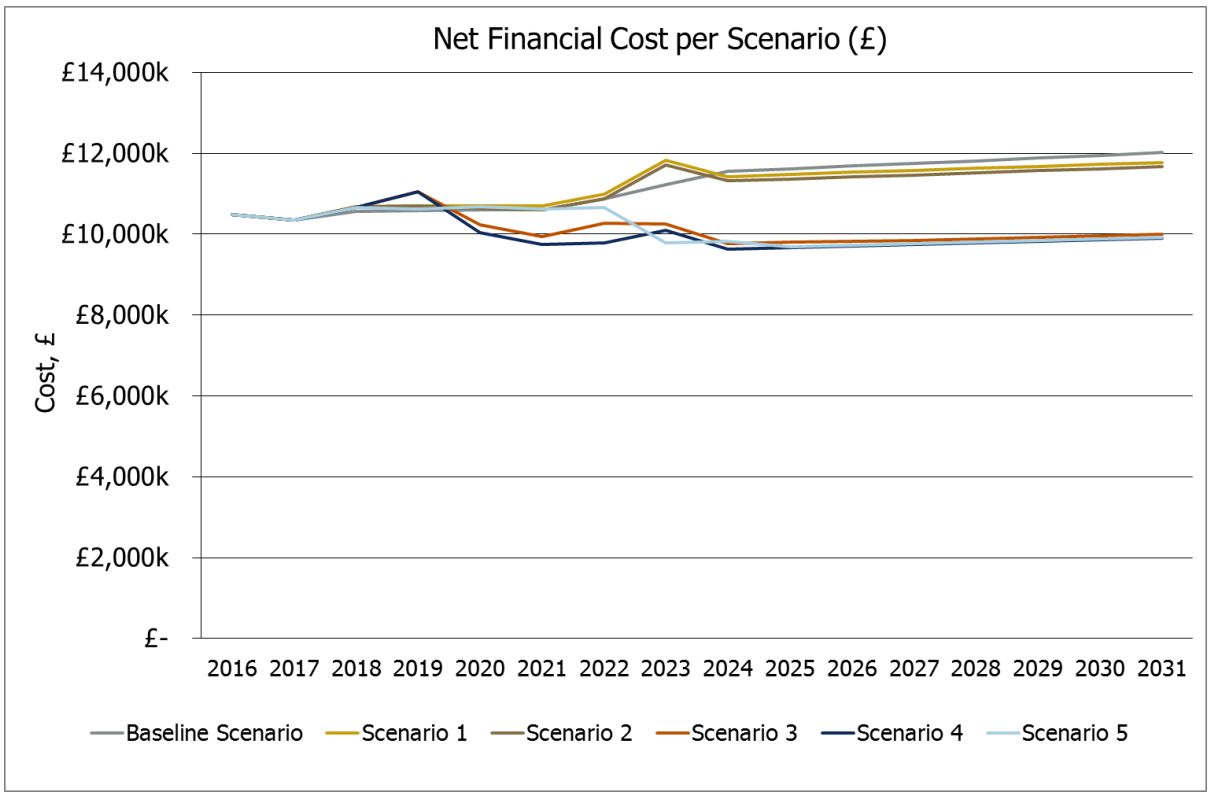


Figure 8 shows that the overall service cost for the baseline is similar to that of Scenario 1 and 2. The baseline has increased from £10.49m in 2016 to £12.02m by 2030/2031, with Scenario 1 and 2 increasing to £11.72m and £11.61m respectively. The main reason for the increase is the housing growth and associated increase in waste arisings. Within Scenario 1 and 2, following the introduction of 3 weekly refuse collection in 2024/2025, the cost of the service falls below that of the baseline.

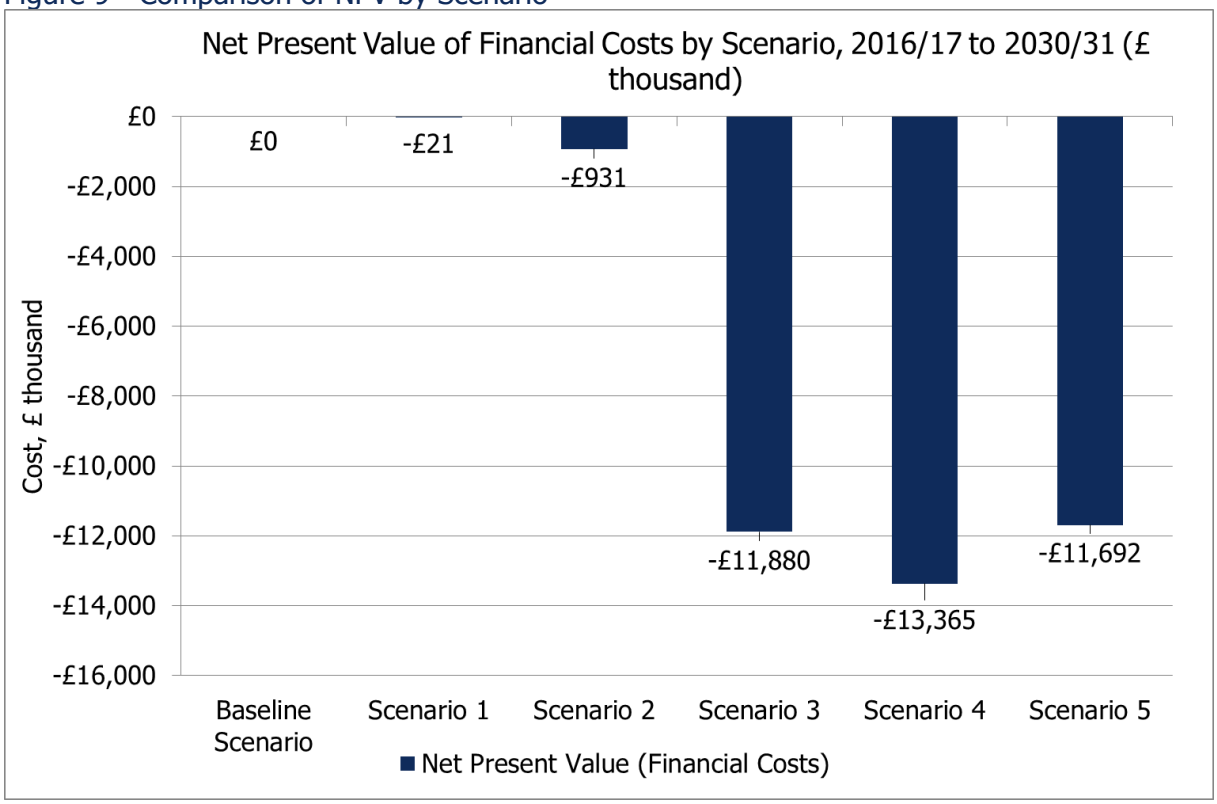
Scenarios 3, 4 and 5 all have relatively similar annual costs price, with £100k between the higher and lower scenarios.

Amongst the scenarios, Scenario 4 has the lowest long term financial cost in 2031 at £9.9m per annum. However, the cost of this option does not come down below the other scenarios until 2020, following the rollout of the new recycling service. Annual costs reduce further in 2023 with the modelled roll out of three weekly refuse collections.

Welsh Government provide an annual grant to CCBC which covers a large proportion of the waste grant budget (£3.13 million in 2016/17), with CCBC providing the remaining funds. As this grant is provided by Welsh Government, CCBC has no control over the amount of money allocated to them. Therefore, if the grant was to be reduced (as has happened over previous years) or not increased in line with the expansion of the recycling services, CCBC would need to contribute further funds to make up this shortfall. The grant has not been included within the output budget lines

Alongside providing year on year costs, the CBA also analyses the comparative NPV of each scenario.

Figure 9 - Comparison of NPV by Scenario



As Figure 9 shows, the comparative NPV of Scenario 1 and 2, remains very similar to the baseline with only small savings being made. The NPV of Scenarios 3, 4 and 5 are very similar, with service costs ranging between £11.7m (Scenario 5) and £13.4m (Scenario 4). Over the 15 years, Scenario 4 offers the lowest NPV. Although the service costs associated with Scenario 5 are very similar to Scenario 4 when the services have been rolled out, it does not provide an NPV as low as Scenario 4, this is due to the delay in introducing the new recycling service.

2.1.2 Capital Costs

In order to develop the waste services and implement the service changes described in the scenarios in Table 6, CCBC will be required in invest capital expenditure into the service. This capital expense will cover the cost of new vehicles, development works for HWRCs and WTSs, and costs of implementing the service change.

Table 9 - Capital costs required for each Scenario between 2017/18 and 2023/24

Scenario	Vehicles	HWRC	Depot & WTS	Containers	Cost of Change	Total
Scenario 1	£0	£0.71m	£0	£0	£0	**£0.71m**
Scenario 2	£0	£2.00m	£0.43m	£0.64m	£0.5m	**£3.59m**
Scenario 3	£2.80m	£2.00m	£1.97m	£0.64m	£1.0m	**£8.48m**
Scenario 4	£3.42m	£2.00m	£1.89m	£0.78m	£1.0m	**£9.14m**
Scenario 5	£3.42m	£2.00m	£1.89m	£0.78m	£0.5m	**£8.63m**

Table 9 shows the level of capital required between 2017/18 and 2023/24 to implement each scenario. A breakdown is provided for each scenario of how the capital costs are made up; kerbside vehicles, HWRC, Depot & WTS, containers and cost of implementing the change in service.

The total cost of vehicles includes the vehicles required when making the switch to fortnightly collections, as well as the additional vehicles required when making the switch to three-weekly collections. The cost of vehicles for switching to Fortnightly collections is £2.2m for Scenario 3, and £ 3.1m for Scenario 4. The extra capital required when moving to three-weekly collections is £530k and £300k for scenario 3 and 4 respectively. As scenario 5 goes straight to three weekly in 2023/24 the full cost of the vehicles come in this year.

In Scenario 3 & 4 the cost of implementing the change is higher, as these scenarios require two change in service. First in 2018/19 for kerbside recycling, and the second in 2023/24 for three weekly refuse.

In Scenario 3, the cost of purchasing new split bodied RCVs has been offset by the vehicles which have already been purchased by CCBC in order to operate the separate collection of food and garden waste. Although the purpose of the vehicles will change, the current vehicles are suitable to be used in Scenario 3, therefore, the capital has been adjusted to purchase only the additional vehicles which are needed.

Full details of the capital costs broken down year by year is provided in Appendix A.

2.2 Performance of the Service

All of the developments included within each of the CBA scenarios have been designed to increase CCBC's recycling performance, supporting the authority in meeting the Welsh Government targets of a 64% recycling rate by 2019/2020 and a 70% recycling rate by

2024/2025. However, due to the different interventions within each scenario, and the timings of these, the overall performance of each scenario does vary.

Figure 10 to Figure 15 illustrate the calculated waste flows for the baseline and Scenarios 1 – 5 and the associated reuse and recycling rates achieved. The baseline recycling rate used within the CBA was 65.7%, inc. IBA, at the time of modelling with was the provisional 2016/2017 recycling rate for the authority. Additional work around this baseline position has been carried out as part of Phase B.

Figure 10 – Phase A Baseline Mass Flows and Recycling Performance

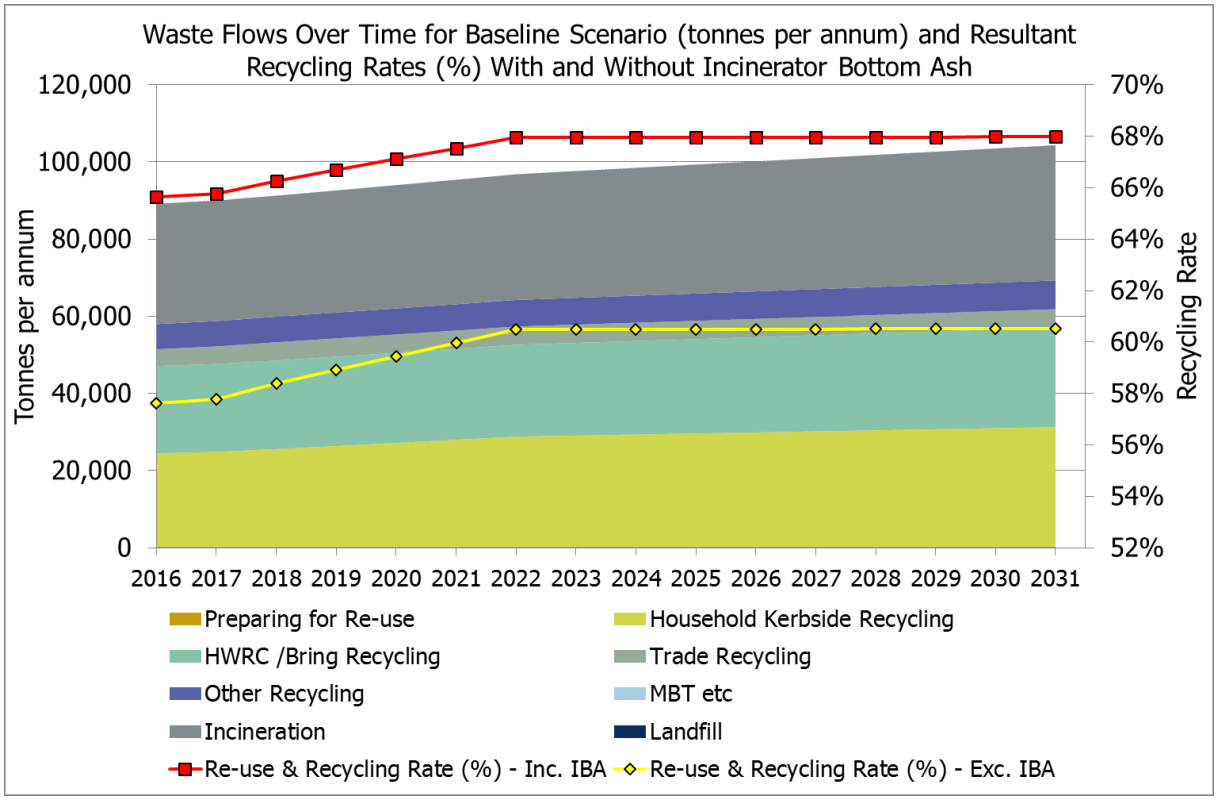


Figure 11 – Phase A Scenario 1 Mass Flows and Recycling Performance

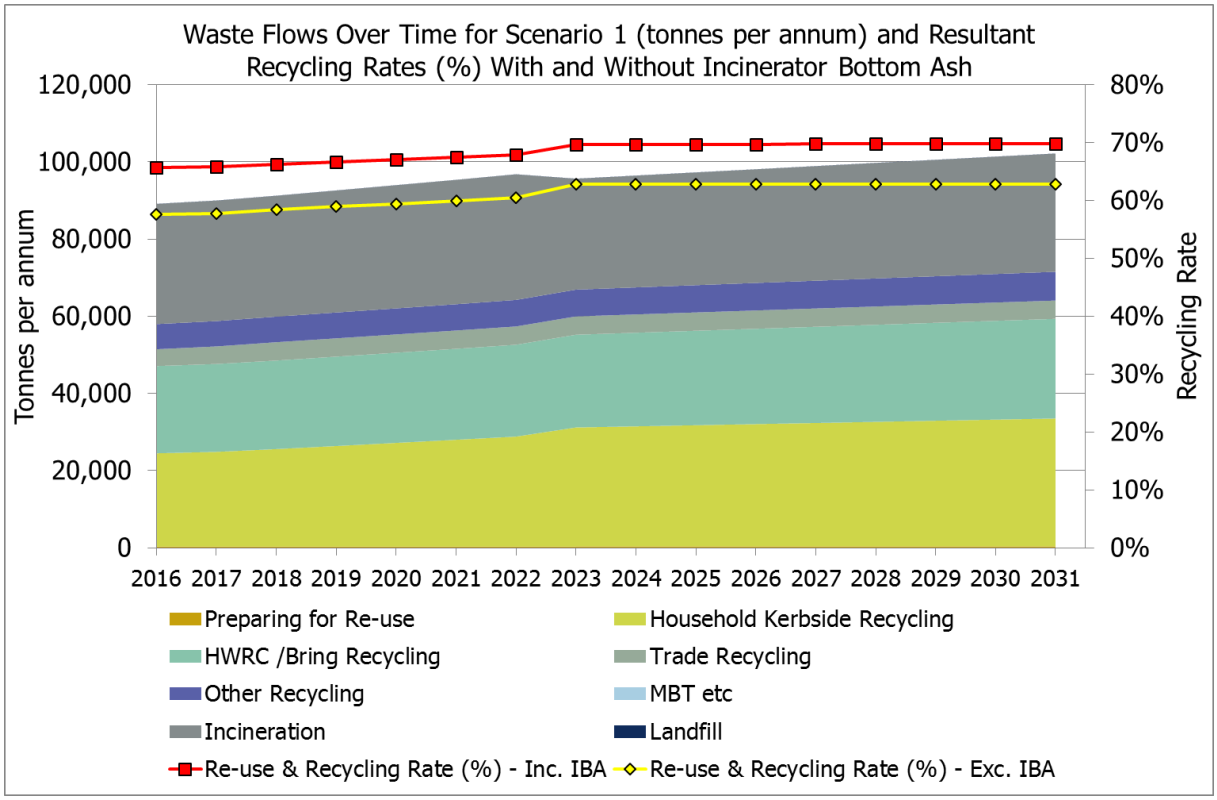


Figure 12 – Phase A Scenario 2 Mass Flows and Recycling Performance

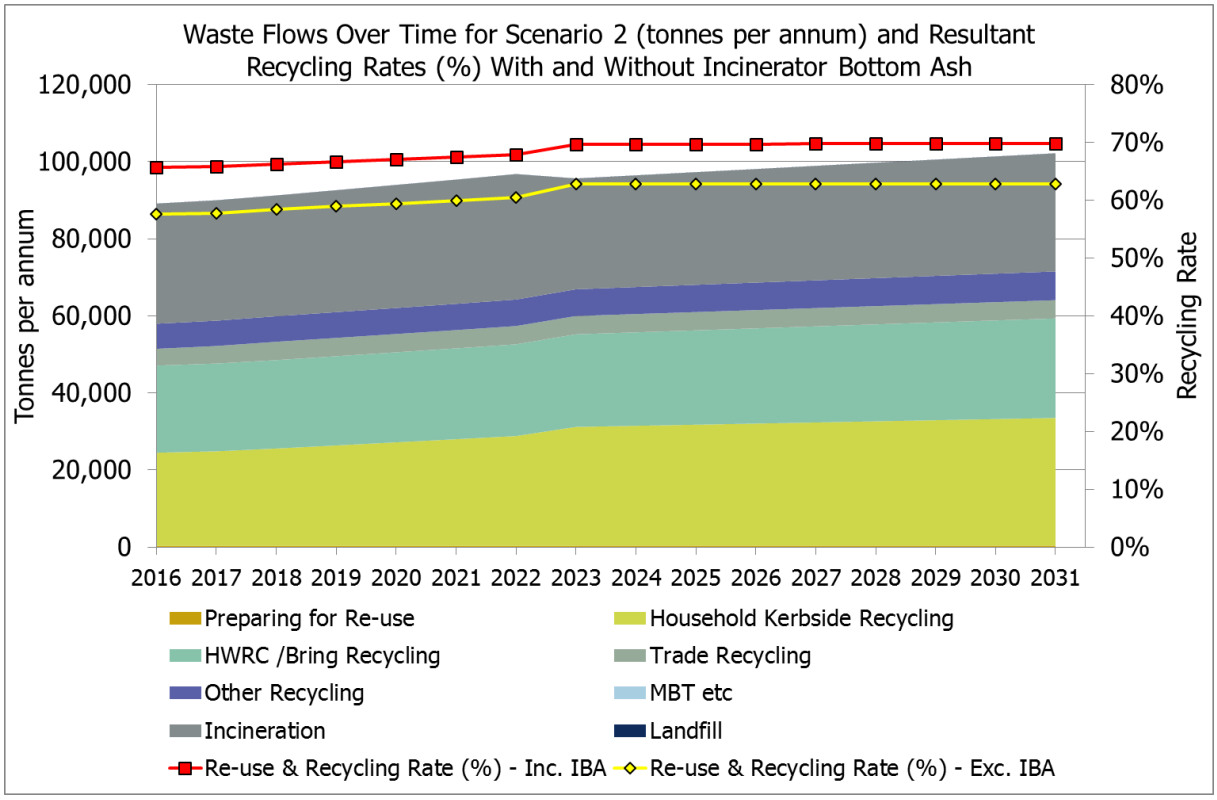


Figure 13 – Phase A Scenario 3 Mass Flows and Recycling Performance

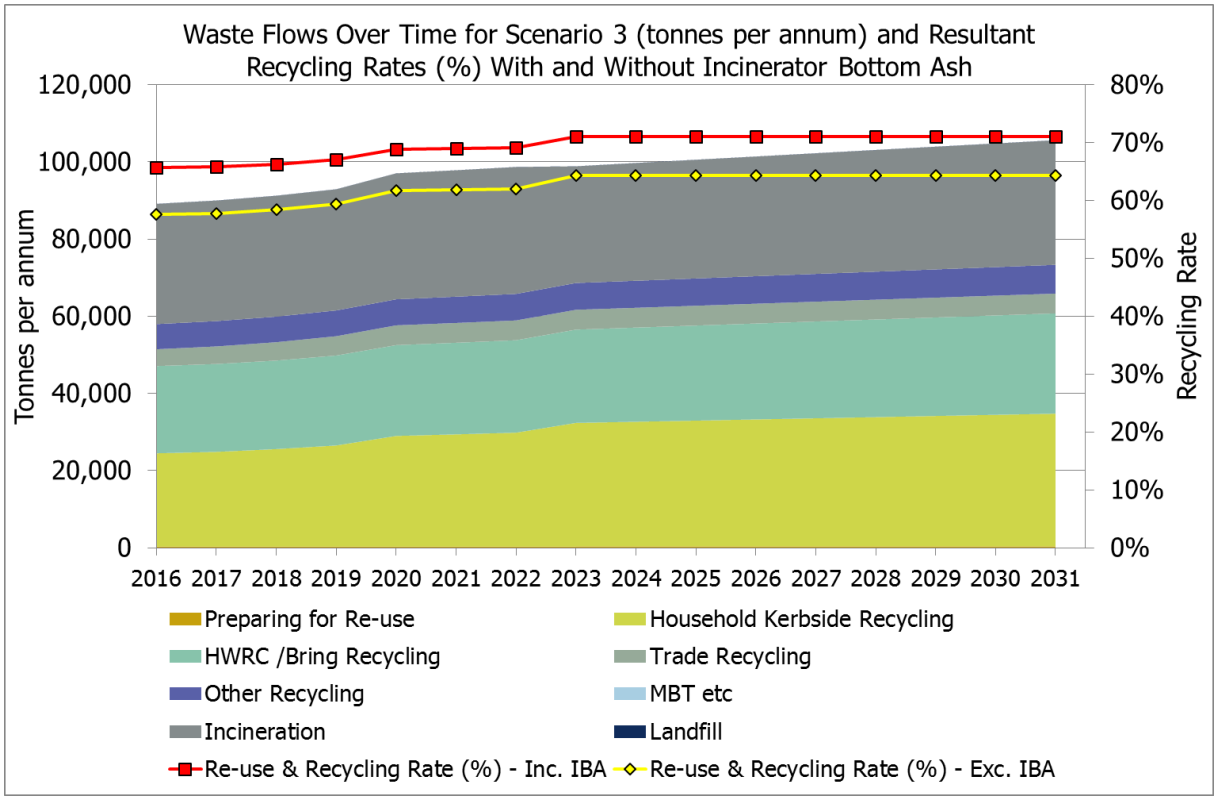


Figure 14 – Phase A Scenario 4 Mass Flows and Recycling Performance

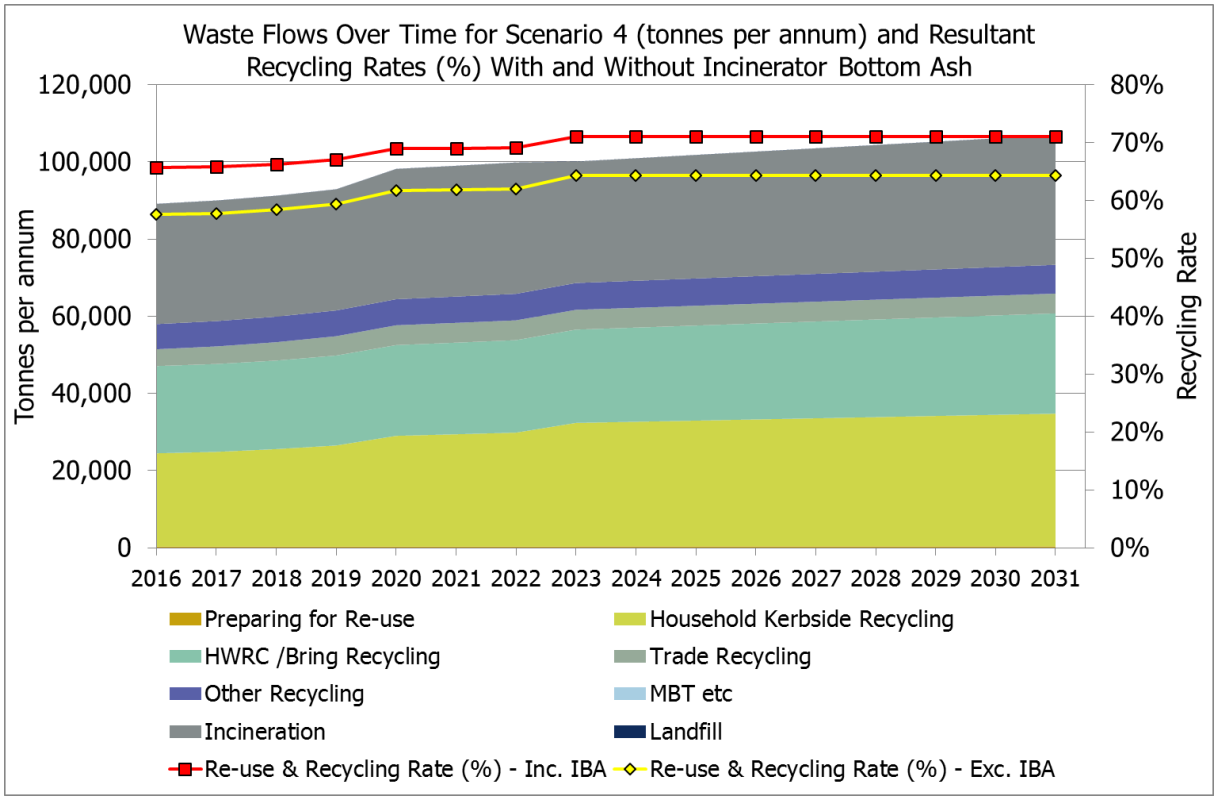
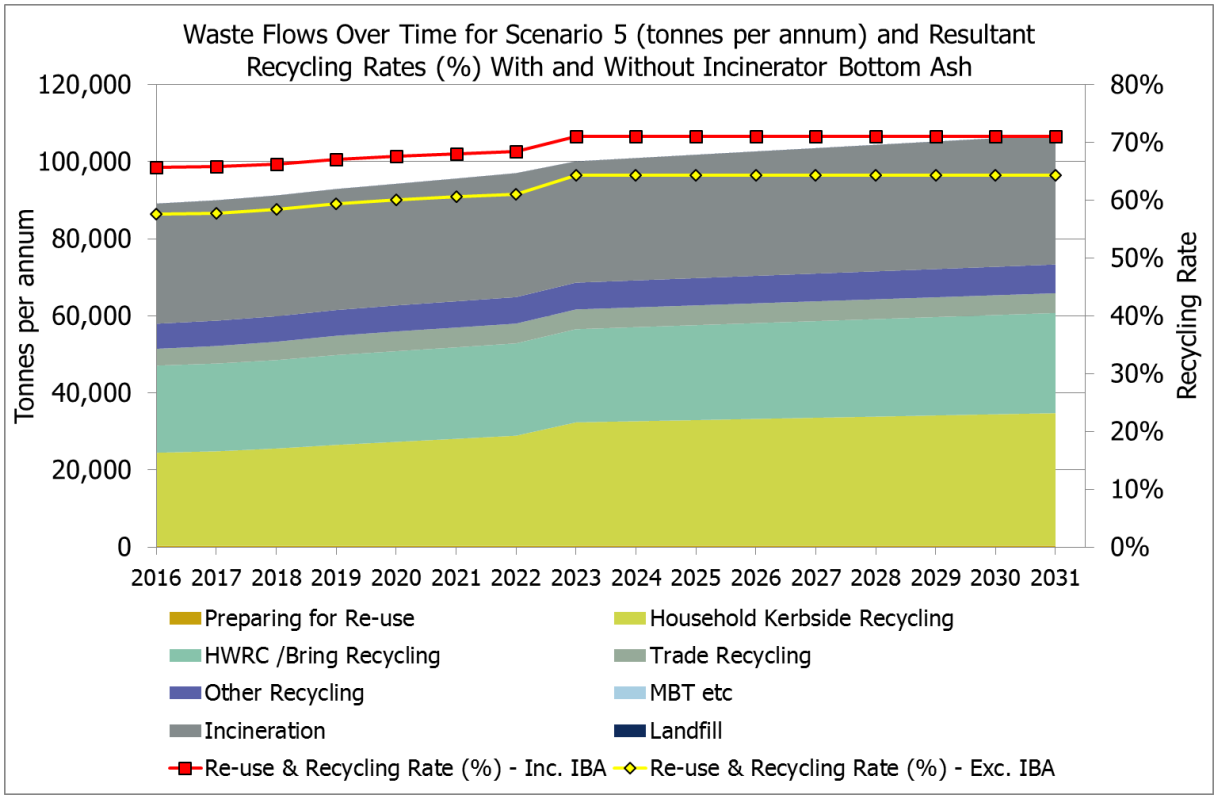


