City of
Mount Gambier

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23rd August, 2018

MAYOR
COUNCILLORS
CITY OF MOUNT GAMBIER

NOTICE is given that the Environmental Sustainability Sub-Committee will meet in the following Meeting Room on the day, date and time as follows:

Environmental Sustainability Sub-Committee

(On Site – Re-Use Market – 3 Eucalypt Drive, Mount Gambier):

Tuesday, 28 August 2018 at time 7:30 a.m.

An agenda for the meeting is enclosed.

Mark McSHANE
CHIEF EXECUTIVE OFFICER

AGENDA INDEX

AGENDA OF ENVIRONMENTAL SUSTAINABILITY SUB-COMMITTEE MEETING

Meeting to be held at the Re-Use Market, 3 Eucalypt Drive, Mount Gambier on Tuesday 28 August, 2018 at 7:30 a.m.

PRESENT Mayor Andrew Lee

Cr Des Mutton (Presiding Member)
Cr Penny Richardson
Cr Sonya Mezinec
Cr Ian Von Stanke

COUNCIL OFFICERS

Chief Executive Officer	-	Mr M McShane
General Manager Community Wellbeing	-	Ms B Cernovskis
General Manager Council Business Services	-	Mrs P Lee
General Manager City Growth	-	Dr J Nagy
General Manager City Infrastructure	-	Mr N Serle
Environmental Sustainability Officer	-	Mr A Izzard
ReUse Market Co-ordinator	-	Ms R Mobbs

WE ACKNOWLEDGE THE BOANDIK PEOPLES AS THE TRADITIONAL CUSTODIANS OF THE LAND WHERE WE MEET TODAY. WE RESPECT THEIR SPIRITUAL RELATIONSHIP WITH THE LAND AND RECOGNISE THE DEEP FEELINGS OF ATTACHMENT OUR INDIGENOUS PEOPLES HAVE WITH THIS LAND.

1. APOLOGY(IES)

Apology(ies) received from Cr

That the apology from Cr be received.

Moved: Seconded:

2. CONFIRMATION OF ENVIRONMENTAL SUSTAINABILITY SUB-COMMITTEE MINUTES

Meeting held on 1 May 2018

That the minutes of the Environmental Sustainability Sub-Committee meeting held on 1 May 2018 as previously circulated be confirmed as an accurate record of the proceedings of that meeting.

Moved: Seconded:

3. QUESTIONS

3.1. With Notice

Nil submitted.

3.2. Without Notice

4. DEPUTATIONS

Nil

5. ENVIRONMENTAL SUSTAINABILITY SUB-COMMITTEE REPORTS

Environmental Sustainability Sub-Committee Reports commence on the following page.

5.1. Solar System Performance 2017/2018 - Report No. AR18/32733

COMMITTEE	Environmental Sustainability Sub-Committee
MEETING DATE:	28 August 2018
REPORT NO.	AR18/32733
RM8 REFERENCE	AF11/407
AUTHOR	Aaron Izzard
SUMMARY	Council's solar power systems have produced over 387,000 kWh of renewable electricity since the first system was switched on. That is equivalent to running an average sized South Australian home for over 60 years.
COMMUNITY PLAN REFERENCE	Goal 3: Our Diverse Economy
	Goal 4: Our Climate, Natural Resources, Arts, Culture and Heritage

REPORT RECOMMENDATION
(a) That Environmental Sustainability Sub-Committee Report No. AR18/32733 titled '*Solar System Performance 2017-2018*' as presented to the Environmental Sustainability Sub-Committee on 28 August 2018 be noted. (b) That Council endorse staff to continue investigating opportunities for solar power at Council facilities.

Moved: Seconded:

Background

The City of Mount Gambier has a history of strong support for environmental sustainability. At the 20 May 2008 Council meeting, Council formerly adopted the Natural Step Framework, to guide its commitment to environmental sustainability. One of the general principles of the Natural Step is to increase the usage of renewable energy, and reduce reliance on fossil fuels. As such, Council has been gradually expanding its solar power capacity over the last few years.

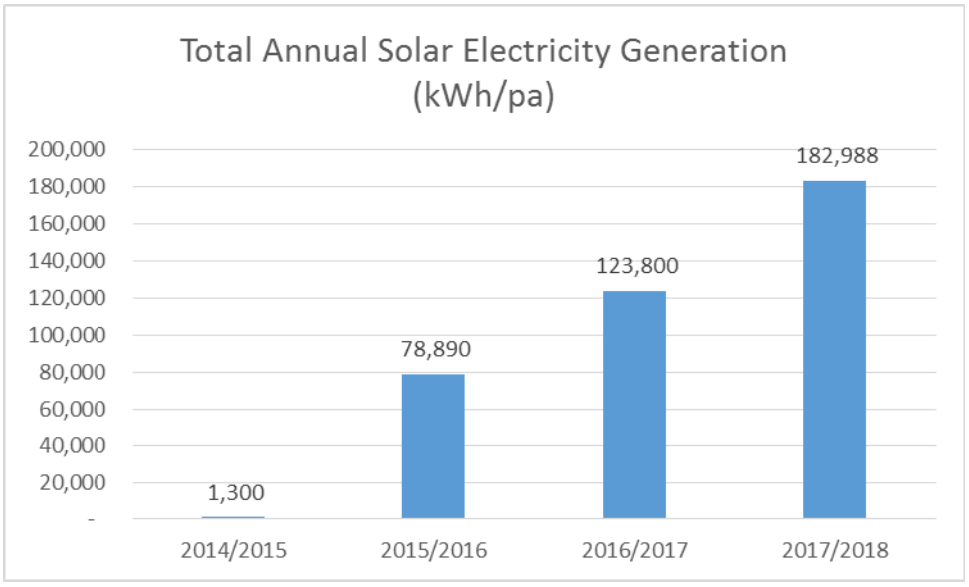
Council now has a total of 171.5 kW of solar power installed across 5 of its sites:

	Size (kW)	Date Switched On
Library	57.5	1/06/2015
Carinya Gardens (cemetery)	10.4	7/06/2016
Waste Transfer Station	5.2	21/06/2016
Works Depot	29.9	11/07/2016
Aquatic Centre	68.5	3/04/2017

Together they have produced a total of over 387,000 kWh of renewable electricity since the first system was switched on. That is equivalent to running an average sized South Australian home for over 60 years, and equates to the prevention of over 190 tonnes of carbon emissions.

Discussion

The graph below lists the total amount of solar electricity generated by Council's solar systems over the past four financial years:



Limited roof space, and constrains of the local electricity grid, have limited the amount of solar power installed at some sites, but the systems are still leading to significant savings in the amount of black electricity used at the facilities. In 2015/2016 (the year following the installation of the solar system) the Library's black electricity use reduced by 31%. In 2016/2017 (the year following the installation of the solar system) the Depot's black electricity use reduced by 45%. Black electricity use at the Waste Transfer Station reduced by 19% following the solar installation. In 2017/2018 the solar system at the Aquatic Centre generated 23% of the electricity used at the facility.

There have been some issues with the 'anti-islanding' equipment of the Aquatic Centre solar system. The purpose of this equipment is to protect the electricity grid in times of black out. It is required by SA Power Networks for all solar systems 30kW or above. The equipment at the Aquatic Centre sometimes switches off the solar system when there is no black out. The reason for this is being investigated by a local solar contractor, so the problem can be rectified. There has also been an issue with online monitoring of the Carinya system. This is also being investigated by a local solar contractor, so the problem can be rectified.

Note: "Black electricity" is electricity generated by burning fossil fuels like coal and gas.

Conclusion

Council is now generating a significant amount of renewable electricity via its solar systems. In line with the Natural Step Framework, further opportunities for solar power on Council facilities should be investigated. Installations that will deliver environmental and financial benefits should be undertaken.

Attachments

Nil

Aaron IZZARD
ENVIRONMENTAL SUSTAINABILITY OFFICER

Barbara CERNOVSKIS
GENERAL MANAGER COMMUNITY WELLBEING

13 August 2018
AI

5.2. ReUse Market Update - August 2018 - Report No. AR18/27187

COMMITTEE	Environmental Sustainability Sub-Committee
MEETING DATE:	28 August 2018
REPORT NO.	AR18/27187
RM8 REFERENCE	AF17/543
AUTHOR	Aaron Izzard
SUMMARY	At the 15 August 2017 Council meeting Council resolved to commence the construction of the ReUse Market. This report provides an update of progress since the last update in May 2018.
COMMUNITY PLAN REFERENCE	Goal 1: Our People
	Goal 2: Our Location
	Goal 3: Our Diverse Economy
	Goal 4: Our Climate, Natural Resources, Arts, Culture and Heritage

REPORT RECOMMENDATION
(a) That Environmental Sustainability Sub-Committee Report No. AR18/27187 titled '*ReUse Market Update - August 2018*' as presented to the Environmental Sustainability Sub-Committee on 7 August 2018 be noted.

Moved: Seconded:

Background

At the 15/08/2017 Council meeting the following resolution was passed:

That Council endorse the detailed design plans and cost estimates for the construction of a Mount Gambier ReUse Market at 3 and 5 Eucalypt Drive and proceed to construct this facility (within the limits of the 2017/2018 budget allocation of $560,000) and with the facility being fully operational by October 2018.

Since that time Council staff have commenced the necessary tasks required to complete this project.

Discussion

Since the last update report in May 2018 the following activities have been undertaken:

- A project plan and timeline to guide the development of the facility have been formulated and updated (attachment 1).
- The ReUse Market Coordinator commenced at Council on 2 July 2018.
- Recruitment of a ReUse Market Assistant has commenced.
- Construction of the receival shed at the Waste Transfer Station, and associated roadworks and signage are complete.
- Commercial cleaning of the existing building office spaces has been completed.
- Walls and floor of warehouse area have been painted.
- Waste Transfer Station staff have commenced collecting items for sale at the ReUse Market.
- Council IT connection has been completed.
- Procurement of sorting crates for receiving items has commenced.
- All diseased trees have been removed.
- External areas of the site have been prepared for a re-seal.
- Warehouse area has been cleaned out, so that stock can begin to be laid out in preparation for sale.
- The ReUse Market Coordinator and Environmental Sustainability Officer have visited 7 similar sites in Victoria, to research finer details of how these facilities are run, including aspects such as site layout, product rotation, product pricing etc.
- The Independent Learning Centre (ILC) continue to work at the site two days per week, doing activities such as sorting, test & tag etc. (under supervision of their teachers).

- The ReUse Market is partnering with Uniting Communities to host the "Mend the Cycle" program, which assists people recovering from addictions to rebuild their life – one activity being repairing bikes, which will be sold at the ReUse Market.

- A "Sort & Save" campaign will be launched in September 2018, to encourage donations of quality goods to the ReUse Market, and encourage customers to sort their loads to minimise waste to landfill. So residents can now officially start donating items for the ReUse Market, via the Waste Transfer Station.

Conclusion

Since the August 2017 Council meeting significant work has been completed towards establishing the ReUse Market. There are still a number of tasks remaining to ensure that the facility becomes operational on schedule in October 2018.

Attachments

Attachment 1 (AR17/36980): Project Plan Summary – ReUse Market

Aaron IZZARD
ENVIRONMENTAL SUSTAINABILITY OFFICER

Nick SERLE
GENERAL MANAGER CITY INFRASTRUCTURE

11 July 2018
AI

5.3. City of Mount Gambier Waste Recycling and Management Update - August 2018 - Report No. AR18/26915

COMMITTEE	Environmental Sustainability Sub-Committee
MEETING DATE:	28 August 2018
REPORT NO.	AR18/26915
RM8 REFERENCE	AF11/391
AUTHOR	Aaron Izzard
SUMMARY	A summary of the Sydney Waste Strategy Summit. Also an update on the emerging options for recycling and waste management.
COMMUNITY PLAN REFERENCE	Goal 4: Our Climate, Natural Resources, Arts, Culture and Heritage

REPORT RECOMMENDATION
(a) That Environmental Sustainability Sub-Committee Report No. AR18/26915 titled '*City of Mount Gambier Recycling and Waste Management Update August 2018*' as presented to the Environmental Sustainability Sub-Committee on 28 August 2018 be noted.

Moved: Seconded:

Background

At the end of 2017 China banned the import of numerous types of recycling and waste resources. Prior to this ban large volumes of Australia's recyclables (and other countries'), were sent to China. The bans have resulted in significant drops in the market price of recyclables and more stringent contamination standards for recycled materials, affecting the viability of the recycling industry in Australia. These changes also impacted Mount Gambier's recycling system, as the cost of recycling has increased.

Since the China waste bans were implemented, waste and recycling have been high on the agenda for councils across Australia. Council staff, in conjunction with the Environmental Sustainability Sub-Committee have been considering alternative waste management options for some time. Local waste and recycling management options have been a topic of frequent discussion at Environmental Sustainability Sub-Committee meetings.

At the Council meeting held on 15 May 2018 the following resolutions were passed:

- *The City of Mount Gambier sends Cr Ian Von Stanke and Cr Josh Lynagh to the waste strategy summit in Sydney from June 26 to 28, 2018 and a staff member nominated by the Chief Executive Officer.*
- *the attendees share the information gathered at the summit at an Elected Members workshop in July 2018.*

This workshop occurred on 6 August 2018.

