Results of FOGO implementation trial

A submission to Southern Metropolitan Regional Council

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Disclaimer

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Executive Summary

The Southern Metropolitan Regional Council (SMRC) commissioned the Waste Composting Facility (WCF) at its Canning Vale site in 2003. When commissioned, the WCF was a state of the art in-vessel composting technology and has enabled SMRC member Councils to achieve a total waste diversion of 65%. It is now reaching the end of its life.

The SMRC adopted a new Strategic Waste Management Plan (SWMP) in 2016. The SWMP recommended that the SMRC progress from the $100m replacement value of an in-vessel WCF system to a 3-bin FOGO system.

The key outcomes sought from a 3-bin FOGO system included:

- Diversion from landfill of at least 65%
- Production of a high quality compost suitable for unrestricted use; and
- Reduced waste processing costs.

A 3-bin FOGO service was modelled to lead to at least 57% diversion from landfill. The SMRC resolved to progress with the implementation of a FOGO service using a staged approach.

The first stage was to conduct a trial of FOGO for selected areas of the City of Melville (Melville). The intent of the trial was to understand challenges with the implementation of a FOGO service, and to test the assumption made around the effectiveness of a FOGO service. Accordingly, the trial was designed to be as representative as possible of the broader demographics of the region.

The trial was preceded by extensive preparation. Staff and Councillors from the SMRC and participant Councils went on a study tour to Victoria, New South Wales and South Australia in early 2017 to observe existing FOGO operations. The SMRC also received briefings from MRA's Ron Wainberg and Leslie Mallinson.

The trial started in October 2017. In preparation for the trial, the SMRC conducted a waste audit in June 2017 for properties that were to be a part of the trial. The audit showed that, of all waste collected in the two bins at the time (rubbish and recycling), the waste could be categorised as:

- Organics: 52%
- Recyclables: 32%
- Rubbish: 16%

That is, over half of the waste stream could be diverted into the FOGO bin. The weight of the rubbish bin contents could be reduced by up 75%, leading to substantial savings in waste disposal costs.

A communication campaign for the trial started in April 2017, well before the trial itself started. Communications developed through four phases:

- Pre-lead in
- Lead-in
- Settle-in period
- Ongoing support

Each phase provided increasingly specific support and guidance for all stakeholders. Simple messages were devised for the new service, including "*if it didn't grow, it's not FOGO*".

Once commenced, the FOGO trial was supplemented by a bin audit and education program. This program involved the use of bin tags to communicate with residents about how they were using their bins, and to do so in a public way. The program saw substantial improvements in the correct sorting of waste into the three bins, and the use of bin tags led to a notable “halo effect” where more people were aware of the tagging program than received tags.

In general, the FOGO bin had the highest degree of compliance. This is likely due to a combination of the simple messaging used and the novelty of the service. Together, these make it easy for people to pay attention to what was expected of them.

Feedback was collected from residents through the bin audit and education program. This feedback can be grouped into three broad themes:

- System design
- Resident behaviour change
- Communication

A survey was conducted into community perceptions of the FOGO service amongst those who were in the trial area. The survey found that 79% of the respondents wanted the FOGO service to continue. This is a very high result noting that a FOGO service demands a high degree of interaction from residents. Residents were also highly satisfied with key elements of the service, including:

- Weekly FOGO collections
- Kitchen caddy
- Compostable caddy liners
- Fortnightly recycling (recycling was previously weekly)

One of the learnings from the trial was that different brands of compostable caddy liners (bags) have different longevity in service, and hence a full scale introduction of FOGO should be preceded by an evaluation of the performance of different compostable bags.

The trial led to a substantial level of diversion from landfill. The overall system diversion is projected to reach 65% diversion from landfill compared with 57% modelled. As anticipated, the FOGO service led to a substantial reduction in the rubbish bin weight. The reduction observed between trial and non-trial areas in Melville was 70%. The total waste generated also declined by 10%. This was not expected, and is likely due to the increased focus on organic waste leading to people being more careful with food wastage.

The FOGO bin was observed to have a low level of contamination at around 2.6%. This is very low in the context of metropolitan FOGO services, however still too high to permit the FOGO material to be composted without pre-treatment to remove glass, plastic and other gross contaminants.

The compost produced during the trial was found to be of a quality that is highly likely to be suitable for unrestricted use under AS 4454.

Audits of the FOGO and rubbish bins showed that people are generally using their bins well, however there remains a further 63% of materials in the rubbish bin that could be recovered using either of the FOGO or the recycling bins. The organics in the FOGO bin was about 28% food waste, with this proportion observed to grow over time.

When comparing the trial against the expected performance based on the June 2017 audit, it broadly met expectations.

The trial makes a compelling case for all participant Councils to proceed with a FOGO service, and for the FOGO service to be implemented as a high priority. It will achieve at least the same amount of diversion as is currently achieved, with an anticipated lower waste management cost. It was also widely accepted by the community.