Figure 15 – Phase A Scenario 5 Mass Flows and Recycling Performance



From these figures, we can isolate what factors have the biggest impact on overall recycling performance. In Scenario 1 – 5, the movement of refuse collections to three weekly shows a corresponding increase in performance between 2023 and 2024. Alongside this, in Scenario 3 and 4 the change of recycling collections to multi-stream and collections blueprint, accordingly, between 2020 and 2021 also shows an uplift in recycling performance.

The introduction of three weekly refuse collections in Scenario 1 and 2, during 2023/24 provides an increase in recycling rate from 69% to 70%. In these scenarios the recycling rate stays steady at 70% beyond 2024.

Table 10 compares the modelled recycling performance (inc. IBA) of each scenario to statutory Welsh Government targets. In the target years, where the scenario has met the target the cells are coloured green, where the scenario has failed to meet the target, cells are coloured red.

Table 10 - Comparison of Recycling Performance (including IBA) of Scenarios to Statutory Targets

		Target Year	Target Year	
Year	2017/18	2019/20	2024/25	2029/30
Statutory Target	61.0%[1]	64.0%	70.0%	70.0%[2]
Baseline	65.8%	66.7%	67.9%	68.0%
Scenario 1	66.4%	67.3%	70.4%	70.4%
Scenario 2	66.4%	67.3%	70.4%	70.4%
Scenario 3	66.4%	67.8%	71.7%	71.7%
Scenario 4	66.4%	67.8%	71.7%	71.7%
Scenario 5	66.4%	67.3%	71.7%	71.7%

Notes:

1. *2017/18 is not a statutory target year. This target was calculated based on a linear trajectory between statutory targets for 2015/16 and 2019/20.*
2. *There is no target in place for 2029/30. This year is included for reference and assumes no change in the 70% target.*

Although Table 10 demonstrates that CCBC's current waste and recycling service can reach the 2019/20 statutory recycling target of 64%; the recycling rate will fall short of meeting the next statutory target of 70% by 2024/25. It is expected that all other scenarios tested through the CBA model will provide a sufficient uplift in recycling rate to hit both 2019/20 and 2024/25 recycling targets.

Welsh Government are able to impose fines on authorities of £200 per tonne, for every tonne of material under the recycling target the service performs. The CBA model includes an analysis of the potential fines within the output. If CCBC continued with the current service, the CBA would expected potential fines of up to £450,000 to be imposed. It is therefore clear that CCBC's service should be developed in order to avoid missing recycling targets and potentially significant fines.

2.3 Environmental Impact of the Service

The environmental impact of each scenario has been calculated using details from various life-cycle studies and takes into account the details of materials collected, the fate of this material (recycling, refuse, organic treatment etc.) and also emissions for collection and onward transportation of material. Details of the assumptions used to calculate the environmental impacts can be found in the Business Planning Toolkit Guidance Document and in the Technical Annex to the 2011 report produced for WRAP on behalf of the Welsh Government on Kerbside Collection Options for Wales.[2,3]

Figure 16 shows the change in Greenhouse Gas (GHG) emissions over the CBA period compared to the baseline. Scenario 3 provides the greatest drop in GHG emissions by 2019/20, and again in 2023/24 when the service goes three weekly. Scenarios 4 and 5 eventually provide the same reductions by 2023/24, with a delay in reduction in scenario 5 due to not going three-weekly until 2023/24. Scenario 1 and 2 have a similar kerbside collection service to the baseline, and so limited GHG emission reductions are made under these options.

[2] *Eunomia (2011) Waste Management Business Plan Toolkit – Guidance Document, written on behalf of the Welsh Government, November 2011.*

[3] *Eunomia / Resource Futures / HWC (2011) Kerbside Collection Options: Wales, Final Report to WRAP*

Figure 16 - Change in GHG Emissions over Time Relative to the Baseline for Each Scenario

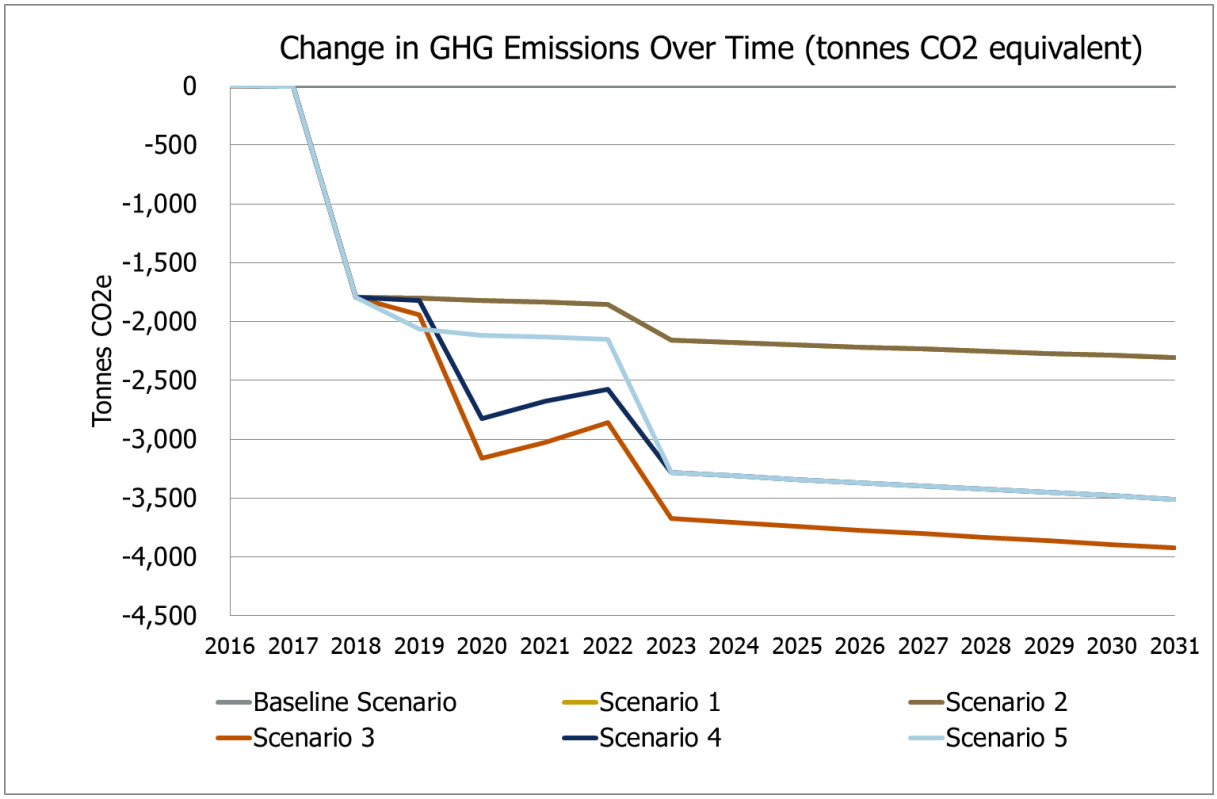
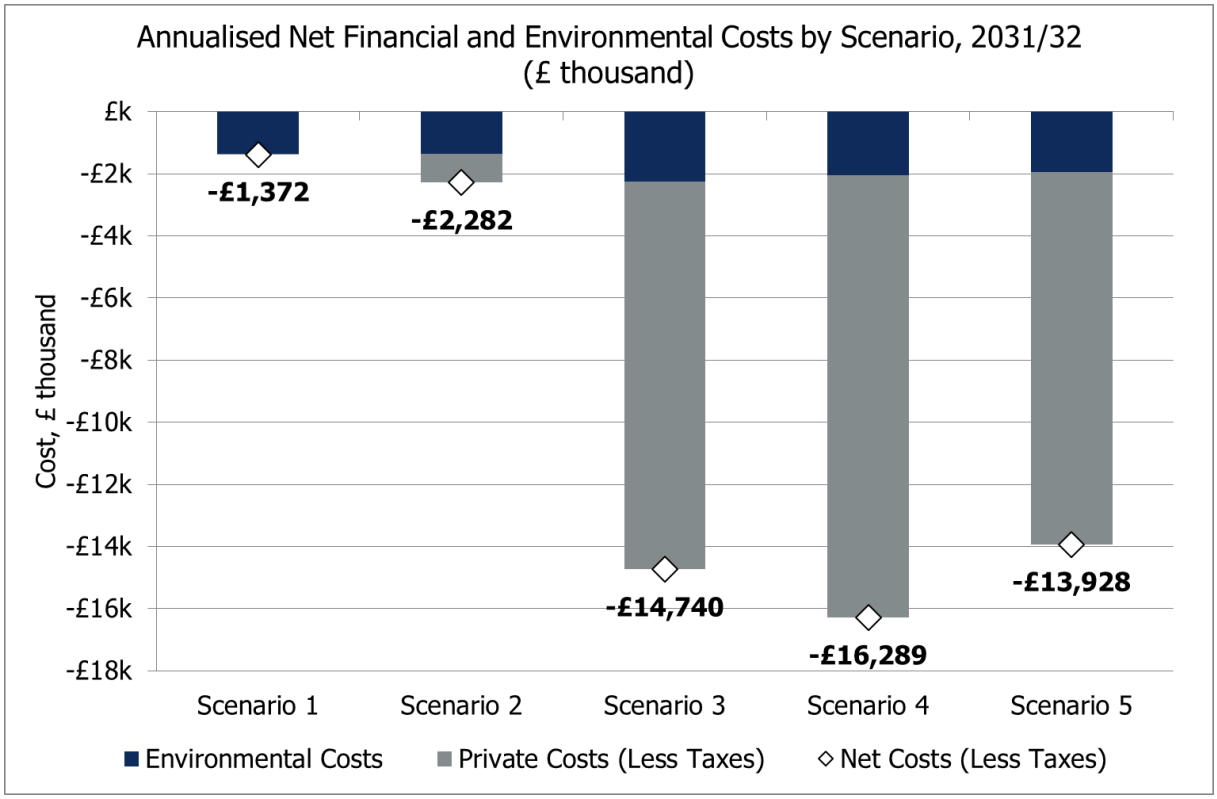


Figure 16 shows how Scenario 3 provides the greatest drop in GHG emissions by 2019/20, and again in 2023/24 when the service goes three weekly. Scenarios 4 and 5 eventually provide the same reductions by 2023/24, with a delay in reduction in scenario 5 due to not going three-weekly until 2023/24. Scenario 1 and 2 have a similar kerbside collection service to the baseline, and so limited GHG emission reductions are made under these options.

Figure 17 compares the combined finical and environmental NPV by scenario (note negative numbers indicate a saving against the baseline.

Figure 17 - Comparison of Combined Financial and Environmental NPV by Scenario, 2016-2030, NPV



2.4 Employment Generated by the Service

To support CCBC meeting the requirements of the Well-being of Future Generations Act (2015) and improve the employment opportunities through the delivery of waste and recycling services within Caerphilly, the employment generated within each Scenario has been analysed.

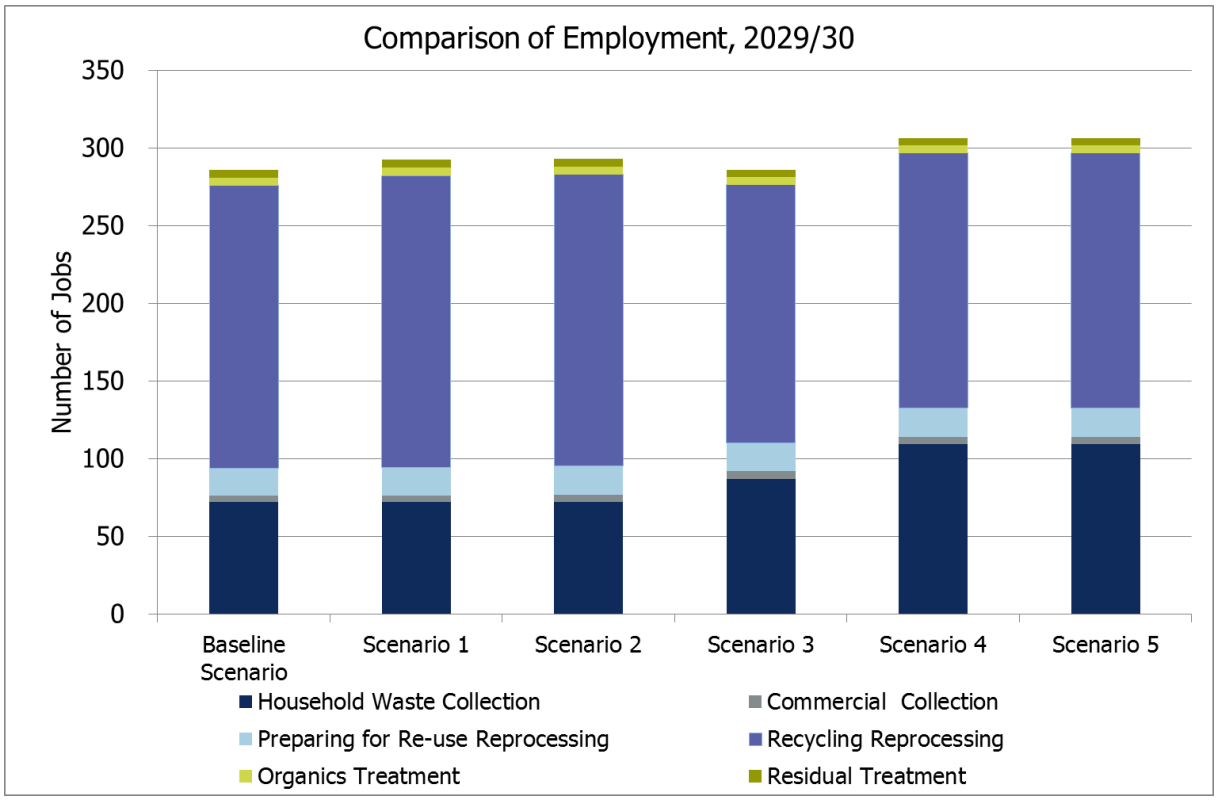
When analysing the employment generated by the delivery of each scenario the following areas have been examined:

- **Household Waste Collections** – The number of people employed in the collection of household waste from the kerbside and the management of this service. These figures are taken from the kerbside collection modelling carried out by WRAP and reflect the kerbside collection options chosen by CCBC.
- **Commercial Waste Collections –** The number of people employed in the collection of trade waste. In Scenarios 3, 4 and 5, where improvements to the commercial service are made, figures have been taken from Amec Foster Wheeler's modelling work.
- **Operations of HWRCs –** The number of people employed in the transfer station, depot and HWRCs
- **Recycling Reprocessing -** The number of people employed in the reprocessing of dry recycling collected as part of the waste and recycling service. This has been calculated by applying the number of jobs created per 1,000 tonnes of material to the tonnages of material collected. Therefore the number of people employed in this area is linked to the amount of material collected for recycling.

- **Organic Treatment –** The number of people employed in the treatment of organic waste collected as part of the waste and recycling service. As with the dry recycling, this has been calculated by applying the number of jobs created per 1,000 tonnes of material to the tonnages of material collected.
- **Residual Treatment -** The number of people employed in the treatment of residual waste collected as part of the waste and recycling service. As with the dry recycling, and organic treatment, this has been calculated by applying the number of jobs created per 1,000 tonnes of material to the tonnages of material collected.
- **Preparation for Re-Use -** The number of people employed in the treatment of residual waste collected as part of the waste and recycling service. As with the other reprocessing elements, this has been calculated by applying the number of jobs created per 1,000 tonnes of material re-used to the tonnages of material collected.

Figure 18 shows the maximum amount of people employed within each Scenario in 2029/2030.

Figure 18 - The Maximum Amount of People Employed in Each CBA Scenario in 2029/2030



It is clear in Figure 18 that the highest levels of employment are highest from scenarios 4 and 5, the main driver behind this being the increase in employment in association with operating the collections blueprint recycling collections. Household collections within Scenario 4 and 5 employ 109 FTEs, whereas Baseline, Scenario 1 and 3 employ 72 FTEs and Scenario 3 employs 87 FTEs.

Although Scenario 3, 4 and 5 provide less employment through recycling reprocessing, reducing from 174.2 FTE to 161.6 FTEs in Scenario 3 and 159.9 FTEs in Scenario 4 and 5, this is offset by the extra employment provided by collection operations.

3.0 Phase B CBA Modelling Results

As discussed in Section 1.2, following the presentation of the Phase A results of this project in July 2017, Eunomia were asked by CCBC and WRAP carry out additional Phase B CBA modelling work. Key changes between Phase A and Phase B were:

- The movement of the WTS
- from Full Moon to Trehir;
- re-assessment of HWRC strategy to reflect movement of WTS;
- understanding that a change to the kerbside collection service is required, therefore, only multi-stream and collections blueprint options to be analysed; and
- a desire to generate greater savings from service change.

For ease of reference, Table 7 of this report is repeated below.

	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Kerbside Refuse and Recycling Services	Collections Blueprint Recycling Three weekly refuse introduced in 2023	Multi Stream Recycling Three weekly refuse introduced in 2023	Collections Blueprint Recycling Three weekly refuse introduced in 2023	Multi Stream Recycling Three weekly refuse introduced in 2023
HWRCs and WTS	• Upgrade Full Moon HWRC to Super HWRC • Expansion of Penallta and Aberbargoed HWRC • Rhymney and Penmaen to close • New HWRC at Trehir • New WTS at Trehir			
			Bryn Quarry no longer used to sort HWRC waste Black bag ban introduced to increase recycling from sites	
Commercial	• New commercial waste service commencing April 2019			

Within Phase B Scenario 1 and 2, the modelling aims to support the authority's understanding of the impact of changing the kerbside recycling service. These changes are then built upon in Scenario 3 and 4, where additional changes have been made to the HWRC service. The rationale behind these further modelled changes is:

- The use of Bryn Quarry to undertake additional post sort at HWRCs is modelled to incur significant cost at £130 per tonne. Therefore, as part of Scenario 3 and 4, this service was removed, reducing cost and also recycling performance. The cost of the staff working at the Rhymney and Penmaen sites was re-allocated to the remaining sites to increase the staff's ability to work with residents to divert more waste to recycling.
- In recognition of challenge increasing recycling at HWRCs within Caerphilly and also the potential additional pressure which could be placed on the service if three weekly collection were to be introduced, residual restrictions including a black bag ban are modelled to be introduced at all sites.

3.1 Cost of Service Delivery

3.1.1 Revenue Costs

In calculating the cost of service delivery, as with Phase A, we have transposed the costs of the scenarios and aligned this with the 2016/2017 budget. By doing this, we can relate savings and costs associated with the service to CCBC's budget lines. However, within Phase B of the project, it was recognised that to support decision making, additional CBA outputs would be required to more clearly show the modelled savings in each scenario before and after the introduction of three weekly refuse collections. Figure 19 shows the annualised saving attributed to undertaking all of changes within each scenario apart from implementing three weekly refuse collections.

Figure 19 – Annualised Phase B Scenario Costs Compared to Baseline Scenario (No Three Weekly Refuse Collections)

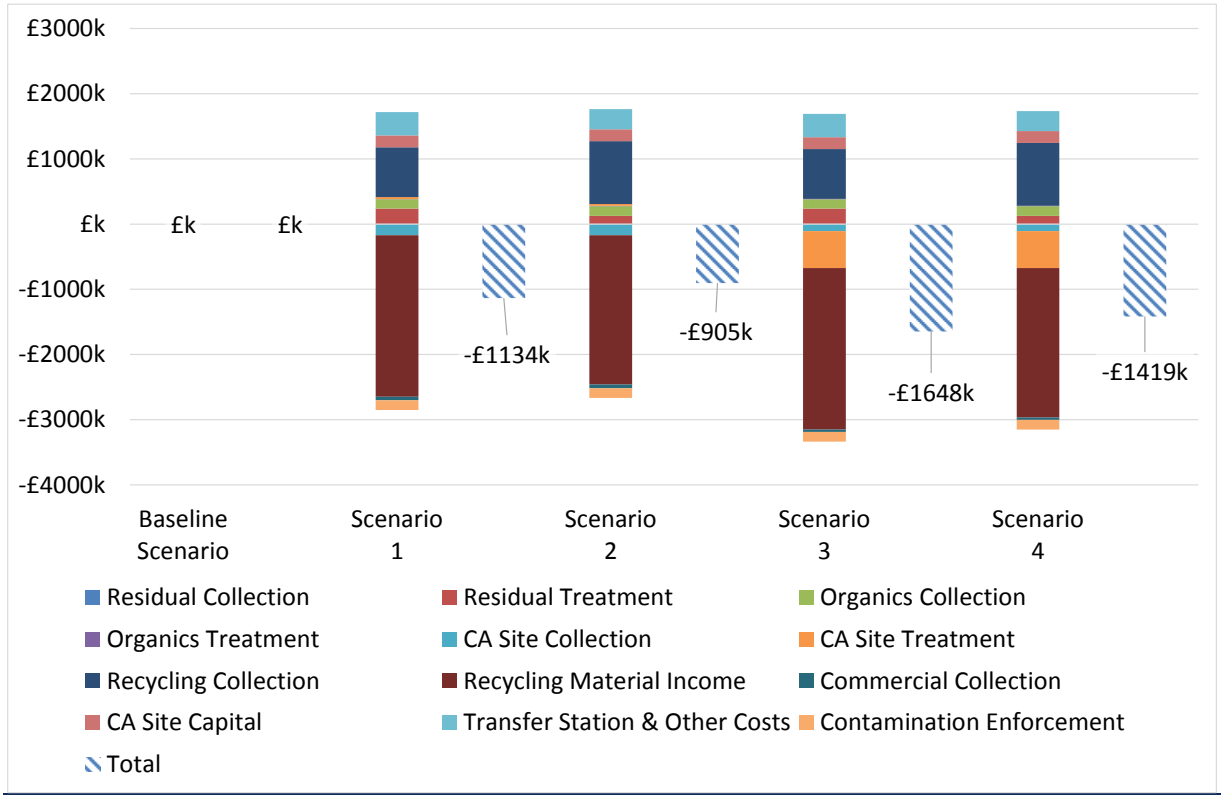


Figure 19 shows net savings of 1.134m from Scenario 1 and £9055k from Scenario 2 (the shaded bars) and additional savings of circa. £510k in Scenario 3 and 4 where Bryn Quarry is no longer used and a black bag ban has been introduced.

