REPORT

Tonkin+Taylor

Investigate Options and Alternatives for the Diversion of Organic Waste

Prepared for
Tasman District Council and Nelson City Council
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1 Introduction

1.1 Project background and approach

Tonkin & Taylor Ltd (T+T) has been engaged by Tasman District Council and Nelson City Council to complete a research project, investigating available services, systems, and technology to collect and process various organic wastes. This work considers both the Tasman and Nelson regions. Our scope of work is set out in our proposal dated 13 March 2020 (T+T reference 1013143).

Specifically, the scope of work that underlies this report comprised:

- Reviewing existing data on organic waste streams, including:
  - Data and reports provided by both Councils (data underlying the Waste Assessment, WMMP and any other relevant information).
  - High level review of existing weighbridge data for York Valley Landfill and transfer stations operated by each Council, alongside associated waste composition data.
  - T+T knowledge of the sector for the Tasman and Nelson regions.
- Estimating current and future waste streams;
- Developing options for recovering organic waste in Tasman District Council and Nelson City Council regions;
- Evaluating options (multi-criteria assessment); and
- Draft a feasibility/options report (this report).

1.2 Project background

In April 2012 Nelson City Council and Tasman District Council agreed to a Joint Waste Management and Minimisation Plan. In September 2019 Nelson City Council and Tasman District Council adopted an updated Joint Waste Management and Minimisation Plan. The shared vision of the plan is that the communities of the Nelson Tasman region work together to reduce waste, with the ambition of eliminating unnecessary waste to landfill, and with a target of reducing waste to landfill by 10% per person by 2030.

Organic waste[1] forms almost 25%[2] of all waste sent to landfill in the Nelson Tasman region. Both Councils have limited control over organic waste streams. Green waste is accepted at transfer stations but collection and transport from businesses and households delivered by the private sector. This feasibility study aims to identify ways that Councils can actively support the recovery of organic waste materials to support the objective of reducing waste to landfill per person by 10%.

York Valley Landfill is the only operational landfill in the region. Waste is transported direct to landfill by commercial customers or via transfer stations and resource recovery centres in the Nelson and Tasman regions. The landfill predominantly accepts a mixture of C&I, kerbside collection, and residential waste. Small amounts of special waste[3] are accepted at the site. A small amount of waste from the Buller District, around 2,000 tonnes per annum (TPA), is also disposed of at the site.

[1] For the purposes of this assessment, organic waste includes food waste/scraps and green waste. Organic waste by-products from primary production (for example, sawdust, sludge, food scraps) may also be relevant where this material is current wasted.

[2] Nelson Tasman Waste Management and Minimisation Plan, 2019

[3] Special wastes are those wastes which cause particular management and/or disposal problems and requires special handling and disposal methods e.g. hazardous and medical wastes, e-waste, biosolids.

Understanding the actual volumes of organic waste produced within the two Districts is challenging. While Council has data on materials that are disposed of at York Valley Landfill and each of the transfer stations, there is limited data on organic waste transported out of the region or processed by the private sector. An understanding of waste volumes is important for Council in designing an approach to influencing the diversion of materials from landfill. Specifically, it is difficult to scope opportunities to separate, reuse locally and/or re-process materials without good data.

Council are looking at options to increase the recovery of organic waste from the Nelson-Tasman region and surrounding areas. This report summarises a review of options taking an approach that is consistent with New Zealand Treasury's 'Better Business Case' approach. This approach focuses on making sure the issue or opportunity is well defined before considering a range of options to realise the opportunity. Once the right option has been identified there is a process of planning for successful delivery, ensuring that timeline and costs reflect what is required for the project to succeed.

1.3 Project approach

The feasibility report has been prepared reflecting the NZ Treasury's five case model as outlined below.

- Strategic Case - what is the reason for the project?
  Reflected in Section 2 (The current situation) and Section 3 (What are we trying to achieve);
- Economic Case - what is the preferred (best value for money) option?
  Summarising the options identification and evaluation process set out in Sections 4 and 5;
- Management Case - how will the project be delivered?
  Discussion around progression of activities to move the preferred options through pilot opportunities, scaled implementation and identification of future expansion options. This is set out in Section 6.1
- Financial Case - what is it going to cost and what is the preferred option for funding?
  Drawing on capital and operating costs. Brief comment on funding options is provided in Section 6.2; and
- Commercial Case - how will the project be procured? We have provided brief comment on procurement aspects is provided in Section 6.3.

2 The current situation

2.1 Data collection and analysis

We have completed a desktop based assessment using reports and data provided by both Councils that summarise information on organic waste in each region.

Existing information on organic waste reviewed included:

- Reports provided by Council
  - The Nelson-Tasman Joint Waste Assessment 2017.
  - Solid Waste Asset Management Plan (2018-2028).
  - Nelson Tasman Waste Management and Minimisation Plan, September 2019.
- Data provided by both Councils:
  - Weighbridge data (2016 – 2019).
  - The 2012 SWAP analysis of York Valley Landfill, Mariri Resource Recovery Centre and Richmond Resource Recovery Centre.
  - Transfer station drop off sources (2014-2017).
- Information provided by Council and green waste operators in the Nelson - Tasman region.
- T+T knowledge of the sector for the Tasman and Nelson regions.
- T+T knowledge of waste composition from similar regions in New Zealand.

The detailed weighbridge data for York Valley Landfill was used alongside waste composition data to derive approximate tonnages of organic waste from the general waste stream currently being disposed of at York Valley Landfill.

The 2012 Solid Waste Analysis Protocol (SWAP) survey for Nelson-Tasman summarises composition data from samples taken from Richmond Transfer Station, Mariri Transfer Station and York Valley Landfill. In the absence of recent composition data for the general waste stream we derived composition data for this analysis through:

1 First identifying the proportion of loads to landfill and transfer stations by source using the MS Excel summary provided (last updated in 2016/2017).

2 Secondly deriving waste compositions of loads by source. This was informed by T+T's industry knowledge of recent composition data where assessments had been undertaken at similar sites around New Zealand and permission had been granted.

3 Concluding with a cross checking exercise in which derived compositions were checked against:
  - 2012 SWAP data (and making sure any changes in trends could be justified).
  - Trends in waste generation and diversion summarised in the 2017 Waste Assessment.
  - Information gathered through conversations with TDC and NCC staff.

2.2 Nelson and Tasman's waste management systems

The current waste system in the Nelson-Tasman Region can be summarised as follows:

- Waste is transported to York Valley landfill direct by commercial customers or via one of the resource recovery centres in either region. The landfill is not open to residential customers.
  - In the Tasman District over 90 % of all waste is delivered via resource recovery centres whereas in the Nelson City area only approximately 20 % is delivered via Transfer Stations and the rest direct to landfill.

- There are five resource recovery centres in Tasman (Richmond, Mariri, Takaka, Collingwood and Murchison) and one in the Nelson region (Pascoe Street).
- Pathways for materials to reach these transfer stations include:
- Self haulage of public (residential) or commercial materials
- Council litter bin collections
- The council's residential kerbside collections
- Private collections of residential kerbside or commercial material
- Some material is dropped directly at local re-processors such as Green waste to Zero and Wholesale Landscapes.

Key existing waste service facilities are highlighted in Figure 2.1.

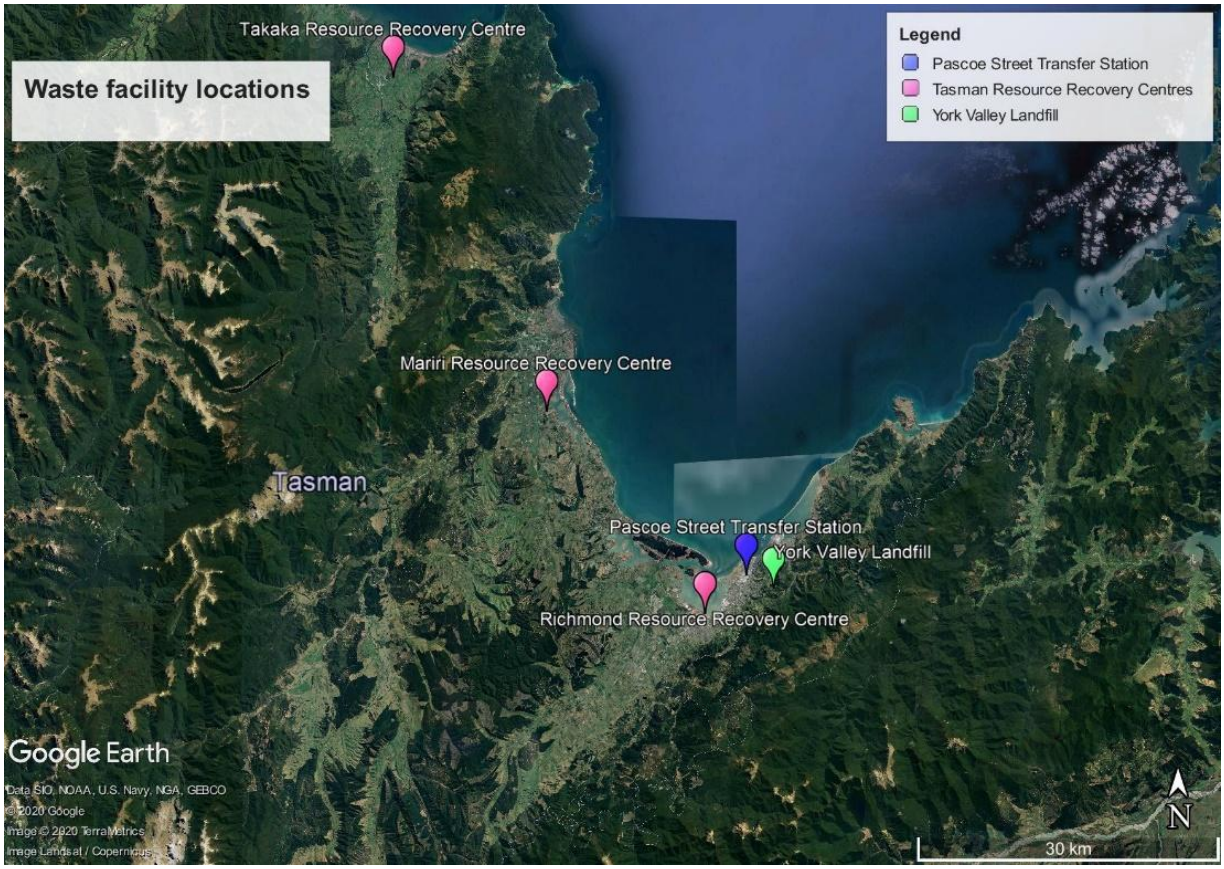

Figure 2.1: Key existing waste services in the Nelson/Tasman region

Waste generated in the Nelson City region is predominantly transported directly to York Valley Landfill due to the close proximity of the disposal site to Nelson City (a total land area serviced of 422 km^2. Because access to York Valley Landfill is for account holders only, domestic, and small commercial material not collected by contractors is taken to the Pascoe Street Transfer Station for consolidation prior to transfer to York Valley.

By comparison, Tasman District Council services an area of 9,771 km^2. Waste is therefore largely consolidated at transfer stations prior to being transported to York Valley landfill. This includes domestic, small commercial and a significant proportion of waste contractor's loads.

2.3 Waste quantity composition and destinations

Organic waste material which has been the focus of this assessment includes:

- Food waste (household food waste, commercial food waste)
- Green waste (household green waste, commercial green waste)

Material which is considered complementary to the evaluation but is not the primary focus of outcomes includes:

- Other organic by-products of commercial operations (forestry biproducts, prunings, processing sludge etc.)
- Grease trap waste

Cardboard and paper have not been considered as organic materials for the purpose of this assessment.

2.3.1 Food waste

The major origins of food waste in Nelson / Tasman include:

- Kerbside collection of residential waste from Nelson / Tasman that is collected in bags or bins that contain a component of food waste.
- Residential general waste that is self-hauled by residents to a transfer station and contains a component of food waste.
- General waste from specific sectors (i.e. hospitality, food manufacturing) can contain significant portions of food waste. General waste is then collected by commercial collection services or self hauled to transfer stations.