At the Operational Standing Committee meeting held on 12 June 2018 the following motion with notice was put and carried:

- *Council Officers prepare a report for Council on international and domestic examples of the use of incineration; power generation; recyclable plastics technology (including pelletising plastics for use in road base and other uses; and any other process or technology which would support Council to reuse or recycle waste, or process products for further use as part of Council's waste management operations. Examples sought should have some regard to the scale of operations and volumes generated, or which could be reasonably expected to be generated if Mount Gambier was to be a hub for such recycling/incineration processes for councils within 330kms of Mount Gambier.*

Discussion

The China waste bans have brought waste and recycling more to the forefront for communities and councils across Australia. Whilst there are some short term challenges, it has also presented opportunities. These are being explored across the country, including in Mount Gambier. Some of the opportunities being explored include utilising low-value recyclable materials locally for applications such as construction, diverting a greater percentage of organics away from landfill, and waste to energy.

<u>Sydney Waste Strategy Summit Workshop</u>

The Sydney Waste Strategy Summit Workshop consisted of thirty three separate presenters or panel discussions over three days from 26 to 28 June 2018. The City of Mount Gambier was represented by Cr Ian Von Stanke, Cr Josh Lynagh, and Nick Serle – General Manager City Infrastructure. These three attendees gave a summary of the Summit at the Members Workshop held on 6 August 2018. Some of the key messages the attendees took from the Summit included:

- Waste production nationally has a compound annual growth rate of 6% (National population growth is approximately 1.5%).
- The China "National Sword" policy and the glut of glass has resulted in a $152/t increase in costs to materials recovery facilities for processing recyclables.
- Local uses for low-value glass and mixed plastics need to be found.
- Waste to energy technology is improving, however the cost is prohibitive and the environmental outcome is less than recycling.
- Reduction in organics going to landfill is the biggest immediate opportunity.

Glass Crushing

One of the product streams produced by the sorting of kerbside recycling is a mixture of broken glass and plastic and metal bottle tops. Following the introduction in 2017 of a cash deposit recycling scheme in Queensland and New South Wales (which included glass beverage bottles), and low-price glass bottle manufacturing in Mexico, the market value of mixed broken glass reduced to zero. Council staff commenced discussions with Green Triangle Recyclers regarding the options for crushing and re-using glass. One option for the local re-use of this material is to have it crushed and then use it in Council's road and/or concrete construction. Council staff had initial discussions with Gambier Earth Movers on the topic and they agreed to a trial of crushing the material in their crusher when it becomes available. This should take place in the near future. The problem of removing the plastic bottle tops from the mixed broken glass still needs to be resolved, or alternatively a solution that can accommodate a mixture of crushed glass and plastic must be identified. Green Triangle Recyclers have submitted a grant application to Green Industries SA to purchase a machine that will remove plastic bottle tops and other plastic contaminants. The subsequent material will be crushed by Gambier Earth Movers on a trial basis. This material could potentially be used in a variety of construction applications – as a base material for paths and roads, as pipe bedding material, in bitumen, asphalt or concrete – if it meets specifications for these uses. This will depend on the quality of material produced by the crushing machine, which is a general crusher, and not specifically designed for glass.

The technology to use crushed glass itself is established, and Lismore Council in NSW are now crushing their own glass and using it in their own works. Other councils using crushed glass as a sand replacement include Cairns, Townsville, Noosa and Lake Macquarie. These councils source the glass sand from a local Materials Recovery Facility (MRF) that has specialised equipment to create glass sand. Port Stephens Council are conducting a trial of 'greencrete'. This involves replacing the sand content of normal concrete - which makes up about 25% - with recycled glass, to be used on traffic islands.

Using crushed glass would require South Australian EPA approval. The material is currently classified by the EPA as waste, and would need the contaminants removed for it to be no longer regarded as waste.

Initially this process is likely to be more expensive than using virgin sand, but it puts this material to beneficial use, otherwise it will end up in landfill, which also has a cost.

Alternative Uses for Low-Value Plastic

Another material produced by the sorting process of kerbside recycling that has little to no value is 'mixed plastics'. These are generally plastics #3, #4 and #5 – mixed in together. When Plastics Granulating Service (PGS) in Adelaide restarts by the end of 2018 this material will be able to be sent there, where the facility will use advanced technology to sort out the different types of plastic, which are then turned into pellets for recycling into new products. However, it is likely that PGS will only accept this material at no cost to them, so this option will be at a net cost, due to processing and transport costs. An alternative that is gaining interest around the world is the use of various types of plastic in the construction of roads. When the China bans came into force Council staff

commenced investigating this option. This option would also require South Australian EPA approval.

This process is occurring in the UK, where they use specific types of pellitised or flaked plastics in road construction e.g. the MacRebur system. In India they have been using shredded plastic in road construction for some time.

Hume City Council in Melbourne, in partnership with construction company Downer, have done a trial of a 'recycled plastic road'. The 250 tonnes of asphalt that was used to construct the road contained approximately 200,000 plastic bags and packaging, 63,000 glass bottle equivalents, 4,500 used printer cartridges and 50 tonnes of recycled asphalt. Sustainability Victoria supported the project with more than $100,000 to develop specialist equipment and help with trial costs. Downer have also built a road in Sutherland Shire NSW, using the same processes.

As with glass sand, using plastics locally in construction applications is likely to be more expensive than using virgin material, but it puts this material to beneficial use locally. Since the China bans commenced, a large proportion of plastics from medium to large businesses, and farms, are currently going to landfill, which also has a cost.

It should be noted that using glass and plastic material in road and footpath works is a good option. However, this only re-uses the material once. Local options that turn the material into new products, which themselves can then be recycled at end of life, would be higher on the waste hierarchy.

One small scale example of this is the "Precious Plastic" system. The system basically consists of small machines that shred plastic, then melt it down into new products. Whilst it is only small scale, it has the potential to open up new markets, new ideas, new enthusiasm, and bring new people into the recycling industry. Most importantly it is actual local recycling – not sending material off elsewhere to be recycled. Tenison Woods College are currently having some Precious Plastic machines built, there could be an opportunity for Council to partner with Tenison on this initiative.

Another opportunity for recycling and reducing waste to landfill is polystyrene recycling. Currently the only local option for polystyrene is landfill. This material takes up a large amount of airspace, compared to its weight. Council has allocated funds in the 2018/2019 budget to purchase an Expanded Polystyrene (EPS) recycling machine. This machine converts loose EPS waste into solid blocks, at a compaction ratio of 100:1. The blocks are then sold to recyclers, where the material is turned into new products. Polystyrene will be accepted at the Waste Transfer Station. The EPS recycling machine will be located in the new recovery shed. The condensed blocks will be stored until a truck load is on hand, when it will be sold and then be freighted to a recycler.

Organics Recycling

As stated above, one of the main take home messages from the Sydney Waste Strategy Summit was that reducing organics going to landfill is the biggest immediate opportunity. Of the 23 MT of waste that Australia generates, 10.5 MT is organics. In our local context, 44.6% of Mount Gambier's general waste bin contents is organics (over 35% is food waste). Over 2,000 tonnes of organics are going to Caroline Landfill every year, just from Mount Gambier's kerbside rubbish bins.

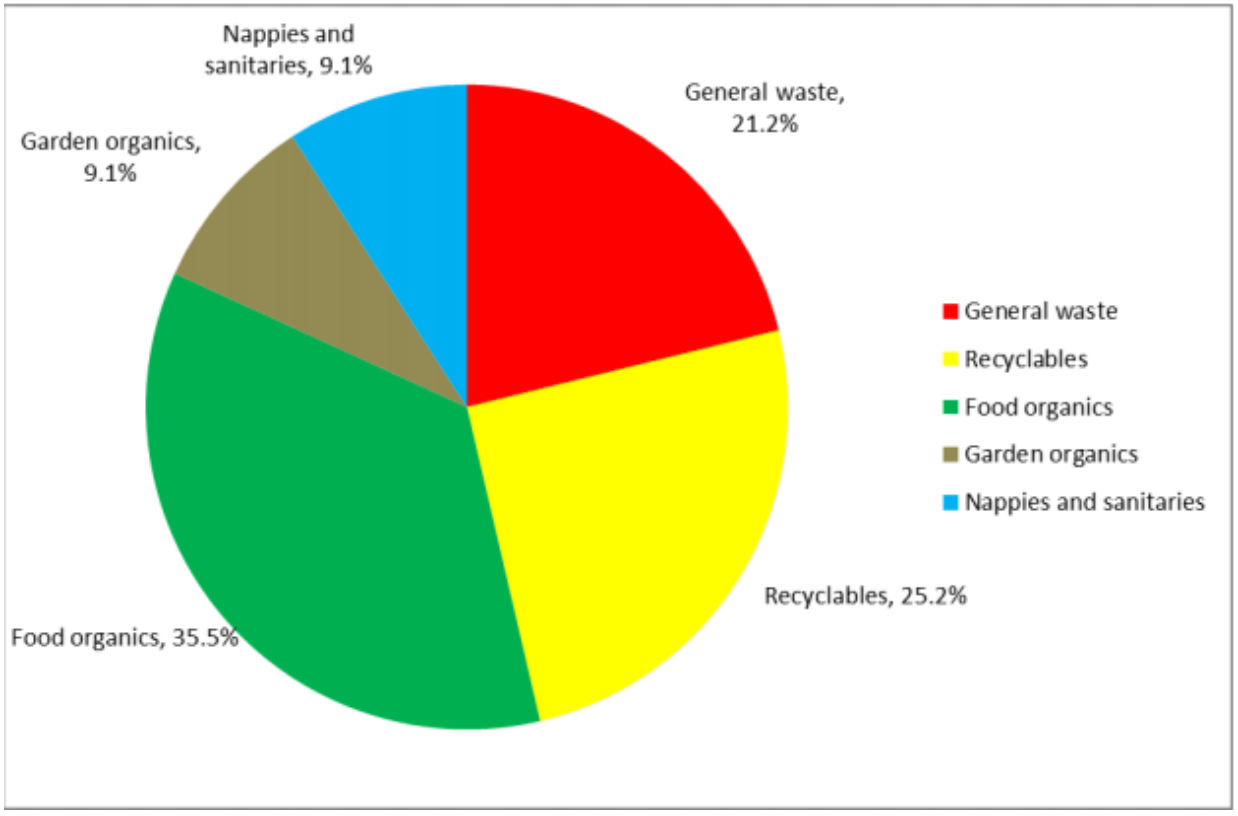


Figure 1: Average contents of Mount Gambier kerbside rubbish bins, from 2016 bin audit.

Following on from the organics and waste modelling done for Council in 2014 by Blue Environment (AR15/5713), Council is endeavouring to reduce waste to landfill and reduce carbon emissions. The guiding principle for reducing waste is the waste hierarchy. The hierarchy clearly states that energy recovery is preferable to landfill, but reducing overall waste volumes is the first step. The Blue Environment report outlined this process with regards to reducing organics to landfill.

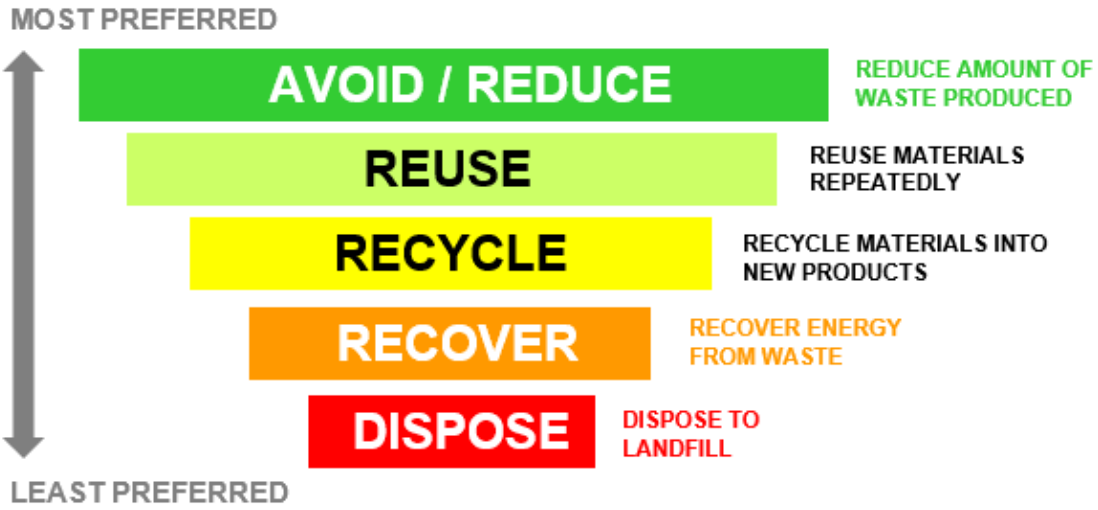


Figure 2: The Waste Hierarchy.

The first step was to conduct a trial of 2,000 kitchen caddies with green organics subscribers. This was completed in 2016, with encouraging results. Following on from the successful trial, the second step is to give kitchen caddies to all green organics subscribers. This commenced in June 2018, and will continue until all of the caddies have been given away.

The third suggested step is to change the configuration of the kerbside bin system to best practice. This involves the rubbish and recycling bins being collected fortnightly, and the organics bin being collected weekly. However, some councils collect all three bins on a fortnightly basis. All residences within the municipality are given a kitchen caddy, which use compostable bags. Any changes to the kerbside bin configuration would need to be preceded by a substantial educational campaign. When 5 councils in southern NSW / northern Victoria changed their kerbside system an educational campaign of almost $1 million was undertaken.

