Part 2 – Municipal Solid Waste Infrastructure Schedule

Contents

1 Overview

The purpose of Part 2 is to set out a schedule of existing and required infrastructure for municipal solid waste (MSW) management for metropolitan Melbourne to 2030. There are a number of contributing factors, outlined in this part of the Strategic Plan, which collectively direct the Schedule. Changes to legislation, the need to meet *Towards Zero Waste Strategy* (TZW) targets and a commitment to the waste management hierarchy all act to focus the Schedule's timeline. The Schedule is designed to act as a strategic planning tool which focuses on MSW collections, outlines a procurement process for new facilities, and provides a range of waste management and resource recovery strategies, maximising the benefits of both existing and new infrastructure.

Figure 1: Geographical boundaries of metropolitan local governments

1.1 Legislative requirements

Under the *Environment Protection Act 1970*, the Metropolitan Waste Management Group (MWMG) is required to set out a Municipal Solid Waste Infrastructure Schedule of existing and required infrastructure for municipal solid waste (MSW) management for metropolitan Melbourne to 2030. This Schedule comprises Part 2 of the Metropolitan Waste and Resource Recovery Strategic Plan. The requirements of the Act are set out in Appendix A.

Figure 1 outlines the geographical boundaries of metropolitan Melbourne to which this Strategic Plan applies. A list of metropolitan councils is set out in Appendix B.

1.1.1 Planning periods

Under the Act, the Metropolitan Plan (Part 1) and accompanying Infrastructure Schedule (Part 2) and Landfill Schedule (Part 3) must be reviewed at least every four years. So although this Schedule considers infrastructure needs to 2030, its primary focus is on ensuring that there will be adequate resource recovery infrastructure to meet TZW targets and the needs associated with projected population and economic growth to 2013–14. It also looks ahead, anticipating any additional processing capacity that will need to be developed during the period from 2013–14 to 2018.

1.2 Strategic intent

This Schedule is not a prescriptive document, but a strategic planning tool. It identifies existing and proposed infrastructure, assesses the capacity of these facilities to meet current and future needs, and assesses the general availability of potential sites for additional infrastructure that may be required. In this context, it identifies a range of responses that will be required in order to meet TZW targets and recover more resources from the MSW stream in the future. The targets of TZW are provided in the Introduction.

1.2.1 Procuring services and facilities

A key role of the MWMG is to facilitate the procurement of resource recovery and waste management services for metropolitan councils. Procurement processes will take into account procurement guidelines (Section 5), state government policy and strategy objectives, including the TZW Strategy, *Melbourne 2030*, and legislated waste minimisation and resource-efficiency objectives.

Procurement of additional infrastructure required to meet TZW and other objectives will be largely determined by competitive processes and will be outcomes based. In such a competitive environment, it is not appropriate to be specific or to pre-empt the market regarding the location and type of resource recovery infrastructure that may meet future tender requirements.

1.2.2 Waste management hierarchy

This Schedule is underpinned by the waste management hierarchy (Figure 3 in the Introduction), which places disposal to landfill as the least preferred option for managing wastes. The hierarchy provides a framework aimed at minimising both resource consumption and the consequent environmental and economic costs associated with resource extraction and harvesting, as well as in the processing, manufacture, transport and disposal of materials.

1.3 Why focus on MSW collections?

The MSW stream accounts for more than 1.96 million tonnes per annum of metropolitan Melbourne's waste generation and there are unique opportunities to increase recovery of materials from this stream.

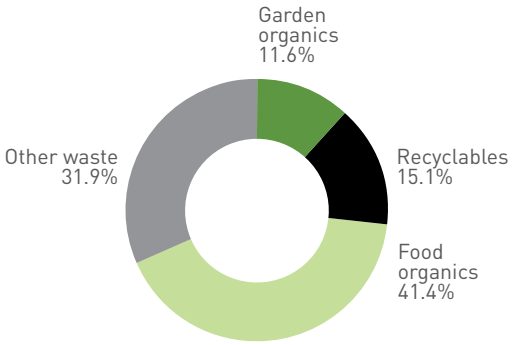
The analysis of current and future resource recovery infrastructure needs within this Schedule is based mainly on MSW sourced from kerbside collections (i.e. two- or three-bin systems), as this represents approximately 70 per cent of the total MSW stream. Whilst recovering more resources from other components of the MSW stream – including household waste materials dropped off at transfer stations by residents, street sweepings and council litter bins – will increase diversion from landfill, improvements in the kerbside component will have the greatest impact.

In addition to market development, which is the main driver for increasing diversion in the C&I and C&D streams, the kerbside-collected MSW stream also relies significantly on a combination of householder engagement and local government leadership. Other characteristics unique to the kerbside-collected MSW stream include the following.

- Collection systems and contracts are usually long term (about seven years), with the type of housing and density affecting the type of collection system used (i.e. two- or three-bin system).
- The volumes of waste are relatively consistent over the medium to long term, which increases investor confidence in resource recovery infrastructure.
- With increased engagement, householders can achieve consistently good performance in sorting waste at home (i.e. source separation).

Audits of the kerbside-collected MSW stream from a number of metropolitan councils (2006–08)[1] show the amount of organic waste and other recyclable material that ends up in the residuals (garbage) bin that could be diverted from landfill and recycled (Figure 2). The audits found that, of the material in the residuals bins, approximately 15 per cent comprised recyclables (plastics, glass and metals) that could be recovered, and over 40 per cent comprised food organics. If this organic material is disposed of to landfill it breaks down to form methane, a significant greenhouse gas. Recovering and processing this organic material would provide a significant greenhouse gas reduction benefit, as an additional 300–500 kg of CO_2-equivalent per tonne of organics would be recovered, compared with disposing of the material to landfill with conventional landfill gas recovery and conversion to grid power.[2]

Figure 2: Composition of the residual stream from metropolitan kerbside collections, 2006–08



This Schedule focuses on the introduction of new resource recovery initiatives for the MSW stream. Where possible, opportunities to integrate priority C&I and C&D materials (especially food and garden organics) for recovery and reprocessing should also be realised.

1.4 Waste management and resource recovery strategies

The formation of the MWMG and the development of the Strategic Plan together provide a flexible and effective approach to the introduction of new generation of waste processing and resource recovery technologies for metropolitan Melbourne. Further information on the MWMG Procurement Guidelines and the Victorian Advanced Resource Recovery Initiative (VARRI) is provided in Section 5.

There is a range of waste management and resource recovery strategies – apart from providing new infrastructure – which will continue to contribute to diverting material from landfill, including:

- the maintenance and upgrade of existing infrastructure (Section 5)
- the continued provision of a range of education and engagement programs with community, government and business (Section 4 and Part 1 – Section 2)
- a range of initiatives targeting the commercial and industrial (C&I) and construction and demolition (C&D) waste streams (Part 1, Section 4).

This section introduces kerbside collection systems and describes the changing conditions affecting the types of infrastructure metropolitan Melbourne needs to manage its municipal waste material. If current trends continue, increasing population will result in increasing amounts of material that need to be recovered and processed. Improvements to waste collection methods and the adoption of best practice systems by more councils will enable more material to be effectively recovered. At the same time, the impetus to reduce carbon emissions and improve resource efficiency is focusing attention on the types of products different infrastructure technologies produce.

[1] *Kerbside waste audit data analysis and audit template*, Sustainability Victoria, June 2008

[2] The Australian Greenhouse Office uses a figure of 900–1100kg CO_2-equivalent per tonne of MSW to landfill, but this assumes no landfill gas capture. The 300–500kg CO_2-equivalent figure cited here is derived from Sustainability Victoria modelling of net gas emissions from MSW assuming 40–60 per cent gas capture over the entire period that organics generate methane, 10 per cent 'sequestration' of carbon in landfill, and conversion of recovered gas to electricity replacing brown coal electricity.

2 Infrastructure needs assessment

2.1 Current kerbside collection systems

There are a number of kerbside collection systems and options provided to ratepayers in metropolitan Melbourne, which vary according to the needs of the residents and the contractual requirements between councils and collection contractors.

The Victorian best practice kerbside system promotes a three-bin system with bin options for the kerbside collection of recyclables, organics and residuals, as follows.

- Recyclables bins: 120L, 240L and 240L split (to separate cardboard/paper from other recyclables)
- Residual bins: 80L, 120L, 140L and 240L
- Organics bins: 120L and 240L.

The best practice system has further options specific to the kerbside collection of recyclables with regard to frequency of service and size and type of bin. These are:

- 120L commingled, collected weekly
- 240L commingled, collected fortnightly
- 240L split bin, collected fortnightly.

Most metropolitan councils have implemented a best practice system, although for organics collection the service is optional, with some municipalities not automatically issuing households a bin. It is expected that as waste collection and disposal contracts are renewed, most metropolitan councils will move to best practice systems.

The current range of kerbside collection systems in place across metropolitan Melbourne generally varies between outer suburban councils and inner suburban councils. Appendix C shows which councils have introduced either a two-bin or three-bin service.

Almost all outer suburban councils provide residents with a three-bin option. The standard best practice kerbside configuration is:

- 120L residual, collected weekly
- 240L commingled recyclables, collected fortnightly
- 240L garden organics, collected fortnightly.

Inner urban councils provide residents with a two-bin option:

- 120L residual, collected weekly
- 240L commingled recyclables, collected fortnightly, or 120L commingled, collected weekly.

The three-bin system works well in outer urban areas, as there is good vehicle access to bins and significant generation of garden organics from gardens and lawns. In many other parts of Melbourne there are high-density developments within municipalities. These areas have characteristics similar to inner Melbourne waste generation and composition. This variation in density will affect the collection options and waste stream composition and will need to be taken into account in the development of future waste technology options.

In inner metropolitan Melbourne a two-bin service is offered – a 120L residual bin and 120L commingled bin, each collected weekly – because of restricted vehicle access and limited space to both store bins and place them at the kerbside. There is no dedicated organics bin, as there are fewer and smaller gardens and residential lawns. Many of the councils in these areas provide either an annual bundled garden organics collection or an on-call service.

Inner (two-bin) and outer (three-bin) councils that have implemented best practice kerbside systems have the highest diversion rates of recyclables across metropolitan Melbourne (Table 1). However it is clear that no one system will suit all metropolitan councils, because of the mix of materials being generated and diverted. The bin type and collection feasibility will also vary depending on access restrictions and limitations on home storage areas, as seen in the inner city municipalities.

Table 1: Comparison of diversion rates of kerbside waste in some inner and outer metropolitan Melbourne councils, 2006–07

COUNCIL	TOTAL WASTE KG/HHLD/YR	TOTAL WASTE (TONNES)/YR	DIVERSION RATE NET OF CONTAMINATION (%)•
"Inner" (two bin)			
Melbourne	504	21,199	20%
Port Phillip	550	32,030	29%
Yarra	677	21,346	39%
"Outer" (three bin)			
Casey	1,009	81,901	51%
Manningham	1,078	46,392	51%
Nillumbik *	984	19,562	67%
Melton	856	25,667	41%
Metro 30 councils	**900**	**1,315,119**	**43%**

Notes

- Diversion rate equals tonnes of recyclables and green organics collected (less contamination) divided by tonnes of garbage, recyclables and green organics collected.

* Nillumbik provides a weekly kerbside food organics recycling collection service within the garden organics bin.

The analysis of current and future resource recovery infrastructure needs within this Schedule is based mainly on the component of MSW sourced from kerbside collections, as this represents approximately 70 per cent of the total MSW stream. Recovering more resources from other components of the MSW stream – including household waste materials dropped off at transfer stations by residents, street sweepings and council litter bins – will increase diversion from landfill, but improvements in the kerbside component will have the greatest impact.

2.2 Current processing of collected material

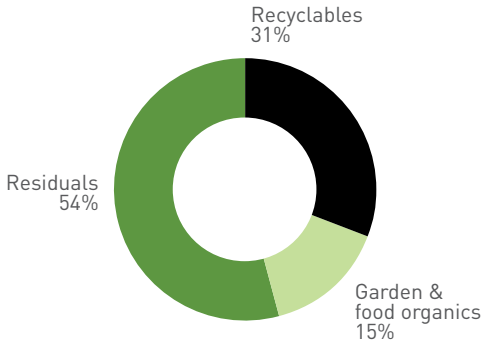
Currently all of the material in residual bins collected from kerbside goes to landfill. All recyclables are processed through a materials recovery facility (MRF) for segregation into different streams, baled or consolidated, and then transported off site to a processing facility. Garden and food organics collected from kerbside are processed at an organics processing facility. Table 2 shows the quantities of material collected from the kerbside compared with quantities processed. The difference between what is collected and what is processed is 'contaminated' material that is sent to landfill.

Table 2: Kerbside materials collected and processed from metropolitan Melbourne in 2006–07

MATERIALS STREAM	TONNES COLLECTED	TONNES PROCESSED
Commingled recyclables	403,100	364,200
Garden and food organics	203,300	203,000
Residuals	708,700	–
Total percentage diverted from landfill (net of contamination) = 43 %. This is 2 per cent above the Victorian average and includes only kerbside material.		

Figure 3 shows the percentage of kerbside materials collected from metropolitan Melbourne by waste stream.

Figure 3: Percentage of kerbside materials, by waste stream, collected from metropolitan Melbourne, 2006–07



Given the relatively high quantity of garden and food organic material in the residual waste stream, there is potential to recover additional organic materials from households. Accordingly, a review of existing kerbside materials (with a focus on commingled recyclables and garden and food organics), facility capacity and the potential for introducing new technologies and facilities has been undertaken as part of the development of this Schedule.

All major MRFs (greater than 20,000 tonnes per annum) across metropolitan Melbourne have also been reviewed. This review shows there is sufficient capacity to recover the envisaged future additional loads of commingled recyclables with the current mix of facilities.

Increasing the diversion of materials for recovery and re-use will not eliminate the need for best practice landfill. The Metropolitan Landfill Schedule, that forms Part 3 of the Strategic Plan, identifies the location and sequence for the filling and operation of landfill sites for the next ten years to 2017–18.

As part of the development of this Schedule, kerbside collection and disposal options have been assessed to increase the recovery of commingled recyclables, garden organics and food organics from kerbside. The waste collection and disposal options modelled for inner and outer metropolitan Melbourne are provided in Section 4 of this Schedule.

2.3 Future waste projections

Melbourne's population will grow significantly during the life of the Strategic Plan. The total quantity of waste generated will also grow, which will increase the quantity of waste to be recovered. Over the next 22 years, Melbourne is expected to grow by up to 1.2 million people[3] (an additional 495,000 households).

There will be key growth patterns during this period. High-density residential and mixed-use areas will include the suburbs of Sunshine, Knox, Cranbourne, Doncaster and Narre Warren.

Melbourne 2030 also identifies 'new major centres', which provide key new suburban development hubs across metropolitan Melbourne. Future key suburban development areas include Donnybrook, Rockbank, Werribee West and Officer. Any future waste collection systems will need to consider and plan for such areas as either high-density/high-rise or suburban developments as identified in *Melbourne 2030*. The Growth Area Authority has been established with a broad role in planning and development of Melbourne growth areas.

Using the latest population projections from the 2006 census results, metropolitan Melbourne is projected to generate an additional 2.3 million tonnes of solid waste (MSW, C&I, C&D) in 2030, compared to 2006–07. These projections are described further in Part 1 – The Metropolitan Plan, Section 1.7.

Modelling of future generation and recovery of MSW are presented in Table 3. The critical time points shown are the end point of TZW (2013–14), which corresponds with the first review point of the Strategic Plan; the expiry of the Landfill Schedule, which coincides with the second review point (2017–18); and the conclusion of the Strategic Plan (2029–30).

