Regional District of Central Okanagan

Life Cycle Assessment of Organic Waste Management Options

SLR Ref : 4CA-00999-00034

March 2012

Version: Rev 1

CONTENTS

TABLES

FIGURES

APPENDICES

1.0 INTRODUCTION

SLR has been appointed by The Regional District of Central Okanagan (RDCO) to undertake an assessment, based upon Life Cycle Assessment (LCA) principles, of options available for management of organic wastes.

At present, the RDCO operates a variety of management options including composting, landfill, recycling and export to market. However, many of these choices are made due to the availability of existing resources rather than as a consequence of strategic options assessment. By undertaking an LCA evaluation, the RDCO will be able to arrive at a number of alternative options that it may consider both in the short and medium term and which may prove to be more sustainable than the current adopted approaches.

LCA is a process to evaluate the environmental burdens associated with a product, process, or activity by quantifying energy, materials used and wastes released to the environment; and assessing the impact of those energy, materials used and releases to the environment; and to identify and evaluate opportunities to affect environmental improvements. The assessment includes the entire life cycle encompassing extracting and processing raw materials; manufacturing, transportation and distribution; use, re-use, maintenance; recycling, and final disposal.

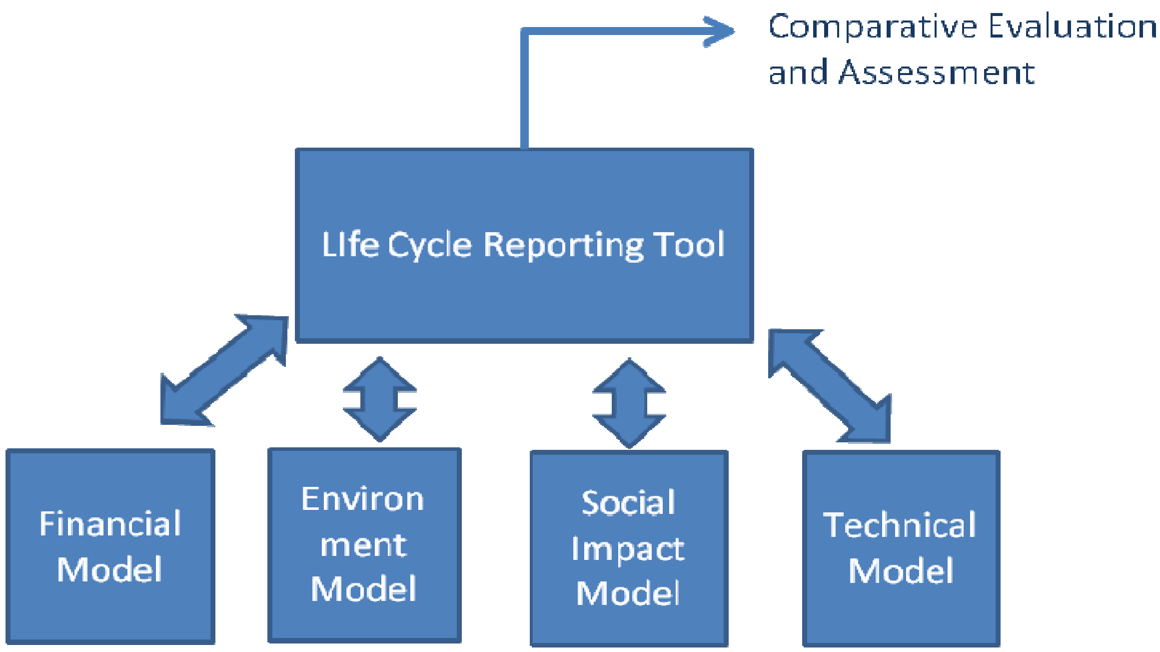
The methodology adopted utilises a number of environmental, social, financial and policy objectives to compare the performance of a range of options for managing organic wastes. Each objective includes one or more indicators/criteria which are measured through either qualitative or quantitative means. For example, one of the environmental objectives is “To reduce greenhouse gas emissions”; the indicator for this objective is “Greenhouse gases emitted”, this indicator is measured through quantitative means using a life cycle assessment tool, the output being kilograms of carbon dioxide equivalent (kg CO_2-Eq). The objectives, indicators and units of measurement are presented in Table 1-1.

Table 1-1 : Assessment Objectives and Indicators

Model		Objective		Indicator / Criteria	Unit of measurement	Method of measurement
Technical						
		Mass balance to define baseline position.				
		Mass and energy balance to determine options				
		Outputs from Technical model to feed Financial, Environmental and Social Impact Models.				
Environmental						
	1	To reduce greenhouse gas emissions	a)	Greenhouse gases emitted	kg CO2-Eq	Quantitative / LCA tool
	2	To minimise adverse impacts on air quality	b)	Emissions contributing to photochemical oxidation	kg ethylene-Eq	Quantitative / LCA tool
			c)	Emissions contributing to depletion of the ozone layer	kg CFC-11-Eq	Quantitative / LCA tool
			d)	Emissions contributing to air acidification	kg SO2-Eq	Quantitative / LCA tool
	3	To minimise adverse effects on water quality	e)	Emissions contributing to aquatic ecotoxicity	kg 1,4-DCB-Eq	Quantitative / LCA tool
			f)	Emissions contributing to eutrophication	kg PO4-Eq	Quantitative / LCA tool
Social Impact						
	4	To protect local amenity	g)	Extent of noise problems	arbitrary score	Qualitative / Professional judgement
			h)	Extent of odour problems	arbitrary score	Qualitative / Professional judgement
	5	To conserve landscapes and townscapes	i)	Extent of visual and landscape impacts	arbitrary score	Qualitative / Professional judgement
	6	To provide opportunities for public involvement	j)	Extent of opportunities for public involvement	arbitrary score	Qualitative / Professional judgement
		and education	k)	Extent of opportunities for education potential	arbitrary score	Qualitative / Professional judgement
	7	To minimise local transport impacts	l)	Net change in waste kilometres compared to baseline	km	Qualitative / Professional judgement
	8	To provide employment opportunities	m)	Number of jobs likely to be created	# of jobs	Qualitative / Professional judgement
Financial						
	9	To minimise costs associated with organic	n)	Capital costs associated with waste infrastructure	$CD	Semi-quantitative / Simplified cost calculations
		waste management	o)	Operating costs, difference from baseline	$CD	Semi-quantitative / Simplified cost calculations
Policy and Adaptability						
	10	To provide an adaptable solution for the future	p)	Potential for adaptability	arbitrary score	Qualitative / Professional judgement
	11	To conform to waste policy	q)	Percentage recycling and composting	% R&C	Quantitative based on Technical Model
			r)	Percentage landfill	% Landfill	Quantitative based on Technical Model

A bespoke assessment model has been developed, based on the multi criteria approach, which draws together each of the individual indicator scores. The indicator scores are measured using a variety of different units (e.g. kgCO_2-Eq, $CD, % landfill), these units are standardised to a value score of between 0 and 1 to assist in the identification of the preferred options. An overview of the interaction between the assessment model is provided in Figure 1-1; more details of the assessment methodology are provided in Section 4, with the detailed scoring tables provided in Appendix D.

Figure 1-1 : Overview of LCA Reporting Methodology



This report aims to provide an overview of the methodology and results of the life cycle assessment of organic wastes in RDCO; this report supports the Microsoft excel assessment model which is the key output from this study.

2.0 ORGANIC WASTE ARISINGS & MANAGEMENT

The information presented in Section 2 is based on data and information provided by RDCO as to the current (baseline) position of organic waste management in the region. The complete background dataset can be found as Appendix A to this report; Sections 2.1 and 2.2 below summarise the key information and trends.

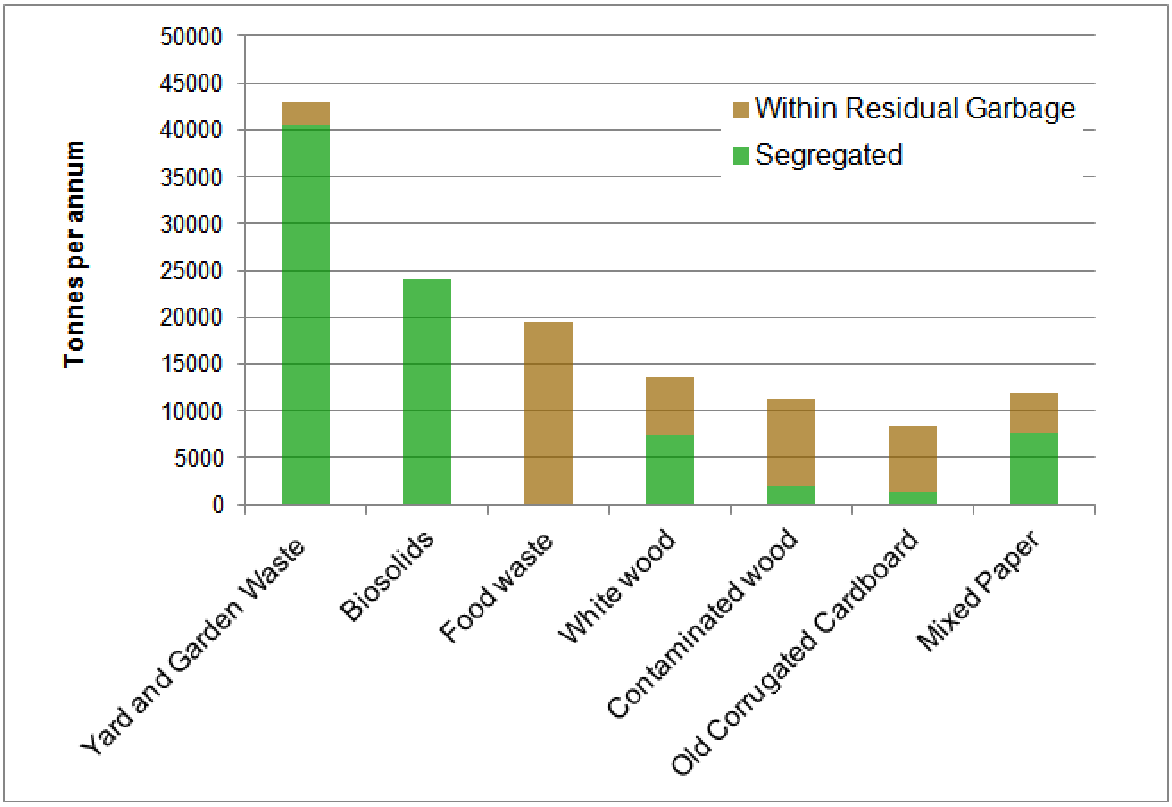
2.1 Current Organic Waste Arisings

Organic waste arising quantities were provided for the year 2010. Organic waste arising data is identified by segregated materials and organics assumed to remain in the residual garbage stream. Quantities of organics remaining in the garbage stream were identified by RDCO utilising waste composition information obtained through earlier projects.

In total, an estimated 131,416 tonnes of organic waste was generated in the RDCO in 2010. Of the total quantity of organic waste arising, 67% (83,052 tonnes) was segregated from the garbage stream and treated as separate organic streams.

Figure 2-1 presents a summary breakdown of the organic waste arisings by component material. Each material shows a further breakdown of tonnage by segregated (green shading) or remaining within the residual garbage stream (brown shading).

Figure 2-1 : Organic Waste Arisings and Segregation



Yard and garden waste is the largest organic stream arising in RDCO, accounting for circa 33% of all organic waste arisings. Figure 2-1 demonstrates that the capture rate (the amount of the total material stream which is segregated from the garbage stream) for yard and garden waste is high, with circa 40,500 tonnes of the estimated 43,000 tonnes arising segregated for treatment (94.5% capture rate).

The biosolids waste stream is the second largest organic waste stream (24,000 tonnes); all of this material is recovered for management via land-spreading (i.e. 100% capture rate). The third largest organic waste stream is food waste; there are no segregated collections for food waste and thus all of this material, estimated at 19,500 tonnes, is currently contained within the residual garbage stream. .

The other identified organic waste streams vary in tonnage arising and capture rates. Based on residual waste composition estimates there are potential additional opportunities due to low capture and high tonnages, for further segregation of the following organic waste streams:

- Contaminated wood – capture rate ~17%, ~9,300t available;
- Old corrugated cardboard – capture rate ~16%, ~7,000t available.

Food waste is currently not segregated, and represents a significant opportunity for future organic waste management and diversion of organic materials from landfill. It is estimated that circa 19,500t of food waste is available for capture and processing.

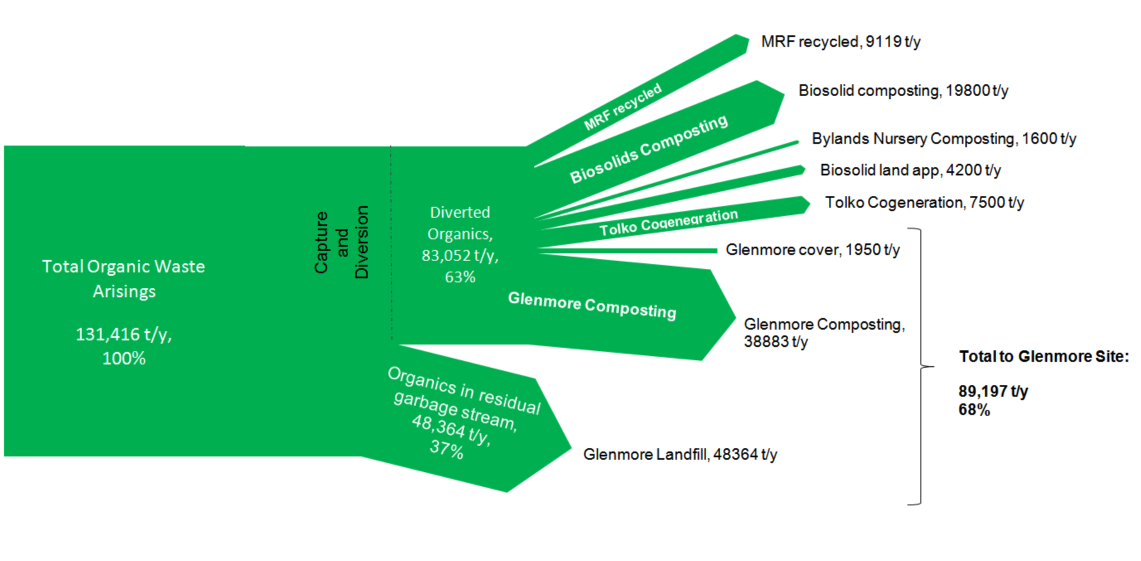
In total RDCO have estimated, based on waste compositional analyses, that 48,364 t (37%) of organic waste remains within the residual garbage stream and is therefore disposed of to landfill.

2.2 Current Organic Waste Management Methods

Organic wastes arising in RDCO are managed through a variety of methods and facilities. All organic materials contained within the residual garbage stream are currently disposed of in the Glenmore Landfill site. Segregated organic waste materials are managed at a variety of treatment facilities (from papermills and compositing sites to land spreading and energy generation).

Figure 2-2 is a Sankey diagram which demonstrates the tonnage of organic waste material consigned to each treatment facility. A detailed description of the current treatment processes can be found in Appendix A.

Figure 2-2 : Sankey Diagram of Organic Waste Management Facilities



Segregated organic waste materials are treated at a combination of facilities within RDCO and out of region. A map showing the locations of the organic waste management facilities utilised by RDCO is presented in Figure 2-3. Four of the facilities (papermills) are located within the United States of America in Washington State; Figure 2-4 focuses on the non-papermill infrastructure to illustrate the facilities within and in close proximity to the RDCO. Table 2-1 provides a key for the symbols utilised on the map.

Figure 2-3 : Overview Map of Organic Waste Management Infrastructure

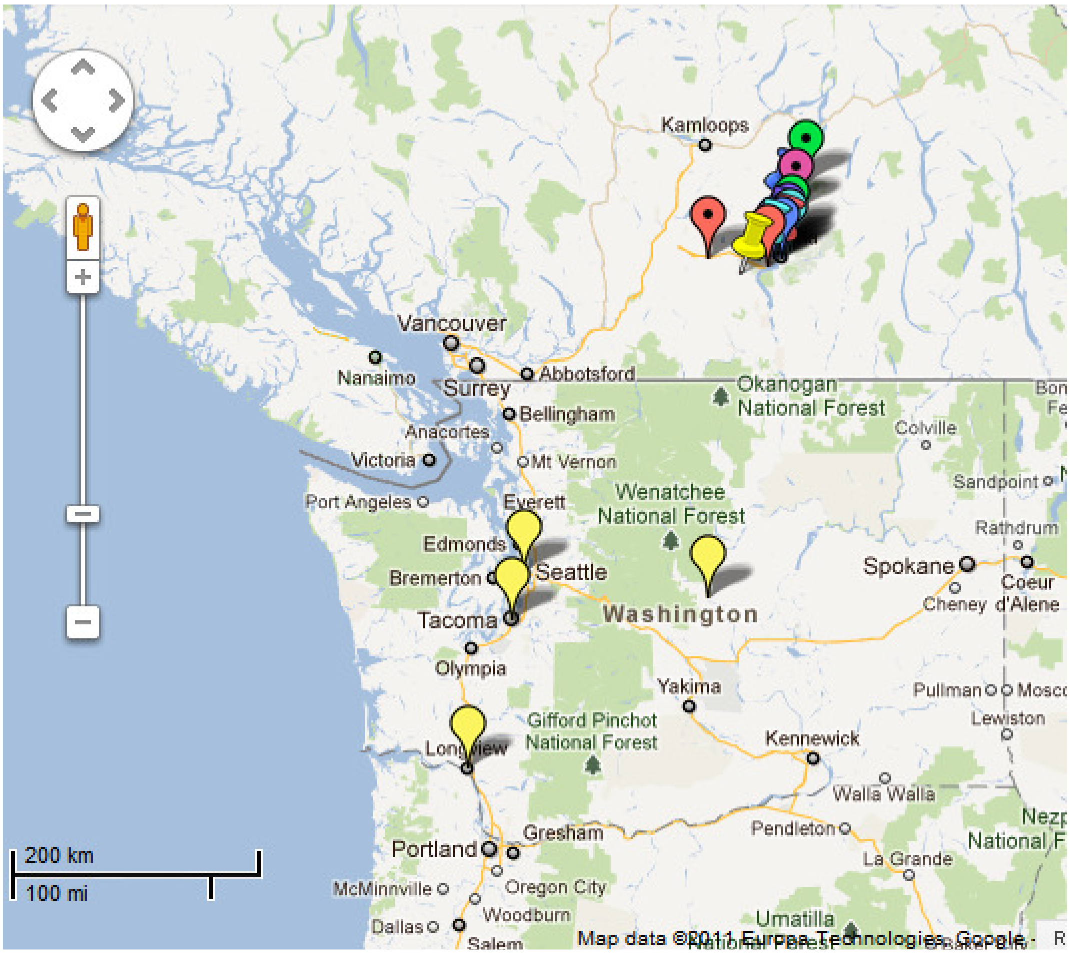
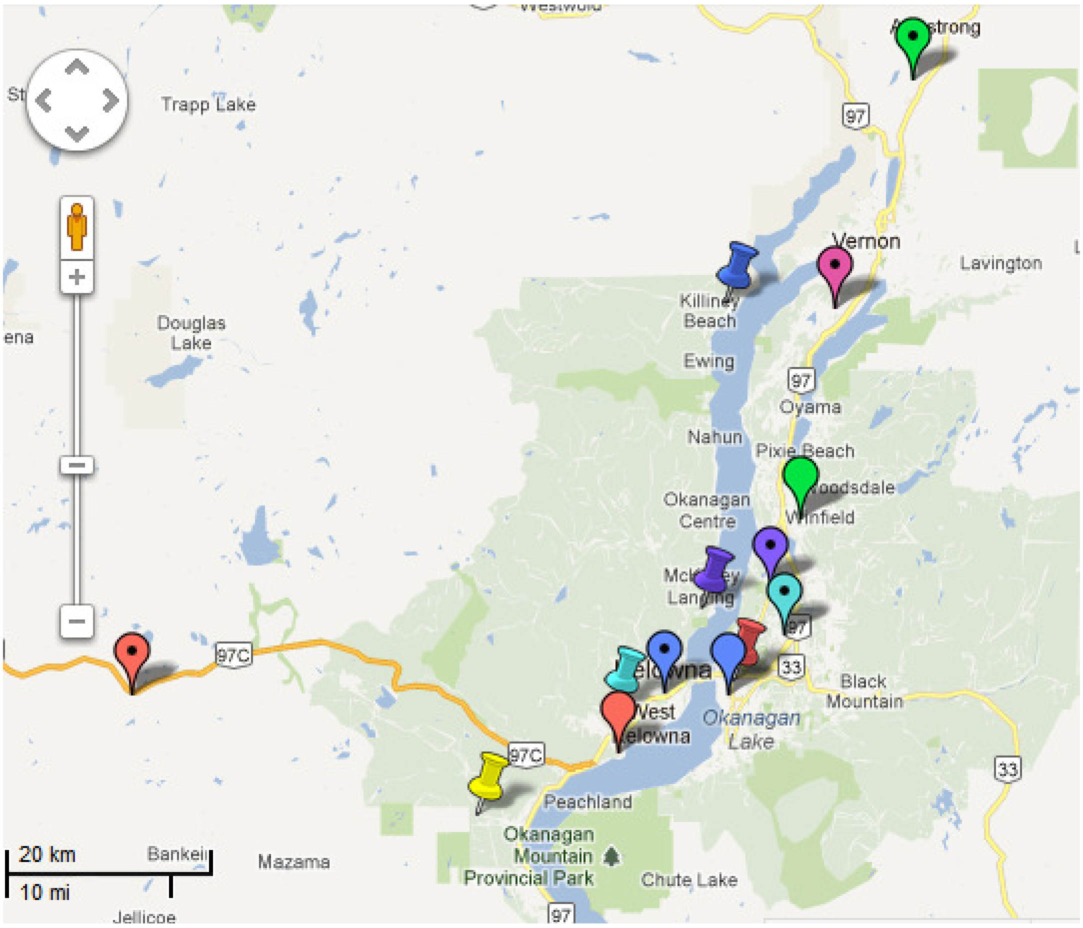


Table 2-1 : Key for Infrastructure Maps

	Bylands Nursery Composting		Peachland Composting Site		Lake Country Wastewater Treatment Plant
	Biosolids Landspreading		North Westside Road Residential Transfer Station		Glenmore Landfill
	Tolko Cogeneration Plant		Traders Cover Residential Transfer Station		Kirshner Recycle Depot
	Materials Recycling Facility		Kelowna Wastewater Treatment Facility		Biosolids Composting
	Westside Residential Waste Disposal and Recycling Centre		Westside Waste Water Treatment Plant		Papermill Locations

Figure 2-4 : Map of RDCO Infrastructure Locations (Excludes Papermills)



An electronic version the infrastructure map is accessible at the following weblink: http://maps.google.ca/maps/ms?hl=en&vpsrc=0&ctz=0&vps=7&ie=UTF8&oe=UTF8&msa=0&msid=213414778867698828107.0004b125e66e22c13cc76

2.3 Future Organic Waste Arisings

Arisings of organic wastes in 2010 amounted to circa 131,500 tonnes. Future arisings of organic waste materials could be higher due to waste growth associated with a number of complex interrelated factors such as economic growth and population increases. For the purposes of this project, the 2010 organic waste arising figures have been projected forward using population growth estimates. Population projections were obtained from the British Columbia (BC) Stats website[1].

[1] http://www.bcstats.gov.bc.ca/data/pop/pop/dynamic/PopulationStatistics/Query.asp?category=Census&type=RD&topic=Projections&agegrouptype=Standard&subtype=&region=35000&year=1986&year=1987&year=1988&year=1989&year=1990&year=1991&year=1992&year=1993&year=1994&year=1995&year=1996&year=1997&year=1998&year=1999&year=2000&year=2001&year=2002&year=2003&year=2004&year=2005&year=2006&year=2007&year=2008&year=2009&year=2010&year=2011&year=2012&year=2013&year=2014&year=2015&year=2016&year=2017&year=2018&year=2019&year=2020&year=2021&year=2022&year=2023&year=2024&year=2025&year=2026&year=2027&year=2028&year=2029&year=2030&year=2031&year=2032&year=2033&year=2034&year=2035&year=2036&agegroup=totals&gender=t&output=browser&rowsperpage=all

Table 2-2 presents the estimated population figures for 2010 to 2025 and the percentage change year on year. The 2010 organic waste arising figures have been projected forward using the percentage change data.

In addition to the population growth scenario, two other scenarios (0% growth and 1% growth) have been developed. The three growth scenarios are presented in Figure 2-5.

Based on the population growth rate, organic waste arisings are estimated to be 156,099 tonnes by 2020. Assuming no change to current collection systems/scheme performance an estimated 57,448 tonnes of organic material will be disposed of to landfill in the garbage stream in 2020.

The remainder of the options assessment process is based on an assessment year of 2020 and total organic waste volumes of 156,099 tonnes.

Projected quantities of total organics, segregated organics and residual garbage organics are presented in Tables 2-3, 2-4 and 2-5 respectively. Each table presents the projected tonnage by material type for the years 2010 through to 2025.

Table 2-2 : Population Projections

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total population	185,443	188,644	191,962	195,324	198,779	202,409	206,029	209,611	213,172	216,726	220,274	223,807	227,253	230,661	234,050	237,374
% change		1.73%	1.76%	1.75%	1.77%	1.83%	1.79%	1.74%	1.70%	1.67%	1.64%	1.60%	1.54%	1.50%	1.47%	1.42%

Source: BC Stats website

Figure 2-5 : Organic Waste Growth Projections

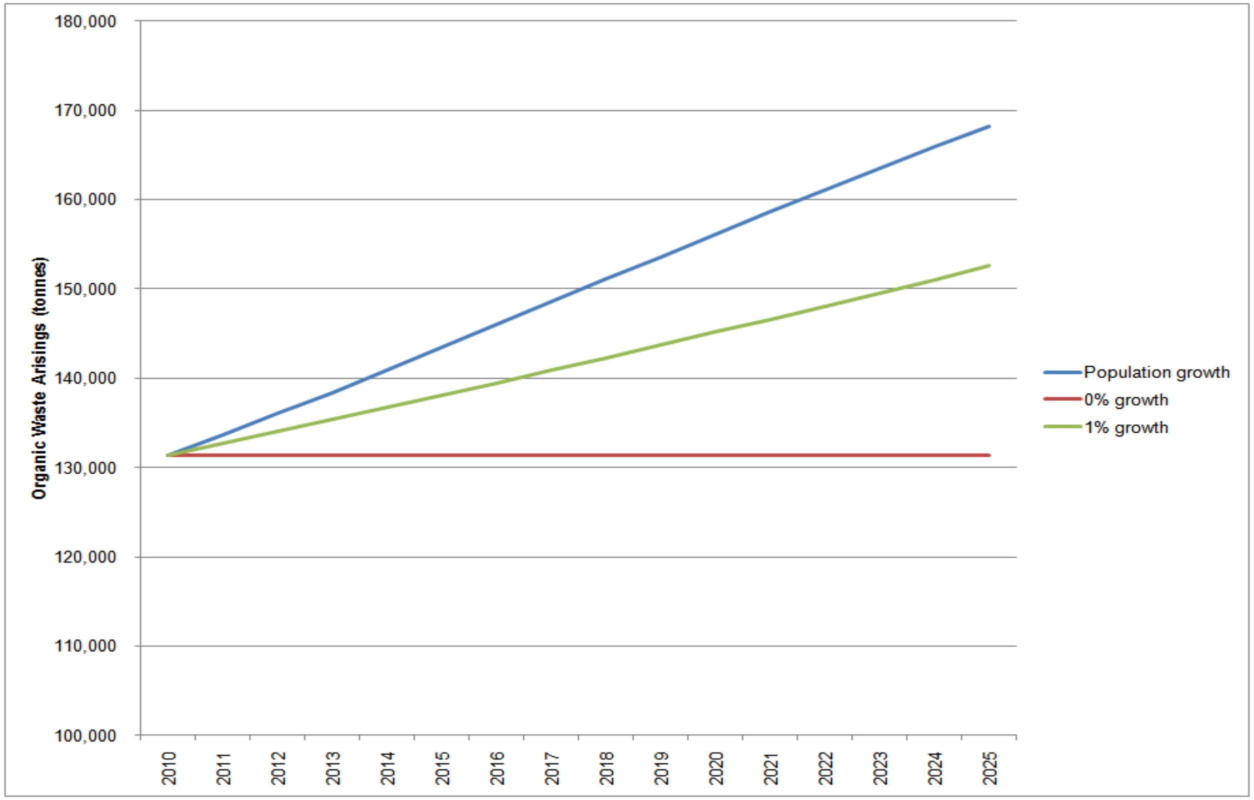


Table 2-3 : Total Organic Waste Arising Projections (by Material Type)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Yard and Garden Waste (<20cm diameter)	41,159	41,869	42,606	43,352	44,119	44,925	45,728	46,523	47,313	48,102	48,890	49,674	50,439	51,195	51,947	52,685
Yard and Garden Waste (>20cm diameter)	1,700	1,729	1,760	1,791	1,822	1,856	1,889	1,922	1,954	1,987	2,019	2,052	2,083	2,115	2,146	2,176
Biosolids	24,000	24,414	24,844	25,279	25,726	26,196	26,664	27,128	27,589	28,049	28,508	28,965	29,411	29,852	30,291	30,721
Food waste	19,500	19,837	20,185	20,539	20,902	21,284	21,665	22,041	22,416	22,790	23,163	23,534	23,896	24,255	24,611	24,961
White wood	13,585	13,819	14,063	14,309	14,562	14,828	15,093	15,355	15,616	15,877	16,137	16,395	16,648	16,898	17,146	17,389
Contaminated wood	11,291	11,486	11,688	11,893	12,103	12,324	12,544	12,763	12,979	13,196	13,412	13,627	13,837	14,044	14,251	14,453
Old Corrugated Cardboard	8,387	8,532	8,682	8,834	8,990	9,154	9,318	9,480	9,641	9,802	9,962	10,122	10,278	10,432	10,585	10,736
Mixed Paper	11,794	11,998	12,209	12,422	12,642	12,873	13,103	13,331	13,558	13,784	14,009	14,234	14,453	14,670	14,885	15,097
Total	**131,416**	**133,684**	**136,036**	**138,418**	**140,867**	**143,439**	**146,004**	**148,543**	**151,066**	**153,585**	**156,099**	**158,603**	**161,045**	**163,460**	**165,862**	**168,217**
Growth rate		1.73%	1.76%	1.75%	1.77%	1.83%	1.79%	1.74%	1.70%	1.67%	1.64%	1.60%	1.54%	1.50%	1.47%	1.42%

Table 2-4 : Projected Source Segregated Organic Waste Arisings (by Material Type)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Yard and Garden Waste (<20cm diameter)	38,783	39,452	40,146	40,849	41,572	42,331	43,088	43,837	44,582	45,325	46,067	46,806	47,527	48,240	48,949	49,644
Yard and Garden Waste (>20cm diameter)	1,700	1,729	1,760	1,791	1,822	1,856	1,889	1,922	1,954	1,987	2,019	2,052	2,083	2,115	2,146	2,176
Biosolids	24,000	24,414	24,844	25,279	25,726	26,196	26,664	27,128	27,589	28,049	28,508	28,965	29,411	29,852	30,291	30,721
Food waste	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
White wood	7,500	7,629	7,764	7,900	8,039	8,186	8,333	8,477	8,621	8,765	8,909	9,052	9,191	9,329	9,466	9,600
Contaminated wood	1,950	1,984	2,019	2,054	2,090	2,128	2,166	2,204	2,242	2,279	2,316	2,353	2,390	2,425	2,461	2,496
Old Corrugated Cardboard	1,366	1,390	1,414	1,439	1,464	1,491	1,518	1,544	1,570	1,596	1,623	1,649	1,674	1,699	1,724	1,749
Mixed Paper	7,753	7,887	8,026	8,166	8,311	8,462	8,614	8,763	8,912	9,061	9,209	9,357	9,501	9,643	9,785	9,924
Total	**83,052**	**84,486**	**85,972**	**87,477**	**89,025**	**90,650**	**92,272**	**93,876**	**95,471**	**97,062**	**98,651**	**100,234**	**101,777**	**103,303**	**104,821**	**106,310**

Table 2-5 : Project Organic Waste Remaining in the Garbage Waste Stream (by Material Type)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Yard and Garden Waste (<20cm diameter)	2,376	2,417	2,460	2,503	2,547	2,593	2,640	2,686	2,731	2,777	2,822	2,868	2,912	2,955	2,999	3,041
Yard and Garden Waste (>20cm diameter)	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Biosolids	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Food waste	19,500	19,837	20,185	20,539	20,902	21,284	21,665	22,041	22,416	22,790	23,163	23,534	23,896	24,255	24,611	24,961
White wood	6,085	6,190	6,299	6,409	6,523	6,642	6,760	6,878	6,995	7,111	7,228	7,344	7,457	7,569	7,680	7,789
Contaminated wood	9,341	9,502	9,669	9,839	10,013	10,196	10,378	10,558	10,738	10,917	11,095	11,273	11,447	11,619	11,789	11,957
Old Corrugated Cardboard	7,021	7,142	7,268	7,395	7,526	7,663	7,800	7,936	8,071	8,205	8,340	8,473	8,604	8,733	8,861	8,987
Mixed Paper	4,041	4,111	4,183	4,256	4,332	4,411	4,490	4,568	4,645	4,723	4,800	4,877	4,952	5,026	5,100	5,173
Total	**48,364**	**49,199**	**50,064**	**50,941**	**51,842**	**52,789**	**53,733**	**54,667**	**55,596**	**56,523**	**57,448**	**58,369**	**59,268**	**60,157**	**61,041**	**61,908**

3.0 POTENTIAL ORGANIC WASTE MANAGEMENT METHODS

RDCO currently manages a number of different organic waste material streams. The organic waste streams which are included within the options assessment are listed and described briefly below in Table 3-1.

Table 3-1 : Description of Organic Waste Material Types

Material Type	Description of Material
Yard and Garden Waste (<20cm diameter)	Organic waste materials of yard and garden origin. The material consists of grass clippings, plant pruning's, leaves and other organic garden matter. Materials within this waste stream should have a diameter of less than 20cm. Material is of residential, commercial, industrial, institutional and construction and demolition origin.
Yard and Garden Waste (>20cm diameter)	Organic materials of yard and garden origin which is over 20cm in diameter, such as large plant pruning's, tree removal etc.
Biosolids	Organic solid derived output from the three waste water treatment works currently operated by RDCO and City of Kelowna.
Food Waste	Organic food waste is currently disposed of in the garbage stream. Food waste materials can include fruit and vegetable peelings, raw meat or fish, plate scrapings and left overs, or out of date or surplus to requirement foods. Material is of residential, commercial, industrial, institutional and construction and demolition origin.
White Wood	White wood is uncontaminated (or clean) wood which is derived from off cuts, excess from construction etc. White wood is derived from all sectors.
Contaminated Wood	Contaminated wood includes wood treated with preservatives, glues or containing laminates (such as furniture or kitchen cupboards). Contaminated wood is accepted from all sectors.
Old Corrugated Cardboard	Old corrugated cardboard is mainly derived from packaging materials. Segregated old corrugated cardboard is collected from residential sources and small businesses. Old corrugated cardboard found in the residual garbage is derived from all sectors.
Mixed Paper	Mixed papers encompass paper derived from a variety of uses, such as newspaper, writing paper, printer paper, brochures, paper bags etc. Segregated mixed paper is collected from residential sources and small businesses. Mixed paper found in residual garbage is derived

	from all sectors.
Other	This category is not defined and has not been included in the analysis.
Residual Organics	Residual organics encompasses all organic materials which have not been segregated for recycling or composting, which remain within the garbage waste stream and are disposed of at the Glenmore Landfill Site. Residual organics will include all of the above material types, apart from biosolids.

RDCO currently utilises a number of treatment and disposal methods to manage the organic waste arisings. In addition to current methods, a number of other alternative treatment/management methods are potentially available. Alternative treatment methods have been derived from SLR's professional experience, and the list of potential infrastructure options was discussed and agreed with RDCO at project inception.

Table 3-2 provides an overview of the different infrastructure types currently utilised or considered in this life cycle assessment of organic waste treatment options.