In terms of the business sector and organics, Council could conduct a trial with various types of businesses that produce a lot of organic waste, particularly food waste.

A program that will assist with promoting home composting is the 'Compost Revolution'. It is an online platform which is an all-in-one education, infrastructure logistics and marketing program, streamlining the process so that councils achieve waste and emissions reduction targets while saving money. Compost Revolution provide information, collect data, offer equipment discounts and organise equipment delivery – all to encourage home composting.

Council could also consider a small rebate system for alternatives to disposable nappies. These make up over 9% of Mount Gambier's rubbish bins. The City of Casey have a cloth nappy rebate program. This consists of a monthly draw that offers Casey residents the chance to win half (up to $300) of their cloth nappy spend back. City of Mount Gambier could run a similar rebate program, and expand it to include compostable nappies. The rebate could be $50/mth for re-usable nappies, and $50/mth for compostable nappies, and decided by a random draw. The rebate program could possibly be promoted during the Baby Bounce sessions at the Library, near the nappy change facilities in the Library, in the maternity unit of the hospital, and child care centres in the town. Such a rebate program could be accommodated within the 2018/2019 Sustainability budget.

Finally, when Council have done all they can to reduce overall waste volumes, then waste to energy could be considered. By this stage the organic and recyclable content of the waste stream should be minor.

Waste to Energy & Caroline Landfill

One of the other messages given at the Sydney Waste Strategy Summit was that waste to energy (WtE) technology is improving, however the cost is prohibitive, the required economies of scale are generally large, and the environmental outcome is only marginally better than landfill, when compared to recycling.

Modern municipal WtE, including no-value recyclable material, has not been undertaken in Australia to date, though several facilities are proposed. WtE is common in Europe, driven by government policy and the lack of space for landfill, more so than environmental or economic drivers. Existing WtE plants overseas are much larger than could be constructed in Mount Gambier. These facilities generally require 200,000 tonnes of waste p.a. or more to be economically viable. Caroline Landfill only receives 25,000 t/pa, and even if waste was imported from further north and also western Victoria, the volumes would still be insufficient.

There is a risk with WtE of compromising the good work that has been done with establishing recycling systems over the past 20 years. Recycling (including organics to compost) is a much better environmental outcome than WtE. Reference should always be made back to the waste hierarchy.

Whilst WtE is not as good as recycling, it is higher on the waste hierarchy than landfill. Given this, in late 2016 Regional Development Australia (RDA) Limestone Coast released a program called the "Bioenergy Feasibility Fund", where funding was available to contribute towards the feasibility assessment of bioenergy projects in the region. Council staff made an application to investigate the feasibility of a WtE facility at the Caroline Landfill, which was successful.

The final report is titled "Proposed Project: Municipal Waste-to-Energy Plant at Caroline Landfill". The main findings of the report are as follows:

- The CAPEX or build cost would be circa $30-35M (±20-30%); and
- The net financial benefit generated for the City of Mount Gambier would be circa $2.3M per year.

The ratio of CAPEX / Net Benefit for the proposed WtE plant is 13.5. Once financing / investment costs are considered, and financial (discounted cash-flow) analysis is conducted, it is not likely that the project would be deemed feasible or financially attractive at the current time. However, this could change in the next five years if electricity continues to increase in price, the cost of landfill disposal rises further and the cost of WtE technology reduces further. It should be noted that this was a very high level pre-feasibility study, not a detailed analysis. Waste to Energy is something that should be regularly considered and revisited by Council. Whilst it has not been determined to be feasible at this point in time this may change in the medium or long term.

The report was presented to Council at the 21 November 2017 meeting, where the following resolution was passed:

That Council staff keep a watching brief on the waste to energy sector, with particular attention to options that may become feasible for the City of Mount Gambier.

When the report went to Council the pre-feasibility study was confidential. RDA Limestone Coast have now indicated that the report can be made publicly available.

Current Green Industries Recycling Grants

Green Industries South Australia have the following grants open:

- Transport subsidies recognising the barrier of high transport costs for recycling in regional areas ($0.5 million). Council has been notified that its application for $37,440 under this fund has been successful.
- A loan scheme to support projects with large capital requirements ($5 million).
- Market development grants to stimulate an increase in the quality and market demand for recyclable materials and recycled content products ($0.3 million).

Conclusion

Council Officers and the Environmental Sustainability Sub-Committee should continue to monitor the emerging options for recycling and waste management and report back to Council on a regular basis. Council staff have begun discussions with Green Triangle Recyclers and Gambier Earth Movers to trial using crushed glass in local construction applications. In the short term development phase utilising no-value glass and plastic in local construction works is likely to be more expensive than using virgin materials. However, it is a much better outcome for the local community and environment, by putting these materials to a local beneficial use. It is likely that specialised equipment may be required to enable these materials to be utilised locally. Once the uses are well established it can be expected that costs will decrease. All levels of government have an obligation to support a circular economy through their procurement and operational practices.

Attachments

Attachment 1 (AR16/51600): Bioenergy Connect Prefeasibility Support Report – Proposed Municipal Waste-to_energy plant at Caroline Landfill
Attachment 2 (AR15/5713): Managing organic waste - scenarios assessment

Aaron IZZARD
ENVIRONMENTAL SUSTAINABILITY OFFICER

Barbara CERNOVSKIS
GENERAL MANAGER COMMUNITY WELLBEING

14 August 2018
AI

6. MOTION(S) - With Notice

Nil Submitted.

7. MOTION(S) - Without Notice

Meeting closed at p.m.

AR18/33991

8. REPORT ATTACHMENTS

City of Mount Gambier

PROJECT PLAN SUMMARY

Project Reference:	**2017-009**	**TRIM Ref.: AR17/36980**
Project Name:	**Reuse Market**	
Documented on:	**11 September 2017**	
Executive Sponsor:	**Judy Nagy**	
Project Manager:	**Aaron Izzard**	**Project Team: ESO, GMs**

1. PROJECT OBJECTIVE

Minimise waste to landfill.

2. PROJECT OUTCOME

- Establish a working ReUse Market that is recognised as best practice in governance and operation.
- Raise awareness and educate the community about waste reduction through education program.
- Change community behaviours.
- Protect the environment.
- Reduce costs to community of waste processing (recycling or dumping).
- Reduce waste to landfill.
- Engage community and volunteers in sustainability behaviours and attitudes e.g. re-use activities.

3. PHASES, ACTIVITIES AND DECISION GATES

What are the key phases/stages, deliverables and decision gates for the project?

Phase	Deliverable	Decision Gate
Council approval	Council report 2017/2018 Budget	August 2017 – Final Council approval July 2017 – Capital budget approved
Establish project team	Project team members nominated	Approved by MET 19 Sept. 2017
Planning and building approval	CAP Report	Planning and development approval by CAP
Procure and contract management	Specifications Tender Contract	Report by GM City Infrastructure approved by CEO September 2017
Fit out of unloading shed at WTS.	Fit out complete	August 2018
Fit out of ReUM site.	Fit out complete	August 2018
Commence collection of items to sell at ReUM.	Items being collected.	Commence July 2018.
Research and site visits e.g. Eaglehawk	Research and site visit report	Report endorsed by MET by March 2018
Build	Earth works and building delivered to spec and budget	Completion report endorsed by MET
Recruitment	Recommended applicant for ReUse Market Coordinator	Letter of appointment signed by CEO and applicant by April 2018
WHS and SOPs incl. fees, what's accepted and what's not	SOP and WHS documented	Signed off by CEO and Site Coordinator by August 2018
Media and Communication Plan	Plan and Schedule	Phase 1 – Pre 30 June 2018 Phase 2 – Post 30 June 2018 Both approved by MET
Marketing including signage	Marketing Plan documented Signage specified and built	Phase 1 – Pre 30 June 2018 Phase 2 – Post 30 June 2018 Both approved by MET
POS hardware, software and procedures	Specifications, HW, SW, Procedures procured / documented	POS HW, SW and procedures approved by MET by 1 September 2018
Induction and training	Induction and training documented and delivered	Approved by Site Coordinator by 1 July 2018. Delivered by 30 July 2018.

3. PHASES, ACTIVITIES AND DECISION GATES contd.

Phase contd.	Deliverable	Decision Gate
Governance incl. insurance, competitive neutrality, amend Council policies as required, financial model/delegations	Governance Structure, delegations, policies, procured documented	Approved by GM City Infrastructure and City Growth by 1 September 2018

3. LINKS AND DEPENDENCIES

This project has links to existing committees / groups / organisations:

- Community Plan
- Environmental Sustainability Sub Committee
- Community Engagement and Social Inclusion network
- Zero Waste Network Australia (ZWNA)
- Community Action for Sustainability (CAS)
- DECD
- Green Triangle Recycling
- Community groups

This project has potential synergies with:

- Labour market suppliers e.g. Bedford Industries and Orana Enterprises

4. DATES

Estimated start date	1 July 2017 Budget approved
Estimated end date	6 October 2018

Are there any time considerations that must be considered for this project?

- LG Election November 2018.

5. BENEFITS

Key benefits of this project are:

- Reduction in waste to landfill.
- Community education, awareness and skill development.
- Meet the Natural Step System conditions.
- Reduce residents' dumping costs.
- Low cost products for purchase / reuse.
- Creates employment.
- Potential reduction in Council waste costs.

6. RISKS

Key risks for this project are:

- Time frame not met.
- Inability to secure qualified and experienced Site Coordinator.
- Inappropriate product mix to sell.
- Budget overrun.
- Competitive neutrality considerations.
- Integration with IT systems.
- Work, health and safety practices.
- Site not embraced by the community.

7. ISSUES

The issues (other than risks) that this project needs to consider are:

Issue No.	Description
1	WHS
2	Media, Communications and Marketing Plan
3	Market (retail) Development
4	Education Program
5	Operations and interface with the transfer station
6	Financial model – capex and opex for 2018/2019 and beyond

8. RESOURCES

The resources (e.g. people, financial, infrastructure) required for this project are:

People needed	Skills / experience needed	FT or PT or contract
Project Coordinator	Project management, sustainability, environmental science	FT
Project team members	SOPs, SW, HS,	PT
Site Manager	See "Site Coordinator" section of AR17/23357. Further info from site visits and research	FT
On Site Support Staff	TBC	
Organisation support staff to establish	IT, HR, Finance, Procurement and Contract Management, Communications	

Financial resources needed	Capex or opex?	Existing or additional budget?	Budget $
Budget approved as part of 2017/2018 e.g. build, signage	Capex	Existing	$560,000
Budget for fitout proposed for 2017/2018 e.g. tools, racking, security, cleaning equipment (high pressure)	Capex	Additional	$100,000
Proposed for 2018/2019 e.g. staffing, IT, workstation, chair, training,	Opex	Additional	$180,000
Some staffing funds will be required in 2017/2018 to recruit a 2nd person at the WTS to assist in collecting and processing items for sale. Would also be beneficial to recruit Site Coordinator in April/May 2017.	Opex	Additional	$50,000

9. EXECUTIVE APPROVAL

Considered on: 11 September 2017
Approved on: 11 September 2017
Status reported on: 07 August 2018

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Bioenergy Connect Prefeasibility Support:

Applicant: City of Mount Gambier

Proposed Project: Municipal Waste-to-Energy plant at Caroline Landfill

Prepared for: Regional Development Australia – Limestone Coast

13 December 2016

- IMPORTANT NOTES-

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Document verification

Description	Bioenergy Connect Pre-feasibility Support Proposed Project: Municipal Waste-to-Energy plant at Caroline Landfill		
Version	CONFIDENTIAL ADVICE		
Issued	13/12/16		
Verification	Prepared by	Checked by	Approved by
Name	C. Colby		C Colby
Signature			

Executive Summary

This report provides presents a Bioenergy Connect Pre-Feasibility Support assessment of a bioenergy project proposed by the City of Mount Gambier:

- Waste-to-Energy (WtE) plant at Caroline Landfill

The plant would process 20,000 tonnes of municipal waste per year and generate up to 10,000MWh of renewable electricity. The plant would be a conventional thermal incineration plant that is well established technology and widely used overseas.

The table below (Table E-1) summarises the cost estimates made for the project:

- The CAPEX or build cost would be *ca.* $30-35M (±20-30%); and
- The net financial benefit generated for the City of Mount Gambier would be *ca.* $2.3M per year.

The ratio of CAPEX / Net Benefit for the proposed WtE plant is 13.5. Once financing / investment costs are considered, and financial (discounted cash-flow) analysis is conducted, it is not likely that this project would be deemed feasible or financially attractive at the current time. However, this could change in the next five years if electricity continues to increase in price, the cost of landfill disposal rises further, and the cost of WtE technology reduces further.

Table E-1: Summary of cost estimates for CAPEX and Net Annual Cost/Benefit

CAPEX (±20-30%)	**$31**	**M**
NET ANNUAL COST / BENEFIT		
• Revenues	$1.3	M
• Savings	$2.3	M
• O&M Costs	-$1.3	M
• **Total**	**$2.3**	**M**

Contents

1 Introduction

The City of Mount Gambier has lodged a successful application for Pre-feasibility Support under the South Australian Government's Bioenergy Connect program, which is being administered by Regional Development Australia – Limestone Coast. A copy of the application is included in Appendix 1 to this report.