In all scenarios, the cost of recycling collections increase significantly (by £765k in Scenario 1 and 3 and £963k in Scenario 2 and 4), alongside an increase in transfer station costs due to the requirement for a new transfer station and sorting facility to be built. These additional costs are however, offset by the increase in income from the sale of dry recyclables by between £2.28m (Scenarios 2 & 4) and £2.47m (Scenarios 1 & 3), and by savings from reducing the budget required to address contamination (we modelled a conservative ongoing cost of £200k for this activity in Phase A of project, however this could reach £300k).

The cost differences between the Blueprint and Multi-stream scenarios are shown in Table 12 below. The Multi-stream options have higher annualised vehicle costs and lower recyclate

income (due to the lower value of mixed paper and cardboard compared to separated material), outweighing savings in waste transfer station costs and residual disposal.[4]

It is recognised that material revenues are subject to fluctuation. Sensitivities were run on material revenues as part of the original WRAP collections options modelling, ensuring that fluctuations in material revenues did not significantly change the order or magnitude of savings modelled. The processing cost paid for the current dry recycling stream is a significant cost in the baseline and therefore the main source of savings when switching to source-segregated recycling system.
Savings from commercial waste changes are comparatively minor but common across all scenarios:

Table 11: Commercial Cost Differences: Common to All Scenarios (2019/20)

		Service Cost Change	Reason
Commercial Waste Collections	**Collections**	£59.0k	AFC modelled collection cost increase
	Income	-£18.7k	AFC modelled commercial revenue increase
	Material Revenues	-£74.7k	AFC modelled increase in recyclate tonnages collected
	Food Waste Treatment	£1.7k	AFC modelled increase in food tonnages collected
	Residual Disposal	-£17.7k	Reduction in disposal costs
Total Cost Difference		**-£50.4k**	

Savings from kerbside services are different between the Blueprint (Sc1 & 3) and the Multistream (Sc2 & 4) scenarios:

Table 12: Kerbside Cost Differences: Blueprint Service (1&3) to Multi-Stream Service (2&4)

		Sc1 & 3	Sc2 & 4	Difference Sc1 - Sc2	Reason for Difference Sc1 – Sc2
Enforcement Cost Differences		-£150k			
Collection Cost Differences	**Residual**	£5.5k	£5.4k	*-£0.1k*	Minor change in tipper costs modelled in KAT between options
	Dry Recycling	£765.3k	£963.5k	*£198.2k*	KAT modelled change
	Food Waste	£39.6k	£47.9k	*£8.3k*	KAT modelled change
	Garden Waste	£100.5k		-	
	Supervision,	£24.7k	£48.1k	*£23.4k*	KAT modelled

[4] In both systems, capture of targeted material is assumed to be the same. However, savings in residual treatment arise due to the fact that more contamination is still assumed to be collected alongside mixed paper and cardboard (so collected residual tonnages are reduced). Additionally, the incineration gate fee is higher at the higher tonnage bands, so this avoids approximately £100/tonne of residual treatment costs. The lower gate fee for mixed fibres takes into account the contamination in the material.

		Sc1 & 3	Sc2 & 4	Difference Sc1 - Sc2	Reason for Difference Sc1 – Sc2
	Overheads, Spares				change
Material Treatment and Revenues	**Kerbside recyclate income**	£2,477.8k	£2,289.6k	*£188.2k*	Less recyclate income due predominantly to lower value of mixed fibres
	Residual waste disposal	£233.5k	£116.9k	*£-116.6k*	Less residual waste collected (due to contamination collected alongside mixed fibres), at a high marginal residual waste gate fee (banding of prices to incinerator)
	Transfer station costs	£332.3k	£260.3k	*-£71.9k*	Reduced transfer station costs
Total Cost Difference		**-£1,077k**	**-£847k**	***£229.5k***	**Net additional cost**

Table 13 below shows a breakdown of HWRC savings.

In scenarios 1 & 2, the impact of a potential increase in gate fees at Bryn undermines the savings made from rationalising the network and introducing increased front-end recycling. The net capital and operational impact of rationalising and improving the HWRC network is minor, but it provides important improvements to the service and enables higher recycling captures.
In scenarios 3 & 4, additional staff investment maintains higher recycling captures than in scenarios 1 & 2, and the savings made in avoided disposal costs at Bryn is greater than the costs of residual disposal and treatment of more HRWC recycling streams.

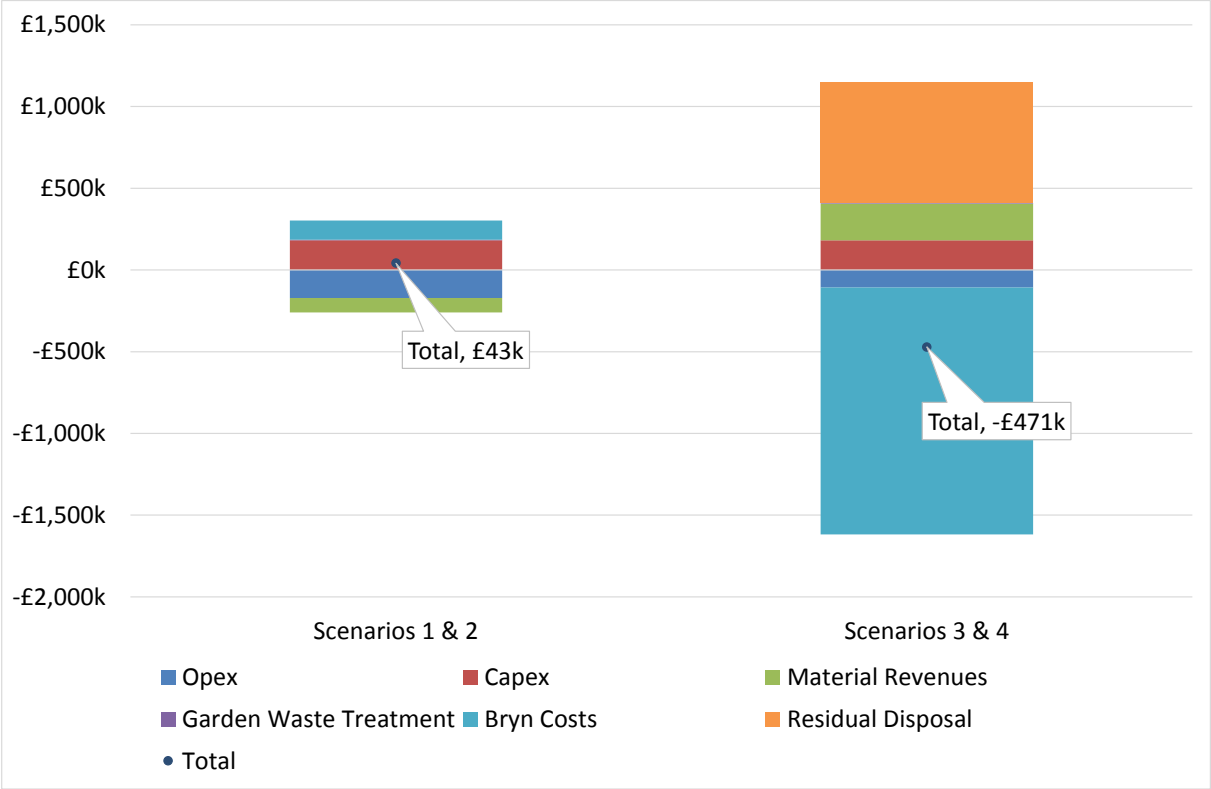


Table 13: Cost Difference: No HWRC Residual Restrictions (Sc1, Sc2) vs Residual Waste Restrictions (Sc3, Sc4)

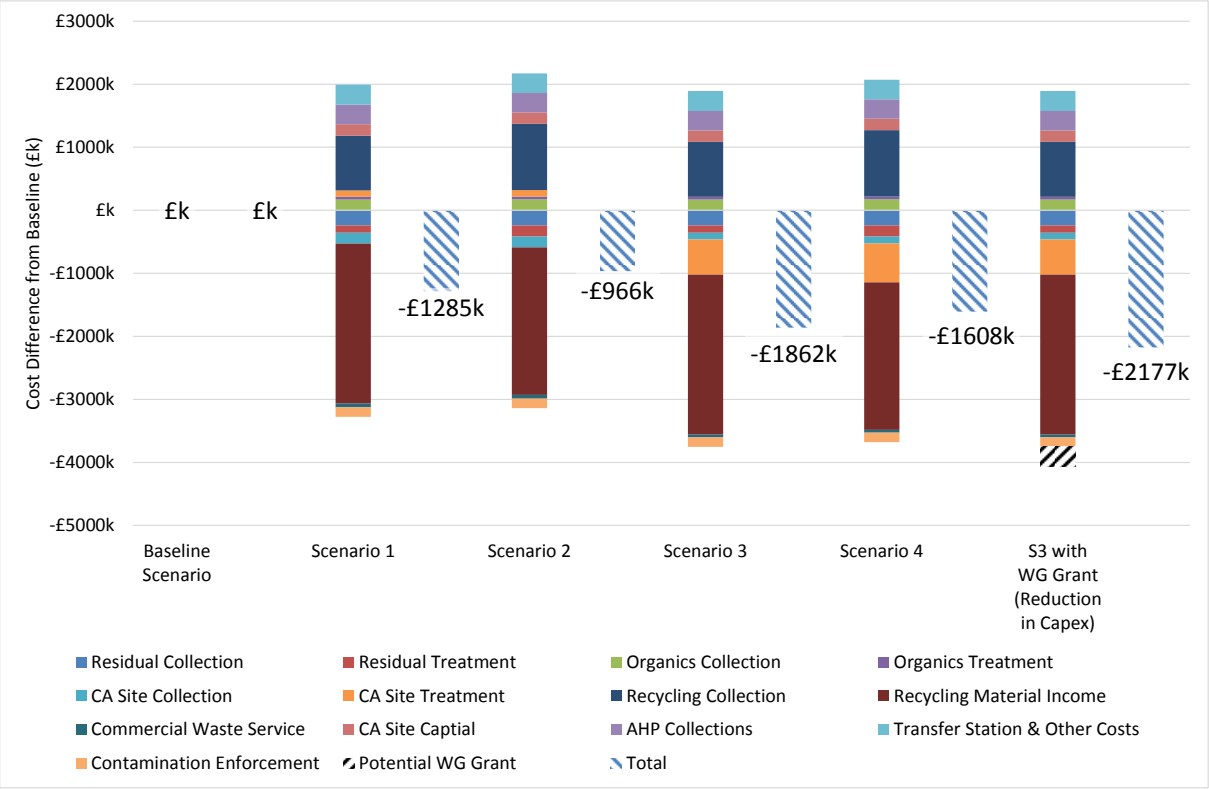
		Sc 1,2	Sc 3,4	Difference	Reason
Operating Cost Differences	**Operating Cost**	-£171.9k	-£107.8k	*£64.2k*	Reduced savings in Sc 3&4 due to redeployment of staff and maintaining current staffing levels
	Capital Costs		£181.8	-	
Material Treatment & Disposal Cost Differences	**Additional Treatment of HWRC Recycling**	-£87.5k	£223.1k	*£310.5k*	Sc 1 & 2 increase capture of higher-value recyclate. Sc 3 & 4 additionally pull out more expensive materials such as mattresses to keep recycling high
	Additional Garden Waste Treatment	£3.5k	£4.6k	*£1.1k*	Less residual waste collected (due to contamination collected alongside mixed fibres), at a high marginal residual waste gate fee (banding of prices to incinerator)
	Bryn Savings	£116.8k	-£1509.7k	*£1,626.4k*	Less recyclate income due predominantly to lower value of mixed fibres
	Residual Disposal	£0.0k	£736.6k	*£736.6k*	Less recyclate income due predominantly to lower value of mixed

					fibres
Total cost difference		**£42.7k**	**-£471.4k**	***-£514.1k***	

These savings are tabulated in more detail in Appendix 5.

Figure 20 shows the annualised saving attributed to undertaking all of changes within each scenario including the rollout of three weekly collections.

Figure 20 - Annualised Phase B Scenario Costs (With Three Weekly Refuse Collections)



When comparing Figure 19 and Figure 20, the financial impact of three weekly refuse collections can be isolated. These savings have been tabulated in Table 14.

Table 14 – Modelling Annualised Savings From the Introduction of Three Weekly Refuse Collections

Scenario	1	2	3	4
Modelled Savings from Three Weekly Collections	£151k	£61k	£214k	£189k

Table 14 highlights that the savings from introducing three weekly refuse collections are much higher in Scenarios 3 and 4 when compared to Scenarios 1 and 2. This is due to the modelled impact of the black bag ban within the HWRCs, minimising the movement of residual waste from the kerbside to HWRCs as capacity is squeezed and the capture of an amount of this displaced waste as recycling. With such a significant difference in the potential level of savings available to CCBC, it would be advisable for the authority to consider the introduction of a restricted residual waste policy at HWRCs before, or alongside, the implementation of three weekly residual waste collections, maximising the financial and performance impact of these changes.

The savings provided in Table 14 are lower than those normally associated with three weekly refuse collections, however, all of the three weekly scenarios also include the cost of the

provision of a weekly Absorbent Hygiene Products (AHP) service. This service costs approximately £300k per annum and has thus reduced the potential savings from this change to the amount shown in Table 14.

An additional column has also been included in Figure 20 to analyse the impact of a £2m capital grant from Welsh Government for the purchase of the vehicles. Although this grant is by no means guaranteed, it is possible that a capital grant of this level could be provided by Welsh Government if CCBC were to move to the Collections Blueprint (Scenario 1 and 3), therefore, for illustrative purposes, the impact of this has been modelled against Scenario 3 (the Scenario with the greatest savings) as an annualised capital saving. The additional saving equates to £315k per annum for the first seven years of the new service. Following the purchase of these vehicles, the purchase of any additional or new vehicles at the end of the depreciation period would need to be included in future budgets.

3.1.2 Capital Costs

In terms of capital costs, there are many similarities between Phase A and Phase B, with the main differences being in the HWRC and WTS/depot costs as in Phase B Full Moon is developed into a super HWRC and a new WTS is modelled to be developed at Trehir. Phase B Capital costs are provided in Table 15.

Table 15 – Phase B Scenario Collection Costs (Fortnightly Residual)

	Vehicles	HWRC	Depot	Containers	Cost of Change	Total
Scenario 1	£3.12M	£3.35M	£2.21M	£0.78M	£0.5M	**£9.96M**
Scenario 2	£2.28M		£2.12M	£0.64M		**£8.90M**
Scenario 3	£3.12M		£2.21M	£0.78M		**£9.96M**
Scenario 4	£2.28M		£2.12M	£0.64M		**£8.90M**

Note that:

- Scenario 2 and 4 capital costs are lower due to the re-allocation of 9 existing twin-back vehicles;
- WTS capital costs include £1.6M for the works, £0.43M for a sort-line and baler and £40k (Sc 1 & 3) - £120k (Sc 2 & 4) for forklifts;

For three-weekly collections, additional capital would be required for:
four additional tippers (total £180k);
additional recycling vehicle (120k for one additional RRV in Scenarios 1 and 3, and £350k for two additional twin-back vehicles in Scenarios 2 and 4).

The three-weekly total capital cost for Blueprint scenarios is £10.26M compared to £9.44M for the Multi-stream scenarios.

The combined capital costs of HWRC and WTS/Depot works are higher in the Phase B modelling due to the more extensive works at Full Moon and the new WTS at Trehir

The capital requirements differ from Phase A modelling only in the HWRC and WTS capital costs.

As discussed in Section 3.1.1, with Scenario 1 and 3 there is the potential opportunity for CCBC to apply for Welsh Government funding for capital assets such as vehicles. As the availability of capital funding is not guaranteed, early engagement with Welsh Government

and clear political and officer commitment would be recommended to maximise the likelihood of receiving additional support with these purchases.

3.2 Performance of the Service

As within Phase A of the project, all of the Phase B scenarios have been designed to increase CCBC's recycling performance, supporting the authority in meeting the Welsh Government targets of a 64% recycling rate by 2019/2020 and a 70% recycling rate by 2024/2025. However, due to the different interventions within each scenario, and the timings of these, the overall performance of each scenario does vary.

In analysing CCBC's current recycling performance in more detail, with the aim of understanding if any further increases in performance could be made, we have made two adjustments to the current baseline position:

3. A more conservative reduction in the MRF reject rate is modelled, from 30% to 25% (rather than down to 15% as previously modelled in Phase A), reflecting ongoing reported issues with the current co-mingled material despite current enforcement efforts. This has an approx. 1.5% impact on baseline recycling rates.
4. Where Bryn Quarry is used, the reported recycling rate of 77% has been replaced by the maximum estimate of 42% in the baseline and 30% in options 1 and 2. This based on a high-level assessment of composition of the Bryn-recycled materials, based on the recent compositional work. With increasing pressure on the wider industry to produce high quality outputs, the risk that the contribution of the sorting undertaken by Bryn Quarry is reduced needs to be accounted for in our modelling. This adjustment has resulted in a 4% reduction in the baseline position.

Although this adjustment to baseline position represents a worst case scenario for CCBC, it is important that this risk is taken into account as part of any assessment of a future 'no change' baseline scenario.

A summary of the modelled recycling performance for each future Scenario can be found in Table 16.

Table 16 – Phase B Scenarios Recycling Rate Performance

Scenario	B/L	1	2	3	4
Recycling Rate – Fortnightly Residual Waste	62%	65%	65%	67%	67%
Recycling Rate – Three Weekly Residual Waste	-	68%	68%	70%	70%
NB: AHP Recycling (rather than disposal) under 3W collections could increase recycling rate by further 1%					

Based upon the more conservative baseline position used in Phase B, in all scenarios CCBC still meet the 2019/2020 target of 64%. However, as within Phase A the modelling demonstrates that 2024/2025 statutory recycling targets of 70% can only be met by moving to three weekly refuse collections. The potential annualised financial liability to CCBC of the 2024/2025 recycling targets not being met are provided in Table 17.

Table 17 – Phase B Scenarios - Potential Rate Fines

Scenario	B/L	1	2	3	4
Fortnightly Residual Waste	£1.7m	£1m	£1m	£650k	£650k
Three Weekly Residual Waste	£1.7m	£430k	£430k	-	-

3.3 Environmental Impact of the Service

As in Phase A, the environmental impact of each scenario has been calculated using details from various life-cycle studies and takes into account the details of materials collected, the fate of this material (recycling, refuse, organic treatment etc.) and also emissions for collection and onward transportation of material.

However, as Phase B focuses on a point in time impact, the outputs for this phase have been tabulated in Table 18 as opposed to being shown graphically over time. For the purposes of our analysis we have used impact in 2020/2021. Changes would be incremental over time following any significant changes in the approach to the way waste and recycling is collected and reprocessed/disposed of.

Table 18 – Environmental Saving of Each Scenario Expressed as Tonnes per CO_2 Equivalent Compared to Baseline

Scenario	Fortnightly	With Three Weekly
Scenario 1	-9,270	-10,148
Scenario 2	-10,856	-11,922
Scenario 3	-14,793	-15,670
Scenario 4	-16,379	-17,443

3.4 Employment Generated by the Service

As in Phase A, to support CCBC meeting the requirements of the Well-being of Future Generations Act (2015) and improve the employment opportunities through the delivery of waste and recycling services within Caerphilly, the employment generated within each Phase B Scenario has been analysed.

Table 19 shows the maximum amount of people employed within each Phase B following rollout of the new service.

Table 19 – Employment Generated Following Rollout of Services – 2021/2022 Used as Reference Year

Scenario	Fortnightly	With Three Weekly
Baseline	269	269
Scenario 1	291	291
Scenario 2	273	274
Scenario 3	283	286
Scenario 4	267	268

It is clear in Table 19 that the highest levels of employment are highest from the Collections Blueprint scenarios (1 and 3). As in Phase A, the main driver behind this being the increase in employment in association with operating the collections blueprint recycling collections.

4.0 **Conclusions**

In conclusion all scenarios modelled will allow CCBC to make significant savings on their baseline budget position. However, the decision to make such substantial changes to the way in which services are delivered is not purely financial, other issues such as operational and delivery risks need to be considered. With the right planning and support (potentially funded via the WRAP CCP programme), most of these risks can however be largely controlled and/or mitigated.

If CCBC do decide to move towards a three weekly refuse service in the future (as this is the most cost effective option), it would be advisable for the authority to consider the introduction of a restricted residual waste policy at HWRCs before, or alongside, the implementation of three weekly residual waste collections, maximising the financial and performance impact of these changes.

CCBC do however, need to be cognisant of risks outside of their control such as the risk of fines from Welsh Government and the ever changing materials reprocessing markets, all of which will have an impact on the medium to long term sustainability of a 'do nothing' approach.

In terms of next steps, we would recommend that CCBC undertake a full analysis of the risks associated with all scenarios, examining the potential impact of those both inside and outside of the authority's control, allowing a balanced approach to be taken to the opportunities for the future development of the authority's waste services.

Appendix A - Modelling Assumptions

A.1 Household Numbers

Data was provided by CCBC for low and high forecasts of housing developments, initially over 5 years from 2016, and then further beyond. Details on the number of small scale site completions are expected at a rate of 50 per year. This data was provided by Victoria Morgan (Principle Planner).

It is assumed that the planned developments will be completed in a linear fashion, and the model apportions the developments over the years used in the model. It has been assumed that small scale developments have 8 properties per site. These have been included annually.

Table 20 details the number of properties assumed in the model for each year[5]. The low forecast has been used within the model.

Table 20 - Caerphilly Household Projections

Year	No. of Households
2015/16	78,197
2016/17	79,672
2017/18	80,410
2018/19	81,148
2019/20	81,885
2020/21	82,623
2021/22	83,403
2022/23	84,183
2023/24	84,964
2024/25	85,744
2025/26	86,524
2026/27	87,304
2027/28	88,084
2028/29	88,865
2029/30	89,645
2030/31	90,425

A.2 Prevention and Preparation for Re-Use

As part of each scenario, policy enforcement will be undertaken with the aim to decrease contamination from 2018. CCBC provided Eunomia with two options for policy enforcement and associated costs. The policy enforcement option would involve teams visiting properties in Caerphilly. Each team would include; 1 Waste Advisory Officer, 1 Driver, 1 R&C operative and a vehicle.

[5] *The Rt Hon Brandon Lewis MP (2014) Written statement to Parliment Small-scale developers*

The policy enforcement approach modelled utilises 2 enforcement teams over a 5 year period, to allow for full coverage of the borough over that period with a repeat visit to 50% of properties. The approximate cost of this is assumed at £200,000 p.a. for 5 years.

Enforcement work will focus, in the main, on reducing contamination rather than solely on increasing recycling tonnages. It is assumed that the target of this enforcement would be to reduce the current high level of contamination (as indicated in the recent input compositions reported to MF portal) and subsequent high rate of rejection from the facility.

A new dry recycling offtaker contract would charge the authority more to achieve recycling rates higher than 70%. Recent sampling work, undertaken by the offtaker and reported to CCBC, has suggested that up to 90-95% of material collected is potentially recyclable.

For the purposes of modelling in the CBA, we assume the impact of enforcement work (and/or the change in MRF) is to bring contamination and subsequent rejects in line with average performance. The assumption of this impact was scaled back for Phase B. This both transfers some contamination into the residual stream, and increases the amount of target material recycled from collections. We also assume a 1% year-on-year target material capture increase is sustained for the five years of the initiative.

In options which switch away from a co-mingled system, the 1% target increase is assumed to be sustained over the remainder of the five year period with a reduced budget of £50k for additional ongoing resident engagement.

Table 21 - Impact of Policy Enforcement

Enforcement		
	Contamination	MRF Rejection Rate
Current	15%	30%
2022/23 (Phase A)	10%	15%
2022/23 (Phase B)	12.5%	20%

As part of the recycling and collection services modelling, there have been no predicted improvements to the kerbside bulky waste or re-use collection tonnages. Currently the majority of re-use is generated through CCBC's network of Bring Sites. This service has not be considered in any of the 5 scenarios.

Modelling work undertaken by Resource Futures hasn't taken into consideration an increase in re-use at HWRCs. No further modelling of this was undertaken as part of the CBA. It is not expected that there will be any increase in the amount of re-use at HWRCs without a serious drive, or improvement in collection facilities. There is currently no infrastructure at HWRCs to set up a re-use drop off point. However, re-use should be considered when designing the "super site" and would further increase CCBC's ability to meet the 70% target

A.3 Recycling and Collection Services

A.3.1 Kerbside Waste and Recycling Collections

Waste Flows
The baseline waste arisings were taken from 2016/17 WasteDataFlow (WDF). The service changed mid-way through this year to introduce separate food and garden waste collections – however, since it is too early to establish a year-round assumption regarding the eventual split and capture of food and garden waste, the assumption of food and garden split remains that used within the KAT modelling.

The Enhanced Baseline as modelled in the KAT work has been used as the baseline KAT scenario from 2017/18 within the CBA model, reflecting the KAT-modelled cost and performance of the separated organics collection over the whole year. Table 22 compares the baseline kerbside-collected tonnages taken from WDF 2016/17 with the calculated tonnage outputs from the Enhanced Baseline scenario and the tonnages modelled within the CBA. The CBA uses co-mingled and residual kerbside household tonnages from WDF but adjusted to align with revised estimates of commercial collected waste. Food and garden waste yields are same in kg/hh terms as in KAT.

Table 22 - Baseline 2016/2017 Household Kerbside Collection Tonnages

Material	KAT Enhanced Baseline (2015/16)	2016/17 WDF Tonnages	CBA Enhanced Baseline 2016/17
Hhlds	**77,614**		**78,935**
Co-mingled	17,884	18,690	18,482
Food	6,343	3,094	6,452
Garden	5,190	450	5,279
Mixed Food and Garden	-	7,766	-
Residual	27,635	26,192	27,796
Total	**57,261**	**56,192**	**57,261**

Source: CCBC WDF 2016/16 & KAT modelling

Service Costs
Baseline service costs for 16/17 have been taken directly from CCBC's budget monitoring sheeting provided by Tony White. The baseline budget can be found in Table 23. Service costs savings in the CBA reflect those modelled within WRAP KAT modelling, and are applied to the budget lines below.