Table 3-2 : Overview of Potential Infrastructure Types

Infrastructure Type	Description of Infrastructure
Recycling	With respect to current management methods "recycling" refers to the reprocessing of old corrugated cardboard and mixed paper to produce corrugated cardboard and new paper products. The terminology "recycling" can also be applied to white wood (non contaminated) where wood can be utilised through chipping to create new wood board products.
Backyard composting	The utilisation of a purchased home composter, a homemade composter or a specific area of the garden designated to manage all organics generated in the yard/garden. Chipped wood, paper or cardboard may be added to the yard and garden waste to add structure. Purpose built home composters can be purchased from hardware and other stores.
In-vessel composting	An industrial composting process which involves the processing of the material under cover or within a purpose built building. Operating the composting process within an enclosed area allows more control of the key process parameters (such as temperature, moisture, oxygen levels etc) and control of potential odours and dust. The increase in control results in a faster decomposition process and production of a more refined compost material. Outputs from the In-vessel composting unit may require further maturation outdoors prior to being marketed.
Open windrow composting	The outdoor processing of yard and garden waste to generate a compost product. Material is often shredded or ground to create a

	homogenous material which is placed in long rows called windrows. The windrows are periodically turned using machinery to aerate and mix the material. Following composting for a sufficient period of time the material is screened prior to marketing. The material may go through a further stage of maturation before marketing.
Aerated static pile	Materials are mixed inside a covered building before being placed outside in a pile arrangement. The material is placed over perforated pipes, which allows for forced air circulation allowing controlled aeration to aid the biodegradation process.
Anaerobic digestion	Normally utilised for the management of food wastes with high biogas potential, the in feed material is macerated and pumped into digestion tanks. The digestion tanks are heated and operated under anaerobic conditions (in the absence of oxygen) where degradation results in the generation of biogas). The heat results in the destruction of any pathogens. The output material is termed “digestate” which can be separated into a solid and liquid phase to aid output marketability. The solid digestate may require a period of maturation before use, the liquid phase is often utilised as a liquid fertiliser.
Codigestion	Codigestion is similar to Anaerobic Digestion; however it involves the treatment of food waste with a second in feed material (such as industrial food processing residues, manure from agriculture or an energy crop).
Landfill (traditional)	A site assigned for the disposal and burial of waste. The traditional landfill is assumed to involve the burial (and compaction) of waste, without implementing systems to capture the gas or liquid (leachate) generated from the decomposing material.
Landfill (recirculating)	As above, however operation in recirculating mode involves the recirculation of leachate to moisten the waste mass and encourage decomposition. The recirculating landfill also includes the ability to capture the landfill gas generated, which is subsequently combusted to generate electricity for export
Land application	The spreading and application of organic derived materials to land (agriculture, forestry, brownfield remediation sites etc) to improve soil structure or apply nutrients.
Mechanical biological treatment	Mechanical biological treatment (MBT) facilities take many different forms; however each facility or process involves some form of mechanical separation of recyclables (e.g. metals, plastics etc), biological treatment through stabilisation, in-vessel composting or anaerobic digestion, and the creation of a fuel for combustion. In some instances the biostabilised waste mass is disposed to landfill. The exact process and chronology of each step varies with the technology provider.

Incineration	The process of combustion of waste resulting in generation of energy which can be converted to electricity and or heat for beneficial use, and subsequently offsetting conventional fuels. Emissions from the combustion process are cleaned and treated before release to the atmosphere. The process results in reduced solid outputs of bottom ash and hazardous air pollution control residues. Incinerators can be operated on a range of scales from small 30,000 tonne plants to facilities with an annual throughput of 800,000 tonnes or more via multiple combustion lines.
Pyrolysis / gasification	Often referred to as Advanced Thermal Treatment (ATT), wastes are generally pre-treated prior to treatment in an ATT plant. ATT uses high temperatures to breakdown the waste without direct combustion. The resulting synthetic gas (or syngas) is then combusted in a boiler or a gas engine to generate electricity and heat. Pyrolysis involves the breakdown of wastes in the absence of oxygen, where as gasification treats the wastes using small amounts of oxygen. ATT has a limited track record in comparison to Incineration. Plants are often modular, and utilised for smaller capacities than incineration.

Infrastructure types identified in Table 3-2 were compared against the different organic waste types to identify potential viable options for further assessment. A matrix of waste types and infrastructure options was developed, firstly to detail the existing management methods (Table 3-3), and secondly to identify the options for assessment (Table 3-4).

Cells with a white background represent options which are technically viable, whereas grey cells represent options which are not technical viable, or not currently commercial viable in SLR's professional opinion. A green tick indicates an existing management method employed by RDCO, an orange tick represents a scenario which is included in the options assessment process. A justification table (Table 3-5) provides further details and explanation of the matrix.

Table 3-3 : Material Type and Infrastructure Matrix – Current Management Methods

	Material Type	Infrastructure												
		Recycling	Back yard composting	In-vessel composting	Open windrow composting	Aerated static pile	Anaerobic digestion	Codigestion	Landfill (traditional)	Landfill (recirculating)	Land application	Mechanical biological treatment	Incineration	Pyrolysis / gasification
Segregated	Yard and Garden Waste (<20cm diameter)	■	✓		✓									
	Yard and Garden Waste (>20cm diameter)	■	■		✓									
	Biosolids	■	■		✓	✓					✓	■		
	Food Waste	Not currently segregated												
	White Wood		■					■					✓	
	Contaminated Wood	■	■	■	■	■	■	■	✓		■	■		
	Old Corrugated Cardboard	✓												
	Mixed Paper	✓												
	Other	Not currently segregated												
Residual	Yard and Garden Waste (<20cm diameter)	■	■	■	■	■	■	■	✓		■			
	Food Waste	■	■	■	■	■	■	■	✓		■			
	White Wood	■	■	■	■	■	■	■	✓		■			
	Contaminated Wood	■	■	■	■	■	■	■	✓		■			
	Old Corrugated Cardboard	■	■	■	■	■	■	■	✓		■			
	Mixed Paper	■	■	■	■	■	■	■	✓		■			
	Other	■	■	■	■	■	■	■	✓		■			

Key:
✓ Current management method
■ Non realistic management method

Table 3-4 : Material Type and Infrastructure Matrix – Potential Management Methods for Assessment

	Material Type	Infrastructure												
		Recycling	Back yard composting	In-vessel composting	Open windrow composting	Aerated static pile	Anaerobic digestion	Codigestion	Landfill (traditional)	Landfill (recirculating)	Land application	Mechanical biological treatment	Incineration	Pyrolysis / gasification
Segregated	Yard and Garden Waste (<20cm diameter)	■	✓	✓ (alt)	✓				✓ (alt)	✓ (alt)				
	Yard and Garden Waste (>20cm diameter)	■	■	✓ (alt)	✓				✓ (alt)	✓ (alt)				
	Biosolids	■	■		✓	✓			✓ (alt)	✓ (alt)	✓	■		
	Food Waste	■	■	✓ (alt)			✓ (alt)		✓ (alt)	✓ (alt)			■	■
	White Wood	✓ (alt)	■	✓ (alt)	✓ (alt)			■	✓ (alt)	✓ (alt)			✓	✓ (alt)
	Contaminated Wood	■	■	■	■	■	■	■	✓	✓	■	■	✓ (alt)	✓ (alt)
	Old Corrugated Cardboard	✓							✓ (alt)	✓ (alt)			✓ (alt)	✓ (alt)
	Mixed Paper	✓							✓ (alt)	✓ (alt)			✓ (alt)	✓ (alt)
	Other								✓ (alt)	✓ (alt)				
Residual	Yard and Garden Waste (<20cm diameter)	■	■	■	■	■	■	■	✓	✓	■	✓ (alt)	✓ (alt)	✓ (alt)
	Food Waste	■	■	■	■	■	■	■	✓	✓	■	✓ (alt)	✓ (alt)	✓ (alt)
	White Wood	■	■	■	■	■	■	■	✓	✓	■	✓ (alt)	✓ (alt)	✓ (alt)
	Contaminated Wood	■	■	■	■	■	■	■	✓	✓	■	✓ (alt)	✓ (alt)	✓ (alt)
	Old Corrugated Cardboard	■	■	■	■	■	■	■	✓	✓	■	✓ (alt)	✓ (alt)	✓ (alt)
	Mixed Paper	■	■	■	■	■	■	■	✓	✓	■	✓ (alt)	✓ (alt)	✓ (alt)
	Other	■	■	■	■	■	■	■	✓	✓	■	✓ (alt)	✓ (alt)	✓ (alt)

Key:
✓ Current management method
✓ (alt) Alternative management option
■ Non realistic management method

Table 3-4 shows the options identified for assessment. A number of technology options are shown in white, but do not have a tick associated with them. These options are those identified as being technical feasible, however unlikely to be delivered in a commercial environment. For example, old corrugated cardboard can feasibly be composted via in-vessel, open windrow or anaerobic digestion, however the biodegradation rates are slightly slower compared to green and or food wastes. In addition, it is unlikely that old corrugated cardboard would be segregated as a waste stream and then composted. Table 3-5 provides support justification to Table 3-4 to explain why options are highlighted grey, white or include a tick.

Table 3-5 : Justification of Infrastructure Inclusions and Exclusions

Material Type	Justification for Infrastructure Selection
Yard and Garden Waste (<20cm diameter)	All infrastructure options are open to segregated yard and garden waste with the exclusion of recycling. Currently yard and garden waste is managed through a combination of open windrow composting and backyard composting. In-vessel composting and landfill have been identified as potential alternative options. Anaerobic digestion and co-digestion have been excluded, as general yard and garden wastes have a lower biogas potential in comparison to other organic materials such as food waste or food processing and agricultural wastes. Land application has been ruled out on the basis that some form of composting would be required in advance of land spreading activities. Treatment processes such as mechanical biological treatment, incineration and pyrolysis/gasification are more costly processes which are reserved for residual waste materials, and not source segregated materials.
Yard and Garden Waste (>20cm diameter)	As above, however it is assumed that yard and garden waste (>20cm diameter) will not be managed through backyard composting due to the requirement for shredders/chippers to break the material down before composting.
Biosolids	The biosolids waste stream could be managed by the majority of infrastructure options, with the exception of recycling, backyard composting and MBT – these exceptions are relating to technical feasibility. In addition to open windrow composting, aerated static pile and land application (current management methods), landfill could potentially be adopted, but is unlikely to be so. The thermal conversion of biosolids is technically feasible, however the biosolids would need to be dewatered and dried first; a process that is often energy intensive and thus results in limited or no environmental or financial benefits.
Food Waste	Food waste is not currently collected as a segregated material, and thus no green ticks are included in the matrix. Recycling, backyard composting, incineration and pyrolysis/gasification have been excluded as infrastructure options which are not suitable for the management of segregated food waste. Thermal treatment of source segregated waste is not deemed an efficient process due to the high moisture content and relatively low calorific value of the food waste material. Open windrow is not deemed a suitable alternative due to the potential for odours, potential disease and pest attraction.

	In-vessel composting, anaerobic digestion and landfill disposal are seen as the most technical and financially viable solutions for food waste.
White Wood	Currently white wood is managed through incineration. SLR's professional opinion is that white wood is not appropriate for treatment via backyard composting or codigestion. Of the remaining infrastructure options, recycling, in-vessel composting, open windrow composting and landfill have been identified as potential management options. Anaerobic digestion (due to slow degradation rates and limited biogas release), land application (due to slow degradation rates) and MBT (due to source segregated nature of feedstock) are not included as alternative management options within the assessment.
Contaminated Wood	Due to the contaminated nature of the wood material, there are a limited number of potential treatment options available. Currently the material is disposed to landfill (as cover material). With the exclusion of recycling and composting options (due to contaminants and pollutants) the potential infrastructure options remaining are thermal treatment through incineration and pyrolysis/gasification.
Old Corrugated Cardboard	Old corrugated cardboard is a material that technically could be managed by all infrastructure options. The material is currently recycled; other options that SLR view as commercially viable options are landfill, incineration and pyrolysis/gasification. Large quantities of segregated old corrugated cardboard are unlikely to be managed by composting due to the longer degradation periods in comparison to yard and garden waste and food wastes. MBT facilities are designed to manage residual garbage streams, and there would be little/no benefit of processing old corrugated cardboard through an MBT plant; the material could be processed as a fuel, which is why incineration and pyrolysis/gasification are included as alternative management options.
Mixed Paper	See above, assumptions relating to old corrugated cardboard can be applied to mixed paper.
Other	This organic waste material type was included by RDCO in the baseline data, but no tonnage was assigned to it.
Residual Organics	Organic materials currently contained in the residual garbage stream are disposed to landfill (traditional and recirculating). Future options for management include the residual treatment methods of MBT, Incineration and ATT. All other infrastructure options have been excluded, as they are designed for source segregated streams.

4.0 OVERVIEW OF ASSESSMENT METHODOLOGY

The options assessment process has been broadly split into 2 phases; the first phase assesses the infrastructure options available to the segregated waste streams and the second phase assesses the infrastructure options available to the management of the residual garbage waste stream. On completion of the two phased assessments, the individual options (for source segregation and residual garbage) are combined to generate complete scenarios for organic waste management in RDCO.

The phase 1 assessment models the segregated waste streams based on projected tonnages in the year 2020. The purpose of the phase 1 assessment is to assess all feasible options for the management of segregated organic waste streams to either validate existing management practices or identify potential options which achieve an overall higher score and are therefore deemed more sustainable.

The phase 2 assessment focuses on the residual garbage stream and the tonnages forecasted in the year 2020. In addition to assessing the total residual garbage stream through a variety of residual treatment methods, the phase 2 assessment considers potential increases in the quantity of material segregated for recycling (and thus a reduction in residual garbage quantity) and options that consider introduction of a new collection scheme to capture food waste from the residual garbage stream. The outputs of the phase 2 assessment identify the preferred method managing the residual garbage stream, but also identify whether increases in capture rates, or introduction of a new collection scheme for food waste would be beneficial.

The remainder of Section 4 details a brief description of the assessment methodology; Section 5 presents the output scores for the assessment, with Section 6 presenting the RDCO Scenario results. The issue of weightings and sensitivities are addressed in Section 7.

4.1 Assessment criteria

A number of environmental, social, financial and policy objectives were developed and agreed at the inception meeting and via further conference calls. Each objective includes one or more indicators which are measured through either qualitative or quantitative means. For example, one of the environmental objectives is “To reduce greenhouse gas emissions”; the indicator for this objective is “Greenhouse gases emitted”.

Table 4-1 details the options assessment objectives and indicators utilised in the assessment of organic waste management options for RDCO. In total the assessment considers 18 indicators across the 4 objective areas.

Table 4-1 : Organic Waste Management Objectives and Indicators

Model		Objective		Indicator / Criteria
Technical				
		Mass balance to define baseline position.		
		Mass and energy balance to determine options		
		Outputs from Technical model to feed Financial, Environmental and Social Impact Models.		
Environmental				
	1	To reduce greenhouse gas emissions	a)	Greenhouse gases emitted
	2	To minimise adverse impacts on air quality	b)	Emissions contributing to photochemical oxidation
			c)	Emissions contributing to depletion of the ozone layer
			d)	Emissions contributing to air acidification
	3	To minimise adverse effects on water quality	e)	Emissions contributing to aquatic ecotoxicity
			f)	Emissions contributing to eutrophication
Social Impact				
	4	To protect local amenity	g)	Extent of noise problems
			h)	Extent of odour problems
	5	To conserve landscapes and townscapes	i)	Extent of visual and landscape impacts
	6	To provide opportunities for public involvement	j)	Extent of opportunities for public involvement
		and education	k)	Extent of opportunities for education potential
	7	To minimise local transport impacts	l)	Net change in waste kilometres compared to baseline
	8	To provide employment opportunities	m)	Number of jobs likely to be created
Financial				
	9	To minimise costs associated with organic	n)	Capital costs associated with waste infrastructure
		waste management	o)	Operating costs, difference from baseline
Policy and Adaptability				
	10	To provide an adaptable solution for the future	p)	Potential for adaptability
	11	To conform to waste policy	q)	Percentage recycling and composting
			r)	Percentage landfill

Detailed descriptions of the social objectives are included in Appendix B.

4.2 Assessment Indicators and Scoring

Assessment objectives and indicators were identified in Table 4-1; each indicator is measured via qualitative or quantitative measures to derive an options score. The indicators and their respective unit of measurement are presented in Table 4-2.

Table 4-2 : Objectives, Indicators and Associated Unit of Measurement

Model		Objective		Indicator / Criteria	Unit of measurement	Method of measurement
Technical						
		Mass balance to define baseline position.				
		Mass and energy balance to determine options				
		Outputs from Technical model to feed Financial, Environmental and Social Impact Models.				
Environmental						
	1	To reduce greenhouse gas emissions	a)	Greenhouse gases emitted	kg CO2-Eq	Quantitative / LCA tool
	2	To minimise adverse impacts on air quality	b)	Emissions contributing to photochemical oxidation	kg ethylene-Eq	Quantitative / LCA tool
			c)	Emissions contributing to depletion of the ozone layer	kg CFC-11-Eq	Quantitative / LCA tool
			d)	Emissions contributing to air acidification	kg SO2-Eq	Quantitative / LCA tool
	3	To minimise adverse effects on water quality	e)	Emissions contributing to aquatic ecotoxicity	kg 1,4-DCB-Eq	Quantitative / LCA tool
			f)	Emissions contributing to eutrophication	kg PO4-Eq	Quantitative / LCA tool
Social Impact						
	4	To protect local amenity	g)	Extent of noise problems	arbitrary score	Qualitative / Professional judgement
			h)	Extent of odour problems	arbitrary score	Qualitative / Professional judgement
	5	To conserve landscapes and townscapes	i)	Extent of visual and landscape impacts	arbitrary score	Qualitative / Professional judgement
	6	To provide opportunities for public involvement	j)	Extent of opportunities for public involvement	arbitrary score	Qualitative / Professional judgement
		and education	k)	Extent of opportunities for education potential	arbitrary score	Qualitative / Professional judgement
	7	To minimise local transport impacts	l)	Net change in waste kilometres compared to baseline	km	Qualitative / Professional judgement
	8	To provide employment opportunities	m)	Number of jobs likely to be created	# of jobs	Qualitative / Professional judgement
Financial						
	9	To minimise costs associated with organic	n)	Capital costs associated with waste infrastructure	$CD	Semi-quantitative / Simplified cost calculations
		waste management	o)	Operating costs, difference from baseline	$CD	Semi-quantitative / Simplified cost calculations
Policy and Adaptability						
	10	To provide an adaptable solution for the future	p)	Potential for adaptability	arbitrary score	Qualitative / Professional judgement
	11	To conform to waste policy	q)	Percentage recycling and composting	% R&C	Quantitative based on Technical Model
			r)	Percentage landfill	% Landfill	Quantitative based on Technical Model

Each option (for phase 1 and phase 2) is assessed against all objectives and indicators. Section 4.3 provides summary details regarding the life cycle assessment tool measurements, and Section 4.4 incorporates details regarding the non-LCA tool assessment methodology.

4.3 Life Cycle Assessment Scoring

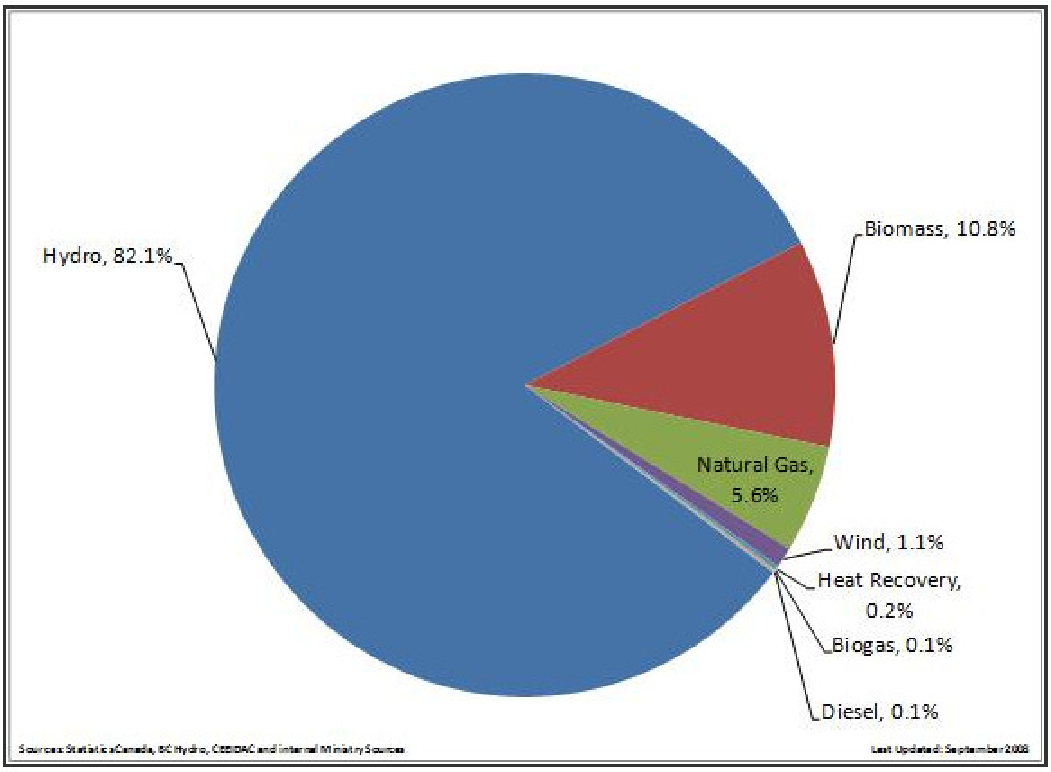
A number of life cycle assessment tools are available for the assessment of waste management activities. As a first stage in developing the Life Cycle Assessment project it was deemed necessary to critically review existing LCA tools and to identify a preferred tool or suite of tools capable of delivering the Authority's objectives. In October 2011 a report providing a critical review of LCA tools together with a recommendation of an approach to be adopted for the life cycle assessment was issued to RDCO. A copy of the LCA review report is included as Appendix C.

The LCA tool "WRATE" (Waste and Resource Assessment Tool for the Environment) was utilised for the majority of the quantitative environmental assessment scores. A description of the WRATE tool is provided in the LCA report in Appendix C. The operation of the WRATE tool requires a number of background assumptions including waste quantity, waste composition and energy mix.

Waste tonnage and composition are derived from the technical model based on the waste projections applying population growth. The baseline energy mix assumptions are required to calculate the environmental burdens of electricity utilised in processing and management of waste. The baseline energy mix data is based on data derived from the BC Ministry of Energy[2], represented below in Figure 4-1.

[2] http://www.em.gov.bc.ca/EPD/ELECTRICITY/SUPPLY/Pages/default.aspx

Figure 4-1 : Energy Mix based on BC Ministry of Energy Data



2012 Forecasted Five-year Average Electricity Supply by GW.h in B.C. by Fuel

In addition to the baseline energy mix (Figure 4-1), the WRATE tool requires information on the marginal energy mix. The marginal energy mix is utilised to calculate the environmental burdens associated with the generation of electricity from waste processes and facilities and the associated impacts of displacing the traditional electricity generation methods with waste derived electricity. An assumed marginal energy mix of 90% hydro and 10% gas was agreed for the purposes of the assessment. The WRATE tool applies offset values (based on a complex background database) to the assumed baseline and marginal energy mix. The WRATE tool does not allow the use of user derived environmental offset factors.

Each waste type and infrastructure option identified are modelled in the WRATE tool; the LCA model is then assessed and the environmental results extracted for inclusion within the bespoke assessment model designed for RDCO.

With respect to the modelling of greenhouse gases, the WRATE LCA tool considers only fossil / anthropogenic carbon, not biogenic carbon; this is in line with international life cycle assessment conventions.

4.4 Non-LCA Tool Assessment Scoring

Non-LCA assessment indicator scores are derived using a variety of qualitative or semi quantitative scoring. Each indicator is broken down in to a number of component impacts. Each individual component is scored against each facility type and a range of facility throughputs. The component scores are combined to generate an aggregate score for each facility type and throughput.

The scoring methodology for non-LCA indicators is best described via example tables. The table below shows the scoring table for Noise indicator. The noise indicator is made up of three component parts:

- Noisy plant and machinery;
- Vehicle movements;
- Hours of operation.

Noisy plant and machinery, and Vehicle movements are scored on an assigned score of 0-10, where 0 is the best (i.e. least amount of noisy plant and machinery or least number of vehicle movements) and 10 the worst. The hours of operation reflect the period of time when machinery is anticipated to be operating and/or deliveries of waste occur.

For the noise scenario, the three component scores are multiplied together and subsequently divided by 10,000 (to derive a more sensible scale) to obtain an aggregate score for each technology type and capacity.

Table 4-3 : Example Background Scoring Table (Noise Indicator)

Facility type	Capacity (t/a)	Aggregate Scores1	Noisy Plant & Machinery2	Vehicle Movements2	Hours of Operation3 (hrs/yr)
MRF - Clean	25,000	2.1	6.5	1.3	2,625
	15,000	1.2	6.0	0.8	2,625
	5,000	0.3	5.0	0.3	2,625
Backyard Composting	1	0.00	0.50	0.00	24.00
Composting - In vessel	40,000	3.0	5.8	2.0	2,625
	25,000	1.8	5.5	1.3	2,625
	15,000	1.0	5.0	0.8	2,625
	10,000	0.5	4.0	0.5	2,625
	5,000	0.2	3.0	0.3	2,625
	2,500	0.1	2.0	0.1	2,625
Composting - Open Windrow	20,000	1.3	5.0	1.0	2,625
	15,000	0.8	4.0	0.8	2,625
	7,500	0.3	3.3	0.4	2,625
	5,000	0.2	3.0	0.3	2,625
	2,500.0	0.1	2.0	0.1	2,625
Aerated static pile	20,000	1.3	5.0	1.0	2,625
	15,000	0.8	4.0	0.8	2,625
	7,500	0.3	3.3	0.4	2,625
	5,000	0.2	3.0	0.3	2,625
	2,500.0	0.1	2.0	0.1	2,625
Anaerobic Digestion	50,000	2.6	4.0	2.5	2,625
	25,000	1.0	3.0	1.3	2,625
Codigestion	50,000	2.6	4.0	2.5	2,625
	25,000	1.0	3.0	1.3	2,625
Landfill - traditional	200,000	7.7	8.8	3.3	2,625
	100,000	3.0	6.8	1.7	2,625
	75,000	1.9	5.8	1.3	2,625
Landfill - Bioreactor	200,000	7.9	9.0	3.3	2,625
	100,000	3.1	7.0	1.7	2,625
	75,000	2.0	6.0	1.3	2,625
Land application	25,000	0.4	4.0	0.4	2,625
	10,000	0.1	3.0	0.2	2,625
	5,000	0.0	2.0	0.1	2,625
MBT (residual to EfW)	60,000	4.8	6.0	1.0	8,000
	30,000	2.2	5.5	0.5	8,000
MBT (residual to l/fill)	60,000	4.4	5.5	1.0	8,000
	30,000	2.0	5.0	0.5	8,000
EfW	60,000	4.4	5.5	1.0	8,000
	30,000	1.6	4.0	0.5	8,000
Pyrolysis	60,000	4.4	5.5	1.0	8,000
	30,000	1.6	4.0	0.5	8,000
Spare	60,000	0.0	0.0	1.0	0
	30,000	0.0	0.0	0.5	0

Aggregate scores are assigned on the basis of technology type and throughput capacity; a formula is applied to calculate the aggregate scores for capacity requirements between the throughputs presented in Table 4-3.

Appendix D contains a description of each of the non-LCA assessment indicators and the detailed scoring tables.

4.5 Combining and Summarising Indicator Scores

The result of the options assessment process is a matrix comprising indicators as rows and options in columns. The resulting matrix provides an aggregation of option performance scores (Table 4-4).

Table 4-4 : Example Performance Score Output

			Yard and Garden Waste (<20cm diameter) Backyard composting	Yard and Garden Waste (<20cm diameter) In-vessel composting	Yard and Garden Waste (<20cm diameter) Open windrow composting	Yard and Garden Waste (<20cm diameter) Landfill traditional	Yard and Garden Waste (<20cm diameter) Landfill bioreactor
			Yard and Garden Waste (<20cm diameter)	Yard and Garden Waste (<20cm diameter)	Yard and Garden Waste (<20cm diameter)	Yard and Garden Waste (<20cm diameter)	Yard and Garden Waste (<20cm diameter)
Objective	**Indicator / Criteria**	**Unit of measurement**	Backyard composting	In-vessel composting	Open windrow composting	Landfill traditional	Landfill bioreactor
Environmental							
To reduce greenhouse gas emissions	Greenhouse gases emitted	kg CO2-Eq	165,644	-1,931,536	-1,931,536	66,439,562	16,224,479
To minimise adverse impacts on air quality	Emissions contributing to photochemical oxidation	kg ethylene-Eq	309.0	-143.0	-143.0	19,302.7	4,836.0
	Emissions contributing to depletion of the ozone layer	kg CFC-11-Eq	0.0	7.6	7.6	3.6	0.9
	Emissions contributing to air acidification	kg SO2-Eq	1,326,452	-1,251	-1,251	8,475	8,150
To minimise adverse effects on water quality	Emissions contributing to aquatic ecotoxicity	kg 1,4-DCB-Eq	-1,809,872	43,709	43,709	43,524	24,130
	Emissions contributing to eutrophication	kg PO4-Eq	300,298	9,482	9,482	34,001	33,919
Social Impact							
To protect local amenity	Extent of noise problems	arbitrary score	0.00	4.16	4.08	1.01	1.01
	Extent of odour problems	arbitrary score	0.00	2.12	6.68	1.59	1.59
To conserve landscapes and townscap	Extent of visual and landscape impacts	arbitrary score	0.00	67.69	50.40	279.71	279.71
To provide opportunities for public involvement and education	Extent of opportunities for public involvement	arbitrary score	50.00	50.00	50.00	1.00	4.00
	Extent of opportunities for education potential	arbitrary score	0.00	56.00	15.00	27.00	27.00
To minimise local transport impacts	Net change in waste kilometres compared to baseline	km	-172,534	0	0	-109,534	-109,534
To provide employment opportunities	Number of jobs likely to be created	# of jobs	0.00	9.36	6.19	5.78	5.78
Financial							
To minimise costs associated with organic waste management	Capital costs associated with waste infrastructure	$CD	4,545,849	5,758,432	0	0	4,606,745
	Operating costs, difference from baseline	$CD	-3,466,633	230,337	0	761,495	761,495
Policy and Adaptability							
To provide an adaptabilte solution for	Potential for adaptability	arbitrary score	25.00	50.00	50.00	1000.00	1000.00
To conform to waste policy	Percentage recycling and composting	% R&C	29.5%	29.5%	29.5%	0.0%	0.0%
	Percentage landfill	% Landfill	0.0%	0.0%	0.0%	29.5%	29.5%

It is not possible to directly compare option results across indicators or in totality due to different units of measurement or scale (for assigned scores). Therefore, the actual performance scores are valued between a score of 0 and 1 with zero assigned to the least favourable performance and 1 to the most favourable, as depicted in Table 4-5.

Table 4-5 : Example Valued Score Output

Objective	Indicator / Criteria	Unit of measurement	Yard and Garden Waste (<20cm diameter) Backyard composting	Yard and Garden Waste (<20cm diameter) In-vessel composting	Yard and Garden Waste (<20cm diameter) Open windrow composting	Yard and Garden Waste (<20cm diameter) Landfill traditional	Yard and Garden Waste (<20cm diameter) Landfill bioreactor
Environmental							
To reduce greenhouse gas emissions	Greenhouse gases emitted	kg CO2-Eq	0.97	1.00	1.00	0.00	0.73
To minimise adverse impacts on air quality	Emissions contributing to photochemical oxidation	kg ethylene-Eq	0.98	1.00	1.00	0.00	0.74
	Emissions contributing to depletion of the ozone layer	kg CFC-11-Eq	1.00	0.00	0.00	0.51	0.87
	Emissions contributing to air acidification	kg SO2-Eq	0.00	1.00	1.00	0.99	0.99
To minimise adverse effects on water quality	Emissions contributing to aquatic ecotoxicity	kg 1,4-DCB-Eq	1.00	0.00	0.00	0.00	0.01
	Emissions contributing to eutrophication	kg PO4-Eq	0.00	1.00	1.00	0.92	0.92
Social Impact							
To protect local amenity	Extent of noise problems	arbitrary score	1.00	0.00	0.02	0.76	0.76
	Extent of odour problems	arbitrary score	1.00	0.68	0.00	0.76	0.76
To conserve landscapes and townscap	Extent of visual and landscape impacts	arbitrary score	1.00	0.76	0.82	0.00	0.00
To provide opportunities for public involvement and education	Extent of opportunities for public involvement	arbitrary score	1.00	1.00	1.00	0.00	0.06
	Extent of opportunities for education potential	arbitrary score	0.00	1.00	0.27	0.48	0.48
To minimise local transport impacts	Net change in waste kilometres compared to baseline	km	1.00	0.00	0.00	0.63	0.63
To provide employment opportunities	Number of jobs likely to be created	# of jobs	0.00	1.00	0.66	0.62	0.62
Financial							
To minimise costs associated with organic waste management	Capital costs associated with waste infrastructure	$CD	0.21	0.00	1.00	1.00	0.20
	Operating costs, difference from baseline	$CD	1.00	0.13	0.18	0.00	0.00
Policy and Adaptability							
To provide an adaptable solution for the	Potential for adaptability	arbitrary score	0.00	0.03	0.03	1.00	1.00
To conform to waste policy	Percentage recycling and composting	% R&C	1.00	1.00	1.00	0.00	0.00
	Percentage landfill	% Landfill	1.00	1.00	1.00	0.00	0.00
VALUED PERFORMANCE SCORES			12.16	10.59	9.97	7.68	8.79

A common valued scale allows comparison of options performance against certain key indicators; it also allows a summation of all indicator results to identify the preferred infrastructure option for a particular organic waste stream. In this example the option in the first column exhibits the highest valued performance score and is thus considered the preferred option.

5.0 OPTION RESULTS

Option results for the phase 1 (segregated organics) and phase 2 (residual garbage) assessments are presented by material type below. Valued scores are summarised for each objective area (environmental, social impact, financial, policy and adaptability); the value scores are summed and ranked to identify the preferred infrastructure option for each organic waste stream.

The scores presented in Section 5 are based on each of the 18 assessment indicators (e.g. greenhouse gases emitted, extent of noise problems, capital costs associated with infrastructure etc) having an equal level of importance, i.e. no weightings have been applied. Section 7 considers the application of weightings.

Appendix E provides complete option tables showing performance and valued scores for all objectives and indicators to allow further results interpretation and understanding.

Section 6 combines the individual options for each material type to create a scenario of organic management for RDCO.

5.1 Yard and Garden Waste (<20cm)

Table 6-1 indicates that backyard composting is the preferred solution although there is only 2 points (less than 20%) difference between the three highest performing options with social impact and financial the two key differentiators.

Table 5-1 : Yard and Garden Waste (<20cm) Assessment Results

	Backyard composting	In-vessel composting	Open windrow composting	Landfill traditional	Landfill recirculating
Environmental	3.95	3.97	3.97	2.39	4.36
Social Impact	5.00	4.44	2.77	3.25	3.32
Financial	1.21	0.13	1.18	1.00	0.21
Policy and Adaptability	2.00	2.03	2.03	1.00	1.00
Total	12.16	10.56	9.94	7.65	8.88
Rank	1	2	3	5	4

In-vessel composting performs marginally better than open-windrow composting mainly due to a higher score against social impact. On further investigation the benefit is due to the following factors:

- in-vessel composting exhibits a higher score for odour potential due to the enclosed nature of the process and the ability to control odour emissions;
- in-vessel composting exhibits a higher score for education potential and this is due to the higher skill levels required to operate the plant compared to open-windrow composting.

The recirculating landfill achieves a high environmental score due to the generation of energy and avoidance of leachate however performs poorly on cost and policy and adaptability when compared to the other options. As anticipated, landfill traditional exhibits the lowest score of all technical options.

Figure 5-1 : Graphical Results of Yard and Garden Waste (<20cm)

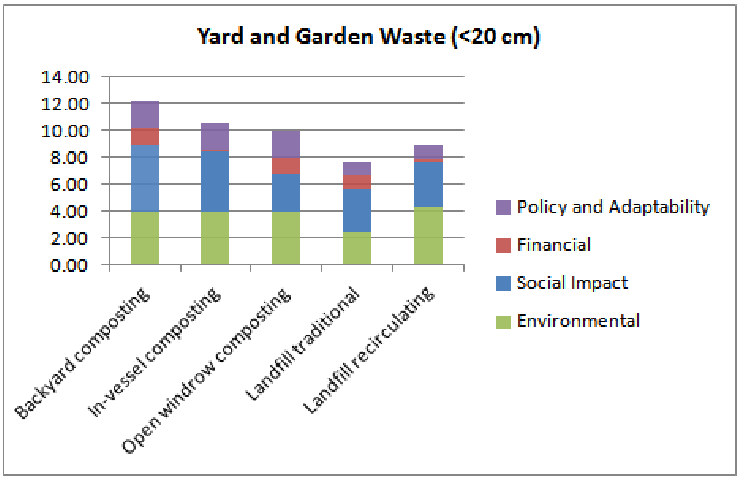
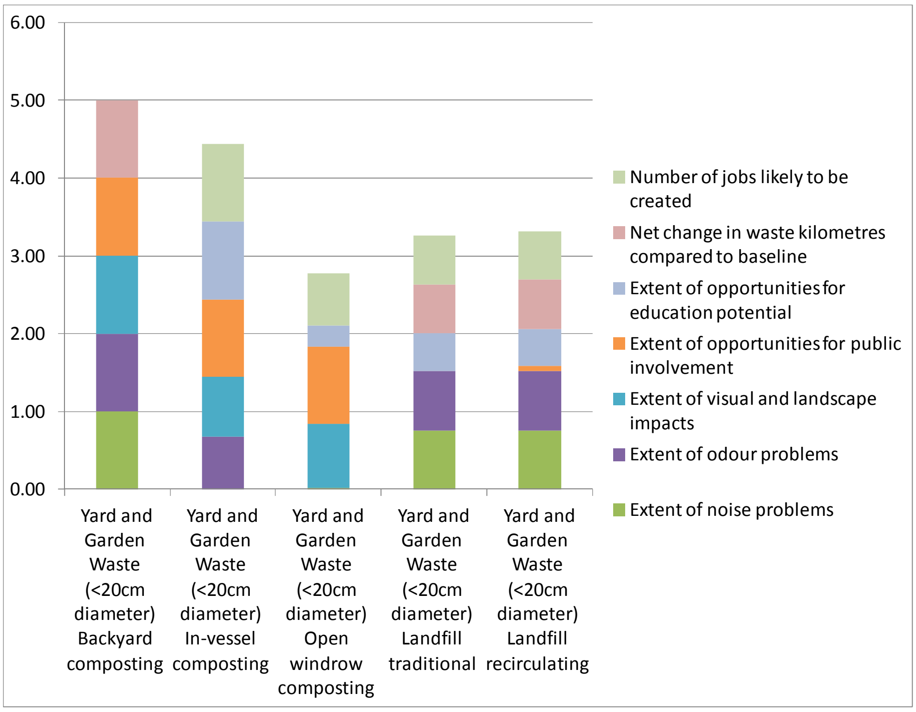


Figure 5-2: Social Impact Results for Yard and Garden Waste (<20cm)



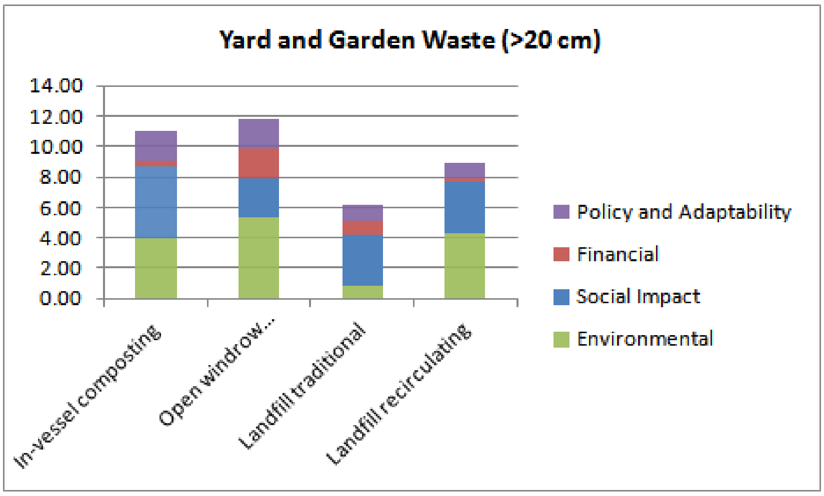
5.2 Yard and Garden Waste (>20cm)

For large Yard and Garden Waste, open windrow composting is the highest performing technology; there are only marginal differences between OW and in-vessel composting asides financial performance where OW is shown to be significantly cheaper.