The bioenergy project proposed by the City of Mount Gambier would convert municipal solid waste currently disposed to Caroline Landfill to electricity and/or heat. This landfill is owned and operated by the City and is located about 10km south east of Mount Gambier – see Figure 1-1 below. The landfill presently receives about 20,000 tonnes per year of municipal waste from kerbside collection and /or transfer stations operated by the City and other councils in the Limestone Coast region.

In reviewing the Pre-feasibility Support application, and from speaking with Mr Aaron Izzard, the City's Environmental Sustainability Officer, the project is considered an opportunity to avoid or minimise landfill disposal, and thus, could reduce the City's future costs (and environmental liabilities) of having to operate and further expand Caroline Landfill (by building new cells) (Izzard, 2016).

It is also seen as a potential opportunity to generate cheaper energy for commercial businesses and/or industry, which would reduce their operating costs and help sustain local jobs.

Figure 1-1: Location of Caroline Landfill relative to Mount Gambier

2 Approach & assumptions

2.1 Location

Consideration was given to co-locating the proposed waste-to-energy (WtE) plant next to other businesses or industry for waste heat recovery. Aaron Izzard (2016) from the City provided a very useful map identifying potential businesses or industry in the nearby Mount Gambier area that might benefit. However, most seem to need electricity and only few had a heat demand that would be best suited to residual heat available from the WtE plant (i.e. low pressure steam, hot water production). Furthermore, this would inevitably involve siting the WtE plant near more populous areas where there could be community opposition and/or planning approval complications.

Consequently, it was decided for the study that the proposed WtE plant would be located at Caroline Landfill.

2.2 Plant & process

A conventional WtE incineration thermal power plant was selected – see Figure 2-1 below:

- Incineration – of the waste to generate hot combustion gases (e.g. at 800°C);
- Steam production – using the hot combustion gases to heat water and generate steam in a boiler;
- Electricity generation – steam drives a turbine to generate electricity;
- Gas treatment – hot gases are treated to remove pollutants before emission into atmosphere
- Ash – the solid by-product from the incineration process is discharged separately;
- Heat rejection – much of the heat generated from incineration (80%) is not converted to electricity and is instead radiated through heat exchangers into the atmosphere;
    - Air cooling systems were assumed for this study over concern about availability and cost of supplying large volumes (>500ML) of cooling water that would otehrwise be needed.

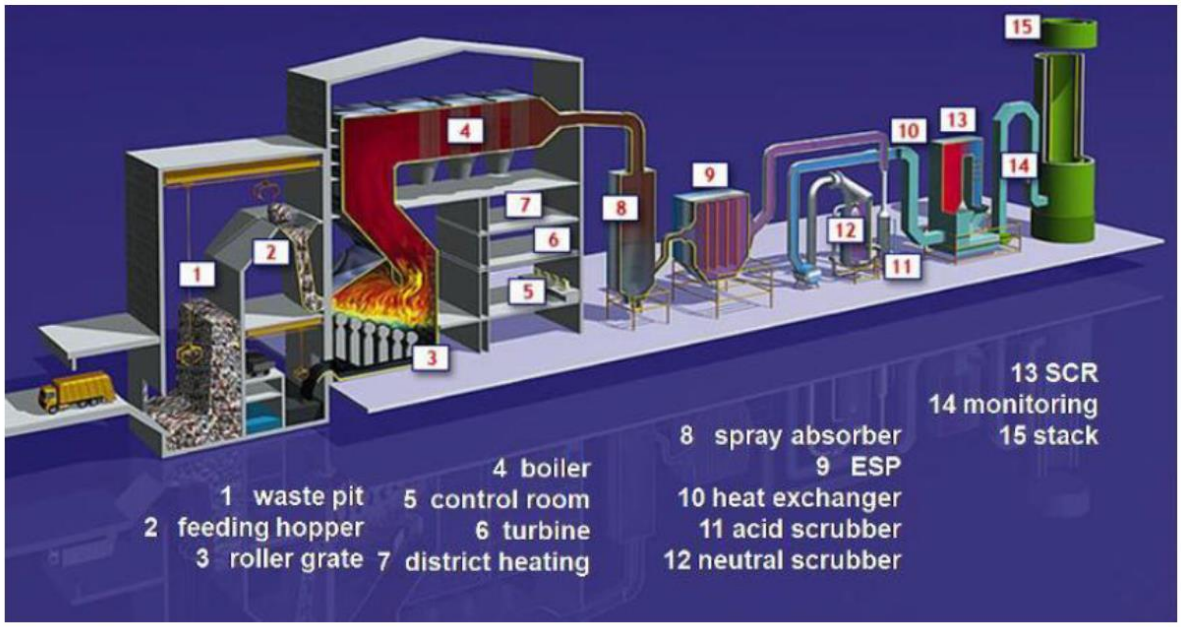

Figure 2-1: Example of a WtE incineration thermal power plant (Zero Waste SA, 2013)

These types of WtE incineration plants and processes are quite common and well demonstrated internationally, particularly in Europe (Zero Waste SA, 2013). However, the efficiency (of energy conversion to electricity) of such WtE plants is relatively low, at 20%, when compared to normal thermal power plants which can operate at up to 30-40%. This is because the calorific (or lower heating) value of municipal waste at *ca.* 10-14 MJ/kg is much lower than solid fossil fuels (e.g. 15-25MJ/kg).

2.3 Plant performance / output

The plant would be available for 90% (329 days) of the year and when operating would operate 24hrs per day, 7 days per week. Based on the volume of waste available and assumed calorific value (lower heating) of 11MJ/kg, the plant:

- Could produce an electrical output of *ca.* 1.5MW
- Generate up to 11,611MWh of electricity per year
    - But part of this (*ca*. 15%) would be needed to meet the electricity demand (or parasitic load) of the plant itself.

2.4 Other equipment & infrastructure

In addition to the WtE process plant, the proposed plant will require other equipment & infrastructure, including (but not limited to):

- Site;
- Access roads, parking areas and fencing;
- Purpose-built shed to house plant & equipment;
- Within the above shed,
    - Set-down areas for trucks to unload the waste;
    - Floor area and excavator to pick through waste and remove larger items, some of which would be recyclable (e.g. metal, cardboard, concrete, etc.) and other items which may not (e.g. asbestos sheeting, e-waste);
    - Bunkers to store sorted waste and separated recyclable and non-recyclable items;
    - Front loader to move sorted waste to and from bunkers and to the feed hopper into pre-processing plant;
    - Pre-processing of the waste, including:
        - Electromagnet to remove metal items;
        - Shredder to reduce size to < 100mm; and
        - Conveyers to transfer shredded waste to incinerator hopper for WtE plant;
    - Bins or bunkers for ash disposal; and
    - Plant electrical & control systems.
- Electrical connection (including transmission lines) to nearest suitable medium or high-voltage electricity cables of the mains Grid (for supply of electricity to the plant (when needed) and feed-in of generated electricity from the plant).

This other equipment and infrastructure adds substantially to the cost of the proposed WtE plant.

2.5 Build or capital cost

Existing cost data for WtE plants in Australia and internationally were reviewed to estimate the CAPEX of the proposed WtE plant at Caroline Landfill (Colby Industries, 2015) (Zero Waste SA, 2013). Some cost data from previous investigations from the City of Mount Gambier was also considered (Izzard, 2016).

In addition, a budget price was obtained from an Australian supplier to WtE plant, Energy Developments and Resources P/L (www.energydr.com.au) (D. Hall, 2016). This was combined with cost estimations for other equipment and infrastructure required, to provide a first-principles cost estimate for the WtE plant. Appendix 2 presents in tabulated format this first-principles cost estimate.

Each of the different approaches yielded similar outcomes – potential build cost between $25M and $40M – which is reasonable considering the accuracy that would be reasonably expected for this type of early-stage preliminary cost estimate (i.e. ±20-30%).

2.6 Revenue

The WtE plant would generate revenue from:

- Electricity sales to the National Electricity Market – expected future SA baseload electricity prices are about $100/MWh (ASX, 2016).
- Generation of Large-generator Technology Certificates (LTCs), which can be sold as part of the Australian Government's Mandatory Renewable Energy Target (RET) scheme – current prices for these LTCs are $80-90/LTC (Green Energy Markets, 2016).
- Sale of recyclable materials recovered during sorting of waste, e.g. metals, cardboard, plastics, etc. – conservative market values were assumed.

See Appendix 2 for more detailed table showing estimated values and pricing or cost assumptions made.

2.7 Other savings

The other savings attributed to the WtE plant were:

- Avoided Landfill Levy – on the waste processed by WtE and not disposed of to the Caroline Levy.
    - Note: not all the waste will avoid the levy as some of the non-recyclables separated during pre-sorting and the ash from the WtE plant may still be disposed of to landfill.
    - It also assumes that the SA EPA will not in the future charge a differential levy on waste disposed via WtE.
- Avoided landfill disposal - O&M costs – a saving to the City of the cost of disposing the waste to landfill.
- Avoided landfill disposal - Landfill capacity – a saving on the future cost of building new cells.

The above were based on current gate rates and landfill development costs provided by the City for Caroline Landfill (Izzard, 2016).

See Appendix 2 for more detailed table showing estimated values and pricing or cost assumptions made.

2.8 Operating Costs

The WtE plant would have the following operating costs.

- Direct Labour Costs – There would need to be at least two operators per 8-hr shift, three shifts per day.
- Supervision, management & other overheads – There would be additional costs for plant supervision and management as well as other overheads for the City to operate the plant.
- Maintenance & consumables – There would be on-going costs to maintain the plant, including replacement of parts and consumables and scheduled maintenance and/or repair of major equipment.
- Professional Fees, Statutory charges, Reporting – There would be costs for testing and reports and charges for licensing and regulation.

See Appendix 2 for more detailed table showing estimated values and pricing or cost assumptions made.

3 Results

Table 3-1 below summarise the key results for CAPEX (or build) cost and Net Annual Cost / Benefit estimate, which considers identified revenues, savings and O&M costs.

- The CAPEX for the proposed WtE plant was estimated at *ca.* $31M, but could range between $25M and $40M.
- The WtE plant would have a Net Benefit of *ca*. $2.3M

Based on the above, the CAPEX / Net Benefit ratio of the proposed WtE plant is 13.5. Once financing / investment costs are considered, and financial discounted cash-flow analysis (i.e. NPV) is conducted, it is not likely that this type of project would presently be deemed feasible or financially attractive (i.e. the payback would probably be > 20yrs). In this respect, many of the financial assumptions made in this analysis are based on current conditions for plant cost, pricing of electricity and LTCs, costs of operating and expanding the Caroline Landfill, etc. These could markedly change in 5 or even 2-3 years' time, making the proposed WtE plant more financially attractive.

Nevertheless, it would not be recommended that the proposed WtE plant would warrant further assessment at the current time; however, this is a decision for the City of Mount Gambier to contemplate and make.

Table 3-1: Summary of cost estimates for CAPEX and Net Annual Cost/Benefit

CAPEX (±20-30%)	**$31**	**M**
NET ANNUAL COST / BENEFIT		
• Revenues	$1.3	M
• Savings	$2.3	M
• O&M Costs	-$1.3	M
• **Total**	**$2.3**	**M**

4 Other comments / notes

During discussions with the City of Mount Gambier, it was mentioned that the waste heat from the WtE plant might be used at Caroline Landfill to treat leachate water (i.e. zero discharge). This is a good idea and is technically achievable.

An alternative for City of Mount Gambier to consider is capturing landfill gas and using it to generate electricity. It is understood that landfill gas capture may not yet in place for Caroline Landfill. There are many potential benefits and Australian Government incentives available to support this type of project, which could assist in making it financially attractive.

5 Clarification

This is a high-level pre-feasibility assessment of the project proposed by the applicant. Cost estimates made herein are an estimate and should be considered no more than ±20-30%. Major capital and operating costs have been identified and estimated, however, there may be other cost items that could still need to be considered. Further and more detailed assessment would be needed so the project to be subject to a proper feasibility assessment, including proper financial analysis.

6 References

ASX. (2016, December 13). *SA Base Load Electricity (BS) Futures*. Retrieved from ASX: http://www.asx.com.au/asx/markets/futuresPriceList.do?code=BS&type=FUTURE

Colby Industries. (2015). *Feasibility of an EfW plant for metropolitan Adelaide (Confidential submission to potential investor).*

D. Hall, E. (2016, December). Emails & phone discussions regarding waste incineration plant including budget price for supply. (C. Colby, Interviewer)

Green Energy Markets. (2016, December 13). *LGC Market Prices*. Retrieved from Green Energy Markets: http://greenmarkets.com.au/resources/lgc-market-prices

Izzard, A. C. (2016, December). Various emails and discussion regarding City of Mount Gambier investigations into WtE plant for Caroline Landfill. (C. Colby, Interviewer)

Zero Waste SA. (2013). *Waste to Energy Background Paper.*

Appendix 1 – Copy of Prefeasibility Application

Bioenergy Roadmap Programs

The Bioenergy Roadmap Programs will provide three forms of assistance:

- A first point of contact and facilitation
- Access through application for a bioenergy mentor to provide technical and logistical support e.g. pre-feasibility (Bioenergy Connect)
- Access through application to RenewablesSA for matched funding to assess the feasibility of projects

Pre-feasibility Support – Bioenergy Connect:

Application process - Preliminary Project Assessment Form

Please complete this form and submit to RDA LC for assessment.