Table 23 - Caerphilly Waste Kerbside Collection Budget 2016/17

Area	Category	Budget
Residual	Collection	£1,302,011
	Treatment	£37,000
	Disposal	£1,430,933
Dry Recycling	Collection	£1,259,429
	Treatment	£2,012,757
Organics	Collection	£1,077,585
	Treatment	£505,094
Bulky	Collection	£52,688
	Treatment	£92,882
Other Associated		£50,914
Transfer Station		£134,694

In KAT, costs are modelled for a 'baseline' year (reflecting the service as it was in 2015/16) and an 'enhanced baseline year' (as it would be in 2017/18).
Due to the introduction of the separate garden and food waste collections halfway through 2016, the budget costs for 2016/17 are assumed to already incorporate half of the cost impacts of switching to the enhanced baseline. A 'KAT current service' equivalent cost was therefore modelled for the organics collections service (at the mid-point between the costs of organics collections under the baseline and the enhanced baseline service), as shown in Table 24.

Table 24 – Baseline Organics Collection Costs

Category	KAT Baseline	KAT Enhanced Baseline	KAT Current Service
Collection	£1,002,215	£1,084,645	£1,043,430

An additional modelling exercise has been completed to inform assumptions around the need for additional resources as household numbers increase. Vehicle requirements were modelled through KAT, and assessed at housing growth of 1400 and 2800. It was assumed that when growth reached these figures the vehicles capacity shown in Table 25 would be required.

Table 25 - Vehicle Uplift with housing growth

Service	+1400	+2800
Baseline, Scenario 1 & 2		
Recycling	0.1	0.2
Food/Garden	0	0.2
Residual	0.1	0.1
Scenario 4 & 5		
Recycling/Food	0.4	0.5
Garden	0	0
Residual	0.1	0.1
Scenario 3		
Recycling	0.2	0.2
Recycling/Food	0.1	0.2
Garden	0	0
Residual	0.1	0.1

It has been assumed that when vehicle requirement reaches 0.2 of a vehicle above the existing resource, an additional vehicle would be required to complete the round. Whole vehicle numbers as used within the CBA are shown in Table 26.

Table 26 - Number of vehicles required each year

Service	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26	26/27
Baseline, Scenario 1 & 2											
Recycling	9	9	9	9	9	9	10	10	10	10	10
Food	7	7	7	7	7	7	7	7	7	7	7
Garden											
Residual	7	7	7	7	7	7	7	6	6	6	6
Tipper	5	5	5	5	5	5	5	5	5	5	5
Total	**28**	**28**	**28**	**28**	**28**	**28**	**29**	**28**	**28**	**28**	**28**
Scneario 4 & 5											
Recycling		21	21	21	21	21	21	22	22	22	22
Food											
Garden		4	4	4	4	4	4	5	5	5	5
Residual		7	7	7	7	7	7	6	6	6	6
Tipper		5	5	5	5	5	5	5	5	5	5
Total		**41**	**41**	**41**	**41**	**41**	**41**	**43**	**43**	**43**	**43**
Scenario 3											
Recycling		18	18	18	18	18	20	20	20	20	20
Food											
Garden		4	4	4	4	4	4	5	5	5	5
Residual		7	7	7	7	7	7	6	6	6	6
Tipper		5	5	5	5	5	5	5	5	5	5
Total		**34**	**34**	**34**	**34**	**34**	**36**	**36**	**36**	**36**	**36**

A.3.2 Fuel Costs

The price of diesel was assumed at £1.15 per litre. As part of the KAT modelling, annual miles of each service were provided, this annual figure was used to calculate the cost of fuel per vehicle. When an additional vehicle has been modelling, the same annual mileage has been used, and fuel costs have been calculated in the same way.

A.4 Waste Transfer Station

The capital costs for undertaking WTS redevelopment for Phase A were provided through Resource Futures. Phase B costs for a new Trehir WTS have been estimated at a high level based upon comparative costs, and a more detailed costing is recommended.

These costs have been annualised, in agreement with CCBC over 25 years and an interest add in of 2.5% pa.

Table 27 - Caerphilly WTS Redevelopment Capital Cost Assumptions

Category	Phase A		Phase B (Blueprint/Multi stream WTS)
	Co-mingled WTS	Blueprint/Multi-stream WTS	
FM Depo Improvements	£430k	-	-
FM WTS Redevelopment	-	£1,343k	-
Trehir Depot and WTS	-	-	£1,660k
Total	**£430k**	**£1,343k**	**£1,660k**
Annualised	**£23k**	**£72k**	**£90k**

A depot cost assessment was provided by WRAP calculating additional operating costs for the Blueprint (£242k) and Multi-stream (£170k) depot configurations compared to current depot costs. This is reproduced below in Table 28.

Table 28 - Caerphilly WTS Operational Cost Assumptions (Above current operational costs)

	Co-mingled WTS		Blueprint/Multi-stream WTS	
Operational factor	**Qnty**	**Annual revenue equivalent**	**Qnty**	**Annual revenue equivalent**
Fork lift trucks	3	£17,143	1	£5,715
Shovel loaders x 2 (redeployed from FM)				
Baler (inc. installation)	1	£28,333	1	£28,333
Equipment maintenance costs		£10,000		£8,000
Power		£2,000		£2,000
Baler wire (£3/tonne baled and estimated 3ktpa to be baled)		£9,000		£9,000
Fork lift drivers	3	£75,000	1	£25,000
Teleporter & Driver	1	£25,000	1	£25,000
Baler operatives	2	£50,000	2	£50,000
Yard manager (£35k)	1	£35,000	1	£35,000
Overheads (10% staff costs)		£18,500		£10,000
Total (estimate)		**£241,976**		**£170,048**
Comingled Recyclate Processing Saving identified in KAT modelling		**-£28,000**		**-£28,000**

The capital requirement is different for each option (though this capital is annualised in the table above), because of the requirement for a sortline and baler for the cans and plastics stream, and between one and three additional forklifts.

A.5 Household Waste Recycling Centres

A.5.1 Waste Flows

For Phase A, Waste Flows have been taken directly from Resource Futures HWRC review and no additional assumptions have been made to this data, with the exception of a transfer of kerbside residual waste tonnage to the HWRC network when three-weekly collections are introduced (as modelled in KAT).

Without assumptions regarding implementation of strict residual waste policies at the HWRC (a focus on design and staffing) it is assumed that this is collected as residual waste at the HWRC and incurs additional costs equivalent to this material being incinerated.

For Phase B, recycling captures from HWRCs were revisited and capture rates for different materials taken from best-practice HWRC performance alongside well-implemented residual waste policies. The net result still only brings the on-site recycling rate from 48% baseline to 76%, which is well below best practice performance in Wales – though some of the remaining residual waste may be displaced back into the kerbside due to the impact of a black bag ban. Table 26 below shows resulting assumptions regarding tonnages captured.

Table 29 – Recycling Collected in HWRC Network, Baseline, Phase A, and Phase B (tonnes)

Category	Waste Type	Current	Phase A	Phase B: With Residual Policies	Est. Phase B capture rate
	Mixed glass		129	251	85%
Paper	Paper		258	258	95%
	Card	194	478	1,115	
Plastics	Mixed Plastics			144	70%
	OTHER PLASTICS [7]		102	861	50%
Organics	Green Garden Waste Only	1,961	2,068	2,102	99%
Wood	Wood	4,432	4,732	4,840	95%
WEEE	WEEE	1,004	1,178	1,178	100%
	Other Scrap metal	682	966	1,030	85%
Furniture	Furniture			368	50%
Construction	Rubble	4,982	5,532	6,047	95%
	Soil		121	121	95%
	Plasterboard	294	294	416	-
	Mineral Oil	29	29	29	-
	Mattresses			643	95%
	Carpets			1,338	90%
	Textiles & footwear		436	443	36%
	Other materials (batteries, foil, cans, scrap metal)		20	262	80%
Residual waste		14,717	11,953	6,850	-
Total		**21,446**	**21,446**	**21,446**	**-**
On-site recycling rate		**48%**	**58%**	**76%**	**-**

A.5.2 Service Costs

Baseline service costs for 16/17 have been taken directly from CCBC's budget monitoring sheeting provided by Tony White. The baseline budget can be found in Table 30.

Table 30 - Caerphilly HWRCSite Budget 16/17

Area	Category	Budget
HWRC Sites	Collection	£967,764
	Treatment	£1,998,588

The capital costs for undertaking HWRC network rationalisation and improvements has been taken directly from Resource Futures' work. Resource Future's work provided capital costs

for redeveloping Aberbargoed, Penmaen and Trehir as well as improvement works on Full Moon. These costs have been annualised, in agreement with CCBC over 25 years and an interest add in of 2.5% pa.

Table 31 - Caerphilly HWRCSite Redevelopment Capital Cost Assumptions

Category	Phase A		Phase B
	Co-mingled	Blueprint/Multi-stream	
Aberbargoed Expansion	£180k	£180k	£180k
Penmaen Expansion	-	£310k	-
Penalta Expansion	-	-	£360k
FM HWRC Improvements	£280k	-	£1,260k
Trehir HWRC	£1,550k	£1,550k	£1,550k
Total	**£2,010k**	**£2,040k**	**£3,350k**
Annualised	**£109k**	**£110k**	**£182k**

Annual operating costs savings from reducing the number of HWRC sites were provided by Resource Futures from their work. For Phase B, staff are assumed to be redeployed across just four sites to maximise recycling and enforce residual policies.

Table 32 –HWRC Site Operating Costs

	Current	Phase A Network Rationalisation	Phase B Network Rationalisation
Staff	£400k	£336k	£400k
(Staff positions)	11	7 + £30k additional supervisor costs	11
Other Operating Costs	£378k	£270k	£270k
Total Operating Costs	**£780k**	**-**	**£670k**

A.6 Commercial Collections

A.6.1 Waste Flows

The waste flows for the kerbside commercial waste service have been taken directly from modelling completed by Amec Foster Wheeler (AFW).

A.6.2 Service Costs

Baseline service costs for 16/17 have been taken directly from CCBC's budget monitoring sheeting provided by Tony White. The baseline budget can be found in Table 33.

Table 33 – Caerphilly Commercial Waste Service Budget 16/17

Area	Category	Budget
Commercial	Collection	£254,402
	Treatment	£303,827
	Income	-£993,920

A split has been added to commercial waste budget in order to identify the costs of operating refuse and recycling collections. This has been based off work completed by AFW. 6% of costs are associated with recycling operations, and the remaining 94% are associated with refuse collections.

In the CBA, the kerbside service costs within the KAT modelling have been adjusted to remove the estimated costs of collecting commercial waste (since these costs are estimated separately). Additionally, the level of commercial waste collections resource included within KAT modelling changes in scenarios when a three-weekly service is introduced, as the kerbside service is assumed to service half of the current trade waste customers, the remaining half serviced by an additional vehicle. The accounting approach for taking the commercial collections cost out of the KAT modelling is defined as follows:

Kerbside Residual Service	Operations	KAT Collection Cost Attributable to Trade Waste
Baseline and Fortnightly Collection	3,352 tonnes collected from trade (11% of total kerbside residual tonnage collected)	Current Cost Estimate = 11% * Residual Kerbside Collection Cost
3-weekly Collections	Half trade customers assumed to be collected by separate vehicle	3-Weekly Cost Estimate = 0.5 * Current Cost Estimate

A.6.3 Bring Site Provision

It was agreed with WRAP and CCBC that within the CBA it should be assumed that that bring site performance is un-changed from the baseline provision. Baseline tonnages have been taken from 2016/17 WDF data. CCBC budget lines do not include a separate service cost for Bring Sites.

A.7 Residual Waste

A.7.1 End Destinations

Table 34 shows the residual waste treatment and disposal routes assumed within the CBA, based on baseline waste data reported to WasteDataFlow for the year 2016/17.

Table 34 - Assumed Residual Waste Treatment Split

Treatment destinations for residual waste (16/17 onwards)	% of waste		
	Collected Residual	Rejects from MRF	Rejects from Bryn Quarry
Landfill	39.2%		56.2%
Incineration	84.8%	100%	43.8%

Source: Caerphilly WDF 16/17

Table 35 shows the assumed percentage of material sent for incineration which is recycled.

Table 35 - Assumed Percentage of Material Sent for Incineration which is Recycled

Recycling from incineration (16/17 onwards)	% of input tonnage waste	
	Collected Residual	Rejects
Incinerator bottom ash	17.6%	16.5%
Recovery of metals	3.7%	3.2%

Source: Caerphilly WDF 16/17

A.7.2 Disposal Costs

Table 36 details the disposal costs for residual waste used within the CBA in, with Table 37 showing the landfill tax forecasts over the period of the CBA. Total incineration gate fee costs have been calculated annually based on the tonnage input modelled, and a WG subsidy equivalent to £20/tonne for tonnages in bands 0 and 1 has been netted off the cost.

Table 36 - Residual Waste Disposal Costs

Service Element	£ per tonne	
Incineration Band 0	£79.86	0 - 24,840 tpa
Incineration Band 1	£64.01	24,841 -31,090 tpa
Incineration Band 2	£97.24	31,091 - tpa
Landfill	£17.50 + LF tax	
Haulage	£5-£6	

Source: Tony White, CCBC

Table 37 - Landfill Tax Costs within CBA

Year	Landfill tax, 2016 real terms
2016/17	£84.40
2017/18	£86.10
2018/19 onwards	£88.95

Source: HM Revenue and Customs, Published landfill tax rates[6]

A.8 Dry Recyclables

A.8.1 Income and Gate Fees

The modelled income and cost for the kerbside dry recyclables can be found in Table 38 and Table 39. A separate sensitivity analysis was run on the original KAT modelling to demonstrate the impact of varying recyclate incomes per tonne. The co-mingled gate fee from 2017/18 has been amended to reflect the new contract amendment.

Table 38 – Kerbside Dry Recycling Income

Material	Cost, £ per tonne
Co-mingled (Current)	
Co-mingled	£87
Haulage	£5
Co-mingled (July 2017)	
Co-mingled	£57
Haulage	£26

Source: Tony White, CCBC

Table 39 - Kerbside Dry Recycling Income

Material	Income, £ per tonne
Separated	
Paper	£75
Card	£72.5
Glass	£5
Plastic	£45
Steel	£40
Aluminium	£610
Textiles	£375
Twin Stream (loose)	
Fibres	£50
Containers (inc. Glass)	-£35
Twin Stream (bagged)	
Fibres	£35
Containers (inc. Glass)	-£50
Plastics & cans (ex. glass)	£10

Source: WRAP KAT Modelling

The modelled income received for the HWRC dry recyclables can be found in Table 40.

[6] *HM Revenue and Customs (2015) Landfill Tax rates, accessed 15 July 2017, https://www.gov.uk/government/publications/rates-and-allowances-landfill-tax/landfill-tax-rates-from-1-april-2013*

Table 40 - HWRC Dry Recycling Income

Material list	Income, £ per tonne
Card	-£10
Paper	£45
Mixed Glass	-£12
Plastics	£100
Garden Waste	£31
Wood	£45
Small WEEE	£0
Large WEEE	£0
Cat Tubes	£0
Fridge/Freezer	£0
Metal	-£65
Rubble	£20
Soil	£20
Plasterboard	£64
Oil	£0
Bryn Quarry Mixed Waste	£98

Source: Resource Futures

Additionally, substantial tonnages of waste recorded within WasteDataFlow as co-mingled recycling is sent to two facilities for sorting/recycling, at Bryn Quarry Ltd. and at Amber Engineering Ltd.

When front-end sorting is introduced and the capture rate of materials rise from HWRCs, it is assumed that the gate fee associated with the material from HWRCs sent to Bryn will increase. CCBC officers reported that conversations with Bryn Quarry have suggested the gate fee shown in Table 41. This is due to the lower recyclable content associated with the residual waste generated from HWRCs.

Quantities and costs of mainly non-household co-mingled recyclable material collected and sent to Amber Engineering are assumed not to change from the baseline.

Table 41 – Bryn Gate Fee (HWRC residual waste)

Material list	Current	With Front End Sort
Gate Fee, £/tonne	£98	£130

Source: Tony White, CCBC

A.9 Organics

A.9.1 Destinations

It was assumed that all organic waste falling under the "Waste Food Only" category of WDF goes to an AD plant. Previously organic waste "Green Garden Waste Only" and "Mixed Garden & Food Waste" have been sent for composting through a mix of Window and in-vessel composting (IVC). However, it has been assumed that going forward with the introduction of a separate food and garden waste collection, all "Green Garden Waste Only" will be send to Windrow.

A.9.2 Disposal Costs

The disposal costs used for garden waste and food waste can be found in Table 42. These have been updated from the values originally used for the KAT modelling.

Table 42 - Organic Disposal Costs

Service Element	£ per tonne	Destination
Garden waste gate fee	£31.00	IVC
Food waste gate fee	£22.00	AD

Source: Tony White, CCBC

Appendix B – Phase A Cost Lines

A breakdown of the cost lines outputs for each scenario over 10 years from 2016/17 to 2025/26.

Table 43 - Baseline Cost Lines 16/17 - 25/26

Cost Line	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26
Residual Collection	£1,302k	£1,294k	£1,294k	£1,294k	£1,294k	£1,294k	£1,294k	£1,294k	£1,294k	£1,294k
Residual Treatment	£1,472k	£1,488k	£1,507k	£1,537k	£1,566k	£1,596k	£1,628k	£1,656k	£1,684k	£1,712k
Organics Collection	£1,078k	£1,119k	£1,119k	£1,119k	£1,119k	£1,119k	£1,264k	£1,264k	£1,264k	£1,264k
Organics Treatment	£505k	£353k	£356k	£359k	£363k	£366k	£370k	£373k	£377k	£381k
CA Site Collection	£968k	£968k	£968k	£968k	£968k	£968k	£968k	£968k	£968k	£968k
CA Site Treatment	£1,999k	£2,015k	£2,031k	£2,047k	£2,063k	£2,079k	£2,095k	£2,112k	£2,129k	£2,146k
Recycling Collection	£1,259k	£1,259k	£1,259k	£1,259k	£1,259k	£1,259k	£1,393k	£1,393k	£1,393k	£1,393k
Recycling Material Income	£2,013k	£1,953k	£1,908k	£1,862k	£1,815k	£1,767k	£1,719k	£2,023k	£2,038k	£2,053k
Bulky Collection	£53k	£53k	£53k	£53k	£53k	£53k	£53k	£53k	£53k	£53k
Bulk Treatment	£93k	£93k	£93k	£93k	£93k	£93k	£93k	£93k	£93k	£93k
Commercial Collection	£254k	£253k	£251k	£251k	£251k	£251k	£251k	£251k	£251k	£251k
Commercial Treatment	£304k	£307k	£311k	£312k	£313k	£314k	£315k	£316k	£317k	£318k
Commercial Income	-£994k	-£992k	-£990k	-£990k	-£990k	-£990k	-£990k	-£990k	-£990k	-£990k
CA Site Capital	£k	£k	£19k	£39k	£39k	£39k	£39k	£39k	£39k	£39k
Cost of Change	£k	£k	£k	£k	£k	£k	£k	£k	£k	£k
AHP Collections	£k	£k	£k	£k	£k	£k	£k	£k	£k	£k
Transfer Station & Other Costs	£186k	£186k	£386k	£386k	£386k	£386k	£386k	£186k	£186k	£186k
Net Financial Costs	**£10,494k**	**£10,351k**	**£10,568k**	**£10,591k**	**£10,594k**	**£10,597k**	**£10,881k**	**£11,221k**	**£11,550k**	**£11,618k**

Table 44 - Scenario 1 Cost Lines 16/17 - 25/26

Cost Line	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26
Residual Collection	£1,302k	£1,294k	£1,294k	£1,294k	£1,294k	£1,294k	£1,294k	£1,048k	£1,048k	£1,048k
Residual Treatment	£1,472k	£1,488k	£1,507k	£1,537k	£1,566k	£1,596k	£1,628k	£1,299k	£1,311k	£1,322k
Organics Collection	£1,078k	£1,119k	£1,119k	£1,119k	£1,119k	£1,119k	£1,264k	£1,274k	£1,274k	£1,274k
Organics Treatment	£505k	£353k	£359k	£363k	£366k	£370k	£373k	£416k	£420k	£424k
CA Site Collection	£968k	£968k	£1,028k	£1,028k	£1,028k	£1,028k	£1,028k	£1,028k	£1,028k	£1,028k
CA Site Treatment	£1,999k	£2,015k	£2,075k	£2,091k	£2,108k	£2,124k	£2,142k	£2,234k	£2,251k	£2,269k
Recycling Collection	£1,259k	£1,259k	£1,259k	£1,259k	£1,259k	£1,259k	£1,393k	£1,589k	£1,589k	£1,589k
Recycling Material Income	£2,013k	£1,953k	£1,908k	£1,862k	£1,815k	£1,767k	£1,719k	£2,174k	£2,191k	£2,207k
Bulky Collection	£53k	£53k	£53k	£53k	£53k	£53k	£53k	£53k	£53k	£53k
Bulk Treatment	£93k	£93k	£93k	£93k	£93k	£93k	£93k	£93k	£93k	£93k
Commercial Collection	£254k	£253k	£251k	£251k	£251k	£251k	£251k	£251k	£251k	£251k
Commercial Treatment	£304k	£307k	£311k	£312k	£313k	£314k	£315k	£314k	£314k	£313k
Commercial Income	-£994k	-£992k	-£990k	-£990k	-£990k	-£990k	-£990k	-£990k	-£990k	-£990k
CA Site Capital	£k	£k	£19k	£39k	£39k	£39k	£39k	£39k	£39k	£39k
Cost of Change	£k	£k	£k	£k	£k	£k	£k	£506k	£k	£k
AHP Collections	£k	£k	£k	£k	£k	£k	£k	£308k	£308k	£308k
Transfer Station & Other Costs	£186k	£186k	£386k	£386k	£386k	£386k	£386k	£190k	£190k	£190k
Net Financial Costs	**£10,494k**	**£10,351k**	**£10,676k**	**£10,700k**	**£10,703k**	**£10,706k**	**£10,991k**	**£11,828k**	**£11,428k**	**£11,477k**

Table 45 - Scenario 2 Cost Lines 16/17 - 25/26

Cost Line	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26
Residual Collection	£1,302k	£1,294k	£1,294k	£1,294k	£1,294k	£1,294k	£1,294k	£1,048k	£1,048k	£1,048k
Residual Treatment	£1,472k	£1,488k	£1,507k	£1,537k	£1,566k	£1,596k	£1,628k	£1,299k	£1,311k	£1,322k
Organics Collection	£1,078k	£1,119k	£1,119k	£1,119k	£1,119k	£1,119k	£1,264k	£1,274k	£1,274k	£1,274k
Organics Treatment	£505k	£353k	£359k	£363k	£366k	£370k	£373k	£416k	£420k	£424k
CA Site Collection	£968k	£968k	£1,028k	£1,028k	£892k	£825k	£825k	£825k	£825k	£825k
CA Site Treatment	£1,999k	£2,015k	£2,075k	£2,091k	£2,108k	£2,124k	£2,142k	£2,234k	£2,251k	£2,269k
Recycling Collection	£1,259k	£1,259k	£1,259k	£1,259k	£1,259k	£1,259k	£1,393k	£1,589k	£1,589k	£1,589k
Recycling Material Income	£2,013k	£1,953k	£1,908k	£1,862k	£1,815k	£1,767k	£1,719k	£2,174k	£2,191k	£2,207k
Bulky Collection	£53k	£53k	£53k	£53k	£53k	£53k	£53k	£53k	£53k	£53k
Bulk Treatment	£93k	£93k	£93k	£93k	£93k	£93k	£93k	£93k	£93k	£93k
Commercial Collection	£254k	£253k	£251k	£251k	£251k	£251k	£251k	£251k	£251k	£251k
Commercial Treatment	£304k	£307k	£311k	£312k	£313k	£314k	£315k	£314k	£314k	£313k
Commercial Income	-£994k	-£992k	-£990k	-£990k	-£990k	-£990k	-£990k	-£990k	-£990k	-£990k
CA Site Capital	£k	£k	£19k	£45k	£105k	£133k	£133k	£133k	£133k	£133k
Cost of Change	£k	£k	£k	£k	£k	£k	£k	£506k	£k	£k
AHP Collections	£k	£k	£k	£k	£k	£k	£k	£308k	£308k	£308k
Transfer Station & Other Costs	£186k	£186k	£386k	£386k	£386k	£386k	£386k	£190k	£190k	£190k
Net Financial Costs	**£10,494k**	**£10,351k**	**£10,676k**	**£10,706k**	**£10,634k**	**£10,597k**	**£10,882k**	**£11,719k**	**£11,319k**	**£11,368k**

Table 46 - Scenario 3 Cost Lines 16/17 - 25/26

Cost Line	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26
Residual Collection	£1,302k	£1,294k	£1,294k	£1,294k	£1,299k	£1,299k	£1,299k	£1,053k	£1,053k	£1,053k
Residual Treatment	£1,472k	£1,488k	£1,507k	£1,528k	£1,662k	£1,673k	£1,685k	£1,400k	£1,413k	£1,425k
Organics Collection	£1,078k	£1,119k	£1,119k	£1,119k	£1,267k	£1,267k	£1,465k	£1,421k	£1,421k	£1,421k
Organics Treatment	£505k	£353k	£359k	£364k	£368k	£371k	£375k	£418k	£422k	£426k
CA Site Collection	£968k	£968k	£1,028k	£1,028k	£1,028k	£926k	£825k	£825k	£825k	£825k
CA Site Treatment	£1,999k	£2,015k	£2,075k	£2,091k	£2,108k	£2,124k	£2,142k	£2,233k	£2,251k	£2,269k
Recycling Collection	£1,259k	£1,259k	£1,259k	£1,259k	£2,223k	£2,223k	£2,439k	£2,312k	£2,312k	£2,312k
Recycling Material Income	£2,013k	£1,953k	£1,908k	£1,862k	-£462k	-£478k	-£494k	-£558k	-£566k	-£575k
Bulky Collection	£53k	£53k	£53k	£53k	£53k	£53k	£53k	£53k	£53k	£53k
Bulk Treatment	£93k	£93k	£93k	£93k	£93k	£93k	£93k	£93k	£93k	£93k
Commercial Collection	£254k	£253k	£251k	£308k	£310k	£310k	£310k	£310k	£311k	£311k
Commercial Treatment	£304k	£307k	£311k	£224k	£216k	£217k	£217k	£213k	£213k	£213k
Commercial Income	-£994k	-£992k	-£990k	-£1,009k	-£1,009k	-£1,009k	-£1,009k	-£1,009k	-£1,010k	-£1,010k
CA Site Capital	£k	£k	£8k	£23k	£69k	£111k	£111k	£111k	£111k	£111k
Cost of Change	£k	£k	£k	£253k	£253k	£k	£k	£506k	£k	£k
AHP Collections	£k	£k	£k	£k	£k	£k	£k	£308k	£308k	£308k
Transfer Station & Other Costs	£186k	£186k	£386k	£549k	£760k	£760k	£760k	£562k	£562k	£562k
Net Financial Costs	**£10,494k**	**£10,351k**	**£10,665k**	**£11,042k**	**£10,241k**	**£9,944k**	**£10,273k**	**£10,254k**	**£9,773k**	**£9,798k**