There are no food waste processing facilities currently available in Nelson / Tasman. Anecdotally recovery is occurring through home composting, and the diversion of some commercial food waste streams (i.e. food manufacturing by-products or wastage to animal feed). Predominately food waste is disposed to landfill as a component of general waste either via consolidation at a transfer station or directly taken to York Valley Landfill.

Nelson / Tasman last completed a Solid Waste Analysis Protocol (SWAP) survey in 2012. The SWAP survey summarises composition data from samples taken from Richmond Transfer Station, Mariri Transfer Station and York Valley Landfill. This survey indicated that approximately 15 % of general waste disposed at transfer stations and 12 % of general waste disposed at York Valley landfill is food waste. The waste stream with the most significant portion of food waste is residential waste. Kerbside bins and bags generally contain up to 40 % and 50 % of their total composition as food waste respectively.

Weighbridge and composition data indicates that over 8,000 tonnes of food waste is currently disposed at York Valley Landfill annually.

2.3.2 Green waste

The major origins of green waste in Nelson / Tasman include:

- Kerbside collection of residential waste from Nelson / Tasman that is collected in bags or bins that contain a component of green waste.
- Residential green waste that is self-hauled by residents to a transfer station or green waste reprocessing facility.

- General waste generated by the commercial sector that contains significant portions of green waste, for exampling from landscaping activities. This general waste is then collected for disposal (in wheelie bins, commercial waste bins or skip bins) or self hauled to transfer stations.
- Green waste that is collected by private sector collection services and transported to transfer stations or green waste reprocessing facilities.

There is currently an established network of green waste processing facilities available in the Nelson - Tasman Region. A summary of green waste flows and destinations is included in Table 2.1.

Weighbridge and composition data indicates that around 3,500 tonnes of garden waste is currently disposed at York Valley Landfill annually. The quantity of green waste diverted is less clear with data on materials collected from households and businesses by the private sector not available. Available data suggests around 5,700 T of green waste is composted by several operators; the total figure is likely to be significantly higher.

Table 2.1: Destination of green waste in Nelson/Tasman Region

Destination	TPA	Comment
Disposal York Valley Landfill	Approximately 3,000 TPA	Green waste incorporated in general waste from households and businesses.
Disposal (other) - i.e. cleanfill sites	Unknown but anecdotal evidence indicates this is low	
Recovery – Composting	Approximately 5 - 10,000 TPA	Green waste separated by residents or businesses and collected or delivered to the processor.
Recovery - other	Total quantity unknown	Woody green waste, pallets, wood processing waste (sawdust, shavings) and forest residue chipped and used for biofuel (including some materials processed into wood pellets)

2.3.3 Other organic waste (by-products)

Key industries in Nelson / Tasman that are likely to generate an organic by-product have been identified as:

- Seafood (through fish processing)
- Vineyards
- Breweries
- Forestry
- Food processing
- Hospitality (cafes and restaurants).

Table 2.2 summarises the organic biproducts and likely disposal destinations for commercial businesses in Nelson / Tasman. Where specific information has not been made publicly available T+T

has assumed that disposal trends are likely to be consistent with industries from other regions in New Zealand.

Table 2.2: Likely organic biproducts and disposal destinations for commercial industries in Nelson / Tasman.

Industry	Bi-product	Destination	Comment
Seafood	Fish waste from fish processing factories	Seadragon – fish oil manufacturing Unknown. Wider trend is offal ocean disposal, fish meal,	
Vineyards	Marc, prunings	Marc – sent to stock feed (evidenced in Nelson-Tasman region) Prunings – Mulched and applied on site (evidenced in Nelson-Tasman region)	Nearby wine region, Marlborough, has contested with issues of stockpiling of grape marc causing water quality issues.
Brewery	Spent grain	Stock food (evidenced in Nelson-Tasman) Others unknown	
Forestry	- Stem wood - Sawmill - Saw dust - Shavings - Contaminated woody biomass	Bioenergy (boiler, pellets) Composting Landfill Burnt/left to decompose on site Domestic firewood	Given the maturity of the industry in Nelson it is believed most waste streams are accounted for. Saw dust has been reported to routinely be disposed in York Valley Landfill.
Food processing	- Food products - Meat processing sludge	Kai food rescue Stock feed Compost (small amounts)	DAF sludge (wastewater treatment)
Café/Restaurants (~ 200)	Food waste	Kai Food Rescue Compost (small amount)	No commercial food waste collection available Waste composition data suggest around 4,000 T per year of food and similar waste is disposed of at York Valley Landfill.
Food retail including supermarkets	Food waste, expired packaged food	Kai Food Landfill	No commercial food waste collection available Waste composition data suggest around 4,000 T per year of food and similar waste is disposed of at York Valley Landfill.

3 What are we trying to achieve?

3.1 Objectives, opportunities and benefits

Council have several objectives in considering opportunities to increase the diversion of organic waste. In all cases reducing[4] and reusing[5] rather than disposing of materials is an important consideration. This is reflected in the seven core principles of the Nelson-Tasman Waste Management and Minimisation Plan. These are:

1. The Waste Hierarchy
2. Global Citizenship
3. Kaitiakitanga and Stewardship
4. Product Stewardship
5. Full-cost Pricing
6. The Life-cycle Principle
7. The Precautionary Principle

For organic waste, Council want to improve the commercial viability of recovery of unwanted materials and avoid resources being sent to landfill. Implicit in this aim is recovering materials that have value often as raw material for other products. This means that in addition to meeting the waste minimisation objectives, a successful recovery operation will be generating economic activity and ensuring food and/or garden waste remain in the economy.

Nelson City Council has also committed to reducing its greenhouse gas emissions in line with the climate change act (zero carbon amendment) – a significant proportion of operational emissions come from waste to landfill.

There are several options for recovery or recycling of green waste in the Nelson - Tasman Region. These involve composting or using woody waste as feedstock for bioenergy including wood pellet production. There are limited options for food waste recovery. The reasons are varied, but include:

- It is relatively cheap to dispose of food waste at landfill, even with transportation costs included;
- Processing of food waste can be odorous, meaning the processing location needs to be located appropriately, use a specifically designed processing approach and be managed carefully.
- Food waste collections can contain contamination (plastics, utensils) that impact on the quality of the end product.

There are examples of processing of food waste in other parts of New Zealand. Examples include:

- Household food waste co-collected and processed with green waste (Christchurch, Timaru).
- Food waste from hospitality and other businesses collected separately and composted with green waste (Wellington, Palmerston North, Auckland).
- Household food waste collected separately and composted with green waste (New Plymouth).

[4] For example, avoiding food waste, landscaping that requires minimal maintenance
[5] For example, redistributing unwanted food, processing unwanted food for stock feed

Figure 3.1 provides a summary of the core problems or opportunities addressed by this report. The table also notes some of the underlying issues and anticipated benefits of addressing the problems and realising the opportunities.

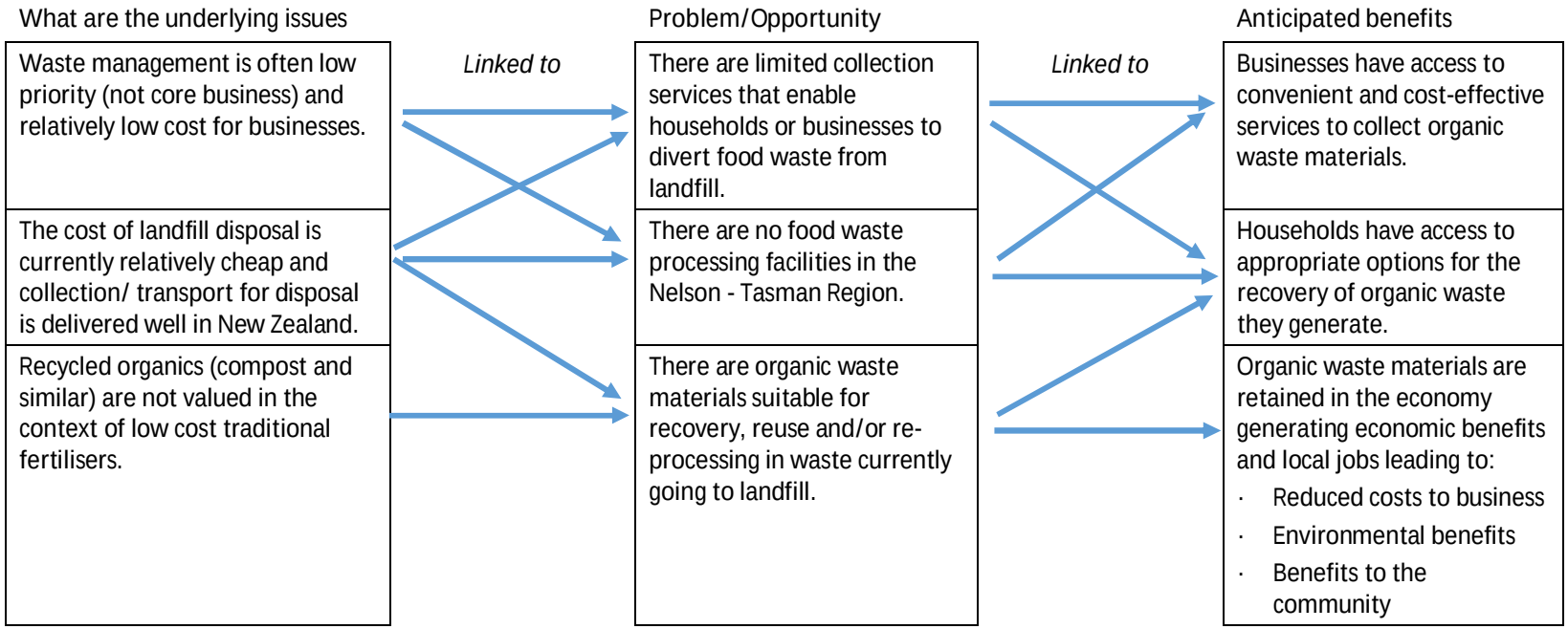

Figure 3.1: Opportunities and benefits summary

3.2 Evaluation criteria

As part of defining our approach to assessing the potential options with Council staff, we discussed key priorities for recovery options. This required creating a list of key assessment criteria. This was done by considering the key priorities for Council when assessing options. The workshop session involved David Stephenson (TDC), Karen Lee (NCC) and Terry Dwyer (Nelson CC).

A range of criteria were identified. In order of priority, the most important criteria selected are:

- Options need to address the needs of households and businesses
- The net carbon impacts need to be considered;
- Options need to deliver increased diversion of waste from landfill;
- Options need to deliver products at a quality suitable for end markets and the risks of identified markets need to be considered;
- The cost need to be acceptable for households and businesses – linked to capital and operational costs less any rate payer subsidy; and
- Capital (infrastructure) and operational costs (whole life cost) including any supporting funding sources such as the Provincial Growth Fund and other funding streams.

Several other criteria were identified but considered lower priority than those noted above. These were:

- Technology maturity – complexity, safety (integral to any decision-making process), operational requirements and proven technology track record;
- Ability for flexible infrastructure/ enable future innovations and scalability (ability to pilot);
- Local vs regional opportunities – opportunity for staging to enable expansion.

4 Organic waste management approaches

4.1 Organic waste management approaches background

Once produced, organic waste is in many cases included as part of the residual waste stream and sent to landfill. This reflects the lack of convenient alternatives available to households and businesses. The focus of this report is identifying ways to reduce the amount of organic waste ending up in landfill. The benefits of avoiding landfill disposal include retaining available void space for other materials, reducing the generation of landfill gas (and associated Emissions Trading Scheme liabilities) and reducing leachate generation[6].

The Nelson Tasman Waste Management and Minimisation Plan refers to the Waste Hierarchy (Figure 4.1) as a one of the seven core principles. Using this framework, the options for managing organic waste include:

- Reduce the volume of organic waste e.g. through food waste minimisation projects like Love Food, Hate Waste and home composting.
- Recycling or Recovery of organic waste to produce a usable product, for example mulch or compost.
- Recovery of energy using an Anaerobic Digestion process for putrescible organic waste or burning of woody organic waste.
- Disposal of organic waste, either at a dedicated disposal facility or a general waste landfill.