Bioenergy Connect Application for Pre-Feasibility Assistance	
Business Name:	City of Mount Gambier
Contact Person:	Aaron Izzard
Phone:	8721 2528
Email:	aizzard@mountgambier.sa.gov.au
Business activities:	Local government.
Proposed use of bioenergy:	Convert waste into energy – electricity and heat.
- Biomass source – if known	Waste that is currently being deposited in landfill.
- Technology – if known	We are open to a variety of technologies.
Annual waste production (biomass) and predominate waste stream – if known/applicable	Annual waste to Caroline Landfill is approximately 20,000 t/pa.
Annual energy use and cost – if known	To be determined with energy users located in close proximity to any proposed waste to energy plant.
Details of any assessment work already completed:	Environmental Sustainability Officer has conducted high level investigations into small

	scale waste to energy plants. he has identified a number of plants in Europe and Asia.
Reasons why bioenergy will benefit your business: e.g. save money, be more sustainable	Will minimise potential negative environmental impacts, would dramatically reduce the volume of waste sent to landfill locally, would reduce consumption of fossil fuels – electricity and gas. Potentially also save the organisation money.
Financial capacity to fund / finance a bioenergy project:	Council could fund a small operation itself, as it did with the biomass boiler at the Aquatic Centre. Council has the capacity to contribute larger bioenergy projects.
Willingness /ability to co-fund a feasibility study if your proposal moves to the next stage:	Council could co-fund a feasibility study, depending on the overall cost.

FOR MORE INFORMATION

http://www.renewablessa.sa.gov.au/news/bioenergy-roadmap-programs

APPLICATIONS TO

REGIONAL DEVELOPMENT AUSTRALIA LIMESTONE COAST

PO Box 1445, MOUNT GAMBIER SA 5290

PH: 08 87231057

EMAIL: ceo@rdalc.org.au

WEB: www.rdalimestonecoast.org.au

Appendix 2 – Cost data

Table A2-1: First-principle cost estimate

Item	Description	Unit	No.	Rate	Estimate
BUILD COST					
1	Site Preparation	m^2	15000	$50	$750,000
2	Roads, Access, Fencing	Item	1	$250,000	$250,000
3	Plant shed with concrete floor	m^2	3200	$900	$2,880,000
4	Waste bunkers (incoming & sorted)	Item	10	$50,000	$500,000
5	Excavator for sorting (mobile)	Item	1	$120,000	$120,000
6	Front loader (mobile)	Item	2	$80,000	$160,000
7	Feeder (fixed)	Item	1	$221,000	$220,000
8	Feed conveyer (fixed)	Item	1	$65,000	$65,000
9	Electromagnet	Item	1	$130,000	$130,000
10	MPS 50HD Waste shredder plant (<100mm), screen & conveyor	Item	1	$390,000	$390,000
11	Eco M10 Waste Fired Steam Cycle Power Plant (inc. Power plant & Gas Treatment)	Item	1	$14,300,000	$14,300,000
12	Air Cooled Condensers	Item	1	$750,000	$750,000
13	Ash bunkers/bins &/or conveyers	Item	3	$150,000	$450,000
14	Electrical - New MV Line to site, transformer, plant connections	Item	1	$2,500,000	$2,500,000
15	Bore water supply & treatment	Item	1	$500,000	$500,000
16	Plant electrical & control	Item	1	$500,000	$500,000
	Estimated Net Cost				$24,465,000
MARGINS & ADJUSTMENTS					
16	Design Contingency	% of BC	$24,465,000	7.5%	$1,830,000
17	Contractor preliminaries	% of BC	$24,465,000	5%	$1,220,000
18	Contractor's margin	% of BC	$24,465,000	5%	$1,220,000
19	Construction contingency	% of BC	$24,465,000	5%	$1,220,000
20	Professional fees	% of BC	$24,465,000	5%	$1,220,000
21	Statutory Fees & Charges	% of BC	$24,465,000	0.3%	$60,000
ESTIMATED TOTAL COST					$31,235,000

Table A2-2: Net cost/benefit estimates

Item	Description	Unit	No.	Rate	Estimate
REVENUES					
1	Sales - Electricity to NEM	MWh	9672	$100	$967,162
2	Sales - LGCs under MRET	LGCs	2901	$85	$246,626
3	Metal recyclables	tonnes	500	$200	$100,000
4	Other recyclables	tonnes	250	$50	$12,500
	SUB-TOTAL				$1,326,288
SAVINGS					
5	Avoided Landfill Levy	tonnes	18,300	$50	$915,000
6	Avoided landfill disposal - O&M costs	tonnes	18,300	$30	$549,000
7	Avoided landfill disposal - Landfill capacity	tonnes	18,300	$45	$823,500
	SUB-TOTAL				$2,287,500
OPERATING COSTS					
8	Direct Labour Costs	FTE	7	$84,000	$588,000
9	Supervision, management & other overheads	% DLC	50%	$588,000	$294,000
10	Maintenance & consumables	% Process CAPEX	2.0%	$16,135,000	$322,700
11	Professional Fees, Statutory charges, Reporting	Item	1	$50,000	$50,000
	SUB-TOTAL				$1,254,700
NETT BENEFIT / COST					$2,359,088

Managing organic waste - scenarios assessment

Final report

prepared for

City of Mount Gambier

15 June 2014

Managing organic waste - scenarios assessment

Final report: P472
15 June 2014

Disclaimer

This report has been prepared for City of Mount Gambier in accordance with the terms and conditions of appointment dated 6 March 2014, and is based on the assumptions and exclusions set out in our scope of work. Information in this document is current as of May 2014. This report has been compiled based on secondary information and data provided by other parties; as such it relies on the accuracy of the provided material. Although the data has been reviewed, the information provided was assumed to be correct unless otherwise stated.

While all professional care has been undertaken in preparing this report, Blue Environment Pty Ltd cannot accept any responsibility for any use of or reliance on the contents of this report by any third party.

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Tables

Figures

Abbreviations & glossary

BAU	business-as-usual
C&I	commercial and industrial (waste)
C&D	construction and demolition (waste)
CoMG	City of Mount Gambier
CO_2-e	carbon dioxide equivalent
kt	kilotonnes
MSW	municipal solid waste
NGER(S)	National Greenhouse and Energy Reporting (System)
ZWSA	Zero Waste South Australia

Summary

Introduction

This report details work undertaken for the City of Mount Gambier (CoMG) by Blue Environment in association with Tonkin Consulting to identify and assess options for future management of organic wastes. In particular, this work has considered:

- the likely gross and net financial costs of expanding current organics recovery services
- the cost-effectiveness of different management options
- greenhouse gas liabilities from different management options.

The current status of waste management

CoMG currently provides a weekly kerbside garbage collection service to households and a voluntary, fortnightly kerbside garden and food organics recovery service. This is currently used by about 50% of households eligible for the service, but generally for garden waste.

Introducing the City of Mount Gambier Organics Model

Blue Environment developed a model for assessing the financial implications of various organic waste management scenarios at the City of Mount Gambier. Six scenarios are assessed as tabulated below. The key differences in the scenario relate to the extent of the organics service, the provision of kitchen caddies for food waste, and the frequency of the collection service for organics and garbage. A range of parameters are applied in calculating the costs of the different scenarios. Default values are provided for these parameters but these can be amended by the user in the adjacent yellow cells.

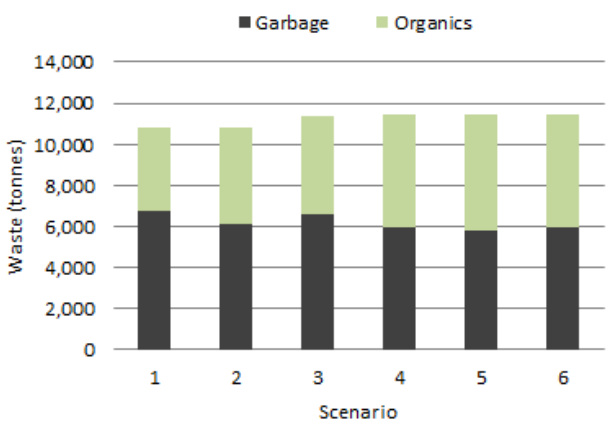
Table 1: Scenarios for organic waste management included in the City of Mount Gambier Organics Model

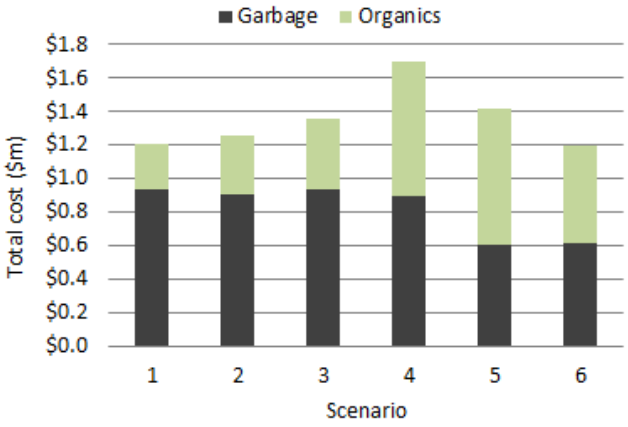
	Organic service				*Garbage service*	
Scenario	**Availability**	**Bin size**	**Frequency**	**Food waste provision**	**Bin size**	**Frequency**
1 Business-as-usual (BAU)	Optional	240L	Fortnightly	Allowed	140L	Weekly
2 Voluntary, kitchen caddies	Optional	240L	Fortnightly	Kitchen caddy & bags	140L	Weekly
3 Universal, garden	Universal	240L	Fortnightly	Allowed	140L	Weekly
4 Universal, food, high collection	Universal	240L	Weekly	Kitchen caddy & bags	140L	Weekly
5 Universal, food, medium collection	Universal	240L	Weekly	Kitchen caddy & bags	140L	Fortnightly
6 Universal, food, low collection	Universal	240L	Fortnightly	Kitchen caddy & bags	140L	Fortnightly

The model includes a calculation of the carbon dioxide equivalent emissions from the Caroline landfill site under each scenario. Various carbon policy scenarios can be selected.

Modelling results

The modelling results using the default parameter values are displayed below. Landfill carbon costs are a small component of total costs and do not affect the overall relative costs of the six scenarios.





Recommendations

1. Consider establishing a food organics recovery service, including kitchen caddies an bio-bags, for current users of the organics service (Scenario 2). This approach provides the service to those who feel they need it most, and will allow a system to be bedded down before any expansion to encompass less enthusiastic residents. Participation and diversion rates tend to be higher and contamination levels lower with voluntary participation. Council should consider the potential for later expanding to a universal service with weekly collection, combined with fortnightly garbage collection (Scenario 5).
2. Consider trialling a dump and sort area at the Caroline landfill to recover recyclable materials from commercial waste streams.
3. In determining whether or not to accept municipal waste from neighbouring councils, consider the impact on landfill life and potential carbon costs.
4. Once the in-progress method for generating carbon credits by passive oxidation of methane is finalised, consider establishing such a passive system at the Caroline landfill.
5. If the Australian Government fails to repeal carbon pricing, consider establishing a carbon price on waste to landfill now to cover future liabilities when site emissions exceed the NGERS threshold.

1. Introduction

This report details work undertaken for the City of Mount Gambier (CoMG) by Blue Environment in association with Tonkin Consulting to identify and assess options for future management of organic wastes. In particular, this work has considered:

- the likely gross and net financial costs of expanding current organics recovery services
- the cost-effectiveness of different management options
- greenhouse gas liabilities from different management options.

Organic waste is responsible for many of the environmental impacts and risks associated with landfill. These impacts and risks include: odours, vermin, fires, groundwater pollution and greenhouse gas emissions (see Box 1).

This report is submitted along with a CoMG Organics Model. This is a Microsoft Excel model that examines costs under various scenarios for organic waste management, and allows the user to explore how these costs change when assumptions are varied.

The model incorporates 'first-order decay' modelling based on the National Greenhouse and Energy Reporting System (NGERS). This component of the model estimates the greenhouse gas emissions from the landfill under the various scenarios, and allows the user to explore the potential financial implications of these emissions by varying the assumptions about the carbon policy settings that will apply.

Much of this report is based on the results of using the model.

In addition to the model construction, the work involved with the project involved discussions with Council's Environmental Sustainability Officer and tour of council facilities accepting organic waste.

Box 1 Landfills and climate change

When organic waste decays in the absence of oxygen, as it does in a mature landfill, methane is generated. Methane is a potent greenhouse gas that produces 25 times as much warming effect per unit mass as carbon dioxide. Consequently, medium-sized and large landfills must report their emissions under the National Greenhouse and Energy Reporting System (NGERS). The NGERS applies a first-order decay model, which assumes that each type of waste decays at a predictable rate. Emissions occur for many decades after waste is deposited in the landfill.

The key questions and issues addressed in this report are:

1. What are Council's current management practices for organics?
2. What practical scenarios can be envisaged for increasing organics recovery?
3. How cost-effective are these scenarios, and what are the financial and environmental costs and benefits associated with them?
4. What are the opportunities and risks for Councils in relation to greenhouse gas emissions from its Caroline landfill?

2. The current status of waste management

This section of the report describes the CoMG's current waste management practices, and the current quantities and composition of waste (as assumed for the modelling). Note that continuation of the current arrangements is the business-as-usual (BAU) scenario in the CoMG Organics Model.