Table 5-2 : Yard and Garden Waste (>20cm) Assessment Results

	In-vessel composting	Open windrow composting	Landfill traditional	Landfill recirculating
Environmental	3.93	5.36	0.85	4.29
Social Impact	4.82	2.49	3.29	3.35
Financial	0.26	2.00	1.00	0.26
Policy and Adaptability	2.00	2.00	1.00	1.00
Total	11.01	11.86	6.14	8.90
Rank	2	1	4	3

Figure 5-3 : Graphical Results of Yard and Garden Waste (>20cm)



Traditional landfill is the lowest performing option with lowest scores across all criteria. Recirculating landfill achieves a high environmental score however performs poorly against Policy and Adaptability, and Financial objectives.

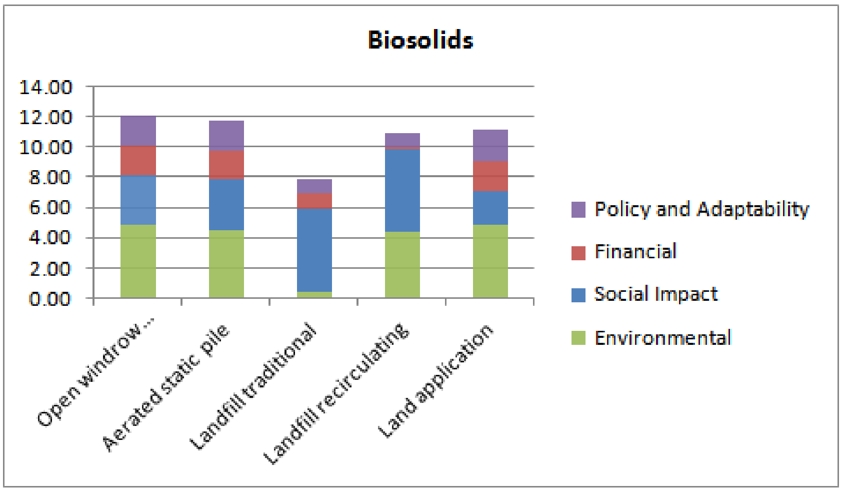
5.3 Biosolids

For biosolids, open windrow composting is the most favourable option, scoring marginally higher than the current waste management approach ASP; differences occur for environmental and financial performance however the differences are in the order of 2% and therefore considered negligible.

Table 5-3 : Biosolids Assessment Results

	Open windrow composting	Aerated static pile	Landfill traditional	Landfill recirculating	Land application
Environmental	4.79	4.54	0.45	4.40	4.79
Social Impact	3.33	3.33	5.45	5.51	2.28
Financial	2.00	1.83	1.00	0.04	2.00
Policy and Adaptability	2.00	2.00	1.00	1.00	2.05
Total	12.13	11.71	7.90	10.95	11.12
Rank	1	2	5	4	3

Figure 5-4 : Graphical Results of Biosolids



Environmental performance is similar for all options except traditional landfill. Both landfill options perform poorly on policy and adaptability but deliver the highest scores for social impact due to low levels of noise and odour and minimal transport implications.

5.4 White Wood

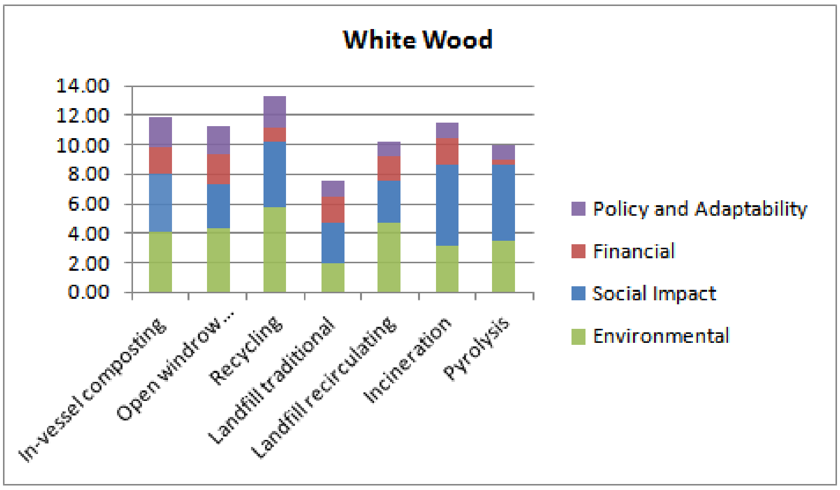
For white wood, recycling is shown to be the highest performing option delivering maximum score for all criteria.

However, despite this being the case the recycling markets for white wood recycling (e.g. particleboard manufacture) are saturated and therefore the potential to deliver recycling extremely limited. The next highest performing option is in-vessel composting followed by incineration and open windrow composting. The variance between these three options is less than 4% and therefore not considered significant.

Table 5-4 : White Wood Assessment Results

	In-vessel composting	Open windrow composting	Recycling	Landfill traditional	Landfill recirculating	Incineration	Pyrolysis
Environmental	4.12	4.37	5.76	1.89	4.70	3.11	3.48
Social Impact	3.95	2.94	4.46	2.75	2.81	5.47	5.17
Financial	1.80	2.00	0.86	1.87	1.73	1.84	0.35
Policy and Adaptability	2.00	2.00	2.21	1.00	1.00	1.05	1.00
Total	11.87	11.31	13.30	7.50	10.24	11.47	10.00
Rank	2	4	1	7	5	3	6

Figure 5-5 : Graphical Results of White Wood



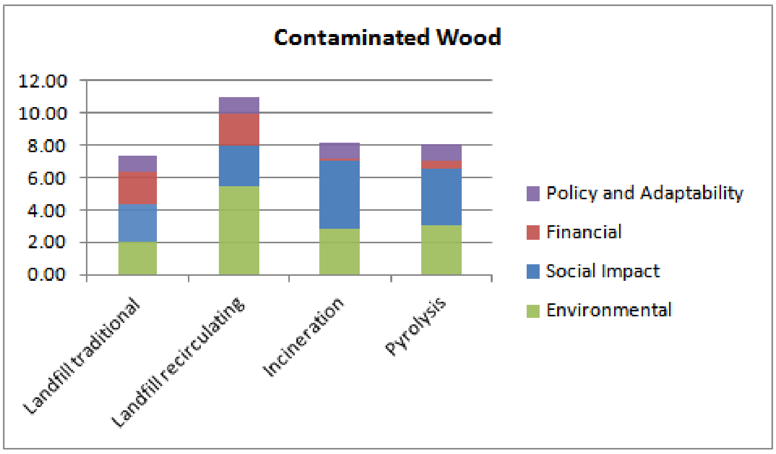
5.5 Contaminated Wood

For contaminated wood landfill recirculating is shown to be the highest performing option followed by incineration; the largest differences occur for environmental criteria (particularly emissions contributing to ozone depletion, air acidification, eutrophication and aquatic ecotoxicity).

Table 5-5 : Contaminated Wood Assessment Results

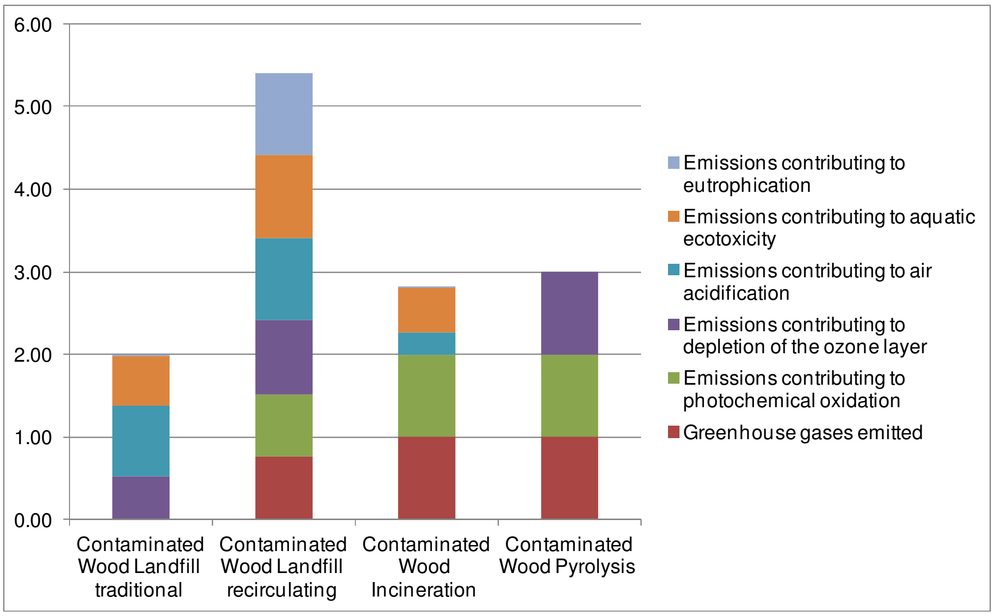
	Landfill traditional	Landfill recirculating	Incineration	Pyrolysis
Environmental	1.99	5.41	2.81	3.00
Social Impact	2.33	2.51	4.18	3.55
Financial	1.99	2.00	0.11	0.49
Policy and Adaptability	1.00	1.00	1.05	1.00
Total	7.31	10.92	8.15	8.04
Rank	4	1	2	3

Figure 5-6 : Graphical Results of Contaminated Wood



It is environmental impacts where recirculating landfill shows the highest score due to recovery of energy and in comparison to the thermal options the absence of any gaseous emissions of contaminants within the waste stream. In particular recirculating landfill performs comparatively well on emissions contributing to eutrophication and aquatic ecotoxicity (Figure 5-7)

Figure 5-7: Valued Performance Scores for Contaminated Wood



5.6 Old Corrugated Cardboard (OCC)

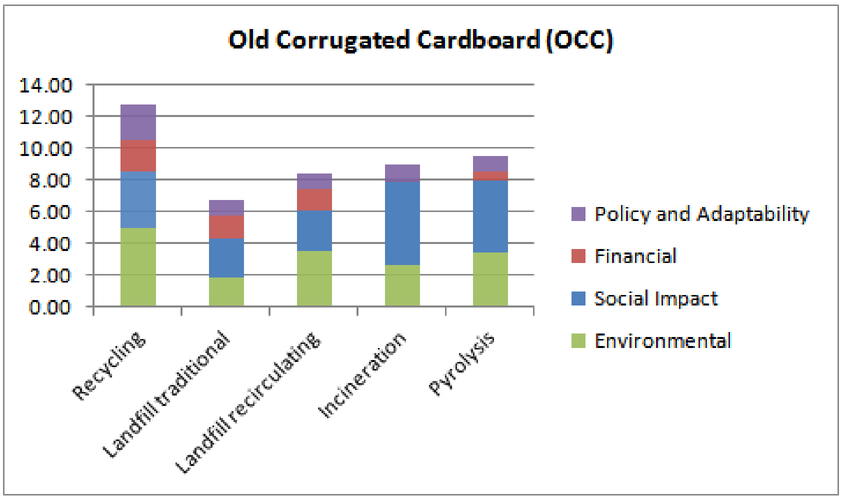
For OCC, recycling is shown to be the most preferable option significantly outperforming all others across all criteria.

Table 5-6 : Old Corrugated Cardboard Assessment Results

	Recycling	Landfill traditional	Landfill recirculating	Incineration	Pyrolysis
Environmental	5.00	1.87	3.52	2.65	3.43
Social Impact	3.52	2.47	2.53	5.21	4.60
Financial	2.00	1.47	1.41	0.05	0.49
Policy and Adaptability	2.21	1.00	1.00	1.05	1.00
Total	12.73	6.82	8.46	8.96	9.53
Rank	1	5	4	3	2

This confirms that current waste management practices for OCC offer a sustainable option when compared to other solutions.

Figure 5-8 : Graphical Results of Old Corrugated Cardboard



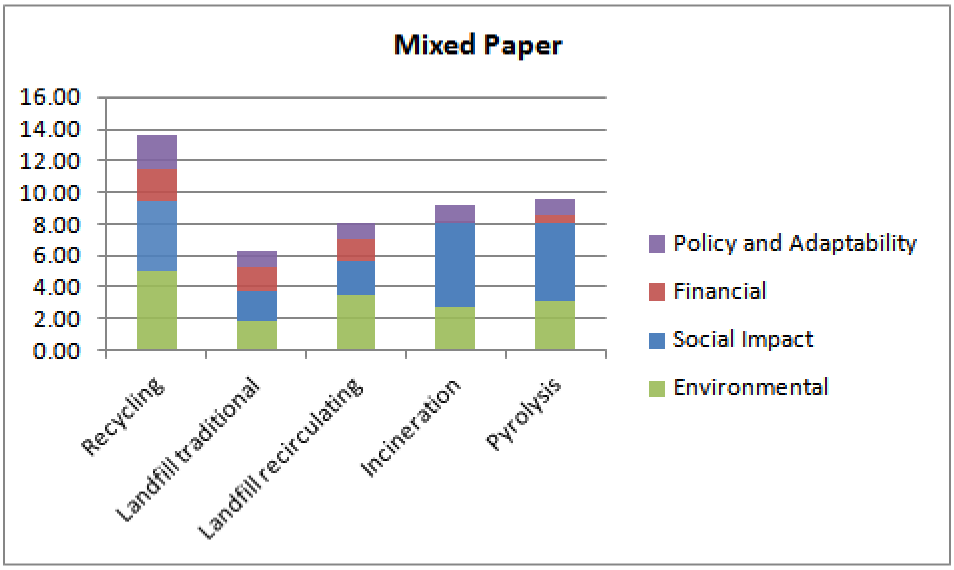
5.7 Mixed Paper

For mixed paper, recycling is shown to be the most preferable option significantly outperforming all others across all criteria. This confirms the sustainability benefit of current waste management practices for mixed paper

Table 5-7 : Mixed Paper Assessment Results

	Recycling	Landfill traditional	Landfill recirculating	Incineration	Pyrolysis
Environmental	5.00	1.78	3.54	2.68	3.07
Social Impact	4.48	2.00	2.06	5.37	5.05
Financial	2.00	1.47	1.41	0.05	0.49
Policy and Adaptability	2.21	1.00	1.00	1.05	1.00
Total	13.69	6.26	8.01	9.15	9.61
Rank	1	5	4	3	2

Figure 5-9 : Graphical Results of Mixed Paper



5.8 Residual Garbage

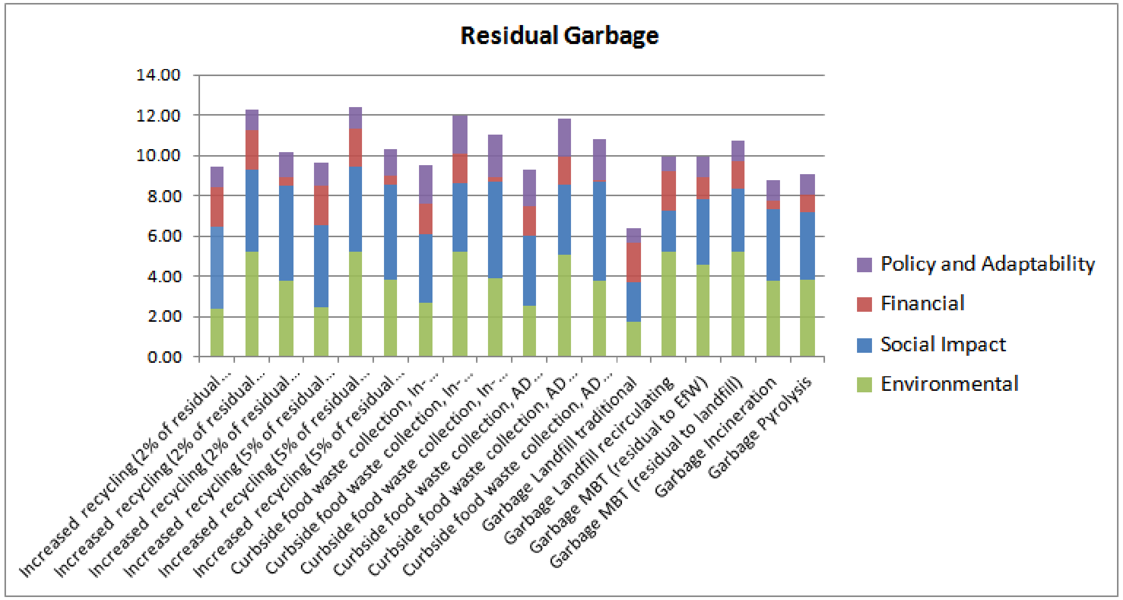
The results for management of residual garbage are set out in Table 5-8 and Figure 5-8.

Performance score range from a lowest score of 6.4 for traditional landfill to a maximum score of 12.43 for increased recycling with recirculating landfill. The top 4 scoring options all include recirculating landfill as one of the contributory technologies.

Table 5-8 : Residual Garbage Assessment Results

	Increased recycling (2% of residual paper, card, white wood) Landfill traditional	Increased recycling (2% of residual paper, card, white wood) Landfill recirculating	Increased recycling (2% of residual paper, card, white wood) Incineration	Increased recycling (5% of residual paper, card, white wood) Landfill traditional	Increased recycling (5% of residual paper, card, white wood) Landfill recirculating	Increased recycling (5% of residual paper, card, white wood) Incineration	Curbside food waste collection, In-vessel Landfill traditional	Curbside food waste collection, In-vessel Landfill recirculating	Curbside food waste collection, In-vessel Incineration	Curbside food waste collection, AD Landfill traditional	Curbside food waste collection, AD Landfill recirculating	Curbside food waste collection, AD Incineration	Garbage Landfill traditional	Garbage Landfill recirculating	Garbage MBT (residual to EfW)	Garbage MBT (residual to landfill)	Garbage Incineration	Garbage Pyrolysis
Environmental	2.37	5.21	3.77	2.41	5.23	3.81	2.68	5.21	3.91	2.54	5.07	3.77	1.70	5.20	4.55	5.19	3.74	3.85
Social Impact	4.05	4.09	4.69	4.15	4.19	4.74	3.38	3.42	4.83	3.48	3.52	4.93	1.98	2.02	3.26	3.15	3.56	3.29
Financial	1.98	1.92	0.45	1.96	1.90	0.45	1.53	1.48	0.18	1.43	1.37	0.08	1.99	2.00	1.12	1.39	0.46	0.89
Policy and Adaptability	1.04	1.04	1.27	1.11	1.11	1.33	1.89	1.89	2.08	1.85	1.85	2.04	0.73	0.73	1.00	1.00	1.04	1.00
Total	9.44	12.26	10.19	9.63	12.43	10.33	9.48	12.00	11.00	9.30	11.82	10.82	6.40	9.95	9.92	10.73	8.80	9.03
Rank	14	2	9	12	1	8	13	3	5	15	4	6	18	10	11	7	17	16

Figure 5-10 : Graphical Results of Residual Garbage



6.0 RDCO ORGANIC WASTE MANAGEMENT SCENARIOS

Section 5 reviews the performance scores for each organic material stream, and the infrastructure options for assessment. Individual scoring as set out above allows an assessment of a single material to identify the best technical solution; however RDCO has a responsibility to manage all organic waste streams. As such, Section 6 combines all of the organic waste streams to create management scenarios with specific criteria/priorities. The preferred management method for a particular waste stream is likely to change depending on the nature of the key concern or priority; for example a low cost management scenario is likely to result in different preferred options to a low carbon scenario.

Table 6-1 outlines 8 scenarios (including the baseline) developed for RDCO. The Microsoft excel options assessment model provides a space for two additional scenarios to investigate further, undefined scenarios which may be of interest.

Table 6-1 : Organic Waste Management Scenario Descriptions

Combined Scenario	Description
Baseline	Reflects the current position.
Low CO2	Selects the management method with the least CO2-Eq emissions for each material stream.
Low cost	Selects the management method with the lowest combined capex and additional opex costs for each material stream.
New food waste segregation	Reflects the current baseline position for source segregated organics, with the addition of a new food waste recycle service.
Increase existing recycling collection performance 2%	Reflects current management methods for source segregated and residual waste, assuming an additional 2% of OCC, mixed paper and white wood is segregated from the residual stream .
Increase existing recycling collection performance 5%	Reflects current management methods for source segregated and residual waste, assuming an additional 5% of OCC, mixed paper and white wood is segregated from the residual stream .
No segregation (all residual waste to Landfill recirculating)	This scenario represents all organic materials going to Landfill recirculating.
No segregation (all residual waste to traditional landfill)	This scenario represents all organic materials going to traditional landfill (no gas capture).
Spare 1	Preferred management method for each material stream can be selected from drop down for a bespoke scenario. User can choose to include or exclude this option in table below.
Spare 2	Preferred management method for each material stream can be selected from drop down for a bespoke scenario. User can choose to include or exclude this option in table below.

All scenarios have been evaluated by first identifying a preferred option for each waste stream, and then combining the option scores for each material to generate a total scenario performance score. The performance scores are once again converted to valued scores to allow summation and ranking of the scenarios. Graphical analysis of the scenario scores are presented in Figures 6-1 to 6-5. The combined scenario scores are included as Table 6-2.

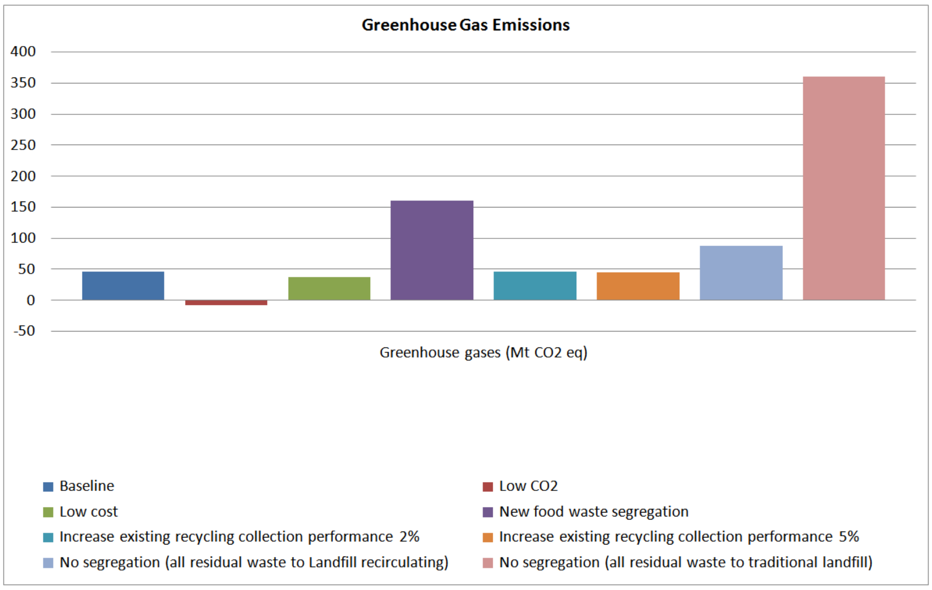
6.1 Absolute Performance

6.1.1 Carbon Emissions

Lifecycle greenhouse gas emissions are exhibited in Figure 6-1 as metric tonnes carbon dioxide equivalent (metric tonnes CO_2 eq). All scenarios result in positive environmental burdens apart from the low carbon scenario which shows a negative carbon impact primarily associated with the inclusion of incineration and thus minimal emissions of methane. The no segregation approach leads to a significant greater carbon impact than all other options and this will be due to enhanced emissions of landfill gas.

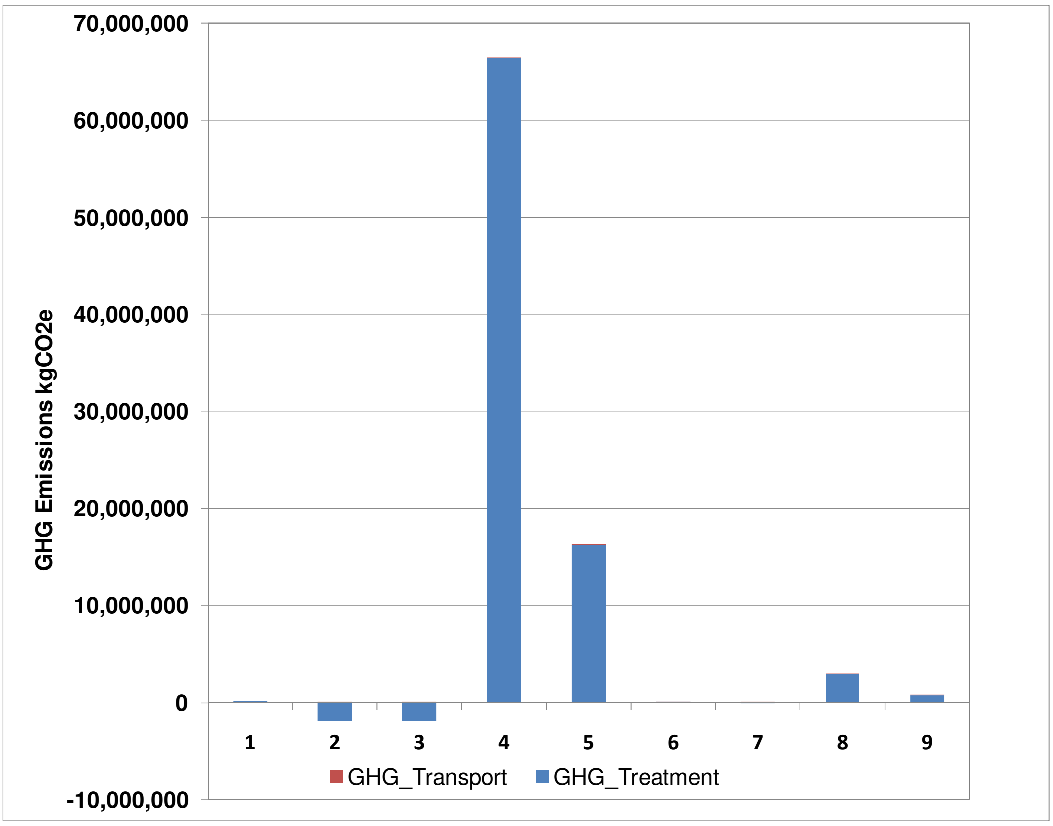
Asides the low carbon scenario, four other scenarios exhibit a similar low carbon impact score (the baseline, low cost, and the two increase recycling scenarios).

Figure 6-1 : Greenhouse Gas Emissions for Waste Management Scenarios



The greenhouse gas emissions include emissions associated with waste transport; transport impacts are also included under other criteria for example waste kilometres and financial (if new waste collection services are required). The scale of transport impacts in GHG estimates is the negligible impact (see Figure 6-2) compared to the direct and avoided burdens associated with the management of the waste

Figure 6-2: Example GHG emissions



6.1.2 Other Environmental Criteria

Figure 6-2 indicates other environmental criteria, primarily photochemical oxidation, ozone depletion, acid gases, aquatic ecotoxicity and eutrophication. In all cases the current baseline performs comparably favourably against the other scenarios. The no-segregation scenario performs particularly poorly as would be expected.

The most significant differences are seen for “photochemical oxidation” and “eutrophication” in which “new food waste segregation” exhibit the most significant variance.

6.1.3 Social Impact Criteria

Social impact criteria are depicted in Figure 6-3. In all cases the current baseline performs comparably favourably against the other scenarios. The no-segregation scenario performs particularly poorly as to be expected.

Of the various criteria odour and noise show the least variance. The most significant variance is shown for visual/landscape impacts, education potential and waste kilometres.

Figure 6-3: Environmental Emissions for Waste Management Scenarios

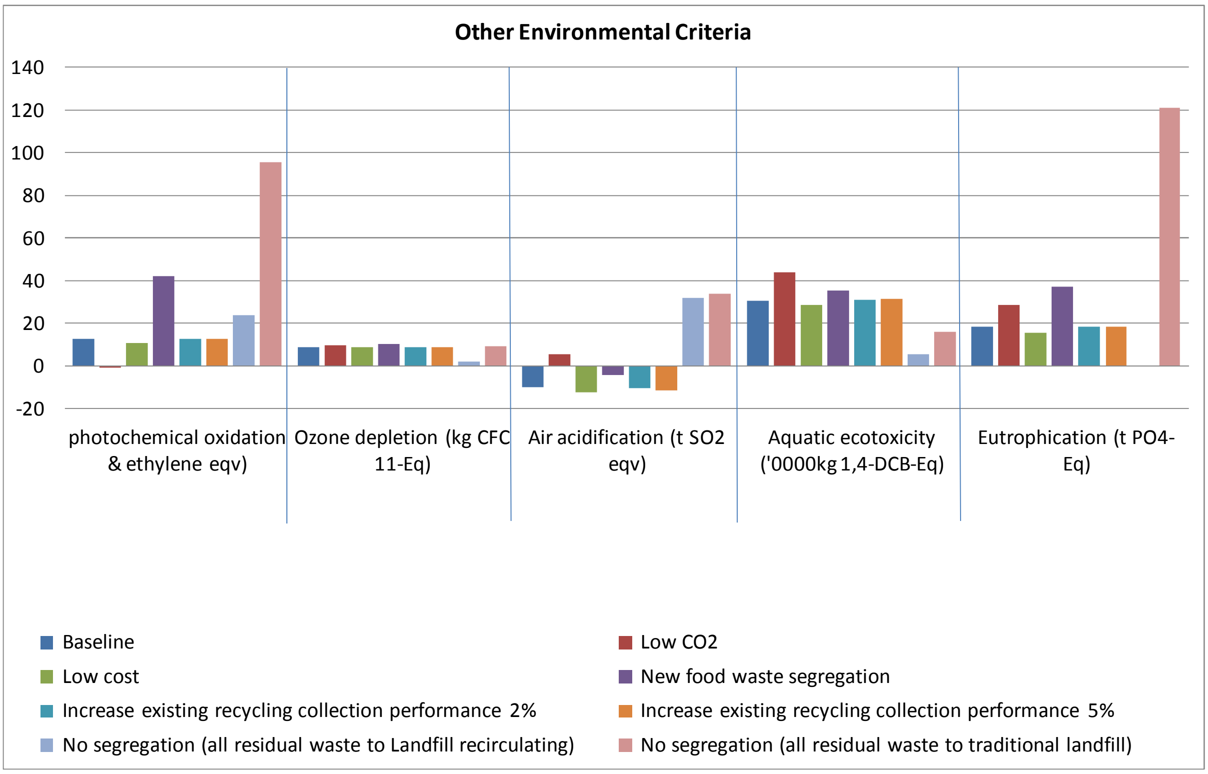
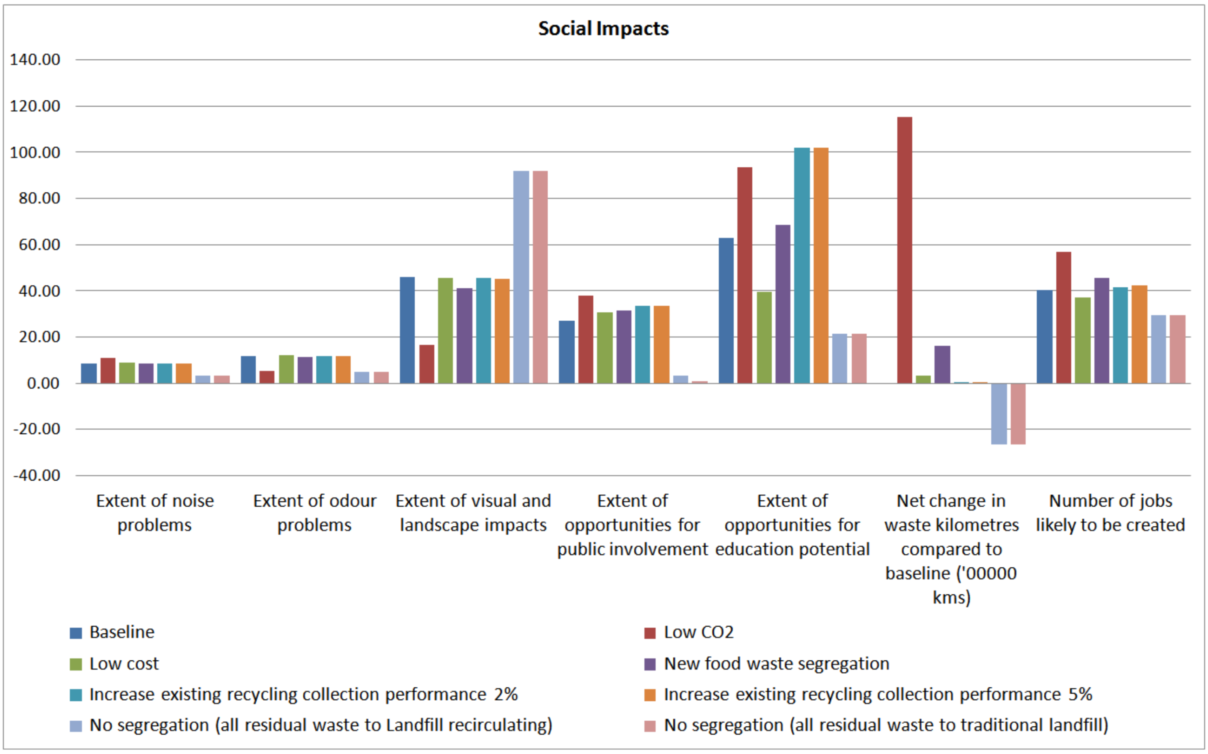


Figure 6-4: Social Impacts of Waste Management Scenarios

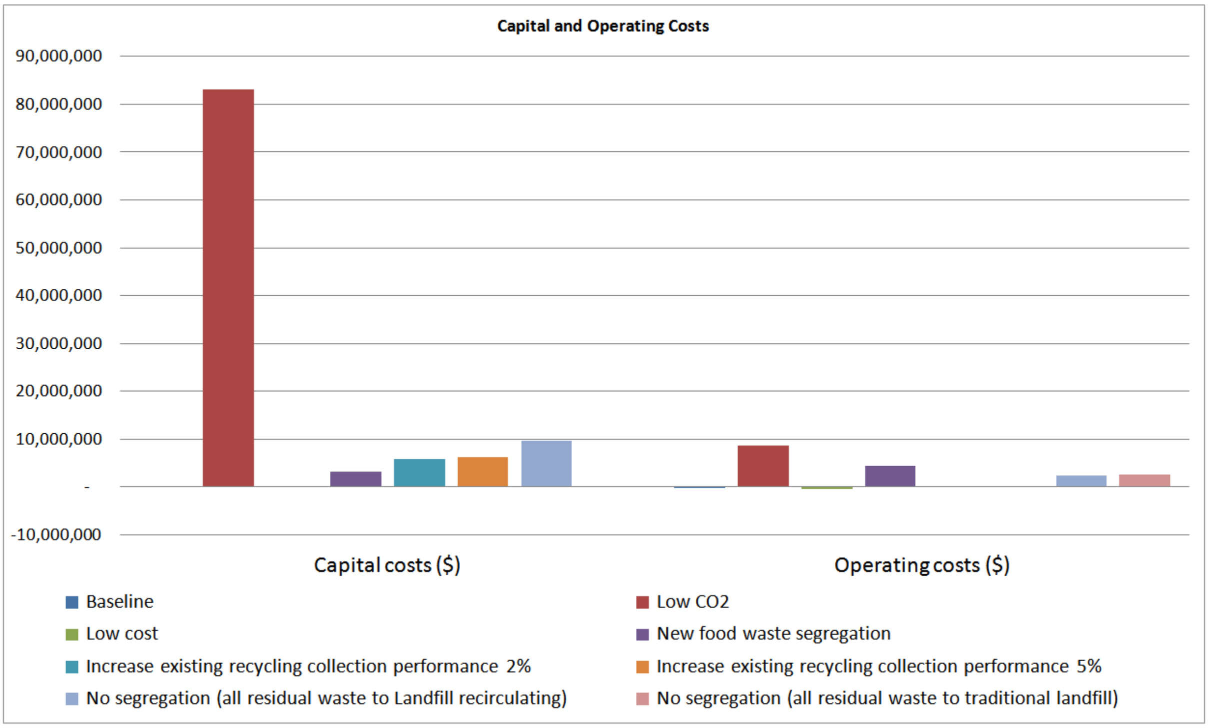


6.1.4 Capital and Operating Costs

The low carbon scenario exhibits significant capital costs associated with the construction of the thermal EfW plant; operating costs are also significant in comparison to the other options.