Table 3: Projected municipal solid waste generation, metropolitan Melbourne, 2006–2030

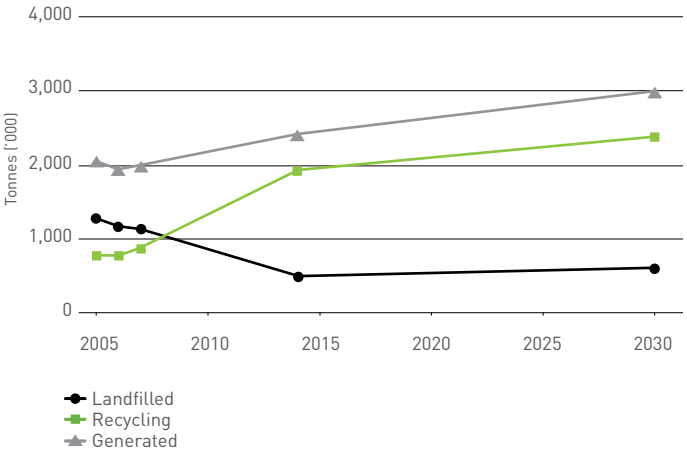
	YEAR DESCRIPTOR	GENERATED MSW	RECOVERED MSW	LANDFILLED MSW
2006–07	Base year	1,964,000	844,000	1,120,000
2013–14	TZW target	2,390,000	1,816,000*	574,000
2017–18	Landfill Schedule expiry	2,546,000	1,935,000*	611,000
2029–30	Life of Strategic Plan	2,965,000	2,253,000*	712,000

Note: * In deriving the TZW targets it is expected urban areas will out perform against the targets compared with the remainder of the state. This is because the economies of scale and concentration of waste generation make ARRTs more viable than in less densely populated areas.

2.3.1 Processing capacity required for MSW

Assuming current rates of waste generation and diversion for recycling are in line with TZW projections, it is estimated that at the metropolitan-wide level, the additional 495,000 households will contribute to an additional 1 million tonnes of residual materials being produced in 2030. By 2030, resource recovery processing capacity will need to be expanded to accommodate an additional 1.5 million tonnes of MSW material compared to the amount recovered for recycling or reprocessing in 2006–07 (Figure 4).

Figure 4: Projected municipal solid waste generation, metropolitan Melbourne, 2005–2030



Note: These projections are totals from the municipal sector, including kerbside collections, transfer station drop-off, council construction, street sweeping and litter. The quantities used in the analysis of options for MSW are modelled for kerbside collection only.

As this Schedule is required to focus on infrastructure needs for the next 10 years (to 2017–18), it must identify the availability of actual or potential processing capacity for 1.94 million tonnes of materials each year by 2018.[4] The required processing capacity can be broken down as follows:

- 400,000–450,000 tonnes per annum kerbside commingled recyclables (up from approximately 350,000 tonnes per annum at present)
- resource recovery of up to 900,000–950,000 tonnes of MSW garden and food organics from both kerbside organics collection and as residual organics in mixed waste[5]

[3] Australian Bureau of Statistics: 2006 Census

[4] Waste and recovery figures, and estimates of required processing capacity are based on internal Sustainability Victoria modelling and estimates of the level of recovery required to achieve TZW and Strategic Plan objectives.

[5] There are limits to the amount of organics that can be recovered through source separation. The TZW estimates for recovery of organics assume high rates of resource recovery of organics in mixed residual waste. Resource recovery includes energy recovery from biogas derived from organics, as well as physical processing of materials into recycled organic products.

- up to 650,000 tonnes of other municipal transfer station and hard wastes (up from approximately 160,000 tonnes per annum at present), consisting mainly of small vehicle loads delivered by householders and small to medium enterprises. This material contains recoverable resources including cardboard, rubble, clean soil, timber, metals, organics and other materials and mixed-component items. In most instances, the required recovery infrastructure considered by this schedule consists of drop-off and separation capacity at transfer stations, with materials being transferred to other private sector processing facilities.

These figures are for municipal wastes from kerbside collection and transfer station operations, and do not include materials from C&I and C&D sources that do not pass through council-provided collection or drop-off facilities. The issue of building capacity for processing C&I and C&D waste through a combination of source-separated and mixed-waste processing facilities is addressed in Part 1 – The Metropolitan Plan, Section 4.4, and is outside the scope of this Schedule.

2.4 Shifting focus to products from waste materials

The imperative to reduce carbon emissions will impact on the waste sector. While the sector will continue to focus on minimising waste, a resource efficient future will need to recirculate waste into products such as viable soil conditioner, a source of energy and inputs for a range of industrial uses. This will require infrastructure for the processing of organics and continual improvement of other collection and processing infrastructure.

Further discussion on generating products from waste materials is provided in Part 1 – The Metropolitan Plan, Section 1.5.

2.4.1 The major challenge – recovery of organics

Garden and food organics remain the largest component by weight of landfilled MSW. These materials pose significant greenhouse and other environmental risks in landfills, and are therefore a high priority for recovery.

TZW sets an ambitious statewide target of 65 per cent diversion of MSW waste from landfill by 2014 (although recovery levels in the metropolitan area are expected to be greater than this). About 70–75 per cent recovery of garden and food organics is needed in order for Victoria to meet the statewide target; the current recovery rate for food and garden organics is less than 30 per cent. Resource recovery from organics includes the recovery of renewable energy and recycled organic products such as composts, mulches and organic fertilisers and soil conditioners.

Existing composting facilities have limited capacity to increase the recovery of garden and food organics. New processing infrastructure is required. A proportion of garden and food organics are recoverable through source-separated organics recycling collection services, but an organics component will remain in household garbage. It is anticipated that a combination of source-separated and mixed-waste processing facilities will be developed through implementation of the Strategic Plan.

It is the intent of this Schedule that the processing of organics and residuals through advanced resource recovery technologies (ARRTs) will be promoted. Such 'controlled environment' technologies will typically:

- contain and manage all emissions to air, water and land
- increase resource recovery from waste
- produce more consistent and higher quality products than current techniques.

ARRTs considered in this Schedule include:

- source-separated technologies, such as controlled environment aerobic composting, anaerobic biodigestion with biogas energy recovery, and potentially thermal energy recovery systems, such as gasification, pyrolysis or direct combustion;
- mixed-waste processing technologies capable of recovering recyclables (metals, plastics, glass, some cardboard and paper), and gaining utility from the organics component (including garden and food organics, soiled paper/cardboard, and other biodegradables, such as nappies and other hygiene products and textiles).

An assessment of different technologies modelled in this Schedule is provided in Appendix D.

The ARRTs that are developed will depend on procurement processes, and the extent to which proponents of technologies can demonstrate to MWMG, users, councils, and other stakeholders that technologies and supporting business plans will cost-effectively and viably achieve high environmental and social outcomes.

3 Existing infrastructure and future recovery opportunities

This section provides an overview of the infrastructure currently operating to recover and process waste material in metropolitan Melbourne. Taking into account the changing conditions identified in section 2, this section also outlines and analyses:

- the importance of education about waste and resource recovery to maximising existing and future infrastructure
- the infrastructure that is available to receive, sort and recover materials for re-use, resale and/or movement on to a reprocessing facility
- the infrastructure that is available to process and reprocess material for use in the generation of new products and services
- future opportunities to improve the resource recovery rates from the kerbside-collected residual waste stream
- future opportunities to recover and process more material from the entire municipal solid waste stream.

There is a range of existing facilities located across metropolitan Melbourne currently recovering and processing waste materials as shown in Table 4. For the purposes of this Schedule, these facilities are defined as those established to receive and process MSW.

Table 4: Number of existing resource recovery facilities across metropolitan Melbourne, July 2008

	FACILITY TYPE	TOTAL EXISTING FACILITIES	TOTAL PROPOSED/ UNDER CONSTRUCTION FACILITIES
Recovery	Transfer stations	38	2
	Resale centres	7	1
	Materials recovery facilities	10 (includes 2 temporarily closed)	3
Processing	Organics (sites >20,000 tpa)	9	2 proposed identified
	Reprocessors (paper/metals/ plastic recyclers)	102	1
Residuals	* Landfills (putrescible and Inert)	21	2

Note: Whilst landfills are not part of this Schedule, and are dealt with separately in Part 3 – Metropolitan Landfill Schedule, some landfills still undertake some recovery and recycling activity via transfer stations on site.

3.1 Waste and resource recovery education

Waste and resource recovery education and support programs developed by local government, the MWMG and Sustainability Victoria have been integral to the success of kerbside recycling systems across Melbourne. Future recovery opportunities will continue to be maximised through community education about waste minimisation principles (i.e. reduce, re-use, recycle) and specific programs targeting actions that improve the quality of feedstock to processing facilities.

Most resource recovery options rely on the community to separate materials at the household level, and if this is not done properly, processing efficiencies are reduced and the resultant recycled materials are degraded because contaminants have not been totally removed.

Local government education programs informing the community about how to use their kerbside service and other options for disposing of material are vital to reducing contamination and ensuring that the composition of materials sent to processing facilities is suitable. Education will continue to play an important role in matching collection systems and resource recovery infrastructure in the future.

Part 1 – The Metropolitan Plan outlines the principles of best practice community education and engagement and provides examples of successful waste minimisation, re-use and recycling programs.

To successfully educate their communities, local governments use a broad range of tools, resources and approaches, including:

- waste services brochures
- website content
- signage and stickers on bins and collection vehicles
- 'follow your waste' tours
- media and newsletter articles
- bin inspection programs
- seminars, displays
- schools programs.

The MWMG, in conjunction with local government and other agencies, is well positioned to build capacity in this area and ensure that educational approaches, programs and tools are consistent across the metropolitan area.

3.1.1 Reduction strategies

Waste reduction – and avoiding the creation of waste in particular – typically results in the lowest environmental impacts. Government agencies will continue to promote reduction of waste to the community through strategies such as:

- purchasing items with less packaging, and less non-recyclable packaging
- purchasing durable products and products supported by take-back or other recycling systems
- purchasing and preparing food to reduce waste (an example of a campaign to look at such consumption practices is the *Love Food Hate Waste* from the United Kingdom – see boxed text)
- low waste gardening
- home composting.

Government agencies will continue to support sustainable initiatives in these areas to reduce waste and increase resource recovery.

It is difficult to reduce waste at the source. In broad terms, it requires a significant change in the community's attitude on the issue of consumption. High demand for scarce resources is expected to continue. The Strategic Plan and this Schedule assume that current trends in waste generation per capita and per unit of economic growth (Gross State Product) will continue. The waste volumes used in the Schedule may be conservatively high if significant waste reduction occurs.

CASE STUDY

Love Food Hate Waste

The UK government backed a campaign called *Love Food Hate Waste*, which was launched in 2007. In addition to press advertising and a supporting public relations campaign that features celebrity chefs, home economists and well-known personalities, the *Love Food Hate Waste* campaign features a website that gives advice, ideas on food preparation, storage, portioning and recipes.

The impetus for the campaign came from research undertaken by Waste and Resources Action Program (WRAP), which found that UK householders throw away one-third of the food they buy.

The *Love Food Hate Waste* campaign has been created to raise consumer awareness of the issue and provide information on the simple steps that can be taken to combat the problem, which has a significant environmental impact. The greenhouse gas impact of food thrown into landfill was seen as only one component of the problem. It was considered that all the embedded energy used to produce, package, transport and deliver the food to homes produces the equivalent of at least 15 million tonnes of carbon dioxide every year in the UK. For more information go to **www.lovefoodhatewaste.com**

Large-scale, local solutions

Although this Schedule focuses on larger scale infrastructure solutions, it acknowledges the principle that sustainable waste practices should begin in the home. This principle is supported, and should continue to be supported, through collaborative and innovative public sector behavioural change programs. Such programs include Sustainable Homes, and all programs with elements about waste reduction and management (e.g. home composting, low waste gardening, etc.) in the home.

3.2 Recovery facilities

In this Schedule, the term 'recovery facilities' refers to the group of facilities set up to receive, sort and recover materials for re-use, resale and/or moving on to a processing facility. The evolution and success of these facilities (through the support of the community, government and business) is directly linked to an ongoing commitment to, and promotion of, waste generator sorting, whether by the householder, individual business or government entity. A better quality input to these facilities (i.e. containing less contamination) supports greater opportunities for re-use, resale and/or processing of the material received.

3.2.1 Transfer stations or resource recovery centres

Transfer stations were originally developed to provide bulk-haulage options for councils to consolidate the materials (waste and/or recyclables) collected by them and/or dropped off by residents and then bulk-haul these materials to either a landfill or a processor.

Although most kerbside-collected materials are now directly hauled to landfill or processing facilities, there are still 15 municipal-based transfer stations from which waste is bulk-hauled to landfill for disposal. The majority of the material received by these transfer stations is delivered by residents or commercial collectors.

Over the past 15 years the number of landfills across metropolitan Melbourne has decreased, while the number of transfer stations has grown to 36. Refer to Appendix E for the sites of both private and local government owned transfer stations across metropolitan Melbourne.

Over the past decade, transfer stations have evolved into resource recovery centres (RRCs) with a focus on the diversion of materials from landfill. This has coincided with an expanded range of drop-off services for both local residents and businesses. Where traditionally transfer stations received solid inert waste such as building waste, garden organics and domestic hard waste (such as furniture and other household items), RRCs now take a broad range of items including the following:

- plastics
- paper/cardboard
- metals
- timber
- concrete
- garden organics
- paints
- motor oil
- household chemicals
- car batteries
- e-waste
- white goods
- gas bottles.

Other innovations at RRCs include the establishment of resale centres and product stewardship programs such as Byteback.

There is potential to further expand recovery services from the residuals stream sent from RRCs to landfills to include high-volume materials and items such as mattresses, used carpet and mixed component household items (e.g. computers and mobile phones) containing recoverable resources.

Existing mattress recycling operations have focused on recovering mattresses from council hard waste collection services, charities and institutions. The number of councils participating in these services has increased in recent years. There is potential to establish additional drop-off facilities for mattresses at transfer stations.

Markets for textile fibres recovered from used carpet are currently limited. Potential markets include thermal energy recovery or textile recycling. If these markets are developed, drop-off services for carpets could be established.

General household waste received at RRCs contains potentially recoverable metals, plastics, timber and/or high calorific materials for energy recovery. Facilities to process these items and to extract resources are yet to be developed. If they are developed, RRCs would be suited to handling this material.

These facilities have been a focus for ongoing upgrades to improve the range and efficiency of materials recovery, and this continual improvement will be important in the future. It is important that linkages to the planning system, that support and promote the maintenance and development of these transfer facilities, are established.

Resale centres

Resale centres developed from the opportunity to add value to and sell items delivered to transfer stations. While this trade has taken place for over the past 15 years, in the past decade it has evolved into a business opportunity.

One of the first large-scale resale centres was established outside metropolitan Melbourne at Eaglehawk, near Bendigo. This site has provided a blueprint for many other operators who have established resale centres throughout metropolitan Melbourne.

One of the largest operators has four resale centres across metropolitan Melbourne. These centres have been established adjacent to landfills and transfer stations. All loads that are identified as including items of value are diverted at the gate to the appropriate location within the facility for assessment, recovery and resale. The sites have workshops, which allow staff to carry out repairs or disassemble items for recovery of component parts.

A number of these resale centres also provide full and part-time employment.

Byteback

The Byteback program was an initiative started in 2005 by EcoRecycle Victoria (now Sustainability Victoria) and Hewlett Packard to assist the information communications technology (ICT) sector to take responsibility for its products.

The program provides a free drop-off service and transfers discarded computers and associated products such as printers, faxes, scanners and monitors to a commercial recycling facility that dismantles and recycles the component parts of the computers. The first site was established at the Boroondara transfer station in Camberwell. Since 2005, Byteback has diverted 1120 tonnes of computer waste from landfill and seven further drop-off locations across Melbourne and major regions have been established in conjunction with ten leading ICT brands.