2.1 Current waste management practices

CoMG currently provides the following opportunities for waste disposal:

- A weekly kerbside garbage collection service to households. This is used by virtually all households in the serviced areas.
- A fortnightly kerbside recycling collection service to households. This is also used by almost all households.
- A voluntary, fortnightly kerbside garden and food organics recovery service. This is currently used by in the order of 50% of households eligible for the service, but generally for garden waste.
- Drop-off waste disposal and recycling services at a transfer station, which is used by households and for smaller loads (up to 5 cubic m) of commercial and industrial (C&I) waste.
- A facility to receive unrecovered waste (the Caroline landfill). This site receives kerbside household garbage from CoMG, waste from the transfer station, large loads of commercial waste, and some waste from neighbouring municipalities. It is not open to small vehicles or the public. The Caroline landfill is purely a disposal site, with no resource recovery activity other than limited scavenging of items and removal of tyres by the compactor operator, and no recovery or flaring of methane.

Box 2 Good practice in kerbside waste systems

No universal concept exists of best practice in providing kerbside services for municipal waste. Good practice reflects settlement size, population density and other local factors. Common elements of good practice in Australia and overseas include:

- Effective community engagement to promote correct use of services to maximise recovery of recyclables and organics, and to minimise contamination of these streams.
- Regular comingled recyclables collection for residents and businesses using 240 or 360L bins.
- Regular and adequate organic waste collection for residents who generate significant quantities of organic waste and cannot manage it on-site, using 240L or 360L bins.
- Regular and adequate garbage collection using a standard bin size of 80L to 140L bins.
- Occasional hard waste collection services.
- On-going monitoring of contamination of recyclables and organics streams, with appropriate enforcement action where necessary.
- Periodic auditing of garbage, recyclables and organics streams to determine the effectiveness of programs.

2.2 Waste quantities

CoMG keeps records of quantities of landfilled waste and waste received at their transfer station. During 2012-13, council managed about:

- 20,000t of garbage at the Caroline landfill, including about 5,600t from its kerbside collections, 600t from the transfer station and 800t of contaminated recyclables
- 3,500t of organic waste, of which 2,400t was collected at the kerbside
- 2,300t of recyclables collected at the kerbside
- 3,600L of waste oil
- 190t of hard waste.

2.3 Waste composition

Composition of organic waste

An audit undertaken during 2012-13 indicates that more than 99% of the organic waste collected at the kerbside is garden waste and less than 1% is food waste.

Composition of waste to landfill

The CoMG has assessed the composition of domestic waste to landfill for reporting to Zero Waste South Australia (ZWSA), but not other waste types sent to landfill. The composition estimates presented here are mainly those included in the *National Greenhouse and Energy Reporting (Measurement) Determination 2008* as amended (NGER Determination). The NGER Determination values are based on national averages and so may not be accurate for the Caroline landfill. However, these are the values that must be applied in calculating the greenhouse gas emissions from the site, so they are highly relevant.

While Blue Environment has used the NGER Determination values in modelling the greenhouse gas emissions from the site, it has applied the results of the ZWSA audit reports in modelling how the different options for kerbside recovery affect organics diversion and recovery. This decision reflects that statutory need to apply the NGER Determination values and the likelihood that the ZWSA audit is likely to provide a more accurate representation of domestic garbage.

The assumed compositions of different materials streams used in NGER Determination and the CoMG Organics Model are shown in Figure 1.

Municipal solid waste (MSW) to landfill

Based on the NGERS values, the organic component of municipal garbage is assumed to consist of:

- *Food organics* (35% by weight). Council audit data measured a considerably higher food waste content of 45%. However, the NGERS composition used also includes hard waste and other types of municipal waste not collected from the kerbside. There is significant potential for reducing the quantity of this material going to landfill.
- *Garden organics* (16.5%). This is close to the audit value of 15% by weight. Achieving and maintaining higher levels of garden organics via the kerbside organics recovery service has potential to reduce the landfilled weight and greenhouse potential of household garbage.
- *Paper and cardboard* (13%). The CoMG audit found only about 9% by weight, even though CoMG offers kerbside recycling of paper and cardboard. There are opportunities to reduce the weight and greenhouse potential of garbage by promoting greater recycling of these materials.
- *Nappies* (4%), *textiles* (2%), *wood* (1%) and other *rubber and leather* (1%). There are currently limited opportunities to reduce these materials in household garbage. Timber and natural fibre textiles could potentially be recovered through the kerbside organics service.

Commercial and industrial (C&I) waste to landfill

The organic component of C&I stream consists of: food organics (21%); paper/cardboard (15%); wood (12%); garden organics (4%); organic sludge (2%) and rubber and leather textile (4%). In total 62% of C&I waste is bio-degradable and therefore has methane generating potential when landfilled.

Construction and demolition (C&D) waste to landfill

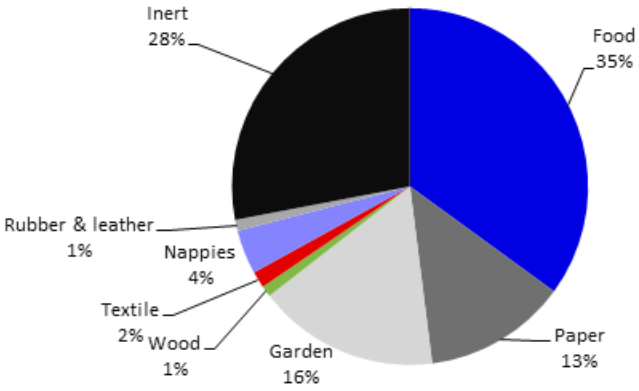
The C&D stream is largely inert (clean fill, rubble, soil), with lesser amounts of wood (6%), paper/cardboard (3%) and garden organics (2%).

Kerbside recycling

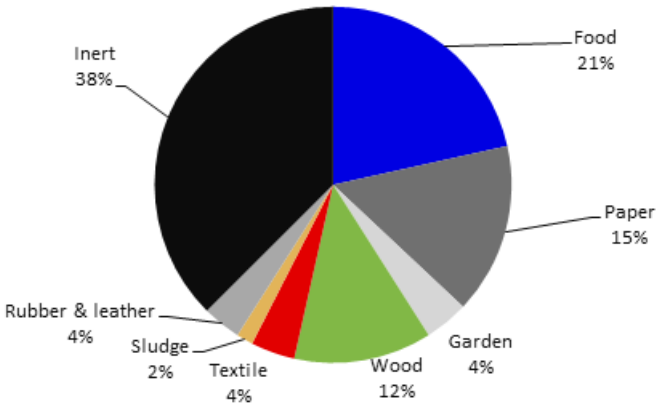
Council audit data indicates that the kerbside recycling stream (Figure 2) is mainly composed of paper/cardboard (61% by weight), with lesser amounts of recyclable containers (mainly plastics, 12%), glass (11%), metals (4%) and non-recyclable contaminants (12%). The diversion of paper and cardboard reduces greenhouse gas emissions from landfill. This does not affect the modelling of emissions profiles from landfill, but is worth recognising as a pre-existing CoMG achievement.

Figure 1: The assumed current composition of waste to landfill (also applies to the BAU scenario)

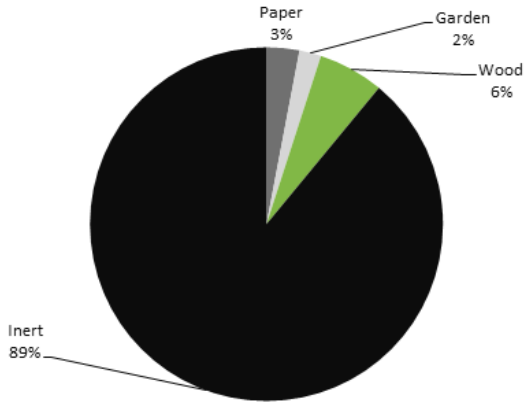
(a) MSW



(b) C&I

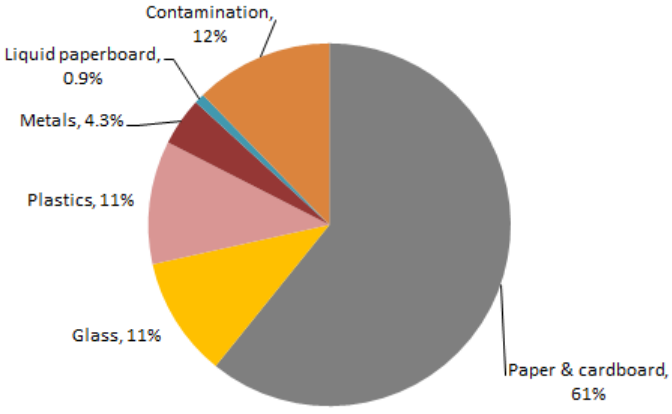


(b) C&D



Source: *The National Greenhouse and Energy (Measurement) Determination 2011*

Figure 2: Estimated composition of kerbside recyclables



Source: *http://www.epa.sa.gov.au/xstd_files/Waste/Report/kerbside.pdf*

3. Introducing the City of Mount Gambier Organics Model

Blue Environment developed a model for assessing the financial implications of various organic waste management scenarios at the CoMG. Six scenarios are assessed as tabulated below. The key differences in the scenario relate to the extent of the organics service, the provision of kitchen caddies for food waste, and the frequency of the collection service for organics and garbage.

Table 1: Scenarios for organic waste management included in the City of Mount Gambier Organics Model

	Organic service				*Garbage service*	
Scenario	**Availability**	**Bin size**	**Frequency**	**Food waste provision**	**Bin size**	**Frequency**
1 Business-as-usual (BAU)	Optional	240L	Fortnightly	Allowed	140L	Weekly
2 Voluntary, kitchen caddies	Optional	240L	Fortnightly	Kitchen caddy & bags	140L	Weekly
3 Universal, garden	Universal	240L	Fortnightly	Allowed	140L	Weekly
4 Universal, food, high collection	Universal	240L	Weekly	Kitchen caddy & bags	140L	Weekly
5 Universal, food, medium collection	Universal	240L	Weekly	Kitchen caddy & bags	140L	Fortnightly
6 Universal, food, low collection	Universal	240L	Fortnightly	Kitchen caddy & bags	140L	Fortnightly

It is assumed that the quantity of waste projected per capita remains constant for each waste stream and local government area. Historic waste management data and demographic information were combined with ABS population projections to estimate future waste quantities. The quantities of C&I and C&D waste to landfill were also assumed to rise with population.

User interaction with the model all occurs through the 'Interface' worksheet. Cells that can be amended by the user are highlighted yellow. The modelling results are shown in adjacent cells, which are highlighted pink.

The calculations are carried out in relation to a given year, which the user can select. A range of parameters are applied in calculating the costs of the different scenarios. Default values are provided for these parameters but these can be amended by the user in the adjacent yellow cells. Some key parameter value settings are shown in Box 3.

The model assumes current waste streams to the Caroline landfill will continue, including waste from neighbouring municipalities using the site (Grant and Wattle Range). It also provides for municipal waste from Kingston, Naracoorte, Tatiara councils (SA) and Glenelg Shire (Vic) to be included or excluded by the user. The most significant

Box 3 Default settings for some key model parameters

1. The landfill stream comprises 45% by weight food organics and 15% garden organics.
2. The 50% of households using the current voluntary organics would rise to 80% with a universal service.
3. When a household receives an organics bin, they place in it an average of 150kg/year of garden waste currently managed on-site.
4. 10% of households currently manage organics on site. 35% of these would abandon on-site management if provided with a kerbside organics service.
5. Kitchen caddies and bio-bags add $11/year (in 2014 $ values) to direct service costs per participating household but result in 40-60% participation, depending on the collection frequencies.
6. The cost per bin lift is $0.82, including transport to the waste facility. (The model provides for separate cost modelling of bin lifts and travel of full trucks to the waste facility, in the event this is needed in future.
7. Landfill disposal costs are $50 per tonne. The gate fee of the compost facility is $30.50 per tonne, but will rise to $43 if food waste is widely included.

increases in landfilled waste are expected to occur if materials from other municipalities in the region are disposed of to the Caroline site.

The model includes a calculation of the carbon dioxide equivalent emissions from the landfill site under each scenario. This involves a complex set of calculations that take up the bulk of the model file size and calculating power. Various carbon policy scenarios can be selected in the Interface worksheet, including:

- no carbon price at any time
- carbon is priced from a year to be selected by the user, at a price trajectory equal to either:
  - the most recent Treasury projections
  - a nominated price (plus inflation) to be selected by the user
- credits are available from the Australian Government's Emission Reduction Fund (its proposed replacement for the carbon price), at a value to be set by the user, for diversion of organic waste from landfill.

Box 4 NGERS and waste composition

The National Greenhouse and Energy Reporting (Measurement) Determination sets out the methods to be used for reporting greenhouse gas emissions from waste. It allows several approaches for determining the composition of waste to landfill, including use of waste audits or default values. However, only one method can be used – if waste audits are to be used they must apply to all waste inputs including commercial wastes and municipal waste from other councils.

The model applies the default waste mix values given in the NGERS Determination.

4. Modelling results

The model compares the financial cost of the six selected scenarios for organic waste management under a particular set of assumed parameter values. However, it is designed to be interactive – it allows the user to 'play' with parameter values in order to test the sensitivity of the results within realistic ranges.

This section of the report presents modelling results with parameter values set at the default levels, and given for the assessment year 2014-15. It also considers the sensitivity of the results to changes in selected parameter values. Blue Environment encourages the CoMG to interact with the model rather than to rely wholly on these reported results.