Capital and operating costs for the baseline scenario are low as the additional capital investment required is marginal in comparison to other scenarios.

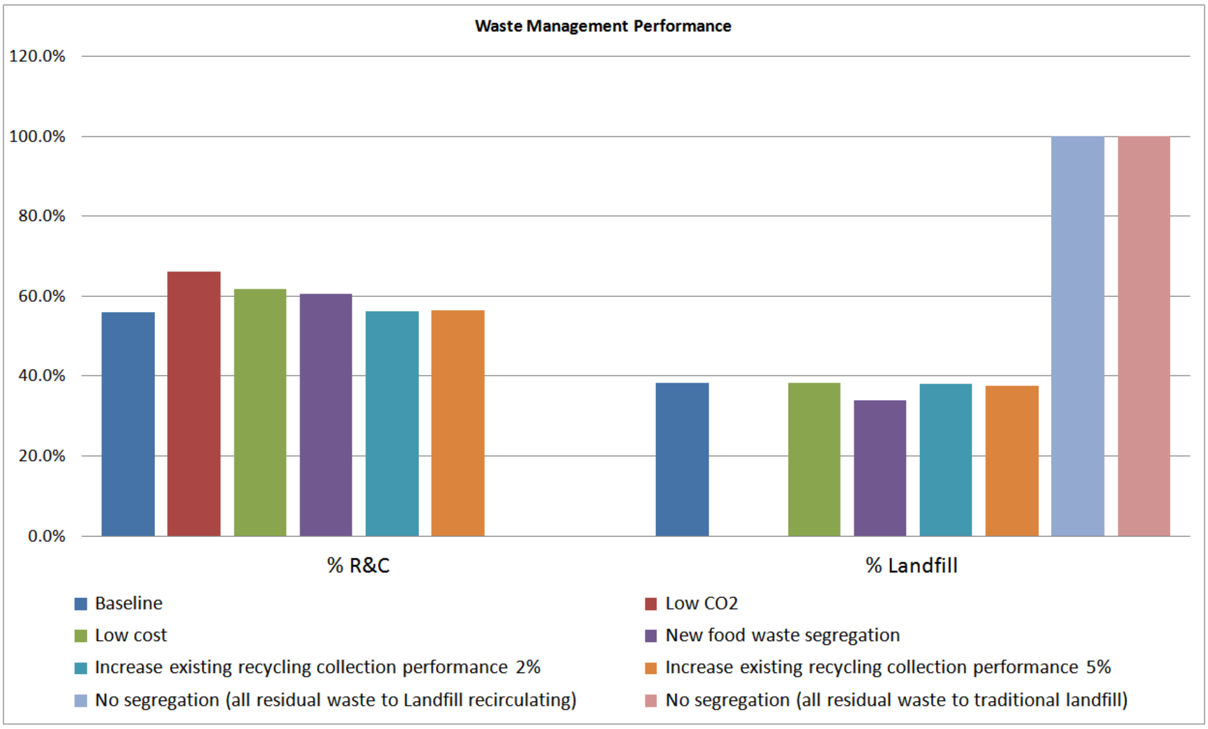
Figure 6-5: Capital and Operating Cost of Waste Management Scenarios



6.1.5 Waste Management Performance

All scenarios, apart from the two no-segregation scenarios show a recycling and composting performance of circa 60% with marginal differences apparent between the scenarios. The “low CO2”, “low cost” and “new food waste segregation” exhibit the highest recycling/ composting rate.

Figure 6-6: Waste Management Performance of Scenarios



6.2 Summary Results

Summary results for all scenarios are shown in Table 6-2 indicating that three scenarios exhibit substantially higher performance than the other scenarios. The 'baseline' scenario is ranked third with the two options with higher recycling performance ranked first and second; however there is very little difference in score between the highest three performing options.

Table 6-2 : Summary Results for Scenario Valued Scores

	Baseline	Low CO2	Low cost	New food waste segregation	Increase existing recycling collection performance 2%	Increase existing recycling collection performance 5%	No segregation (all residual waste to Landfill recirculating)	No segregation (all residual waste to traditional landfill)
Environmental	4.03	3.46	4.25	2.83	4.03	4.04	4.52	0.87
Social Impact	3.37	4.81	3.00	3.78	4.09	4.13	3.06	3.00
Financial	1.96	0.00	2.00	1.42	1.88	1.86	1.57	1.67
Policy and Adaptability	1.72	2.00	1.80	1.84	1.78	1.79	1.00	1.00
Total	11.08	10.27	11.05	9.87	11.77	11.81	10.16	6.54
Rank	3	5	4	7	2	1	6	8

Of particular interest is the poor performance of the New Food Waste Segregation scenario compared to the Baseline scenario which illustrates that the separate treatment of food waste is unlikely to provide benefits over current waste management practices.

7.0 WEIGHTING AND SENSITIVITY

The analysis preceding this section has presented the performance of options based on non-weighted valued performance scores. Weightings provide a means of prioritising indicators and criteria by level of importance. Three weightings sets have been developed (Table 7-1) and applied to the valued scores to provide weighted performance scores the results being presented in Tables 7-2 for the combined scenarios. Appendix F contains the breakdown of weightings by individual indicator.

Table 7-1: Applied Weightings Sets

	Weighting Set 1	Weighting Set 2	Weighting Set 3
	Consultant *	Regional Strategic Plan	Heavily Financed Weighted
Environmental	37.4%	30.0%	22.5%
Social Impact	36.4%	30.0%	22.0%
Financial	8.1%	30.0%	50.0%
Policy and adaptability	18.2%	10.0%	5.5%
Total	**100.0%**	**100.0%**	**100.0%**

* Consultant weightings based on consultation exercise undertaken with Local Authorities in the UK.

Table 7-2: Scenario Weighted Scores

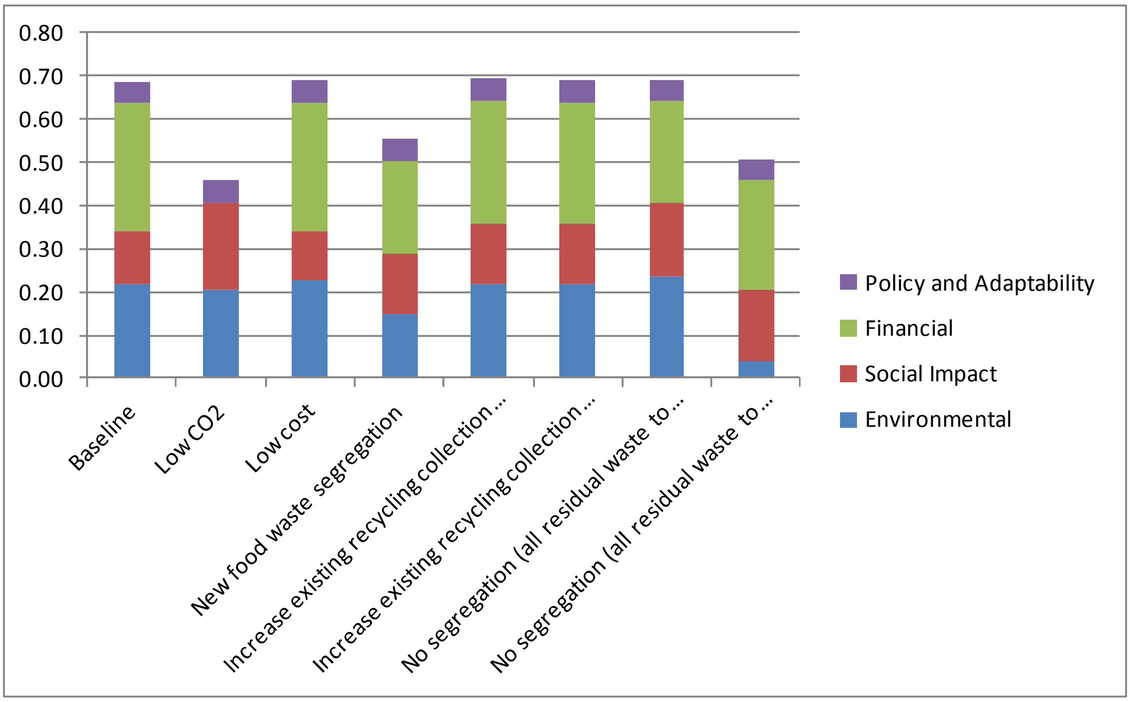
	Baseline	Low CO2	Low cost	New food waste segregation	Increase existing recycling collection performance 2%	Increase existing recycling collection performance 5%	No segregation (all residual waste to Landfill recirculating)	No segregation (all residual waste to traditional landfill)
Environmental	4.03	3.46	4.25	2.83	4.03	4.04	4.52	0.87
Social Impact	3.37	4.81	3.00	3.78	4.09	4.13	3.06	3.00
Financial	1.96	0.00	2.00	1.42	1.88	1.86	1.57	1.67
Policy and Adaptability	1.72	2.00	1.80	1.84	1.78	1.79	1.00	1.00
Total	11.08	10.27	11.05	9.87	11.77	11.81	10.16	6.54
No Weighting	3	5	4	7	2	1	6	8
Consultant	5	3	4	7	2	1	6	8
Regional Strategic Plan	5	8	3	6	1	2	4	7
Heavily Financed Weighted	2	8	1	6	3	4	5	7

Table 7-2 clearly shows the impact of weightings on performance of the options; for example the “Baseline” scenario moves to fifth position for the Consultant and Regional Strategic Plan weightings set but from third to second position with the Heavily Financed weighting set.

Whilst two weighting sets do not appear to benefit the “Baseline” scenario in reality, as indicated in Figure 7-1 (Regional Strategic Plan weightings), there is a only a very marginal difference between the 5 highest scoring scenarios of less than 1%.

The increased recycling performance scenarios consistently perform highest however the “New food waste segregation” scenario yields poor performance even under the Regional Strategic Plan weightings set.

Figure 7-1: Weighted Scenario Performance based on Regional Strategic Plan Weightings set



In summary, both valued performance scores (Table 6-2) and weighted performance scores (Table 7-2) indicate that the Council's current approach to organic waste management offers high levels of sustainability. Contrary to expectations the introduction of segregated food waste collections is unlikely to deliver improved performance; utilising the multi criteria approach presented herein calculations indicate that performance could actually worsen.

8.0 CONCLUSIONS AND RECOMMENDATIONS

A multi criteria approach has been used to assess options for the management of organic wastes. In particular the assessment compares elements of the current organic waste management strategy with other potential organic waste management technologies.

The analysis has been carried out in two Stages as follows:

- Stage 1 considers each type of organic waste on an individual basis and compares viable technologies/options for managing each waste stream;
- Stage 2 combines all of the organic waste streams to create management scenarios with specific criteria/priorities.

Stage 1 and Stage 2 also utilise different approaches to compare the different scenarios with Stage 1 assessment utilising valued performance scores and Stage 2 applying weightings to the valued performance scores to reflect particular priorities.

The results of the stage 1 assessments are summarised in Table 8-1.

Table 8-1: Summary of Stage 1 Assessments

Organic Component	Highest Performing Option	Current Management Option	Current Management Option Rank
Yard and Garden <20cm	Backyard Composting	Back Yard / Open Windrow	1 / 2
Yard and Garden >20cm	Open Windrow	Open Windrow	1
Biosolids	Open Windrow	Aerated Static Pile / Land Application	2 / 3
White Wood	Recycling	Incineration	3
Contaminated Wood	Landfill	Landfill	1
OCC	Recycling	Recycling	1
Mixed paper	Recycling	Recycling	1

Table 8-1 indicates that the waste management options currently utilised by the RDCO for the different organic waste streams represent the highest scoring option when compared to other alternative treatment methods. These results confirm that RDCO's approach offer a high degree of sustainability and that when the balance of economic, environmental and socio-economic factors are considered that it would be difficult to achieve any significant improves on current management methods.

In Stage 2 a number of scenarios have been devised as follows:

Combined Scenario	Description
Baseline	Reflects the current position.
Low CO2	Selects the management method with the least CO2-Eq emissions for each material stream.
Low cost	Selects the management method with the lowest combined capex and additional opex costs for each material stream.
New food waste segregation	Reflects the current baseline position for source segregated organics, with the addition of a new food waste recycle service.
Increase existing recycling collection performance 2%	Reflects current management methods for source segregated and residual waste, assuming an additional 2% of OCC, mixed paper and white wood is segregated from the residual stream .
Increase existing recycling collection performance 5%	Reflects current management methods for source segregated and residual waste, assuming an additional 5% of OCC, mixed paper and white wood is segregated from the residual stream .
No segregation (all residual waste to Landfill recirculating)	This scenario represents all organic materials going to Landfill recirculating.
No segregation (all residual waste to traditional landfill)	This scenario represents all organic materials going to traditional landfill (no gas capture).
Spare 1	Preferred management method for each material stream can be selected from drop down for a bespoke scenario. User can choose to include or exclude this option in table below.
Spare 2	Preferred management method for each material stream can be selected from drop down for a bespoke scenario. User can choose to include or exclude this option in table below.

A combination of value and weighted performance analyses have been carried out. These show that the current approach (Baseline) is the third highest performing approach based on un-weighted valued scores and that when a set of weightings that reflect current financial constraints are applied that performance increases to position 2.

In summary, both valued performance scores and weighted performance scores indicate that the Council's current approach to organic waste management offers high levels of sustainability. Contrary to expectations the introduction of segregated food waste collections is unlikely to deliver improved performance; utilising the multi criteria approach calculations indicate that performance could actually worsen.

9.0 CLOSURE

This report has been prepared by SLR Consulting Limited with all reasonable skill, care and diligence, and taking account of the manpower and resources devoted to it by agreement with the client. Information reported herein is based on the interpretation of data collected and has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of Regional District of Central Okanagan; no warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the client and others in respect of any matters outside the agreed scope of the work.

APPENDICES

APPENDIX A

RDCO Organic Waste Arising Baseline Data

Material type	Collection Method	Initial disposal site (location when ownership is relinquished)	Origin of waste	Handling, processing, temporary storage, transport, and final disposal (after initial disposal).	Tonnage disposed of at final disposal site in 2010 (metric tonnes). Source: scale reports unless otherwise noted.	Final Disposal/Processing method
Yard and Garden Waste (<20cm diameter)	Bring Site	Westside Residential Waste Disposal and Recycling Centre (solid waste transfer station - a site for disposal of excess yard and garden waste that can't fit in curbside carts)	Residential	Bylands Nursery Composting	1,600	Material is grinded and composted in an open windrow system.
	Source Segregated Direct to Glenmore	**Containers of all types for source separated yard and garden waste from all sectors. This includes the material that is self-hauled directly to the Glenmore Landfill.**	Residential, Commercial, Industrial, Institutional, Construction/Demolition (i.e. all sectors)	Glenmore Composting	24,000	Material is grinded and composted in an open windrow system. Compost product is marketed as "Glengrow"
	Bring Site	Peachland Composting Site (a site for disposal of excess yard and garden waste that can't fit in curbside carts)	Residential	Glenmore Composting	500	

Material type	**Collection Method**	**Initial disposal site (location when ownership is relinquished)**	**Origin of waste**	**Handling, processing, temporary storage, transport, and final disposal (after initial disposal).**	**Tonnage disposed of at final disposal site in 2010 (metric tonnes). Source: scale reports unless otherwise noted.**	**Final Disposal/Processing method**
	Curbside Organics	**Residential curbside yard waste carts** (approximately 52,000 households have curbside carts for yard waste disposal. The cart contents are collected biweekly between March and November. Most curbside carts are 240 litres capacity but approximately 10% of residents have upgraded to 360 litre)	Residential	Glenmore Composting	12,500	
	Bring Site	North Westside Road Residential Transfer Station (services a small area that doesn't have curbside service)	Residential	Glenmore Composting	141	
	Bring Site	Traders Cover Residential Transfer Station (services a small area that does not have curbside service)	Residential	Glenmore Composting	42	
	Residual to Glenmore	**Containers of all types for garbage (i.e. the yard waste that is mixed with garbage and landfilled)**	All sectors	Glenmore Landfill	2,376	Landfilling

Material type	**Collection Method**	**Initial disposal site (location when ownership is relinquished)**	**Origin of waste**	**Handling, processing, temporary storage, transport, and final disposal (after initial disposal).**	**Tonnage disposed of at final disposal site in 2010 (metric tonnes). Source: scale reports unless otherwise noted.**	**Final Disposal/Processing method**
Yard and Garden Waste (>20cm diameter)	Source Segregated Direct to Glenmore	**Containers of all types for source separated yard and garden waste greater than 20cm in diameter from all sectors.**	All sectors (Residential, Commercial, Construction Demolition)	Glenmore Composting	1,700	Material is grinded and composted in an open windrow system. Compost product is marketed as "Glengrow"
Biosolids	Biosolids	**City of Kelowna Waste Water Treatment Plant**	All sectors	Biosolid composting	18,000	Aerated static pile composting system. Material is handled multiple times in order to process, move to aeration piles, and curing site, and then load for market. In addition, more than 10,000 metric tonnes of wood waste is brought in from the private sector (up to 100 km away) as it is needed in the composting process. Compost is marketed as Ogogrow. Detailed description of the system is provided in a separate excel file.

Material type	Collection Method	Initial disposal site (location when ownership is relinquished)	Origin of waste	Handling, processing, temporary storage, transport, and final disposal (after initial disposal).	Tonnage disposed of at final disposal site in 2010 (metric tonnes). Source: scale reports unless otherwise noted.	Final Disposal/Processing method
	Biosolids	**Westside Waste Water Treatment Plant**		Biosolid land app	4,200	Land application. Biosolids are stock piled at the land application site and tilled into the land periodically by heavy machinery. Application typically occurs after several thousand metric tonnes of biosolids have been stockpiled.
	Biosolids	**Lake Country Waste Water Treatment Plant**		Biosolid composting	1,800	Aerated static pile composting system. Material is handled multiple times in order to process, move to aeration piles, and curing site, and then load for market. In addition, more than 10,000 metric tonnes of wood waste is brought in from the private sector (up to 100 km away) as it is needed in the composting process. Compost is marketed as Ogogrow. Detailed description of the system is provided in a separate excel file.

Material type	Collection Method	Initial disposal site (location when ownership is relinquished)	Origin of waste	Handling, processing, temporary storage, transport, and final disposal (after initial disposal).	Tonnage disposed of at final disposal site in 2010 (metric tonnes). Source: scale reports unless otherwise noted.	Final Disposal/Processing method
Food waste	Residual to Glenmore	**Containers of all types for garbage (i.e. the food waste that is mixed with garbage and landfilled)**	All sectors	Glenmore Landfill	19,500	Landfilling
White wood	Source Segregated Direct to Glenmore	**Containers of all types for source separated white wood from all sectors. This includes the material that is self-hauled directly to the Glenmore Landfill.**	All sectors	Tolko Cogeneration	7,500	Feedstock for Tolko Industries cogeneration plant (combusted to generate heat and electricity).
	Residual to Glenmore	**Containers of all types for garbage (i.e. the white wood that is mixed with garbage and landfilled)**	All sectors	Glenmore Landfill	6,085	Landfilling
	Bring Site	Westside Residential Waste Disposal and Recycling Centre (Solid Waste Transfer Station) - a site for disposal of white wood.	Residential	Tolko Cogeneration	quantity is included with value in cell H28	Feedstock for Tolko Industries cogeneration plant (combusted to generate heat and electricity).
Contaminated Wood	Source Segregated Direct to Glenmore	**Containers of all types for source separated contaminated wood from all sectors. This includes the material that is self-hauled directly to the Glenmore Landfill.**	All sectors	Glenmore cover	1,950	Chipped and used as cover material at Glenmore Landfill.

Material type	Collection Method	Initial disposal site (location when ownership is relinquished)	Origin of waste	Handling, processing, temporary storage, transport, and final disposal (after initial disposal).	Tonnage disposed of at final disposal site in 2010 (metric tonnes). Source: scale reports unless otherwise noted.	Final Disposal/Processing method
	Residual to Glenmore	**Containers of all types for garbage (i.e. the contaminated wood that is mixed with garbage and landfilled)**	All sectors	Glenmore Landfill	9,341	Landfilling
Old Corrugated Cardboard	Curbside Recycling	**Residential curbside recycle carts** (approximately 52,000 households have curbside carts for recyclables disposal (comingled). The cart contents are collected biweekly throughout the year. Most curbside carts are 240 litres capacity but approximately 20% of households have upgraded to 360 litre)	Residential	MRF recycled	1,120	Recycled (specific mill location and method info can be provided)
	Bring Site	Glenmore Landfill Recycle Depot (a depot for curbside recyclables that can be used by those not on curbside collection or for materials that won't fit into curbside recycling bins)	Residential/small business	MRF recycled	66	Recycled (specific mill location and method info can be provided)

Material type	Collection Method	Initial disposal site (location when ownership is relinquished)	Origin of waste	Handling, processing, temporary storage, transport, and final disposal (after initial disposal).	Tonnage disposed of at final disposal site in 2010 (metric tonnes). Source: scale reports unless otherwise noted.	Final Disposal/Processing method
	Bring Site	Kirshner Recycle Depot (a depot for curbside recyclables that can be used by those not on curbside collection or for materials that won't fit into curbside recycling bins)	Residential/small business	MRF recycled	100	Recycled (specific mill location and method info can be provided)
	Bring Site	Westside Recycle Depot (a depot for curbside recyclables that can be used by those not on curbside collection or for materials that won't fit into curbside recycling bins)	Residential/small business	MRF recycled	66	Recycled (specific mill location and method info can be provided)
	Bring Site	North Westside Road Residential Transfer Station (services a small area that doesn't have curbside service)	Residential	MRF recycled	9	Recycled (specific mill location and method info can be provided)
	Bring Site	Traders Cover Residential Transfer Station (services a small area that does not have curbside service)	Residential	MRF recycled	5	Recycled (specific mill location and method info can be provided)
	Residual to Glenmore	**Containers of all types for garbage (i.e. the cardboard that is mixed with garbage and landfilled)**	All sectors	Glenmore Landfill	7,021	Landfilled

Material type	Collection Method	Initial disposal site (location when ownership is relinquished)	Origin of waste	Handling, processing, temporary storage, transport, and final disposal (after initial disposal).	Tonnage disposed of at final disposal site in 2010 (metric tonnes). Source: scale reports unless otherwise noted.	Final Disposal/Processing method
Mixed Paper	Curbside Recycling	**Residential curbside recycle carts** (approximately 52,000 households have curbside carts for recyclables disposal (comingled). The cart contents are collected biweekly throughout the year. Most curbside carts are 240 litres capacity but approximately 20% of residents have upgraded to 360 litre)	Residential	MRF recycled	6,350	Recycled (specific mill location and method info can be provided)
	Bring Site	Glenmore Landfill Recycle Depot (a depot for curbside recyclables that can be used by those not on curbside collection or for materials that won't fit into curbside recycling bins)	Residential/small business	MRF recycled	325	Recycled (specific mill location and method info can be provided)
	Bring Site	Kirshner Recycle Depot (a depot for curbside recyclables that can be used by those not on curbside collection or for materials that won't fit into curbside recycling bins)	Residential/small business	MRF recycled	675	Recycled (specific mill location and method info can be provided)

Material type	Collection Method	Initial disposal site (location when ownership is relinquished)	Origin of waste	Handling, processing, temporary storage, transport, and final disposal (after initial disposal).	Tonnage disposed of at final disposal site in 2010 (metric tonnes). Source: scale reports unless otherwise noted.	Final Disposal/Processing method
	Bring Site	Westside Recycle Depot (a depot for curbside recyclables that can be used by those not on curbside collection or for materials that won't fit into curbside recycling bins)	Residential/small business	MRF recycled	325	Recycled (specific mill location and method info can be provided)
	Bring Site	North Westside Road Residential Transfer Station (services a small area that doesn't have curbside service)	Residential	MRF recycled	50	Recycled (specific mill location and method info can be provided)
	Bring Site	Traders Cover Residential Transfer Station (services a small area that does not have curbside service)	Residential	MRF recycled	28	Recycled (specific mill location and method info can be provided)
	Residual to Glenmore	**Containers of all types for garbage (i.e. the cardboard that is mixed with garbage and landfilled)**	All sectors	Glenmore Landfill	4,041	Landfilled

APPENDIX B

Indicator Descriptions

Model		Objective		Indicator / Criteria	Description of measurement
Social Impact					
	4	To protect local amenity	g)	Extent of noise problems	Living and working environments make an important contribution to 'quality of life.' In addition to attractive streets and buildings, access to green spaces, and community safety, low levels of noise is also an important consideration. All waste management options generate noise, as they involve the storage, treatment and transport of waste. However, noise is most likely to be of concern in relation to sites that operate outside standard working hours, or use particularly noisy unenclosed plant (e.g. screening/crushing machinery). In this assessment the measurement of this sustainability objective is made using professional judgement based on the current performance of existing facilities proposed for each of the options considered. For a range of facilities types and capacities, an arbitrary score is assigned to 3 criteria (noisy plant & machinery, vehicle movements and hours of operation). The 3 criteria scores are aggregated together to derive a total score for each facility type and capacity.
			h)	Extent of odour problems	Odour is a common cause of public concern in relation to waste management. Like dust, odours can be particularly acute where mechanical operations and storage of waste take place in open air. Odours are difficult and expensive to abate. Measurement of this indicator is made using professional judgement based on experience of existing facilities. A qualitative scoring allocation for each facility type is used. In this assessment 3 criteria (covered storage, vehicle movements and

Model	Objective	Indicator / Criteria	Description of measurement
			open or closed operations) are given an arbitrary score based on professional judgement. The scores are aggregated to derive a total score for each facility type and capacity.
	5 To conserve landscapes and townscapes	i) Extent of visual and landscape impacts	Landscapes and townscapes have strong economic, social and community value. All waste management options involve the development of components such as buildings, processing plant, access roads, lighting/signage, storage mounds and perimeter bunds. These can generate impact on landscape (effects on the general landscape character and quality of the surrounding area) and visual impacts (including changes in available views, the effect of those changes on people and the overall impact on visual amenity). Whilst the extent of landscape and visual impacts is strongly influenced by the nature of the receiving environment, concern is likely to be greatest where options involve emissions stacks, large enclosed facilities or significant storage/disposal of waste above ground level. In this assessment measurement of this sustainability objective is made using professional judgement based on the typical nature, size and number of facilities proposed for each of the options considered. Three criteria, landscape impact, height of facility and scale of facility (landtake) are scored, with the individual scores aggregated to derive a total score for each facility type and capacity.
	6 To provide opportunities for public involvement and education	j) Extent of opportunities for public involvement	Public participation is at the heart of sustainable development. In this context it is important for the Government, locally and regionally, to 'send the right signals' to the public in order to encourage changes in behaviour and lifestyles. Measurement of this sustainability objective is made using professional judgement based on experience of existing facilities and the extent to which they are likely to provide opportunities for positive public involvement.

Model	Objective	Indicator / Criteria	Description of measurement
			In this assessment 2 criteria, sending the right message and potential for public involvement, are given an arbitrary scores based on professional judgement. The individual scores are aggregated to derive a score for each facility type and capacity for opportunities for public involvement.
		k) Extent of opportunities for education potential	Education of waste management issues and the wider impacts of waste management choices on sustainable development are important to ensure participation in waste segregation schemes and inform purchasing decisions which may lead to waste reduction. Measurement of this sustainability objective is made using professional judgement based on experience of existing facilities and the extent to which they are likely to provide opportunities for education. In this assessment 2 criteria, sending the right message and potential for education, are given an arbitrary scores based on professional judgement. The individual scores are aggregated to derive a score for each facility type and capacity for opportunities for education.
	7 To minimise local transport impacts	l) Net change in waste kilometres compared to baseline	An efficient transport system is needed to support a strong and prosperous economy and to maintain and improve people's quality of life. However, congestion and unreliability of journeys add to the costs of business, and undermine competitiveness. Major traffic arteries cause 'severance' within a community when people become separated from places and other people; and 'fear and intimidation' amongst pedestrians. Heavy levels of traffic also damage towns and cities, and harm the countryside. All waste management options have local transport impacts as they involve some degree of off-site movement of waste. The scale of impacts will be influenced by factors such as vehicle size, frequency of vehicle movements, road/pavement width, and traffic speeds. The scope to mitigate or avoid impacts (e.g. by avoiding sensitive receptors, restricting hours of operation and 'backloading' vehicles) is also

Model		Objective		Indicator / Criteria	Description of measurement
					important. Measurement of this sustainability objective uses total waste kilometres travelled for each recycling and composting option. This information is estimated from input data, facility locations and option modelling.
	8	To provide employment opportunities	m)	Number of jobs likely to be created	A high employment rate is one of the key objectives of sustainable development. It is considered that employment enables people to meet their needs and improve their living standards, and thereby to help tackle poverty and social exclusion. Development of new waste management facilities will create temporary construction employment, which may be available to local people, and their long-term operation will create jobs, the nature of which will depend on the facility. Professional judgement based on experience of job creation at existing facilities is made to measure this sustainability objective.
Financial					
	9	To minimise costs associated with organic waste management	n)	Capital costs associated with waste infrastructure	Costs are clearly a key concern for Government, waste contractors and the general public and can have a significant impact in determining the nature of waste management to be developed. The principal costs relate to waste collection and waste treatment/disposal. RDCO currently own and operate a range of waste management infrastructure; consideration should be given for existing infrastructure, and in this regard existing facilities will have no or low capital cost requirements. Professional judgement based on experience of waste management costs is made to measure this sustainability indicator.

Model	Objective		Indicator / Criteria	Description of measurement
		o)	Operating costs, difference from baseline	Costs are clearly a key concern for Government, waste contractors and the general public and can have a significant impact in determining the nature of waste management to be developed. The principal costs relate to waste collection and waste treatment/disposal. Professional judgement based on experience of waste management costs is made to measure this sustainability indicator. Unit costs and their derivation are provided for each waste treatment, disposal and transfer route and are generally based on current costs. Costs are presented on a net increase or decrease basis, to avoid the development of a complicated financial model required to calibrate existing costs.

APPENDIX C

Life Cycle Assessment Model Review

global environmental solutions

Central Okanagan Regional District

Review of LCA Models

SLR Ref : 4CA.00999.00034

October 2011

Version: Rev 2

Project Title	**LCA Assessment of Okanagan Organic Waste Treatment Options**	**Job Number**	**4CA.00999.00034**
		Phase Number	
Client	Central Okanagan Regional District	**Client Contact**	

The Following Documents are issued by SLR Consulting Limited:

Day	23	31						
Month	10	10						
Year	11	11						

Document Reference	**Title**	**Reason for Issue**	**Revision Number (x = pre revision issue)**							
	Review of LCA Models	D	1							
	Review of LCA Models_Rev 2	F		2						

Reason for Issue:	
P	Preliminary
A	Approval
C	Comments
D	Draft
F	Final
S	Issue Sheet Only
I	Information
Z	Other (State)

No. of Copies								
E-mail								
Disk								

CONTENTS

TABLES

FIGURES

1.0 INTRODUCTION

SLR has been appointed by The Regional District of Central Okanagan to undertake an assessment, based upon Life Cycle Assessment (LCA) principles, of options available for management of organic wastes.

At present, the RDCO operates a variety of management options including composting, landfill, recycling and export to market. However, many of these choices are made due to the availability of existing resources rather than as a consequence of strategic options assessment. By undertaking an LCA evaluation, the RDCO will be able to arrive at a number of alternative options that it may consider both in the short and medium term and which may prove to be more sustainable than the current adopted approaches.

As a first stage in developing the Life Cycle Assessment project it was deemed necessary to critically review existing LCA tools and to identify a preferred tool or suite of tools capable of delivering the Authority's objectives. This report provides a critical review of LCA tools together with a recommendation of an approach to be adopted for the life cycle assessment.

2.0 POTENTIAL LCA MODELS

The primary reference study for this report is a briefing note prepared for the California Integrated Waste Management Board which presented the results of an "Evaluation of Existing Municipal Solid Waste/ Life Cycle Assessment (MSW/LCA) Tools"[1]

The primary reference study identified 10 LCA models capable of modelling the life cycle impacts of municipal waste management, as follows:

- IWM (Integrated Solid Waste Management tool)
- ORWARE (Organic Waste Research)
- LCA-IWM (Life Cycle Assessment-Integrated Waste Management)
- IWM-2 (Integrated Solid Waste Management tool 2)
- WASTED (Waste Analysis Software Tool for Environmental Decisions)
- EASEWASTE (Environmental Assessment of Solid Waste Systems and Technologies)
- WRATE (Waste and Resources Assessment Tool for the Environment)
- WISARD (Waste-Integrated Systems for Assessment of Recovery and Disposal)
- WARM (Waste Reduction Model)
- MSW DST (Municipal Solid Waste Decision Support Tool)

SLR has also carried out a separate literature search to identify any further candidate models; it was subsequently concluded that the above represented an exhaustive list of waste related LCA models.

[1] http:// www.calrecycle.ca.gov/Climate/Organics/LifeCycle/LCAToolEval.pdf accessed 4th October 2011

3.0 EVALUATION CRITERIA & METHOLDOLOGY

3.1 Criteria

SLR has developed a list of criteria that have been used to provide a semi-quantitative comparison of the LCA tools and determine their suitability for the purposes of the Okanagan project.

The criteria included in the evaluation are set out below:

- Availability of tool(for study)
- Independent Peer Review
- Geographic Scope (N.America)
- User defined models
- Data extraction
- Infrastructure
- Waste streams considered
- Environmental Impacts – Greenhouse gases
- Environmental Impacts – Other Criteria
- Cost

3.1.1 Availability for Study

This criterion refers to whether the tool has open source code, is publicly available free of charge or with a charge or per subscription. A number of models are available free of charge, however most are subscription based services with some models requiring users to undertake a training course before receiving the software.

This criterion is considered as critical for the success of the study; however, only 4 out of the 10 models are readily accessible for this study.

3.1.2 Independent Peer Review

This criterion seeks to confirm the scientific validity of the methodology and data used in a tool. Ideally tools should have undergone peer review to be considered for the Okanagan study.

This criterion is not considered critical.

3.1.3 Geographic Scope

This criterion refers to the representativeness of the default data to the study area. A tool that includes data representative of the North America could be more useful than others. However, some tools allow user defined data instead of the default data which provides mitigation against the absence of local data.

This criterion is not considered critical.

3.1.4 User Defined Data

It is SLR's experience that no one LCA tool provides all of the parameters and covers all of the waste and technology scenarios that need to be modelled within a project. The ability to incorporate additional data and/or technical processes can help resolve the limitations in the default databases.

This criterion is not considered critical.

3.1.5 Data Extraction

Data extraction capability allows model parameters to be extracted from the LCA tool and incorporated into a bespoke model. Through data extraction it is also possible to combine data from different modelling tools into the bespoke model.

This criterion is not considered critical.

3.1.6 Waste Management Infrastructure

This criterion is intended to list the waste management infrastructure available in each tool with particular emphasis on the following management methods[2]:

- Recycling
- In-vessel composting
- Open windrow composting
- Anaerobic digestion
- Landfill
- Mechanical biological treatment
- Incineration
- Pyrolysis / gasification

The ability to model composting, recycling, AD and landfill is considered critical whilst inclusion of MBT and thermal technologies important attributes.

3.1.7 Waste Streams

This criterion is intended to evaluate the waste streams considered by the tools. In particular inclusion of the following waste streams is considered important

- Paper
- Cardboard
- Biosolids
- Food Waste
- Parks and Green Waste
- Lumber - treated / untreated / composite

3.1.8 Environmental Impacts

This criterion is intended to evaluate the environmental impacts considered by the tools. Greenhouse gas[3] evaluation is considered critical whilst evaluation of other criterion considered important.

---

[2] A list of all organic treatment methods to be considered is presented in Section 5.

[3] Not every tool reports the three significant carbon species. In particular certain tools do not report nitrous oxide emissions. This is important as the purpose of the study is to accurately predict all greenhouse gas emissions

3.2 Model Evaluation

3.2.1 Methodology

Evaluation has been carried out in two stages;

- Firstly, each tool is evaluated against the criteria in turn with a simple yes/no answer applied and the number of yes answers subsequently counted and presented as a performance score.
- Secondly, a weighting exercise is carried out with each criterion assigned a weighting (critical, important, consideration) based on its relative importance and the weightings subsequently applied to the performance scores.

The initial evaluation of the tools is set out in Tables 3-1, with those tools that fail against a critical criterion highlighted in orange.