Detox Your Home program

The Detox Your Home program provides a free mobile and permanent drop-off centre service for a range of unwanted household products, such as weed killers, pool chemicals and household cleaning products. Permanent centres accept only:

- fluorescent lighting tubes
- paint
- motor oil
- gas bottles
- household batteries
- car batteries.

Residents are able to deliver these unwanted household items and chemicals to the site at no charge. The chemicals and household items are collected and sent to an Environment Protection Authority-approved facility for treatment and disposal. The first centre was established at the Geelong Resource Recovery Centre. There are currently a number of Detox Your Home centres across metropolitan Melbourne.

3.2.2 Material recovery facilities (MRFs)

Material recovery facilities (MRFs) are a key part of the recycling infrastructure mix for metropolitan Melbourne. All commingled recyclables collected at kerbside are transported to MRFs for the segregation of material streams. These segregated streams are compacted and baled or consolidated and then transported off site to processing facilities to be used in the manufacture of new products. The MRFs also receive and segregate commingled materials sourced from commercial and industrial sources.

All existing MRFs are operated privately. Across metropolitan Melbourne there are eight sites, giving a good spread of sites and operators (Table 5, and Appendix F for a map showing the sites). The high capital costs of establishing an MRF means that a critical factor for operators is the guarantee of large volumes of materials and long-term contracts.

Table 5: Sites sorting commingled recyclables

COMPANY	LOCATION
Dasma Recycling	Lilydale
JJ Richards	Hallam
SKM	Coolaroo
Thiess	Coburg
Thiess	Hallam
Visy	Springvale
Visy	Bellfield
Visy	Laverton

The sorting of paper and containers at MRFs has been greatly improved over the past 15 years. A modern semi-automatic facility can now sort 20 tonnes per hour with a staff of 16, which represents the throughput required for a fortnightly kerbside collection service of up to 140,000 homes.

These specialist facilities are designed to handle domestic waste and some C&I collections. In the past, nearly all MRFs collected only plastics coded 1 to 3. With new markets and technology advancements, most of these facilities now have the capacity to sort all rigid plastics coded 1 to 7.

With the introduction of optical sorting, MRF productivity has been further enhanced, which has resulted in the reduction of labour at some facilities.

There is a strategic network of MRFs across metropolitan Melbourne that have the capacity, through the introduction of new technology or expansion, to handle the increased volumes expected during the life of this Schedule. This includes expected increases in the quantity of materials to be processed from the adoption of best practice by all metropolitan Melbourne councils for collection of commingled materials.

3.3 Processing facilities

The term 'processing facilities' is used in this Schedule to describe facilities that either receive materials directly from collection systems or from recovery facilities (described in the previous section) for further sorting and/or processing to provide material for use in the generation of new products. For example, organic processing facilities might use a range of technologies that convert organics into valuable products, including renewable energy, organic fertilisers, soil conditioners, mulches and crop treatments. Other processing facilities (commonly termed reprocessors) accept a range of metals, glass, plastics and other materials for further refinement from sorting facilities such as transfer stations and MRFs.

3.3.1 Reprocessors

There are a number of reprocessing facilities, identified in Table 4, which accept a range of metals, glass, plastics and other materials, once separated at sorting facilities such as transfer stations and MRFs. Reprocessing facilities are diverse, and their scale and type are in direct response to the provision of suitable (well-sorted) material of a consistent quantity. Therefore the number and specific types of reprocessing facilities changes over time when compared to other infrastructure facilities servicing MSW. A number of these facilities will also reprocess material from C&I and C&D waste streams where the opportunity is available. Reprocessing facilities can be located in a range of industrial areas, and no significant barriers are identified to the private sector developing additional processing capacity as required. These facilities are exposed to changes in domestic and international markets.

3.3.2 Organics processing

TZW projects that a total of 1.1 million tonnes of garden and food organics will be recovered in the metropolitan area by 2014, up from approximately 250,000–300,000 tonnes per annum in 2006–07[6]. This is expected to use a combination of source-separated and mixed-waste processing technologies to be secured through competitive procurement processes. The development of these facilities and the selection of technologies will be market driven, with an emphasis on technologies that convert organics into valuable products, including renewable energy, organic fertilisers, soil conditioners, mulches and crop treatments.

Current facilities

Within the metropolitan area, there are nine major composting facilities processing a total of approximately 250,000 tonnes of garden and food organics per annum sourced from both the municipal and the C&I sectors. These facilities are well located across metropolitan Melbourne (see Appendix G for a map showing current major garden organic facilities). Smaller operations process a total of up to an additional 40,000–50,000 tonnes per annum. Recent revisions to the *Environment Protection (Scheduled Premises and Exemptions) Regulations 2007* require all existing operations with a capacity of more than 100 tonnes per month of input material to be licensed. Licensing requirements will likely result in the need to upgrade some facilities, or alternatively reduce the volumes of materials processed at some sites. Table 6 details the major garden and food organics sites and amount of materials processed each year.

Table 6: Major garden and food organic facilities, processing 20,000 tonnes or more per annum

COMPANY	LOCATION	CURRENT TECHNOLOGY USED
ANL	Coldstream	Covered aerated static windrows and turned maturation windrows
Consolidated Waste	Dandenong	Open turned windrow aerobic composting Developing fluidised-bed gasifier energy recovery facility to process clean woody organics including timber and some garden materials.
Mossrock*	Epping	Open turned windrow aerobic composting
NRS*	Dandenong	In-vessel/tunnel aerobic composting
PineGro	Truganina	Open turned windrow aerobic composting, with basic cover system
SITA*	Brooklyn	Open turned windrow aerobic composting
TPI	Pakenham	Open aerated static pile composting and turned windrow
Waste Converters	Lyndhurst	Open turned windrow aerobic composting
Enviromix	Dingley	Open turned windrow aerobic composting
Total processed at identified sites per annum		**250,000 tonnes per annum**
Total processing capacity at existing sites without significant upgrade or expansion		**up to 320,000 tonnes per annum**
Total potential expanded processing capacity at existing sites		**up to 370,000 tonnes per annum**

Note: * These facilities have an EPA licence or exemption to accept food on site. At the time of writing, many EPA licences for composting facilities were under review.

Issues with existing sites

A number of the existing major composting sites have a history of odour complaints and EPA and local government enforcement action. The Victorian Government favours moving to a mix of organics processing technologies with more controlled environment processing systems appropriate for locations susceptible to off-site odour and other environmental risks. Controlled environment processing has the advantage of consistent management of materials, producing consistent and higher quality products.

Whilst the current key facilities have the capacity to accept additional kerbside collections, a number of these sites continue to operate open windrows on sites with limited potential for expansion. If volumes are to increase, technology improvements or site relocations may become necessary.

[6] The *Local Government Survey 2006–07* shows that approximately 203,000 tonnes per annum of garden and food organics waste was collected at kerbside from metropolitan Melbourne municipalities. A small amount of MSW food is recovered through kerbside services. A further 50,000 to 100,000 tonnes per annum of garden organics from drop-off facilities is processed, with other material that comes from C&I sources such as markets, the food industry, market gardens, water treatment plants, and supermarkets. These figures may understate the potential for annual recovery of organics through existing organics kerbside and drop-off collection systems. Over the past five years, Melbourne has experienced the lowest rainfall for a five-year period on record, and this has reduced the volumes of garden waste generated. Composters report that volumes of bin-based organics collected and processed was lower than expected – down by as much as 20 per cent by weight, or in the order of 40,000–50,000 tonnes in 2006–07.

Existing sites are close to full capacity

Existing sites are close to full capacity with, at the most, potential for another 50,000–70,000 tonnes of materials to be processed with significant upgrade or expansion (Table 6). This capacity is not sufficient to process expanded garden organics collection services, but should be sufficient in the immediate term to meet demand should 'normal' or above average spring rainfall result in high levels of plant growth and generation of organics. The most significant shortfall in processing capacity is that for processing food organics. This is discussed in Section 3.3.3 below.

The recycled organics processing industry is still in its establishment phase and will need continued support from all elements involved in the recycled compost supply chain to achieve the level of commercial stability now experienced in the commingled kerbside recycling industry.

Short-term risks to current processing capacity include:

- commercial failure of existing processors, putting pressure on remaining facilities
- a change in rainfall patterns, reversing the downward trend in organics waste generation rates and putting pressure on processing and marketing capacity
- legislative/regulatory restrictions to processing activity.

If the capacity of existing sites is exceeded, interim alternatives such as low-grade processing for use in rehabilitation of former landfill and quarry sites, or if landfill is unavoidable, landfilling to sites with high levels of landfill gas recovery will need to be considered until additional processing capacity is established. These are not preferred options, and efforts will be made to avoid the need to employ them. Proponents of such options will be required to demonstrate compliance with, and approvals for, all relevant EPA and local government planning and environment requirements. Preference is for facilities that produce the highest environmental outcomes.

Potential expansion of existing facilities

Of the major sites identified, several could potentially expand composting operations to include more garden and food organics (Section 3.3.3) with a significant upgrade to controlled environment composting. An indicative cost to upgrade to relatively 'low tech' controlled environment composting is $3-5 million per site. Higher technology composting such as fully housed 'tunnel' composting will incur costs of $5–10 million per facility depending on the size of the facilities. Any upgrades of facilities will occur in response to competitively tendered contracts for processing municipal bin-based garden collections or combined garden and food organics collections.

Future procurement considerations

As the recycled organics industry is still in its establishment phase, its long-term sustainability will have to be carefully considered in any procurement process. Any business case being developed for a specific ARRT proposal will need to be sensitive to the broader issues facing the industry and give due consideration of factors such as:

- current and future processing capacity to meet projected growth in the volume and type of organic material to be processed over the life of contracts;
- capacity of processors to process food and other organics within their operations;
- impact of a major technology provider on existing contracts and associated markets, (i.e. market oversupply and general destabilisation of a relatively immature industry sector);
- appropriate quality management systems such as ISO 9000, AS 4454 and/or 'Certified Compost' certified by a recognised professional industry cooperative to be required under contract conditions to guarantee high-quality recycled organic products that will drive long-term success in the industry;
- appropriate systems and technologies across the collection and processing systems to minimise contamination. This will require councils and collectors, in partnership with processors, to continue to play a role in community education and enforcement with processors to look towards improved technology in product cleaning equipment.

The concept of a 'compost supply chain' needs to be actively promoted to all those involved in it, including councils and their communities, state government, commercial retailers as well as the processing industry. In such an immature industry, opportunities to develop markets should not rest on the industry alone, but be supported by all participants. In particular, local government, state government and the processing industry are seen as key partners in the development of a sustainable industry. Creating opportunities for the use and promotion of products in public works such as parks and gardens, recreational surface establishment and maintenance and other urban amenity works will be a necessary consideration in any procurement process. There is also a potential to identify other uses, such as land rehabilitation, for lower value residuals from reprocessing or periodic market oversupply.

3.3.3 Food organics processing

The recovery of the food organics household waste stream holds the key to significant increases in diversion from landfill and to providing a contribution to greenhouse gas abatement. The recovery of food organics at kerbside is essential if the TZW targets are to be achieved.

Current facilities

Currently there are three facilities licensed to process food organics within metropolitan Melbourne. One of these facilities sources food organics from municipal sources, whilst the other two source food mainly from commercial and industrial sources. Refer to Appendix G for a map of licensed food organics processing facilities. At the time of writing, the EPA licences of many composting facilities were under review and it is possible that at least one other composting facility will be able to process additional food organics in the future.

Collection systems

Food organics can be either recovered through source-separated organics recycling or mixed-waste residual garbage collection.

Kerbside waste audits undertaken across Melbourne from 2006-08 reported that households produced approximately 4.5 kilograms of food organics in the residual bin per household per week. It is estimated that the food organics component comprises over 40 per cent of the current residual waste stream. On this basis, the introduction of a mixed garden and food organics kerbside collection service across metropolitan Melbourne, could provide a significant increase in the tonnage of materials diverted from landfill. Food organics are a relatively heavy material due to their high water content. This means that although they are a significant contributor to the weight of wastes, they represent a relatively small volume in residual bin collections, contributing a few litres of bin contents per week. There is potential to include food organics in existing or expanded garden organics collection services, without significantly increasing the volume of organics collected through these services. Due to actual and perceived odour issues, however, kerbside organics recycling services containing food organics may have to be collected weekly rather than fortnightly, adding to service costs.

The recovery of food organics through source separation requires householder 'buy-in' to be effective. Results elsewhere suggest that as little as half of available food organics would be collected through source-separated organics recycling collection services[7]. This would leave a significant proportion – in the order of 20–30 per cent by weight of the total garbage stream – of food and other organics in the residuals garbage waste stream. There is potential to recover these organics through ARRT mixed-waste processing of residuals garbage. To achieve TZW objectives, such recovery from residuals garbage will be required.

The extent to which councils promote source separation of food organics through kerbside organics recycling services will depend on procurement processes for collection and processing services, and the cost differential between processing source-separated organics compared to processing mixed waste.

Collection frequencies

A key issue in determining the cost-effectiveness of a source-separated garden and food organics service will be the frequency of collection of organics and/or garbage. One metropolitan council currently provides a regular food organics kerbside collection service (the Shire of Nillumbik, see case study below). Nillumbik has adopted weekly collection of organics, and fortnightly collection of residual garbage. Other councils are currently investigating such a collection.

These, as well as other site-specific issues, will be investigated as part of a detailed business case development phase within a specific project procurement process.

3.4 Residuals

One purpose of the Strategic Plan is to identify and lead to opportunities to improve resource recovery rates out of the residual waste stream.

Melbourne councils collected nearly 710,000 tonnes of residual material in 2006–07, all of which went to landfill. Greenhouse gas emissions from this material are conservatively estimated at 215,000–360,000 tonnes CO_2-equivalent (assuming net emissions of 300–500kg CO_2-equivalent per tonne of landfilled MSW)[8]. Currently there is no pre-treatment or processing of waste prior to landfilling in metropolitan Melbourne. In some cases residuals are consolidated at transfer stations and these loads are bulk-hauled to the most cost-effective landfill.

3.4.1 Recovery opportunities within existing systems

The residual waste stream contains valuable resources (recyclables account for 15 per cent, and organics and other biodegradable materials such as soiled paper and nappies account for over 40–50 per cent) that can be recovered to achieve the benefits of lower greenhouse gas emissions and higher resource recovery.

Effort will be made to further increase the recovery of recyclable containers and paper products through source separation. Effort will also be made to reduce organics in residual garbage through greater recovery through existing and expanded organics collection services and the promotion of waste reduction and home composting.

[7] Hyder Consulting (2006a) TBL Assessment of Domestic Food Organics Management for the NSW Dept of Environment and Conservation, www.environment.nsw.gov.au/resources/2007153_TBLassessment.pdf

[8] The Australian Greenhouse Office uses a figure of 900–1100kg CO_2-equivalent per tonne of MSW to landfill, but this assumes no landfill gas capture. The 300–500kg CO_2-equivalent figure cited here is derived from Sustainability Victoria modelling of net gas emissions from MSW assuming 40–60 per cent gas capture over the entire period that organics generate methane, 10 per cent 'sequestration' of carbon in landfill, and conversion of recovered gas to electricity replacing brown coal electricity.

3.4.2 Source-separated or ARRT mechanical recovery

Increased recovery rates from the residual stream can be achieved through:

- building on the current approach to source separation (food organics separation, greater household participation and recycling diligence in general)
- 'end of pipe' biological and mechanical technology approaches with the emphasis on mixed waste ARRT facilities to separate and process the residuals stream.