Table 47 - Scenario 3 Cost Lines 16/17 - 25/26

Cost Line	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26
Residual Collection	£1,302k	£1,294k	£1,294k	£1,294k	£1,299k	£1,299k	£1,299k	£1,053k	£1,053k	£1,053k
Residual Treatment	£1,472k	£1,488k	£1,507k	£1,528k	£1,773k	£1,786k	£1,800k	£1,472k	£1,497k	£1,523k
Organics Collection	£1,078k	£1,119k	£1,119k	£1,119k	£1,259k	£1,259k	£1,387k	£1,446k	£1,446k	£1,446k
Organics Treatment	£505k	£353k	£359k	£364k	£368k	£371k	£375k	£418k	£422k	£426k
CA Site Collection	£968k	£968k	£1,028k	£1,028k	£1,028k	£926k	£825k	£825k	£825k	£825k
CA Site Treatment	£1,999k	£2,015k	£2,075k	£2,091k	£2,108k	£2,124k	£2,142k	£2,232k	£2,251k	£2,269k
Recycling Collection	£1,259k	£1,259k	£1,259k	£1,259k	£2,025k	£2,025k	£2,025k	£2,219k	£2,219k	£2,219k
Recycling Material Income	£2,013k	£1,953k	£1,908k	£1,862k	-£544k	-£561k	-£579k	-£641k	-£651k	-£660k
Bulky Collection	£53k	£53k	£53k	£53k	£53k	£53k	£53k	£53k	£53k	£53k
Bulk Treatment	£93k	£93k	£93k	£93k	£93k	£93k	£93k	£93k	£93k	£93k
Commercial Collection	£254k	£253k	£251k	£308k	£310k	£310k	£310k	£310k	£311k	£311k
Commercial Treatment	£304k	£307k	£311k	£224k	£220k	£220k	£221k	£213k	£214k	£214k
Commercial Income	-£994k	-£992k	-£990k	-£1,009k	-£1,009k	-£1,009k	-£1,009k	-£1,009k	-£1,010k	-£1,010k
CA Site Capital	£k	£k	£8k	£23k	£69k	£111k	£111k	£111k	£111k	£111k
Cost of Change	£k	£k	£k	£253k	£253k	£k	£k	£506k	£k	£k
AHP Collections	£k	£k	£k	£k	£k	£k	£k	£308k	£308k	£308k
Transfer Station & Other Costs	£186k	£186k	£386k	£549k	£725k	£725k	£725k	£485k	£485k	£485k
Net Financial Costs	**£10,494k**	**£10,351k**	**£10,665k**	**£11,042k**	**£10,033k**	**£9,736k**	**£9,781k**	**£10,097k**	**£9,630k**	**£9,669k**

Table 48 - Scenario 5 Cost Lines 16/17 -25/26

Cost Line	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26
Residual Collection	£1,302k	£1,294k	£1,294k	£1,294k	£1,294k	£1,294k	£1,294k	£1,053k	£1,053k	£1,053k
Residual Treatment	£1,472k	£1,488k	£1,507k	£1,528k	£1,552k	£1,582k	£1,614k	£1,472k	£1,497k	£1,523k
Organics Collection	£1,078k	£1,119k	£1,119k	£1,119k	£1,119k	£1,119k	£1,247k	£1,446k	£1,446k	£1,446k
Organics Treatment	£505k	£353k	£359k	£364k	£368k	£371k	£375k	£418k	£422k	£426k
CA Site Collection	£968k	£968k	£1,028k	£1,028k	£1,028k	£926k	£825k	£825k	£825k	£825k
CA Site Treatment	£1,999k	£2,015k	£2,075k	£2,091k	£2,108k	£2,124k	£2,142k	£2,232k	£2,251k	£2,269k
Recycling Collection	£1,259k	£1,259k	£1,259k	£1,259k	£1,259k	£1,259k	£1,259k	£2,219k	£2,219k	£2,219k
Recycling Material Income	£2,013k	£1,953k	£1,908k	£1,862k	£1,815k	£1,767k	£1,719k	-£641k	-£651k	-£660k
Bulky Collection	£53k	£53k	£53k	£53k	£53k	£53k	£53k	£53k	£53k	£53k
Bulk Treatment	£93k	£93k	£93k	£93k	£93k	£93k	£93k	£93k	£93k	£93k
Commercial Collection	£254k	£253k	£251k	£308k	£310k	£310k	£310k	£310k	£311k	£311k
Commercial Treatment	£304k	£307k	£311k	£224k	£213k	£214k	£215k	£213k	£214k	£214k
Commercial Income	-£994k	-£992k	-£990k	-£1,009k	-£1,009k	-£1,009k	-£1,009k	-£1,009k	-£1,010k	-£1,010k
CA Site Capital	£k	£k	£12k	£28k	£83k	£134k	£134k	£134k	£134k	£134k
Cost of Change	£k	£k	£k	£k	£k	£k	£k	£337k	£169k	£k
AHP Collections	£k	£k	£k	£k	£k	£k	£k	£308k	£308k	£308k
Transfer Station & Other Costs	£186k	£186k	£386k	£386k	£386k	£386k	£386k	£328k	£485k	£485k
Net Financial Costs	**£10,494k**	**£10,351k**	**£10,668k**	**£10,630k**	**£10,676k**	**£10,628k**	**£10,660k**	**£9,794k**	**£9,821k**	**£9,692k**

Appendix C – Phase A Capital Costs

Table 49 - Annual breakdown of Capital Cost Requirements

	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24	Total
Scenario 1									
Kerbside Vehicles	£k	£k	£k	£k	£k	£k	£k	£k	**£k**
Containers	£k	£k	£k	£k	£k	£k	£k	£k	**£k**
HWRCs	£k	£k	£286k	£k	£k	£k	£k	£k	**£286k**
Depot and WTS	£k	£k	£428k	£k	£k	£k	£k	£k	**£428k**
Cost of Change	£k	£k	£k	£k	£k	£k	£k	£k	**£k**
Total	**£k**	**£k**	**£714k**	**£k**	**£k**	**£k**	**£k**	**£k**	**£714k**
Scenario 2									
Kerbside Vehicles	£k	£k	£k	£k	£k	£k	£k	£k	**£k**
Containers	£k	£k	£643k	£k	£k	£k	£k	£k	**£643k**
HWRCs	£k	£k	£286k	£177k	£1,554k	£k	£k	£k	**£2,017k**
Depot and WTS	£k	£k	£428k	£k	£k	£k	£k	£k	**£428k**
Cost of Change	£k	£k	£k	£k	£k	£k	£k	£k	**£506k**
Total	**£k**	**£k**	**£1,357k**	**£177k**	**£1,554k**	**£k**	**£k**	**£k**	**£3,513k**
Scenario 3									
Kerbside Vehicles	£k	£k	£2,275k	£k	£k	£k	£k	£530k	**£2,805k**
Containers	£k	£k	£643k	£k	£k	£k	£k	£k	**£643k**
HWRCs	£k	£k	£311k	£711k	£1,554k	£k	£k	£k	**£2,043k**
Depot and WTS	£k	£k	£k	£1,973k	£k	£k	£k	£k	**£1,973k**
Cost of Change	£k	£k	£253k	£253k	£k	£k	£506k	£k	**£1,012k**
Total	**£k**	**£k**	**£3,483k**	**£2,403**	**£1,554k**	**£k**	**£506k**	**£530k**	**£6,729k**

Scenario 4									
Kerbside Vehicles	£k	£k	£3,120k	£k	£k	£k	£k	£300k	**£3,420k**
Containers	£k	£k	£775k	£k	£k	£k	£k	£k	**£775k**
HWRCs	£k	£k	£311k	£177k	£1,554k	£k	£k	£k	**£2,043k**
Depot and WTS	£k	£k		£1,888k					**£1,888k**
Cost of Change	£k	£k	£253k	£253k	£k	£k	£k	£k	**£1,012k**
Total	**£k**	**£k**	**£4,460k**	**£2,318k**	**£1,554k**	**£k**	**£506k**	**£300k**	**£9,138k**
Scenario 5									
Kerbside Vehicles	£k	£k	£k	£k	£k	£k	£k	£3,420k	**£3,420k**
Containers	£k	£k	£k	£k	£k	£k	£k	£775k	**£775k**
HWRCs	£k	£k	£k	£177k	£1,866k	£k	£k	£k	**£2,043k**
Depot and WTS	£k	£k	£k	£k	£k	£k	£k	£1,888k	**£1,888k**
Cost of Change	£k	£k	£k	£k	£k	£k	£337k	£169k	**£506k**
Total	**£k**	**£k**	**£k**	**£177k**	**£1,866k**	**£k**	**£337k**	**£6,252k**	**£8,632k**

Appendix D – Breakdown of Phase B Costs

Table 50 – Breakdown of Annual Savings (No Three Weekly Refuse Collections)

	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Residual Collection	£5k	£5k	£5k	£5k
Residual Treatment	£234k	£120k	£234k	£120k
Organics Collection	£140k	£148k	£140k	£148k
Organics Treatment	£5k	£5k	£6k	£6k
CA Site Collection	-£172k	-£172k	-£108k	-£108k
CA Site Treatment	£29k	£29k	-£567k	-£568k
Recycling Collection	£765k	£963k	£765k	£963k
Recycling Material Income	-£2,478k	-£2,290k	-£2,478k	-£2,290k
Commercial Collection	-£52k	-£56k	-£35k	-£38k
CA Site Capital	£182k	£182k	£182k	£182k
Transfer Station & Other Costs	£357k	£308k	£357k	£308k
Contamination Enforcement	-£150k	-£150k	-£150k	-£150k
Total	**-£1134k**	**-£905k**	**-£1648k**	**-£1419k**

Table 51 - Breakdown of Annual Savings (Three Weekly Refuse Collections)

	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Residual Collection	£241k	-£241k	-£241k	-£241k
Residual Treatment	-£115k	-£177k	-£115k	-£177k
Organics Collection	£169k	£174k	£169k	£174k
Organics Treatment	£43k	£43k	£45k	£45k
CA Site Collection	-£172k	-£172k	-£108k	-£108k
CA Site Treatment	£101k	£102k	-£558k	-£618k
Recycling Collection	£870k	£1,052k	£870k	£1,052k
Recycling Material Income	-£2,538k	-£2,340k	-£2,538k	-£2,340k
Commercial Collection	-£60k	-£59k	-£43k	-£46k
CA Site Capital	£182k	£182k	£182k	£182k
AHP Collections	£308k	£308k	£308k	£308k
Transfer Station & Other Costs	£317k	£310k	£317k	£310k
Contamination Enforcement	-£150k	-£150k	-£150k	-£150k
Total	**-£1,285k**	**-£966k**	**-£1,862k**	**-1,608k**

Appendix E – Phase B Costs Per Annum

Costs provided in are full year following the rollout of services.

Table 52 – By Line Costs Following Rollout of Service (No Three Weekly Collections)

Financial Cost	Baseline Scenario	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Residual Collection	£1294k	£1299k	£1299k	£1299k	£1299k	£1302k
Residual Treatment	£1552k	£1786k	£1673k	£1991k	£1883k	£1538k
Organics Collection	£1119k	£1259k	£1267k	£1259k	£1267k	£1078k
Organics Treatment	£366k	£371k	£371k	£372k	£372k	£470k
CA Site Collection	£968k	£796k	£796k	£860k	£860k	£968k
CA Site Treatment	£2078k	£2108k	£2108k	£1307k	£1300k	£2078k
Recycling Collection	£1259k	£2025k	£2223k	£2025k	£2223k	£1259k
Recycling Material Income	£1917k	-£561k	-£373k	-£561k	-£373k	£1917k
Bulky Collection	£53k	£53k	£53k	£53k	£53k	£53k
Bulk Treatment	£93k	£93k	£93k	£93k	£93k	£93k
Commercial Collection	£251k	£310k	£310k	£310k	£310k	£310k
Commercial Treatment	£313k	£220k	£217k	£237k	£235k	£212k
Commercial Income	-£990k	-£1009k	-£1009k	-£1009k	-£1009k	-£1009k
CA Site Captial	£k	£182k	£182k	£182k	£182k	£k
Cost of Change	£k	£k	£k	£k	£k	£k
AHP Collections	£k	£k	£k	£k	£k	£k
Transfer Station & Other Costs	£386k	£593k	£544k	£593k	£544k	£386k
Landfill Tax	£3k	£3k	£3k	£3k	£3k	£3k
Recycling Target Fines	£k	£k	£k	£k	£k	£k
Total	**£10662k**	**£9528k**	**£9757k**	**£9014k**	**£9243k**	**£10659k**

Table 53- By Line Costs Following Rollout of Service (Three Weekly Collections)

Financial Cost	Baseline Scenario	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Residual Collection	£1294k	£1053k	£1053k	£1053k	£1053k	£1053k
Residual Treatment	£1552k	£1437k	£1375k	£1697k	£1584k	£1697k
Organics Collection	£1119k	£1288k	£1293k	£1288k	£1293k	£1288k
Organics Treatment	£366k	£410k	£410k	£411k	£411k	£411k
CA Site Collection	£968k	£796k	£796k	£860k	£860k	£860k
CA Site Treatment	£2078k	£2180k	£2180k	£1260k	£1252k	£1260k
Recycling Collection	£1259k	£2130k	£2312k	£2130k	£2312k	£2130k
Recycling Material Income	£1917k	-£621k	-£424k	-£621k	-£424k	-£621k
Bulky Collection	£53k	£53k	£53k	£53k	£53k	£53k
Bulk Treatment	£93k	£93k	£93k	£93k	£93k	£93k
Commercial Collection	£251k	£310k	£310k	£310k	£310k	£310k
Commercial Treatment	£313k	£212k	£214k	£230k	£227k	£230k
Commercial Income	-£990k	-£1009k	-£1009k	-£1009k	-£1009k	-£1009k
CA Site Captial	£k	£182k	£182k	£182k	£182k	£182k
Cost of Change	£k	£k	£k	£k	£k	£k
AHP Collections	£k	£308k	£308k	£308k	£308k	£308k
Transfer Station & Other Costs	£386k	£552k	£546k	£552k	£546k	£552k
Landfill Tax	£3k	£3k	£3k	£3k	£3k	£3k
WG Government Grant	£k	£k	£k	£k	£k	-£315k
Total	**£10662k**	**£9377k**	**£9695k**	**£8800k**	**£9054k**	**£8485k**

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Help Wales reduce its Carbon Footprint

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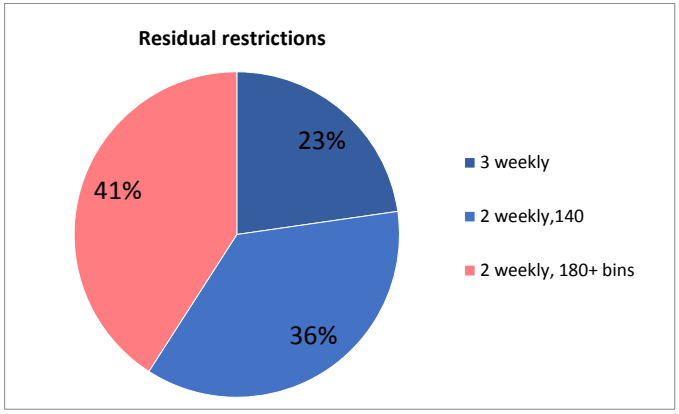
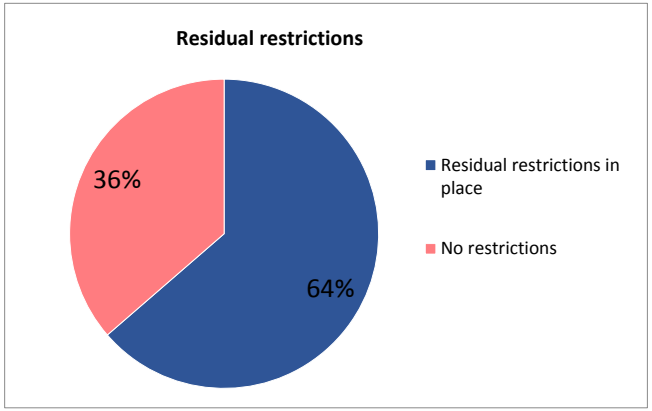
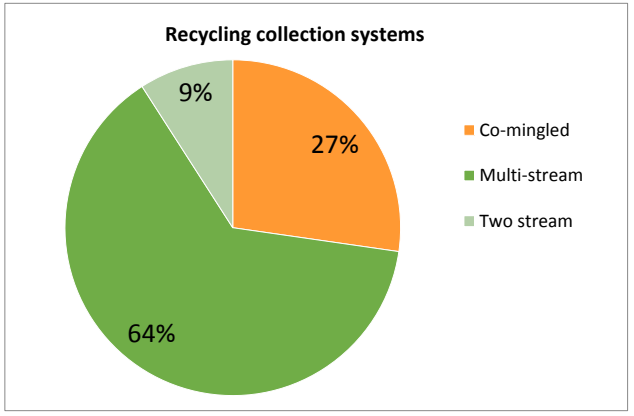
Service Confirguration and Collection Frequency for Welsh Local Authorities

*** This information represents WRAP's best understanding of kerbside collections being operated by local authorities in Wales as of October 2018**
On an ongoing basis LAs are introducing service changes and improvements and so note that there may be some variations to the information below.







Local Authority	Current Dry Recycling Collections			Current Food Waste Collections		Current Residual Waste Collections		Current Garden Waste Collections		Current Nappy/AHP collection		
	Scheme Type	Frequency of Collection	Type of Vehicle Used	Service	Frequency of Collection	Container	Frequency of Collection	Frequency of Collection	Charge	Collection provided?	Frequency of Collection	Notes
Isle of Anglesey County Council	Multi-stream	Weekly	Kerbloader	Separate food waste	Weekly	Wheeled bin 180-240 litres	3-weekly and Fortnightly	Fortnightly	No	Yes	n/k	
Conwy County Borough Council	Multi-stream	Weekly / Fortnightly	Kerbloader	Separate food waste	Weekly	Wheeled bin 180-240 litres	3-weekly and 4-weekly	Fortnightly	No	Yes	Weekly	
Flintshire County Council	Multi-stream	Weekly	Some Kerbloaders, some BMI maximisers	Separate food waste	Weekly	Wheeled bin 140-180 litres	Fortnightly	Fortnightly	No	No		
Denbighshire County Council	Co-mingled	Fortnightly/ Weekly	RCV	Separate food waste	Weekly	Wheeled bin 140 litres	Fortnightly	Fortnightly	Yes	No		
Gwynedd County Council	Multi-stream	Weekly	Kerbloader	Separate food waste	Weekly	Wheeled bin 180-240 litres	3-weekly	Fortnightly	Yes	Yes	Weekly	Collected separately
Wrexham County Borough Council	Multi-stream	Weekly	Kerbloader	Separate food waste	Weekly -	Wheeled bin 180-240 litres	Fortnightly	Fortnightly	No	No		

Powys County Council	Multi-stream	Weekly	Kerbloader	Separate food waste	Weekly	Wheeled bin 180-240 litres	3-weekly	None	n/a	No		
Ceredigion County Council	Co-mingled	Weekly	RCV	Separate food waste	Weekly	Householder provides	Fortnightly	Weekly	Not clear	No		
Pembrokeshire County Council	Two Stream (59407 HHs) / Co-mingled (2002 HHs)	Weekly (glass fortnightly)	RCV	Separate food waste	Weekly	Non-reusable sack	Fortnightly	Fortnightly	Yes	No		
Carmarthenshire County Council	Co-mingled	Fortnightly	Split back RCV	Separate food waste	Weekly	Householder provides	Fortnightly	Fortnightly	Yes	Yes	Weekly	Collected separately
Neath Port Talbot County Borough Council	Multi-stream	Weekly	Kerbloader	Separate food waste	Weekly	Wheeled bin 140 litres	Fortnightly	Weekly	no	No		
Swansea City and County Council	Multi-stream	Fortnightly	Split back RCV	Separate food waste	Weekly	Non-reusable sack	Fortnightly	Fortnightly	No	Yes		Can apply for exemption to have additional allowance of residual waste bags
Merthyr Tydfil County Borough Council	Multi-stream	Weekly	Kerbloader	Separate food waste	Weekly	Wheeled bin 140 litres or less	Fortnightly	Fortnightly	No	No		
Blaenau Gwent County Borough Council	Multi-stream	Weekly	Kerbloader	Separate food waste	Weekly	Wheeled bin 180-240 litres	3-weekly	Fortnightly	No	Yes	Weekly	Collected separately
Monmouthshire County Council	Two Stream	Weekly	RCV	Co-collected with garden waste	Weekly	2 Non-reusable sack per collection	Fortnightly	Weekly	Yes	Yes	Fortnightly	Provides bags which are co-collected with refuse
Torfaen County Borough Council	Multi-stream	Weekly/ Fortnightly	Bespoke kerbloader - Designed by the LA	Separate food waste	Weekly	Wheeled bin 140 litres	Fortnightly	Fortnightly	No	Yes	Fortnightly	Provides bags which are co-collected with refuse
Caerphilly County Borough Council	Co-mingled	Weekly	RCV	Separate food waste	Weekly	Wheeled bin 240 litres	Fortnightly	Weekly	No	Yes	Fortnightly	Provides bags which are co-collected with refuse
Rhondda Cynon Taff County Borough Council	Two stream	Weekly	RCV	Separate food waste	Weekly	Wheeled bin 180-240 litres	Fortnightly	Weekly	No	Yes	Weekly	Collected separately
Bridgend County Borough Council	Multi-stream	Weekly	Kerbloader	Separate food waste	Weekly	Non-reusable sack	Fortnightly	Fortnightly	Yes	No		
Newport City Council	Multi-stream	Weekly	Kerbloader	Separate food waste	Weekly	Wheeled bin 180 litres	Fortnightly	Fortnightly	No	Yes	Fortnightly	Collected on alternate week to refuse collection
Cardiff County Council	Co-mingled	Weekly	RCV	Separate food waste	Weekly	Wheeled bin 140 litres	Fortnightly	Fortnightly	No	Yes	Weekly	Collected separately
Vale of Glamorgan Council	Co-mingled	Weekly	RCV	Separate food waste	Weekly	Non-reusable sack - 2 sacks only	Fortnightly	Fortnightly	Yes	No		

Collaborative Change Programme Support to Caerphilly County Borough Council

Caerphilly County Borough Council - KAT Modelling results – Further analysis

This report provides a summary of the outputs from modelling for service collection options at Caerphilly County Borough Council

Date: December 2015

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We work with businesses, individuals and communities to help them reap the benefits of reducing waste, developing sustainable products and using resources in an efficient way.

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Written by: WRAP Collaborative Change Programme Unit

Executive summary

Caerphilly County Borough Council (CCBC) is being supported through the Welsh Government Collaborative Change Programme to investigate the impact of various recycling and waste collection options.

The current collection service comprises of a weekly comingled collection, weekly mixed garden and food collection and fortnightly residual waste collection.

WRAP's Kerbside Analysis Tool (KAT) is an Excel based spreadsheet tool, which allows users to make projections of kerbside collection infrastructure and associated standardised costs by applying default and user-defined values to key parameters. The projected costs are standardised in order to fairly assess the differences between options. **It is important to note that KAT modelling is relative and based on the current service; if efficiency savings could be made on the current services, then they would also be able to be made on all of the options considered.** As such it is the cost difference that is the relevant output of this work rather than the absolute numbers.

Two stream, three stream and kerbside sort options have been compared to the current service

Contents

1.0 Introduction

1.1 Support Aims

Caerphilly County Borough Council (CCBC), supported by WRAP and the Welsh Government Collaborative Change Programme, is investigating the potential impacts of introducing one of a range of recycling and waste collection options. This report follows on from the previous papers *'Caerphilly KAT Modelling – Indicative results & assumptions'* (issued July 2015 in which early indicative results from options modelling were presented) and *'Caerphilly County Borough Council - KAT Modelling results and assumptions'* (issued November 2015).

After the indicative results were shared with the authority, a number of refinements and enhancements of the modelling work were undertaken by WRAP and included in the follow up paper issued in November.

The key changes to the modelling were as follows:

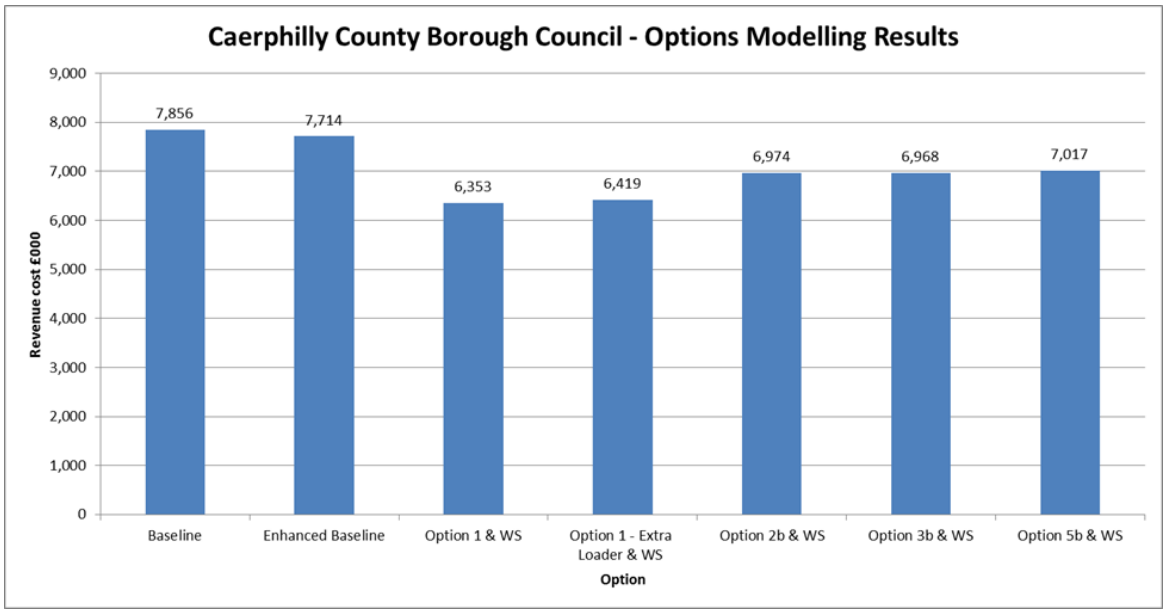
- In addition to driver +1 configuration, blueprint options modelled as driver +2 and driver +1.5.
- Paper/cardboard split updated to reflect the reduction in paper and increased cardboard yields seen.
- Examination of the effect that variations to material prices have on overall cost.
- Updated depot costings
- Additional collection option suggested by CCBC modelled (5b)
- Options modelled with fortnightly, 3 weekly and 4 weekly residual waste collection
- All core options also modelled with winter suspension of garden waste.