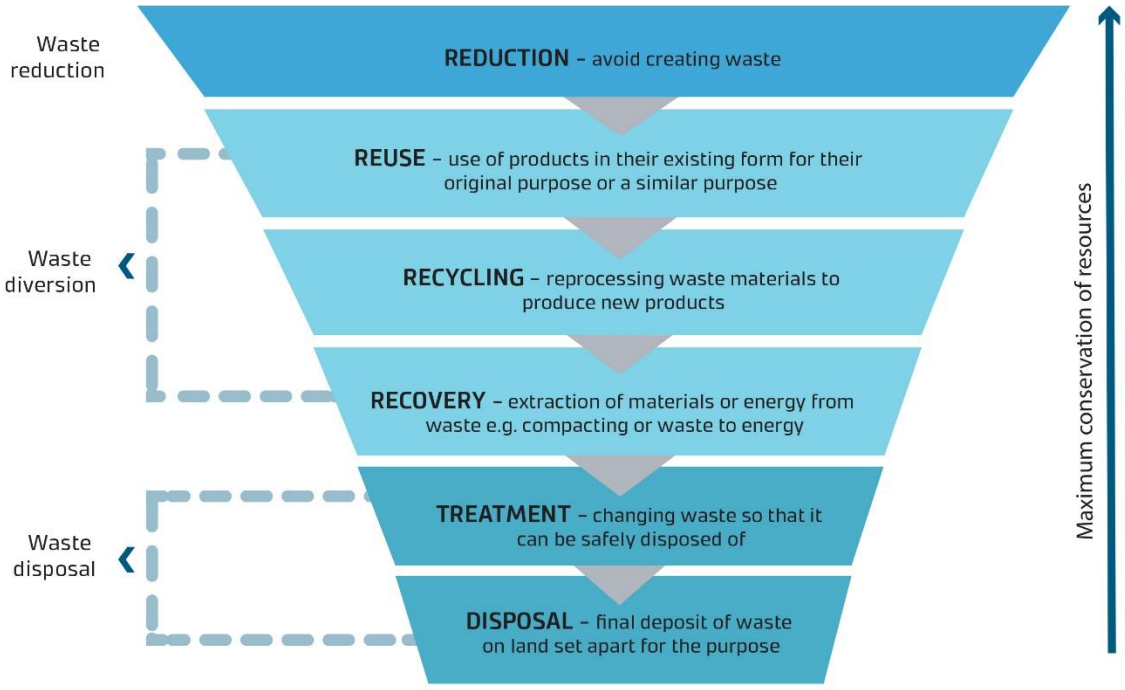

Figure 4.1: Waste hierarchy

[6] Organic waste in landfill typically degrades over the life of the landfill releasing a portion of the void space initial used. Degrading organic waste has some impact on leachate quantity but is an important influence on leachate composition.

In some cases organic waste can be managed at household or business level through small scale approaches such as composting or worm farming. In most cases before materials can be processed they need to be 'collected' in some way. There are a number of options for the 'collection' of organic waste from households and commercial businesses. These include:

- Council or private collections - garden waste and in some cases food organics.
- Local collection points e.g. recycling, waste and/or organics collection point for apartment buildings.
- Council or private sector transfer stations/recycling facilities.

Figure 4.2 is a flow diagram showing the generation, collection, processing and markets for the products from organic waste processing. The ideal scenario reflects the concept of a circular economy where nutrients and organic matter in organic waste is used to maintain soil health and becomes incorporated in new primary product. The alternative scenarios represent a linear scenario where organic materials end up in a larger mass of waste in a landfill or are in part destroyed to generate energy.

The focus of this report is on collection and processing aspects of the pathway outlined in Figure 4.2. The remainder of Section 4 sets out approaches to managing organic waste. Reduction (before waste requires collection or management), collection, processing and markets for products are considered.

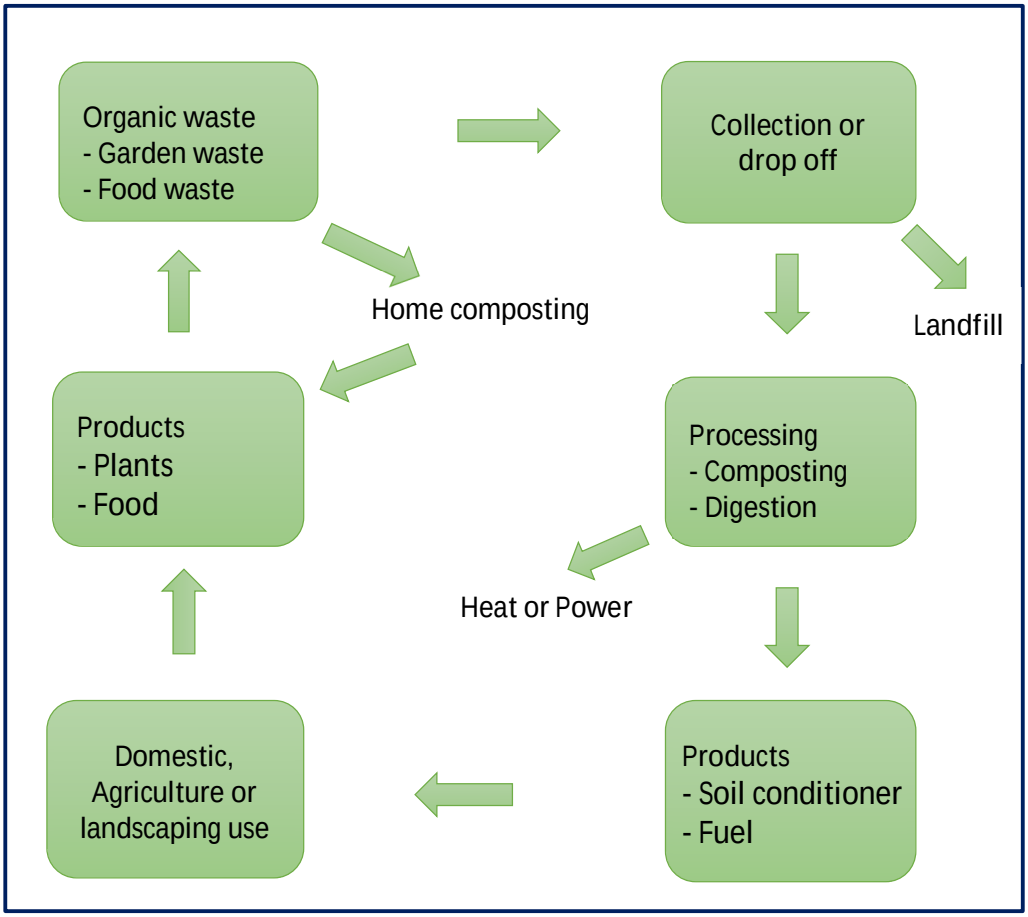

Figure 4.2: Circular and Liner pathways for organic waste management and use.

4.2 Organic waste reduction

From a Council perspective the ideal solution is to work at the top of the waste hierarchy, avoiding the generation of garden or food waste altogether. The Love Food, Hate Waste campaign being run at a national level and supported by NCC and TDC is a good example of this approach.

While not reducing the generation of organic waste, encouraging households or businesses to manage organic waste on site or within their operation appropriately avoids the need for Council or a third party to process or dispose of the material.

TDC and NCC both offer options to rate payers to subsidise the purchase of composting bins to encourage home or on-site composting of organic waste. Where householders are composting or worm farming their own waste it is important that information is provided on how to keep the composting or vermi-composting process working efficiently. A well maintained system can typically process household quantities of organic waste effectively. Overloaded or poorly aerated systems can produce unpleasant odours and methane or attract flies or other pests, highlighting the need for good information to support householders who are motivated to handle materials at home.

4.3 Collections

For the purposes of this report collections cover options that capture organic waste for processing by Council or commercial operators. This means in addition to kerbside or on-site collections, drop-off at neighbourhood collection points, transfer stations and processing sites are also considered.

Key considerations for kerbside/on site collections include:

- Target materials - garden waste and/or food waste[7].
- Collection methodology - Container (bag, bin), collection frequency.
- Funding - rates, direct charge, universal vs optional service.
- Seasonal effects - changes in green waste quantity, storage of food waste in warmer months.

The research completed for this report has identified a range of organic waste collection arrangements in New Zealand and further afield are summarised in Table 4.1.

Table 4.1 Summary of organic waste collection examples

	Target materials			Collection approach							Funding
	Food	Garden	Food and Garden	Bins (240 L)	Bins (140 L)	Bins (80L)	Bins (23 L)	Bags	Drop-off	Other	
New Zealand											
Timaru			ü	ü							Targeted rate
Selwyn			ü	ü							Annual charge (optional)
Christchurch			ü	ü	ü						Targeted rate

[7] Often referred to as Garden Organics (GO), Food Organics (FO) or Food Organics and Garden Organics (FOGO)

	Target materials			Collection approach							Funding
	Food	Garden	Food and Garden	Bins (240 L)	Bins (140 L)	Bins (80L)	Bins (23 L)	Bags	Drop-off	Other	
South Taranaki		ü		ü							Annual charge (optional)
Whakatane		ü		ü							Targeted rate
Hamilton	*ü*						*ü*				*Targeted rate (roll out in August 2020)*
Auckland	ü						ü				*Targeted rate (roll out in 2021)*
New Plymouth							ü				Targeted rate
Waimakariri			ü	ü	ü	ü					Annual charge (optional)
Palmerston North	ü			ü		ü					Business collection user pays
Wellington	ü			ü	ü	ü					Commercial (various) - user pays
Commercial		ü	ü	ü	ü			ü			User charge
Drop off		ü	ü						ü		User charge
International											
Australia											
Metro NSW (Sydney)		ü		ü							Most councils have Green waste collection, 2 food waste trials being undertaken.
Metro Victoria (Melbourne)		ü	ü								Waste collection rate (15 FOGO)
Rural Victoria		ü	ü								Waste collection rate (15 FOGO)
Bulky waste		ü								ü	Periodic bulky waste, rates funded
United Kingdom											
UK garden waste		ü					ü				Property tax
UK food waste	ü						ü				Property tax

	Target materials			Collection approach							Funding
	Food	Garden	Food and Garden	Bins (240 L)	Bins (140 L)	Bins (80L)	Bins (23 L)	Bags	Drop-off	Other	
UK bulky Waste		ü						ü		ü	User charge and Property tax (dependant on materials and Council)
Urban South Korea	ü							ü	ü		User charge, RFID tag

Generally, a Council looks for the lowest cost option to achieve a defined objective. Objectives often include targeting high resident satisfaction, diverting waste from landfill and achieving maximum value from waste materials or increasing 'beneficial' use. This means considering a range of factors including:

- Existing services,
- Potential grant funding (capital or operating),
- Ongoing funding options,
- Savings to be made (including who is saving the money), and
- The cost of processing inclusive of revenue from sale of product(s).

In the UK, food waste collection has gained traction with incentives for renewable energy generation reducing the cost of anaerobic digestion as a processing option (less suitable for green waste and combined food and garden waste feedstock). With aggressive European and UK specific targets, specifically for the diversion of organic waste, alongside evidence suggesting recovery of food organics is higher in a dedicated collection, separate green waste and food waste collections have been implemented in some areas[8].

In Australia combined food and garden waste collections are gaining traction reflecting a different combination of factors. In this case Councils have identified an opportunity to capture additional material within the existing garden waste collections. Policy incentives and funding support for both composting and anaerobic digestion means the preference for digestion is not as pronounced.

In the metropolitan context of Victoria increasing the recovery of organic waste is one of the key strategic regional waste group objectives. Through the development of significant collective procurement contracts, Melbourne's organic processing network provides processing capacity of over 520,000 T per year of food and garden waste. Examples of successful joint procurement ventures include:

- 11 Metropolitan Councils have entered the Northern and Western Organics Processing Contract where a purpose built in vessel composting facility is capable of processing 85,000 tonnes of organic waste a year.