The actual tonnage of residuals recovered through these approaches will depend on the tonnage of garden and food organics recovered through source-separated services and the type and extent of recovery technologies introduced across metropolitan Melbourne.

3.5 Additional recovery and processing

There is a range of additional opportunities to recover and process more material from the MSW stream. Opportunities arise from improving the systems that are currently in place, including kerbside and hard waste collections, the management of waste in multiple-unit dwellings and better litter management. Further opportunities should emerge through the introduction of new programs, technologies and facilities to respond to changing lifestyles and demands.

3.5.1 Improved kerbside collection

Managing contamination

Separation of waste materials at source (e.g. using separate bins at home) is fundamental to promoting cost-effective resource recovery and processing. Separation by the resident helps to reduce the labour and energy required to sort materials and manage contamination at processing sites. Comprehensive education programs about the appropriate use of the kerbside system are required to improve kerbside collections by reducing inappropriate disposal of potentially hazardous materials and items that damage processing infrastructure and end-product markets.

Standardised collection systems

In metropolitan Melbourne there are two systems designed to assist the additional recovery and processing of MSW.

- In the outer suburban area there is a three-bin system with separate collection for:
  - commingled recyclables
  - organics (garden and food)
  - residuals.
- In the inner suburban area there is a two-bin system with separate collections for:
  - commingled recyclables
  - residuals.

Although these systems are currently used by most councils in metropolitan Melbourne, there are variations in regularity and service provision between councils. With the prospect that a 'mix' of processing technologies may be introduced across metropolitan Melbourne over time, education and promotional strategies will need to be more broadly addressed before new systems are implemented.

Best practice kerbside service

Increased take-up of best practice kerbside service through education, infrastructure improvements and enforcement will help increase the recovery of recyclables and garden organics from the kerbside materials stream. The adoption of alternative waste recovery combinations will further increase the source-separation opportunities at kerbside without additional collections.

Business recycling

Resource recovery may be extended by integrating collections from the C&I sector into councils' current kerbside collections. These collections could include paper/cardboard, plastics, metals, organics, timber and mixed waste.

Kerbside innovation

There are a number of metropolitan Melbourne councils that have trialled and introduced innovative kerbside recycling collections to further increase the diversion of materials from landfill. The case studies in boxed text are just two examples of these innovative approaches.

CASE STUDY

Nillumbik – food organics

In late 2003, the Shire of Nillumbik introduced its GRO (green, recycling and other) waste-collection service that provides a 120L weekly kerbside collection service for food and garden materials. The provision for food in the garden organics bin has improved the overall kerbside diversion rates for the shire. In 2006, waste stream audits carried out in six northern based councils found that within the residual waste bin, the food stream ranged from 44–46 per cent by weight and in the Shire of Nillumbik, 19 per cent.

The GRO service has encountered some ongoing contamination issues and these are being reviewed. New communication and educational material will be trialled and then more broadly rolled out to improve the community's understanding and usage of their organics collection. The outcomes from this project will be valuable for other councils considering the introduction of food organics collection.

Moonee Valley – day-after collection for household goods

In May and October 2007, the City of Moonee Valley trialled a new kerbside recycling collection service targeting household goods, known as Re-new. During the trials householders could use their existing kerbside recycling bin to place goods at the kerbside the day after the usual recyclables collection. Goods accepted included clothing, textiles, printer cartridges, mobile phones, toys and unwanted household items. The trial involved 5750 households and diverted approximately 116 tonnes from landfill.

A 13 per cent participation rate was achieved with approximately 40 kg of materials recovered per household. From the trials it was estimated that conducting four council-wide collections each year would divert additional 3–5 per cent of material by weight from landfill over the long term.

The introduction of the Re-new program across metropolitan Melbourne councils could provide an additional opportunity to recover material that is currently being disposed of in the residuals bin.

Plastic containers

Most metropolitan councils are now collecting rigid plastics coded 1 to 7 as part of the commingled materials stream. Councils have identified that most MRFs will now accept these codes of plastics for recycling. This offers a minor increase in the volume of recyclables, which should be manageable within the current best practice systems. It also makes recycling easier for householders as these coded plastics can be recycled through the kerbside service.

3.5.2 Hard waste

Across Victoria, over 63,000 tonnes of hard waste were collected in 2006–07, which is an average of 46 kg per serviced household, at a collection cost of about $6 per household. Of that tonnage, 55,000 tonnes were disposed of to landfill, representing a 13 per cent diversion rate. In addition to kerbside-collected material, this stream also includes dumped rubbish that is dumped in laneways, creeks and streets.

Collection systems used

Many councils continue to operate municipality-wide collections once or twice a year. In most cases separate trucks are used for the collection of recoverable items before the waste items are collected for disposal to landfill. On-call hard waste collections have been implemented by some councils using a mixture of 'as of right' and 'user pays' approaches. Using systems that minimise damage to collected items when they and other recyclable materials are taken to facilities for sorting, repair, recycling and resale is progressively increasing resource recovery through such services. Once sorted the recoverable items are then passed on to third parties for sale or sold through a resale shop at the recovery centre where the sorting occurs. Another advantage of on-call services is that the types of goods to be collected can be broadly identified when bookings are made and collection may be possible from within the property rather than at kerbside.

Another approach that can be used is for skips to be provided for collections at kerbside. These can then be taken to a sorting facility for recovery of materials before the residual is disposed to landfill.

Drivers for change

While nearly all metropolitan councils provide kerbside hard waste collection services, the type of service provided has been changing in recent years, which has been driven by councils seeking to address concerns related to scavenging, occupational health and safety, inefficient service provision and recovery of resources. Hard waste collection systems are expected to keep evolving, particularly as product stewardship arrangements are made for some products.

Work Safe has prepared draft guidelines on Safe Collection of Hard Waste, with contributions from councils, industry and the MWMG. The application of these guidelines will drive further change in the types of hard waste collection services councils provide.

Local government and consumers currently share the cost of collecting household waste for landfill or recycling, but the idea of 'shared responsibility' for waste is beginning to shape government policy and the thinking of various industry sectors. There is growing interest in the idea of manufacturers taking greater responsibility for the environmental impacts of their products. Product stewardship puts a value on residual waste

at the time a product is produced rather than externalising end-of-life waste costs as is currently the norm. Future hard waste service requirements will need to adapt to a growing range of waste products that can be recovered through product stewardship programs similar to Byteback.

3.5.3 Multi-unit dwellings

As Melbourne continues to grow so does pressure to maximise housing potential in the existing urban areas, which can be seen in the increasing number of large residential multi-unit developments throughout Melbourne. This trend is expected to continue.

State government and council planning conditions and building controls placed on multi-unit developments about on-site waste management vary in type and effectiveness across metropolitan Melbourne. The approach to maximising resource recovery opportunities from proposed multi-unit dwellings is an important area for improvement.

Sustainability Victoria is currently preparing best practice guidelines for the collection of recyclables at multi-unit dwellings. These guidelines will provide the basis for further discussion about the incorporation of consistent planning principles for the management of waste in large-scale multi-unit developments.

In the majority of cases, established multi-unit dwellings are not designed to incorporate good at-source separation and collection. Some sites are treated as a C&I premises rather than being serviced by the council. Residents wishing to change from services provided by C&I collection contractors to council services can create difficulties when trying to match expectations of level of service to physical and design constraints. Important factors such as the commitment of residents to share bins, collection access and designing for separation (i.e. multiple waste chutes) need to be considered and worked through.

3.5.4 Improved away-from-home collection

The continuing challenge for councils and other public place bin owners/operators is to provide adequate bin infrastructure to meet people's needs away from home. There are a number of considerations, including infrastructure cost, amenity impacts and fostering responsible behaviour. Once collection bins have been put in place, contracts for collection and disposal follow.

According to *Local Government Data Collection 2006–07* there were 20,800 litter bins in place across metropolitan Melbourne collecting a total of 21,000 tonnes of waste per annum. Either private contractors or council staff empty these bins. All of this waste is currently being sent to landfill for disposal. Sustainability Victoria notes that data provided about public place bin collection is generally poorly recorded, with figures varying considerably from one year to the next.

Whilst this Schedule does not specifically look at recovery options for waste from litter bins, councils should be aware of the magnitude of the issue and assess opportunities for this waste to be recovered. In some instances, the value of recyclable containers in litter is significant, and it may be viable for appropriate ARRT operations to extract aluminium and plastics from a mixed stream. Separating recyclables at source in public places presents an opportunity for improved resource recovery.

Evolving consumption patterns clearly indicate more people are eating and drinking away from home, resulting in more away-from-home waste. There is an opportunity to recycle more wastes collected from major sporting and commercial venues, events, gathering points, tourist spots and municipal sites across metropolitan Melbourne.

Sustainability Victoria released *Public Place Recycling: Best Practice Guidelines* in April 2007. Implementation of public place recycling at sites and venues has achieved acceptable recycling rates as the community increasingly expects to be able to recycle away from home just as they do at home. Increased away-from-home recycling is likely to influence the composition and quantity of materials received at MRFs and future requirements for bin infrastructure.

A recent report entitled *Major Venues Sustainability Snapshot* commissioned by Sustainability Victoria showed that the state or local government owns 70 per cent of major venues, which provides an opportunity for the collection of this material to be incorporated into future contracts.

Councils and other service providers (e.g. venue managers and event organisers) should be aware of existing opportunities to recover more waste through away-from-home recycling and develop a coordinated approach targeting local needs. In accordance with the *Best Practice Guidelines*, councils and other relevant service providers could improve public place recycling systems.

3.5.5 Street sweepings

Street sweepers clean metropolitan Melbourne streets periodically, and the majority of this waste is sent to landfill, costing $37 million in 2006–07. Depending on the location and time of year, the composition of this waste stream varies from highly organic (with leaves) to inorganic (with soil, stone and dust from roads). Materials collected may be suitable for daily cover at landfills, or made into a low-grade topsoil (through composting and blending with composts) for the rehabilitation of closed landfill cells or other land (e.g. mining sites) that will not revert to sensitive uses or pose risk to waterways or groundwater. These re-uses are not likely to be a 'market' for products, and will be pursued only where it is a cost-effective option with landfilling.

3.5.6 Advanced resource recovery technologies

To achieve the TZW recovery goals, a significant shift in the mix of materials that are collected and delivered to processing facilities is needed. This is particularly significant for the future processing of residuals and food organics.

Advanced resource recovery technologies (ARRTs) can significantly reduce Victoria's dependence on landfill, with benefits for communities, business and the environment. However, establishing facilities – especially if the technology is new – requires thorough research into the available options to ensure operational and product quality issues are addressed.

Alternative resource recovery facilities provide an opportunity for the treatment of residuals from kerbside, diverting waste away from landfill and maximising resource recovery. There are a number of ARRT processes that can be implemented to treat these streams with a number of value-added outcomes that can provide an economically viable way to extract resources and prevent greenhouse gas emissions from landfills.

Resource recovery facilities, depending on the operational configuration, generally require feedstock material in one of the following three forms:

- residuals, including garden and food organics
- residuals, excluding garden organics
- garden and food organics combined.

Currently in Australia there are a number of operational integrated ARRT facilities that either take mixed residual and/or source-separated garden, food and other C&I organics. These include:

- Global Renewables Limited (GRL) at Eastern Creek, NSW (hybrid anaerobic/aerobic)
- Bedminster at Perth, WA; Cairns, Qld; and Port Stephens, NSW (aerobic)
- Earth Power at Camilla, NSW (anaerobic for source-separated organics)
- Biomass Solutions at Coffs Harbour, NSW (aerobic)
- SITA at Perth, WA (aerobic)
- WSN Arrowbio at Macarthur Resource Recovery Park, NSW (hybrid anaerobic/aerobic).

A number of other ARRT facilities for the recovery of source-separated organics and mixed residual waste are currently being developed interstate. Many of these are combining source-separated organics processing with mixed residual waste treatment.

There is an ARRT facility in Melbourne, Natural Recovery Systems, which processes source-separated C&I food and municipal garden organics using in-vessel controlled environment aerobic composting for the first active stage of composting. This facility has very limited capacity to expand the volumes of materials it processes.

Melbourne will need additional processing capacity of 750,000–800,000 tonnes per annum of garden and food organics by 2014 to achieve TZW objectives. It is proposed that this capacity will be developed through a combination of source-separated and mixed residual waste ARRT facilities, which will be secured through competitive procurement processes.

The options for materials recovery and reprocessing technologies are further detailed in Appendix D.

3.5.7 Integrating streams

As the three waste streams – MSW, C&I and C&D – generally use different collection systems and require different recovery processes, there are currently limited opportunities to integrate the streams before or during processing. However, opportunities for resource recovery of food waste and recyclables from C&I and C&D should be explored when ARRTs are established.

Key factors to be considered when introducing C&I food organics recovery systems include:

- ensuring sufficient storage capacity for recovered material on the waste generators' sites – could be facilitated by planning approval processes
- integration of effective source-separation systems into C&I manufacturing/production processes – could be facilitated by activity or facility licensing process
- provision of adequate employee training – could be integrated into quality assurance programs and facilitated by government training schemes.

For more information on the quantities of the C&I and C&D streams refer to Part 1 – Metropolitan Plan, Section 4.

4 Future waste infrastructure considerations

After identifying the need for infrastructure (Section 2) and the review of existing infrastructure and future opportunities to meet those needs (Section 3), this section outlines some key considerations to inform decision making on future infrastructure.

This Infrastructure Schedule has been developed as a guide for future planning of resource recovery facilities. It has been developed in a way that ensures that metropolitan Melbourne councils are provided with the best opportunity to recover the maximum amount of materials from kerbside collections, in a cost-effective and sustainable manner.

A number of critical elements are outlined below that will have a significant impact on both the movement and final levels of disposal/recovery of kerbside collected materials. To facilitate discussion and understanding of those critical elements by a broad range of stakeholders, the future infrastructure needs for metropolitan Melbourne were modelled, based on current kerbside data and projected waste volumes to 2030.

4.1 Modelling and analysis of MSW infrastructure

The basis for this modeling exercise is a report entitled *Modelling and Analysis of Options for the Metropolitan Waste and Resource Recovery Strategic Plan* prepared by Hyder Consulting (2008). Hyder modelled six options based on three processes for increased recovery of materials collected at kerbside.

This modelling provided an environmental, social and economic assessment for six options. It included economic costs and benefits, life-cycle assessment (greenhouse gas emissions, energy and water consumption, air emissions and waste to landfill) and an assessment of transport options and impacts. The report also provided an analysis of the relative performance of each option.

The assessment has helped identify a number of opportunities to recover materials that are currently being sent to landfill for disposal. Options for the aggregation or clustering of kerbside materials for delivery to new recovery facilities have also been assessed.

For modelling purposes Melbourne was divided into an inner and an outer suburban area. The inner urban area was assumed as the area within seven kilometres of the city centre.

For the inner metropolitan area, the option modelled was:

- a two-bin system: recyclables and residuals (including garden and food) bin for anaerobic digestion.

For the outer metropolitan area, the options modelled were:

- Option 1 – a three-bin system: recyclables, garden (for aerobic composting), and residual (containing food) bin for anaerobic digestion
- Option 1A – a three-bin system: recyclables, garden (for aerobic composting), and residual (containing food) bin for aerobic composting
- Option 2 – a three-bin system: recyclables, garden and food (for anaerobic digestion), and residuals bin (to landfill)
- Option 2A – a three-bin system: recyclables, garden and food (for aerobic composting), and residual bin (to landfill)
- Option 3 – a three-bin system: recyclables, garden (for aerobic composting), and residual (containing food) bin for thermal treatment
- Option 4 – a two-bin system: recyclables, and residual (including garden and food) bin for anaerobic digestion.