Results from previous paper '*Caerphilly County Borough Council - KAT Modelling results and assumptions'* shown in fig 1 below.

Fig 1 – Previous modelling results

Revenue Expenditure	Baseline	Enhanced Baseline	Option 1 & WS	Option 1 - Extra Loader & WS	Option 2b & WS	Option 3b & WS	Option 5b & WS
Annual Capital - Vehicles	611,870	633,919	775,665	681,168	663,843	797,714	799,289
Containers	118,582	118,582	265,139	265,139	246,333	312,303	312,303
Operating costs	2,527,720	2,563,984	2,875,290	3,064,189	2,848,850	3,150,063	3,181,117
Supervision	370,644	370,644	370,644	370,644	370,644	370,644	370,644
Overhead	447,877	447,877	447,877	447,877	447,877	447,877	447,877
Restricted Access Collections	303,959	303,959	331,448	331,448	330,782	330,782	330,782
Spare Vehicles	184,979	153,133	219,159	190,125	173,867	183,741	200,429
Total collection	**4,565,631**	**4,592,098**	**5,285,222**	**5,350,589**	**5,082,197**	**5,593,125**	**5,642,441**
Bulking Costs	235,000	235,000	610,000	610,000	525,000	610,000	610,000
Treatment - Dry	1,520,140	1,520,140	-1,034,177	-1,034,177	-46,721	-672,004	-672,004
Treatment - Organic	645,904	478,084	461,994	461,994	461,994	461,994	461,994
Disposal - Residual	1,664,932	1,664,932	1,806,145	1,806,145	1,727,343	1,750,963	1,750,963
Income - Trade	-813,000	-813,000	-813,000	-813,000	-813,000	-813,000	-813,000
Costs - Trade	37,000	37,000	37,000	37,000	37,000	37,000	37,000
Total	**7,855,606**	**7,714,253**	**6,353,184**	**6,418,551**	**6,973,813**	**6,968,078**	**7,017,395**
Variation from E Baseline	141,353	0	-1,361,070	-1,295,702	-740,440	-746,175	-696,858

Fig 2 – Previous results



From the modelling undertaken previously, it can be seen that Option 1 exhibited the lowest cost overall. Options 2b, 3b and 5b were similar to each other in terms of cost and were all lower than the enhanced baseline.

In light of the above findings, and taking into account feedback from the authority, it was decided that further revisions to the modelling were required:

- Updated commodity prices – Latest available data to be used
- Reduced driver contribution in Option 1 + Extra loader. Previous 10% assumed driver contribution to be reduced to zero.
- Increased ratio of spare vehicles to frontline vehicles – Model updated to include a greater number of spare vehicles. Closer to current level of spares
- Garden waste containment – Brown wheeled bins previously modelled to be replaced by reusable sacks

Also, in light of the results of the previous modelling work, it was decided by the authority to reduce the number of options to be considered, with two preferred options identified for further modelling in addition to the blueprint and baseline options.

Options taken forward:

- Enhanced Baseline – Business as usual option, but with the mixed organic waste stream split into separately collected food and garden waste streams.

- Option 1 – WG Blueprint, source segregated collection of dry recyclate and food using RRV

- Option 1 + Extra Loader – As Option 1, but with Driver +2 configuration rather than the Driver + 1 modelled in option 1.

- Option 5b – 3 stream dry recycling collection and food. Glass, plastics & cans, mixed paper & card and food waste collected using a combination of two twin chamber RCVs.

It was decided by the authority that the following options would not be explored further

- Options 2a and 2b – Small benefit in terms of cost compared to options 3b and 5b, but there was a significant potential risk in terms of compliance as a result of the commingled collection of glass with other recyclate.

- Options 3a and 3b – Slightly lower cost than Option 5b, but not taken forward due to concerns over the complexity and serviceability of the three chamber 'One Pass' vehicles.

1.2 Current Waste and Recycling Services

CBCC delivers an 'in house' kerbside waste and recycling service to approximately 77,614 households across the authority area. The current kerbside service is summarised in Fig 3 below.

Fig 3- CBCC Current Service Profile

Service	Frequency	Containers Used	Materials Collected
Dry Recycling	Weekly	240l wheeled bin (approx. 70% of households) Kerbside boxes (to approx. 25% households) Single use sacks (approx. 5% of households)	• Glass • Cans • Plastic Bottles • Mixed Plastic • Paper • Card
Food Waste	Weekly	5 Litre Internal Caddy 23Litre Kerbside Caddy	• All Food Waste
Garden Waste	Weekly	Reusable Sack	• All Garden Waste
Refuse	Fortnightly	240l wheeled bin (approx. 98% of households) Plastic sacks	• Residual Waste

1.2.1 Kerbside Dry Recycling

Every household in the authority receives a weekly commingled dry recyclate collection.

The authority currently uses a fleet of 9 standard RCVs to provide this service along with a smaller tipper vehicle to collect from areas of restricted access. The dry recycling vehicles offload at the authority's bulking station prior to material being sent for sorting to a MRF.

1.2.2 Kerbside Organics

All households across the authority receive a weekly food waste collection, with every household being provided with internal and external caddies. A weekly garden waste collection is also provided using reusable hessian sacks. Whilst food and garden wastes are

presented separately at the kerbside, they are mixed at the point of collection in a standard RCV. Collection fleet consists of 7 RCVs and up to two small caged vehicles for areas of restricted access.

1.2.3 Kerbside Residual Waste

Residual waste is collected fortnightly from all properties. Residual waste is currently collected by a fleet of 7 RCVs and up to two small caged vehicles. This material is then bulked at the authority's transfer station before onward transport to the Viridor EfW facility in Cardiff.

1.2.4 Other Council Services

CCBC operate six Household Waste Recycling Centres (Full Moon, Aberbargoed, Penallta, Penmaen, Trehir, Rhymney). Additionally, CCBC also operate 22 bring sites throughout the county.

CCBC operates a commercial waste and recycling service across the county. Residual waste is co-collected with household waste using a common fleet of RCVs. The mass of commercial waste collected is not directly measured, but recent work undertaken by WRAP on behalf of the authority estimated, based on the number of customers & lifts, that 3,325 tonnes of material is collected. Commercial recycling collections are also offered and again, material is co-collected with the household dry recycling fraction. The amount of commercial recycling is relatively low, estimated to be approximately 208 tonnes.

As commercial wastes are co-collected with household waste they have been included in the KAT model.

2.0 KAT Modelling

WRAP's Kerbside Analysis Tool (KAT) is an Excel based spreadsheet tool, which allows users to make projections of kerbside collection infrastructure and associated standardised costs by applying default and user-defined values to key parameters.

The first step in modelling the service is to create a baseline representative of the authority's current service. It is essential that the resources and logistics of the existing services are reflected as accurately as possible within this so that it serves as a reliable foundation for testing various alternative collection service options. Authority specific inputs to the baseline include information regarding the number and type of households, current services and service performance and resources. Known inputs (from the perspective of the model these include tonnages of each material type collected, numbers and types of households offered the service, assumed tipping locations) are calibrated to known outputs (which in modelling terms includes the numbers of crew and vehicles used to deliver the collection services).

Factors such as productivity, pass rates, participation rates, recognition rates (and therefore capture rates) are subsequently checked (where known), or developed from scratch where required (depending on the data available and its quality) to provide a full baseline model.

Put simply, the baseline model should accurately reflect:

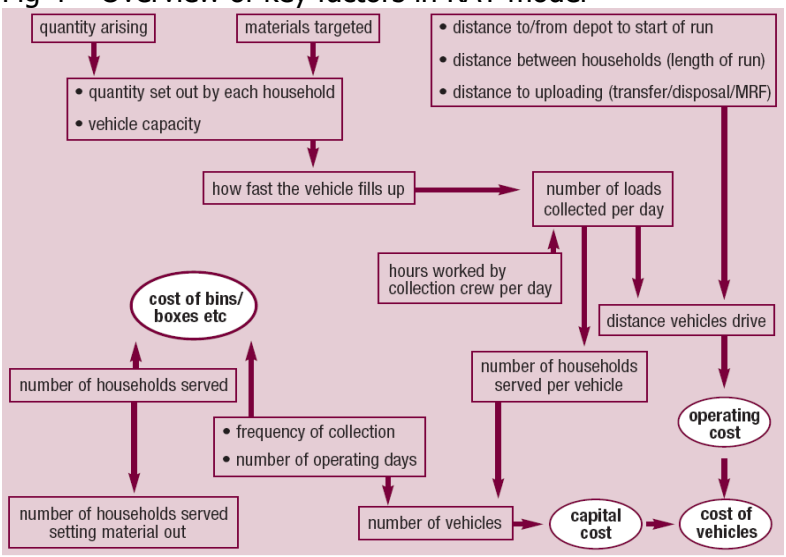
- Waste composition and tonnages;
- Current participation, set out, recognition and capture;
- Authority characteristics (household numbers, population, housing types, distances etc.);

- Travel logistics (time, distance, speed, pass rate, pick up time etc.); and
- Current vehicle and container types and costs.

This creates a sensible/credible basis from which to establish the change in resource requirements for different potential future service configurations, ensuring that CCBC's specific constraints are properly reflected.

The key factors that influence the outputs from KAT are shown in Fig 4 below. KAT uses a series of calculations based on the inter-relationship between refuse collection and recycling to make projections of resources required for a new service provision.

Fig 4 – Overview of key factors in KAT model



For CCBC, KAT has been calibrated using the current collection arrangements. The majority of the data used in the model has been provided by the authority.

KAT outputs are derived from projections of the infrastructure and resource requirements for new services e.g. numbers of collection vehicles required, numbers of loads per day, number of rounds and average round size. All projections are based on average and therefore are indicative of the authority as a whole. The projections highlight the costs of the different options in direct relation to the operational and capital requirements of the vehicles required to deliver the various service options being considered.

The projected costs are standardised in order to fairly assess the differences between options. **It is important to note that KAT modelling is relative and based on the current service; if efficiency savings could be made on the current services, then they would also be able to be made on all other options modelled.** As such it is the costs **difference** that is the relevant output of this work rather than the absolute numbers.

2.1.1 The Enhanced Baseline

The enhanced baseline is created to ensure that a relevant and fair comparison is made with the current system. The current service has a slightly uneven working pattern. As such the enhanced baseline assumes that work is undertaken over an even working day of 7 hours. This results in a slight reduction in collection cost and reflects a more relevant "as is" picture if the current service carried on. It should be noted however, that the enhanced baseline does not address any other service inefficiencies. It is important to note that if the current system can be made more efficient then this should be applied to all options so the relative results will still stand.

CCBC are intending to collect food and garden wastes separately in future, so a variant of the enhanced baseline has been modelled to reflect this. In this option, the current combined organic collection via single chamber RCVs is replaced by a separate collection using twin chamber RCVs.

Seasonal garden waste collection variants have been applied to all of the options modelled and these are discussed further in Section 4.1.

2.2 Options Modelled

The future service delivery options are described below:

Fig 5 – Options modelled

Option	Description	Dry		Food		Green	
		Frequency	Vehicles & Containers	Frequency	Vehicles & Containers	Frequency	Vehicles & Containers
Baseline	**Current Service**	Weekly	RCV - Single stream commingled 240l wheeled bin	Weekly	RCV- Combined Food & Green Waste 23lCaddy & Reusable Sacks	Weekly	RCV- Combined Food & Green Waste 23lCaddy & Reusable Sacks
Enhanced Baseline & Separate Organic	**Current Service plus efficiencies & Separate organic waste**	Weekly	RCV - Single stream commingled 240l wheeled bin	Weekly	Twinpack - 23l Caddy	Weekly	Twinpack - Reusable sack
Option 1	**WG Blueprint**	Weekly	RRV - 3x Kerbisde boxes & lids	Weekly	RRV - 23l Caddy	Fortnightly	RCV - Reusable sack
Option1 + Extra Loader	**As WG Blueprint additional loader on dry recyclate collection**	Weekly	RRV - 3x Kerbisde boxes & lids	Weekly	RRV - 23l Caddy	Fortnightly	RCV - Reusable sack
Option 5b	**Multi-Stream**	Weekly	Twinpack 1 - Fibres/Plastics & Cans. Twinpack 2 - Glass/food Reusable sacks & box for glass	Weekly	Twinpack - 23l Caddy	Fortnightly	RCV - Reusable sack
All Options - Fortnightly Residual - RCV 240l wheeled bin							
Run all options with separate food & seasonal garden							
Run all options with high and low commodity prices							
Run all options with 3 weekly & 4 weekly residual waste collection							

2.3 Assumptions

The following assumptions have been made as part of the options modelling process:

2.3.1 Depots

From the indicative modelling work it was clear that any service change would likely require a significant change to the current depot and waste transfer station infrastructure. WRAP is currently working with the authority on a detailed study of depot requirements and from this work, the likely cost of new infrastructure will be determined. In lieu of the results of this study being available, a high level estimate of cost has been produced to enable a comparison of options to be undertaken. However, depot costs used in the model will need to be updated when results of the depot study become available, therefore the final comparative option costs may be subject to change as a result.

In calculating the high level depot costs, the current cost of operating the waste transfer station, along with the contribution towards shared depot costs, have been extracted from the waste budget and are used in the baseline and enhanced baseline models.

It is assumed that for the other options the current transfer station would not be suitable for handling the dry recyclate and food waste collected. However, for these options, the current site would still be used for the deposit and bulking of residual wastes. The cost of operating the transfer station for residual waste only has been reduced by £25,000 to reflect the likely reduction in resources required onsite due to the removal of the dry recyclate stream.

Costs were then estimated for establishing and operating a separate facility for the handling of kerbside collected dry recyclate and food waste. The cost of such a site varies depending on the activities required to be undertaken onsite, however, as the material handling requirements of the alternative options considered are broadly similar, the costs of operating a depot for these options is assumed to be the same. It is assumed that the land used for the example site costed is leased rather than purchased, with the annual lease cost included within the revenue cost.

Fig 6 below shows both capital and revenue costs associated with a typical depot required for each collection option, along with the total annual revenue cost resulting from the operation of the depot.

Fig 6 – Depot costs

Capital Cost (£)			
Item	Baseline	Option 1	5b
Design		25,000	25,000
Geotechnical survey		5,000	5,000
Supervison		10,000	10,000
Concrete yard		400,000	400,000
Enclosed Structure		400,000	400,000
External Bays		60,000	60,000
Baler		150,000	150,000
Plastic & cans Sort		200,000	200,000
Loading Shovel		75,000	75,000
FLT		25,000	25,000
Food Skips		10,000	10,000
Total Capital		1,360,000	1,360,000
Annualised capital	**0**	**155,392**	**155,392**
Revenue Cost (£)			
Land Rent/Lease		60,000	60,000
Staff		125,000	125,000
Maintenance		15,000	15,000
Licenses & Permits		10,000	10,000
Baling Wire		6,000	6,000
Electricity		8,000	8,000
Loading shovel running costs		8,000	8,000
FLT Running costs		6,000	6,000
Other costs/contingency		10,000	10,000
Revenue Cost (excluding capital)	0	248,000	248,000
Total Revenue cost including capital	0	403,392	403,392
Residual Waste - Transfer	178,000	150,000	150,000
Shared depot costs	57,000	57,000	57,000
Total Depots & Bulking	**235,000**	**610,392**	**610,392**

2.3.2 Material Income

The previous models were calculated using material prices obtained at the end of December 2014. It was agreed that the models would be re-run using current material prices.

Material prices were obtained from the WRAP Material Pricing Report (MPR) for the month of October 2015, with the mid-point values for each waste stream used.

In addition to re-modelling with updated material prices, the effect that variations to prices would have on overall cost is examined by modelling using material prices 30% greater and 30% lower than those used in the core models.

Fig 7 – Material prices used in model

Material	Core	High	Low
Paper	-75	-97.5	-52.5
OCC	-72.5	-94.25	-50.75
Mixed plastics	-45	-58.5	-31.5
Glass	-5	-6.5	-3.5
Steel	-40	-52	-28
Aluminium	-610	-793	-427
Twin Stream			
Fibres (loose)	-50	-65	-35
Containers (inc Glass - Loose)	35	23	47
Fibres (bagged)	-35	-50	-20
Containers (inc glass - bagged)	50	38	62

Effect on MRF gate fees

It is acknowledged that commodity prices also affect MRF gate fees. Therefore MRF gate fees were varied as part of the sensitivity modelling.

It was assumed that the MRF gate fee is made up of an operating cost (i.e. labour, capital recharges, maintenance, energy use, profit etc.) less the income received from the sale of recyclate to the market.

The 'operating cost' was estimated by taking the current gate fee and subtracting typical incomes from the sale of material processed during the same period (material prices taken from MPR).

For the sensitivity modelling, higher material incomes would result in lower MRF gate fees (i.e. greater income offsetting more of the operating cost) whilst lower material incomes would result in a higher gate fee. The same +/- 30% range of material prices was used.

Fig 8 below details the adjusted MRF gate fees used in the model.

Fig 8 – Adjusted MRF gate fees

Adjusted MRF Costs	Core	High	Low
Commingled dry	85	72	98

2.3.3 Vehicles

A range of vehicles were used in the modelling.

For consistency, the capital cost of vehicles for all options modelled are annualised over 7 years.

RCV

Based on Dennis chassis, single chamber compacting body with 16.7 m^3 capacity.

RCV - Split back

Based on Dennis Chassis, vehicle comprises of twin chamber compacting body with total capacity of 16.2m^3. Larger compartment 65% of total volume, smaller compartment 35%.

Resource Recovery Vehicle - RRV

A Romaquip Kerb sort multi compartment vehicle, with compaction for card and plastic.

Following work undertaken by WRAP, since 2007, RRVs have been developed as an alternative to stillage and Kerbsider type collection vehicles. Standard RRVs are mounted on 12 tonne chassis and are able to load on either one or both sides. They are typically crewed by a team of driver plus one loader.

Separate Food Waste/AHP vehicle

Terberg Plastic Bodied Utility Vehicle (PBUV). Non compacting body constructed from a polypropylene material. Mounted on 7.5t chassis with body volume of 7.5 m3.

Vehicle capacity

For the RRV vehicles an analysis was undertaken as to which compartments within the vehicle were rate limiting, and therefore the likely overall capacity of the vehicle was calculated.

From a detailed specification obtained from the manufacturer, the volumes of the internal compartments within the vehicle were deduced.

It is acknowledged that not all of the available volume within the compartments can be used, therefore the useable volume for each compartment was estimated.

Based on the density and the likely yield of materials collected, it is possible to calculate the number of households that can be collected from before a compartment is full.

Clearly, once a compartment is full the vehicle will need to return to the bulking station to be emptied even if space exists in the other compartments. It is likely therefore that the utilisation of available space within the vehicle will be significantly less than 100%.

From the analysis carried out (see fig 9) it can be seen that typically, the rate limiting compartment on the vehicle will be Cardboard. The analysis would suggest that the vehicle would need to be emptied after passing 582 properties. The analysis would also suggest that at this point 64% of the nominal volume of the vehicle is used.

The % utilisation figure is used within the KAT model to determine the capacity of the collection vehicle. In order to be conservative, a lower utilisation figure of 60% was used in the KAT model.

Fig 9 – Analysis of rate limiting compartment RRV

Material	Nominal Volume (m^3)	Usable volume (m^3)	Density (kgm^{-3})	Compaction Ratio	Mass (kg)	Av Yield per hh (kg)	Households collected	Mass at hh limit (kg)	Volume used (m^3)
Paper	4.4	3.6	300	1	1,080	1.24	873	720	2.4
Card	4.8	4	60	2	480	0.83	582	480	4.0
Plastics & Cans	19	17	31	1	527	0.67	783	392	12.6
Glass	4.9	4	400	1	1,600	1.09	1,469	634	1.6
Food	2.6	2.2	500	1	1,100	1.57	700	914	1.8
Additional (textiles)	1.5	1							1.0
Total	37.2	31.8			4,787	5.40		3,139	23.4
						Households collected at limit			582
						% Utilisation (Usable volume)			75%
						% Utilisation (Nominal volume)			64%

2.3.4 Yield

Mass data was provided by CCBC/WasteDataFlow for the current service for calendar year 2014:

Fig 10 – Mass Collected

Material	Household	Non-Household
Commingled Dry	17,884	5,592
Commingled Organic	11,534	0
Refuse	27,635	3,352

Commercial residual waste is co-collected with the household waste. Recent work undertaken on behalf of CCBC estimates the mass of commercial residual waste to total 3,352 tonnes. For the purposes of the modelling it is assumed that this arrangement would remain across all of the options modelled. The non-household portion of the waste stream is therefore included in the KAT models. It is recognised that the collection of commercial residual waste will incur both costs (from collection and disposal) and income (from commercial waste customers) both of which are included in the modelling results.

The non-household element of kerbside dry recycling recorded in WDF is not collected by the main collection fleet, so is excluded from the KAT models.

In order to model the additional options, it is necessary to estimate the yield and composition of the commingled waste streams currently collected.

Dry Recycling

Data from WDF Q100 put the average MRF contamination rate for the commingled dry recycling stream at 13.68%

It is therefore assumed that of the 17,884 tonnes of commingled material collected at the kerbside, 15,438 tonnes is target material. For options 1 to 5 it is assumed that the mass of target material collected remains constant, but that non target material collected with it, but subsequently rejected, varies (i.e. 0.5% reject rate assumed for separate collections, 10% for three stream).

The mass of dry recyclate collected at the kerbside will be less for Kerbside sort options and three stream options compared to the baseline commingled service. This is due to a reduction in the amount of contamination collected along with the target material compared

to the baseline commingled service). However the amount collected and subsequently recycled (i.e. the target material) will be the same for all options.

It is also assumed that non-target material previously collected via the commingled system that would not be collected in KSS or twinstream systems would instead be collected via the domestic residual service. Therefore, for all of the core options modelled, the overall total waste arisings are constant.

The yield calculation is dependent on the reported MRF reject rate being as accurate as possible. The MRF reject rate will be due to both the collection of non-target material and from target material being incorrectly or incompletely sorted at the MRF.

An overall yield of 199 kg per household is calculated by this method.

Whilst this figure in absolute terms is higher than a number of other Welsh authorities which operate a kerbside source segregated collection, it should be viewed in context.

CCBC have the 3rd highest municipal waste arisings per household in Wales. When yield from kerbside dry recyclate of 199kg is taken as a percentage of total MSW, we get a figure of 16.06% (15445 tonnes from Total MSW 96,180)

For comparison, other authorities in South Wales operating a source segregated collection are achieving similar yields:

Newport – 194kg per household, 17.88%
Bridgend – 177kg per household, 16.14%

In addition, early data from Merthyr Tydfil further supports the premise that the yield modelled is achievable with source segregated collection. Based on a 13 week sample of data following the recent service change, the overall annual yield of kerbside dry recycling can be estimated:

Merthyr Tydfil – 214 kg per household

Based on the total municipal waste arisings for 2014/15, a kerbside dry recyclate yield of 214 kg per household per year as calculated would represent 18.4% of total MSW, a figure in excess of that modelled for CCBC.

From the available data, the 199kg dry recycling yield calculated for CCBC, which represents 16% of total municipal waste arisings for the authority, is slightly lower than the yields seen in Newport (17.9%) and Merthyr Tydfil (18.4%) , and broadly similar to that seen in Bridgend (16.1%).

Composition

In order to model separate collection, it is necessary to determine the composition of the commingled dry recycling stream. This can be estimated based on outputs from WDF Q100:

Fig 11 – Composition data

Q100 Composition Data	
Material	%
Glass	25%
Paper & Card	47%
Metal	4%
Plastics	11%
Reject	14%

Using data from WDF Q100 and data gathered by WRAP from WDF and elsewhere, it is then possible to estimate composition of the mixed waste streams shown in the above table.

Fig 12 – Composition of mixed recyclate streams

Composition of mixed streams	
Paper & Card	
Paper	60%
Card	40%
Pastics	
Film	15%
Bottles	50%
Rigid	35%
Cans	
Steel	71%
Aluminium	29%

Since the first iteration of the model, additional data has become available from other Welsh local authorities, and from the initial indicative results of the national waste composition study, which would suggest that the proportion of cardboard within the mixed paper and card stream is likely to be higher than that modelled initially.

Given that cardboard is significantly less dense than paper, the effect of additional cardboard on collection modelling could be significant, having higher volumes of cardboard in the dry recyclate stream is likely to require more resources to collect it.

Therefore the composition of the dry recyclate stream has been updated in the latest models to reflect the increasing amounts of card collected.