The results of the weighted evaluation are presented in Table 3-2 based on the following weighting scores; critical(3), important(2), consideration(1). Models are ranked on a scale of 1 to 10 for weighted and unweighted scores.

3.2.2 Evaluation of Results

The analysis set out in Table 3-1 indicates that only four LCA tools will be readily available for the study. Since availability is a critical criterion it is concluded that the choice of final LCA tool will need to be made between the following:

- Integrated Solid Waste Management Tool
- IWM2
- WRATE
- WARM

The quantitative comparison (scoring) set out in Table 3-2 shows that WRATE scores highest in the rankings for score and weighted score. IWM is sat at 3rd place whilst ISWMT and WARM are placed at rank 5 and 8 respectively.

Despite WARM being available for the study it scores poorly because of the limited technology and environmental impact database and the absence of a peer review.

Table 3-1: Evaluation of LCA Studies

	Integrated Solid Waste Management Tool	OR-WARE	LCA-IWM	IWM-2	WASTED	EASE WASTE	WISARD	WRATE	WARM	MSW-DST	Level of Importance	Weighting
GENERAL												
Availability (for study)	Yes	No	Yes	No	No	No	No	Yes	Yes	No	critical	3
Independent Peer Review	Yes	No	No	No	No	No	Yes	Yes	No	Yes	consideration	1
Geographic Scope	Yes	No	No	No	Yes	No	No	No	Yes	No	important	2
User defined models	No	No	No	No	No	No	No	Yes	No	No	consideration	1
Data extraction	No	No	No	No	No	No	No	Yes	No	No	consideration	1
INFRASTRUCTURE												
Collection	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	critical	3
Recycling	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	critical	3
Composting	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	critical	3
Anaerobic Digestion	yes	yes	yes	yes	no	yes	yes	yes	no	offline	critical	3
Land application	yes	yes	yes	yes	yes	yes	no	no	no	yes	important	2
WTE-Incineration	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	important	2
Gasification	no	no	no	no	yes	no	yes	yes	no	offline	important	2
Pyrolysis	no	no	no	no	no	no	yes	yes	no	offline	important	2
Landfilling	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	critical	3
Transportation	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	critical	3
WASTE STREAMS												
Paper/cardboard	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	critical	3
Food Waste	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	critical	3
Yard waste	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	critical	3
Treated Lumber	no	no	no	no	no	no	no	no	no	no	important	3

Untreated Lumber	no	no	no	no	no	no	no	yes	no	no	important	2
Composite Lumber	no	no	no	no	no	no	no	no	no	no	important	2
Biosolids	no	no	no	no	no	no	no	no	no	no	important	2
ENVIRONMENTAL IMPACTS												
GHG- C02	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	critical	3
GHG - CH4	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	critical	3
GHG - N20	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	critical	3
Photochemical oxidation	no	no	yes	no	no	yes	yes	yes	no	no	consideration	1
Ozone depletion	no	no	no	no	no	yes	yes	yes	no	no	consideration	1
Acidification	no	no	yes	no	no	yes	yes	yes	no	no	consideration	1
Aquatic ecotoxicity	no	no	no	no	no	yes	yes	yes	no	no	consideration	1
Water consumption	no	no	no	no	no	no	no	yes	no	no	consideration	1
COST	no	no	yes	yes	no	no	yes	no	no	yes	important	2

Table 3-2: Scoring of LCA Study Evaluation

	Integrated Solid Waste Management Tool	**OR-WARE**	**LCA-IWM**	**IWM-2**	**WASTED**	**EASE WASTE**	**WISARD**	**WRATE**	**WARM**	**MSW-DST**
Score (No. of yes)	**16**	**12**	**17**	**16**	**15**	**18**	**21**	**26**	**14**	**14**
Weighted Score	***43***	***34***	***44***	***45***	***41***	***44***	***49***	***58***	***40***	***37***
Rank Score	5	10	4	5	7	3	2	1	8	8
Rank Weighted Score	6	10	4	3	7	4	2	1	8	9

4.0 COMPARISON OF LCA TOOLS

4.1 Integrated Solid Waste Management Tool

The Integrated Solid Waste Management Model was commissioned by Corporations Supporting Recycling (CSR), the Environment and Plastics Industry Council (EPIC) and Environment Canada. The LCA tool was developed to provide Canadian municipalities with the ability to evaluate environmental performance of various elements of existing or proposed waste management systems.

Environmental Parameters considered in the model are as follows:

Energy	Emissions to air	Emissions to water	Emissions to land
Total energy consumed (or produced)	Carbon dioxide Methane Nitrogen Oxides Sulphur Dioxide Hydrogen Chloride Particulate matter less than 10 microns Non-methane VOCs Lead Cadmium Mercury PCDD/F	Lead Cadmium Mercury BOD PCDD/F	Residual Solid Waste

The model includes various types of paper product as well as food and yard wastes.

The tool includes modelling of composting and anaerobic digestion and includes a number of parameters that can be changed by the user. Results are reported in excel tables detailing summary values for environmental parameters, more detailed output attributing values to different process stages, and an equivalent impacts sheet.

This tool has a North American focus.

4.2 WRATE

WRATE was developed by the Environment Agency in the UK to provide UK municipalities with the ability to evaluate environmental performance of proposed waste management schemes.

The model includes various types of paper product as well as food and yard wastes and timber.

The tool includes modelling of composting and anaerobic digestion as well as MBT and thermal treatment processes including incineration, gasification and pyrolysis. Facilities are included to enable users to alter input parameters and to define bespoke waste management processes.

Environmental parameters considered in the model are as follows:

Energy	Emissions to air	Emissions to water	Emissions to land
Total energy consumed (or produced)	All Greenhouse Gases Methane Nitrous oxide Nitrogen Oxides Sulphur Dioxide Hydrogen Chloride Particulate matter less than 10 microns Non-methane VOCs Lead Cadmium Mercury PCDD/F	Lead Cadmium Mercury BOD PCDD/F	Residual Solid Waste MBT Outputs

Results are reported in excel tables detailing summary values for environmental parameters, more detailed output attributing values to different process stages, and an equivalent impacts sheet.

Export of all input and output data is readily available. The tool has a European focus.

4.3 WARM

The US EPA created the Waste Reduction Model (WARM) to help solid waste planners and organizations track and voluntarily report greenhouse gas (GHG) emissions reductions from several different waste management practices. WARM is available both as a Web-based calculator and as a Microsoft Excel spreadsheet. The Excel-based version of WARM offers more functionality than the Web-based calculator.

WARM calculates and totals GHG emissions of baseline and alternative waste management practices—source reduction, recycling, combustion, composting, and landfilling. The model calculates emissions in metric tons of carbon equivalent (MTCE), metric tons of carbon dioxide equivalent (MTCO2E), and energy units (million BTU) across a wide range of material types commonly found in municipal solid waste (MSW).

The tool models an extensive range of organic materials as illustrated below.

Branches	Magazines / Third-Class Mail	Wood Flooring
Carpet*	Medium-density Fiberboard	Yard Trimmings
Newspaper	Mixed MSW	Leaves
Office Paper	Mixed Organics	
Food Scraps	Mixed Paper (general)	
Grass	Mixed Paper (primarily from offices)	
Dimensional Lumber	Mixed Paper (primarily residential)	

The WARM model does not include anaerobic digestion as a technology and the only environmental impact reported is greenhouse gas emissions. Data in the tool is readily extractable.

The tool does have a North American focus.

4.4 IWM2

The IWM2 software has been developed by Proctor and Gamble. The IWM model looks at the life cycle of municipal solid waste, from the moment it becomes waste (loses value) until it ceases to be waste by becoming a useful product, residual landfill material or an emission to air or water.

SLR has access to a copy of this tool and would be able to carry out the LCA analysis using this tool.

The IWM tool is extensive in its scope and provides default and user defined options for all elements of an integrated waste management process from collection through to final management of outputs. The tool also provides a cost analysis based on user defined operating costs and incomes and reports a range of environmental criteria including emissions to air, water and land.

The major downside of the tool is the coverage of organic waste fractions which is limited to primarily paper, organics and textiles.

The tool does not have a specific North American focus.

4.5 Comparison of Shortlisted Tools

On the basis that the Authority would like to see consideration given to environmental emissions other than greenhouse gases, the WARM tool, despite its extensive material database will not be suitable for the purposes of this study although it may be possible to extract certain data from the tool.

The remaining three tools all have their own particular advantages and disadvantages and this poses difficulty in identifying a preferred approach for the purposes of the Okanagan study.

SLR’s suggestion is that a bespoke, excel based model is constructed that includes elements from all four shortlisted LCA tools. In this manner it is possible to circumvent the shortcomings of the individual tools, whilst drawing upon the useful elements and providing full traceability on all assumptions and model inputs.

Table 4.1 provides a gap analysis which identifies the desired requirements that can and cannot be provided from the individual tools. Almost all criteria/parameters are available in one or more of the tools providing a number of opportunities for provision of environmental data for a bespoke model.

It is noted that the modelling of treated and composite lumbers is not adequately covered by any of the tools and therefore data from other sources may need to be sourced to avoid any limitations in the study. In SLR’s experience the presence of chemicals, in the form of biocides and glues, and physical contamination such as laminates will have a marked effect on the environmental performance of lumber recovery options.

IWM2 is the only too that includes a cost analysis, although the approach is based upon user input information. As such, it is proposed that the cost analysis is carried out in a bespoke financial model.

A number of the tools, but not all, have a North American focus. The absence of local focus will need to be accounted for in any data that is drawn, for example from a European based modelling tool. The most critical differences are likely to be associated with energy inputs and outputs.

Table 4-1: Gap Analysis of Shortlisted Models

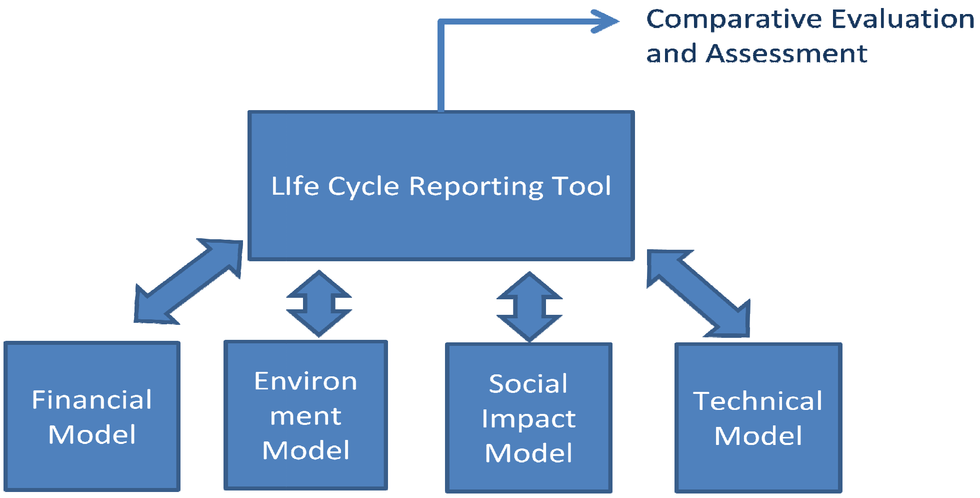
MODEL	ISWMT	WRATE	WARM	IWM2
INFRASTRUCTURE				
Collection	yes	yes	yes	yes
Recycling	yes	yes	yes	yes
Composting	yes	yes	yes	yes
Anaerobic Digestion	yes	yes		yes
Land application	yes			yes
WTE-Incineration	yes	yes	yes	yes
Gasification		yes		
Pyrolysis		yes		
Landfilling	yes	yes	yes	yes
Transportation	yes	yes	yes	yes
WASTE STREAMS				
Paper/cardboard	yes	yes	yes	yes
Food Waste	yes	yes	yes	yes
Yard waste	yes	yes	yes	yes
Treated Lumber				
Untreated Lumber		yes		
Composite Lumber				
Biosolids				
ENVIRONMENTAL IMPACTS				
GHG- C02	yes	yes	yes	yes
GHG - CH4	yes	yes	yes	yes
GHG - N20	yes	yes	yes	yes
Photochemical oxidation		yes		
Ozone depletion		yes		
Acidification		yes		
Aquatic ecotoxicity		yes		
Water consumption		yes		
COST				yes

5.0 SUMMARY

On the basis of the analysis carried out SLR is of the opinion that the objectives of the study can best be delivered through development of a bespoke LCA reporting tool and would propose that a model structure similar to that depicted in Figure 5/1 be adopted.

The tool would be used to analyse and compare a range of scenarios for dealing with the full range of organic wastes identified in the baseline assessment.

Figure 5-1: Okanagan LCA Tool Concept



A description of each of the LCA tool elements is set out below.

5.1.1 Life Cycle Reporting Tool

The Life Cycle Reporting tool will be the primary means of analysis and evaluating the scenarios for managing organic waste that have been modelled through the financial, environment, social impact and technical model.

5.1.2 Technical Model

The technical model will comprise a mass balance assessment of different organics waste management options and will be used as the main driver for the other models. As well as measuring inputs and outputs the technical model will enable energy balances and facility capacities to be defined. Data from the Technical model will feed into the Environment and Social Impact Models.

The technical model will include the following organic waste treatment methods.

- Recycling
- Back yard composting,
- In-vessel composting
- Open windrow composting
- Anaerobic digestion
- Codigestion
- Landfill
- Land application

- Mechanical biological treatment
- Incineration
- Pyrolysis / gasification

The Technical model will have the ability to conduct simple sensitivity analyses as a measure of technology adaptability.

5.1.3 Financial Model

A Financial model, based on excel spreadsheets will be developed to determine the cost of each scenario. It will be linked to mass balances so that changes in the mass balance will be replicated in the Financial model

The Financial model will have the ability to conduct simple sensitivity analyses as a measure of adaptability

The Financial model will record the Net cost of waste management, calculated on an annualised basis including:

- **Collection Cost**
- *Collection receptacles*
- *Vehicles CAPEX & Opex*
- *Staffing costs*
- **Waste Treatment Cost;**
- *Capital Cost*
- *Operating Cost*
- *Maintenance costs plus consumables*
- **Revenues**
- *Income from sale of products*
- *Cost of Disposal*

Investment in existing waste management infrastructure and organic waste management programmes will also need to be factored into the financial evaluation.

5.1.4 Environment Model

SLR proposes to develop a bespoke Environmental Model, based on LCA principles.

The Environmental Model would be populated with data from the four shortlisted tools highlighted in Chapter 4, namely ISWMT, WRATE, WARM and IWM2.

The model would report the life cycle environmental impact of each scenario as described in the mass balance to include the following criteria:

- Greenhouse Gasses
- Air pollution - Photochemical oxidation
- Air pollution - Ozone depletion
- Air pollution - Acidification
- Aquatic ecotoxicity / water pollution

In accordance with standard LCA protocols we would propose to exclude biogenic carbon dioxide emissions from the evaluation unless advised or agreed otherwise.

5.1.5 Social Impact Model

Social impact will be measured on a Semi-quantitative basis utilising the following factors:

- Noise
- Odour
- Visual intrusion
- Education potential
- Community involvement (individual usability)
- Traffic movements
- Job creation

6.0 CLOSURE

This report has been prepared by SLR Consulting Limited with all reasonable skill, care and diligence, and taking account of the manpower and resources devoted to it by agreement with the client. Information reported herein is based on the interpretation of data collected and has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of Regional District of Central Okanagan; no warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the client and others in respect of any matters outside the agreed scope of the work.

SLR

global environmental solutions

AYLESBURY
7 Wornal Park, Menmarsh Road, Worminghall, Aylesbury, Buckinghamshire HP18 9PH
T: +44 (0)1844 337380

BELFAST
24 Ballynahinch Street, Hillsborough, Co. Down, BT26 6AW Northern Ireland
T: +44 (0)28 9268 9036

BRADFORD-ON-AVON
Treenwood House, Rowden Lane, Bradford on Avon, Wiltshire BA15 2AU
T: +44 (0)1225 309400

BRISTOL
Langford Lodge, 109 Pembroke Road, Clifton, Bristol BS8 3EU
T: +44 (0)117 9064280

CAMBRIDGE
8 Stow Court, Stow-cum-Quy, Cambridge CB25 9AS
T: + 44 (0)1223 813805

CARDIFF
Fulmar House, Beignon Close, Ocean Way, Cardiff CF24 5HF
T: +44 (0)29 20491010

CHELMSFORD
Unit 77, Waterhouse Business Centre, 2 Cromar Way, Chelmsford, Essex CM1 2QE
T: +44 (0)1245 392170

DUBLIN
7 Dundrum Business Park, Windy Arbour, Dublin 14 Ireland
T: + 353 (0)1 2964667

EDINBURGH
No. 4 The Roundal, Roddinglaw Business Park, Gogar, Edinburgh EH12 9DB
T: +44 (0)131 3356830

EXETER
69 Polsloe Road, Exeter EX1 2NF
T: + 44 (0)1392 490152

FARNBOROUGH
The Pavilion, 2 Sherborne Road, South Farnborough, Hampshire GU14 6JT
T: +44 (0)1252 515682

GLASGOW
4 Woodside Place, Charing Cross, Glasgow G3 7QF
T: +44 (0)141 3535037

HUDDERSFIELD
Westleigh House, Wakefield Road, Denby Dale, Huddersfield HD8 8QJ
T: +44 (0)1484 860521

LEEDS
Suite 1, Jason House, Kerry Hill, Horsforth, Leeds LS18 4JR
T: +44 (0)113 2580650

MAIDSTONE
19 Hollingworth Court, Turkey Mill, Maidstone, Kent ME14 5PP
T: +44 (0)1622 609242

NEWCASTLE UPON TYNE
Sailors Bethel, Horatio Street, Newcastle upon Tyne NE1 2PE
T: +44 (0)191 2611966

NOTTINGHAM
Aspect House, Aspect Business Park, Bennerley Road, Nottingham NG6 8WR
T: +44 (0)115 9647280

ST. ALBAN'S
White House Farm Barns, Gaddesden Row, Hertfordshire HP2 6HG
T: +44 (0)1582 840471

SHEFFIELD
STEP Business Centre, Wortley Road, Deepcar, Sheffield S36 2UH
T: +44 (0)114 2903628

SHREWSBURY
Mytton Mill, Forton Heath, Montford Bridge, Shrewsbury SY4 1HA
T: +44 (0)1743 850170

STAFFORD
8 Parker Court, Staffordshire Technology Park, Beaconside, Stafford ST18 0WP
T: +44 (0)1785 241755

WARRINGTON
Suite 9 Beech House, Padgate Business Park, Green Lane, Warrington WA1 4JN
T: +44 (0)1925 827218

WORCESTER
Suite 5, Brindley Court, Gresley Road, Shire Business Park, Worcester WR4 9FD
T: +44 (0)1905 751310

Energy | Waste Management | Planning & Development | Industry | Mining & Minerals | Infrastructure

APPENDIX D

Indicator Assessment Tables and Scores

ENVIRONMENTAL INDICATORS

Objective	Indicator / Criteria	Unit of measurement	Yard and Garden Waste (<20cm diameter) Backyard composting	Yard and Garden Waste (<20cm diameter) In-vessel composting	Yard and Garden Waste (<20cm diameter) Open windrow composting	Yard and Garden Waste (<20cm diameter) Landfill traditional	Yard and Garden Waste (<20cm diameter) Landfill recirculating	Yard and Garden Waste (>20cm diameter) In-vessel composting	Yard and Garden Waste (>20cm diameter) Open windrow composting	Yard and Garden Waste (>20cm diameter) Landfill traditional	Yard and Garden Waste (>20cm diameter) Landfill recirculating	Biosolids Open windrow composting	Biosolids Aerated static pile	Biosolids Landfill traditional	Biosolids Landfill recirculating	Biosolids Land application	White Wood In-vessel composting	White Wood Open windrow composting
Environmental																		
To reduce greenhouse gas emissions	Greenhouse gases emitted	kg CO2-Eq	165,644	-1,931,536	-1,931,536	66,439,562	16,224,479	13,425	-84,654	2,911,878	711,078	-1,297,013	-2,662,200	41,115,310	10,040,321	-1,297,013	93,793	-567,711
To minimise adverse impacts on air quality	Emissions contributing to photochemical oxidation	kg ethylene-Eq	309.0	-143.0	-143.0	19,302.7	4,836.0	10.9	-6.3	846.0	212.0	-81.3	-221.0	11,945.0	2,993.0	-81.3	49.6	-47.8
	Emissions contributing to depletion of the ozone layer	kg CFC-11-Eq	0.0	7.6	7.6	3.6	0.9	0.0	0.0	0.2	0.0	0.5	0.4	2.3	0.6	0.5	0.0	0.2
	Emissions contributing to air acidification	kg SO2-Eq	1,326,452	-1,251	-1,251	8,475	8,150	290	-55	371	357	-914	-3,371	5,245	5,044	-914	1,427	-650
To minimise adverse effects on water quality	Emissions contributing to aquatic ecotoxicity	kg 1,4-DCB-Eq	-1,809,872	43,709	43,709	43,524	24,130	6,664	1,916	1,908	1,058	27,048	36,713	26,935	14,933	27,048	29,406	9,676
	Emissions contributing to eutrophication	kg PO4-Eq	300,298	9,482	9,482	34,001	0	307	416	1,490	0	5,718	9,590	21,041	0	5,718	1,418	2,502

Objective	Indicator / Criteria	Unit of measurement	White Wood Recycling	White Wood Landfill traditional	White Wood Landfill recirculating	White Wood Incineration	White Wood Pyrolysis	Contaminated Wood Landfill traditional	Contaminated Wood Landfill recirculating	Contaminated Wood Incineration	Contaminated Wood Pyrolysis	O d Corrugated Cardboard Recycling	O d Corrugated Cardboard Landfill traditional	O d Corrugated Cardboard Landfill recirculating	O d Corrugated Cardboard Incineration	O d Corrugated Cardboard Pyrolysis	Mixed Paper Recycling	Mixed Paper Landfill traditional	Mixed Paper Landfill recirculating	Mixed Paper Incineration	Mixed Paper Pyrolysis
Environmental																					
To reduce greenhouse gas emissions	Greenhouse gases emitted	kg CO2-Eq	8,543	49,648,282	12,073,030	-261,179	-202,055	12,906,657	3,138,527	-67,897	-52,527	-99,988	3,221,596	785,465	-9,691	-3,601	-2,757,795	18,279,528	4,456,773	-42,567	-7,854
To minimise adverse impacts on air quality	Emissions contributing to photochemical oxidation	kg ethylene-Eq	-39.1	12,217.0	3,043.0	12.0	32.7	3,174.3	791.0	3.1	8.5	-287.0	825.6	206.0	6.2	10.6	-354.0	4,681.3	1,171.0	32.9	56.6
	Emissions contributing to depletion of the ozone layer	kg CFC-11-Eq	0.0	0.2	0.1	0.5	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0	-0.3	0.1	0.0	0.4	0.0
	Emissions contributing to air acidification	kg SO2-Eq	19	3,425	3,182	4,453	4,921	890	827	1,158	1,279	-4,376	248	233	868	977	-19,214	1,409	1,320	4,885	5,441
To minimise adverse effects on water quality	Emissions contributing to aquatic ecotoxicity	kg 1,4-DCB-Eq	1,599	12,321	-2,229	14,816	34,393	3,203	-580	3,852	8,941	37,174	1,532	590	4,498	8,122	151,720	8,701	3,350	27,224	47,227
	Emissions contributing to eutrophication	kg PO4-Eq	-15	1,234	0	1,231	1,244	321	0	320	323	-937	101	0	232	236	-1,537	573	0	1,319	1,336

Objective	Indicator / Criteria	Unit of measurement	Increased recycling (2% of residual paper, card, white wood) Landfill traditional	Increased recycling (2% of residual paper, card, white wood) Landfill recirculating	Increased recycling (2% of residual paper, card, white wood) Incineration	Increased recycling (5% of residual paper, card, white wood) Landfill traditional	Increased recycling (5% of residual paper, card, white wood) Landfill recirculating	Increased recycling (5% of residual paper, card, white wood) Incineration	Curbside food waste collection, In-vessel Landfill traditional	Curbside food waste collection, In-vessel Landfill recirculating	Curbside food waste collection, In-vessel Incineration	Curbside food waste collection, AD Landfill traditional	Curbside food waste collection, AD Landfill recirculating	Curbside food waste collection, AD Incineration	Garbage Landfill traditional	Garbage Landfill recirculating	Garbage MBT (residual to EfW)	Garbage MBT (residual to landfill)	Garbage Incineration	Garbage Pyrolysis
Environmental																				
To reduce greenhouse gas emissions	Greenhouse gases emitted	kg CO2-Eq	164,303,028	39,975,924	-14,782	162,245,055	39,425,869	-71,146	155,709,135	37,954,023	-89,376	155,110,010	37,354,898	-688,501	165,671,324	40,341,731	25,640,093	32,077,631	22,813	206,671
To minimise adverse impacts on air quality	Emissions contributing to photochemical oxidation	kg ethylene-Eq	42,332.8	10,541.0	185.0	41,782.7	10,367.0	134.0	39,821.3	9,965.0	218.0	39,939.9	10,084.0	336.0	42,698.2	10,657.0	7,068.0	8,770.0	219.0	370.0
	Emissions contributing to depletion of the ozone layer	kg CFC-11-Eq	2.7	0.7	1.9	2.7	0.7	1.9	2.2	0.6	1.9	2.1	0.5	1.8	2.7	0.7	0.9	0.3	1.9	0.1
	Emissions contributing to air acidification	kg SO2-Eq	13,160	12,358	29,762	12,151	11,357	28,576	13,768	13,007	27,911	18,939	18,178	33,082	13,835	13,025	18,840	10,812	30,552	33,962
To minimise adverse effects on water quality	Emissions contributing to aquatic ecotoxicity	kg 1,4-DCB-Eq	67,501	19,389	180,072	75,293	27,763	187,055	78,679	33,102	169,471	63,820	18,245	154,614	62,308	13,806	106,794	49,629	175,415	298,385
	Emissions contributing to eutrophication	kg PO4-Eq	22,407	0	8,113	22,214	0	7,888	18,519	0	8,344	18,742	0	8,567	62,308	0	8,789	11,817	8,263	8,360

NOISE INDICATORS

TYPICAL BREAKDOWN OF NOISE SCORES FOR EACH FACILITY TYPE

Facility type	Capacity (t/a)	Aggregate Scores1	Noisy Plant & Machinery2	Vehicle Movements2	Hours of Operation3 (hrs/yr)
MRF - Clean	25,000	2.1	6.5	1.3	2,625
	15,000	1.2	6.0	0.8	2,625
	5,000	0.3	5.0	0.3	2,625
Backyard Composting	1	0.00	0.50	0.00	24.00
Composting - In vessel	40,000	3.0	5.8	2.0	2,625
	25,000	1.8	5.5	1.3	2,625
	15,000	1.0	5.0	0.8	2,625
	10,000	0.5	4.0	0.5	2,625
	5,000	0.2	3.0	0.3	2,625
	2,500	0.1	2.0	0.1	2,625
Composting - Open Windrow	20,000	1.3	5.0	1.0	2,625
	15,000	0.8	4.0	0.8	2,625
	7,500	0.3	3.3	0.4	2,625
	5,000	0.2	3.0	0.3	2,625
	2,500	0.1	2.0	0.1	2,625
Aerated static pile	20,000	1.3	5.0	1.0	2,625
	15,000	0.8	4.0	0.8	2,625
	7,500	0.3	3.3	0.4	2,625
	5,000	0.2	3.0	0.3	2,625
	2,500	0.1	2.0	0.1	2,625
Anaerobic Digestion	50,000	2.6	4.0	2.5	2,625
	25,000	1.0	3.0	1.3	2,625
Codigestion	50,000	2.6	4.0	2.5	2,625
	25,000	1.0	3.0	1.3	2,625
Landfill - traditional	200,000	7.7	8.8	3.3	2,625
	100,000	3.0	6.8	1.7	2,625
	75,000	1.9	5.8	1.3	2,625
Landfill - recirculating	200,000	7.9	9.0	3.3	2,625
	100,000	3.1	7.0	1.7	2,625
	75,000	2.0	6.0	1.3	2,625
Land application	25,000	0.4	4.0	0.4	2,625
	10,000	0.1	3.0	0.2	2,625
	5,000	0.0	2.0	0.1	2,625
MBT (residual to EfW)	60,000	4.8	6.0	1.0	8,000
	30,000	2.2	5.5	0.5	8,000
MBT (residual to l/fill)	60,000	4.4	5.5	1.0	8,000
	30,000	2.0	5.0	0.5	8,000
EfW	60,000	4.4	5.5	1.0	8,000
	30,000	1.6	4.0	0.5	8,000
Pyrolysis	60,000	4.4	5.5	1.0	8,000
	30,000	1.6	4.0	0.5	8,000
Spare	60,000	0.0	0.0	1.0	0
	30,000	0.0	0.0	0.5	0

Notes:
Highest value has greatest noise impact
1 - Aggregate scores = Noisy Plant and Machinery x Vehicle movements x Hours of Operation/10000
2 - Nominal scale used for all variables (10 = worst, 0 = best)
3 - Hours of operation based on typical yearly figures (2625 hrs = 52.5hrs/wk x 50wks, 7200hrs = 20hrs/day x 52wks)

SUMMARY OF NOISE IMPACTS FOR RESIDUAL TREATMENT

PHASE ONE OPTIONS

		Yard and Garden Waste (<20cm diameter) Backyard composting	Yard and Garden Waste (<20cm diameter) In-vessel composting	Yard and Garden Waste (<20cm diameter) Open windrow composting	Yard and Garden Waste (<20cm diameter) Landfill traditional	Yard and Garden Waste (<20cm diameter) Landfill recirculating	Yard and Garden Waste (>20cm diameter) In-vessel composting	Yard and Garden Waste (>20cm diameter) Open windrow composting	Yard and Garden Waste (>20cm diameter) Landfill traditional	Yard and Garden Waste (>20cm diameter) Landfill recirculating	Biosolids Open windrow composting	Biosolids Aerated static pile
Recycling	MRF - Clean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Backyard composting	Backyard Composting	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
In-vessel composting	Composting - In vessel	0.00	4.16	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00
Open windrow composting	Composting - Open Windrow	0.00	0.00	4.08	0.00	0.00	0.00	0.05	0.00	0.00	2.08	0.00
Anaerobic digestion	Anaerobic Digestion	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Codigestion	Codigestion	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Landfill traditional	Landfill - traditional	0.00	0.00	0.00	1.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00
Landfill recirculating	Landfill - recirculating	0.00	0.00	0.00	0.00	1.01	0.00	0.00	0.00	0.01	0.00	0.00
Land application	Land application	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Aerated static pile	Aerated static pile	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.08
MBT (residual to EfW)	MBT (residual to EfW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MBT (residual to landfill)	MBT (residual to l/fill)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Incineration	EfW	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pyrolysis	Pyrolysis	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Spare	Spare	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	AGG SCORE	**0.00**	**4.16**	**4.08**	**1.01**	**1.01**	**0.05**	**0.05**	**0.01**	**0.01**	**2.08**	**2.08**

		Biosolids Landfill traditional	Biosolids Landfill recirculating	Biosolids Land application	White Wood In-vessel composting	White Wood Open windrow composting	White Wood Recycling	White Wood Landfill traditional	White Wood Landfill recirculating	White Wood Incineration	White Wood Pyrolysis	Contaminated Wood Landfill traditional	Contaminated Wood Landfill recirculating
Recycling	MRF - Clean	0.00	0.00	0.00	0.00	0.00	0.64	0.00	0.00	0.00	0.00	0.00	0.00
Backyard composting	Backyard Composting	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
In-vessel composting	Composting - In vessel	0.00	0.00	0.00	0.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Open windrow composting	Composting - Open Windrow	0.00	0.00	0.00	0.00	0.41	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Anaerobic digestion	Anaerobic Digestion	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Codigestion	Codigestion	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Landfill traditional	Landfill - traditional	0.51	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.02	0.00
Landfill recirculating	Landfill - recirculating	0.00	0.51	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.02
Land application	Land application	0.00	0.00	0.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Aerated static pile	Aerated static pile	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MBT (residual to EfW)	MBT (residual to EfW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MBT (residual to landfill)	MBT (residual to l/fill)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Incineration	EfW	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.27	0.00	0.00	0.00
Pyrolysis	Pyrolysis	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.27	0.00	0.00
Spare	Spare	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	AGG SCORE	**0.51**	**0.51**	**0.54**	**0.42**	**0.41**	**0.64**	**0.10**	**0.10**	**0.27**	**0.27**	**0.02**	**0.02**

		Contaminated Wood Incineration	Contaminated Wood Pyrolysis	Old Corrugated Cardboard Recycling	Old Corrugated Cardboard Landfill traditional	Old Corrugated Cardboard Landfill recirculating	Old Corrugated Cardboard Incineration	Old Corrugated Cardboard Pyrolysis	Mixed Paper Recycling	Mixed Paper Landfill traditional	Mixed Paper Landfill recirculating	Mixed Paper Incineration	Mixed Paper Pyrolysis
Recycling	MRF - Clean	0.00	0.00	0.09	0.00	0.00	0.00	0.00	0.67	0.00	0.00	0.00	0.00
Backyard composting	Backyard Composting	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
In-vessel composting	Composting - In vessel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Open windrow composting	Composting - Open Windrow	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Anaerobic digestion	Anaerobic Digestion	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Codigestion	Codigestion	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Landfill traditional	Landfill - traditional	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00
Landfill recirculating	Landfill - recirculating	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.11	0.00	0.00
Land application	Land application	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Aerated static pile	Aerated static pile	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MBT (residual to EfW)	MBT (residual to EfW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MBT (residual to landfill)	MBT (residual to l/fill)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Incineration	EfW	0.04	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.29	0.00
Pyrolysis	Pyrolysis	0.00	0.04	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.29
Spare	Spare	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	AGG SCORE	**0.04**	**0.04**	**0.09**	**0.01**	**0.01**	**0.02**	**0.02**	**0.67**	**0.11**	**0.11**	**0.29**	**0.29**

SUMMARY OF NOISE IMPACTS FOR RESIDUAL TREATMENT

PHASE TWO OPTIONS

		Increased recycling (2% of residual paper, card, white wood) Landfill traditional	Increased recycling (2% of residual paper, card, white wood) Landfill recirculating	Increased recycling (2% of residual paper, card, white wood) Incineration	Increased recycling (5% of residual paper, card, white wood) Landfill traditional	Increased recycling (5% of residual paper, card, white wood) Landfill recirculating	Increased recycling (5% of residual paper, card, white wood) Incineration	Curbside food waste collection, In-vessel Landfill traditional	Curbside food waste collection, In-vessel Landfill recirculating	Curbside food waste collection, In-vessel Incineration
Recycling	MRF - Clean	0.01	0.01	0.01	0.03	0.03	0.03	0.00	0.00	0.00
Backyard composting	Backyard Composting	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
In-vessel composting	Composting - In vessel	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.30	0.30
Open windrow composting	Composting - Open Windrow	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Anaerobic digestion	Anaerobic Digestion	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Codigestion	Codigestion	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Landfill traditional	Landfill - traditional	1.36	0.00	0.00	1.34	0.00	0.00	1.15	0.00	0.00
Landfill recirculating	Landfill - recirculating	0.00	1.36	0.00	0.00	1.34	0.00	0.00	1.15	0.00
Land application	Land application	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Aerated static pile	Aerated static pile	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MBT (residual to EfW)	MBT (residual to EfW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MBT (residual to landfill)	MBT (residual to l/fill)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Incineration	EfW	0.00	0.00	4.10	0.00	0.00	4.06	0.00	0.00	3.42
Pyrolysis	Pyrolysis	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Spare	Spare	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	AGG SCORE	**1.37**	**1.37**	**4.11**	**1.37**	**1.37**	**4.09**	**1.45**	**1.45**	**3.72**

		Curbside food waste collection, AD Landfill traditional	Curbside food waste collection, AD Landfill recirculating	Curbside food waste collection, AD Incineration	Garbage Landfill traditional	Garbage Landfill recirculating	Garbage MBT (residual to EfW)	Garbage MBT (residual to landfill)	Garbage Incineration	Garbage Pyrolysis
Recycling	MRF - Clean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Backyard composting	Backyard Composting	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
In-vessel composting	Composting - In vessel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Open windrow composting	Composting - Open Windrow	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Anaerobic digestion	Anaerobic Digestion	0.16	0.16	0.16	0.00	0.00	0.00	0.00	0.00	0.00
Codigestion	Codigestion	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Landfill traditional	Landfill - traditional	1.15	0.00	0.00	1.38	0.00	0.00	0.00	0.00	0.00
Landfill recirculating	Landfill - recirculating	0.00	1.15	0.00	0.00	1.38	0.00	0.00	0.00	0.00
Land application	Land application	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Aerated static pile	Aerated static pile	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MBT (residual to EfW)	MBT (residual to EfW)	0.00	0.00	0.00	0.00	0.00	4.57	0.00	0.00	0.00
MBT (residual to landfill)	MBT (residual to l/fill)	0.00	0.00	0.00	0.00	0.00	0.00	4.19	0.00	0.00
Incineration	EfW	0.00	0.00	3.42	0.00	0.00	0.00	0.00	4.13	0.00
Pyrolysis	Pyrolysis	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.13
Spare	Spare	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	AGG SCORE	**1.31**	**1.31**	**3.58**	**1.38**	**1.38**	**4.57**	**4.19**	**4.13**	**4.13**