The modelling was not intended to be prescriptive and has been used for comparative purposes only. Councils may wish to configure service frequencies and other logistical assumptions not covered in the options listed above.

Table 7 details the collection and waste processing modelled in each option for inner and outer suburban areas.

Whilst no one option provides the perfect solution, some options have better outcomes overall. It is clear that all options provide better outcomes (except for overall cost) than landfilling mixed residuals.

The environmental, social and financial outcomes assessed and the key factors for modelling predictions are presented in Appendix H.

Table 7: Waste disposal options modelled for inner and outer suburban Melbourne

<table>
<tr><th></th><th>OPTION 1</th><th>OPTION 1A</th><th>OPTION 2</th><th>OPTION 2A</th><th>OPTION 3</th><th>OPTION 4</th></tr>
<tr><td>Inner</td><td colspan="5">Two-bin service</td></tr>
<tr><td>Recyclables</td><td colspan="5">Materials Recovery Facility</td></tr>
<tr><td>Residuals</td><td colspan="5">Alternative Waste Treatment (AWT) (anaerobic digestion)</td></tr>
<tr><td>Outer</td><td colspan="5">Three-bin service</td><td>Two-bin service</td></tr>
<tr><td>Recyclables</td><td colspan="5">Materials Recovery Facility</td></tr>
<tr><td>Garden organics</td><td colspan="2">Aerobic composting (controlled environment)</td><td>Anaerobic digestion</td><td colspan="2">Aerobic composting (controlled environment)</td><td rowspan="3">AWT (anaerobic digestion)</td></tr>
<tr><td>Food organics</td><td rowspan="2">AWT (anaerobic digestion)</td><td rowspan="2">AWT (aerobic composting)</td><td rowspan="2"></td><td colspan="2" rowspan="2"></td></tr>
<tr><td>Residuals</td><td colspan="2">Landfill</td><td>AWT (thermal treatment)</td></tr>
</table>

4.1.1 Analysis of modelling results

While the analysis of the options summarised in Tables 8 and 9 supports the conclusion that no single option provides clearly superior outcomes for the metropolitan area, four of the six options would provide the means for meeting the 2014 TZW targets. These are Option 1, 1A, 3 and 4.

Table 8: Summary of options and projected results for inner urban Melbourne, 2014

	BASE CASE	OPTION 1	OPTION 1A	OPTION 2	OPTION 2A	OPTION 3	OPTION 4
Waste Stream – inner urban		**Two-bin service**	**Two-bin service**	**Two-bin service**	**Two-bin service**	**Two-bin service**	**Two-bin service**
Recyclables	To MRFs	To MRFs	To MRFs	To MRFs	To MRFs	To MRFs	To MRFs
Residuals	Assume current approach	To AWT (anaerobic digestion)	To AWT (anaerobic digestion)	To AWT (anaerobic digestion)	To AWT (anaerobic digestion)	To AWT (anaerobic digestion)	To AWT (anaerobic digestion)

Table 9: Summary of options and projected results for outer suburban Melbourne, 2014

	BASE CASE	OPTION 1	OPTION 1A	OPTION 2	OPTION 2A	OPTION 3	OPTION 4
Waste Stream – outer suburban		**Three-bin service**	**Three-bin service**	**Three-bin service**	**Three-bin service**	**Three-bin service**	**Two-bin service**
Recyclables	To MRFs	To MRFs	To MRFs	To MRFs	To MRFs	To MRFs	To MRFs
Green organics	Assume current approach	To aerobic composting (controlled environment)	To aerobic composting (controlled environment)	To anaerobic digestion	To aerobic composting (controlled environment)	To aerobic composting (controlled environment)	To AWT (anaerobic digestion)
Food organics	To landfill	To AWT (anaerobic digestion)	To AWT (aerobic composting)	To anaerobic digestion	To aerobic composting (controlled environment)	To AWT (fluidised bed)	To AWT (anaerobic digestion)
Residuals	To landfill	To AWT (anaerobic digestion)	To AWT (aerobic composting)	To landfill	To landfill	To AWT (thermal treatment)	To AWT (anaerobic digestion)
Recovery rate	42%	76%	76%	64%	64%	80%	67%
Waste to landfill		✓✓	✓✓	✓	✓	✓✓	✓✓
Greenhouse gas emissions		✓✓	✓✓	✓✓	✓	✓✓	✓✓
Air emissions		✓	✓	✓	✓	✓	✓
Energy from fossil fuel use		✗	✗	✓✓	✗	✓✓	✗
Water consumption		✓✓	✓✓	✓✓	✓✓	✓✓	✓
Cost per household per year (2013-14)	$126	$151	$144	$152	$148	$175	$144
Additional cost per household per week (2013-14)		$0.48	$0.35	$0.49	$0.42	$0.94	$0.35

Legend: Performance compared to base case ✗ = poor outcome, ✓ = acceptable outcome, ✓✓ = desirable outcome

Further analysis of qualitative as well as quantitative data has been used to identify a mix of systems and facilities to provide the necessary flexibility to meet the TZW targets, while maximising environmental benefits and meeting the needs of the community.

While thermal technology (fluidised bed incinerators), as proposed in Option 3, performs as well as other options on environmental and amenity grounds, locating a suitable site is expected to be difficult as the community could oppose this type of technology due to perceived off-site affects of incineration processes, including stack emissions. Community perceptions have been based on poor historical operations of these types of facilities. Also, this option is more expensive than the others.

Option 4 – which involves the entire Melbourne metropolitan area adopting a two-bin system, with commingled recycling and the residuals stream processed by AWT (with anaerobic digestion) – has the benefit of simple collection and good overall environmental outcomes, including diversion from landfill. The initial consultation process revealed, however, that there is strong community commitment to separating materials for recycling. At present, 19 outer suburban municipalities have a three-bin system, including one bin for garden waste. Councils have progressively introduced these systems with state government support to represent best practice. Consequently, to regress from these arrangements at this time is seen as undesirable.

Options 1, 1a, 2 and 2a have overall good outcomes and generally build on current systems. The main challenge for Options 2 and 2a is that the householder has to sort food waste from the residual stream and include it with the garden waste. They will also need to carry the waste from the kitchen to the organics bin in suitable containers/wrapping.

To ensure a high level of participation in, and the effectiveness of, future resource recovery technologies (while achieving very low levels of contamination), targeted education programs will be required to achieve a significant behavioural change. These programs could also reinforce and build on previous education in the community about recycling and sustainable living – and in the process link waste with the issue of climate change.

The anaerobic process of Option 2 is likely to be more suitable for inclusion of food organics from the C&I sectors and has the greatest potential to produce renewable energy from the harvested methane. Both Options 2 and 2a should also produce better quality compost material than aerobic processing of separated garden waste (provided that contamination can be minimised), which should assist with the establishment of viable markets.

As Options 2 and 2a have the lowest diversion rate, and consequently the greatest need for landfill disposal, it is advisable to introduce these types of facilities where there is sufficient landfill capacity within close proximity.

Options 1 and 1a use relatively low-cost composting of garden organics and maximise greenhouse gas reduction by processing all organic materials (residues) through AWTs. These options achieve high diversion rates, including further recovery of recyclables from the residual stream. The residues from the AWT processing facilities are of relatively low quality and value, presenting a significant, ongoing market development challenge.

The modelling options and the assumptions underpinning them have been generalised and drawn from recently commissioned technologies. The options were chosen to identify any significant differences in outcomes. The implementation of specific or actual proprietary technologies may produce different outcomes. As the facilities will be implemented over several years, new technologies will be considered in future procurement processes.

4.2 Council clusters

As most ARRTs require relatively large volumes of waste, it will be necessary for several councils to aggregate their waste to secure the volume required for the development of the new recovery facilities. In modelling the options presented above, clusters of metropolitan Melbourne councils were used to provide sufficient aggregated waste volumes to support new recovery facilities.

Clustering is a flexible approach to grouping councils with similar waste infrastructure needs. In developing these clusters a range of factors were considered:

- existing collection systems (two-bin/three-bin)
- current and future kerbside materials generations within the clusters or catchments
- current key recovery infrastructure facilities
- projected population growth patterns up to 2030
- projected travel distances from facilities
- housing and population densities
- local government waste contract expiry dates covering the disposal of residuals and recovery of commingled and organic materials.

These factors will be important issues in the actual procurement of ARRT facilities. Procurement processes should be flexible enough to allow the marketplace to deliver the best outcomes for the whole metropolitan area in terms of scale, location and time.

To further illustrate the flexible approach to defining cluster boundaries, individual councils could provide varying service options in response to different demographics within their municipality. This clustering will be further developed with councils as part of the implementation strategy to plan, site and procure ARRTs as well as develop programs to educate the community about the new facilities and the complementary collection systems.

Appendix I provides a map showing the broad concept of council clusters. These clusters are considered to provide an effective collection scenario as they provide a geographic matrix of councils. However, councils do not need to be adjacent or in particular clusters in order to collaborate.

The development of clusters and resource recovery options to support diversion of waste from landfill will include discussion with adjacent non-metropolitan regional waste management groups.

4.2.1 Adjacent waste management regions

Waste and recyclables are currently transported in and out of metropolitan Melbourne as a result of competitive landfill gate fees and the ability to bulk haul volumes of material.

Opportunities should be pursued to link services and infrastructure to adjacent municipalities and regions. In particular, the Barwon, Highlands and Mornington Peninsula regions have potential benefits for logistics and processing economies of scale. A list of neighbouring regions and local government shires is given in Appendix J.

4.3 Siting facilities

The siting of facilities will require a review of waste generation data and existing processing capacities to determine the ideal number and location of proposed facilities. Other considerations include the required scale of the various technology options, available locations, appropriate planning and zoning controls. New facilities will need to address the following:

- buffer distances from sensitive land uses
- planning issues
- assessment of landfill locations in proximity to potential new resource recovery facilities
- transport distances
- potential for expansion.

Engaging the community in siting these facilities and alleviating their concerns about the off-site effects will also be essential in ensuring their success. Community engagement and education in establishing new waste infrastructure is discussed in Section 4.8. Further consultation with stakeholders will assist in identifying appropriate locations.

4.3.1 Planning scheme

A Planning Advisory Committee appointed by the Minister for Planning is reviewing the existing definitions for waste and recycling facilities and the appropriateness of the land-use controls applying to these facilities. This review will provide revised planning scheme controls and assessment processes for the upgrading and development of new facilities. The MWMG and other agencies have contributed to this review process and is aware of the implications of the review for future facilities.

4.3.2 Resource recovery and planning assessment matrix

A planning assessment matrix is being developed to inform the siting assessment of potential resource recovery facilities for metropolitan Melbourne. This planning matrix will include:

- impacts (noise, airborne emissions, odour, traffic, etc);
- protection (buffers and management);
- strategic planning (zone patterns, state policies, controls, etc);
- statutory planning (definitions, zone controls, relevant guidelines, etc).

4.3.3 Integrated facilities

There is a range of opportunities for co-locating facilities that process waste materials with facilities that could best use the resulting products. For instance, an ARRT producing energy from waste might be located close to an existing or proposed site that uses a significant amount of electrical, gas or heat energy. Alternatively aerobic composting, recycling and reprocessing centres might be co-located to permit movement of materials between different routes on a weekly, seasonal or structural basis as market conditions change.

Section 3.5.7 Integrating streams, highlights the potential to broaden source material from C&I and C&D streams. Where the input of material from these other streams is viable, the effects on siting need to be considered.

4.4 Risk management

The Schedule puts forward some preferred management options for materials, based on detailed life-cycle, triple bottom line (TBL) and economic assessments. However, the final decisions about procurement of more advanced waste management systems will depend on how proposed management systems compare with a range of economic, environmental and social criteria.

A range of technologies and supporting systems are available for recovering greater utility from waste. Life cycle and TBL assessments have demonstrated that all proposed alternatives to current landfill practices deliver significant environmental benefits for relatively modest increases in management costs. There are different ways in which technology types and the systems supporting the technologies can be structured and operated. These variations and differences can influence the costs and net benefits of technologies.

An example of the risks associated with recovery technologies and the ways in which these risks can be managed is provided in Appendix K. The assessment considers options for the management of residual household waste once most of the conventional recyclables (metals, cardboard/paper, glass and plastics) have been recovered through kerbside recycling. A more detailed assessment would cover different technologies and systems and outline management approaches that will be adopted in the introduction of such technologies.

4.5 Local government and industry 'buy in'

The facilitation of local government buy-in is needed to procure sufficient waste material volumes and levels of interest to initiate ARRT proposals with industry.

The appropriateness of food organics recovery options (food and garden organics or food and residuals collections) needs to be assessed for different councils. This information can then be provided to councils so relevant collection strategies and technologies can be developed. To improve the level of industry buy-in, MWMG and local government will have to work with industry to develop targeted proposals.

4.6 Landfill gate fees

Currently landfill gate fees vary significantly across metropolitan Melbourne. From an economic viewpoint, any future resource recovery facility will always be competing with landfill and its gate fee will need to be competitive.

4.7 Impacts of climate change

The potential impacts of climate change and policy responses are uncertain, and they have not been factored into the assessment of options. The following discussion considers how climate change may affect future waste management.

4.7.1 Carbon trading and renewable energy

The potential impacts on future waste management of greenhouse gas reduction policy responses are uncertain. Once finalised, the impacts of the Carbon Pollution Reduction Scheme (CPRS) and interactions with other incentives, regulations and measures such as the expanded national Renewable Energy Target (RET) scheme, will need to be incorporated into the economic analysis of future infrastructure.

Greenhouse gas reduction initiatives may impact on the economics of future waste management and infrastructure provision, as presented in the following points.

- Increased landfilling costs as operators need to account for greenhouse gas emissions. With the waste industry being a covered sector in the CPRS, liable landfill operators will need to purchase tradable emissions permits for any landfill gas emissions that have not been captured. For some landfills, it may be cheaper to install additional gas capture infrastructure, although full capture is presently not achievable.
- Demand for lower emissions energy may increase due to emissions trading, as may demand for Renewable Energy Certificates (RECs) under an expanded national RET scheme. This may increase the viability of and investment in facilities that recover renewable energy from waste.
- Recycling has significantly lower energy demand and greenhouse impact than the manufacture of first use materials. However, due to the partial allocation of free permits to 'emissions intensive trade exposed' industries, it is not clear whether the CPRS will grant an advantage to recycled material.
- Increased fuel prices under a CPRS may impact on waste and recycling collection, processing and some operation costs. In the metropolitan area, where the distances to recycling facilities and landfills are fairly similar, this impact will affect both landfill disposal and recycling collection service costs similarly. The CPRS White Paper indicates that fuel tax will be reduced on a 'cent for cent' basis for the first three years of the CPRS, fully compensating for the inclusion of transport over this period.
- Increased power costs will impact on reprocessing/recycling operations with high energy demand.
- A CPRS may lead to increased demand for recycled organic products. Synthetic fertilisers could have higher costs (especially if sourced and supplied domestically), and growers wanting to reduce nitrous oxide emissions may seek alternative ways to supply and manage nutrients.

A detailed assessment of opportunities and impacts of a CPRS on the waste sector will be required when the CPRS legislation is finalised and subsequent markets set carbon prices. The potential ramifications of the CPRS for waste are also discussed in Part 1 – Metropolitan Plan, Section 1.4.

4.7.2 Impacts of adapting to climate change

Climate change due to enhanced greenhouse gas emissions is already affecting Melbourne's climate. Greenhouse models predict that to 2030, Melbourne will have lower and less reliable rainfall, less winter rainfall, more frequent extreme rainfall events in spring and summer, and warmer winters and hotter summers. The main potential effects of this will be on the quantities of garden organics generated and the demand for recycled organic products. In recent dry years, councils and composters have reported as much as a 20 per cent fall in the volume of organics collected and processed. At the same time, demand for compost and mulch products has increased, partly due to increased drought-proofing of gardens. If this trend continues, the average volumes of organics requiring processing and end products may not be as high as modelled. However, this is uncertain, and this Schedule has assumed organic waste generation will continue according to current trends.