From the available data, it is possible to estimate the overall kerbside yield for each material stream:

Fig 13 – Yields used in KAT models

Material	Current		Option 1		Option 5	
	Total	kg/hh	Total	Kg/hh	Total	kg/hh
Paper	4,995	64	4,995	64	4995	64
OCC	3,330	43	3,330	43	3,330	43
Film	295	4	295	4	295	4
Bottles	984	13	984	13	984	13
Rigid	689	9	689	9	689	9
Glass	4,396	57	4,396	57	4,396	57
Steel	534	7	534	7	534	7
Alu	214	3	214	3	214	3
Reject	2,446	32	77	1	1,104	14
Total Dry (collected)	**17,884**	**230**	**15,515**	**200**	**16,542**	**213**
Total Dry ex reject	**15,438**	**199**	**15,438**	**199**	**15,438**	**199**
Residual (HH)	27,635	356	30,004	387	28,977	373
Residual (trade)	3,352	43	3,352	43	3,352	43
Food	6,344	82	6,344	82	6,344	82
Green	5,190	67	5,190	67	5,190	67
Total Organic	**11,534**	**149**	**11,534**	**149**	**11,534**	**149**
Total Arisings	**60,405**	**778**	**60,405**	**778**	**60,405**	**778**

3 weekly & 4 weekly refuse

The effect of additional residual waste restrictions has also been considered in the modelling. Based on results obtained from other local authorities who have introduced 3 weekly and 4 weekly residual waste collections, material yields have been varied to reflect likely uplifts in both dry recyclate and food waste as a result of less frequent residual waste collection.

However, a number of other factors also need to be taken into account:

AHP Collection

It is likely that a separate collection service for Absorbent Hygiene Products (AHP) would be required for 3 & 4 weekly refuse options.

Yield is estimated based on the amount of this type of material within the residual waste stream and the frequency of residual waste collection (i.e. more material collected when 4 weekly residual collections in place compared to 3 weekly residual)

Fig 14 – AHP Yield calculation

AHP Collection - Yield	
Total Residual (household)	27037
AHP as % of Residual (from comp analysis)	11.50%
Mass AHP	3109
Capture %	40%
Mass for collection	1244
Collection Weeks (3 weekly Residual)	17
Weeks AHP Collected	35
Mass separately collected	837
Collection Weeks (4 weekly Residual	13
Weeks AHP Collected	39
Mass separately collected	933

Separate trade waste collection

Given that trade waste is currently co-collected with residual waste, it is likely that a separate collection vehicle would be required to service existing trade customers during weeks where no household residual collections are planned.

It is estimated that approximately half of the current trade waste would be collected on a dedicated vehicle.

The updated trade waste arising figure of 3,352 tonnes, estimated as part of the recent trade waste project undertaken at CCBC, has been used.

Diversion of material to HWRC

It is likely that some material would be diverted to HWRC as a result of increased residual restriction. This has been estimated as 4% of total household residual waste for 3 weekly and 6% for 4 weekly collections.

Waste Reduction effect

Data from other authorities operating 3 & 4 weekly collections would suggest that a reduction in overall waste arisings, albeit small, will occur as a result of introducing less frequent residual waste collection. A reduction factor of 2% of total household residual waste for 3 weekly collection and 4% for 4 weekly collections has been applied.

The effect of these changes can be seen in figs 15 & 16 below.

Fig 15 – Material yields 3 weekly residual

Material	Option 1 - 3W		Option 5 - 3W	
	Total	kg/hh	Total	Kg/hh
Paper	5,245	68	5,245	68
OCC	3,830	49	3,830	49
Film	310	4	310	4
Bottles	1,132	15	1,132	15
Rigid	792	10	792	10
Glass	4,528	58	4,528	58
Steel	614	8	614	8
Alu	247	3	247	3
Reject	83	1	1,217	16
Total Dry (collected)	**16,781**	**216**	**17,914**	**231**
Total Dry ex reject	**16,697**	**215**	**16,697**	**215**
Residual (HH)	27,210	351	26,077	336
Residual (trade)	1,676	22	1,676	22
Separately collected trade	1,676	22	1,676	22
Diverted Residual to HWRC	1,105	14	1,105	14
Waste reduction factor	553	7	553	7
Food	7,612	98	7,612	98
Green	5,450	70	5,450	70
Total Organic	**13,062**	**168**	**13,062**	**168**
Total Arisings	**59,852**	**771**	**59,852**	**771**

Fig 16 – Material yields 4 weekly residual collection

Material	Option 1 - 4W		Option 5 - 4W	
	Total	kg/hh	Total	Kg/hh
Paper	5,495	71	5,495	71
OCC	4,329	56	4,329	56
Film	340	4	340	4
Bottles	1,279	16	1,279	16
Rigid	896	12	896	12
Glass	4,836	62	4,836	62
Steel	694	9	694	9
Alu	279	4	279	4
Reject	91	1	1,331	17
Total Dry (collected)	**18,238**	**235**	**19,478**	**251**
Total Dry ex reject	**18,147**	**234**	**18,147**	**234**
Residual (HH)	24,859	320	23,619	304
Residual (trade)	1,676	22	1,676	22
Separately collected trade	1,676	22	1,676	22
Diverted Residual to HWRC	1,658	21	1,658	21
Waste reduction factor	1,105	14	1,105	14
Food	8,247	106	8,247	106
Green	5,709	74	5,709	74
Total Organic	**13,956**	**180**	**13,956**	**180**
Total Arisings	**59,300**	**764**	**59,300**	**764**

3.0 Core results

The following section seeks to present the headline results and draw out the key findings. The costs are broken down as follows:

Vehicle Capital – This is the annualised capital cost of the core fleet used in each option, based on financing over 7 years. Tipper vehicles and spare vehicles are accounted for separately.
Operating Costs – This includes all costs relating to direct operational staff (drivers and loaders), Fuel and vehicle maintenance costs and standing charges relating to vehicles.
Containers – On going replacement costs for existing containers (i.e. 240l residual bins) are included in the KAT model, however it is assumed that there is no repayment of capital required for the existing containers. In options where new containers are required (e.g. boxes for kerbside sort) capital repayment costs are included within the model in addition to ongoing replacement costs.
Restricted access vehicles – All costs relating to restricted access routes are accounted for, including annualised capital costs for vehicles, staff costs, fuel and vehicle maintenance.
Spare vehicles – Annualised capital costs for spare vehicles are included along with maintenance costs and standing charges.
Bulking costs – costs relating to operation of bulking facilities.
Dry Treatment – This includes the treatment cost of dry recyclate collected, including any income received from sale of material.
Organic Treatment – This includes costs relating to treatment of food & garden waste, based on current arrangements.
Residual Disposal –this includes the treatment and disposal costs relating to residual waste collected, along with cost of disposal of rejected material where applicable.
Trade Income – Income from trade waste service included as trade residual co-collected with household waste
Trade Costs – Additional costs resulting from operation of trade waste service
Supervision and Overheads -
Supervision and management is assumed to be constant across all option, Figures supplied by CCBC used.

3.1 Options Modelled

Option 1 follows the WG Blueprint. Option 5 is a 3 stream configuration, with material presented in a combination of boxes and reusable bags for collection.

Table in Fig 17 shows the revenue cost for the core options modelled. As can be seen, Option 1 exhibits the lowest cost of the options modelled, £1.14m less than the enhanced baseline option.

The variant of Option 1 with additional loader does exhibit higher costs than Option 1 with a single loader, approximately £180,000 more, but cost calculated for this option is still approximately £330,000 lower than the three stream collection modelled in 5b.

Whilst collection costs for option 1 are around £750,000 more expensive than the enhanced baseline, the cost of processing the collected material is far less in option 1. The enhanced baseline sees costs in excess of £1.5m resulting from MRF gate fees & haulage costs compared to an income of just over £870,000 is seen in Option 1 from the sale of separately collected dry recyclate.

A similar pattern is seen in Option 5, with higher collection costs, in excess of those modelled in the enhanced baseline, offset by income generated from the sale of the collected material (as opposed to MRF treatment costs).

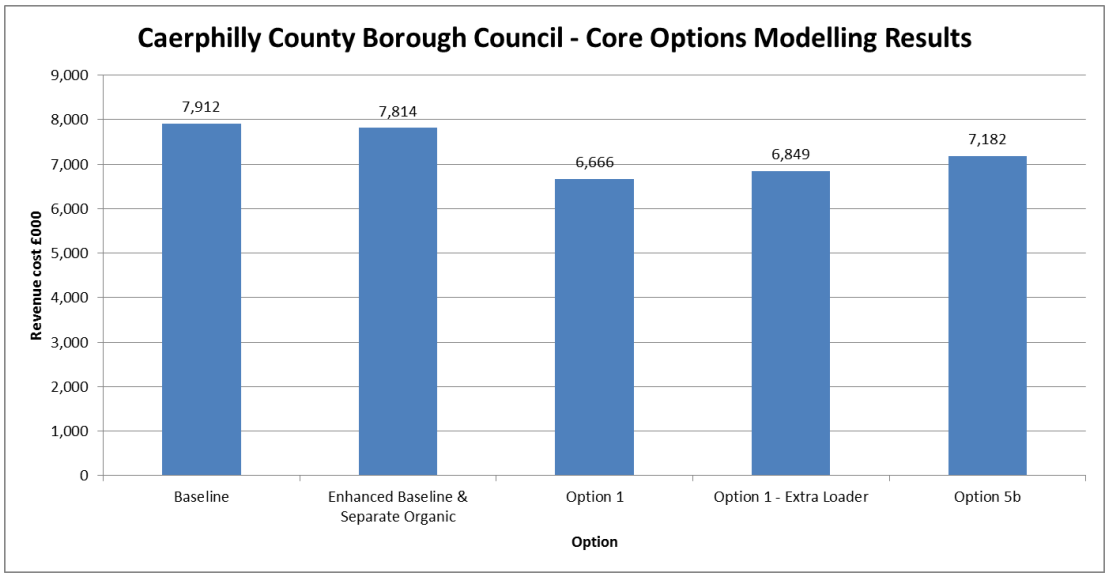
Incomes in option 5 are lower than those in option 1, with just over £720,000 income generated. This is largely due to the reduced income realised from the sale of mixed paper and card compared to the sale of separately collected paper and card fractions in option 1.

Work currently being undertaken by WRAP examining the potential options for bulking facilities and depots for CCBC will also examine whether potential exists to separate cardboard from one of the mixed streams onsite, thus increasing overall income from sales. The additional cost of this activity, if deemed technically possible, will need to be considered alongside the potential increased income.

Fig 17 – KAT modelling results – Core options

Revenue Expenditure	Baseline	Enhanced Baseline	Option 1	Option 1 - Extra Loader	Option 5b
Annual Capital - Vehicles	611,870	633,919	775,665	700,067	799,289
Containers	118,582	118,582	202,592	202,592	301,958
Operating costs	2,527,720	2,572,000	3,017,241	3,305,249	3,313,662
Supervision	370,644	370,644	370,644	370,644	370,644
Overhead	447,877	447,877	447,877	447,877	447,877
Restricted Access Collections	303,959	303,959	331,448	331,448	330,782
Spare Vehicles	240,874	244,874	294,638	265,604	289,020
Total collection	**4,621,526**	**4,691,855**	**5,440,104**	**5,623,481**	**5,853,232**
Bulking Costs	235,000	235,000	610,000	610,000	610,000
Treatment - Dry	1,520,140	1,520,140	-878,841	-878,841	-720,651
Treatment - Organic	645,904	478,084	478,084	478,084	478,084
Disposal - Residual	1,664,932	1,664,932	1,792,201	1,792,201	1,737,019
Income - Trade	-813,000	-813,000	-813,000	-813,000	-813,000
Costs - Trade	37,000	37,000	37,000	37,000	37,000
Total	**7,911,502**	**7,814,011**	**6,665,548**	**6,848,925**	**7,181,685**
Variation from E Baseline	97,491	0	-1,148,462	-965,085	-632,326

Fig 18 – KAT modelling results – core options



Daily Pass Rates

One of the key outputs from the KAT model will be the number of vehicles/crews required for each collection option modelled.

This is affected by a number of factors, such as the mass and density of material set out for collection, the number of households setting out waste for collection in any given week, the capacity of the collection vehicle, crew size, distances travelled, amount of productive and non-productive time in a day, current productivity, time required to empty different waste container types etc.

The KAT model takes all of these factors into consideration when performing the necessary calculations to quantify the level of resources required for each option modelled.

Once the number of vehicles has been calculated, it is possible then to work out the daily average pass rate for each element of the service (i.e. The average number of households each vehicle drives past in a day)

In light of the modelling results presented to the authority, concerns were raised about how achievable the modelled levels of productivity were for the WG Blueprint options (Option 1).

It is useful therefore to compare the pass rates as calculated by the KAT model for CCBC with other authorities operating similar collection systems.

Table in fig 19 below shows the daily average pass rates for a number of local authorities.

Fig 19 – Daily pass rates

Council	Daily Pass rate	Crewing
Newport	765	D+1
Anglsey	680	D+1
Bridgend	750	D+1
Merthyr Tydfil	540	D+1
Blaenau Gwent	711	D+2
Conwy	622	D+2

It can be seen that the calculated pass rate of 616 households per day (for driver + 1) for CCBC is comparable to a number of the authorities sampled, lower than the pass rates achieved by Newport, Anglesey and Bridgend, but higher than those seen in Merthyr Tydfil. Anecdotally, it does appear that now the new service has had time to bed in, some spare capacity exists in the Merthyr Tydfil rounds. With collection rounds routinely finishing ahead of time, potential may exist for a reduction in collection fleet numbers, with a resultant increase in the average daily pass rate.

The daily pass rate of 725 households when the driver + 2 configuration as modelled is broadly similar to that of Blaenau Gwent and is lower than that seen in Bridgend and Newport who operate the service with a single loader. The figure modelled does however exceed that seen in Conwy.

Due to the many and varied factors affecting productivity, it is difficult to compare figures directly with other authorities, but the figures calculated do appear to be in the range of what could realistically be achieved.

4.0 Sensitivities Modelled

4.1 Seasonal garden waste

The current garden waste service is run weekly all year round, largely due to the fact that garden waste is co-collected with food. Garden waste is extremely seasonal and in winter months very little is produced by households. Many authorities either suspend their service or reduce the frequency of collection over the winter months as a result.

In Options 1 & 5, garden waste is collected on a fortnightly basis in a dedicated vehicle; consequently, it is relatively straightforward to suspend the service over the winter months.

Following discussions with CCBC it was felt that the existing brown recycling bin would not be suitable for garden waste collection due to the potential for increased contamination.

It as therefore assumed that householders would continue to be provided with reusable sacks for presentation of garden waste. It should be noted however that WRAP do have concerns regarding manual handling for garden waste collection using this type of container.

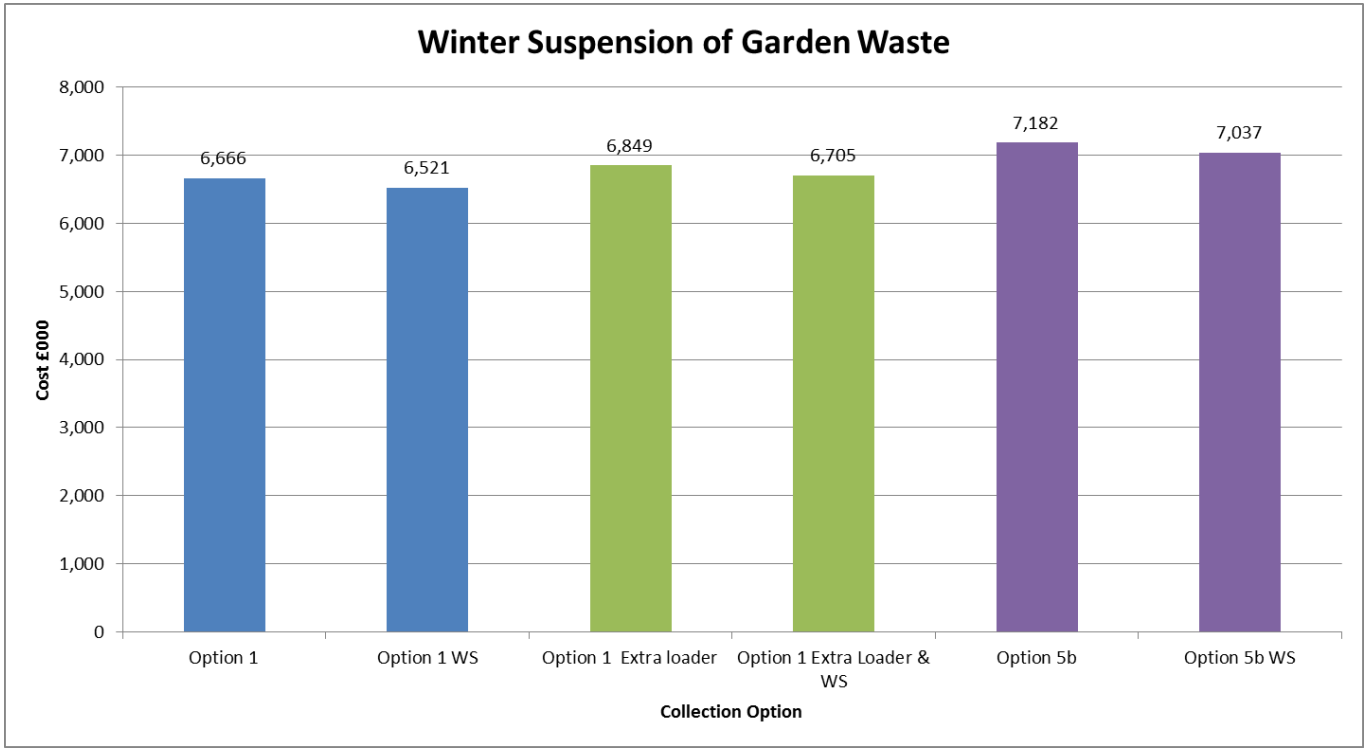
The model has been adjusted to take into account the difference in cost of providing sacks rather than wheeled bins. The collection of bagged materials is likely to be marginally quicker than a corresponding service using bins, but as it is difficult to estimate the resource required for collection of garden waste due to the extremely seasonal nature of collections, the same level of resource has been modelled as previously.

The cost of providing a weekly collection of garden waste for options 1 and 5 has not been modelled, however it is estimated that an additional 2-3 RCVs and crew would be needed, adding approximately £300,000 to the core model cost.

The projected costs of options with suspended garden waste are shown in the chart in fig 20 below, alongside the cost of the corresponding core option.

Fig 20 – Winter suspension of garden waste

Option	Option 1	Option 1 WS	Option 1 Extra loader	Option 1 Extra Loader & WS	Option 5b	Option 5b WS
Cost £000's	6,666	6,521	6,849	6,705	7,182	7,037



It can be seen that in all cases a similar cost saving of approximately £140,000 could be realised from suspending garden waste collections over the winter months.

It is assumed that all labour savings can be realised, though this will require appropriate planning and flexibility. Vehicles will still incur standing cost when not used (insurance, tax etc.), however fuel and other running costs will not be incurred.

4.2 Additional loaders for blueprint options

As requested by CCBC, the blueprint option, Option 1, was modelled with an additional loader per vehicle.

In addition to modelling collections with an extra loader, the model was also run with an additional 0.5 loaders per vehicle. This was to reflect the option of retaining a driver +1 configuration for half of the collection rounds and the operation of driver +2 for the rest.

Fig 21 below shows the relative costs of the driver +1, driver + 1.5 and driver +2 configurations.

Fig 21 – Cost comparison – Additional loaders Option1

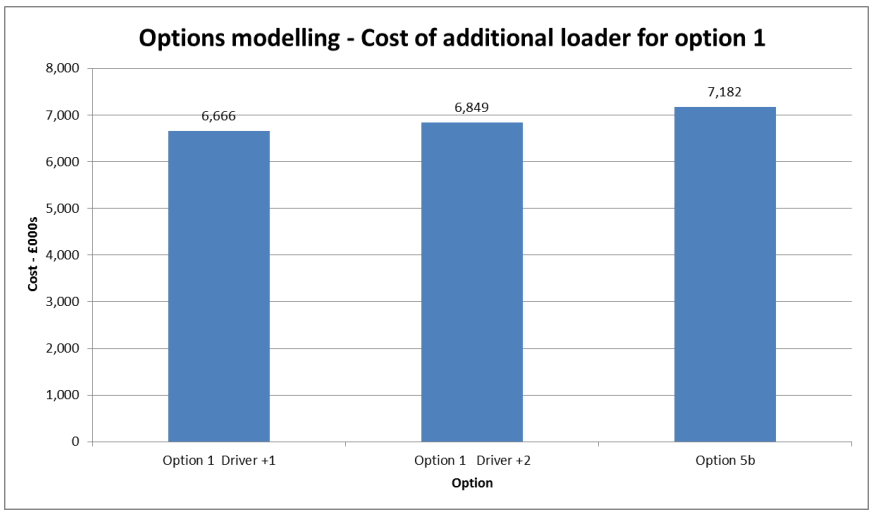
	Option 1 Driver + 1	Option 1 Driver + 1.5	Option 1 Driver + 2
Cost - £000s	6,666	6,710	6,849
Difference from core	-	44	183
Vehicles	24.4	21.8	20.7
Av daily pass rate	616	688	725

The addition of a second loader does increase collection costs; however the increased productivity from having a second loader on the vehicle increases the daily pass rate of the collection vehicle and thus reduces the number of vehicles required overall.

The model was modified with a zero figure assumed for driver contribution (previously 10%). The resulting reduction in productivity means that more vehicles and crew would be required than previously modelled. The daily pass rate dropped from 761 households per day to 725, with an additional vehicle needed as a result. Consequently, the cost of this option increased relative to the core option. However, as was the case previously, the overall cost modelled for option 1 with the additional loader is still less than that calculated for Option 5.

Fig 22 – Cost comparison – Additional loader

	Option 1 Driver +1	Option 1 Driver +2	Option 5b
Cost - £000s	6,666	6,849	7,182



4.3 Effect of commodity prices

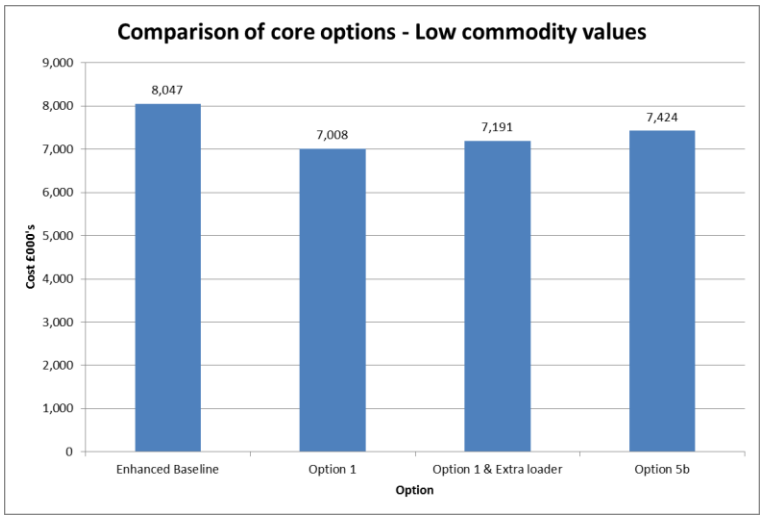
The original commodity prices used in the model were updated with the latest data available from the WRAP Materials Pricing Report (MPR). The figures used were from October 2015, and in general prices are lower for most of the materials modelled compared to the previous data used. This means that overall service costs are higher across all of the alternative collection options modelled, however, the relative positions of the options considered is largely unchanged.

The effect of possible future variations to the commodity prices modelled was also examined.

4.3.1 Low commodity prices

Using the methodology described previously in section 2.3.2 commodity prices in the modelling were reduced by 30% and the adjusted MRF gate fee was used. Fig 23 below shows the costs of core options modelled with low commodity prices:

Fig 23 – Kat modelling results – Low commodity values

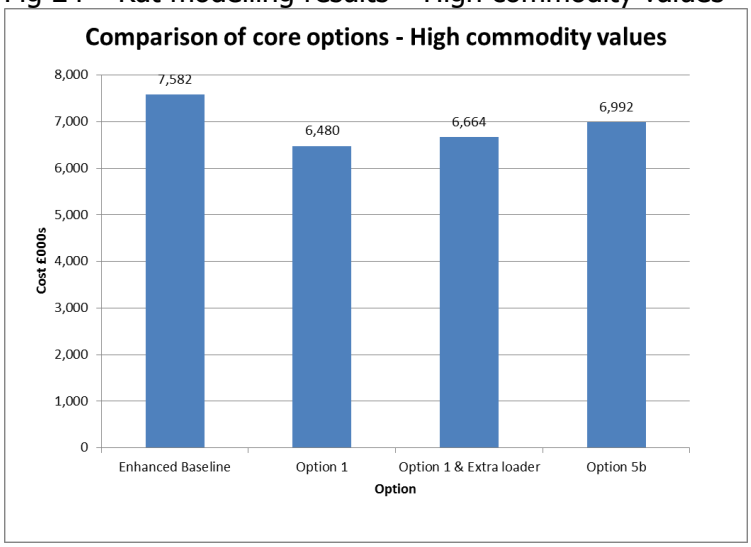


Overall, reduced incomes from the sale of materials result in increased service costs for all of the options modelled. Option 1 remains significantly cheaper than the enhanced baseline, though the difference is reduced to just over £1m. Option 1 also remains the lowest cost option overall, £416,000 less than option (5b). When the variant of option 1 with an additional loader is considered, the differential is reduced to £233,000.

4.3.2 High commodity prices

Again, using the same methodology, commodity prices were increased by 30% compared to those used in the core model. The updated MRF gate fee was also used. Results are shown in fig 24 below.

Fig 24 – Kat modelling results – High commodity values



Increased income from the sale of recyclate resulted in lower costs overall. Option 1 was the lowest cost option overall, approximately £1.1m cheaper than the enhanced baseline. The difference between option 1 and option 5b is more pronounced, with option 1 costing £512,000 less. The addition of a second loader reduces this differential to £328,000.

Ultimately, whilst commodity prices have a significant impact on overall service costs; the relative position of the options being compared remains unchanged.

It should also be noted that high quality separated material is likely to command higher prices and will be easier to sell during periods of low market prices.