[8] Bridgewater, E. and Parfitt, J. (2009). Evaluation of the WRAP Separate Food Waste Collection Trials. Wrap. Available at: http://www.wrap.org.uk/node/14212 [Accessed 10 Nov. 2017].

- 8 Metropolitan councils in the in the South East have entered a shared contract which includes a transfer stations, and two in-vessel composting facilities with a combined processing capacity of 280,000 T per year.

With large areas of agricultural land and former or current mine sites requiring rehabilitation there is a large potentially market for compost and soil amendment products. Diversion targets in Australia generally apply to all household waste, with processing of residual waste required to meet the 65 to 70 % targets in place in some states.

In New Zealand existing or proposed collections are typically implemented by Council's will full control of household waste (through rates funded refuse and recycling collections). This reflects the ability of an individual Council to realise the benefits of any reduction in refuse collection and disposal costs for households. In Auckland, Hamilton and New Plymouth, Councils have chosen to compliment rather than replace existing garden waste collections provided by the private sector by focussing on food waste.

Where collection relies on materials drop off considerations may include:

- Target materials - garden waste and/or food waste.
- Drop-off facility configuration - opening hours, containers, managing vermin and odour with stored materials.
- Funding - user charges, rates funded.
- Seasonal effects - managing changes in materials and storage of materials.

In the research for this project we have identified organic waste drop-off examples, largely focussed on garden waste. Most transfer stations in New Zealand and those in Australia and the United Kingdom accept green waste. We have not identified any comparable scale examples of transfer stations accepting food waste for recycling / recovery[9].

We have identified examples of neighbourhood (or building) level food waste drop off points. These address the challenge of providing a conventional kerbside collection for multi-unit dwellings like apartment blocks. These may be funded by body corporate charges or with a RFID based user pays system (South Korea).

4.4 Processing technology

Once materials are collected or dropped off they require treatment to enable beneficial use. There are a wide range of technologies available, but they can be grouped to provide an overview of the advantages and disadvantages.

4.4.1 Composting

Composting involves the transformation of organic materials microbiologically under aerobic and thermophilic (relatively high temperature) conditions. The New Zealand Standard for Composts, Mulches and Soil Conditions (NZS4454) sets out detailed time and temperature requirements and product standard for composts and similar products in New Zealand.

Key factors to consider for commercial scale composting include:

- Feedstock - balancing high carbon and high nitrogen materials, water content, adequate mixing of material inputs.

[9] Kaikōura's Resource Recovery Centre accepts a small amount of food waste for composting with dropped off garden waste.

- Maintaining adequate aeration during active composting, achieved through adequate particle size in feedstock, mixing and/or forced aeration.
- Managing odour risk, through maintenance of aerobic conditions (turning, aeration), enclosed or vacuum systems to allow venting through odour treatment system and/or timing of turning for open air systems to avoid unfavourable weather conditions.

Composting is well suited to garden waste and in some locations combined food and garden waste feedstock. Where food waste or other highly putrescible[10] material is to be composted a bulking agent is typically employed to provide additional carbon and improve the particle size distribution of the feedstock (to aid aeration). Shredded green waste is one example but wood chips, bark and sawdust are other common additives.

In New Zealand most composting operations are open windrow on a concrete or compacted soil composting pad, processing garden waste or similar materials like bark. There are also examples of enclosed composting[11] and forced aeration[12] operations.

Vermicomposting is also employed in some areas[13] processing industrial wastewater solids, municipal biosolids, drilling muds and food waste.

4.4.2 Anaerobic Digestion

Anaerobic digestion is a series of biological processes in which microorganisms break down biodegradable material in the absence of oxygen. It is in essence the same process by which organic material degrades in a landfill however in this context, the digestion occurs in a sealed tank.

Anaerobic digestion is well suited to putrescible materials including industrial wastewater solids, municipal sewage sludge and food waste. The process requires a consistent feedstock and 'shocks' in the quantity or strength of feedstock can result in process failure or overproduction of gas. Conventional methods process low solid feedstock producing a digestate that is dewatered to produce solid (15-20% dry solids) digestate and liquid. Solids are further processed or disposed of to landfill, liquids are typically recycled through wastewater treatment processes.

There are emerging approaches that involve pre-treatment of feedstock to enhance degradability[14] and that process very high solids in a batch style process. These are unproven in a New Zealand context and at an early stage of commercialisation internationally. In New Zealand, anaerobic digestion is common in major wastewater treatment plants but has not been applied to food waste. There are examples of municipal wastewater treatment plants co-digesting industrial wastewater solids[15].

4.4.3 Other processing options

There are other processes which can be used for the treatment of organic waste including conventional energy from waste (mass burn), gasification and pyrolysis. These technologies are more typically applied to mixed municipal solid wastes or specific industrial waste streams internationally and only starting to be implemented in New Zealand.

[10] For example municipal wastewater treatment solids (screenings, primary sludge, waste activated sludge), industrial wastewater treatment solids (DAF sludge, screenings) or manure.
[11] For example HotRot in Selwyn, Tunnel composting in Christchurch, Gore Bag system in Timaru, BioRich in Hawkes Bay
[12] EnvirfoFert (Tuakau, South Auckland), BioRich, Hawkes Bay.
[13] Wormworx in Central Otago, Revital in Taranaki and Waikato, MyNoke in Waikato and Bay of Plenty
[14] Cambi, Ultrasonic or similar pre-treatment designed to breakdown organic waste at a cellular level to improve digestability. These systems have been developed for wastewater solids processing.
[15] For example Palmerston North City Council co-digesting municipal biosolids with wastewater solids from Fonterra's Longburn processing site.

In the UK and Europe and increasingly in Australia, combined mechanical and biological treatment of residual waste is implemented to reduce the organic fraction of waste disposed of to landfill or sent to energy from waste facilities. The output of the biological process is typically a low grade compost type product usable for landfill or mine rehabilitation or similar purposes[16]. In some cases the product is a Refuse Derived Fuel for use in conventional waste to energy processes or advanced thermal treatment processes.

There are multiple examples of the use of wood waste to generate energy on wood processing sites around New Zealand[17]. There is potential for woody green waste or the oversize fraction from compost screening to be utilised in existing facilities or a facility established to make use of that material.

4.5 Products and markets

4.5.1 Soil amendments

Processing of green waste will reduce the total quantity of material while processing of food waste and digestate typically requires a carbon rich bulking agent in limited volume reduction or an increase in volume. Many processes produce products with potential for beneficial use. A key consideration in selecting processing technology is potential products and market requirements for that product. For example, a soil amendment product targeting soil water retention may be different from a product intended to provide nutrients or soil structure benefits.

Potential products include:

- Compost.
- Mulch (typically larger particle size).
- Vermicompost (from worm farming).
- Liquid product from worm farming or anaerobic digestion (liquid digestate).
- Dewatered digestate (solids) from anaerobic digestion.

All of these products provide soil structure and/or nutrient benefits when used in landscape or growing systems. The value of these benefits have an impact on the cost of each product, alongside the way the product is delivered to market. Typical markets include:

- Domestic/ landscaping - delivered in bags or in bulk.
- Agricultural (horticulture, arable and grazing) - delivered in bulk, often includes application.
- Council activities (parks and gardens, roadside landscaping/mulching) - required in bulk.

In New Zealand markets for soil amendment products include home gardening, commercial landscaping, soil stabilisation (for example in road construction projects) and horticulture (kiwifruit, vineyards). Food and garden waste derived products compete materials produced using bark and agricultural residues including manures and bedding.

[16] The NSW EPA re-evaluated the use of 'mixed waste organic outputs' from biological treatment processes resulting in the removal of some markets for the use of these materials in NSW. Refer https://www.epa.nsw.gov.au/your-environment/recycling-and-reuse/resource-recovery-framework/mixed-waste-organic-material

[17] See https://www.usewoodfuel.org.nz/, examples include Christchurch City Council's biosolids drying facility, Nelson Pine Industries, CHH Tasman, Red Stag timber in Bay of Plenty, Kinleith (pulp and Paper mill), Waikato and Golden Bay Cement (Northland). Azwoods in the Tasman / nelson Region produce wood pellets for use in appropriately designed boilers.

4.5.2 Other products

Where organic waste is burned to produce energy, ash is the key residual. The majority of ash produced is 'bottom ash' that is left after burning. There is also fine ash that is captured during emissions treatment. Ash produced is typically 5-10% of the wood combusted. While there is potential to reuse wood ash as a soil conditioner at a large scale the ash is typically placed in landfill or managed in dedicated disposal site (monofill).

If unwanted food is captured before it spoils, it can be processed into stock feed. We understand that this is occurring in the Nelson / Tasman region but have been unable to quantify this activity. Examples include off-specification or out of data food manufactured for human consumption and residues from food processing. Appropriately processed stock feed has markets in Nelson / Tasman (piggery, dairy farm) and if processed to be stable can be transported for use in other parts of New Zealand.

5 Options for Nelson- Tasman

5.1 Developing options

Our approach is to identify a range of possible options for the various components of an organic waste collection, processing, and beneficial use 'system'. Individual system components are considered to identify those most appropriate for the materials to be processed and markets available. Different combinations of collection, processing and use are then considered referencing Tasman District and Nelson City Council's objectives for organic waste management.

The options are grouped under:

- Organic waste reduction;
- Collection;
- Processing technologies; and
- Markets for organic waste derived products that are currently available or have potential within Nelson-Tasman region.

In considering these options, individually and at a system level, we have considered:

- Indicative costs for households/businesses and for Council
- Anticipated level of diversion

Other factors that have been considered at a high level include

- Convenience for system users
- Links to existing infrastructure and services
- Environmental risk - the potential for negative environmental impacts such as odour or unplanned discharges
- Technological risk - the complexity and commercial maturity of technology to be employed.
- Seasonal variation in composition and quantity of material.

5.2 Organic waste reduction

5.2.1 Love Food, Hate Waste

The Love Food Hate Waste campaign initiated in Great Britain inspired New Zealand to undertake a 3 year campaign from June 2016, to reduce the amount of food being wasted. WasteMINZ partnered with the Ministry for the Environment and 60 councils and community groups to deliver this campaign. The campaign itself provides information around the global issue of food waste and types of food being wasted in New Zealand, guidance around how you as an individual can reduce food waste, information on recipes, storage and events promoting the campaign. NCC and TDC are both currently participants in the National Love Food Hate Waste campaign.

5.2.2 Food rescue

Kai Rescue is a food rescue operation that is currently active in Nelson, engaging with large food waste generators (such as large supermarkets and food manufacturers) and diverting over 100 t per year of food waste from landfill. The operation is run as a division of the Nelson Environment Centre.

5.2.3 Home composting

Home composting and similar solutions like worm farms, have been promoted in other countries and are used by many householders across New Zealand. While not reducing waste per se, managing organic waste at a household level reduces the quantity of waste that enters the waste collection system.

There are a number of different products on the market ranging from simple composting bins, multi-chamber composting bins and various worm farming products. Subsidised composting products and educational material is currently supplied by NCC and TDC to residents.

5.2.4 Waste disposal units (kitchens)

Many New Zealand homes have in sink waste disposal units that shred food waste allowing the shredded material to be disposed of via the wastewater network. The shredded materials are treated with other municipal wastewater with solid (biosolids) and liquid residuals require disposal or management. In the Nelson / Tasman region liquid residuals are largely discharged to coastal water. The majority of biosolids are managed at the Nelson Regional Sewerage Business Unit's Bell Island wastewater treatment plant where they are aerobically digested before application to forest on the neighbouring Maturoa / Rabbit Island.

This approach has some similarities to home composting in that it reduces the amount of organic waste entering the solid waste collection system.

5.3 Collections

As noted in Section 4.3 there are several aspects to consider when designing a collection system, including:

- Coverage.
- Area to be covered (urban vs. rural).
- Optional service or universal service (for all properties in the serviced area).
- Households, businesses or both.
- Materials being collected - food organics, garden organics or a combination of both.
- Collection methodology - in part defined by the materials to be collected, but also consideration of container (type and size), collection frequency and any kitchen caddies for food waste.