ODOUR INDICATORS

TYPICAL BREAKDOWN OF ODOUR SCORES FOR EACH FACILITY TYPE

Facility type	Capacity (t/a)	Aggregate Scores1	Odour Potential2	Vehicle Movements2	Open or closed operations2
MRF - Clean	25,000	0	1.0	1.3	2.0
	15,000	0	1.0	0.8	2.0
	5,000	0	1.0	0.3	2.0
Backyard Composting	1	0	5.0	0.0	1.0
Composting - In vessel	40,000	2	10.0	2.0	2.0
	25,000	1	10.0	1.3	2.0
	15,000	0	10.0	0.8	2.0
	10,000	0	10.0	0.5	2.0
	5,000	0	10.0	0.3	2.0
	2,500	0	10.0	0.1	2.0
Composting - Open Windrow	20,000	1	5.0	1.0	9.0
	15,000	1	5.0	0.8	9.0
	7,500	0	5.0	0.4	9.0
	5,000	0	5.0	0.3	9.0
	2,500	0	5.0	0.1	9.0
Aerated static pile	20,000	1	7.0	1.0	9.0
	15,000	1	7.0	0.8	9.0
	7,500	0	7.0	0.4	9.0
	5,000	0	7.0	0.3	9.0
	2,500	0	7.0	0.1	9.0
Anaerobic Digestion	50,000	3	10.0	2.5	2.0
	25,000	1	10.0	1.3	2.0
Codigestion	50,000	3	10.0	2.5	2.0
	25,000	1	10.0	1.3	2.0
Landfill - traditional	200,000	33	5.0	3.3	10.0
	100,000	8	5.0	1.7	10.0
	75,000	5	5.0	1.3	10.0
Landfill - recirculating	200,000	30	5.0	3.3	9.0
	100,000	8	5.0	1.7	9.0
	75,000	4	5.0	1.3	9.0
Land application	25,000	1	7.0	0.4	10.0
	10,000	0	7.0	0.2	10.0
	5,000	0	7.0	0.1	10.0
MBT (residual to EfW)	60,000	1	5.0	1.0	2.0
	30,000	0	5.0	0.5	2.0
MBT (residual to l/fill)	60,000	1	5.0	1.0	2.0
	30,000	0	5.0	0.5	2.0
EfW	60,000	1	5.0	1.0	2.0
	30,000	0	5.0	0.5	2.0
Pyrolysis	60,000	1	5.0	1.0	2.0
	30,000	0	5.0	0.5	2.0
Spare	60,000	0	0.0	1.0	0.0
	30,000	0	0.0	0.5	0.0

Notes:
Highest value has greatest odour, litter and dust impact
1 - Aggregate scores = (Capacity x Odour Potential x Vehicle movements x Open/closed facility)/1000000
2 - Nominal scale used for all variables (10 = worst, 0 = best)

SUMMARY OF LITTER/ODOUR/DUST IMPACTS FOR RESIDUAL TREATMENT

PHASE ONE OPTIONS

		Yard and Garden Waste (<20cm diameter) Backyard composting	Yard and Garden Waste (<20cm diameter) In-vessel composting	Yard and Garden Waste (<20cm diameter) Open windrow composting	Yard and Garden Waste (<20cm diameter) Landfill traditional	Yard and Garden Waste (<20cm diameter) Landfill recirculating	Yard and Garden Waste (>20cm diameter) In-vessel composting	Yard and Garden Waste (>20cm diameter) Open windrow composting	Yard and Garden Waste (>20cm diameter) Landfill traditional	Yard and Garden Waste (>20cm diameter) Landfill recirculating	Biosolids Open windrow composting	Biosolids Aerated static pile	Biosolids Landfill traditional	Biosolids Landfill recirculating	Biosolids Land application
Recycling	MRF - Clean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Backyard composting	Backyard Composting	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
In-vessel composting	Composting - In vessel	0.00	2.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Open windrow composting	Composting - Open Windrow	0.00	0.00	6.68	0.00	0.00	0.00	0.01	0.00	0.00	2.56	0.00	0.00	0.00	0.00
Anaerobic digestion	Anaerobic Digestion	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Codigestion	Codigestion	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Landfill traditional	Landfill - traditional	0.00	0.00	0.00	1.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.61	0.00	0.00
Landfill recirculating	Landfill - recirculating	0.00	0.00	0.00	0.00	1.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.61	0.00
Land application	Land application	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.95
Aerated static pile	Aerated static pile	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.56	0.00	0.00	0.00
MBT (residual to EfW)	MBT (residual to EfW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MBT (residual to landfill)	MBT (residual to l/fill)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Incineration	EfW	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pyrolysis	Pyrolysis	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Spare	Spare	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	AGG SCORE	**0.00**	**2.12**	**6.68**	**1.59**	**1.59**	**0.00**	**0.01**	**0.00**	**0.00**	**2.56**	**2.56**	**0.61**	**0.61**	**0.95**

		White Wood In-vessel composting	White Wood Open windrow composting	White Wood Recycling	White Wood Landfill traditional	White Wood Landfill recirculating	White Wood Incineration	White Wood Pyrolysis	Contaminated Wood Landfill traditional	Contaminated Wood Landfill recirculating	Contaminated Wood Incineration	Contaminated Wood Pyrolysis	Old Corrugated Cardboard Recycling	Old Corrugated Cardboard Landfill traditional	Old Corrugated Cardboard Landfill recirculating	Old Corrugated Cardboard Incineration	Old Corrugated Cardboard Pyrolysis	Mixed Paper Recycling	Mixed Paper Landfill traditional	Mixed Paper Landfill recirculating	Mixed Paper Incineration	Mixed Paper Pyrolysis
Recycling	MRF - Clean	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Backyard composting	Backyard Composting	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
In-vessel composting	Composting - In vessel	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Open windrow composting	Composting - Open Windrow	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Anaerobic digestion	Anaerobic Digestion	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Codigestion	Codigestion	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Landfill traditional	Landfill - traditional	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.00
Landfill recirculating	Landfill - recirculating	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00
Land application	Land application	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Aerated static pile	Aerated static pile	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MBT (residual to EfW)	MBT (residual to EfW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MBT (residual to landfill)	MBT (residual to l/fill)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Incineration	EfW	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
Pyrolysis	Pyrolysis	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Spare	Spare	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	AGG SCORE	**0.08**	**0.25**	**0.01**	**0.06**	**0.06**	**0.01**	**0.01**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.01**	**0.06**	**0.06**	**0.01**	**0.01**

SUMMARY OF LITTER/ODOUR/DUST IMPACTS FOR RESIDUAL TREATMENT

PHASE TWO OPTIONS

		Increased recycling (2% of residual paper, card, white wood) Landfill traditional	Increased recycling (2% of residual paper, card, white wood) Landfill recirculating	Increased recycling (2% of residual paper, card, white wood) Incineration	Increased recycling (5% of residual paper, card, white wood) Landfill traditional	Increased recycling (5% of residual paper, card, white wood) Landfill recirculating	Increased recycling (5% of residual paper, card, white wood) Incineration	Curbside food waste collection, In-vessel Landfill traditional	Curbside food waste collection, In-vessel Landfill recirculating	Curbside food waste collection, In-vessel Incineration	Curbside food waste collection, AD Landfill traditional	Curbside food waste collection, AD Landfill recirculating	Curbside food waste collection, AD Incineration	Garbage Landfill traditional	Garbage Landfill recirculating	Garbage MBT (residual to EfW)	Garbage MBT (residual to landfill)	Garbage Incineration	Garbage Pyrolysis
Recycling	MRF - Clean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Backyard composting	Backyard Composting	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
In-vessel composting	Composting - In vessel	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.05	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Open windrow composting	Composting - Open Windrow	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Anaerobic digestion	Anaerobic Digestion	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.05	0.05	0.00	0.00	0.00	0.00	0.00	0.00
Codigestion	Codigestion	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Landfill traditional	Landfill - traditional	2.44	0.00	0.00	2.39	0.00	0.00	1.91	0.00	0.00	1.91	0.00	0.00	2.48	0.00	0.00	0.00	0.00	0.00
Landfill recirculating	Landfill - recirculating	0.00	2.44	0.00	0.00	2.39	0.00	0.00	1.91	0.00	0.00	1.91	0.00	0.00	2.48	0.00	0.00	0.00	0.00
Land application	Land application	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Aerated static pile	Aerated static pile	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MBT (residual to EfW)	MBT (residual to EfW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.55	0.00	0.00	0.00
MBT (residual to landfill)	MBT (residual to l/fill)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.55	0.00	0.00
Incineration	EfW	0.00	0.00	0.55	0.00	0.00	0.54	0.00	0.00	0.43	0.00	0.00	0.43	0.00	0.00	0.00	0.00	0.55	0.00
Pyrolysis	Pyrolysis	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.55
Spare	Spare	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	AGG SCORE	**2.44**	**2.44**	**0.55**	**2.39**	**2.39**	**0.54**	**1.96**	**1.96**	**0.47**	**1.96**	**1.96**	**0.47**	**2.48**	**2.48**	**0.55**	**0.55**	**0.55**	**0.55**

LANDSCAPE INDICATORS

CONSERVE TOWNSCAPES AND LANDSCAPES FOR EACH FACILITY TYPE					
Facility type	Capacity (t/a)	Aggregate Scores1	Visual Impact2	Height of facility2	Scale of facility (hectares)3
MRF - Clean	25,000	24	6.0	5.0	0.8
	15,000	10	4.0	4.0	0.6
	5,000	2	2.0	3.0	0.4
Backyard Composting	<1	0	0.0	0.0	0.0
Composting - In vessel	40,000	46	5.8	4.0	2.0
	25,000	30	5.0	4.0	1.5
	15,000	25	5.0	4.0	1.3
	10,000	9	4.0	3.0	0.8
	5,000	3	3.0	2.0	0.5
	2,500	2	2.0	2.0	0.4
Composting - Open Windro	20,000	16	6.5	2.0	1.2
	15,000	12	6.0	2.0	1.0
	7,500	3	4.5	1.3	0.5
	5,000	2	4.0	1.0	0.5
	2,500	1	3.0	1.0	0.3
Aerated static pile	20,000	16	6.5	2.0	1.2
	15,000	12	6.0	2.0	1.0
	7,500	3	4.5	1.3	0.5
	5,000	2	4.0	1.0	0.5
	2,500	1	3.0	1.0	0.3
Anaerobic Digestion	50,000	9	3.0	2.0	1.5
	25,000	5	2.0	2.0	1.3
Codigestion	50,000	48	4.0	8.0	1.5
	25,000	20	2.0	8.0	1.3
Landfill - traditional	200,000	1,350	9.0	6.0	25.0
	100,000	800	8.0	5.0	20.0
	75,000	420	7.0	4.0	15.0
Landfill - recirculating	200,000	1,350	9.0	6.0	25.0
	100,000	800	8.0	5.0	20.0
	75,000	420	7.0	4.0	15.0
Land application	25,000	333	4.0	1.0	83.3
	10,000	100	3.0	1.0	33.3
	5,000	33	2.0	1.0	16.7
MBT (residual to EfW)	160,000	126	7.0	9.0	2.0
	100,000	84	7.0	8.0	1.5
	60,000	48	6.0	8.0	1.0
	30,000	38	6.0	8.0	0.8
MBT (residual to l/fill)	160,000	112	7.0	8.0	2.0
	100,000	72	6.0	8.0	1.5
	60,000	40	5.0	8.0	1.0
	30,000	26	4.0	8.0	0.8
EfW	160,000	150	7.5	8.0	2.5
	135,000	145	7.3	8.0	2.5
	100,000	140	7.0	8.0	2.5
	70,000	96	6.0	8.0	2.0
	60,000	80	5.0	8.0	2.0
	50,000	64	4.0	8.0	2.0
	30,000	24	2.0	8.0	1.5
Pyrolysis	60,000	40	5.0	8.0	1.0
	30,000	32	4.0	8.0	1.0
Spare	60,000	0	0.0	0.0	0.0
	30,000	0	0.0	0.0	0.0

Notes:
Highest value has greatest impact on landscape
1 - Aggregate scores = Visual impact x facility height x Scale of facility
2 - Nominal scale used for landscape impact and facility height (10 = worst, 0 = best)
3 - Scale of facility related to landtake factor

SUMMARY OF LANDSCAPE IMPACTS FOR RESIDUAL TREATMENT

PHASE ONE OPTIONS

		Yard and Garden Waste (<20cm diameter) Backyard composting	Yard and Garden Waste (<20cm diameter) In-vessel composting	Yard and Garden Waste (<20cm diameter) Open windrow composting	Yard and Garden Waste (<20cm diameter) Landfill traditional	Yard and Garden Waste (<20cm diameter) Landfill recirculating	Yard and Garden Waste (>20cm diameter) In-vessel composting	Yard and Garden Waste (>20cm diameter) Open windrow composting	Yard and Garden Waste (>20cm diameter) Landfill traditional	Yard and Garden Waste (>20cm diameter) Landfill recirculating	Biosolids Open windrow composting	Biosolids Aerated static pile	Biosolids Landfill traditional	Biosolids Landfill recirculating	Biosolids Land application
Recycling	MRF - Clean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Backyard composting	Backyard Composting	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
In-vessel composting	Composting - In vessel	0.00	67.69	0.00	0.00	0.00	1.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Open windrow composting	Composting - Open Windrow	0.00	0.00	50.40	0.00	0.00	0.00	0.57	0.00	0.00	25.36	0.00	0.00	0.00	0.00
Anaerobic digestion	Anaerobic Digestion	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Codigestion	Codigestion	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Landfill traditional	Landfill - traditional	0.00	0.00	0.00	279.71	0.00	0.00	0.00	8.69	0.00	0.00	0.00	164.18	0.00	0.00
Landfill recirculating	Landfill - recirculating	0.00	0.00	0.00	0.00	279.71	0.00	0.00	0.00	8.69	0.00	0.00	0.00	164.18	0.00
Land application	Land application	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	414.35
Aerated static pile	Aerated static pile	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.36	0.00	0.00	0.00
MBT (residual to EfW)	MBT (residual to EfW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MBT (residual to landfill)	MBT (residual to l/fill)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Incineration	EfW	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pyrolysis	Pyrolysis	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Spare	Spare	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	AGG SCORE	**0.00**	**67.69**	**50.40**	**279.71**	**279.71**	**1.17**	**0.57**	**8.69**	**8.69**	**25.36**	**25.36**	**164.18**	**164.18**	**414.35**

		White Wood In-vessel composting	White Wood Open windrow composting	White Wood Recycling	White Wood Landfill traditional	White Wood Landfill recirculating	White Wood Incineration	White Wood Pyrolysis	Contaminated Wood Landfill traditional	Contaminated Wood Landfill recirculating	Contaminated Wood Incineration	Contaminated Wood Pyrolysis
Recycling	MRF - Clean	0.00	0.00	5.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Backyard composting	Backyard Composting	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
In-vessel composting	Composting - In vessel	8.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Open windrow composting	Composting - Open Windrow	0.00	4.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Anaerobic digestion	Anaerobic Digestion	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Codigestion	Codigestion	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Landfill traditional	Landfill - traditional	0.00	0.00	0.00	45.13	0.00	0.00	0.00	10.12	0.00	0.00	0.00
Landfill recirculating	Landfill - recirculating	0.00	0.00	0.00	0.00	45.13	0.00	0.00	0.00	10.12	0.00	0.00
Land application	Land application	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Aerated static pile	Aerated static pile	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MBT (residual to EfW)	MBT (residual to EfW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MBT (residual to landfill)	MBT (residual to l/fill)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Incineration	EfW	0.00	0.00	0.00	0.00	0.00	9.17	0.00	0.00	0.00	2.23	0.00
Pyrolysis	Pyrolysis	0.00	0.00	0.00	0.00	0.00	0.00	21.65	0.00	0.00	0.00	14.03
Spare	Spare	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	AGG SCORE	**8.03**	**4.80**	**5.20**	**45.13**	**45.13**	**9.17**	**21.65**	**10.12**	**10.12**	**2.23**	**14.03**

		Old Corrugated Cardboard Recycling	Old Corrugated Cardboard Landfill traditional	Old Corrugated Cardboard Landfill recirculating	Old Corrugated Cardboard Incineration	Old Corrugated Cardboard Pyrolysis	Mixed Paper Recycling	Mixed Paper Landfill traditional	Mixed Paper Landfill recirculating	Mixed Paper Incineration	Mixed Paper Pyrolysis
Recycling	MRF - Clean	0.48	0.00	0.00	0.00	0.00	5.45	0.00	0.00	0.00	0.00
Backyard composting	Backyard Composting	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
In-vessel composting	Composting - In vessel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Open windrow composting	Composting - Open Windrow	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Anaerobic digestion	Anaerobic Digestion	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Codigestion	Codigestion	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Landfill traditional	Landfill - traditional	0.00	6.81	0.00	0.00	0.00	0.00	46.83	0.00	0.00	0.00
Landfill recirculating	Landfill - recirculating	0.00	0.00	6.81	0.00	0.00	0.00	0.00	46.83	0.00	0.00
Land application	Land application	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Aerated static pile	Aerated static pile	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MBT (residual to EfW)	MBT (residual to EfW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MBT (residual to landfill)	MBT (residual to l/fill)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Incineration	EfW	0.00	0.00	0.00	1.53	0.00	0.00	0.00	0.00	9.50	0.00
Pyrolysis	Pyrolysis	0.00	0.00	0.00	0.00	12.51	0.00	0.00	0.00	0.00	21.88
Spare	Spare	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	AGG SCORE	**0.48**	**6.81**	**6.81**	**1.53**	**12.51**	**5.45**	**46.83**	**46.83**	**9.50**	**21.88**

SUMMARY OF LANDSCAPE IMPACTS FOR RESIDUAL TREATMENT

PHASE TWO OPTIONS

		Increased recycling (2% of residual paper, card, white wood) Landfill traditional	Increased recycling (2% of residual paper, card, white wood) Landfill recirculating	Increased recycling (2% of residual paper, card, white wood) Incineration	Increased recycling (5% of residual paper, card, white wood) Landfill traditional	Increased recycling (5% of residual paper, card, white wood) Landfill recirculating	Increased recycling (5% of residual paper, card, white wood) Incineration	Curbside food waste collection, In-vessel Landfill traditional	Curbside food waste collection, In-vessel Landfill recirculating	Curbside food waste collection, In-vessel Incineration	Curbside food waste collection, AD Landfill traditional	Curbside food waste collection, AD Landfill recirculating	Curbside food waste collection, AD Incineration	Garbage Landfill traditional	Garbage Landfill recirculating	Garbage MBT (residual to EfW)	Garbage MBT (residual to landfill)	Garbage Incineration	Garbage Pyrolysis
Recycling	MRF - Clean	0.04	0.04	0.04	0.13	0.13	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Backyard composting	Backyard Composting	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
In-vessel composting	Composting - In vessel	0.00	0.00	0.00	0.00	0.00	0.00	5.82	5.82	5.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Open windrow composting	Composting - Open Windrow	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Anaerobic digestion	Anaerobic Digestion	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.69	1.69	1.69	0.00	0.00	0.00	0.00	0.00	0.00
Codigestion	Codigestion	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Landfill traditional	Landfill - traditional	354.58	0.00	0.00	350.37	0.00	0.00	309.73	0.00	0.00	309.73	0.00	0.00	357.39	0.00	0.00	0.00	0.00	0.00
Landfill recirculating	Landfill - recirculating	0.00	354.58	0.00	0.00	350.37	0.00	0.00	309.73	0.00	0.00	309.73	0.00	0.00	357.39	0.00	0.00	0.00	0.00
Land application	Land application	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Aerated static pile	Aerated static pile	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MBT (residual to EfW)	MBT (residual to EfW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	55.65	0.00	0.00	0.00
MBT (residual to landfill)	MBT (residual to l/fill)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	43.10	0.00	0.00
Incineration	EfW	0.12	0.12	64.78	0.32	0.32	64.31	0.00	0.00	56.84	0.00	0.00	56.84	0.00	0.00	0.00	0.00	65.09	0.00
Pyrolysis	Pyrolysis	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	39.44
Spare	Spare	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	AGG SCORE	**354.74**	**354.74**	**64.81**	**350.82**	**350.82**	**64.44**	**315.55**	**315.55**	**62.66**	**311.42**	**311.42**	**58.53**	**357.39**	**357.39**	**55.65**	**43.10**	**65.09**	**39.44**

PUBLIC INVOLVEMENT INDICATORS

TABLE C9A: TYPICAL BREAKDOWN OF PUBLIC INVOLVEMENT SCORES FOR EACH FACILITY TYPE

Facility type	Capacity (t/a)	Aggregate Scores1	Sending right message2	Potential for public involvement3
MRF - Clean	25,000	50	10	5
	15,000	50	10	5
	5,000	50	10	5
Backyard Composting	<1	50	10	5
Composting - In vessel	40,000	50	10	5
	25,000	50	10	5
	15,000	50	10	5
	10,000	50	10	5
	5,000	50	10	5
	2,500	50	10	5
Composting - Open Windrow	20,000	50	10	5
	15,000	50	10	5
	7,500	50	10	5
	5,000	50	10	5
	2,500	50	10	5
Aerated static pile	20,000	50	10	5
	15,000	50	10	5
	7,500	50	10	5
	5,000	50	10	5
	2,500	50	10	5
Anaerobic Digestion	50,000	50	10	5
	25,000	50	10	5
Codigestion	50,000	15	5	3
	25,000	15	5	3
Landfill - traditional	200,000	1	1	1
	100,000	1	1	1
	75,000	1	1	1
Landfill - recirculating	200,000	4	2	2
	100,000	4	2	2
	75,000	4	2	2
Land application	25,000	24	8	3
	10,000	24	8	3
	5,000	24	8	3
MBT (residual to EfW)	160,000	21	7	3
	100,000	21	7	3
	60,000	21	7	3
	30,000	21	7	3
MBT (residual to l/fill)	160,000	21	7	3
	100,000	21	7	3
	60,000	21	7	3
	30,000	21	7	3
EfW	160,000	15	5	3
	135,000	15	5	3
	100,000	15	5	3
	70,000	15	5	3
	60,000	15	5	3
	50,000	15	5	3
	30,000	15	5	3
Pyrolysis	60,000	18	6	3
	30,000	18	6	3
Gasification	60,000	18	6	3
	30,000	18	6	3

Notes:
Highest value has best opportunity for public involvement
1 - Aggregate scores = Sending right message x potential for public involvement in recycling/composting
2 - Nominal scale used for sending right message based on waste hierarchy(10 = best, 0 = worst)
3 - Nominal scale used for potential for public involvement in recycling /composting (1 = worst, 5 = best)

SUMMARY OF PUBLIC INVOLVEMENT OPPORTUNITIES FOR RESIDUAL TREATMENT

PHASE ONE OPTIONS

		Yard and Garden Waste (<20cm diameter) Backyard composting	Yard and Garden Waste (<20cm diameter) In-vessel composting	Yard and Garden Waste (<20cm diameter) Open windrow composting	Yard and Garden Waste (<20cm diameter) Landfill traditional	Yard and Garden Waste (<20cm diameter) Landfill recirculating	Yard and Garden Waste (>20cm diameter) In-vessel composting	Yard and Garden Waste (>20cm diameter) Open windrow composting	Yard and Garden Waste (>20cm diameter) Landfill traditional	Yard and Garden Waste (>20cm diameter) Landfill recirculating	Biosolids Open windrow composting	Biosolids Aerated static pile	Biosolids Landfill traditional	Biosolids Landfill recirculating	Biosolids Land application	White Wood In-vessel composting	White Wood Open windrow composting	White Wood Recycling
Recycling	MRF - Clean	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50
Backyard composting	Backyard Composting	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
In-vessel composting	Composting - In vessel	0	50	0	0	0	50	0	0	0	0	0	0	0	0	50	0	0
Open windrow composting	Composting - Open Windrow	0	0	50	0	0	0	50	0	0	50	0	0	0	0	0	50	0
Anaerobic digestion	Anaerobic Digestion	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Codigestion	Codigestion	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Landfill traditional	Landfill - traditional	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0
Landfill recirculating	Landfill - recirculating	0	0	0	0	4	0	0	0	4	0	0	0	4	0	0	0	0
Land application	Land application	0	0	0	0	0	0	0	0	0	0	0	0	0	24	0	0	0
Aerated static pile	Aerated static pile	0	0	0	0	0	0	0	0	0	0	50	0	0	0	0	0	0
MBT (residual to EfW)	MBT (residual to EfW)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MBT (residual to landfill)	MBT (residual to l/fill)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Incineration	EfW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyrolysis	Pyrolysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spare	Spare	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	AGG SCORE	**50**	**50**	**50**	**1**	**4**	**50**	**50**	**1**	**4**	**50**	**50**	**1**	**4**	**24**	**50**	**50**	**50**

		White Wood Landfill traditional	White Wood Landfill recirculating	White Wood Incineration	White Wood Pyrolysis	Contaminated Wood Landfill traditional	Contaminated Wood Landfill recirculating	Contaminated Wood Incineration	Contaminated Wood Pyrolysis	Old Corrugated Cardboard Recycling	Old Corrugated Cardboard Landfill traditional	Old Corrugated Cardboard Landfill recirculating	Old Corrugated Cardboard Incineration	Old Corrugated Cardboard Pyrolysis	Mixed Paper Recycling	Mixed Paper Landfill traditional	Mixed Paper Landfill recirculating	Mixed Paper Incineration	Mixed Paper Pyrolysis
Recycling	MRF - Clean	0	0	0	0	0	0	0	0	50	0	0	0	0	50	0	0	0	0
Backyard composting	Backyard Composting	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
In-vessel composting	Composting - In vessel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Open windrow composting	Composting - Open Windrow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anaerobic digestion	Anaerobic Digestion	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Codigestion	Codigestion	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Landfill traditional	Landfill - traditional	1	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0
Landfill recirculating	Landfill - recirculating	0	4	0	0	0	4	0	0	0	0	4	0	0	0	0	4	0	0
Land application	Land application	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aerated static pile	Aerated static pile	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MBT (residual to EfW)	MBT (residual to EfW)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MBT (residual to landfill)	MBT (residual to l/fill)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Incineration	EfW	0	0	15	0	0	0	15	0	0	0	0	15	0	0	0	0	15	0
Pyrolysis	Pyrolysis	0	0	0	18	0	0	0	18	0	0	0	0	18	0	0	0	0	18
Spare	Spare	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	AGG SCORE	**1**	**4**	**15**	**18**	**1**	**4**	**15**	**18**	**50**	**1**	**4**	**15**	**18**	**50**	**1**	**4**	**15**	**18**

Notes:
1 - Highest value is most desirable ... lowest value is least desirable

SUMMARY OF PUBLIC INVOLVEMENT OPPORTUNITIES FOR RESIDUAL TREATMENT

PHASE TWO OPTIONS

		Increased recycling (2% of residual paper, card, white wood) Landfill traditional	Increased recycling (2% of residual paper, card, white wood) Landfill recirculating	Increased recycling (2% of residual paper, card, white wood) Incineration	Increased recycling (5% of residual paper, card, white wood) Landfill traditional	Increased recycling (5% of residual paper, card, white wood) Landfill recirculating	Increased recycling (5% of residual paper, card, white wood) Incineration	Curbside food waste collection, In-vessel Landfill traditional	Curbside food waste collection, In-vessel Landfill recirculating	Curbside food waste collection, In-vessel Incineration	Curbside food waste collection, AD Landfill traditional	Curbside food waste collection, AD Landfill recirculating	Curbside food waste collection, AD Incineration	Garbage Landfill traditional	Garbage Landfill recirculating	Garbage MBT (residual to EfW)	Garbage MBT (residual to landfill)	Garbage Incineration	Garbage Pyrolysis
Recycling	MRF - Clean	50	50	50	50	50	50	0	0	0	0	0	0	0	0	0	0	0	0
Backyard composting	Backyard Composting	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
In-vessel composting	Composting - In vessel	0	0	0	0	0	0	50	50	50	0	0	0	0	0	0	0	0	0
Open windrow composting	Composting - Open Windrow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anaerobic digestion	Anaerobic Digestion	0	0	0	0	0	0	0	0	0	50	50	50	0	0	0	0	0	0
Codigestion	Codigestion	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Landfill traditional	Landfill - traditional	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	0	0	0
Landfill recirculating	Landfill - recirculating	0	4	0	0	4	0	0	4	0	0	4	0	0	4	0	0	0	0
Land application	Land application	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aerated static pile	Aerated static pile	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MBT (residual to EfW)	MBT (residual to EfW)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21	0	0	0
MBT (residual to landfill)	MBT (residual to l/fill)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21	0	0
Incineration	EfW	15	15	15	15	15	15	0	0	15	0	0	15	0	0	0	0	15	0
Pyrolysis	Pyrolysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18
Spare	Spare	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	AGG SCORE	**66**	**69**	**65**	**66**	**69**	**65**	**51**	**54**	**65**	**51**	**54**	**65**	**1**	**4**	**21**	**21**	**15**	**18**

Notes:
1 - Highest value is most desirable ... lowest value is least desirable

EDUCATION INDICATORS

TYPICAL BREAKDOWN OF EDUCATION SCORES FOR EACH FACILITY TYPE

Facility type	Capacity (t/a)	Aggregate Scores1	Number of jobs2	Potential for skilled employment3
MRF - Clean	25,000	140	20	7
	15,000	112	16	7
	5,000	35	5	7
Backyard Composting	<1	0	0	0
Composting - In vessel	40,000	56	8	7
	25,000	56	8	7
	15,000	49	7	7
	10,000	35	5	7
	5,000	35	5	7
	2,500	21	3	7
Composting - Open Windrow	20,000	15	5	3
	15,000	15	5	3
	7,500	9	3	3
	5,000	9	3	3
	2,500	9	3	3
Aerated static pile	20,000	15	5	3
	15,000	15	5	3
	7,500	9	3	3
	5,000	9	3	3
	2,500	9	3	3
Anaerobic Digestion	50,000	56	8	7
	25,000	49	7	7
Codigestion	50,000	56	8	7
	25,000	49	7	7
Landfill - traditional	200,000	27	9	3
	100,000	27	9	3
	75,000	18	6	3
Landfill - recirculating	200,000	27	9	3
	100,000	27	9	3
	75,000	18	6	3
Land application	25,000	9	3	3
	10,000	6	2	3
	5,000	6	2	3
MBT (residual to EfW)	160,000	200	20	10
	100,000	200	20	10
	60,000	140	14	10
	30,000	100	10	10
MBT (residual to l/fill)	160,000	140	20	7
	100,000	140	20	7
	60,000	98	14	7
	30,000	70	10	7
EfW	160,000	250	25	10
	135,000	250	25	10
	100,000	250	25	10
	70,000	200	20	10
	60,000	200	20	10
	50,000	125	13	10
	30,000	125	13	10
Pyrolysis	60,000	150	15	10
	30,000	125	13	10
Spare	60,000	0	5	0
	30,000	0	3	0

Notes:
Highest value has best opportunity to provide education
1 - Aggregate scores = Number of jobs x potential for skilled employment
2 - Numbers of jobs (higher number = best)
3 - Nominal scale used for potential for skilled employment (1 = worst, 10 = best)

SUMMARY OF EDUCATION OPPORTUNITIES FOR RESIDUAL TREATMENT

PHASE ONE OPTIONS

		Yard and Garden Waste (<20cm diameter) Backyard composting	Yard and Garden Waste (<20cm diameter) In-vessel composting	Yard and Garden Waste (<20cm diameter) Open windrow composting	Yard and Garden Waste (<20cm diameter) Landfill traditional	Yard and Garden Waste (<20cm diameter) Landfill recirculating	Yard and Garden Waste (>20cm diameter) In-vessel composting	Yard and Garden Waste (>20cm diameter) Open windrow composting	Yard and Garden Waste (>20cm diameter) Landfill traditional	Yard and Garden Waste (>20cm diameter) Landfill recirculating
Recycling	MRF - Clean	0	0	0	0	0	0	0	0	0
Backyard composting	Backyard Composting	0	0	0	0	0	0	0	0	0
In-vessel composting	Composting - In vessel	0	56	0	0	0	56	0	0	0
Open windrow composting	Composting - Open Windrow	0	0	15	0	0	0	15	0	0
Anaerobic digestion	Anaerobic Digestion	0	0	0	0	0	0	0	0	0
Codigestion	Codigestion	0	0	0	0	0	0	0	0	0
Landfill traditional	Landfill - traditional	0	0	0	27	0	0	0	27	0
Landfill recirculating	Landfill - recirculating	0	0	0	0	27	0	0	0	27
Land application	Land application	0	0	0	0	0	0	0	0	0
Aerated static pile	Aerated static pile	0	0	0	0	0	0	0	0	0
MBT (residual to EfW)	MBT (residual to EfW)	0	0	0	0	0	0	0	0	0
MBT (residual to landfill)	MBT (residual to l/fill)	0	0	0	0	0	0	0	0	0
Incineration	EfW	0	0	0	0	0	0	0	0	0
Pyrolysis	Pyrolysis	0	0	0	0	0	0	0	0	0
Spare	Spare	0	0	0	0	0	0	0	0	0
	AGG SCORE	**0**	**56**	**15**	**27**	**27**	**56**	**15**	**27**	**27**

		Biosolids Open windrow composting	Biosolids Aerated static pile	Biosolids Landfill traditional	Biosolids Landfill recirculating	Biosolids Land application	White Wood In-vessel composting	White Wood Open windrow composting	White Wood Recycling	White Wood Landfill traditional	White Wood Landfill recirculating	White Wood Incineration	White Wood Pyrolysis
Recycling	MRF - Clean	0	0	0	0	0	0	0	140	0	0	0	0
Backyard composting	Backyard Composting	0	0	0	0	0	0	0	0	0	0	0	0
In-vessel composting	Composting - In vessel	0	0	0	0	0	56	0	0	0	0	0	0
Open windrow composting	Composting - Open Windrow	15	0	0	0	0	0	15	0	0	0	0	0
Anaerobic digestion	Anaerobic Digestion	0	0	0	0	0	0	0	0	0	0	0	0
Codigestion	Codigestion	0	0	0	0	0	0	0	0	0	0	0	0
Landfill traditional	Landfill - traditional	0	0	27	0	0	0	0	0	27	0	0	0
Landfill recirculating	Landfill - recirculating	0	0	0	27	0	0	0	0	0	27	0	0
Land application	Land application	0	0	0	0	9	0	0	0	0	0	0	0
Aerated static pile	Aerated static pile	0	15	0	0	0	0	0	0	0	0	0	0
MBT (residual to EfW)	MBT (residual to EfW)	0	0	0	0	0	0	0	0	0	0	0	0
MBT (residual to landfill)	MBT (residual to l/fill)	0	0	0	0	0	0	0	0	0	0	0	0
Incineration	EfW	0	0	0	0	0	0	0	0	0	0	250	0
Pyrolysis	Pyrolysis	0	0	0	0	0	0	0	0	0	0	0	150
Spare	Spare	0	0	0	0	0	0	0	0	0	0	0	0
	AGG SCORE	**15**	**15**	**27**	**27**	**9**	**56**	**15**	**140**	**27**	**27**	**250**	**150**

		Contaminated Wood Landfill traditional	Contaminated Wood Landfill recirculating	Contaminated Wood Incineration	Contaminated Wood Pyrolysis	Old Corrugated Cardboard Recycling	Old Corrugated Cardboard Landfill traditional	Old Corrugated Cardboard Landfill recirculating	Old Corrugated Cardboard Incineration	Old Corrugated Cardboard Pyrolysis	Mixed Paper Recycling	Mixed Paper Landfill traditional	Mixed Paper Landfill recirculating	Mixed Paper Incineration	Mixed Paper Pyrolysis
Recycling	MRF - Clean	0	0	0	0	140	0	0	0	0	140	0	0	0	0
Backyard composting	Backyard Composting	0	0	0	0	0	0	0	0	0	0	0	0	0	0
In-vessel composting	Composting - In vessel	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Open windrow composting	Composting - Open Windrow	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anaerobic digestion	Anaerobic Digestion	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Codigestion	Codigestion	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Landfill traditional	Landfill - traditional	27	0	0	0	0	27	0	0	0	0	27	0	0	0
Landfill recirculating	Landfill - recirculating	0	27	0	0	0	0	27	0	0	0	0	27	0	0
Land application	Land application	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aerated static pile	Aerated static pile	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MBT (residual to EfW)	MBT (residual to EfW)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MBT (residual to landfill)	MBT (residual to l/fill)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Incineration	EfW	0	0	250	0	0	0	0	250	0	0	0	0	250	0
Pyrolysis	Pyrolysis	0	0	0	150	0	0	0	0	150	0	0	0	0	150
Spare	Spare	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	AGG SCORE	**27**	**27**	**250**	**150**	**140**	**27**	**27**	**250**	**150**	**140**	**27**	**27**	**250**	**150**