4.8 Community education and engagement

Increasing resource recovery needs good infrastructure and systems, and a community that knows how to use them. Raising community awareness about resource recovery opportunities and how to correctly use these services is a vital component of this Schedule, because it will increase participation and resource recovery, and reduce the incidence of misuse and contamination of materials streams (recycling, organics and residual garbage). Waste minimisation messages – how to reduce waste – will be promoted as a way in which the community can reduce environmental impacts and costs.

It will be important to engage the community in decisions regarding the future siting and operation of resource recovery facilities. Effective and transparent engagement and communication of the costs, impacts and benefits of facilities will help to achieve appropriate location and operation of facilities.

The Strategic Plan identifies some major changes for metropolitan Melbourne that could revolutionise the way waste is treated and disposed of in the future. This Schedule focuses very strongly on new waste processing infrastructure, but education and engagement will be key factors in improving the way the community uses the new infrastructure. A vocabulary that is appropriate and well-crafted key messages supported by an education and engagement strategy are needed.

With the establishment of the MWMG there is now a greater opportunity to develop metropolitan-wide campaigns about key issues, including contamination, in collaboration with local government and other agencies.

4.8.1 Engagement – siting facilities

Planned new and upgraded resource recovery facilities are required to comply with planning and environmental regulation and conditions. The siting and operation of future resource recovery facilities are typically subject to public review and comment during local government planning and EPA Works Approval processes.

As a part of the procurement process, transparent community engagement processes will need to be promoted to ensure that communities have access to information about the operation of facilities.

In situations where existing or proposed facilities are, or may, affect their neighbouring communities, MWMG and local government will promote the adoption of mechanisms to improve communications between communities and facility operators.

4.8.2 Awareness of opportunities, services and products

Lack of awareness about the availability of recycling opportunities and quality products with recycled contents reduces the effectiveness and viability of resource recovery. Continuing and improved education will be undertaken to promote community engagement in new approaches to waste management.

- *Availability of recycling opportunities*. The community will continue to be made aware of opportunities to recycle through kerbside collection, drop-off and take-back services. The need to separate loads for recycling at transfer stations and the expanding range of items that can be recycled will be promoted.
- *Availability of quality recycled products*. The viability of recycling in marginal markets, such as recycled organics, can be improved by promoting the products. Infrastructure may help here, with resource recovery and transfer station drop-off points also providing shopfronts for the sale of products.
- *Waste reduction strategies*. Reducing the volumes of wastes to be recycled and disposed of can reduce the costs of waste management to the community. The upstream and downstream environmental benefits of waste reduction are also highly significant. The state government will continue to promote ways to reduce waste.
- *Management of contaminants*. Increasing community awareness about the effects of contaminants on recyclables and garbage could improve the quality of recovered products (see next section).

4.8.3 Education – contamination

Physical and chemical contamination of the container and organics recycling streams reduces the viability of recycling and increases costs to the community. Such contaminants add to processing costs and can reduce the quality of products. If these contaminants are not removed from recycled organic products they can cause environmental and other risks associated with litter, damage to visual amenity, and pollution of land and waterways.

Preventing contaminants (e.g. chemicals/toxics and glass fines in organics) entering the waste stream is important to protect the environment and maintain high-quality recycled material. There are also risks associated with the placement of household and garden chemicals into household garbage and organics collection bins. These items should not be in any of the household garbage, container recycling, or the organics recycling streams. In landfill, chemical contamination from household and garden chemicals and hazardous wastes poses risks to groundwater and those working at the landfill. Organic products derived from mixed residual waste may be contaminated by householders placing items such as household chemicals, pesticides, paint, oil, batteries and electrical equipment containing heavy metals in their waste.

For this reason, Detox Your Home, Byteback and other related programs are important demonstrations of actions that can be taken to ensure potentially toxic contamination of residual and organic wastes are minimised.

There are some key messages to be promoted in this area.

- Physical and chemical contamination of recycling and residual streams reduces the viability and environmental benefits of resource recovery.
- Contaminants in commingled recyclables reduce the quality of recovered materials, and increase OH&S, sorting and waste disposal costs to recyclers. These costs are passed on to the community.
- Glass, plastics and other physical contaminants reduce the quality of recycled organic products and require investment in systems for monitoring and screening out contamination. These associated costs are passed on to the community.

4.9 Product stewardship

Whilst the development of resource recovery facilities for metropolitan Melbourne is essential to reducing both waste going to landfill and the impacts of greenhouse gas emissions, greater consideration also needs to be given to other approaches. Product stewardship addresses resource efficiency and waste-related environmental impacts of products throughout the product life cycle, by engaging with designers, brand owners, end-of-life managers, government and the community.

With new waste technology developments, product stewardship programs play a vital role in removing potential contaminants (such as household chemical, paints, batteries and compact fluorescent tubes) from the kerbside because of their effect on the processed material.

The government's product stewardship programs focus on ways to reduce waste through product design as well as options for managing and recovering resources from products at the end of their useful life. Products targeted so far include electronic material, batteries and paint. Increasingly, priority is being given to engaging with industry to enable them to assume greater responsibility for the end-of-life management of their products.

Manufacturers can play a role beyond the point of sale or warranty by designing products that produce less waste, use fewer resources, contain more recycled and less toxic components and are more durable.

4.10 Market development

A vital component of all materials recovery processes is the development of markets for the end products. This section assesses the need for market development initiatives and outlines actions to be taken to strengthen the viability of resource recovery operations.

4.10.1 Recycled metals, paper and plastics

Over the past five to ten years, commodity prices for common recyclables such as metals, cardboard and paper and many plastics improved markedly, removing much uncertainty in the market. MRF operations were for a number of years typically very profitable, and up to early 2008 there were record high commodity prices. As a result there has been significant investment in resource recovery infrastructure and negotiation of municipal recycling contracts, whereby the recycler assumed risks associated with commodity prices. There has been less investment by government in market development initiatives because the market was driving this and forecasts were for continued strong demand. This assumption is likely to need to be reassessed in light of recent steep falls in commodity prices due to the global financial downturn.

These falls – of 50 per cent or more for cardboard, paper, metals and plastics – have followed the global financial downturn. At the time of preparing the Strategic Plan, the extent to which prices might recover and the impacts of lower prices across the industry was uncertain, although the fall in prices was partially being offset by the lower Australian dollar and lower fuel and transport costs. In addition, investment in sorting technologies has generally improved the efficiency of MRF operations since the last period of low commodity prices. Sudden falls in prices tend to have greatest impact on municipal recycling contracts where contractors have assumed all risks associated with the sale of commodities. It is anticipated that the adverse impact is likely to be greatest for the recovery of plastics. Metal and paper prices are yet to fall to levels where recycling is not financially viable.

4.10.2 Recycled garden and food organics

Recycled garden and food organics is the most significant market development challenge. Current production in the order of 250,000 to 300,000 cubic metres of recycled organics in metropolitan Melbourne and 30,000 to 50,000 cubic metres in the rest of Victoria periodically oversupplies the market. Market development programs need to be supported by investment in appropriate technologies that can consistently produce high-value products. For example, if the TZW target of 65 per cent is to be achieved through aerobic composting of source-separated organics there would be an annual volume of 800,000 cubic metres of recycled organics available to end markets. Alternatively, investment in technologies that also reduce the volumes of finished products, such as anaerobic digestion, could alleviate this problem and potentially produce higher value products (i.e. digestion converts organics to biogas energy, and nutrient–rich organic fertiliser products) that are more marketable.

Sustainability Victoria, MWMG and other RWMGs are working with the recycled organics industry to develop good quality products and markets for these products. Victoria has led the way in the development of a national certified compost quality and marketing scheme, which ensures that compost manufacturers meet quality standards for application-specific products, and gives markets greater confidence in the products. Sustainability Victoria is currently supporting a Compost Victoria Market and Industry Development Officer (MIDO) position to implement a Market and Industry Development Strategy and a range of other initiatives with the composting industry and other stakeholders to promote quality products and markets. A recent example of this has been improvements in the compost and mulch market via the Healthy Sustainable Gardens Program, where mulch and compost are promoted through councils and local garden supply centres. Other components of the Market and Industry Development Strategy include support for Department of Primary Industries research and demonstration trials in vegetable and wine grape growing, and support to industry for infrastructure for processing, cleaning and applying compost products.

Further initiatives to develop markets include promoting local and state government and private sector purchasing policies that favour the use of equivalent quality recycled-content and certified compost products. If mixed-waste ARRTs are established, markets for stabilised organic products will also need to be developed. Some of these products may have restricted access to markets due to actual and potential contamination issues.

Technical advances and improved systems for both recovering potential contaminants separately from residual waste and screening them from processed mixed wastes should progressively improve the quality and market potential of these products. In Europe, refuse-derived fuels are being produced from the stabilised organics and other residuals from mixed waste ARRTs. Markets may be developed for appropriately managed and sited stationary energy and other industrial facilities.

MWMG and other state government agencies will promote the establishment of facilities that have viable markets or end-of-life management for organic products. They will also continue to promote the development of products and markets for organic products from both source-separated and mixed-waste processing technologies.

4.10.3 MSW timber (household and small vehicle load)

MSW timber is defined as timber from small vehicle loads delivered to transfer stations. As there is an insignificant amount of timber deposited in household kerbside-collected rubbish, there is no case for infrastructure to recover this material as a separate stream.

The main barriers to greater recovery of MSW timber are the lack of transfer station drop-off facilities, and lack of community awareness about existing opportunities to recycle timber. Timber recovery will be increased through investment in drop-off and processing infrastructure, and will likely be a sub-set of greater investment in infrastructure targeting C&I and C&D timber. Greater resource recovery of timber from commercial mini-bin and municipal hard waste collection services will be promoted.

Although markets for timber mulches have improved, this market is still prone to oversupply. Market development work has been undertaken to improve mulch products and markets, and also to see more of the timber returned to dimensional or engineered timber products. Recent advances in processing technology mean that even the mixed C&D stream can be cleaned to produce recyclable timber for landscaping mulches and engineered timber products. It is anticipated that energy recovery markets for some of this material will develop within the next few years.

4.10.4 MSW C&D waste (household and small vehicle load)

The main barrier to greater recovery of MSW C&D waste currently delivered by small vehicle loads to transfer stations is the lack of infrastructure for reprocessing and the lack of community awareness of opportunities to recycle. This infrastructure will continue to be developed at appropriate sites, with recovered materials being processed at C&D waste recycling facilities that have been or will be developed in response to demand from the C&D sector. Greater recovery of MSW C&D from commercial mini-bins and municipal hard waste collection services will be promoted.

Improved processing and cleaning technologies, and increased landfill prices, have improved the viability of recycling. Sustainability Victoria has supported both private investment in processing infrastructure to recycle C&D materials and the development of product specifications for a range of engineering applications, mainly in road construction and other civil engineering works. Demand for many of these products is variable and subject to economic activity. Major road and other construction works, as well as high levels of land development, have created fairly consistent demand for many grades of C&D brick and rubble products and timber mulch products. Metals are readily recovered for recycling. C&D materials recycling has also been helped by the fact that the per-tonne processing cost is typically considerably lower than typical landfill gate fees, meaning that in some instances the gate fees that recyclers can command can cover most of the processing costs, allowing markets to be developed, selling products at competitive prices compared to other products.

4.10.5 Low-grade glass

There are a limited number of domestic buyers for recycled glass cullet, and most of the demand is currently domestic. Prices for recycled glass have remained low, and lower grade mixed glass 'fines' (broken glass not sorted by MRFs) have very poor markets. Sustainability Victoria has previously supported advanced glass-sorting technology to improve the quality of recycled glass, and encouraged the use of glass as an aggregate in road surfacing and other civil engineering applications. If prices remain low, further work will be needed to develop markets for recycled glass.

4.10.6 Mixed plastics – film and 'non-1, 2, 3' plastics

Although many plastics have high and increasing dollar-per-tonne value, they have very low density, making transport expensive. Most of the demand for 'non-1, 2, 3' plastics comes from overseas, and while this demand is currently strong relative to historical trends, it could change. These plastics are a relatively small contributor to the waste stream in terms of weight, but they can occupy significant volume in collected and landfilled waste. A potential market for plastics without ready recycling markets – and particularly for contaminated plastic residues from MRFs and ARRT facilities – could be for refuse-derived fuel going to appropriately located and operated industry stationary energy facilities.

4.10.7 Other items

Items such as mattresses, carpet, mixed component, and electrical and electronic waste items have been discussed in Section 3.2.1. These items have some resource recovery value, including the recovery of metals and calorific value (as refuse-derived fuel). Key activities in this area will be investment in and promotion of drop-off infrastructure at transfer stations. The investment in market development and processing infrastructure is likely to come from the private sector targeting C&I and C&D waste streams.

5 Upgrades and new infrastructure

Government, councils and industry will need to cooperatively invest time, energy and resources into an implementation process to deliver appropriate infrastructure responses to the directions established by this Strategic Plan. Councils and industry have established an ongoing role in the provision of waste and resource recovery services and have provided feedback to government on areas for further clarity and assistance.

This section outlines the direction government is taking to establish an implementation process that takes into consideration the range of elements generated through consultation and outlined in Section 4. The development of procurement guidelines by the MWMG provides a preferred pathway by which councils and MWMG may choose to purchase future waste and resource recovery services.

It is clear from the information provided in Section 3, and assumed in the modelling prepared by Hyder Consulting, that upgrades to existing infrastructure servicing metropolitan Melbourne will occur over time to meet increased capacity demands. Key areas are existing composting facilities, transfer stations and MRFs.

The rollout of new infrastructure focusing on maximising the processing of material (predominantly organics) currently going to landfill to produce useful and viable products will begin to occur over the next few years.

5.1 Infrastructure upgrades

5.1.1 Compost facilities

As described in this Schedule, metropolitan Melbourne already has processing facilities that deal with garden organics and in some cases food organics. While the quality of the material produced from open windrow composting has been saleable, supply has exceeded demand – further market development is required. Also, the proximity of facilities to sensitive neighbouring land uses (e.g. residential housing) is currently creating community concern at a number of sites.

The solution is to either upgrade some of the existing facilities or establish replacement facilities that will process the garden organics in a closed or covered system, reducing the risk of processing odour impacting on the local community.

Over the coming years there is a need to:

- upgrade a number of composting facilities, primarily enclosing the composting operations to help improve overall performance and product quality
- expand existing markets to match increased production.

5.1.2 Transfer station upgrades

The Schedule has identified a need to expand the capacity for private and municipal transfer stations to increase recovery of recyclables, with the recyclables being transferred to mainly private sector recyclers or reprocessing contractors. Commencing in 2008–09, MWMG will work with local governments and transfer station operators to identify opportunities and priorities for facilities upgrades. MWMG will liaise with facility operators and Sustainability Victoria to develop and implement detailed rollout programs for upgrades of key facilities. Priority will be given to facilities according to community need and the potential to recover large volumes of materials.

5.1.3 MRF upgrades

It is anticipated that MRF upgrades will occur according to need by the private sector, and through future municipal and private recycling contracts. MWMG will play a role through procurement of future waste management contracts on behalf of user councils.

5.2 Future resource recovery infrastructure for metropolitan Melbourne

If Melbourne is to achieve its waste diversion goals through establishing advanced resource recovery processing facilities, the MWMG will need to facilitate close cooperation between state and local government authorities.