5.3.1 Coverage

Area

If a collection service is to be implemented the area could replicate that for refuse and recycling collections or adopt a different collection area. There is potential for a range of solutions to be adopted, for example hubs for central city areas, roadside collection in other urban areas and support for on-site processing for rural and lifestyle areas.

Opt in/out

In addition to universal collection services (offered to all households), opt in and opt out collection systems are offered by some Councils[18]. This approach offers flexibility, allowing householders to choose whether they participate in collection services. The disadvantage is uncertainty in determining the likely volumes of the waste stream being captured, clearly related to the number of households using the services on offer.

This is often used as a transitional approach starting with an opt in service allowing for direct cost recovery (from those who opt in). At a certain level of adoption, it is likely to become possible to offer a service to all households at a similar total cost to offering the service to individual households on a case by case basis. This reflects the benefits of spreading the relatively fixed costs (vehicles, travel to/from processing site) across a larger number of service users.

It is worth noting that an opt in service for garden organics may compete with existing collection services offered by the private sector in urban areas of nelson /Tasman. Where there are existing garden organics collection a variation on Council offering an opt in service is to support the private sector. This could take the form of sharing information about available services or more active support such as subsidising services or providing discounted access to Council processing facilities.

In Nelson / Tasman an opt in services is only an option for garden organics collections making use of existing processing capability. A food only or food and garden organics service is likely to involve the establishment or upgrade of existing processing capability. This is likely to require commitment of a significant quantity of material. This is unlikely to be realistic to secure through an optional service.

Property type

The collection service offer could be varied by property type. For example:

- CBD households or apartments may be offered food waste only collections.
- Hospitality businesses could be offered food waste collections at a larger scale.

5.3.2 Materials collected

5.3.2.1 Garden organics (GO) collections

In Nelson-Tasman, as for similar cities in New Zealand and further afield, there is a range of options for managing garden organics. Many larger properties and/or households with keen gardeners compost garden organics for use on site. There are commercial garden organics collection services available in Nelson / Tasman, effectively an opt in collection service. Households can also choose to transport garden organics to a drop off site (one of the Council transfer stations or a privately owned green waste processors).

Garden organics are also disposed with general waste. There is unlikely to be a significant amount of garden organics in the Council refuse bags. Surveys completed elsewhere[19] indicate the percentage composition in council rubbish bags of green waste is as low as 5 %. By comparison, garden organics can make up a significant portion of wheelie bins (up to 20 %). Garden organics are also be present in general waste bins or skips.

[18] Examples include South Taranaki District Council (opt in green waste), Selwyn District Council (opt in food and garden waste) and Brisbane City Council (opt in green waste). Auckland Council has provision for householders to opt out of targeted rate funded refuse and recycling service where it is offered.
[19] New Plymouth, Wellington

It would be possible to establish a service that targets garden organics (GO) only. This would target materials currently transported to transfer stations and materials disposed of using kerbside refuse collections. Experience elsewhere has been that garden waste collection services can also capture a proportion of materials that have previously been composted or stockpiled on site, referred to as induced waste.

Key considerations for a garden organics collection service include:

- Alternative options for managing or disposing of garden organics.
- The impact of large wheelie bins[20].
- Likely take up of an optional service.
- Likely capture of 'new' materials such as those currently composted or otherwise managed on site.
- Seasonal fluctuations - relatively high quantity of material generated in spring, summer and autumn but minimal quantities in mid-winter.

A key consideration for the Nelson-Tasman region is the alternatives already available for managing and disposing of garden organics. Available data indicates that a significant portion of green waste in the region is already being diverted from landfill as described in Section 2.

5.3.2.2 Food organics (FO) collections

Unlike garden organics, food organics from households are typically disposed of with general waste in refuse bags or bins. A proportion of households are likely to be adding food scraps to composting, worm farms or systems like Bokashi[21]. There are no large scale commercial services for household food waste collection in the Nelson-Tasman region. On a small scale Community Compost is currently diverting food waste from 20 households and five businesses in the Nelson CBD area.

Food organics from commercial activities (food processing, hospitality) may be captured for stock food or other diversion but is most likely to be incorporated into general waste collected for landfill disposal. It is possible that commercial collection services would be offered if suitable processing capability was available in or close to Nelson.

It would be possible to establish a collection service that targets food organics only. This has the advantage of avoiding conflict with existing garden organics services and is likely to have direct impact on household refuse in bags as well as larger wheelie bins. As noted previously capture rates for food waste are likely to be higher when collected separately.

Key considerations for a food organics collection service include:

- Likely capture of materials including those currently composted or otherwise managed on site.
- Potential for private sector services e.g. for commercial kitchens or food processing sites.
- Likely take up of an optional service.

[20] Composition survey data suggests a tendency to use available capacity in large (240 L) wheelie bins for garden waste, this has the potential to impact on the capture of green waste into a dedicated container.
[21] An enzyme based system for managing household organic waste, promoted by via the DCC website, See http://www.zingbokashi.co.nz/.

5.3.2.3 Food and garden organics (FOGO) collections

The collection of food organics and garden organics is offered in Christchurch, Timaru and Selwyn (opt in) and is increasingly common in Australia. There are also examples where private garden organics collectors informally allow a small amount of food organics to be included. The key determining factor is the capability of the receiving processing facility to handle food organics as part of their feedstock. This typically implies some form of advanced processing such as aerated and/or in-vessel composting technology.

It would be possible to put in place a food and garden organics collection service subject to appropriate processing being available in Nelson Tasman. There are examples of food organics being transport long distances for processing[22] but only for short periods, typically to allow for establishment of local processing capability.

Key considerations for a food and garden organics collection service include:

- Alternative options for managing or disposing of garden organics.
- The impact of large wheelie bins[23].
- Likely capture of materials including those currently composted or otherwise managed on site on site.
- Potential for complimentary private sector services e.g. for commercial kitchens or food processing sites feeding in to processing operation.
- Likely take up of an optional service.
- Seasonal fluctuations.

A key consideration for the Nelson/Tasman region is the alternatives already available for managing and disposing of garden organics. A FOGO system would potentially be in conflict with the existing green waste collection network.

5.3.3 Drop off

Green waste is currently accepted at the four Tasman District Council Resource Recovery Centres (Takaka, Collingwood, Murchison and Mariri) and the Nelson Resource Recovery Centre at Pascoe Street. Since Richmond Resource Recovery Centre is immediately to Greenwaste to Zero, customers with green waste are directed to that facility. Greenwaste from Tasman District Council's four rural transfer stations is currently transported to Wholesale Landscapes (owned by Azwood) in Eves Valley for processing. Greenwaste from the Pascoe Street transfer station is taken to Greenwaste to Zero for processing.

The private green waste processors (Greenwaste to Zero and Wholesale Landscapes) provide green waste drop off facilities for household and commercial quantities.

Drop off of green waste relies on separation and transport by individual householders or business. While food waste drop-off could also be offered there are no examples of this service in New Zealand or Australia and it is unlikely to be practical from a storage at home or management of materials at transfer station perspective.

As noted in Section 4 there are examples of neighbourhood or building drop off facilities for food waste. There is potential to adopt this approach in the CBD or other high density areas, possibly linking with community gardens or the new recycle drop off facilities.

[22] For example food organics collected on behalf of New Plymouth have been transported to the Waikato for processing while a local processing facility has worked through securing resource consent to process food organics.
[23] Composition survey data suggests a tendency to use available capacity in large (240 L) wheelie bins for garden waste, this has the potential to impact on the capture of green waste into a dedicated container.

5.3.4 Collection methodology

Collection methodology is heavily influenced by the materials to be collected. Garden organics are often collected fortnightly or even monthly with both wheelie bins (often referred to as Mobile Garbage Bins or MGB) and garden bags (wool sacks) used. Food and garden organics are typically collected weekly in a wheelie bin reflecting the potential for food waste to become odorous on standing, particularly in warm weather. Food organics are typically collected weekly in small bins (20 to 40 L), again managing potential for materials to become odorous. Food organics collection includes those combined with garden organics, often also involve kitchen caddies with compostable plastic liners to improve capture of materials.

5.3.5 Compostable packaging products

There are a wide range of 'compostable' packaging and serviceware available to consumers and hospitality business in New Zealand. A key challenge with these products is determining the validity of the claims to compostability, degradability or similar. Materials marketed as degradable may be petroleum based plastic designed to breakdown during composting, as a result of extended exposure to sunlight and/or biological based plastics designed for composting or other breakdown[24].

International standards provide a useful benchmark and the WasteMINZ Organic Waste Materials Group has supported the use of European Standard EN13432 or the Australian Standard AS4736. These standards do not address the issue as to whether the plastic film is made from organic materials or not. The standards address decomposition times and temperatures. Regardless of meeting standards, WasteMINZ advice is to discuss the suitability of a specific product with the specific processing site. This is because factors including pre-processing, specific process conditions and product certification (e.g. BioGrow) may all be relevant in deciding whether a product can be accepted.

For collections there are two considerations:

- Liner bags for food waste. Food waste collections commonly use small kitchen caddies with compostable liners. These are intended to make it easy to capture materials during food preparation or clean-up and transfer to the collection container.
- Event organisers, and in some cases householders, are increasingly making use of compostable or degradable cutlery, plates/bowls and cups. Clear information is required to avoid event planners and householders causing processing and/or product issues for organic waste processers.

For Council the simplest approach is to focus on garden and/or food waste and exclude compostable packaging and serviceware materials as much as practical, particularly for household sourced material. This avoids 'degradable' material that cannot be broken down through conventional composting entering the materials stream.

Where materials are sourced from events, or similar scenarios where there is a relatively high level of control over the products being used, it may be appropriate to accept packaging or service ware. Christchurch City Council has adopted this approach for Council run events, specifying suitable products for food suppliers working closely with the processing site.

5.3.6 Collections - Summary

Table 5.1 summarises collection options for Nelson-Tasman, illustrating that certain approaches apply for each target material type.

[24] The NZ Government have announced an intention to ban oci-degradable plastics from January 2023.

Table 5.1: Summary of organic waste collection options

COLLECTION	Kerbside collection	Commercial collection	Drop-off at transfer station
Food Waste	ü	ü	?
Garden waste	ü	ü	ü
Food and Garden Waste	ü	û	û
Other materials	û	ü	û

5.4 Processing

As noted in Section 4.4 there are several aspects to consider when selecting a processing approach, including:

- Processing technology - suitability for feedstock, management of product quality, management of processing impacts.
- Seasonal changes – there is likely to be little green waste collected over the winter months i.e. any process will need to cope with variation in both quantity and composition.
- Contamination: likely type, source, percentage and effect on processing and product.
- Feedstock - garden, food or food and garden organics, additional materials required.
- Processing location - collection/transport logistics, surrounding land use, proximity to market.
- Processing operations ownership - council, partnership (sub-regional, Council/private or fully private sector.
- Existing processing capability of the region, potential to disrupt or complement of the capabilities of existing services.

5.4.1 Composting (open and in-vessel)

Open windrow composting

Open windrow composting and aerated windrow composting are typically used for the processing of garden organics. There are examples in New Zealand of this approach being used for combined food and garden or organics[25] or the processing of other putrescible materials[26].

The current composting operation at Green Waste to Zero is garden organics only and given the proximity of residential properties adding food organics may introduce an unacceptable odour risk. Alternate greenwaste processors Wholesale Landscapes face a similar issue.

Where green organics composting is not managed efficiently, anaerobic conditions and thus odour can develop, a consideration should the current operation expand with the proximity to residential properties. Effective aeration mitigates this risk but may require investment in additional equipment or infrastructure such as dedicated a compost turner or forced aeration system.

[25] Capital Compost - open windrow composting of garden organics (private sector collections and drop off) and food organics (commercial food organics - Kai to Compost).
[26] BioRich - aerated windrow composting of garden organics (private sector collections and public drop off), food organics (informally allowed in private sector garden organics collections) and other putrescible materials.

Considerations for open composting include:

- Management of odour.
- Arrangements for turning of materials.
- Feedstock - best suited to garden organics only feedstock.