Notes:
1 - Highest value is most desirable … lowest value is least desirable

SUMMARY OF EDUCATION OPPORTUNITIES FOR RESIDUAL TREATMENT

PHASE TWO OPTIONS

		Increased recycling (2% of residual paper, card, white wood) Landfill traditional	Increased recycling (2% of residual paper, card, white wood) Landfill recirculating	Increased recycling (2% of residual paper, card, white wood) Incineration	Increased recycling (5% of residual paper, card, white wood) Landfill traditional	Increased recycling (5% of residual paper, card, white wood) Landfill recirculating	Increased recycling (5% of residual paper, card, white wood) Incineration	Curbside food waste collection, In-vessel Landfill traditional	Curbside food waste collection, In-vessel Landfill recirculating	Curbside food waste collection, In-vessel Incineration	Curbside food waste collection, AD Landfill traditional	Curbside food waste collection, AD Landfill recirculating	Curbside food waste collection, AD Incineration	Garbage Landfill traditional	Garbage Landfill recirculating	Garbage MBT (residual to EfW)	Garbage MBT (residual to landfill)	Garbage Incineration	Garbage Pyrolysis
Recycling	MRF - Clean	140	140	140	140	140	140	0	0	0	0	0	0	0	0	0	0	0	0
Backyard composting	Backyard Composting	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
In-vessel composting	Composting - In vessel	0	0	0	0	0	0	56	56	56	0	0	0	0	0	0	0	0	0
Open windrow composting	Composting - Open Windrow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anaerobic digestion	Anaerobic Digestion	0	0	0	0	0	0	0	0	0	56	56	56	0	0	0	0	0	0
Codigestion	Codigestion	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Landfill traditional	Landfill - traditional	27	0	0	27	0	0	27	0	0	27	0	0	27	0	0	0	0	0
Landfill recirculating	Landfill - recirculating	0	27	0	0	27	0	0	27	0	0	27	0	0	27	0	0	0	0
Land application	Land application	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aerated static pile	Aerated static pile	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MBT (residual to EfW)	MBT (residual to EfW)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	200	0	0	0
MBT (residual to landfill)	MBT (residual to l/fill)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	140	0	0
Incineration	EfW	250	250	250	250	250	250	0	0	250	0	0	250	0	0	0	0	250	0
Pyrolysis	Pyrolysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	150
Spare	Spare	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	AGG SCORE	**417**	**417**	**390**	**417**	**417**	**390**	**83**	**83**	**306**	**83**	**83**	**306**	**27**	**27**	**200**	**140**	**250**	**150**

Notes:
1 - Highest value is most desirable … lowest value is least desirable

TRANSPORT INDICATORS

Assumptions

New service - Annual curbside collection distance (weekly service)	150,000	cumulative km
New service - Annual curbside collection distance (bi-weekly service)	90,000	cumulative km
Removal of service - Annual curbside collection distance (weekly servic	-150,000	cumulative km
Removal of service - Annual curbside collection distance (bi-weekly ser	-90,000	cumulative km

Out of RDCO facility assumptions	Distance (km)		Payload (t)
MRF - Clean		one way journey km assumed within RDCO	20
Backyard Composting		one way journey km assumed within RDCO	0
Composting - In vessel		one way journey km assumed within RDCO	20
Composting - Open Windrow		one way journey km assumed within RDCO	20
Anaerobic Digestion		one way journey km assumed within RDCO	20
Codigestion		one way journey km assumed within RDCO	20
Landfill - traditional		one way journey km assumed within RDCO	20
Landfill - recirculating		one way journey km assumed within RDCO	20
Land application		one way journey km assumed within RDCO	10
MBT (residual to EfW)	150	one way journey km	20
MBT (residual to l/fill)	150	one way journey km	20
EfW	150	one way journey km	20
Pyrolysis	150	one way journey km	20
Spare			

Onward transportation of facility outputs	Distance (km)		Payload (t)
Incinerator Bottom Ash	100	one way journey km	20
Air Pollution Control Residues	250	one way journey km	20
Metals	250	one way journey km	20
Plastics	250	one way journey km	10
SRF	250	one way journey km	10
Compost	20	one way journey km	10
Recycling	50	one way journey km	15
Landfill	75	one way journey km	20

Factors	Factors to convert input to output	
Compost OW	57%	figures to be linked in with Hatties calculations
Compost IVC	57%	figures to be linked in with Hatties calculations
Compost AD	50%	figures to be linked in with Hatties calculations
Compost ASP	57%	figures to be linked in with Hatties calculations
IBA	20%	
APCR	5%	
SRF	50%	
Nominal saving associated with collecting material in garbage stream	5%	
Wood ash	3%	
MBT landfill rejects	10%	

PHASE ONE OPTIONS

Assessment Year 2020

PHASE ONE OPTIONS

treatment method			Yard and Garden Waste (<20cm diameter) Backyard composting	Yard and Garden Waste (<20cm diameter) In-vessel composting	Yard and Garden Waste (<20cm diameter) Open windrow composting	Yard and Garden Waste (<20cm diameter) Landfill traditional	Yard and Garden Waste (<20cm diameter) Landfill recirculating	Yard and Garden Waste (>20cm diameter) In-vessel composting	Yard and Garden Waste (>20cm diameter) Open windrow composting	Yard and Garden Waste (>20cm diameter) Landfill traditional	Yard and Garden Waste (>20cm diameter) Landfill recirculating
		Material Stream	Yard and Garden Waste (<20cm diameter)	Yard and Garden Waste (<20cm diameter)	Yard and Garden Waste (<20cm diameter)	Yard and Garden Waste (<20cm diameter)	Yard and Garden Waste (<20cm diameter)	Yard and Garden Waste (>20cm diameter)	Yard and Garden Waste (>20cm diameter)	Yard and Garden Waste (>20cm diameter)	Yard and Garden Waste (>20cm diameter)
		Treatment Method	Backyard composting	In-vessel composting	Open windrow composting	Landfill traditional	Landfill recirculating	In-vessel composting	Open windrow composting	Landfill traditional	Landfill recirculating
		Total arisings	48,890	48,890	48,890	48,890	48,890	2,019	2,019	2,019	2,019
		Source Segregated Tonnage	46,067	46,067	46,067	46,067	46,067	2,019	2,019	2,019	2,019
Recycling	MRF - Clean		0	0	0	0	0	0	0	0	0
Backyard composting	Backyard Composting		46,067	0	0	0	0	0	0	0	0
In-vessel composting	Composting - In vessel		0	46,067	0	0	0	2,019	0	0	0
Open windrow composting	Composting - Open Windrow		0	0	46,067	0	0	0	2,019	0	0
Anaerobic digestion	Anaerobic Digestion		0	0	0	0	0	0	0	0	0
Codigestion	Codigestion		0	0	0	0	0	0	0	0	0
Landfill traditional	Landfill - traditional		0	0	0	46,067	0	0	0	2,019	0
Landfill recirculating	Landfill - recirculating		0	0	0	0	46,067	0	0	0	2,019
Land application	Land application		0	0	0	0	0	0	0	0	0
Aerated static pile	Aerated static pile		0	0	0	0	0	0	0	0	0
MBT (residual to EfW)	MBT (residual to EfW)		0	0	0	0	0	0	0	0	0
MBT (residual to landfill)	MBT (residual to l/fill)		0	0	0	0	0	0	0	0	0
Incineration	EfW		0	0	0	0	0	0	0	0	0
Pyrolysis	Pyrolysis		0	0	0	0	0	0	0	0	0
Spare	Spare		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL ADDITIONAL DISTANCE (compared to baseline position)		**0**	**-172,534**	**0**	**0**	**-109,534**	**-109,534**	**0**	**0**	**-9,104**	**-9,104**

treatment method		Biosolids Open windrow composting	Biosolids Aerated static pile	Biosolids Landfill traditional	Biosolids Landfill recirculating	Biosolids Land application	White Wood In-vessel composting	White Wood Open windrow composting	White Wood Recycling	White Wood Landfill traditional	White Wood Landfill recirculating	White Wood Incineration	White Wood Pyrolysis
	Material Stream	Biosolids	Biosolids	Biosolids	Biosolids	Biosolids	White Wood	White Wood	White Wood	White Wood	White Wood	White Wood	White Wood
	Treatment Method	Open windrow composting	Aerated static pile	Landfill traditional	Landfill recirculating	Land application	In-vessel composting	Open windrow composting	Recycling	Landfill traditional	Landfill recirculating	Incineration	Pyrolysis
	Total arisings	28,508	28,508	28,508	28,508	28,508	16,137	16,137	16,137	16,137	16,137	16,137	16,137
	Source Segregated Tonnage	28,508	28,508	28,508	28,508	28,508	8,909	8,909	8,909	8,909	8,909	8,909	8,909
Recycling	MRF - Clean	0	0	0	0	0	0	0	8,909	0	0	0	0
Backyard composting	Backyard Composting	0	0	0	0	0	0	0	0	0	0	0	0
In-vessel composting	Composting - In vessel	0	0	0	0	0	8,909	0	0	0	0	0	0
Open windrow composting	Composting - Open Windrow	28,508	0	0	0	0	0	8,909	0	0	0	0	0
Anaerobic digestion	Anaerobic Digestion	0	0	0	0	0	0	0	0	0	0	0	0
Codigestion	Codigestion	0	0	0	0	0	0	0	0	0	0	0	0
Landfill traditional	Landfill - traditional	0	0	28,508	0	0	0	0	0	8,909	0	0	0
Landfill recirculating	Landfill - recirculating	0	0	0	28,508	0	0	0	0	0	8,909	0	0
Land application	Land application	0	0	0	0	28,508	0	0	0	0	0	0	0
Aerated static pile	Aerated static pile	0	28,508	0	0	0	0	0	0	0	0	0	0
MBT (residual to EfW)	MBT (residual to EfW)	0	0	0	0	0	0	0	0	0	0	0	0
MBT (residual to landfill)	MBT (residual to l/fill)	0	0	0	0	0	0	0	0	0	0	0	0
Incineration	EfW	0	0	0	0	0	0	0	0	0	0	8,909	0
Pyrolysis	Pyrolysis	0	0	0	0	0	0	0	0	0	0	0	8,909
Spare	Spare	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL ADDITIONAL DISTANCE (compared to baseline position)		**0**	**0**	**-64,998**	**-64,998**	**0**	**33,408**	**33,408**	**57,164**	**5,273**	**5,273**	**0**	**0**

treatment method		Contaminated Wood Landfill traditional	Contaminated Wood Landfill recirculating	Contaminated Wood Incineration	Contaminated Wood Pyrolysis	Old Corrugated Cardboard Recycling	Old Corrugated Cardboard Landfill traditional	Old Corrugated Cardboard Landfill recirculating	Old Corrugated Cardboard Incineration	Old Corrugated Cardboard Pyrolysis	Mixed Paper Recycling	Mixed Paper Landfill traditional	Mixed Paper Landfill recirculating	Mixed Paper Incineration	Mixed Paper Pyrolysis
	Material Stream	Contaminated Wood	Contaminated Wood	Contaminated Wood	Contaminated Wood	Old Corrugated Cardboard	Old Corrugated Cardboard	Old Corrugated Cardboard	Old Corrugated Cardboard	Old Corrugated Cardboard	Mixed Paper	Mixed Paper	Mixed Paper	Mixed Paper	Mixed Paper
	Treatment Method	Landfill traditional	Landfill recirculating	Incineration	Pyrolysis	Recycling	Landfill traditional	Landfill recirculating	Incineration	Pyrolysis	Recycling	Landfill traditional	Landfill recirculating	Incineration	Pyrolysis
	Total arisings	13,412	13,412	13,412	13,412	9,962	9,962	9,962	9,962	9,962	14,009	14,009	14,009	14,009	14,009
	Source Segregated Tonnage	2,316	2,316	2,316	2,316	1,623	1,623	1,623	1,623	1,623	9,209	9,209	9,209	9,209	9,209
Recycling	MRF - Clean	0	0	0	0	1,623	0	0	0	0	9,209	0	0	0	0
Backyard composting	Backyard Composting	0	0	0	0	0	0	0	0	0	0	0	0	0	0
In-vessel composting	Composting - In vessel	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Open windrow composting	Composting - Open Windrow	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anaerobic digestion	Anaerobic Digestion	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Codigestion	Codigestion	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Landfill traditional	Landfill - traditional	2,316	0	0	0	0	1,623	0	0	0	0	9,209	0	0	0
Landfill recirculating	Landfill - recirculating	0	2,316	0	0	0	0	1,623	0	0	0	0	9,209	0	0
Land application	Land application	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aerated static pile	Aerated static pile	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MBT (residual to EfW)	MBT (residual to EfW)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MBT (residual to landfill)	MBT (residual to l/fill)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Incineration	EfW	0	0	2,316	0	0	0	0	1,623	0	0	0	0	9,209	0
Pyrolysis	Pyrolysis	0	0	0	2,316	0	0	0	0	1,623	0	0	0	0	9,209
Spare	Spare	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL ADDITIONAL DISTANCE (compared to baseline position)		**0**	**0**	**35,323**	**35,323**	**0**	**-18,317**	**-18,317**	**-17,911**	**-17,911**	**0**	**-68,895**	**-68,895**	**-66,592**	**-66,592**

PHASE ONE OPTIONS

Assessment Year 2020

PHASE TWO OPTIONS

treatment method			Increased recycling (2% of residual paper, card, white wood) Landfill traditional	Increased recycling (2% of residual paper, card, white wood) Landfill recirculating	Increased recycling (2% of residual paper, card, white wood) Incineration	Increased recycling (5% of residual paper, card, white wood) Landfill traditional	Increased recycling (5% of residual paper, card, white wood) Landfill recirculating	Increased recycling (5% of residual paper, card, white wood) Incineration	Curbside food waste collection, In-vessel Landfill traditional	Curbside food waste collection, In-vessel Landfill recirculating	Curbside food waste collection, In-vessel Incineration
		Material Stream	Increased recycling (2% of residual paper, card, white wood)	Increased recycling (2% of residual paper, card, white wood)	Increased recycling (2% of residual paper, card, white wood)	Increased recycling (5% of residual paper, card, white wood)	Increased recycling (5% of residual paper, card, white wood)	Increased recycling (5% of residual paper, card, white wood)	Curbside food waste collection, In-vessel	Curbside food waste collection, In-vessel	Curbside food waste collection, In-vessel
		Treatment Method	Landfill traditional	Landfill recirculating	Incineration	Landfill traditional	Landfill recirculating	Incineration	Landfill traditional	Landfill recirculating	Incineration
		Total arisings	57,041	57,041	57,041	56,430	56,430	56,430	50,499	50,499	50,499
		Source Segregated Tonnage	407	407	407	1,018	1,018	1,018	6,949	6,949	6,949
Recycling	MRF - Clean		263	263	263	657	657	657	0	0	0
Backyard composting	Backyard Composting		0	0	0	0	0	0	0	0	0
In-vessel composting	Composting - In vessel		0	0	0	0	0	0	6,949	6,949	6,949
Open windrow composting	Composting - Open Windrow		0	0	0	0	0	0	0	0	0
Anaerobic digestion	Anaerobic Digestion		0	0	0	0	0	0	0	0	0
Codigestion	Codigestion		0	0	0	0	0	0	0	0	0
Landfill traditional	Landfill - traditional		57,041	0	0	56,430	0	0	50,499	0	0
Landfill recirculating	Landfill - recirculating		0	57,041	0	0	56,430	0	0	50,499	0
Land application	Land application		0	0	0	0	0	0	0	0	0
Aerated static pile	Aerated static pile		0	0	0	0	0	0	0	0	0
MBT (residual to EfW)	MBT (residual to EfW)		0	0	0	0	0	0	0	0	0
MBT (residual to landfill)	MBT (residual to l/fill)		0	0	0	0	0	0	0	0	0
Incineration	EfW		145	145	57,185	361	361	56,791	0	0	50,499
Pyrolysis	Pyrolysis		0	0	0	0	0	0	0	0	0
Spare	Spare		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL ADDITIONAL DISTANCE (compared to baseline position)		**0**	**2,716**	**2,716**	**1,043,708**	**6,789**	**6,789**	**1,036,630**	**165,843**	**165,843**	**1,087,454**

treatment method		Curbside food waste collection, AD Landfill traditional	Curbside food waste collection, AD Landfill recirculating	Curbside food waste collection, AD Incineration	Garbage Landfill traditional	Garbage Landfill recirculating	Garbage MBT (residual to EfW)	Garbage MBT (residual to landfill)	Garbage Incineration	Garbage Pyrolysis
	Material Stream	Curbside food waste collection, AD	Curbside food waste collection, AD	Curbside food waste collection, AD	Garbage	Garbage	Garbage	Garbage	Garbage	Garbage
	Treatment Method	Landfill traditional	Landfill recirculating	Incineration	Landfill traditional	Landfill recirculating	MBT (residual to EfW)	MBT (residual to landfill)	Incineration	Pyrolysis
	Total arisings	50,499	50,499	50,499	57,448	57,448	57,448	57,448	57,448	57,448
	Source Segregated Tonnage	6,949	6,949	6,949	0	0	0	0	0	0
Recycling	MRF - Clean	0	0	0	0	0	0	0	0	0
Backyard composting	Backyard Composting	0	0	0	0	0	0	0	0	0
In-vessel composting	Composting - In vessel	0	0	0	0	0	0	0	0	0
Open windrow composting	Composting - Open Windrow	0	0	0	0	0	0	0	0	0
Anaerobic digestion	Anaerobic Digestion	6,949	6,949	6,949	0	0	0	0	0	0
Codigestion	Codigestion	0	0	0	0	0	0	0	0	0
Landfill traditional	Landfill - traditional	50,499	0	0	57,448	0	0	0	0	0
Landfill recirculating	Landfill - recirculating	0	50,499	0	0	57,448	0	0	0	0
Land application	Land application	0	0	0	0	0	0	0	0	0
Aerated static pile	Aerated static pile	0	0	0	0	0	0	0	0	0
MBT (residual to EfW)	MBT (residual to EfW)	0	0	0	0	0	57,448	0	0	0
MBT (residual to landfill)	MBT (residual to l/fill)	0	0	0	0	0	0	57,448	0	0
Incineration	EfW	0	0	50,499	0	0	0	0	57,448	0
Pyrolysis	Pyrolysis	0	0	0	0	0	0	0	0	57,448
Spare	Spare	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL ADDITIONAL DISTANCE (compared to baseline position)		**163,898**	**163,898**	**1,085,509**	**0**	**0**	**998,159**	**1,120,236**	**1,048,426**	**1,048,426**

EMPLOYMENT INDICATORS

TYPICAL BREAKDOWN OF EMPLOYMENT OPPORTUNITIES SCORES FOR EACH FACILITY TYPE

Facility type	Capacity (t/a)	No of Jobs created1	Staff per shift	Number of shifts
MRF - Clean	25,000	20	10	2
	15,000	16	8	2
	5,000	5	5	1
Backyard Composting	<1	0	0	0
Composting - In vessel	40,000	8	8	1
	25,000	8	8	1
	15,000	7	7	1
	10,000	5	5	1
	5,000	5	5	1
	2,500	3	3	1
Composting - Open Windrow	20,000	5	5	1
	15,000	5	5	1
	7,500	3	3	1
	5,000	3	3	1
	2,500	3	3	1
Aerated static pile	20,000	5	5	1
	15,000	5	5	1
	7,500	3	3	1
	5,000	3	3	1
	2,500	3	3	1
Anaerobic Digestion	50,000	8	8	1
	25,000	7	7	1
Codigestion	50,000	8	8	1
	25,000	7	7	1
Landfill - traditional	200,000	9	6	2
	100,000	9	6	2
	75,000	6	4	2
Landfill - recirculating	200,000	9	6	2
	100,000	9	6	2
	75,000	6	4	2
Land application	25,000	3	3	1
	10,000	2	2	1
	5,000	2	2	1
MBT (residual to EfW)	160,000	20	10	2
	100,000	20	10	2
	60,000	14	7	2
	30,000	10	5	2
MBT (residual to l/fill)	160,000	20	10	2
	100,000	20	10	2
	60,000	14	7	2
	30,000	10	5	2
EfW	160,000	25	10	3
	135,000	25	10	3
	100,000	25	10	3
	70,000	20	8	3
	60,000	20	8	3
	50,000	13	5	3
	30,000	13	5	3
Pyrolysis	60,000	15	6	3
	30,000	13	5	3
Spare	60,000	5	10	1
	30,000	3	25	0

Notes:

1 - Employment score = staff per shift x number of shifts

SUMMARY OF EMPLOYMENT OPPORTUNITIES FOR RESIDUAL TREATMENT

PHASE ONE OPTIONS

		Yard and Garden Waste (<20m diameter) Backyard composting	Yard and Garden Waste (<20m diameter) In-vessel composting	Yard and Garden Waste (<20m diameter) Open windrow composting	Yard and Garden Waste (<20m diameter) Landfill traditional	Yard and Garden Waste (<20m diameter) Landfill recirculating	Yard and Garden Waste (>20m diameter) In-vessel composting	Yard and Garden Waste (>20m diameter) Open windrow composting	Yard and Garden Waste (>20m diameter) Landfill traditional	Yard and Garden Waste (>20m diameter) Landfill recirculating	Biosolids Open windrow composting	Biosolids Aerated static pile	Biosolids Landfill traditional	Biosolids Landfill recirculating	Biosolids Land application
Recycling	MRF - Clean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Backyard composting	Backyard Composting	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
In-vessel composting	Composting - In vessel	0.00	9.36	0.00	0.00	0.00	3.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Open windrow composting	Composting - Open Windrow	0.00	0.00	6.19	0.00	0.00	0.00	2.48	0.00	0.00	5.38	0.00	0.00	0.00	0.00
Anaerobic digestion	Anaerobic Digestion	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Codigestion	Codigestion	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Landfill traditional	Landfill - traditional	0.00	0.00	0.00	5.78	0.00	0.00	0.00	2.01	0.00	0.00	0.00	4.92	0.00	0.00
Landfill recirculating	Landfill - recirculating	0.00	0.00	0.00	0.00	5.78	0.00	0.00	0.00	2.01	0.00	0.00	0.00	4.92	0.00
Land application	Land application	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.95
Aerated static pile	Aerated static pile	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.38	0.00	0.00	0.00
MBT (residual to EfW)	MBT (residual to EfW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MBT (residual to landfill)	MBT (residual to l/fill)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Incineration	EfW	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pyrolysis	Pyrolysis	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Spare	Spare	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	AGG SCORE	**0.00**	**9.36**	**6.19**	**5.78**	**5.78**	**3.12**	**2.48**	**2.01**	**2.01**	**5.38**	**5.38**	**4.92**	**4.92**	**2.95**

		White Wood In-vessel composting	White Wood Open windrow composting	White Wood Recycling	White Wood Landfill traditional	White Wood Landfill recirculating	White Wood Incineration	White Wood Pyrolysis	Contaminated Wood Landfill traditional	Contaminated Wood Landfill recirculating	Contaminated Wood Incineration	Contaminated Wood Pyrolysis	Old Corrugated Cardboard Recycling	Old Corrugated Cardboard Landfill traditional	Old Corrugated Cardboard Landfill recirculating	Old Corrugated Cardboard Incineration	Old Corrugated Cardboard Pyrolysis	Mixed Paper Recycling	Mixed Paper Landfill traditional	Mixed Paper Landfill recirculating	Mixed Paper Incineration	Mixed Paper Pyrolysis
Recycling	MRF - Clean	0.00	0.00	8.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.91	0.00	0.00	0.00	0.00	9.01	0.00	0.00	0.00	0.00
Backyard composting	Backyard Composting	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
In-vessel composting	Composting - In vessel	5.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Open windrow composting	Composting - Open Windrow	0.00	3.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Anaerobic digestion	Anaerobic Digestion	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Codigestion	Codigestion	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Landfill traditional	Landfill - traditional	0.00	0.00	0.00	3.32	0.00	0.00	0.00	2.11	0.00	0.00	0.00	0.00	1.87	0.00	0.00	0.00	0.00	3.36	0.00	0.00	0.00
Landfill recirculating	Landfill - recirculating	0.00	0.00	0.00	0.00	3.32	0.00	0.00	0.00	2.11	0.00	0.00	0.00	0.00	1.87	0.00	0.00	0.00	0.00	3.36	0.00	0.00
Land application	Land application	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Aerated static pile	Aerated static pile	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MBT (residual to EfW)	MBT (residual to EfW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MBT (residual to landfill)	MBT (residual to l/fill)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Incineration	EfW	0.00	0.00	0.00	0.00	0.00	6.93	0.00	0.00	0.00	3.64	0.00	0.00	0.00	0.00	3.07	0.00	0.00	0.00	0.00	7.04	0.00
Pyrolysis	Pyrolysis	0.00	0.00	0.00	0.00	0.00	0.00	9.08	0.00	0.00	0.00	6.37	0.00	0.00	0.00	0.00	5.80	0.00	0.00	0.00	0.00	9.16
Spare	Spare	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	AGG SCORE	**5.26**	**3.83**	**8.75**	**3.32**	**3.32**	**6.93**	**9.08**	**2.11**	**2.11**	**3.64**	**6.37**	**1.91**	**1.87**	**1.87**	**3.07**	**5.80**	**9.01**	**3.36**	**3.36**	**7.04**	**9.16**

Notes:
1 - Highest value is most desirable … lowest value is least desirable
2 - Summary is calculated by multiplying facilities requirement and assigned factor.

SUMMARY OF EMPLOYMENT OPPORTUNITIES FOR RESIDUAL TREATMENT

PHASE TWO OPTIONS

		Increased recycling (2% of residual paper, card, white wood) Landfill traditional	Increased recycling (2% of residual paper, card, white wood) Landfill recirculating	Increased recycling (2% of residual paper, card, white wood) Incineration	Increased recycling (5% of residual paper, card, white wood) Landfill traditional	Increased recycling (5% of residual paper, card, white wood) Landfill recirculating	Increased recycling (5% of residual paper, card, white wood) Incineration	Curbside food waste collection, In-vessel Landfill traditional	Curbside food waste collection, In-vessel Landfill recirculating	Curbside food waste collection, In-vessel Incineration	Curbside food waste collection, AD Landfill traditional	Curbside food waste collection, AD Landfill recirculating	Curbside food waste collection, AD Incineration	Garbage Landfill traditional	Garbage Landfill recirculating	Garbage MBT (residual to EfW)	Garbage MBT (residual to landfill)	Garbage Incineration	Garbage Pyrolysis
Recycling	MRF - Clean	0.38	0.38	0.38	0.85	0.85	0.85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Backyard composting	Backyard Composting	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
In-vessel composting	Composting - In vessel	0.00	0.00	0.00	0.00	0.00	0.00	4.82	4.82	4.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Open windrow composting	Composting - Open Windrow	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Anaerobic digestion	Anaerobic Digestion	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.47	5.47	5.47	0.00	0.00	0.00	0.00	0.00	0.00
Codigestion	Codigestion	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Landfill traditional	Landfill - traditional	6.22	0.00	0.00	6.19	0.00	0.00	5.97	0.00	0.00	5.97	0.00	0.00	6.23	0.00	0.00	0.00	0.00	0.00
Landfill recirculating	Landfill - recirculating	0.00	6.22	0.00	0.00	6.19	0.00	0.00	5.97	0.00	0.00	5.97	0.00	0.00	6.23	0.00	0.00	0.00	0.00
Land application	Land application	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Aerated static pile	Aerated static pile	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MBT (residual to EfW)	MBT (residual to EfW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.80	0.00	0.00	0.00
MBT (residual to landfill)	MBT (residual to l/fill)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.80	0.00	0.00
Incineration	EfW	0.96	0.96	16.88	1.49	1.49	16.82	0.00	0.00	15.90	0.00	0.00	15.90	0.00	0.00	0.00	0.00	16.91	0.00
Pyrolysis	Pyrolysis	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14.83
Spare	Spare	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	AGG SCORE	**7.56**	**7.56**	**17.25**	**8.54**	**8.54**	**17.67**	**10.79**	**10.79**	**20.72**	**11.44**	**11.44**	**21.37**	**6.23**	**6.23**	**13.80**	**13.80**	**16.91**	**14.83**

Notes:
1 - Highest value is most desirable … lowest value is least desirable
2 - Summary is calculated by multiplying facilities requirement and assigned factor.

ADAPTABILITY INDICATORS

TYPICAL BREAKDOWN OF ADAPTABILITY SCORES FOR EACH FACILITY TYPE

Facility type	Capacity (t/a)	Aggregate Scores1	Increases in Tonnage2	Ability to manage contaminatio	Collection System Requirement
MRF - Clean	25,000	250	5	5	10
	15,000	250	5	5	10
	5,000	250	5	5	10
Backyard Composting	<1	25	5	1	5
Composting - In vessel	40,000	50	5	1	10
	25,000	50	5	1	10
	15,000	50	5	1	10
	10,000	50	5	1	10
	5,000	50	5	1	10
	2,500	50	5	1	10
Composting - Open Windrow	20,000	50	5	1	10
	15,000	50	5	1	10
	7,500	50	5	1	10
	5,000	50	5	1	10
	2,500	50	5	1	10
Aerated static pile	20,000	50	5	1	10
	15,000	50	5	1	10
	7,500	50	5	1	10
	5,000	50	5	1	10
	2,500	50	5	1	10
Anaerobic Digestion	50,000	1	1	1	1
	25,000	1	1	1	1
Codigestion	50,000	5	1	1	5
	25,000	5	1	1	5
Landfill - traditional	200,000	1,000	10	10	10
	100,000	1,000	10	10	10
	75,000	1,000	10	10	10
Landfill - recirculating	200,000	1,000	10	10	10
	100,000	1,000	10	10	10
	75,000	1,000	10	10	10
Land application	25,000	100	10	1	10
	10,000	100	10	1	10
	5,000	100	10	1	10
MBT (residual to EfW)	160,000	50	1	5	10
	100,000	50	1	5	10
	60,000	50	1	5	10
	30,000	50	1	5	10
MBT (residual to l/fill)	160,000	50	1	5	10
	100,000	50	1	5	10
	60,000	50	1	5	10
	30,000	50	1	5	10
EfW	160,000	100	1	10	10
	135,000	100	1	10	10
	100,000	100	1	10	10
	70,000	100	1	10	10
	60,000	100	1	10	10
	50,000	100	1	10	10
	30,000	100	1	10	10
Pyrolysis	60,000	50	1	5	10
	30,000	50	1	5	10
Spare	60,000				
	30,000				
			Fixed (1) Modular (5) No limit (10)		New system required (1) Revision to existing (5) No change (10)

Highest value has greatest flexibility
1 - Aggregate scores = Tonnage x Ability to manage contamination x Collection system requirements
2 - Nominal scale used for collection system requirements (10 = best, 0 = worst). Fixed tonnage = 1, Modular = 5, No limit =10.
3 - Nominal scale used for ability to manage contamination (10 = best, 0 = worst).
4 - Nominal scale used collection system requirements (0 = worst, 10 = best).
New collection system needed = 1, Some revisions to collection system need = 5, No changes required =10.

SUMMARY OF NOISE IMPACTS FOR RESIDUAL TREATMENT

		PHASE ONE OPTIONS																																		
		Yard and Garden Waste (<20cm diameter) Backyard composting	Yard and Garden Waste (<20cm diameter) In-vessel composting	Yard and Garden Waste (<20cm diameter) Open windrow composting	Yard and Garden Waste (<20cm diameter) Landfill traditional	Yard and Garden Waste (<20cm diameter) Landfill recirculating	Yard and Garden Waste (>20cm diameter) In-vessel composting	Yard and Garden Waste (>20cm diameter) Open windrow composting	Yard and Garden Waste (>20cm diameter) Landfill traditional	Yard and Garden Waste (>20cm diameter) Landfill recirculating	Biosolids Open windrow composting	Biosolids Aerated static pile	Biosolids Landfill traditional	Biosolids Landfill recirculating	Biosolids Land application	White Wood In-vessel composting	White Wood Open windrow composting	White Wood Recycling	White Wood Landfill traditional	White Wood Landfill recirculating	White Wood Incineration	White Wood Pyrolysis	Contaminated Wood Landfill traditional	Contaminated Wood Landfill recirculating	Contaminated Wood Incineration	Contaminated Wood Pyrolysis	Old Corrugated Cardboard Recycling	Old Corrugated Cardboard Landfill traditional	Old Corrugated Cardboard Landfill recirculating	Old Corrugated Cardboard Incineration	Old Corrugated Cardboard Pyrolysis	Mixed Paper Recycling	Mixed Paper Landfill traditional	Mixed Paper Landfill recirculating	Mixed Paper Incineration	Mixed Paper Pyrolysis
Recycling	MRF - Clean	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	250	0	0	0	0	0	0	0	0	250	0	0	0	0	250	0	0	0	0
Backyard composting	Backyard Composting	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
In-vessel composting	Composting - In vessel	0	50	0	0	0	50	0	0	0	0	0	0	0	0	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Open windrow composting	Composting - Open Windrow	0	0	50	0	0	0	50	0	0	50	0	0	0	0	0	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anaerobic digestion	Anaerobic Digestion	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Codigestion	Codigestion	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Landfill traditional	Landfill - traditional	0	0	0	1000	0	0	0	1000	0	0	0	1000	0	0	0	0	0	1000	0	0	0	1000	0	0	0	0	1000	0	0	0	0	1000	0	0	0
Landfill recirculating	Landfill - recirculating	0	0	0	0	1000	0	0	0	1000	0	0	0	1000	0	0	0	0	0	1000	0	0	0	1000	0	0	0	0	1000	0	0	0	0	1000	0	0
Land application	Land application	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aerated static pile	Aerated static pile	0	0	0	0	0	0	0	0	0	0	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MBT (residual to EfW)	MBT (residual to EfW)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MBT (residual to landfill)	MBT (residual to l/fill)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Incineration	EfW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	100	0	0	0	0	100	0	0	0	0	100	0
Pyrolysis	Pyrolysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50	0	0	0	50	0	0	0	0	50	0	0	0	0	50
Spare	Spare	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	AGG SCORE	**25**	**50**	**50**	**1000**	**1000**	**50**	**50**	**1000**	**1000**	**50**	**50**	**1000**	**1000**	**100**	**50**	**50**	**250**	**1000**	**1000**	**100**	**50**	**1000**	**1000**	**100**	**50**	**250**	**1000**	**1000**	**100**	**50**	**250**	**1000**	**1000**	**100**	**50**

SUMMARY OF NOISE IMPACTS FOR RESIDUAL TREATMENT

		PHASE TWO OPTIONS																	
		Increased recycling (2% of residual paper, card, white wood) Landfill traditional	Increased recycling (2% of residual paper, card, white wood) Landfill recirculating	Increased recycling (2% of residual paper, card, white wood) Incineration	Increased recycling (5% of residual paper, card, white wood) Landfill traditional	Increased recycling (5% of residual paper, card, white wood) Landfill recirculating	Increased recycling (5% of residual paper, card, white wood) Incineration	Curbside food waste collection, In-vessel Landfill traditional	Curbside food waste collection, In-vessel Landfill recirculating	Curbside food waste collection, In-vessel Incineration	Curbside food waste collection, AD Landfill traditional	Curbside food waste collection, AD Landfill recirculating	Curbside food waste collection, AD Incineration	Garbage Landfill traditional	Garbage Landfill recirculating	Garbage MBT (residual to EfW)	Garbage MBT (residual to landfill)	Garbage Incineration	Garbage Pyrolysis
Recycling	MRF - Clean	250	250	250	250	250	250	0	0	0	0	0	0	0	0	0	0	0	0
Backyard composting	Backyard Composting	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
In-vessel composting	Composting - In vessel	0	0	0	0	0	0	50	50	50	0	0	0	0	0	0	0	0	0
Open windrow composting	Composting - Open Windrow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anaerobic digestion	Anaerobic Digestion	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0
Codigestion	Codigestion	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Landfill traditional	Landfill - traditional	1000	0	0	1000	0	0	1000	0	0	1000	0	0	1000	0	0	0	0	0
Landfill recirculating	Landfill - recirculating	0	1000	0	0	1000	0	0	1000	0	0	1000	0	0	1000	0	0	0	0
Land application	Land application	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aerated static pile	Aerated static pile	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MBT (residual to EfW)	MBT (residual to EfW)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50	0	0	0
MBT (residual to landfill)	MBT (residual to l/fill)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50	0	0
Incineration	EfW	100	100	100	100	100	100	0	0	100	0	0	100	0	0	0	0	100	0
Pyrolysis	Pyrolysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50
Spare	Spare	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	AGG SCORE	**1350**	**1350**	**350**	**1350**	**1350**	**350**	**1050**	**1050**	**150**	**1001**	**1001**	**101**	**1000**	**1000**	**50**	**50**	**100**	**50**

POLICY INDICATORS

% OF TOTAL ORGANIC STREAM LANDFILL AND RECYCLING/COMPOSTING

PHASE ONE OPTIONS

Indicator / Criteria	Unit of measurement	Yard and Garden Waste (<20cm diameter) Backyard composting	Yard and Garden Waste (<20cm diameter) In-vessel composting	Yard and Garden Waste (<20cm diameter) Open windrow composting	Yard and Garden Waste (<20cm diameter) Landfill traditional	Yard and Garden Waste (<20cm diameter) Landfill recirculating	Yard and Garden Waste (>20cm diameter) In-vessel composting	Yard and Garden Waste (>20cm diameter) Open windrow composting	Yard and Garden Waste (>20cm diameter) Landfill traditional	Yard and Garden Waste (>20cm diameter) Landfill recirculating	Biosolids Open windrow composting	Biosolids Aerated static pile	Biosolids Landfill traditional	Biosolids Landfill recirculating	Biosolids Land application
Percentage recycling and composting	% R&C	29.5%	29.5%	29.5%	0.0%	0.0%	1.3%	1.3%	0.0%	0.0%	18.3%	18.3%	0.0%	0.0%	18.3%
Percentage landfill	% Landfill	0.0%	0.0%	0.0%	29.5%	29.5%	0.0%	0.0%	1.3%	1.3%	0.0%	0.0%	18.3%	18.3%	0.0%