As the scale of most AWTs or ARRTs requires relatively large volumes of waste, it will be necessary for several councils to aggregate their volumes to provide the security for investors in the development of the new recovery facilities.

It is likely that there will be a variation of bin systems and final processing options for kerbside materials depending on the source, geographic location and clustering of councils:

- for the inner cluster, a two-bin system sending the residuals bin (including food/garden organics) to an AWT for processing
- for the outer clusters, a three-bin system (with food included in the garden bin or left in the residuals bin).

5.2.1 AWT (all residuals)

Recycling or diversion rates in Melbourne's inner areas have been historically lower than in other areas of the city, mainly because the higher density living areas have traditionally not been offered an integrated service due to space constraints.

Introducing an efficient collection system, given the lack of space and high volumes, remains an issue. Integrating efficient collection systems into the building control and land-use planning around the activity centres, in line with strategic direction provided by *Melbourne 2030*, is an important area of work for the future.

In response to the current targets for MSW diversion to 2013–14, and limited scope to improve waste diversion at the householder level in these higher density inner-city areas, an AWT (all residuals) option that will recover and reprocess all the material in the residuals bin becomes more attractive.

AWTs are more energy intensive, with energy needed to drive mechanical processes to sort the residual waste material for glass, plastics and metals, leaving organic material (mostly food) for processing. The quantity of residuals recovered and diverted from landfill is maximised when compared with other options, and the removal of the majority of material with high levels of embodied energy and processing of all organics gives high greenhouse gas abatement benefits.

The organic residues from an AWT (all residual) processing facility are of relatively low quality and value and will present a significant ongoing challenge for market development.

Future AWT infrastructure may be able to accept material streams generated from C&I sources, so future facilities handling materials generated from the inner urban area should be designed to receive food organics collected from commercial generators.

5.2.2 Processing organics (food and garden)

Diverting food waste into the garden organics bin and processing the combined waste will increase diversion from landfill and improve the quality of the final products. These facilities could be aerobic (tunnel composting) or anaerobic (digestion). Anaerobic facilities have the potential to produce renewable energy from the harvested methane and good volumes of high quality fertiliser and/or soil conditioner for viable end markets – provided contamination can be minimised. This would effectively close the loop for organic material.

Introducing a recycling program for kerbside food organics, where residents are encouraged to place food organics into their garden recycling bin, would provide a number of challenges. Targeted promotion and education programs will be vital to introducing this type of waste technology to ensure its viability and to ensure that contamination is kept to a minimum. Such targeted promotion and behavioural change work may also be viewed as an opportunity to further develop community capacity about recycling and sustainable living in the broader sense. The level of diversion of food organics from the residuals bin determines the relative level of greenhouse gas abatement achieved.

Composting a mix of food and garden organic material together produces better quality compost and soil conditioner, which assists with holding moisture and boosting nutrient levels in soils.

Introducing advanced resource recovery infrastructure within a cluster would still leave some residual material (a variety of packaging materials and other items that don't easily recycle) in the residual bin, which would need to be landfilled. It would be sensible, therefore, to introduce these types of facilities in areas where there is abundant landfill capacity.

5.2.3 Infrastructure modelling

Based on the Hyder modelling, potential combinations of facilities are suggested in Table 10. The facility types (AWT and anaerobic digestion – food/garden) facility proposals and capacities outlined are based on kerbside-collected material only, and therefore should be seen as indicative, minimum capacities. They do not include material that could come from the C&I and C&D sectors. Therefore, facilities are likely to process larger quantities based on their ability to secure solid industrial waste on a commercial basis.

Table 10: Infrastructure scenarios modelled for areas of metropolitan Melbourne

INNER SUBURBS				
INNER SUBURBS (TWO BIN SYSTEM)	**TYPE OF FACILITY**	**NUMBER OF FACILITIES**	**TOTAL INDICATIVE CAPACITY, 2013 (TONNES P.A.)**	**TOTAL INDICATIVE CAPACITY, 2030 (TONNES P.A.)**
Recycling	Material recovery facilities (MRFs)*	Use outer MRFs		
Residuals	Mechanical sorting plus anaerobic digestion at an alternative waste treatment (AWT) facility	1	120,000	170,000

SOUTH EAST METROPOLITAN AREA – PROPOSAL 1				
OUTER SUBURBAN (THREE BIN SYSTEM)	**TYPE OF FACILITY**	**NUMBER OF FACILITIES**	**TOTAL INDICATIVE CAPACITY, 2013 (TONNES P.A.)**	**TOTAL INDICATIVE CAPACITY, 2030 (TONNES P.A.)**
Recycling	Material recovery facilities (MRFs)*	4		
Residuals **	Mechanical sorting plus anaerobic digestion at an alternative waste treatment (AWT) facility	3	375,000	480,000
Garden organics	Garden organics to controlled atmosphere composting	4	230,000	310,000

OR

SOUTH EAST METROPOLITAN AREA – PROPOSAL 2				
OUTER SUBURBAN (THREE BIN SYSTEM)	**TYPE OF FACILITY**	**NUMBER OF FACILITIES**	**TOTAL INDICATIVE CAPACITY, 2013 (TONNES P.A.)**	**TOTAL INDICATIVE CAPACITY, 2030 (TONNES P.A.)**
Recycling	Material recovery facilities (MRFs)*	4		
Residuals	Landfill	N/A	285,000	370,000
Garden and food organics	Food organics and garden organics to anaerobic digestion	4-5	320,000	420,000

NORTH WEST METROPOLITAN AREA – PROPOSAL 1				
OUTER SUBURBAN (THREE BIN SYSTEM)	**TYPE OF FACILITY**	**NUMBER OF FACILITIES**	**TOTAL INDICATIVE CAPACITY, 2013 (TONNES P.A.)**	**TOTAL INDICATIVE CAPACITY, 2030 (TONNES P.A.)**
Recycling	Material recovery facilities (MRFs)*	3		
Residuals	Landfill	N/A	145,000	170,000
Garden and food organics	Food organics and garden organics to an anaerobic digestion	4-5	210,000	300,000

OR

NORTH WEST METROPOLITAN AREA – PROPOSAL 2				
OUTER SUBURBAN (THREE BIN SYSTEM)	**TYPE OF FACILITY**	**NUMBER OF FACILITIES**	**TOTAL INDICATIVE CAPACITY, 2013 (TONNES P.A.)**	**TOTAL INDICATIVE CAPACITY, 2030 (TONNES P.A.)**
Recycling	Material recovery facilities (MRFs)*	3		
Residuals **	Mechanical sorting plus anaerobic digestion at an alternative waste treatment (AWT) facility	2	200,000	255,000
Garden organics	Garden organics to controlled atmosphere composting	3	155,000	215,000

Notes:

* Based on analysis, existing facilities will be able to manage any future increases of commingled recyclables.

** Up to 40 per cent of the input material processed by an AWT requires landfilling. However this material is relatively inert and will not generate methane in landfill.

5.3 Implementation process

The successful introduction of ARRTs and systems depends on establishing a clear policy direction and having the cooperation of all levels of government. The MWMG, in collaboration with the state government, will work with local governments to encourage industry to provide and maintain appropriate ARRT solutions across Melbourne.

Infrastructure to recover organics and other recyclables using a combination of source separation and residual garbage ARRT facilities has been identified as a key priority of the Strategic Plan.

The modelling of options (section 5.2.3) has helped identify potential technologies and catchments and presents a number of opportunities for new processing facilities. It is anticipated that up to eight facilities will be required across metropolitan Melbourne to support meeting the 2014 TZW targets.

In the short term the focus is on getting the first two advanced waste and resource recovery facilities well advanced by 2010 through the Victorian Advanced Resource Recovery Initiative, with the balance being implemented thereafter. This will involve MWMG and DSE working with local government, the waste industry and other state government agencies to set clear directions for potential user councils regarding performance requirements, siting needs, financial and technical viability and risk, and recommended procurement approaches.

The introduction of new waste processing and resource recovery technology is crucial to meet MSW targets under TZW for metropolitan Melbourne. In addition, a range of complementary but non-technology based programs needs to be supported:

- waste avoidance and minimisation
- increased recyclables recovery
- combined food with garden organic composting
- e-waste
- hazardous waste (Detox Your Home)
- textiles

  } via transfer stations and new collection services such as day-after collections (see Section 3.5.1)

- locally based community sustainable homes programs.

A number of these programs are described in Section 2 of Part 1 – Metropolitan Plan.

5.3.1 Victorian Advanced Resource Recovery Initiative

The Victorian Advanced Resource Recovery Initiative (VARRI) is a $10 million package established to explore the provision of new waste recovery technology for metropolitan Melbourne. VARRI was announced in August 2008 as part of the government's $300 million Innovation Statement.

The first phase of VARRI will involve the government working with the MWMG, councils and industry to develop a business case exploring options for new waste technology designed to recover valuable resources and prevent waste going to landfill.

The business case will engage all stakeholders and explain the costs and benefits of establishing multiple advanced resource recovery facilities within metropolitan Melbourne. This process will provide certainty to state and local government and industry about roles, policy settings, risk and viability to begin procurement of advanced resource recovery facilities. It is clear that local government and the private sector need to have confidence in the commercial, technical and environmental viability of new facilities, including the reliability of quality feedstock and supportive policy settings.

VARRI will build on elements outlined in Section 4 and help extend the key roles for government in:

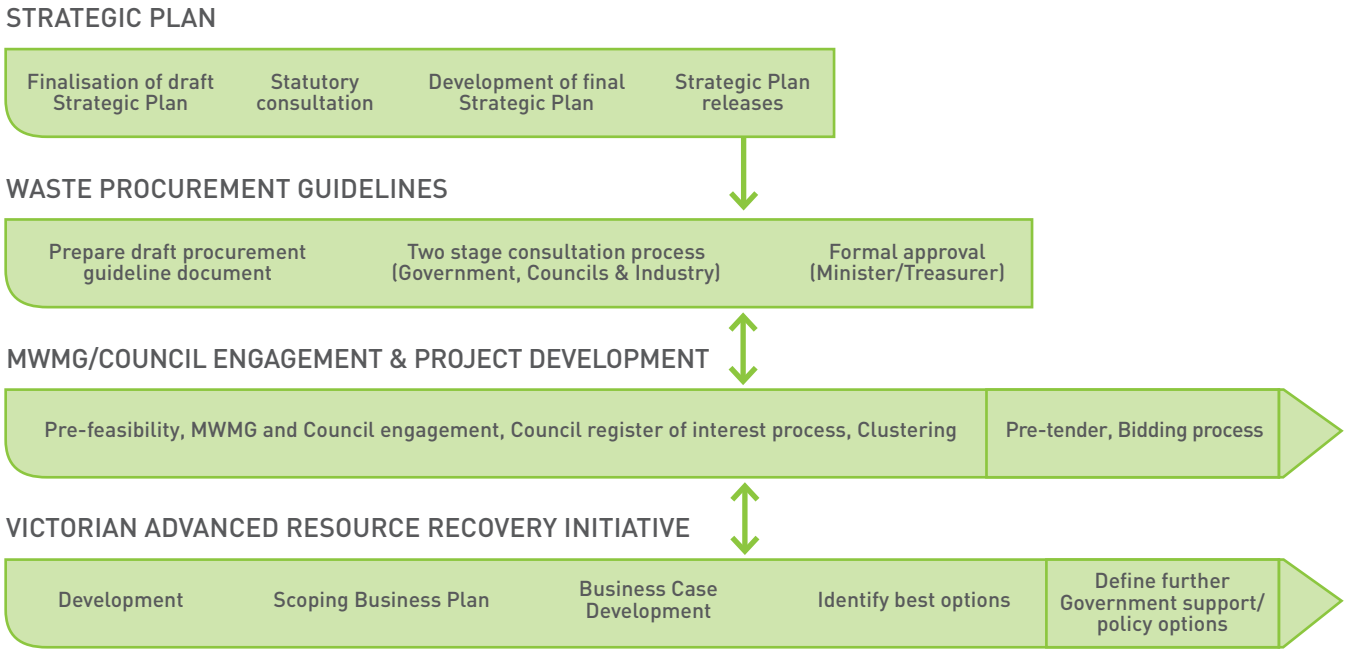
- implementing key components of TZW and this Strategic Plan
- working with the MWMG to help facilitate local government commitment to provide guaranteed supply to a preferred processing facility
- creating the correct mix of regulatory policy and incentives to create a price point that industry and councils can respond to
- ensuring siting requirements are strategically examined and match community expectations
- managing risk allocation across government, local government and industry
- ensuring any chosen technology/facility matches an agreed set of performance requirements.

The procurement of ARRT services (outlined in section 5.4) will require extensive due diligence and negotiation processes. Based on the outcomes of the business case, it is expected that the second phase of the project will begin the procurement process. This will most likely incorporate the establishment of revised council waste contracting arrangements under the stewardship of MWMG. It is currently anticipated that this would involve:

- long-term waste disposal contracts that incorporate performance standards compatible with requirements to encourage the development of ARRT facilities
- revised waste-collection arrangements to maximise the opportunities for recycling/reprocessing waste (particularly organic materials)
- community education / change management programs to support the utilisation of new infrastructure.

Figure 5 illustrates the importance of the engagement process with metropolitan councils through the MWMG to establish support for implementing the vision of this Strategic Plan. The successful management of interrelationships between the directions established by the Strategic Plan, finalisation of procurement guidelines, council engagement and VARRI are crucial to providing informed and clear signals about performance requirements and conditions to the market.

Figure 5: Building the implementation process



5.3.2 Infrastructure rollout

Table 11 shows the anticipated timeline for all processes leading to the contracting, construction and operation of ARRT facilities to address Melbourne's future needs. It shows that initial priority will be given to the development of two ARRT facilities to:

- process residual garbage from inner urban and potentially other councils (supported by a two-bin garbage and container recycling system)
- recover garden and food organics from councils outside of this area through anaerobic biodigestion with energy recovery (supported by a three-bin system, but also potentially recovering organics from residual garbage).

Priority will also be given to the upgrade of aerobic composting facilities to allow a wider range of food organics to be processed through organics recycling collection services. This will also be supported by continuing market and industry development work to build viable markets for recycled organic products.

Table 11: Infrastructure priorities for rollout

FACILITY TYPE	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	LOCATION
STAGE 1 – 2 ARRT facilities addressing priority councils													
One ARRT (residual garbage)													Inner Melbourne
One ARRT (food & garden)													Outer Melbourne
Compost facility upgrades													Outer Melbourne
STAGE 2 - Additional facilities													
ARRTs *													Outer Melbourne

* Note: An integrated plan defining the balance of ARRTs required for Melbourne will be developed as part of the VARRI business case process.

5.4 Procurement of waste services

Under the *Environment Protection Act 1970*, the MWMG is required to plan, coordinate and facilitate procurement of waste management and resource recovery services for metropolitan local government areas. Procurement guidelines are currently being developed in consultation with councils, industry, Department of Sustainability and Environment (DSE) and Department of Treasury and Finance (DTF) to guide decision making for large-scale capital-intensive waste treatment facilities.

The guidelines are being developed in parallel with the Strategic Plan and will ensure a complementary and flexible process to suit the waste management opportunities that will arise over the life of the Strategic Plan and the outcomes of the VARRI business case.