In-vessel composting

In-vessel composting is typically employed where putrescible materials, including food organics, are being processed. While the enclosure of the composting process reduces the risk of odour impacts, in-vessel composting is typically located away from sensitive receptors and careful thought is required to manage materials reception and load out facilities as well as the composting process.

With respect to materials, in-vessel composting can be flexible with either food, garden, or a combined feedstock potentially appropriate. A food only feedstock would require mixing with a carbon rich bulking agent, for example green waste or sawdust/wood chips.

The in-vessel composting process is intended to actively manage mixing and aeration components of the composting during the initial phases of composting. Processes are typically designed for several weeks residence time with the product 'matured' in conventional windrows. This means in addition to the infrastructure associated with the in-vessel process space is also required for maturing on a pad with appropriate control of stormwater[27].

Considerations for in-vessel composting include:

- Management of odour including venting, materials reception and load out.
- Compost maturation - space for storing compost post the initial intensive in-vessel processing.
- Feedstock - suited to combined food and garden organics or food organics with additional carbon rich bulking agent.

5.4.2 Anaerobic digestion

Anaerobic digestion is well suited to highly putrescible materials including food waste and wastewater treatment solids. A key consideration in any anaerobic digestion process is providing a consistent feedstock to allow the microbial community in the digestor to establish. This is relatively straightforward processing sewage solids but more challenging with inherently variable feedstocks such as household food organics.

For Nelson-Tasman digestion of food organics could take place in a dedicated facility, or in a combined facility utilising an additional organic feedstock.

The Bell Island Wastewater Treatment Plant services the Nelson-Tasman region, treating the sewage equivalent to a domestic population of around 133,000. The system typically disposes of 50-100 m^3 per day of biosolids (equivalent to 2-3 tonnes per day of dry solids). Biosolids are currently aerobically digested but there is potential to transition to anaerobic digestion of a combined aerobic/anaerobic digestion process.

The aerobically digested biosolids from Bell Island are applied as a liquid slurry onto forestry on Moturoa / Rabbit Island. There is limited capacity for additional slurry to be applied at this location i.e. any increased production of digestate/biosolids would need to be accompanied by new or additional markets for a slurry or a dewatered product.

[27] For example, the Living Earth composting process in Christchurch (processing FOGO from household collections alongside other feedstocks) comprises an in-vessel process (approx. 7,500 m^2) and maturing area (approx. 40,000 m^2).

Dedicated anaerobic digestion of food organics could be located at the Bell Island Wastewater Treatment Plant or an alternative location. Biogas generated through digestion could be used directly for heat or to generate electricity in a gas engine. The resulting solid digestate could be dewatered and used as a soil amendment without further processing but is likely to require further processing to be acceptable to agricultural or landscaping markets.

Digestion of food organics with biosolids in a new anaerobic digester at the Bell Island wastewater treatment plant would have similar benefits to establishing a parallel digester. Combining the food organics with wastewater solids would mitigate (but not eliminate) the variability in food organics. The solid digestate would need to be treated as wastewater solids and be subject to appropriate controls. This is likely to mean applying controls set out in the Biosolids Guidelines[28].

Further processing may involve dewatering, drying, or composting. Drying is energy intensive[29] and typically produces a granular product suitable for soil incorporation and for some applications top dressing[30]. Composting is typically in-vessel (to manage odour) and requires a high carbon bulking agent similar to the processing of raw food organics.

Where wastewater solids are included there may be an impact on value or acceptability in certain markets. Some export market quality assurance schemes preclude the use of wastewater effluent and producers of edible crops are often unwilling to risk negative customer perceptions impact on their products. This means that while co-digestion with biosolids may be worth considering, keeping food organics separate may be preferred when securing markets for the (processed) digestate.

Dry digestion is an emerging technology that can reportedly handle a mixed garden and food organics feedstock. This technology is relatively unproven and has yet to be implemented in Australia or New Zealand for any feedstock. On this basis dry digestion is not considered further.

Anaerobic digestion is more complex than in-vessel composting and variability in feedstocks can have significant impacts on process stability and outputs. Other potential feedstocks for digestion include waste from wineries, brewery waste, agricultural slurries, wheat, and barley, all available around Nelson / Tasman. However, a constant supply/ contracted volume would be required to ensure a consistent feedstock.

5.4.3 Other processing technologies

Stock feed - Commercial operators in the Nelson-Tasman region have indicated that they have successfully been diverting organic biproducts to stock feed. In general, this is achievable due to the ability to manage consistency and quality through well defined inputs. Large scale diversion of municipal waste to stockfeed is not generally considered feasible due to contamination issues.

Biofuel - waste from timber processing is being used as 'biofuel' providing heat across the region[31]. Major biofuel users are Nelson Pine Industries (Richmond), Carter Holt Harvey (Eaves Valley), Eurocell Wood Products (Tahunanui) and South Pine (Annesbrook).

[28] Guidelines for the Safe Application of Biosolids to Land in New Zealand (NZWWA, 2003), currently being updated with a the Guidelines for Beneficial Use of Organic Materials on Land (Water NZ) currently in draft form.
[29] Selwyn District Council have recently installed a solar drying facility that is less energy intensive but requires a significant amount of space.
[30] See http://www.bioboost.co.nz/, dried biosolids from New Plymouth wastewater treatment plant.
[31] http://www.nelson.govt.nz/assets/Our-council/Downloads/council-agendas/2013/Nelson-City-Council-Renewable-Energy-Study-Final-26Jun2013-smaller-file-size.pdf - estimated 24,000 T/yr in Nelson with 'more in the Tasman District'.

Gasification and pyrolysis are widely used in other countries for the treatment of a mixture of waste streams and generally for larger volumes of waste. There are some facilities which operate with lower volume feedstocks and focussed on specific material streams, typically urban wood waste or wood processing residues. Products include gas (for further refining or energy generation), liquid (pyrolysis oil, condensate) and solids (biochar, ash). These processes also typically generate air pollution control residues that require treatment prior to disposal as stabilised hazardous waste.

While these gasification and pyrolysis could be applicable for the processing organic waste in Nelson / Tasman they are not considered feasible when cost and technology risk are taken into account. On this basis they are not considered further.

Mechanical biological treatment or mechanical heat treatment (MBT or MHT) is also an option employed for managing organic waste. This suite of technologies could be employed in Nelson / Tasman but are focussed on residual waste treatment, are costly and have yet to be implemented in New Zealand. On this basis they are not considered feasible when cost and risk are taken into account and are *not considered further*.

Vermicomposting has been implemented successfully elsewhere in New Zealand, primarily for the processing of biosolids but has been demonstrated at a small scale for food waste applications. Success has been reliant on having a local vermicompost processor and the availability of suitable bulking agents to provide the right mix for the feedstock[32]. Without these key factors in play in Nelson / Tasman we consider cost and *risk too high to consider this option further*.

5.4.4 Processing - Summary

Table 5.2 summarises processing options for Nelson-Tasman. While advanced treatment such as gasification, pyrolysis, mechanical biological treatment, or mechanical biological treatment could be applied they are considered high risk and are not considered further noting that there are conventional processing options available.

Table 5.2: Summary of organic waste processing options

PROCESS	Home compost	Compost, windrow	Compost, enclosed	Vermi-compost	Anaerobic digestion	Biofuel	Stock food
Food	ü	û	ü	ü	ü	û	ü
Garden	ü	ü	ü	û	û	~	û
Bark, wood	û	ü	ü	û	û	ü	û
By-products	û	û	ü	ü	ü	û	~

[32] Success in the central North Island has been in part due to the access to paper mill biproducts as a bulking agent for food waste

Processing capability and capacity in an area has an impact on the viability options for other parts of the materials flow. For example, processing capability has been highlighted as the missing pre-requisite for the diversion of food waste from households and businesses in Nelson / Tasman[33]. With the exception of small scale facilities (such as community compost) there is no food waste processing capability in the region. For substantial diversion of food waste to be achieved this gap in processing capacity will need to be addressed and ultimately this will determine the feasibility of collections.

There are two broad options for Council involvement in food waste processing. These are:

1 Establishing, owning, and operating a facility that can process food and/or other organic materials.

2 Enabling private businesses to establish food waste processing capability in the region. This could be achieved through:

- Collecting materials (opt in, compulsory under rates) through the council waste services that provide a private operator with secure 'baseload' tonnages.
- Providing a site for operations.
- Incentivising diversion through indirect mechanisms such as pricing or subsidies.
- Direct mechanisms such as regulating the disposal or processing of organic waste at landfill.

5.5 Markets

5.5.1 Council use

Council operations typically use composts and soil conditioners for landscaping (parks and gardens) and land stabilisation. Providing products of appropriate quality for supply to Council can support an 'internal market' by utilising the compost produced in the region using food and/or garden waste. A key consideration is understanding the requirements for each use and working with the end users within each Council to specify suitable products. For example:

- Requirements for parks and reserves - growing media, top-dressing for turf.
- Requirements for urban and rural road berms or stabilisation of slopes.

5.5.2 Retail

There is an active retail market for compost with bagged and bulk product available from landscaping, garden supplies and hardware retailers. The market for bagged product tends to be dominated by national suppliers (Tui, Daltons, and Living Earth) with bagged product shipped around the country and often marketed at low prices to attract customers through national chains. Local compost producers also market directly to users with bagged and bulk materials available. Where materials are sold direct to the public logistics and marketing costs can be avoided.

Further work is required to understand current demand and the potential for compost produced from Council controlled materials to secure market share by displacing products imported into Nelson / Tasman or growing the overall retail market for compost products.

[33] With the exception of unwanted food suitable for stock feed.

5.5.3 Horticulture

The horticulture market in Nelson / Tasman provides a potential outlet for compost and soil conditioner products. Current markets in and around Nelson / Tasman include horticulture, agriculture, and forestry. The potential markets for a high quality product would include[34]:

- 750 Ha of vegetable growing land
- 9,000 Ha of fruit and berry crop growing land (includes vineyards)

5.5.4 Grassland and arable crops

In 2016 there was around 14,000 Ha of grain growing land in the Nelson / Tasman Region. With regular working of soil there are potential soil structure and nutrient benefits from the application of compost and other soil amendments.

There is a large area used for dairy and sheep and beef in Nelson-Tasman, approximately 259,000 and 247,000 Ha respectively. While soil is worked less regularly there is potential for compost and soil amendment use at re-sowing of pasture and also as a periodic top dressing to provide both soil structure and nutrient benefits. Depending on the original source of compost (if containing food waste) grazing breaks maybe required dependant on the type of ruminant grazing.

Applications of 30 tonnes plus per hectare have been used for wheat crops north of Christchurch and have shown to provide estimated yield increases of up to 30%. Living Earth compost has been utilised on grassland post grazing (note it was highlighted that forward planning was required), but the application of this compost accelerated the rate of soil reserve during pasture rotation. Living Earth has also supply compost for use in arable production systems.

Application rates to established grassland are difficult to determine and are dependent on soil requirements and limits on nutrient loading. The application rate utilised for arable land is 28 T[35]-30 T per hectare, the former data from a UK compost supplier to farmers. This same source has highlighted a lower application rate of 24 tonnes per hectare[36] for compost from in-vessel composting, likely reflecting a different nutrient profile (higher nitrogen content).

5.5.5 Other

Biofuel - as noted above there are several major biofuel users in the Nelson / Tasman area. Azwoods also process materials into pellets for use in domestic and commercial scale pellet fires across New Zealand.

Stock feed - there are potential markets for stock feed in Nelson / Tasman (dairy, piggeries) for quality stock feed. Well processed materials can also be transported to other areas for sale and use.

5.5.6 Markets - Summary

Table 5.3 summarises processing options for Nelson-Tasman. While advanced treatment such as gasification, pyrolysis, mechanical biological treatment, or mechanical biological treatment could be applied they are considered high risk and are not considered further noting that there are conventional processing options available.