The key assumptions and outputs of the organics processing component of the model are summarised in Table 2. The overall model outputs are shown in Table 3, including carbon costs if carbon pricing were not repealed. Figures 3 to 5 show these results graphically. The 'cost of carbon' is therefore included in the results.

The following observations encompass the tabulated and graphed results, and also consider the effects of changing parameter values (sensitivity analysis) and the assumed carbon policy settings.

4.1 Overall results based on the default parameter values

Key modelling suggests that:

1. Because CoMG already has a voluntary garden and food organics recovery service in place, the opportunities to further reduce organics and greenhouse gas emissions and liabilities through the organics service are relatively modest. However, some systems will be more effective and cost-effective than others.
2. More aggressive promotion of food organics using the current voluntary system (Scenario 2) is likely to be more effective in reducing organics to landfill than adopting a universal garden organics service without aggressive food recovery (Scenario 3).
3. Expanding to universal system will bring to the kerb larger volumes of 'additional' garden organics streams that are currently managed on site.
4. Universal organics services with more aggressive promotion of food organics recovery (Scenarios 4, 5, and 6) will significantly reduce organics to landfill, but will increase processing costs.
5. The number of collections per year has a dominant impact on costs.
6. Only Scenario 6 (universal garden and food organics with fortnightly collection of both organics and garbage) is likely reduce costs relative to the current system – and then only slightly. All other service options are likely to increase costs. The increase under Scenario 2 is small.
7. A weekly organics collection services would markedly increase costs and is not recommended unless the residual garbage collections service can be reduced to a fortnightly service. The option that does so (Scenario 5) could be expected to deliver the greatest diversion from landfill.
8. CoMG would need to start reporting under the NGERS sometime between 2057 and 2063, and continue until a few years after closure between 2079 and 2083. The emission curves of the different scenarios do not differ greatly.

Table 2: Key assumptions and model outputs of the CoMG kerbside organics service scenarios, based on default parameter values, excluding carbon costs

	Units	Sc. 1	Sc. 2	Sc. 3	Sc. 4	Sc. 5	Sc. 6
Organics system		Optional	Optional	Universal	Universal	Universal	Universal
Kitchen caddy?		No	Yes	No	Yes	Yes	Yes
Collection frequency – organics	lifts/yr	26	26	26	52	52	26
Collection frequency – garbage	lifts/yr	52	52	52	52	26	26
Households regularly using the organics service – proportion	%	50%	50%	80%	80%	80%	80%
Proportion of garden waste that users transfer from garbage bin to organics bin	%	90%	90%	80%	80%	80%	80%
Proportion of food waste that users transfer from garbage bin to organics bin	%	0.1%	60%	0.1%	40%	50%	40%
Cost per bin lift (including bin purchase) and transport to the waste facility	$	$0.82	$0.82	$0.82	$0.82	$0.82	$0.82
Cost per household per year of kitchen caddies, bio-bags etc.	$		$11		$11	$11	$11
Cost of composting a tonne of organic material	$	$31	$31	$43	$43	$43	$43
Cost of landfilling a tonne of municipal waste	$	$50	$50	$50	$50	$50	$50
Garden waste previously managed on-site that new users put in their organics bin[1]	kg/hh/yr			150	150	150	150
Food waste previously managed on-site that new users put in their organics bin[1]	kg/hh/yr		6		6	6	6
Garden waste previously put in the garbage bin that new users put in their organics bin[1]	kg/hh/yr			30	30	30	30
Food waste previously put in the garbage bin that new users put in their organics bin[1]	kg/hh/yr		99		66	83	66
Garden waste diverted from the garbage to the organics bin	t/yr			180	180	180	180
Food waste diverted from the garbage to the organics bin	t/yr		105		72	89	72
Proportion of material in the garbage bin diverted to the organics bin	%		10%	2%	12%	15%	12%
Proportion of this diverted material that is food waste	%		100%	0%	69%	74%	69%
Total organic waste processed	t/yr	4,057	4,746	4,762	5,517	5,691	5,517
Total waste to landfill	t/yr	6,737	6,086	6,621	5,926	5,753	5,926
Average landfilled garbage per household	kg/hh/yr	515	465	506	453	439	453
Cost of collecting & transporting organics	$000s/yr	$140	$212	$223	$562	$562	$339
Cost of collecting & transporting garbage	$000s/yr	$558	$558	$558	$558	$279	$279
Cost of organics processing	$000s/yr	$124	$145	$205	$237	$245	$237
Cost of garbage disposal	$000s/yr	$337	$304	$331	$296	$288	$296
Cost of organics processing and garbage disposal	$000s/yr	$461	$449	$536	$534	$532	$534

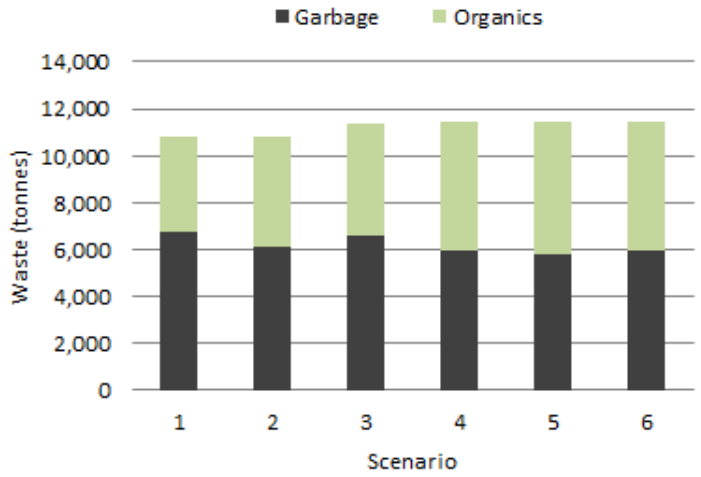
[1] See Section 4.1, item 3.

Table 3: Key model results for the assessment year 2014-15 based on default parameter values and assuming carbon pricing remains in place

			Sc. 1	Sc. 2	Sc. 3	Sc. 4	Sc. 5	Sc. 6
COST PER YEAR ($000s)	CoMG garbage	Collection, transport & disposal	$895	$863	$889	$855	$567	$575
		Landfill carbon costs for CoMG MSW	$45	$42	$45	$42	$40	$42
	CoMG organics	Collection, transport & processing	$263	$356	$428	$799	$807	$576
		CoMG garbage and organics	**$1,203**	**$1,261**	**$1,362**	**$1,695**	**$1,414**	**$1,193**
		Savings relative to BAU		-$58	-$159	-$492	-$211	$10
COST PER HOUSEHOLD PER YEAR		CoMG garbage	$72	$69	$71	$68	$46	$47
		CoMG organics	$20	$27	$33	$61	$62	$44
		CoMG garbage and organics	**$92**	**$96**	**$104**	**$129**	**$108**	**$91**
		Savings relative to BAU		-$4.43	-$12.14	-$37.59	-$16.08	$0.79
COST PER TONNE		Savings relative to BAU		$0.09	$1.36	$0.61	$0.21	-$0.01
	Landfill carbon costs	MSW	$3.70	$2.50	$3.40	$2.30	$1.90	$2.30
		C&I	$4.10	$2.90	$3.80	$2.70	$2.20	$2.70
		C&D	$0.80	$0.60	$0.80	$0.60	$0.50	$0.60
KEY LANDFILL DATES		First year of NGERS carbon liability	2057	2061	2058	2062	2064	2062
		Year of landfill closure	2079	2082	2080	2083	2083	2083
OTHER INFO		Waste landfilled (kilotonnes)	16.7	16.1	16.6	15.9	15.7	15.9
		CoMG MSW landfilled (kilotonnes)	6.7	6.1	6.6	5.9	5.8	5.9
		Whole decay life emissions from CoMG MSW deposited this year (kt CO2-e)	8.0	7.3	8.0	7.3	7.9	7.1
		Recovery rate[2]	49%	54%	50%	55%	56%	55%

[2] Assuming no change in the proportion of waste recycled in any of the scenarios (i.e. the only differences are in relation to organic waste).

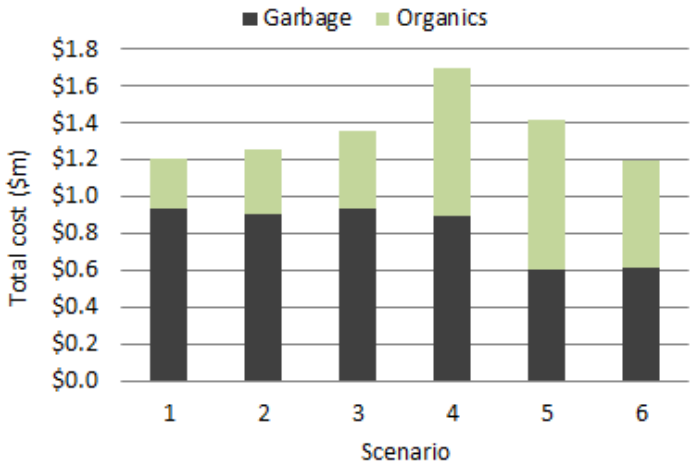
Figure 3: Estimated quantities of City of Mount Gambier kerbside garbage and organic waste recovered under the different scenarios (for 2013-14, using the default parameter values)



Scenarios

1 Business-as-usual (BAU)
2 Voluntary, kitchen caddies
3 Universal, garden
4 Universal, food, high collection
5 Universal, food, medium collection
6 Universal, food, low collection

Figure 4: Estimated costs of managing City of Mount Gambier kerbside garbage and organic waste under the different scenarios (for 2013-14, using the default parameter values)

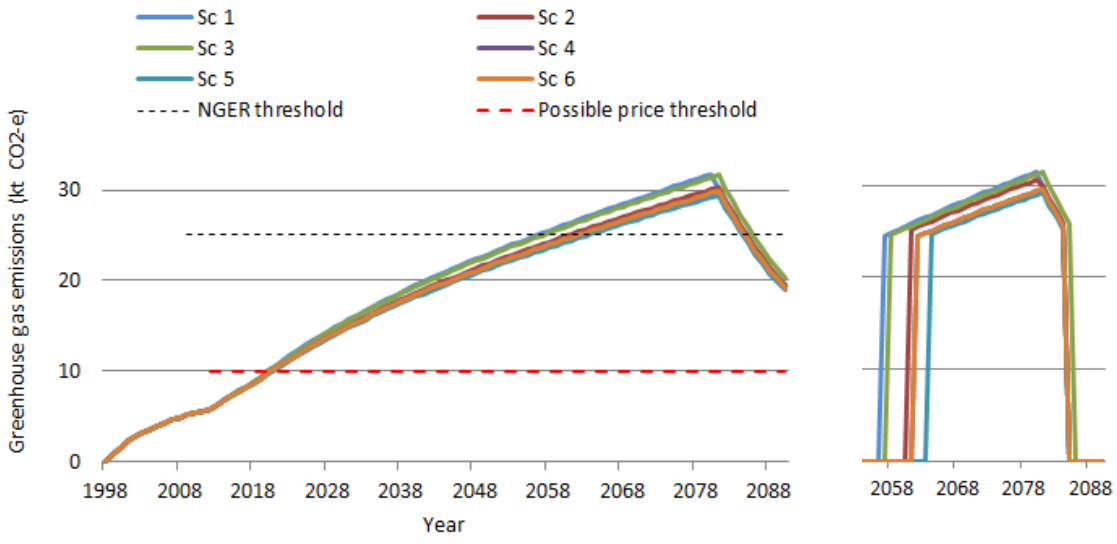


Scenarios

1 Business-as-usual (BAU)
2 Voluntary, kitchen caddies
3 Universal, garden
4 Universal, food, high collection
5 Universal, food, medium collection
6 Universal, food, low collection

Figure 5: Estimated greenhouse emissions from the Caroline landfill under the different scenarios (assuming no waste received from Kingston, Naracoorte, Tatiara councils or Glenelg Shire)

(a) Total emissions (b) Emissions liable under NGERS



4.2 Sensitivity analysis on the overall results

Blue Environment investigated the effect of varying parameter values within a reasonable range. This sensitivity analysis suggested that the relative costs of the scenarios are not strongly sensitive to changes in parameter values. However, there are some slight sensitivities to:

1. The price of composting and landfill. It would be worth confirming that the composting gate fee when food waste is included would increase by 40% (from $30.50 to $43.00).
2. The cost of kitchen caddies and bags. A $1 increase in the annual cost of these increases costs per participating household by a similar amount and net costs per all households by $0.50-0.80/household/year depending on whether the service is voluntary or universal.
3. The quantities of 'additional' garden and food organics that enters the formal waste stream when a kerbside service is adopted.
4. The assumed proportions of food and garden waste currently in garbage bins.

None of these are as influential, within realistic assumption ranges, as the cost of collections. As an illustration to make Scenario 6 (low collection) more expensive than Scenario 5 (medium collection) when other default parameter values are held constant:

- The cost per household per year for kitchen caddies and bags would need to be $32, rather than the default of $11. This is unlikely – the cost of biobags has been falling rather than increasing.
- The average quantity of 'additional' garden waste would need to reach almost 1500 kg/household/year, rather than the default of 150 kg. This is highly unlikely.

4.3 Carbon costs and benefits

The model was used to explore the carbon costs and benefits of the different scenarios using the different policy settings and prices. It was found that:

1. In all realistic settings of the parameter values, including the default model settings, landfill carbon costs are a small component of total costs of waste collection and disposal and do not affect the overall relative costs of the six scenarios.
2. If a carbon price exists at some point during the next few decades, accepting waste from other councils now is likely to increase future carbon liabilities. In percentage terms, the increase could be significant. This is because receipt of the additional tonnes brings forward the day the landfill emissions exceed the liability threshold (assumed to remain at the current 25 kt CO_2-e) and delays the day the emissions subsequently fall below this threshold. This effect is illustrated in Table 4.