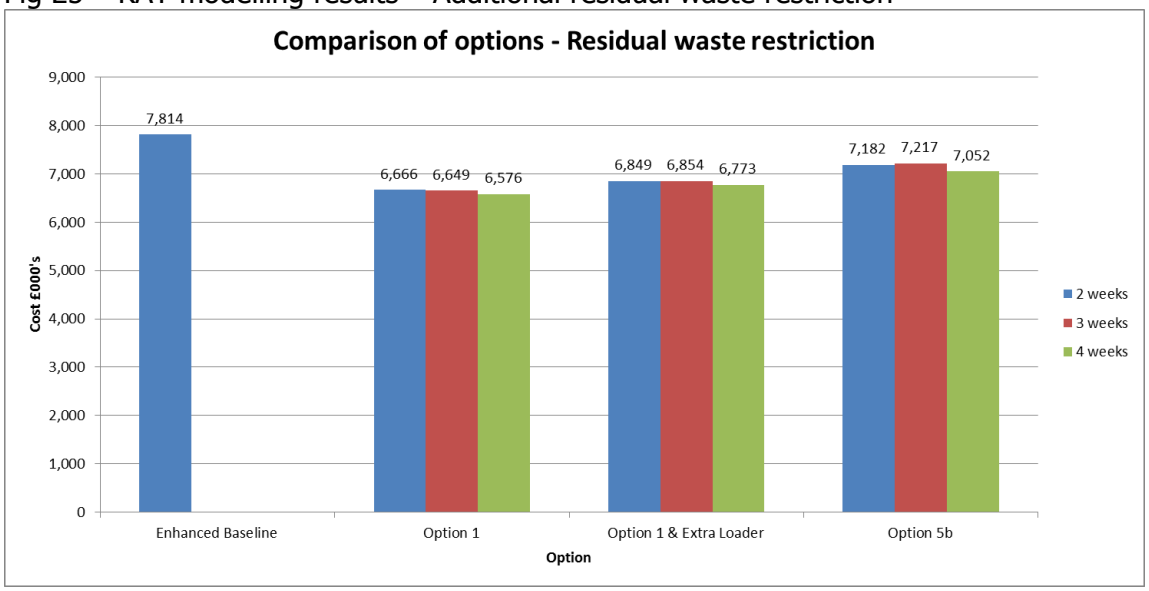
4.4 Additional restriction to residual waste

3 & 4 weekly collection

The core options were modelled with increased yields arising from the less frequent collection of residual wastes.

The chart on fig 25 below shows the cost of the core options as modelled with 2 weekly, 3 weekly and 4 weekly refuse collection.

Fig 25 – KAT modelling results – Additional residual waste restriction



For both 3 and 4 weekly collection the increase in yield of food waste and dry recycling results in an increase in resources required to collect the material. The increased average household yield means that vehicles will fill quicker and the collection rounds themselves will be slower.

For example, when considering Option 1, with current residual waste restriction, the collection vehicle will be full after passing 582 properties, and overall a total of 616 households will be passed per day by each vehicle (requiring 2 trips to the bulking facility). However when the frequency of residual waste collection is reduced to once every 4 weeks, the increased material yield means that the vehicle will, on average, be full after passing 447 properties, and overall the additional work required to collect the additional waste means that the daily pass rate will also be reduced to 553 households. The number of visits each vehicle is required to make to unload at the bulking facility remains at 2 per day, but the lower daily pass rate due to the increased yield means that more vehicles are required overall.

To some degree, this increase in collection cost is offset by the reduction in frequency of residual waste collection and the resulting reduction in the number of residual waste collection vehicles and crews required.

The uplift in recycling yields, and consequent reduction in residual waste collected also results in savings from lower disposal costs and higher incomes from the sale of material, though there is also a significant increase in the treatment cost associated with food waste.

In general terms, the net cost of treatment and disposal of collected material decreases with reduction in frequency of residual waste collection.

However, the reduction in frequency of residual waste collection requires the establishment of collection services for Absorbent Hygiene Product (AHP), and it is assumed that a separate trade waste collection vehicle would be required to collect from premises during periods where no residual waste collections are made.

AHP costs

Service provided using a caged tipper or similar vehicle. Crewing level is assumed to be a driver + 1 loader.

Fig 26 – AHP service cost

Residual Frequency	Vehicles required	Annualised capital	Bags	Operating cost	Total
4 weekly	4.3	35,436	22,198	296,704	354,338
3 weekly	3.8	28,349	22,198	257,776	308,323

CCBC suggest that separate AHP collection may not be required for 3 weekly residual collection options. In this case, the cost of operating the collection, £308,323 can be removed from the overall option cost. This will not affect the relative position of the options being considered as the same cost will need to be removed from all, however, the overall service cost would be lower than that calculated for 4 weekly collection of residual waste.

4 weekly Residual collection – vehicle numbers

Some concerns were raised by CCBC regarding the number of vehicles calculated for the collection of residual waste for the 4 weekly residual collections.

For example, in option 1, the number of RCVs required reduces from 6.5 to 3.7 vehicles.

This is partly due to the reduction in frequency itself, but also due to the additional diversion of material from the residual waste stream to the food and dry recyclate collection services. Some material previously collected, namely a portion of commercial waste and AHP will also move to dedicated collection rounds, further reducing the mass of residual waste to be collected.

With the current fortnightly residual collection, for option 1 it has been calculated that 32,703 tonnes of residual waste would be collected by 6.5 vehicles. This equates to an average mass per vehicle per day of 19.35 tonnes.

The average daily pass rate per vehicle for this collection is calculated as 1,159 properties per day.

With a 4 weekly collection, the mass collected is reduced significantly to 22,361 tonnes. With 3.7 collection vehicles, this equates to 23.2 tonnes per day per vehicle. The daily mass per vehicle is higher than modelled for the 2 weekly residual collection, however it is assumed that due to the less frequent collection, both set out rate and the average mass of material presented by the householder per collection is increased. This results in significantly shorter rounds, albeit with heavier average bin weights (round is reduced to 954 properties per day).

Trade Waste Costs

Fig 27 – Additional trade round cost

Additional Trade round	
Resource	Annual cost
26t RCV	42,996
Driver	29,675
Loader	27,028
Total	99,699

The additional costs from these services mean that overall, the difference in costs between the core options and those for 3 & 4 weekly refuse options are relatively small.

Cost of 3 weekly options are slightly higher than the corresponding core option, whilst the 4 weekly options are generally slightly lower in terms of cost when compared to the core options.

Whilst there may be little benefit in terms of cost, the move to less frequent residual waste collection as modelled does have a beneficial effect on overall recycling rate.

Based on the arisings used for the modelling, and from recycling rates during the same period, the uplift to overall recycling rate resulting from the expected increased yield of dry recyclate and food waste can be calculated.

Moving to a three weekly collection of residual waste would result in an increase of 3.2 percentage points to the overall recycling rate. Whilst moving to a 4 weekly collection cycle would result in an increase of 8.5 percentage points.

Fig 28 – Recycling rate uplift – additional residual waste restriction

	Total Dry Reuse (tonnes)	Total Dry Recycling (tonnes)	Total Composting (tonnes)	Total Municipal Waste (tonnes)	Average Dry Reuse Rate	Average Dry Recycling Rate	Average Composting Rate	Average Reuse, Recycling & Composting Rate	Difference
Baseline	160	32327	23218	99575	0.16%	32.46%	23.32%	55.94%	
Adjustment for 3 weekly	0	1259	1528	-624					
Revised output	160	33586	24747	98951	0.16%	33.94%	25.01%	59.11%	3.17%
Adjustment for 4 weekly	0	2709	1851	-1118					
Revised output	160	36295	26598	97832	0.16%	37.10%	27.19%	64.45%	8.51%

4.5 Trolibocs

As a sensitivity, the cost of providing Trolibocs to all householders for Option 1 was modelled. Trolibocs are significantly more expensive than providing standard boxes and lids, with a unit price of around £28 (as obtained from WRAP Container framework) compared to just under £10 for 3 standard boxes.

Ultimately, provision of Trolibocs all households would have a capital cost of £2.1m. Written off over 10 years, this would represent an additional revenue cost of £154,000 per annum over and above that calculated for the core blueprint option.

5.0 Conclusions and Recommendations

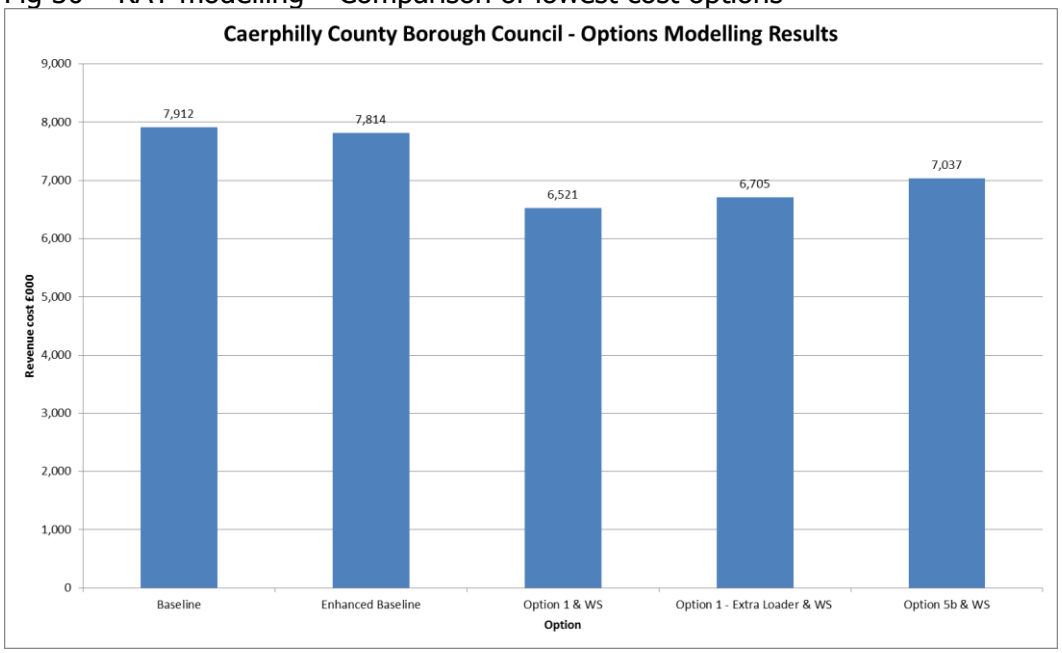
From the modelling work it is possible to draw a comparison of costs across the range of options modelled. From the sensitivities modelled, it is shown that a fortnightly collection of green waste, coupled with a suspension of that service over the winter months will realise a cost saving for all options.

Therefore, to ensure a fair comparison, the table and chart below show the costs for all options with this configuration for green waste.

Fig 29 – KAT Modelling results – comparison of lowest cost options

Revenue Expenditure	Baseline	Enhanced Baseline	Option 1 & WS	Option 1 - Extra Loader & WS	Option 5b & WS
Annual Capital - Vehicles	611,870	633,919	775,665	700,067	799,289
Containers	118,582	118,582	202,592	202,592	301,958
Operating costs	2,527,720	2,572,000	2,875,290	3,163,298	3,171,117
Supervision	370,644	370,644	370,644	370,644	370,644
Overhead	447,877	447,877	447,877	447,877	447,877
Restricted Access Collections	303,959	303,959	331,448	331,448	330,782
Spare Vehicles	240,874	244,874	294,638	265,604	289,020
Total collection	**4,621,526**	**4,691,855**	**5,298,153**	**5,481,530**	**5,710,687**
Bulking Costs	235,000	235,000	610,000	610,000	610,000
Treatment - Dry	1,520,140	1,520,140	-878,841	-878,841	-720,651
Treatment - Organic	645,904	478,084	461,994	461,994	461,994
Disposal - Residual	1,664,932	1,664,932	1,806,145	1,806,145	1,750,963
Income - Trade	-813,000	-813,000	-813,000	-813,000	-813,000
Costs - Trade	37,000	37,000	37,000	37,000	37,000
Total	**7,911,502**	**7,814,011**	**6,521,451**	**6,704,828**	**7,036,994**
Variation from E Baseline	97,491	0	-1,292,559	-1,109,182	-777,017

Fig 30 – KAT modelling – Comparison of lowest cost options



The modelling results indicate that option 1, the WG Blueprint, combined with the suspension of garden waste collections over the winter period, is the lowest cost option.

The cost modelled for this option is around £1.4m per annum less than the baseline option and £1.3m less than the enhanced baseline.

When options 1 and 5 are compared, it can be seen that the cost modelled for option 1 is £516,000 lower than the next lowest cost option (option 5b).

Costs increase with the addition of a second loader to Option 1, reducing the differential in costs with option 5b to £332,000.

All options assume that a similar yield of dry recyclate is collected, and that overall waste arisings remain constant, therefore the performance, in terms of recycling rate, for all the options modelled will be the same.

Sensitivities

In addition to the core options modelling, a number of sensitivities were examined.

Fluctuations in commodity prices

The effect of both high and low commodity prices was examined as part of the modelling. It was shown that commodity prices would have an impact on overall service cost, with low prices resulting in higher overall service costs and conversely, high commodity prices resulting in lower service costs. However, the overall position of the options modelled relative to each other remained unchanged, with option 1 remaining the lowest cost configuration when both high and low commodity prices were modelled.

Additional residual waste restriction

In addition to the current fortnightly residual waste service, options were modelled both with a 3 and 4 weekly residual waste service (using the existing 240l wheeled bin).

The additional yield of dry recyclate and food waste resulting from the additional residual waste restriction required additional resources to collect it, with more vehicles and crew needed for all of the options modelled. The resulting additional costs were offset by reduced disposal costs and increased incomes from the sale of recyclate, along with a reduction in the residual waste fleet. However less frequent residual collection would mean that additional resources would also be needed to provide a collection of AHP and an additional dedicated trade waste round.

Ultimately, moving to less frequent residual waste collection would have little impact in terms of cost, with 3 weekly options exhibiting slightly higher cost than the current restriction and 4 weekly residual resulting in slightly lower costs.

However, there would be an uplift in recycling performance, with 3 weekly residual collection predicted to result in an uplift of 3.2 percentage points and 4 weekly collection resulting in an 8.5 percentage point increase.

Again, the relative position of the options modelled remains largely unchanged when residual waste collection frequency is varied.

The KAT modelling results do indicate that moving from the current commingled system and adopting one of the alternative options modelled would result in cost savings to the authority, with option1, the WG Blueprint, realising the greatest saving.

Reducing the frequency of residual waste collections will not have a great impact on cost, with 4 weekly collections resulting in a small overall cost saving compared to the equivalent core option. However such a move would result in significant improvements to overall recycling rates.

It is recognised that adopting any of the alternative options modelled would require significant capital investment, both in terms of collection vehicles and depot/bulking infrastructure.

WRAP and CCBC are currently examining the depot infrastructure requirements in a separate project, and the results from this work will need to be incorporated in the options modelling once results are available.

Appendix 1 – Supplementary information

Containers

The assumptions made regarding the containers required for each option are provided in Fig 31 below. These assumptions are based upon industry best practice with costs provided by the authority, or where applicable, from the WRAP container procurement framework.

Fig 31 – Container costs

Containers			
Container	Unit cost (£)	Write off period	Replacement rate
240 ltre bin	16.50	10	2%
5 & 23l caddy	2.98	10	4%
kerbside box	3.33	10	4%
Reusable sacks	1.24	5	25%
Poly Sacks	0.03		

Staff

Fig 32 - Staffing levels allocated to the options modelled

Crewing Levels	
Baseline	**Crew**
Dry Recycling	1+2
Organic	1+2*
Residual	1+2
Blueprint	**Crew**
Dry Recycling	1+1
Garden Waste	1+2
Residual	1+2
Twin/Multi Stream	**Crew**
Dry Recycling	1+2
Organic	1+2*
Separate Food	1+1
Separate garden	1+2

Fig 33 – Staff unit costs

Staff costs	
Driver	29,675
Loader	27,028

Overheads

Overhead figure of £447,877 has been taken from information supplied by CCBC.

Supervision

Supervision costs are assumed to remain constant across all options, with figure of £370,654 taken from data provided by CCBC.

Vehicle costs

Fig 34 - Typical vehicle costs

Vehicles - Typical figures used in KAT						
Vehicle	Purchase Cost	Depreciation Period	Annual Capital	Standing cost	Maintenance	Total
RCV	155,000	7	24,412	2,584	10,000	36,996
RCV & Lift	175,000	7	27,562	2,584	10,000	40,146
Twin Pack	175,000	7	27,562	2,584	12,000	42,146
Twin & Lift	195,000	7	30,712	2,584	12,000	45,296
One Pass	200,000	7	31,499	2,584	13,000	47,083
RRV	120,000	7	18,899	2,134	8,000	29,033
PBUV	60,000	7	9,450	2,134	4,000	15,584
Tipper	45,000	7	7,087	2,134	2,000	11,221
Micro RRV	50,000	7	7,875	2,134	2,000	12,009

Vehicle numbers

Calculated by the KAT model, vehicles required for each collection option shown in Fig 35 below.

Fig 35 - Vehicle requirements

2 weekly refuse

Collection	Baseline	Enhanced Baseline	Option 1	Option 1 - WS	Option 1 - 2 loaders	Option 1 - 2 Loaders & WS	Option 5b	Option 5b & WS
A	9.0	9.0	24.4	24.4	20.7	20.7	10.0	10.0
B	6.8	6.9	3.9	4.0	3.9	4.0	8.0	8.0
C	0.0	0.0	0.0	0.0	0.0	0.0	3.9	3.9
D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Refuse	6.7	6.5	6.5	6.5	6.5	6.5	6.5	6.5

3 weekly refuse

Collection	Option 1	Option 1 - WS	Option 1 - 2 loaders	Option 1 - 2 Loaders & WS	Option 5b	Option 5b & WS
A	25.8	25.8	21.9	21.9	10.4	10.4
B	4.0	4.0	4.0	4.0	8.3	8.3
C	3.8	3.8	3.8	3.8	3.9	3.9
D	0.0	0.0	0.0	0.0	3.8	3.8
Refuse	4.3	4.4	4.3	4.4	4.3	4.3

4 weekly refuse

Collection	Option 1	Option 1 - WS	Option 1 - 2 loaders	Option 1 - 2 Loaders & WS	Option 5b	Option 5b & WS
A	27.2	27.2	23.1	23.1	10.8	10.8
B	4.0	4.0	4.0	4.0	8.6	8.6
C	4.3	4.3	4.3	4.3	3.9	3.9
D	0.0	0.0	0.0	0.0	4.3	4.3
Refuse	3.7	3.8	3.7	3.8	3.5	3.6

Collection A = Dry Recycling, B = Organic, C = AHP (Option 5b B=Food, C= Green, D=AHP)

Spare Vehicles

Based on the fleet requirement for each option, a reasonable number of spare vehicles has been estimated for each option capital costs for spare fleet have been annualised (over 7 years) and included in the overall option cost. In addition, standing charges and maintenance costs ae also included.

Fig 36 – Spare vehicles

2 weekly refuse

	Baseline	Enhanced Baseline		Option 1		Option 1 - WS		Option 1 - Extra Loader		Optin 5b		Option 5 b - WS	
Collection	RCV	RCV	Twinpack	RCV	RRV	RCV	RRV	RCV	Twinpack	RCV	Twinpack	RCV	Twinpack
Dry	9	9		0	25		25		21		18		18
Organic	7		7	4	0	4	0	4		4		4	
Residual	7	7		7	0	7	0	7		7		7	
Total	23	16	7	11	25	11	25	11	21	11	18	11	18
Spare	5	4	2	3	6	3	6	3	5	3	4	3	4
Cost	184979	160583	84291	120437	174201	120437	174201	120437	145167	120437	168583	120437	168583

3 weekly refuse

	Option 1		Option 1 - WS		Option 1 - Extra Loader		Optin 5b		Option 5 b - WS	
Collection	RCV	RRV	RCV	RRV	RCV	Twinpack	RCV	Twinpack	RCV	Twinpack
Dry	0	26		26		21		19		19
Organic	4	0	4		4		4		4	
Residual	5	0	5		5		5		5	
Total	9	26	9	26	9	21	9	19	9	19
Spare	2	6	2	6	2	5	2	5	2	5
Cost	80291	174201	80291	174201	80291	145167	80291	210729	80291	210729

4 weekly refuse

	Option 1		Option 1 - WS		Option 1 - Extra Loader		Optin 5b		Option 5 b - WS	
Collection	RCV	RRV	RCV	RRV	RCV	Twinpack	RCV	Twinpack	RCV	Twinpack
Dry	0	28		28	0	22		20		20
Organic	4	0	4		4		4		4	
Residual	4	0	4		4		4		4	
Total	8	28	8	28	8	22	8	20	8	20
Spare	2	7	2	7	2	5	2	5	2	5
Cost	80291	203234	80291	203234	80291	145167	80291	210729	80291	210729

Productivity

Fig 37 below shows the number of properties passed on average by each collection vehicle over the course of a working day.

Fig 37 - Daily Pass Rates

2 Weekly residual

Collection	Baseline	Enhanced Baseline	Option 1	Option 1 & Winter suspension	Option 1 Extra Loadr	Option 1 Extra Loader & WS	Option 5b	Option 5b WS
A	1,661	1,663	616	616	725	725	1,497	1,497
B	2,213	2,177	1,911	1,877	1,911	1,877	1,887	1,887
C	0	0	0	0	0	0	1,911	1,911
D	0	0	0	0	0	0	0	0
Refuse	1,121	1,159	1,159	1,159	1,159	1,159	1,159	1,159

3 weekly residual

Collection	Option 1	Option 1 & Winter suspension	Option 1 Extra Loader	Option 1 Extra Loader & WS	Option 5b	Option 5b WS
A	583	583	685	685	1,441	1,441
B	1,877	1,877	1,877	1,877	1,815	1,815
C	2,633	2,633	2,633	2,633	1,911	1,911
D	0	0	0	0	2,633	2,633
Refuse	1,159	1,147	1,159	1,147	1,159	1,159

4 weekly residual

Collection	Option 1	Option 1 & Winter suspension	Option 1 Extra Loader	Option 1 Extra Loader & WS	Option 5b	Option 5b WS
A	553	553	650	650	1,389	1,389
B	1,877	1,877	1,877	1,877	1,748	1,748
C	2,633	2,633	2,633	2,633	1,911	1,911
D	0	0	0	0	2,633	2,633
Refuse	1,004	992	1,004	992	1,062	1,062

Collection A = Dry Recycling, B = Organic, C = AHP (Option 5b B=Food, C= Green, D=AHP)

Length of day

Fig 38 below shows the actual working times used in the baseline model (calculated from the tachograph data supplied), along with the times used for the enhanced baseline and subsequent options.

Fig 38 – Hours worked

Working Hours		
Service	**Baseline**	**Enhanced Baseline & Options**
Dry	06:35	07:00
Organic	06:50	07:00
Residual	06:50	07:00

Tipper fleet

It is assumed that the requirement to service 2500 properties not on core collection rounds can be provided using a similar level of resource as that used currently across all of the commingled and twinstream options.

Fleet requirements for commingles and source segregated collections were both run through the KAT model.

Costs shown in table below Costs calculated in a similar was as main options and are included in Fig 39 below

Fig 39 – Tipper fleet costs

Costs	Comingled	KSS	2 stream
Capital - Vehicles	37,011	40,161	37,011
Operating Costs	266,948	291,286	293,771
Total	303,959	331,448	330,782

WMT010 & 009b - Waste Reused, Recycled or Composted

Appendix 4

2018-19

Authority	Total Dry Reuse (tonnes)	Total Dry Recycling (tonnes)	Total Composting (tonnes)	Total Municipal Waste (tonnes)	Average Dry Reuse Rate	Average Dry Recycling Rate	Average Composting Rate	Average Reuse, Recycling & Composting Rate
Isle of Anglesey CC	1.01	15,202.83	10,038.81	36,133.95	0.00%	42.07%	27.78%	69.86%
Bridgend CBC	1,448.56	25,976.61	11,792.38	56,516.36	2.56%	45.96%	20.87%	69.39%
Flintshire County Council	12,067.75	30,869.04	14,965.72	84,246.78	14.32%	36.64%	17.76%	68.73%
Vale of Glamorgan Council	271.79	24,808.15	13,816.31	57,974.24	0.47%	42.79%	23.83%	67.09%
Wrexham CBC	13,820.27	27,137.83	15,438.39	85,795.72	16.11%	31.63%	17.99%	65.73%
Caerphilly CBC	273.83	52,071.22	15,531.89	104,290.41	0.26%	49.93%	14.89%	65.08%
Conwy CBC	322.05	20,490.30	15,514.89	55,958.56	0.58%	36.62%	27.73%	64.92%
Denbighshire County Council	395.35	17,050.35	10,252.68	43,090.53	0.92%	39.57%	23.79%	64.28%
Monmouthshire CC	159.21	19,139.74	10,978.72	47,781.02	0.33%	40.06%	22.98%	63.37%
City and County of Swansea	319.42	45,084.65	23,268.06	109,211.12	0.29%	41.28%	21.31%	62.88%
Gwynedd Council	98.98	29,737.52	14,449.65	71,070.98	0.14%	41.84%	20.33%	62.31%
Pembrokeshire County Council	478.05	28,442.23	15,100.85	71,044.55	0.67%	40.03%	21.26%	61.96%
Merthyr Tydfil CBC	270.14	11,707.55	4,609.58	26,933.64	1.00%	43.47%	17.11%	61.59%
Powys County Council	1,453.38	19,706.16	14,023.60	57,259.02	2.54%	34.42%	24.49%	61.45%
Rhondda Cynon Taff CBC	1,201.86	55,189.73	18,399.46	122,604.01	0.98%	45.01%	15.01%	61.00%
Neath Port Talbot CBC	168.74	31,398.98	10,992.70	69,989.74	0.24%	44.86%	15.71%	60.81%
Torfaen CBC	464.99	19,385.64	8,039.21	46,076.58	1.01%	42.07%	17.45%	60.53%
Ceredigion County Council	1,573.26	13,721.93	5,378.34	34,263.51	4.59%	40.05%	15.70%	60.34%
Blaenau Gwent CBC	98.91	13,153.51	4,557.12	30,044.08	0.33%	43.78%	15.17%	59.28%
Cardiff County Council	382.58	66,443.29	34,110.31	170,522.87	0.22%	38.96%	20.00%	59.19%
Newport City Council	699.11	30,015.43	12,136.13	72,692.01	0.96%	41.29%	16.70%	58.95%
Carmarthenshire County Council	306.15	37,000.14	15,110.01	88,922.35	0.34%	41.61%	16.99%	58.95%