Indicator / Criteria	Unit of measurement	White Wood In-vessel composting	White Wood Open windrow composting	White Wood Recycling	White Wood Landfill traditional	White Wood Landfill recirculating	White Wood Incineration	White Wood Pyrolysis	Contaminated Wood Landfill traditional	Contaminated Wood Landfill recirculating	Contaminated Wood Incineration	Contaminated Wood Pyrolysis
Percentage recycling and composting	% R&C	5.7%	5.7%	5.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Percentage landfill	% Landfill	0.0%	0.0%	0.0%	5.7%	5.7%	0.0%	0.0%	1.5%	1.5%	0.0%	0.0%

Indicator / Criteria	Unit of measurement	Old Corrugated Cardboard Recycling	Old Corrugated Cardboard Landfill traditional	Old Corrugated Cardboard Landfill recirculating	Old Corrugated Cardboard Incineration	Old Corrugated Cardboard Pyrolysis	Mixed Paper Recycling	Mixed Paper Landfill traditional	Mixed Paper Landfill recirculating	Mixed Paper Incineration	Mixed Paper Pyrolysis
Percentage recycling and composting	% R&C	1.0%	0.0%	0.0%	0.0%	0.0%	5.9%	0.0%	0.0%	0.0%	0.0%
Percentage landfill	% Landfill	0.0%	1.0%	1.0%	0.0%	0.0%	0.0%	5.9%	5.9%	0.0%	0.0%

APPENDIX E

Full Performance and Valued Score Results Tables

Performance Scores – Phase 1 (Segregated Organic Wastes)

PHASE ONE OPTIONS

Objective	Indicator / Criteria	Unit of measurement	Yard and Garden Waste (<20cm diameter) Backyard composting	Yard and Garden Waste (<20cm diameter) In-vessel composting	Yard and Garden Waste (<20cm diameter) Open windrow composting	Yard and Garden Waste (<20cm diameter) Landfill traditional	Yard and Garden Waste (<20cm diameter) Landfill recirculating	Yard and Garden Waste (>20cm diameter) In-vessel composting	Yard and Garden Waste (>20cm diameter) Open windrow composting	Yard and Garden Waste (>20cm diameter) Landfill traditional	Yard and Garden Waste (>20cm diameter) Landfill recirculating	Biosolids Open windrow composting	Biosolids Aerated static pile	Biosolids Landfill traditional	Biosolids Landfill recirculating	Biosolids Land application	White Wood In-vessel composting	White Wood Open windrow composting	White Wood Recycling	White Wood Landfill traditional	White Wood Landfill recirculating	White Wood Incineration	White Wood Pyrolysis	Contaminated Wood Landfill traditional	Contaminated Wood Landfill recirculating	Contaminated Wood Incineration	Contaminated Wood Pyrolysis	Old Corrugated Cardboard Recycling	Old Corrugated Cardboard Landfill traditional	Old Corrugated Cardboard Landfill recirculating	Old Corrugated Cardboard Incineration	Old Corrugated Cardboard Pyrolysis	Mixed Paper Recycling	Mixed Paper Landfill traditional	Mixed Paper Landfill recirculating	Mixed Paper Incineration	Mixed Paper Pyrolysis
			Yard and Garden Waste (<20cm diameter)	Yard and Garden Waste (<20cm diameter)	Yard and Garden Waste (<20cm diameter)	Yard and Garden Waste (<20cm diameter)	Yard and Garden Waste (<20cm diameter)	Yard and Garden Waste (>20cm diameter)	Yard and Garden Waste (>20cm diameter)	Yard and Garden Waste (>20cm diameter)	Yard and Garden Waste (>20cm diameter)	Biosolids	Biosolids	Biosolids	Biosolids	Biosolids	White Wood	White Wood	White Wood	White Wood	White Wood	White Wood	White Wood	Contaminated Wood	Contaminated Wood	Contaminated Wood	Contaminated Wood	Old Corrugated Cardboard	Old Corrugated Cardboard	Old Corrugated Cardboard	Old Corrugated Cardboard	Old Corrugated Cardboard	Mixed Paper	Mixed Paper	Mixed Paper	Mixed Paper	Mixed Paper
			Backyard composting	In-vessel composting	Open windrow composting	Landfill traditional	Landfill recirculating	In-vessel composting	Open windrow composting	Landfill traditional	Landfill recirculating	Open windrow composting	Aerated static pile	Landfill traditional	Landfill recirculating	Land application	In-vessel composting	Open windrow composting	Recycling	Landfill traditional	Landfill recirculating	Incineration	Pyrolysis	Landfill traditional	Landfill recirculating	Incineration	Pyrolysis	Recycling	Landfill traditional	Landfill recirculating	Incineration	Pyrolysis	Recycling	Landfill traditional	Landfill recirculating	Incineration	Pyrolysis
Environmental																																					
To reduce greenhouse gas emissions	Greenhouse gases emitted	kg CO2-Eq	165,644	-1,873,020	-1,873,020	66,498,078	16,282,995	15,990	-82,089	2,914,443	713,643	-1,247,750	-2,612,937	41,164,573	10,089,584	-1,179,253	105,109	-556,395	54,543	49,659,598	12,084,346	-123,179	-64,055	12,909,599	3,141,469	-32,017	-16,647	-11,138	3,223,657	787,526	15,443	21,533	-2,253,508	18,291,226	4,468,471	100,088	134,801
To minimise adverse impacts on air	Emissions contributing to photochemical oxida	kg ethylene-Eq	309.0	-143.0	-143.0	19,302.7	4,836.0	10.9	-6.3	846.0	212.0	-81.3	-221.0	11,945.0	2,993.0	-81.3	49.6	-47.8	-39.1	12,217.0	3,043.0	12.0	32.7	3,174.3	791.0	3.1	8.5	-287.0	825.6	206.0	6.2	10.6	-354.0	4,681.3	1,171.0	32.9	56.6
quality	Emissions contributing to depletion of the ozor	kg CFC-11-Eq	0.0	7.6	7.6	3.6	0.9	0.0	0.0	0.2	0.0	0.5	0.4	2.3	0.6	0.5	0.0	0.2	0.0	0.2	0.1	0.5	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0	-0.3	0.1	0.0	0.4	0.0
	Emissions contributing to air acidification	kg SO2-Eq	1,326,452	-1,251	-1,251	8,475	8,150	290	-55	371	357	-914	-3,371	5,245	5,044	-914	1,427	-650	19	3,425	3,182	4,453	4,921	890	827	1,158	1,279	-4,376	248	233	868	977	-19,214	1,409	1,320	4,885	5,441
To minimise adverse effects on water	Emissions contributing to aquatic ecotoxicity	kg 1,4-DCB-Eq	-1,809,872	43,709	43,709	43,524	24,130	6,664	1,916	1,908	1,058	27,048	36,713	26,935	14,933	27,048	29,406	9,676	1,599	12,321	-2,229	14,816	34,393	3,203	-580	3,852	8,941	37,174	1,532	590	4,498	8,122	151,720	8,701	3,350	27,224	47,227
quality	Emissions contributing to eutrophication	kg PO4-Eq	300,298	9,482	9,482	34,001	0	307	416	1,490	0	5,718	9,590	21,041	0	5,718	1,418	2,502	-15	1,234	0	1,231	1,244	321	0	320	323	-937	101	0	232	236	-1,537	573	0	1,319	1,336
Social Impact																																					
To protect local amenity	Extent of noise problems	arbitrary score	0.00	4.16	4.08	1.01	1.01	0.05	0.05	0.01	0.01	2.08	2.08	0.51	0.51	0.54	0.42	0.41	0.64	0.10	0.10	0.27	0.27	0.02	0.02	0.04	0.04	0.09	0.01	0.01	0.02	0.02	0.67	0.11	0.11	0.29	0.29
	Extent of odour problems	arbitrary score	0.00	2.12	6.68	1.59	1.59	0.00	0.01	0.00	0.00	2.56	2.56	0.61	0.61	0.95	0.08	0.25	0.01	0.06	0.06	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.06	0.06	0.01	0.01
To conserve landscapes and townscap	Extent of visual and landscape impacts	arbitrary score	0.00	67.69	50.40	279.71	279.71	1.17	0.57	8.69	8.69	25.36	25.36	164.18	164.18	414.35	8.03	4.80	5.20	45.13	45.13	9.17	21.65	10.12	10.12	2.23	14.03	0.48	6.81	6.81	1.53	12.51	5.45	46.83	46.83	9.50	21.88
To provide opportunities for public	Extent of opportunities for public involvement	arbitrary score	50.00	50.00	50.00	1.00	4.00	50.00	50.00	1.00	4.00	50.00	50.00	1.00	4.00	24.00	50.00	50.00	50.00	1.00	4.00	15.00	18.00	1.00	4.00	15.00	18.00	50.00	1.00	4.00	15.00	18.00	50.00	1.00	4.00	15.00	18.00
involvement and education	Extent of opportunities for education potential	arbitrary score	0.00	56.00	15.00	27.00	27.00	56.00	15.00	27.00	27.00	15.00	15.00	27.00	27.00	9.00	56.00	15.00	140.00	27.00	27.00	250.00	150.00	27.00	27.00	250.00	150.00	140.00	27.00	27.00	250.00	150.00	140.00	27.00	27.00	250.00	150.00
To minimise local transport impacts	Net change in waste kilometres compared to b	km	-172,534	0	0	-109,534	-109,534	0	0	-9,104	-9,104	0	0	-64,998	-64,998	0	33,408	33,408	57,164	5,273	5,273	0	0	0	0	35,323	35,323	0	-18,317	-18,317	-17,911	-17,911	0	-68,895	-68,895	-66,592	-66,592
To provide employment opportunities	Number of jobs likely to be created	# of jobs	0.00	9.36	6.19	5.78	5.78	3.12	2.48	2.01	2.01	5.38	5.38	4.92	4.92	2.95	5.26	3.83	8.75	3.32	3.32	6.93	9.08	2.11	2.11	3.64	6.37	1.91	1.87	1.87	3.07	5.80	9.01	3.36	3.36	7.04	9.16
Financial																																					
To minimise costs associated with	Capital costs associated with waste infrastruc	$CD	4,545,849	5,758,432	0	0	4,606,745	252,413	0	0	201,930	0	0	0	2,850,782	0	1,113,587	0	890,869	0	890,869	0	6,331,243	0	0	3,249,320	1,646,123	0	0	162,257	2,276,190	1,153,130	0	0	920,921	12,918,962	6,544,817
organic waste management	Operating costs, difference from baseline	$CD	-3,466,633	230,337	0	761,495	713,847	24,736	0	33,379	31,290	-117,595	24,944	709,132	679,646	-117,595	-196,310	-240,853	1,302,133	-34,171	-43,386	0	755,411	0	-2,396	183,398	205,291	0	160,634	158,956	289,107	304,444	0	911,712	902,187	1,640,885	1,727,930
Policy and Adaptability																																					
To provide an adaptabilte solution for	Potential for adaptability	arbitrary score	25.00	50.00	50.00	1000.00	1000.00	50.00	50.00	1000.00	1000.00	50.00	50.00	1000.00	1000.00	100.00	50.00	50.00	250.00	1000.00	1000.00	100.00	50.00	1000.00	1000.00	100.00	50.00	250.00	1000.00	1000.00	100.00	50.00	250.00	1000.00	1000.00	100.00	50.00
To conform to waste policy	Percentage recycling and composting	% R&C	29.5%	29.5%	29.5%	0.0%	0.0%	1.3%	1.3%	0.0%	0.0%	18.3%	18.3%	0.0%	0.0%	18.3%	5.7%	5.7%	5.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%	0.0%	0.0%	0.0%	0.0%	5.9%	0.0%	0.0%	0.0%	0.0%
	Percentage landfill	% Landfill	0.0%	0.0%	0.0%	29.5%	29.5%	0.0%	0.0%	1.3%	1.3%	0.0%	0.0%	18.3%	18.3%	0.0%	0.0%	0.0%	0.0%	5.7%	5.7%	0.0%	0.0%	1.5%	1.5%	0.0%	0.0%	0.0%	1.0%	1.0%	0.0%	0.0%	0.0%	5.9%	5.9%	0.0%	0.0%

Valued Scores – Phase 1 (Segregated Organic Wastes)

VALUED PERFORMANCE SCORES FOR OPTIONS

Objective	Indicator / Criteria	Unit of measurement	Yard and Garden Waste (<20cm diameter) Backyard composting	Yard and Garden Waste (<20cm diameter) In-vessel composting	Yard and Garden Waste (<20cm diameter) Open windrow composting	Yard and Garden Waste (<20cm diameter) Landfill traditional	Yard and Garden Waste (<20cm diameter) Landfill recirculating	Yard and Garden Waste (>20cm diameter) In-vessel composting	Yard and Garden Waste (>20cm diameter) Open windrow composting	Yard and Garden Waste (>20cm diameter) Landfill traditional	Yard and Garden Waste (>20cm diameter) Landfill recirculating	Biosolids Open windrow composting	Biosolids Aerated static pile	Biosolids Landfill traditional	Biosolids Landfill recirculating	Biosolids Land application	White Wood In-vessel composting	White Wood Open windrow composting	White Wood Recycling	White Wood Landfill traditional	White Wood Landfill recirculating	White Wood Incineration	White Wood Pyrolysis	Contaminated Wood Landfill traditional	Contaminated Wood Landfill recirculating	Contaminated Wood Incineration	Contaminated Wood Pyrolysis	Old Corrugated Cardboard Recycling	Old Corrugated Cardboard Landfill traditional	Old Corrugated Cardboard Landfill recirculating	Old Corrugated Cardboard Incineration	Old Corrugated Cardboard Pyrolysis	Mixed Paper Recycling	Mixed Paper Landfill traditional	Mixed Paper Landfill recirculating	Mixed Paper Incineration	Mixed Paper Pyrolysis
Environmental																																					
To reduce greenhouse gas emissions	Greenhouse gases emitted	kg CO2-Eq	0.97	1.00	1.00	0.00	0.73	0.97	1.00	0.00	0.73	0.97	1.00	0.00	0.71	0.97	0.99	1.00	0.99	0.00	0.75	0.99	0.99	0.00	0.75	1.00	1.00	1.00	0.00	0.75	0.99	0.99	1.00	0.00	0.67	0.89	0.88
To minimise adverse impacts on air	Emissions contributing to photochemical oxida	kg ethylene-Eq	0.98	1.00	1.00	0.00	0.74	0.98	1.00	0.00	0.74	0.99	1.00	0.00	0.74	0.99	0.99	1.00	0.99	0.00	0.75	1.00	0.99	0.00	0.75	1.00	1.00	1.00	0.00	0.56	0.74	0.73	1.00	0.00	0.70	0.92	0.92
quality	Emissions contributing to depletion of the ozor	kg CFC-11-Eq	1.00	0.00	0.00	0.51	0.87	1.00	0.79	0.00	0.78	0.95	1.00	0.00	0.93	0.95	0.95	0.70	1.00	0.52	0.90	0.00	0.99	0.52	0.91	0.00	1.00	1.00	0.64	0.87	0.00	0.91	1.00	0.39	0.54	0.00	0.56
	Emissions contributing to air acidification	kg SO2-Eq	0.00	1.00	1.00	0.99	0.99	0.19	1.00	0.00	0.03	0.71	1.00	0.00	0.02	0.71	0.63	1.00	0.88	0.27	0.31	0.08	0.00	0.86	1.00	0.27	0.00	1.00	0.14	0.14	0.02	0.00	1.00	0.16	0.17	0.02	0.00
To minimise adverse effects on water	Emissions contributing to aquatic ecotoxicity	kg 1,4-DCB-Eq	1.00	0.00	0.00	0.00	0.01	0.00	0.85	0.85	1.00	0.44	0.00	0.45	1.00	0.44	0.14	0.67	0.90	0.60	1.00	0.53	0.00	0.60	1.00	0.53	0.00	0.00	0.97	1.00	0.89	0.79	0.00	0.96	1.00	0.84	0.70
quality	Emissions contributing to eutrophication	kg PO4-Eq	0.00	0.97	0.97	0.89	1.00	0.79	0.72	0.00	1.00	0.73	0.54	0.00	1.00	0.73	0.43	0.00	1.00	0.50	0.99	0.51	0.50	0.01	1.00	0.01	0.00	1.00	0.12	0.20	0.00	0.00	1.00	0.27	0.47	0.01	0.00
Social Impact																																					
To protect local amenity	Extent of noise problems	arbitrary score	1.00	0.00	0.02	0.76	0.76	0.00	0.07	1.00	1.00	0.00	0.00	1.00	1.00	0.98	0.40	0.43	0.00	1.00	1.00	0.68	0.68	1.00	1.00	0.00	0.00	0.00	1.00	1.00	0.83	0.83	0.00	1.00	1.00	0.68	0.68
	Extent of odour problems	arbitrary score	1.00	0.68	0.00	0.76	0.76	0.90	0.00	1.00	1.00	0.00	0.00	1.00	1.00	0.83	0.70	0.00	1.00	0.79	0.79	0.98	0.98	0.00	0.00	1.00	1.00	1.00	0.00	0.00	0.90	0.90	1.00	0.00	0.00	0.90	0.90
To conserve landscapes and townscap	Extent of visual and landscape impacts	arbitrary score	1.00	0.76	0.82	0.00	0.00	0.93	1.00	0.00	0.00	1.00	1.00	0.64	0.64	0.00	0.92	1.00	0.99	0.00	0.00	0.89	0.58	0.33	0.33	1.00	0.00	1.00	0.47	0.47	0.91	0.00	1.00	0.00	0.00	0.90	0.60
To provide opportunities for public	Extent of opportunities for public involvement	arbitrary score	1.00	1.00	1.00	0.00	0.06	1.00	1.00	0.00	0.06	1.00	1.00	0.00	0.06	0.47	1.00	1.00	1.00	0.00	0.06	0.29	0.35	0.00	0.18	0.82	1.00	1.00	0.00	0.06	0.29	0.35	1.00	0.00	0.06	0.29	0.35
involvement and education	Extent of opportunities for education potential	arbitrary score	0.00	1.00	0.27	0.48	0.48	1.00	0.00	0.29	0.29	0.33	0.33	1.00	1.00	0.00	0.17	0.00	0.53	0.05	0.05	1.00	0.57	0.00	0.00	1.00	0.55	0.51	0.00	0.00	1.00	0.55	0.51	0.00	0.00	1.00	0.55
To minimise local transport impacts	Net change in waste kilometres compared to b	km	1.00	0.00	0.00	0.63	0.63	0.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	0.00	0.42	0.42	0.00	0.91	0.91	1.00	1.00	1.00	1.00	0.00	0.00	0.00	1.00	1.00	0.98	0.98	0.00	1.00	1.00	0.97	0.97
To provide employment opportunities	Number of jobs likely to be created	# of jobs	0.00	1.00	0.66	0.62	0.62	1.00	0.42	0.00	0.00	1.00	1.00	0.81	0.81	0.00	0.34	0.09	0.94	0.00	0.00	0.63	1.00	0.00	0.00	0.36	1.00	0.01	0.00	0.00	0.30	1.00	0.97	0.00	0.00	0.63	1.00
Financial																																					
To minimise costs associated with	Capital costs associated with waste infrastruc	$CD	0.21	0.00	1.00	1.00	0.20	0.00	1.00	1.00	0.20	1.00	1.00	1.00	0.00	1.00	0.82	1.00	0.86	1.00	0.86	1.00	0.00	1.00	1.00	0.00	0.49	1.00	1.00	0.93	0.00	0.49	1.00	1.00	0.93	0.00	0.49
organic waste management	Operating costs, difference from baseline	$CD	1.00	0.13	0.18	0.00	0.01	0.26	1.00	0.00	0.06	1.00	0.83	0.00	0.04	1.00	0.97	1.00	0.00	0.87	0.87	0.84	0.35	0.99	1.00	0.11	0.00	1.00	0.47	0.48	0.05	0.00	1.00	0.47	0.48	0.05	0.00
Policy and Adaptability																																					
To provide an adaptable solution for the	Potential for adaptability	arbitrary score	0.00	0.03	0.03	1.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	0.05	0.00	0.00	0.21	1.00	1.00	0.05	0.00	1.00	1.00	0.05	0.00	0.21	1.00	1.00	0.05	0.00	0.21	1.00	1.00	0.05	0.00
To conform to waste policy	Percentage recycling and composting	% R&C	1.00	1.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
	Percentage landfill	% Landfill	1.00	1.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00	0.00	1.00	1.00
VALUED PERFORMANCE SCORES			**12.16**	**10.56**	**9.94**	**7.65**	**8.88**	**11.01**	**11.86**	**6.14**	**8.90**	**12.13**	**11.71**	**7.90**	**10.95**	**11.12**	**11.87**	**11.31**	**13.30**	**7.50**	**10.24**	**11.47**	**10.00**	**7.31**	**10.92**	**8.15**	**8.04**	**12.73**	**6.82**	**8.46**	**8.96**	**9.53**	**13.69**	**6.26**	**8.01**	**9.15**	**9.61**

Performance Scores – Phase 2 (Residual Garbage)

PHASE TWO OPTIONS

Objective	Indicator / Criteria	Unit of measurement	Increased recycling (2% of residual paper, card, white wood) Landfill traditional	Increased recycling (2% of residual paper, card, white wood) Landfill recirculating	Increased recycling (2% of residual paper, card, white wood) Incineration	Increased recycling (5% of residual paper, card, white wood) Landfill traditional	Increased recycling (5% of residual paper, card, white wood) Landfill recirculating	Increased recycling (5% of residual paper, card, white wood) Incineration	Curbside food waste collection, In-vessel Landfill traditional	Curbside food waste collection, In-vessel Landfill recirculating	Curbside food waste collection, In-vessel Incineration	Curbside food waste collection, AD Landfill traditional	Curbside food waste collection, AD Landfill recirculating	Curbside food waste collection, AD Incineration	Garbage Landfill traditional	Garbage Landfill recirculating	Garbage MBT (residual to EfW)	Garbage MBT (residual to landfill)	Garbage Incineration	Garbage Pyrolysis
Environmental																				
To reduce greenhouse gas emissions	Greenhouse gases emitted	kg CO2-Eq	164,377,586	40,050,482	870,910	162,321,991	39,502,806	808,236	155,782,106	38,026,995	701,709	155,182,982	37,427,870	102,584	165,744,296	40,414,703	26,529,991	32,967,529	912,711	1,096,569
To minimise adverse impacts on air quality	Emissions contributing to photochemical oxida	kg ethylene-Eq	42,332.8	10,541.0	185.0	41,782.7	10,367.0	134.0	39,821.3	9,965.0	218.0	39,939.9	10,084.0	336.0	42,698.2	10,657.0	7,068.0	8,770.0	219.0	370.0
	Emissions contributing to depletion of the ozor	kg CFC-11-Eq	2.7	0.7	1.9	2.7	0.7	1.9	2.2	0.6	1.9	2.1	0.5	1.8	2.7	0.7	0.9	0.3	1.9	0.1
	Emissions contributing to air acidification	kg SO2-Eq	13,160	12,358	29,762	12,151	11,357	28,576	13,768	13,007	27,911	18,939	18,178	33,082	13,835	13,025	18,840	10,812	30,552	33,962
To minimise adverse effects on water quality	Emissions contributing to aquatic ecotoxicity	kg 1,4-DCB-Eq	67,501	19,389	180,072	75,293	27,763	187,055	78,679	33,102	169,471	63,820	18,245	154,614	62,308	13,806	106,794	49,629	175,415	298,385
	Emissions contributing to eutrophication	kg PO4-Eq	22,407	0	8,113	22,214	0	7,888	18,519	0	8,344	18,742	0	8,567	62,308	0	8,789	11,817	8,263	8,360
Social Impact																				
To protect local amenity	Extent of noise problems	arbitrary score	1.37	1.37	4.11	1.37	1.37	4.09	1.45	1.45	3.72	1.31	1.31	3.58	1.38	1.38	4.57	4.19	4.13	4.13
	Extent of odour problems	arbitrary score	2.44	2.44	0.55	2.39	2.39	0.54	1.96	1.96	0.47	1.96	1.96	0.47	2.48	2.48	0.55	0.55	0.55	0.55
To conserve landscapes and townscap	Extent of visual and landscape impacts	arbitrary score	354.74	354.74	64.81	350.82	350.82	64.44	315.55	315.55	62.66	311.42	311.42	58.53	357.39	357.39	55.65	43.10	65.09	39.44
To provide opportunities for public involvement and education	Extent of opportunities for public involvement	arbitrary score	66.00	69.00	65.00	66.00	69.00	65.00	51.00	54.00	65.00	51.00	54.00	65.00	1.00	4.00	21.00	21.00	15.00	18.00
	Extent of opportunities for education potential	arbitrary score	417.00	417.00	390.00	417.00	417.00	390.00	83.00	83.00	306.00	83.00	83.00	306.00	27.00	27.00	200.00	140.00	250.00	150.00
To minimise local transport impacts	Net change in waste kilometres compared to b	km	2,716	2,716	1,043,708	6,789	6,789	1,036,630	165,843	165,843	1,087,454	163,898	163,898	1,085,509	0	0	998,159	1,120,236	1,048,426	1,048,426
To provide employment opportunities	Number of jobs likely to be created	# of jobs	7.56	7.56	17.25	8.54	8.54	17.67	10.79	10.79	20.72	11.44	11.44	21.37	6.23	6.23	13.80	13.80	16.91	14.83
Financial																				
To minimise costs associated with organic waste management	Capital costs associated with waste infrastruc	$CD	202,791	5,906,857	80,221,139	506,977	6,149,940	79,668,155	868,598	5,918,521	71,710,433	3,233,274	8,283,197	74,075,110	0	0	16,031,952	16,031,952	80,589,795	40,827,234
	Operating costs, difference from baseline	$CD	90,272	31,274	4,606,674	224,950	166,583	4,692,971	3,799,322	3,747,090	7,797,783	4,427,132	4,374,900	8,425,593	0	-59,420	5,733,708	3,459,381	4,548,656	5,091,647
Policy and Adaptability																				
To provide an adaptabilte solution for	Potential for adaptability	arbitrary score	1350.00	1350.00	350.00	1350.00	1350.00	350.00	1050.00	1050.00	150.00	1001.00	1001.00	101.00	1000.00	1000.00	50.00	50.00	100.00	50.00
To conform to waste policy	Percentage recycling and composting	% R&C	0.2%	0.2%	0.2%	0.4%	0.4%	0.4%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Percentage landfill	% Landfill	36.5%	36.5%	0.0%	36.1%	36.1%	0.0%	32.4%	32.4%	0.0%	32.4%	32.4%	0.0%	36.8%	36.8%	0.0%	0.0%	0.0%	0.0%

Valued Scores – Phase 2 (Residual Garbage)

VALUED PERFORMANCE SCORES FOR OPTIONS

Objective	Indicator / Criteria	Unit of measurement	Increased recycling (2% of residual paper, card, white wood) Landfill traditional	Increased recycling (2% of residual paper, card, white wood) Landfill recirculating	Increased recycling (2% of residual paper, card, white wood) Incineration	Increased recycling (5% of residual paper, card, white wood) Landfill traditional	Increased recycling (5% of residual paper, card, white wood) Landfill recirculating	Increased recycling (5% of residual paper, card, white wood) Incineration	Curbside food waste collection, In-vessel Landfill traditional	Curbside food waste collection, In-vessel Landfill recirculating	Curbside food waste collection, In-vessel Incineration	Curbside food waste collection, AD Landfill traditional	Curbside food waste collection, AD Landfill recirculating	Curbside food waste collection, AD Incineration	Garbage Landfill traditional	Garbage Landfill recirculating	Garbage MBT (residual to EfW)	Garbage MBT (residual to landfill)	Garbage Incineration	Garbage Pyrolysis
Environmental																				
To reduce greenhouse gas emissions	Greenhouse gases emitted	kg CO2-Eq	0.01	0.76	1.00	0.02	0.76	1.00	0.06	0.77	1.00	0.06	0.77	1.00	0.00	0.76	0.84	0.80	1.00	0.99
To minimise adverse impacts on air quality	Emissions contributing to photochemical oxida	kg ethylene-Eq	0.01	0.76	1.00	0.02	0.76	1.00	0.07	0.77	1.00	0.06	0.77	1.00	0.00	0.75	0.84	0.80	1.00	0.99
	Emissions contributing to depletion of the ozor	kg CFC-11-Eq	0.00	0.78	0.31	0.00	0.78	0.32	0.20	0.83	0.33	0.24	0.87	0.37	0.00	0.78	0.68	0.91	0.30	1.00
	Emissions contributing to air acidification	kg SO2-Eq	0.90	0.93	0.18	0.94	0.98	0.23	0.87	0.91	0.26	0.65	0.68	0.04	0.87	0.90	0.65	1.00	0.15	0.00
To minimise adverse effects on water quality	Emissions contributing to aquatic ecotoxicity	kg 1,4-DCB-Eq	0.81	0.98	0.42	0.78	0.95	0.39	0.77	0.93	0.45	0.82	0.98	0.51	0.83	1.00	0.67	0.87	0.43	0.00
	Emissions contributing to eutrophication	kg PO4-Eq	0.64	1.00	0.87	0.64	1.00	0.87	0.70	1.00	0.87	0.70	1.00	0.86	0.00	1.00	0.86	0.81	0.87	0.87
Social Impact																				
To protect local amenity	Extent of noise problems	arbitrary score	0.98	0.98	0.14	0.98	0.98	0.15	0.96	0.96	0.26	1.00	1.00	0.30	0.98	0.98	0.00	0.12	0.14	0.14
	Extent of odour problems	arbitrary score	0.02	0.02	0.96	0.04	0.04	0.97	0.26	0.26	1.00	0.26	0.26	1.00	0.00	0.00	0.96	0.96	0.96	0.96
To conserve landscapes and townscap	Extent of visual and landscape impacts	arbitrary score	0.01	0.01	0.92	0.02	0.02	0.92	0.13	0.13	0.93	0.14	0.14	0.94	0.00	0.00	0.95	0.99	0.92	1.00
To provide opportunities for public involvement and education	Extent of opportunities for public involvement	arbitrary score	0.96	1.00	0.94	0.96	1.00	0.94	0.74	0.78	0.94	0.74	0.78	0.94	0.00	0.04	0.29	0.29	0.21	0.25
	Extent of opportunities for education potential	arbitrary score	1.00	1.00	0.93	1.00	1.00	0.93	0.14	0.14	0.72	0.14	0.14	0.72	0.00	0.00	0.44	0.29	0.57	0.32
To minimise local transport impacts	Net change in waste kilometres compared to b	km	1.00	1.00	0.07	0.99	0.99	0.07	0.85	0.85	0.03	0.85	0.85	0.03	1.00	1.00	0.11	0.00	0.06	0.06
To provide employment opportunities	Number of jobs likely to be created	# of jobs	0.09	0.09	0.73	0.15	0.15	0.76	0.30	0.30	0.96	0.34	0.34	1.00	0.00	0.00	0.50	0.50	0.71	0.57
Financial																				
To minimise costs associated with organic waste management	Capital costs associated with waste infrastruc	$CD	1.00	0.93	0.00	0.99	0.92	0.01	0.99	0.93	0.11	0.96	0.90	0.08	1.00	1.00	0.80	0.80	0.00	0.49
	Operating costs, difference from baseline	$CD	0.98	0.99	0.45	0.97	0.97	0.44	0.55	0.55	0.07	0.47	0.48	0.00	0.99	1.00	0.32	0.59	0.46	0.39
Policy and Adaptability																				
To provide an adaptable solution for the	Potential for adaptability	arbitrary score	1.00	1.00	0.23	1.00	1.00	0.23	0.77	0.77	0.08	0.73	0.73	0.04	0.73	0.73	0.00	0.00	0.04	0.00
To conform to waste policy	Percentage recycling and composting	% R&C	0.04	0.04	0.04	0.09	0.09	0.09	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
	Percentage landfill	% Landfill	0.01	0.01	1.00	0.02	0.02	1.00	0.12	0.12	1.00	0.12	0.12	1.00	0.00	0.00	1.00	1.00	1.00	1.00
VALUED PERFORMANCE SCORES			**9.44**	**12.26**	**10.19**	**9.63**	**12.43**	**10.33**	**9.48**	**12.00**	**11.00**	**9.30**	**11.82**	**10.82**	**6.40**	**9.95**	**9.92**	**10.73**	**8.80**	**9.03**

APPENDIX F

Weightings by Indicator

Objective	Indicator / Criteria	Unit of measurement	Consultant Weighting	Regional Strategic Plan	Heavily Financed Weighting
Environmental					
To reduce greenhouse gas emissions	Greenhouse gases emitted	kg CO2-Eq	11%	10%	8%
To minimise adverse impacts on air quality	Emissions contributing to photochemical oxida	kg ethylene-Eq	5%	5%	4%
	Emissions contributing to depletion of the ozor	kg CFC-11-Eq	6%	3%	2%
	Emissions contributing to air acidification	kg SO2-Eq	5%	3%	2%
To minimise adverse effects on water quality	Emissions contributing to aquatic ecotoxicity	kg 1,4-DCB-Eq	5%	5%	4%
	Emissions contributing to eutrophication	kg PO4-Eq	4%	5%	4%
Social Impact					
To protect local amenity	Extent of noise problems	arbitrary score	2%	5%	4%
	Extent of odour problems	arbitrary score	6%	8%	5%
To conserve landscapes and townscap	Extent of visual and landscape impacts	arbitrary score	11%	5%	4%
To provide opportunities for public involvement and education	Extent of opportunities for public involvement	arbitrary score	5%	2%	2%
	Extent of opportunities for education potential	arbitrary score	2%	2%	2%
To minimise local transport impacts	Net change in waste kilometres compared to b	km	5%	5%	4%
To provide employment opportunities	Number of jobs likely to be created	# of jobs	5%	5%	4%
Financial					
To minimise costs associated with organic waste management	Capital costs associated with waste infrastruc	$CD	4%	15%	25%
	Operating costs, difference from baseline	$CD	4%	15%	25%
Policy and Adaptability					
To provide an adaptabilte solution for the future	Potential for adaptability	arbitrary score	7%	5%	3%
To conform to waste policy	Percentage recycling and composting	% R&C	6%	3%	2%
	Percentage landfill	% Landfill	5%	3%	2%
			100%	**100%**	**100%**

SLR

global environmental solutions

AYLESBURY
7 Wornal Park, Menmarsh Road, Worminghall, Aylesbury, Buckinghamshire HP18 9PH
T: +44 (0)1844 337380

BELFAST
24 Ballynahinch Street, Hillsborough, Co. Down, BT26 6AW Northern Ireland
T: +44 (0)28 9268 9036

BRADFORD-ON-AVON
Treenwood House, Rowden Lane, Bradford-on-Avon, Wiltshire BA15 2AU
T: +44 (0)1225 309400

BRISTOL
Langford Lodge, 109 Pembroke Road, Clifton, Bristol BS8 3EU
T: +44 (0)117 9064280

CAMBRIDGE
8 Stow Court, Stow-cum-Quy, Cambridge CB25 9AS
T: + 44 (0)1223 813805

CARDIFF
Fulmar House, Beignon Close, Ocean Way, Cardiff CF24 5HF
T: +44 (0)29 20491010

CHELMSFORD
Unit 77, Waterhouse Business Centre, 2 Cromar Way, Chelmsford, Essex CM1 2QE
T: +44 (0)1245 392170

DUBLIN
7 Dundrum Business Park, Windy Arbour, Dundrum, Dublin 14 Ireland
T: + 353 (0)1 2964667

EDINBURGH
No. 4 The Roundal, Roddinglaw Business Park, Gogar, Edinburgh EH12 9DB
T: +44 (0)131 3356830

EXETER
69 Polsloe Road, Exeter EX1 2NF
T: + 44 (0)1392 490152

FARNBOROUGH
The Pavilion, 2 Sherborne Road, South Farnborough, Hampshire GU14 6JT
T: +44 (0)1252 515682

GLASGOW
4 Woodside Place, Charing Cross, Glasgow G3 7QF
T: +44 (0)141 3535037

HUDDERSFIELD
Westleigh House, Wakefield Road, Denby Dale, Huddersfield HD8 8QJ
T: +44 (0)1484 860521

LEEDS
Suite 1, Jason House, Kerry Hill, Horsforth, Leeds LS18 4JR
T: +44 (0)113 2580650

MAIDSTONE
19 Hollingworth Court, Turkey Mill, Maidstone, Kent ME14 5PP
T: +44 (0)1622 609242

NEWCASTLE UPON TYNE
Sailors Bethel, Horatio Street, Newcastle-upon-Tyne NE1 2PE
T: +44 (0)191 2611966

NOTTINGHAM
Aspect House, Aspect Business Park, Bennerley Road, Nottingham NG6 8WR
T: +44 (0)115 9647280

ST. ALBAN'S
White House Farm Barns, Gaddesden Row, Hertfordshire HP2 6HG
T: +44 (0)1582 840471

SHEFFIELD
STEP Business Centre, Wortley Road, Deepcar, Sheffield S36 2UH
T: +44 (0)114 2903628

SHREWSBURY
Mytton Mill, Forton Heath, Montford Bridge, Shrewsbury SY4 1HA
T: +44 (0)1743 850170

STAFFORD
8 Parker Court, Staffordshire Technology Park, Beaconside, Stafford ST18 0WP
T: +44 (0)1785 253331

WARRINGTON
Suite 9 Beech House, Padgate Business Park, Green Lane, Warrington WA1 4JN
T: +44 (0)1925 827218

WORCESTER
Suite 5, Brindley Court, Gresley Road, Shire Business Park, Worcester WR4 9FD
T: +44 (0)1905 751310

Energy | Waste Management | Planning & Development | Industry | Mining & Minerals | Infrastructure