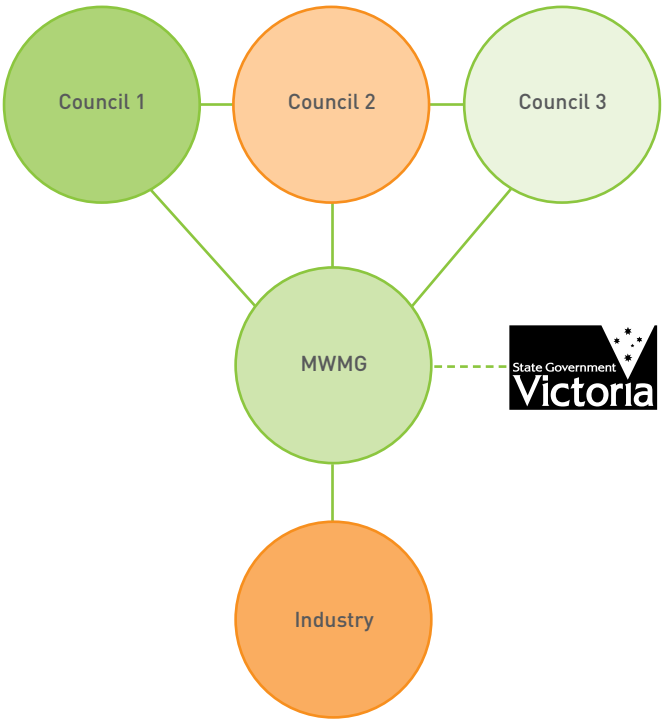
5.4.1 Preferred Procurement Process Model

Notwithstanding a need to monitor current world economic conditions with respect to procurement opportunities for large scale ARRT projects, it is still envisaged that the best approach to procuring ARRT to service multiple councils will be for the MWMG to lead the process between participating councils and industry.

This MWMG-led process is illustrated in Figure 6 and will effectively see the MWMG acting as an agent for councils with the ability to contract between industry and those councils participating in a procurement process.

As well as facilitating and participating in contractual arrangements, the MWMG will also provide to participating councils ongoing contract management and other service related assistance if required.

Figure 6: Preferred procurement process model



It is acknowledged that detailed project business case development will be required before any decision can be made on the specific procurement model to be used for a specific project. The VARRI process will identify the most appropriate procurement mechanisms for specific projects accounting for current economic conditions, environmental outcomes and project risks.

5.4.2 Key procurement assumptions

There are some key assumptions underlying the development of the procurement guidelines, which are listed below.

Council participation

- Local government retains responsibility for providing municipal waste management services to ratepayers.
- It is acknowledged that it is ultimately up to individual councils whether they want to participate in a procurement process.
- It is also acknowledged that local government cooperation is essential for successful project procurement. Unified commitment from groups of councils to supply material over an extended contract period is an essential element of the procurement process. Such commitment provides the opportunity to realise the advantages of economies of scale and gives industry confidence going into a competitive process.
- Local government will be represented in the major procurement planning and decision making phases. As stakeholders critical for success local government will be involved in all incremental steps towards an ultimate contractual commitment.

Project scale and type to determine final procurement protocols

- While the procurement guidelines are being developed to provide guidance in the procurement of large-scale facilities, a specific business case may identify smaller scale and/or modular development opportunities more appropriate for certain areas.
- Smaller-scale regional contracts may be facilitated by the MWMG using public tendering processes in accordance with procurement protocols appropriate for smaller scale service-related contracts matching the lower level of risk investment and complexity.
- Contract governance arrangements for smaller scale contracts will be made on a project-by-project basis.

Government involvement

Any level of government involvement in a procurement process will depend on a number of factors including:

- the project development approach and the level of commitment shown by key stakeholders through a rigorous business case development process
- the form of procurement to be undertaken and level of conformance with approved guidelines
- outcomes from the Victorian Advanced Resource Recovery Initiative (VARRI)
- cost differential between landfill and advanced resource recovery options demonstrated in project business case outcomes.

Procurement evaluation

In general terms any procurement of major waste management services will be outcomes based.

The solutions proposed by the market will be evaluated against environmental, social and economic criteria and influenced by a number of key inputs including:

- types of materials generated within the specific municipality
- location of materials generation
- requirements of the participating municipalities.

As well as feedback from consultation on the Strategic Plan, the following factors affecting procurement have been identified:

- site identification and acquisition
- aggregating waste volumes
- affordability
- planning delays and costs
- business case robustness
- funding and contractual issues
- strategic and statutory land use planning approvals
- technology risks to the environment
- environmental approvals
- risk sharing between state, local government and proponents
- community consultation.

6 Conclusion

6.1 Overview

In preparing this Schedule, existing infrastructure and future infrastructure needs have been assessed to provide direction for the development of waste technologies and systems for metropolitan Melbourne. To meet TZW targets we need to change the way we collect, sort and process waste to increase the recovery of materials from kerbside and reduce the percentage of waste going to landfill. The Schedule particularly focuses on infrastructure required to achieve TZW targets for 2013–14, but also assesses the needs for the next 10 years (to 2017–18).

While this Schedule has identified that there is an adequate network of MRFs and resource recovery centres to collect, sort and transfer a significant proportion of MSW in and around metropolitan Melbourne, a step change in infrastructure provision is required to make significant progress towards to the 65 per cent statewide MSW recovery target by 2013–14.

The step change required for increased MSW diversion focuses in particular on recovering a higher proportion of the organic material – both garden organics and food organics – which currently remains in the residual waste stream and is disposed of to landfill. Consequently, in the development of this Schedule, considerable attention has been given to developing and evaluating options that address increasing the recovery of these organic materials from the MSW stream through kerbside collections.

Based on current and proposed recovery technologies in Australia and Europe, there are many available systems and technology options to achieve the TZW targets and deliver better environmental outcomes compared to the current arrangements. The market and procurement processes will determine the ARRT infrastructure that is developed.

Modelling presented in this Schedule indicated that no one option offers a final 'end' solution to the type of technology needed. However, there were some options that had better outcomes overall. It is clear that each of the options provides a better result than disregarding the processing of organics.

Local government is responsible for the provision of waste management services as defined under the Act. The future directions below are subject to consultation and agreement of local government and other stakeholders through the implementation strategy and the proposed testing of cluster arrangements facilitated by the MWMG.

The development of a business case through the establishment of VARRI will enable buy-in from stakeholders and investors and the rollout of the necessary resource recovery infrastructure for metropolitan Melbourne.

6.2 Key findings

The key findings acknowledge the fundamental issues that need to be addressed in the development of programs and infrastructure needs to support the waste sector achieving TZW targets.

	KEY FINDINGS
Reduction strategies	• Programs that support waste avoidance, sustainable consumption, and sustainable waste management approaches need to be integrated into waste and recycling services provided to the community.
Transfer stations/ Resource recovery facilities	• The availability and accessibility of local transfer stations/RRCs are important elements of modern waste management infrastructure because these facilities can receive and separate items suitable for resource recovery. It is important that linkages to the planning system that support and promote the maintenance and development of these transfer facilities are established. • The current number of transfer stations across Melbourne is adequate, but continued improvements and uptake of new technology will be an integral factor to their ongoing viability and efficiency of resource recovery. • Expansion of the services offered at transfer stations is expected as new materials and end markets are developed.
Resale centres	• Resale centres provide additional resource recovery and employment opportunities.
Byteback	• Byteback is an important example of a product stewardship initiative. It is supported by the Victorian government.
Detox	• The Detox Your Home program is very important for supporting the management of potential contaminants in the kerbside waste stream.
Materials Recovery Facilities (MRFs)	• Current MRF processing capacity is adequate to receive and process the additional metropolitan Melbourne kerbside commingled volumes during the four-year review term of this Schedule. Some equipment upgrades and facility relocations may be required to address projected volume increases. • MRFs can be located in areas of light industry. No significant barriers are identified to the private sector developing additional processing capacity as required.
Organics processing	• There may be immediate and medium term organic processing capacity shortages until new procurement processes secure additional capacity. Facilities have limited potential to expand processing capacity of garden organics. • The recycled organics processing industry is still in its development phase, and ongoing market development will be needed to ensure that it becomes sustainable.
Food organic facilities	• Existing organics processing facilities have minimal capacity to process additional municipal food organics.
Residuals	• There are significant opportunities to recover more materials from the residual stream as new processing technologies become available and new markets are developed for materials. • Local government will need to consider carefully the types of available recovery opportunities and approaches and how the options may meet their community's expectations for future waste services.
Improved kerbside collection	• There are opportunities to improve source separation activities from the MSW stream within current collection systems.
Hard waste	• Hard waste services will be affected by a number of change drivers in coming years, including safety and product stewardship program enhancements. • Future contractual arrangements may need to include requirements for the practical recovery of 'product stewardship recoverable' items to maximise resource recovery from hard waste services.
Multi unit dwellings	• The number of large multiunit developments throughout Melbourne will continue to grow. • Efficient and effective integration of waste management and resource recovery considerations into landuse planning and building control processes for multi-unit dwellings is needed. For example, waste management plans developed for multi-unit dwellings need to be designed, applied and assessed across the life of a building. • MWMG in working with other stakeholders including SV, DPCD, and councils is seeking improvements for resource recovery from multi-unit dwellings across metropolitan Melbourne. The finalisation and implementation of best practice guidelines for collection of recyclables at multi-unit dwellings by SV will be an important component to meeting challenges in this area.

	KEY FINDINGS
Improved away from home collection	• The quantity and composition of materials disposed of at public sites and major venues needs to be assessed further to better understand the cost implications and recovery opportunities relating to public place recycling. • Future advanced resource recovery infrastructure may provide an opportunity to recover a significant proportion of recyclable waste from public sites and major venues (particularly where public place recycling infrastructure has not been established or is not likely to be established).
Street sweepings	• Composting the organic loads from street sweepings has been trialled in the past, but contaminants makes processing difficult. Low-value re-uses for products derived from street sweeping could be developed where it is cost effective compared to landfilling the material.
ARRTs	• Advanced resource recovery technologies offer an opportunity to reduce greenhouse gas emissions whilst recovering valuable resources. • The quality of material and the availability of stable markets are key to developing successful ARRTs.
Integrating streams	• In inner city areas, there may be an opportunity for dedicated C&I collections (from office buildings and restaurants) to be processed at a MSW facility. • When considering appropriate sites, it is important to think carefully about the opportunities that may arise from sourcing viable material additional to the MSW stream and the distance to product markets.
Modelling and analysis of MSW infrastructure	• The modelling provides the underlying methodology for determining future waste infrastructure needs and can be used to assist in future planning across metropolitan Melbourne. • The adoption of preferred collection systems across metropolitan areas is necessary to process organic materials and maximise their diversion from landfill. The processing facilities will also have the potential to receive organic materials from the C&I and C&D sectors.
Council clusters	• Clustering is the preferred method to generate necessary volumes of waste material for contractual purposes.
Siting facilities	• The State Planning Policy Framework (SPPF) at Clause 12.07–2 provides waste management policy to guide existing and future land-use planning and development decisions. The clause promotes re-use and recycling, protection of buffers and encourages the siting of waste generators and businesses near each other.
Risk management	• A risk assessment tool and related risk management strategies, developed in consultation with local government and industry, would provide a level of confidence in the outputs and performance of potential technologies.
Community engagement and education	• Good community engagement and consultation identifies and defuses potential community concerns about any potential new facilities.
Market Development	• Until the global financial downturn later in 2008, a strong market demand and the value of metals, paper and plastics made recycling profitable for recyclers. Since the downturn, there have been falls of 50 per cent or more for recyclables and at the time of the plan's publication, the extent and timing of market recovery was uncertain. • Establishing markets for recycled organic soil conditioner and mulch products continues to present a significant challenge. • Markets for recovered timber require further development, with opportunities in the areas of energy recovery and engineered timber. • Greater recovery from the MSW/small vehicle load stream will require greater community awareness about opportunities to recycle timber and the ways to present materials for recycling. • There is opportunity to develop markets for unrecycled glass fines, through either further investment in technologies to screen and grade fine for recycling, or develop alternative uses such as an aggregate in civil engineering works.
Product Stewardship	• Product stewardship is important in addressing life cycle impacts and is essential to reducing waste going to landfill. There are a number of programs in place that are supported by the state government.
Procurement of waste services	• There are a number of possible routes for procuring infrastructure and services capable of meeting the objectives of TZW. The preferred approach will be a MWMG led process between participating councils and industry. • The MWMG may play a variety of project development, procurement and contract management roles for and on behalf of metropolitan councils.

6.3 Future directions

The future directions have been developed to outline key paths for steering the waste sector to achieving TZW targets. To achieve these future directions action will be required by all parties involved in resource recovery – ie, state and local government, the waste and resource recovery industry and environmental organisations. It is expected that some further partnerships will emerge to realise common goals.

	FUTURE DIRECTIONS
Reduction strategies	• Expand waste reduction strategies by identifying: key items to be avoided; approaches for making sustainable purchasing choices; and methodologies for optimising waste management. • Run programs that target efficient use of food in the home and minimise waste by reducing spoilage.
Organics processing	• Future upgrades of existing organics processing facilities will comply with EPA works approval and licensing requirements; these upgrades will primarily entail enclosing composting operations to help improve overall performance and product quality where appropriate. • Expand and/or establish appropriate markets to match increased production.
Food organics facilities	• To maximise the recovery of food organics and avoid contaminants in the kerbside residuals bins: - establish new organics recovery infrastructure and/or significantly upgrade existing windrow compost facilities - provide the appropriate bin configuration for collection of food organics - run targeted community education programs.
Improved kerbside collection	• Establish specialised collection services (such as the ReNew, the day-after collection) to increase the range of products and material being recovered from the kerbside. • Encourage all metropolitan councils to arrange for the collection of all codes of rigid plastics. • Continue to expand education and behavioral change programs in support of proper source separation of household waste and recyclables and the recycling ethic in general. • Further pilot projects and trials of collections from multi-unit dwellings will be needed.
ARRTs	• Thorough research into any new technology is critical to it being considered as a marketable option to both reliably process available waste steams and produce viable end products. • Ensure that any future decisions on the establishment of resource recovery facilities are made after consultation and consensus with metropolitan councils to ensure their commitment to providing the long-term dedicated feedstock required for these facilities.
Integrating streams	• When considering appropriate sites for integrated facilities, consideration should be given to the opportunities to integrate waste from C&I and C&D in terms of the logistical benefits associated with access to material inputs and to markets for products.
Council clusters	• Councils will need to agree to effective clustering to enable the MWMG to proceed with procurement processes for appropriate technology solutions for metropolitan Melbourne and to ensure councils deliver effective services to their residents. • Opportunities to link services and infrastructure to adjacent municipalities and regions should also be considered.
Siting facilities	• The intent and relevant components of Towards Zero Waste and the Strategic Plan need to be reflected appropriately in Victoria's planning system.
Resource recovery and planning assessment matrix	• While the state government is currently reviewing the Victorian Planning Scheme an assessment matrix will need to be developed to assist in the assessment of potential sites in accordance with the revised planning provisions.
Community engagement and education	• An education and engagement implementation strategy will need to be developed so that key messages are identified and understood by all the stakeholders and brought to the community.

	FUTURE DIRECTIONS
Market development	• Further market and industry development is required to promote the sale of higher value organics products into the urban amenity, horticultural and agricultural markets. Community engagement and infrastructure is also required to reduce the risk of physical and chemical contamination of products. • Markets for timber will be developed by commercial timber recycling facility operators, which predominantly process materials from the C&I and C&D sectors. • Markets for materials recovered from C&D waste from MSW/small vehicle loads will be developed as a sub-set of C&D sector waste recyclers.
Procurement of waste services	• The proposed procurement guidelines will be based on an MWMG led model but this does not preclude other procurement models being used if appropriate for local government and/or industry. • Through the procurement process, clusters of councils and/or the MWMG may enter into contracts for the provision of infrastructure and services which are capable of meeting the objectives of TZW in a manner which is consistent with the Strategic Plan. • Specific contract governance arrangements will be determined on a project-by-project basis and will be influenced by the type and scale of the project and consideration of local government needs as the responsible manager for MSW.