Table 4: Carbon costs of CoMG municipal waste deposited in 2014-15, under business-as-usual

MSW received from	Waste landfilled (kilotonnes)	Carbon costs ($000s)	First year the liability threshold is exceeded
CoMG, DC Grant, Wattle Range	16.7	$45	2057
Kingston + CoMG, DC Grant, Wattle Range	17.4	$57	2054
Naracoorte + CoMG, DC Grant, Wattle Range	19.3	$97	2047
Tatiara + CoMG, DC Grant, Wattle Range	18.7	$79	2050
Glenelg + CoMG, DC Grant, Wattle Range	22.8	$163	2038
All seven councils	28.1	$192	2031

Based on the BAU scenario, default parameter values, no carbon price repeal and Treasury carbon price projections.

3. Landfill carbon costs do not vary markedly between the different scenarios. The NGERS Determination assumes a single default value for the composition of MSW so savings arise only through reduced tonnages sent to landfill[3].
4. If the carbon price is not repealed, CoMG should consider imposing a carbon price on waste to landfill from next year. Although the site is not currently liable, the modelling suggests that it will become liable in the future. Emissions from all waste deposited subsequent to July 2012 are subject to the carbon price.
5. A method may be developed in the near future to enable the carbon credits to be generated by diverting organic waste from landfill, and thereby avoiding methane emissions. These credits could then potentially be sold into the Emission Reduction Fund, which is set to replace carbon pricing. The potential income for CoMG under each scenario is as shown in Table 5. These figures ignore transaction costs and are based on the assumptions[4] that:
   - there would be no payment for organic waste diversion that is currently occurring
   - all organic waste processed is counted as diverted from landfill
   - the crediting calculation assumes all gas generated from the landfill is emitted to the atmosphere
   - the value is $5 per t CO_2-e.

Table 5: Potential value of carbon credits from diversion of organic waste from landfill (2014-15 assessment year)

Scenario	Value of carbon credits ($000s)
2 Voluntary, kitchen caddies	$29
3 Universal, garden	$4
4 Universal, food, high collection	$33
5 Universal, food, medium collection	$41
6 Universal, food, low collection	$33

[3] NGERS reporters can use their own waste composition data in place of the default, but only if they can provide adequate data for each waste stream – MSW (including non-kerbside collections), C&I and C&D. This is onerous. The authors are unaware of any landfills that have used this approach.

[4] Any or all of these assumptions could be incorrect – at the time of writing no methods have yet been finalised for obtaining credits under the Emission Reduction Fund.

5. Discussion and recommendations

The modelling and other analysis undertaken by Blue Environment suggest that practical opportunities exist for the CoMG to reduce organic waste to landfill. The CoMG does not have the economies of scale needed for high-tech approaches such as advanced waste technologies or waste sorting. Instead, low-technology and low-cost options should be pursued.

5.1 Model findings

The preferred scenarios

The model shows that collection frequency is the most important influence in the cost of different arrangements for managing organic waste. The best alternatives to the BAU scenario appear to be either Scenario 2 (provision of kitchen caddies and biobags to those who want them) or Scenario 5 (establishment of a universal, weekly organics service combined with fortnightly garbage collection).

Scenario 2 is easier to establish and run, cheaper, and is likely to result in a high quality waste stream – which may mean the processing price does not go up. Scenario 5 is more difficult and expensive to establish and run, and is likely to result in an increased volume of waste. However, it should result in a higher recovery rate. Establishment of Scenario 2 with the potential to move later to Scenario 5 would appear to be a safe and appropriate approach.

Based on the model, Scenario 6 produces the best results – a high recovery rate at low cost. However, a shift to fortnightly collection of both garbage and organics in a universal system would be a major jump from the present approach and may not be politically and practically acceptable. Blue Environment is unaware of other municipalities using this approach. A week-on week-off arrangement for both streams would be logistically optimal but could lead to very high contamination rates. Scenario 6 may be an option for later, once a more readily accepted universal option has been bedded down.

Carbon costs

The model indicates that likely carbon costs should not be a dominant factor in deciding on what organics waste management options to pursue. The emission differences between the scenarios are small.

Acceptance of waste from other local governments could affect carbon costs by bringing forward and slightly extending the period during which the Caroline landfill exceeds the 25 kt CO_2-e reporting schedule. Accepting waste from other areas will also bring forward the closure date, potentially shortening the remaining life by about 20 years. These are important considerations for the CoMG in considering acceptance of additional municipality waste streams.

5.2 Reliance on the current organics processor

The CoMG has convenient access to a local low-cost, yet high quality, composting operation[5]. Higher organics processing costs would reduce the competitiveness of organics recovery. The cost of open windrow organic processing at sites without the current operators' large supply of forestry residues is around $65 per tonne. The CoMG should consider this the likely cost should access to the current operator cease.

[5] So inexpensive is this composting facility that organic waste from Blue Environment's project manager's property at the foot of Mount Macedon in Victoria was transported over 400km to this site until the recent regulated closure of this route.

5.3 Education to promote recycling and limit contamination

Effective community engagement and performance monitoring is a vital aspect of good waste management. Often more than half of the garbage bin contains materials that could be recovered through existing recycling and organics recovery services. Some useful actions are discussed below.

Clear and unambiguous communication.

A degree of contamination occurs because residents are unsure what to place in which bins, and how to present materials. Common contaminants of recycling systems include non-recyclable materials (ceramics and some plastics and glass) and recyclables in bags (operators of materials recovery facilities will generally not open bagged materials). Common contaminants of organics services are non-degradable garden wastes and organics in bags. Some councils have found that inviting food waste to be placed in organics bins can attract high levels of food packaging. Bin stickers, fridge magnets, web-based and mailed communications and local media promotions can be helpful.

Contamination monitoring, enforcement and education

An effective program is needed to identify and caution those who misuse systems, and to penalise repeat offenders. Penalties may range from non-collection of bin, bin confiscation or a fine. Operators at the organics receival site should be able to identify loads that have high contamination, and the collection vehicles that delivered them. The vehicles in turn can be traced back to collection areas, and these can be targeted for closer monitoring. Requiring the involvement of collection contractors is usually a good idea. Use of closed circuit TV mounted on collection vehicles to inspect bin contents is common, and some systems can photograph and log bin contents to allow 'traceability'. An appropriate enforcement measure is one written warning followed by a penalty action for any repeat offence within a 12 month period.

A number of councils have had successful programs that identify and target individuals or demographic groups associated with poor waste management.

Use of local print and electronic media

Mount Gambier has the advantage of a relatively concentrated media market, with many residents use local print and electronic media as a key source of information. Useful media strategies can include:

- Regular placement of advertising promoting waste reduction, greater recycling and organics diversion and correct use of systems.
- Regular media releases about the benefits and performance of recycling and organics recovery services.
- High profile reporting of penalty actions taken against those misusing recycling and organics recovery services.
- High profile reporting of people being rewarded for correct use of systems. Some council have adopted 'bin lotto' reward systems where randomly selected households found to have no contamination of recycling or organics services receive gift vouchers or other rewards.
- Promotion of the message that good recycling and organics recovery are now the 'norm' for community waste management. It can be effective to stress that most people recycle well and those who do not place a cost burden on the whole community.

Monitoring the effectiveness of behaviour change programs

It is often difficult to determine how effective community engagement programs have been. Good information sources can be:

- materials recovery facilities and organics centres regarding contamination levels
- periodic bin audits –those that 'bag and tag' all bins from randomly selected households allow more accurate determination of different behaviours across the community than aggregated waste audits
- community surveys – these can be used to confirm whether messages are being 'heard' and acted on widely, and identify the extent to which an entrenched under-performing demographic persists.

5.4 Reducing household organic waste

CoMG could promote reduction in organics in households waste through 'conserver' behaviour such as: more efficient purchasing, storage and preparation of food; low-waste gardening; and reducing paper waste through greater use of electronic media (on-line and e-publications) and 'no junk mail' signage. On-site management of compostable organics could also reduce the quantities of organics in garbage and kerbside organics, with direct cost-savings to council and the community through reduced disposal and processing gate fees.

Provision of convenient kerbside organics service works against the objective of reducing the quantity of materials in the waste management system, as it makes it easier for households to 'dispose' of garden and food organics.

The extent to which such strategies can effectively reduce waste on an on-going basis is not well known. The modelling undertaken by Blue Environment conservatively assumes that waste generation per household will not significantly change.

5.5 Reducing and diverting non-household organic waste

The quantities of privately collected or managed C&I and C&D waste received at the Caroline landfill depends on economic activity, price signals and opportunities for alternative management. The model anticipates the quantities of these wastes sent to landfill will grow with population, but a greater proportion of waste could be recovered if it becomes economically viable or more convenient to do so. Landfill pricing incentives and the provision of resource recovery opportunities could help recover more of these wastes.

One relatively low cost option would be to provide a hardstand 'dump and sort' area at the Caroline landfill where trucks thought to contain materials suitable for recovery could be asked to deposit their loads for inspection and sorting. Typically waste would be deposited to a depth of 0.5 to 1m and picked over by hand, using a front-end loader, or both. This would typically take 15-20 minutes. Provision would need to be made for the storage of recyclables, which could include metals and similar as well as organics. A trial could be organised, with inspection by the organics processing contractor to confirm the value of the accumulated materials.

The CoMG may wish to consider the option of diverting street sweepings from landfill in consultation with the organics processor. The challenges of doing so would focus on glass and plastic contamination – oily residues and rubber tend to disappear in the compost process. Glass shards are difficult to remove and it may be better to generate a low grade product rather than invest in cleaning this waste stream. Most street sweepings go to landfill, sometimes as cover material.

5.6 Preparing for NGERS liability

The model analysis focuses on potential carbon costs under NGERS, showing that costs are relatively small in the context of organics management. Emissions are expected to exceed the NGERS liability threshold for a short period during the landfill life, and this means that accepting waste from neighbouring councils could significantly increase the carbon penalties, albeit from a low base.

It is not certain that NGERS liability will arise, even if current reporting requirements do not change. There may be opportunities to reduce reportable emissions – see Section 5.7.

At present, Council's waste acceptance procedures do not match those required under NGERS, which require classification into MSW, C&I, C&D or 'homogenous waste'. The classification method can involve use of invoices, measurement or reasonable estimates[6]. Usually, each truck would be classified into one of the relevant categories based on the predominant waste load. If, when NGERS liability occurs, Council is unable to verify the composition of waste deposited in the past, then default factors will need to be used. The current NGERS default factors for South Australia are: MSW 36%; C&I waste 19%; C&D waste 45%.

5.7 Other methods for reducing emissions

The focus on NGERS modelling means that some methods for reducing emissions are not well covered. Reducing the organic content of waste, for example, has no impact on NGERS modelling of emissions per tonne because default composition values are applied[7].

One option for reducing emissions is to use passive oxidation of methane through biofilters. This technique has proven to be effective in oxidising methane. A method is likely to become available in the near future for generating carbon credits from this technique, which can potentially be sold into the Emission Reduction Fund.

Blue Environment does not consider differential landfill pricing of landfill inputs based on organic content to be an effective way to reduce emissions. It would be too difficult to police and administer such a system, and anyway reliance on NGER default composition values effectively means that reducing waste tonnages is the only way to reduce emissions. In this sense, diverting a cubic metre of concrete has three times the calculated carbon benefit as diverting a cubic metre of garden waste.

5.8 Recommendations

6. Consider establishing a food organics recovery service, including kitchen caddies an bio-bags, for current users of the organics service (Scenario 2). This approach provides the service to those who feel they need it most, and will allow a system to be bedded down before any expansion to encompass less enthusiastic residents. Participation and diversion rates tend to be higher and contamination levels lower with voluntary participation. Council should consider the potential for

[6] If South Australia were to follow other states in establishing reporting requirements in these categories, the data resulting from those requirements would need to be used.

[7] This is not a major source of 'inaccuracy' – adjustment of the model to take into account the estimated actual composition values would only slightly change the calculated emissions. This is because of the relationship between the methane generation potentials (L_0) of: the organic wastes that are actually being subtracted; and the average MSW that the NGERS effectively assumes is being subtracted. The L_0 of garden waste is 1.33 t CO_2-e, which is coincidentally also the L_0 of NGERS default MSW, which means it makes no difference whether or not the composition is adjusted to show a lower proportion of garden waste. The L_0 of food waste is 1.59 t CO_2-e, some 33% higher than that of NGERS default MSW. If the model took account of the actual proportion of food waste, calculated emissions per tonne would fall – but not by much.

later expanding to a universal service with weekly collection, combined with fortnightly garbage collection (Scenario 5).

7. Consider trialling a dump and sort area at the Caroline landfill to recover recyclable materials from commercial waste streams.
8. In determining whether or not to accept municipal waste from neighbouring councils, consider the impact on landfill life and potential carbon costs.
9. Once the in-progress method for generating carbon credits by passive oxidation of methane is finalised, consider establishing such a passive system at the Caroline landfill.
10. If the Australian Government fails to repeal carbon pricing, consider establishing a carbon price on waste to landfill now to cover future liabilities when site emissions exceed the NGERS threshold.