[34] http://archive.stats.govt.nz/browse_for_stats/environment/environmental-reporting-series/environmental-indicators/Home/Land/land-use.aspx
[35] http://www.fgsorganics.co.uk/wp-content/uploads/2015/09/2016-FGS-Organics-brochure-to-Agriculture.pdf
[36] https://www.livingearth.co.nz/rural-testimonials/black-estate-vineyard-waipara

Table 5.3: Summary of potential viable markets

	Council use	Retail	Horticulture	Grassland/ Arable	**Fuel**	**Animal Feed**
Compost	ü	ü	ü	ü	û	û
Vermi-compost	ü	ü	ü	ü	û	û
Digestate	Feedstock for further processing (compost, vermi-compost					
Bark, wood chip	ü	ü	û	û	ü	û
Stock food	û	û	û	û	û	ü

5.6 Preliminary evaluation

Figure 5.1 illustrates how the various components (collection, target material, processing, and markets) combine to provide a range of potential materials flows.

Key points to note include:

- In-vessel composting can process a range of target materials - a combined feedstock may present a stronger case for investment than a single material stream.
- The currently available processing options (open windrow composting, biofuel, and stock feed) provide outlets for garden waste, potential fuels (bark, wood chip) and potential stock feed (some by-products, some food waste).
- Anaerobic digestion does not produce a generally usable soil amendment product - further processing will be required to meet requirements for most markets.
- Garden organics processing is a fully commercial activity i.e. the only Council support is through 'disposing' of garden organics from transfer stations.

Establishing processing capacity for one material stream has the potential to create new options for other material streams. For example, an in-vessel composting processing can handle food waste (subject to available bulking agent such as garden organics, bark or sawdust), mixed food and garden waste, digestate and/or organic by-products.

In addition to the 'flow' of materials it is important to consider who will provide collection or processing. In Nelson / Tasman the private sector offers green waste collection and processing. Wastes suitable for biofuel and stock feed are also handled by the private sector with no involvement from Council.

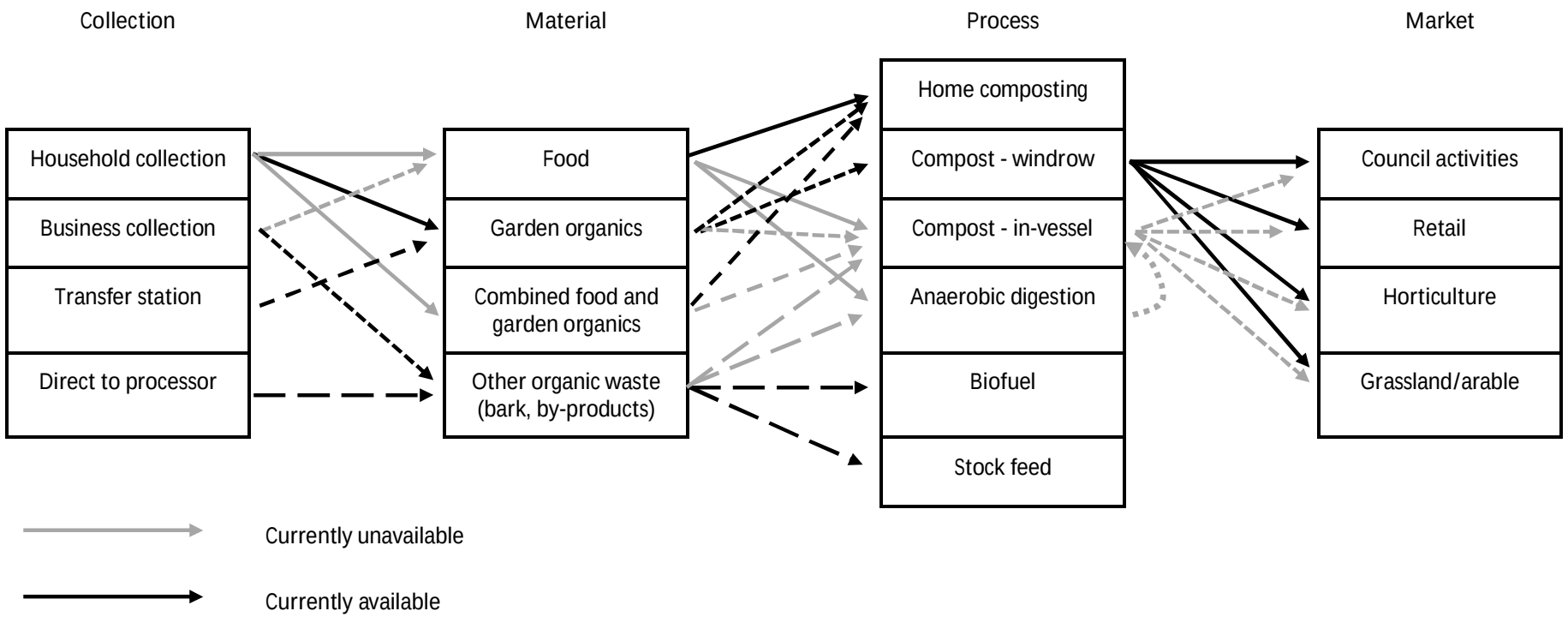

Figure 5.1: Materials flows / options

Building on the discussion above and flows presented in Figure 5.1, the options worthy of further consideration for Nelson / Tasman are outlined below. These focus on supporting existing flows (black lines) and a selection of currently unavailable flows (grey arrows) where Council can have a material impact through establishing collection or processing.

1	Food organics - promote home composting (existing). Active promotion of home composting (composting workshops, subsidy for composting bins or worm farms/worms).	Existing
2	Food organics - Council collection from <u>households</u> with new in vessel composting or anaerobic digestion. Provide a collection service for food organics from urban properties. Typical configuration of kitchen caddy, compostable liners for caddy and 20 to 40 L bin emptied weekly. Collected food organics processed using in vessel composting with bulking agent (garden organics, sawdust, or wood shavings).	New
3	Food organics - Council collection from <u>businesses</u> (hospitality) with in vessel composting or anaerobic digestion. Provide a collection service for food organics from business focussing on those generating significant quantities of putrescible waste. Typical configuration of 120 - 240 L bin emptied regularly. Collected food organics processed using in-vessel composting or anaerobic digestion at Bell Island WWTP or elsewhere followed by in vessel composting with bulking agent (garden organics, sawdust, or wood shavings).	New
4	Garden organics - promote home composting (existing). Active promotion of home composting (composting workshops, subsidy for composting bins or worm farms/worms).	Existing
5	Garden organics - promote and support private sector collections from <u>households</u> with existing open windrow composting (existing). Promote private sector collection of garden organics from urban properties. Typical configuration 240L bin emptied weekly, supported by Council advertising, subsidy and/or credit for delivery of material to existing green waste processors. Collected garden organics processed using existing windrow composting by existing green waste processors.	Existing /New
6	Garden organics - drop-off with existing open windrow composting (existing). Accept garden organics for drop off at transfer stations with processing of materials using existing open windrow composting at existing green waste processors.	Existing
7	Food and garden organics - promote home composting (existing) Active promotion of home composting (composting workshops, subsidy for composting bins or worm farms/worms).	Existing
8	Food and garden organics - promote and support private sector collections from <u>households</u> with new in vessel composting. Promote private sector collection of food and garden organics from urban properties. Typical configuration 240L bin emptied weekly, supported by Council advertising, subsidy and/or credit for delivery of material to an appropriate processing site. Collected garden organics processed using existing windrow or new in vessel composting at existing or new processors.	New

The other materials streams noted are important in that they may be an important feedstock (wood waste, bark as bulking agent) or may utilise processing capability established to address specific materials streams (putrescible by-products as feedstock for in-vessel composting or anaerobic digestion).

Options excluded include:

- Food organics - collection via hubs in high density areas because there are limited areas of sufficient density to preclude a conventional kerbside collection service.
- Garden organics - collection from households, because this replicates services that are already available on a commercial basis.
- Food and garden organics - collection from households because this would compete with existing garden waste collection services provided on a commercial basis.

In addition to the combined service and processing options noted above there are several complimentary initiatives that should be continuing to be supported or implemented. These include:

- A focus on reduction of organic waste, for example:
  - Love Food, Hate Waste - public communication campaign targeting wasted food.
  - Kai Rescue (Nelson), Kai with Love (Richmond) - distributing unwanted food.
- Supporting those who manage organic waste on their own property through information and a subsidy for compost bins and materials.
- Supporting community gardens as users and recyclers of organic waste as growing media.

5.7 Shortlist Evaluation

Table 5.4 summarises each option and notes indicative costs (refer also to Table 5.5 for further information), advantages and disadvantages of each option.

The selection of an option, or combination of options, will depend on which objectives are most important. For example, if Council is seeking to maximise diversion of material from landfill combining individual food organics and garden organics collections is likely to be the most effective. The current approach (private sector and drop off for garden organics only) is the least cost option for Council. There are several options that could expose council to risk, for example odour from processing, inability to sell product and localised impacts.

Table 5.5 summarises cost (for households and for Council) vs anticipated diversion as a percentage of the total waste stream. Points to note include:

- Generally increasing cost (to Council and to households or businesses) delivers increasing diversion.
- Opt-in scenarios are more costly on an individual household basis and will deliver a lower overall level of diversion due to low anticipated participation.
- Council services provided to all eligible households are relatively cheap on a per household basis but represent a significant increase in Council expenditure. Based on budgets set out in the respective 2020/21 Annual plans and figures presented in Table 5.5 the rates increase would be in the order of 1.5 % for food organics collection.

Given the comments above, options that warrant further consideration include:

1,4,7 Promotion of home composting[37].

2 Food organics collection from households with a new in-vessel composting or anaerobic process.

5 Promotion of private sector collections of garden organics (to existing open windrow composting) including extending the compost bin subsidy to subsidising garden organics collection.

If there is capability to process food organics in the Tasman / Nelson area there is potential to develop a collection of food organics from businesses (Option 3). If the processing can accept a mix food and garden organics waste stream there is potential to promote a food and garden organics service through supporting existing green waste collections to expand the range of materials accepted (Option 8).

A system that combines promotion of home composting, a household organic collection, an opt in commercial food waste collection and a subsidy for garden organics collection would:

- Achieve over 7% diversion of organic waste from landfill.
- Deliver a significant carbon benefit.
- Cost around $110 per household, business would cover their costs through user charges.

[37] Including schemes like ShareWaste, a platform to 'share' food waste with local home composters. www.wharewaste.org.nz.

Table 5.4: Short-listed Collection - Processing - Market options - evaluation

	Target	Collection	Processing	Carbon impact	Indicative diversion	Market(s)	Indicative cost per household	Capital and operational costs	Comments
1	Food	NA	Home composting	Small benefit - diversion	<1% (est 400 T/yr)	NA	Existing subsidy and information	No capital required Operational cost current $20 subsidy per household + staff costs	Requires informed and motivated residents
2		Kitchen caddy + 20-40L MGB for households	In vessel composting or Anaerobic digestion	Benefit - but diversion offset by transport	<5% (est 1,900 T/yr)	Retail, Arable, Horticulture	Weekly $75 - 125/yr[38]	Capital for containers, collection equipment and processing. Operational cost for collection and processing (capital from Council or private sector)	High capture rate for food Process required can manage other material streams Complex (digestion) Requires bulking agent (In Vessel)
3		120-240 L MGB for businesses, opt in	In vessel composting or Anaerobic digestion	Small benefit - diversion offset by transport	~ 1% (est 600 T/yr)	Retail, Arable, Horticulture	Estimate $5-$10 per pick-up	Capital for containers and processing Operational cost for collection and processing. Unlikely to justify capital alone.	Process required can manage other material streams Complex (digestion) Requires bulking agent (In Vessel)
4	Garden	NA	Home Composting	Small benefit - diversion	< 1% (est 300 T/yr)	NA	Existing subsidy and information	No capital required Operational cost current $20 subsidy per household + staff costs	Requires informed and motivated residents

[38] Based on Auckland and Hamilton estimates for their planned services and indicative sums from contractors.

	Target	Collection	Processing	Carbon impact	Indicative diversion	Market(s)	Indicative cost per household	Capital and operational costs	Comments
5		Private sector 240L MGB	Windrow	Benefit - but diversion offset by transport	~ 1% (est 600 T/yr)	Retail, Arable, Horticulture	Fortnightly $100-200/yr[39]	No capital required Operational cost for subsidy/ support.	Supports existing garden organics services Uses existing processing capacity Opt-in service
6		Drop off	Windrow	Existing	Existing	Retail, Arable, Horticulture	$25 - 50/yr assume 0.5 T per year[40]	Existing	Uses existing drop-off system Support existing private sector
7	Food and Garden	NA	Home composting	Benefit - but diversion offset by transport	~ 1% (est 700 T/yr)	NA	Existing subsidy and information	No capital required Operational cost current $20 subsidy per household + staff costs	Requires informed and motivated residents
8		Private sector (addition to garden organics service) 240L MGB + kitchen caddy	In-vessel composting	Benefit - but diversion offset by transport	~ 2.5% (est 1,200 T/yr)	Retail, Arable, Horticulture	Weekly $120 - 200/yr[41]	No capital required Operational cost for subsidy/ support. Unlikely to justify capital investment for in-vessel alone.	Supports existing garden organics services Uses existing processing capacity Opt-in service

[39] For example, Selwyn District Council food + garden $200 per year, South Taranaki $115 per year for garden organics only.
[40] Green drop off fee in Dunedin $91/T
[41] Timaru District Council – Redruth Eco-Centre, Council owned and operated by Waste Management – windrow composting with Gore Cover system = $133 per year

Table 5.5: Collection, processing and marketing indicative costs and additional diversion

Label	Indicative costs				Diversion (%)	Assumptions
	Low ($/yr)	High ($/yr)	TDC ($/yr)	NCC ($/yr)		
Food - home composting	5	20	46,000	43,000	0.8%	$5 promotion and education $20 per year subsidy for bins (existing) 5-10% increase in the quantity of material home composted (food and garden waste) with associated 5-10% of households taking up subsidy (21,500 households in Nelson, 23,000 Households in Tasman)
Household food collection - composting[42]	75	125	2,150,000	2,300,000	3.6%	Cost range based on cost build-up and comparison with existing/planned food waste services. Assume median cost, 21,500 households in Nelson, 23,000 Households in Tasman, 80% participation and approx. 60% capture rate
Household food collection - digestion[42]	75	125	2,150,000	2,300,000	3.6%	Cost range based on cost build-up and comparison with existing/planned food waste services. Assume median cost, 21,500 households in Nelson, 23,000 Households in Tasman, 80% participation and approx. 60% capture rate
Commercial food waste collection	$5 per pick up	$10 per pick up	Cost recovery	Cost recovery	1.2%	Assume $5-$10 per pick up for food waste only. Assume 20% participation and 80 capture from participating businesses.
Garden - home composting	5	20	46,000	43,000	0.6%	$5 promotion and education $20 per year subsidy for bins (existing) 5-10% household take-up (21,500 households in Nelson, 23,000 Households in Tasman)
Garden private collection - composting	150	200	215,000	230,000	1.1%	$100-150 for each household based on commercial rates. Assume 25% take up of $20 subsidy (10,750 and 11,500 households) and approx. 80% capture rate.

[42] Using mid point between low and high costs, typical range +/- 50% or more. Detail system design will improve accuracy, but actual costs will depend on system, procurement process and market conditions.

Label	Indicative costs				Diversion (%)	Assumptions
	Low ($/yr)	High ($/yr)	TDC ($/yr)	NCC ($/yr)		
Garden drop-off - composting	$15	$50	No change	No change	No change	$25 based on current disposal rate and 0.25T per household and $60 per T. Council cost small allowance for promotion
Food and Garden - home composting	5	20	46,000	43,000	1.3%	$5 promotion and education $20 per year subsidy for bins (existing) 5-10% household take-up (21,500 households in Nelson, 23,000 Households in Tasman)
Food and Garden private collection - open composting	120	200	215,000	230,000	2.3%	$120-200 based on Timaru, Canterbury and discount on commercial rates. Assume 25% take up of $20 subsidy (10,750 and 11,500 households) and approx. 70% capture rate.
Food and Garden collection - in-vessel composting	150	225	215,000	230,000	2.3%	$150-225 based on Timaru, Canterbury and discount on commercial rates. Assume 25% take up of $20 subsidy and approx. 70% capture rate. Requires investment in new technology by Councils or another investor. Estimated capital cost in the range $5 - $10M depending on scale and materials processed (financing cost 200-400,000 per year.

5.8 Options assessment summary

Successfully capturing, processing and beneficially using organic waste requires one or more viable chain of activities for each target material. In some cases, collections, processes or markets can accommodate multiple materials meaning there is potential for synergies across an integrated system.

In Nelson / Tasman there are existing activities that need to be considered when evaluating potential new activity. A key consideration for this assessment has been how to support and leverage existing services while targeting increased diversion, reduced carbon impact and reasonable cost for both Councils and the community.

A key gap in the current capacity and capability in Nelson / Tasman is processing of putrescible materials such as food waste and primary sector by-products. Our evaluation of individual materials streams suggests there is a significant amount of material available, but it is fragmented. Household food waste, food waste from hospitality activities and primary sector by-products are all potential feedstock for a processing site but are relatively small quantities in isolation.

The evaluation concluded that:

1 Councils should continue to support home composting through providing information and a small subsidy for home composting. This provides modest diversion with modest expenditure.

2 Councils should extend the subsidy to support existing garden waste collection services in available to Nelson / Tasman residents. This could take the form of a voucher similar to the current home composting subsidy or be administered through a payment to current service providers subject to evidence of existing or new services.

3 Councils should work towards implementing a universal, rates funded food waste collection service for urban households. This will require establishing suitable food waste processing capacity and capability in Nelson / Tasman as well as the physical collection of food waste. Key considerations include:

   · Because of the significance of the proposal a detailed business case is likely to be required.

   · In establishing new processing capability there is an opportunity to make provision for other putrescible materials streams, for example business food waste and primary sector by-products.

   · Processing of putrescible waste or digestate (post anaerobic digestion) is likely to require a carbon rich bulking agent. Examples include garden organics, bark, sawdust. This component of the processing system is critical to the viability of the processing system selected.

4 Subject to the availability of suitable processing capability, Council should consider establishing, or supporting, a food waste collection service for businesses on a full cost recovery basis.

In addition to the combined service and processing options noted above there are several complimentary initiatives that should continue to be support or implemented. These include:

· A focus on reduction of organic waste, for example:

· Love Food, Hate Waste - public communication campaign targeting wasted food

· Kai Rescue (Nelson), Kai with Love (Richmond) - distributing unwanted food.

· Supporting those who manage organic waste on their own property through information and a subsidy for compost bins and materials.

· Supporting community gardens as users and recyclers of organic waste as growing media.

6 Planning for success

6.1 How will the project be delivered (the Management Case)

6.1.1 Overview

The next steps for the project involve:

- Developing the design of an extended subsidy scheme to support existing garden waste collection services in available to Nelson / Tasman residents. Key design decisions include
    - Level of subsidy.
    - Payment approach - voucher, payment to current service providers or other.
    - Approaches to providing education and support for successful home composting.
- Developing a Detailed Business Case for a household food waste collection. This will include:
    - Completing a pilot study to confirm collection methodology options
    - Engaging with existing processors of organic waste in Nelson / Tasman regarding establishing food / putrescible waste processing capability.
    - Quantifying complimentary materials streams
        - Other putrescible materials (commercial/business food waste, primary sector by-products
        - Potential bulking agents
    - Planning for implementation.
- Subject to the availability of suitable processing capability, developing a case for establishing, or supporting, a food waste collection service for businesses on a full cost recovery basis.

The project will be managed by Council staff with specialist support on pilot design, system design, procurement planning and procurement process.

The information provided below is in the form of a preliminary project plan. This will be expanded in accordance with each Council's project management approach including addressing reporting, risk management and delivery requirements for project partners.

6.1.2 Project team and governance

Key project team members will include:

- TBC – Project oversight
- Terry Dwyer – Project Manager
- Technical support - TBC

Given the involvement of the two councils simple and effective governance and reporting will enable all parties to be well informed. We anticipate a governance group approving the detailed project plan, tracking progress against the plan, monitoring project risks and addressing relevant matters as they arise. Day to day management and delivery will be the responsibility of Terry Dwyer as the project manager.

The governance group will comprise

- Chair
- TDC representative
- NCC representative

- Other funder representative(s).

6.1.3 Anticipated project plan

Project activities will include:

1 Detailed project plan

A detailed project plan will be developed covering

- *Design and implementation of expanded subsidy scheme to cover garden organics collection services*
- *Developing a Detailed Business Case for a household food waste collection service including*
  - *A pilot study (collection).*
  - *Market engagement with potential collection and processing contractors.*
  - *Detailed evaluation of complimentary materials including likely commercial arrangements for processing.*
  - *Drafting a Detailed Business Case for consideration by each Council.*
- *Developing a Single Stage Business Case for a commercial food waste collection service.*

2 Design and implement an expanded garden organics collection subsidy scheme.

3 Detailed Business Case (household food waste collection)

A detailed business case will be prepared building on the feasibility analysis presented in this report. Key activities will include:

- *Confirming the Strategic Case for investment*
- *Evaluating the options for collection and processing in a detailed Economic Case. This will include running a Pilot Trial household food waste collection, researching markets for collection and processing, and determining the demand for processing of complimentary materials. The outcome of this stage will be a confirmed preferred option including detailed collection methodology and processing option.*
- *Detailed planning for implementation including:*
  - *A project plan for detailed systems design, procurement and service roll out.*
  - *A detailed funding model including implications for Council budgets, Fees and Charges and financing of key capital investments.*
  - *A preliminary procurement strategy.*

The detailed Business Case will be presented to each Council for consideration.

4 Business Case for commercial food waste collection service. This is reliant on the availability of food waste processing in Nelson / Tasman and will be assessed as a commercial service.

5 Detailed systems design and procurement (household food waste collection)

6 Pre-implementation (household food waste collection)

- *Bin purchase and roll out*
- *Processing solution detailed design and construction*
- *Commence operations*

7 Commercial food waste collection

- *Bin purchase and service sales*
- *Commence operations*

Table 6.1: Indicative project budget

Activity	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
1.Detailed project plan	$5,000					
2. Garden organics collection subsidy						
Design subsidy scheme	$10,000					
Roll out		$100,000	$250,000	$250,000	$250,000	$250,000
Household food waste collection						
3. Detailed Business Case	$25,000	$125,000				
5. System design, procurement			$100,000			
Processing solution			*$0.5M*	*$5M*	*$3M*	
Bin purchase/roll out				*$1.5M*		
System implementation					*$4.5M*	*$4.5M*
Commercial food waste collection						
4. System design/business case			$50,000			
7. Bin purchase/roll out				$0.1M		
System implementation						
Total Investigations	$40,000	$125,000	$150,000			
Total Capital			*$0.5M*	*$7M*	*$3M*	
Total Operating		$100,000	$250,000	*$5M*	*$5M*	*$5M*
TOTAL	$40,000	$225,000	*$1M*	*$12M*	*$8M*	*$5M*

Grey font = subject to approval to proceed on the basis of a Business Case

6.2 How will the project be funded (the Financial Case)

The indicative project budget is provided in Table 6.1. Funding will be confirmed through the business case process but is likely to be a combination of:

- Regional Landfill Waste Minimisation Funding for investigations
- Loan or Regional Landfill Waste Minimisation Funding for capital investment
- User charges (direct per service charge and/or targeted rate) for operational costs.

6.3 How will the project be procured (the Commercial Case)

Procurement of the activities set out in Section 6.1 project will be subject to a procurement plan. This will include:

- Investigations (where external consultants are involved)
- Capital investments
  - Bin purchase may be included in operational contracts
  - Processing solution may be procured as a processing service or as a discrete capital investment in processing technology.
- Operational contracts
  - As noted above, operational contracts may include amortised capital costs for bins and/or processing.

7 Applicability

This report has been prepared for the exclusive use of our client Tasman District Council and Nelson City Council, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

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