Glossary

Terminology	Description
CCM	Consolidated Cost Model
Cockburn	City of Cockburn
EfW	Energy from Waste (see also WtE, Waste to Energy)
F/OF	Full / Overfull (bins)
FOGO	Food Organics and Garden Organics
Melville	City of Melville
LGA	Local Government Area
MWRRG	Metropolitan Waste and Resource Recovery Group (Victoria)
MSW	Municipal Solid Waste
MUD	Multi-Unit Development
RRRC	Regional Resource Recovery Centre
SMRC	Southern Metropolitan Regional Council
SWMP	Strategic Waste Management Plan
WCF	Waste Composting Facility
WtE	Waste to Energy (see also EfW, Energy from Waste)

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1 Introduction

The Southern Metropolitan Regional Council (SMRC) commissioned the Waste Composting Facility (WCF) at its Canning Vale site in 2003. It represented cutting edge waste processing technology at the time, and enabled the SMRC member Councils to achieve a total waste diversion of 65%.

The waste industry has changed since the decision was made to commence the WCF. Landfill gate fees have not increased at the rate expected, and various Energy from Waste (EfW) proposals have emerged that promise the same or higher diversion at lower gate fees.

The WCF is now reaching the end of its design life, and in 2016 the SMRC adopted a new Strategic Waste Management Plan (SWMP).

The SWMP modelled several options using MRA's Consolidated Cost Model (CCM). That modelling drew the following three key conclusions:

1. WCF drums achieve high diversion but are expensive in the modern context.
   System NPV = $715m
2. 2-bin EfW is the least cost option, but unproven and still unavailable in Australia.
   System NPV = $460m
3. 3-bin FOGO (Food Organics Garden Organics). This is best practice around Australia. It is low risk, as all of the elements currently exist
   System NPV = $520m

The SWMP recommended that the SMRC progress from the current WCF system to a 3-bin FOGO system. In the first instance, residual waste from bins and FOGO processing goes to landfill. When EfW becomes available in Perth, residuals can be disposed to EfW.

The FOGO with landfill disposal of residuals was modelled to achieve a net diversion of 57%. FOGO with EfW disposal of residuals was modelled to achieve a net diversion of 89%.

The SMRC resolved to proceed with the implementation of a FOGO service across the region, and to understand implications of implementing a FOGO service, the SMRC decided to conduct a trial of FOGO collections in selected areas of the City of Melville (Melville). The intent of the trial was to understand challenges with the implementation of FOGO, and to test the input assumptions of the CCM.

The City of Cockburn (Cockburn), a member of the SMRC at the time, had already decided independently to proceed with a Garden Organics (GO) service, and withdrew from the SMRC prior to the remaining SMRC Participants making a decision in relation to FOGO. The withdrawal had an effective date of 30 June 2017. Cockburn's contract for the delivery of waste to the SMRC for processing through the WCF expires on 30 June 2020.

The amended SMRC Business Plan, prepared following the Cockburn withdrawal, calls for the complete transition of the WCF to a pre-sort and transfer station for FOGO processing from 1 July 2020.

The withdrawal of Cockburn does not change the merits of the FOGO solution, but rather reinforces the need for the SMRC and its member Councils to shift to a FOGO service. A FOGO service enables the SMRC to be able to provide a cost-effective waste service for its member Councils.

2 The situation before the trial

A waste audit was conducted during June 2017 for the properties proposed to be part of the FOGO trial. The results of the audit are reported in the Waste Composition Audit summary report (29 August 2017). Composition data from the waste audit is used, together with waste quantities averaged over the 2016/17 financial year, to derive average quantities of materials over the year.

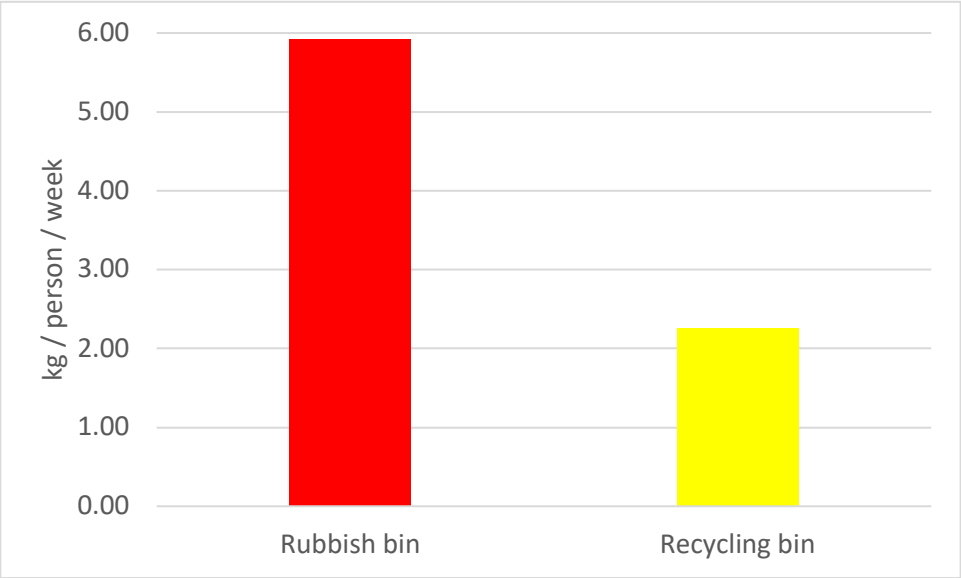
For consistency throughout the report, data per household has been converted to data per person. This conversion was performed using the regional average population density of 2.52 people/household as developed Profile ID from Census data.

Key elements of the report are summarised below.

2.1 Totals collected

The average amount of waste collected per person per week in the City of Melville throughout the year is presented in Figure 1. The rubbish bin contains more than twice as much waste as the recycling bin.

Figure 1: Average waste collected per person – City of Melville 2016/17

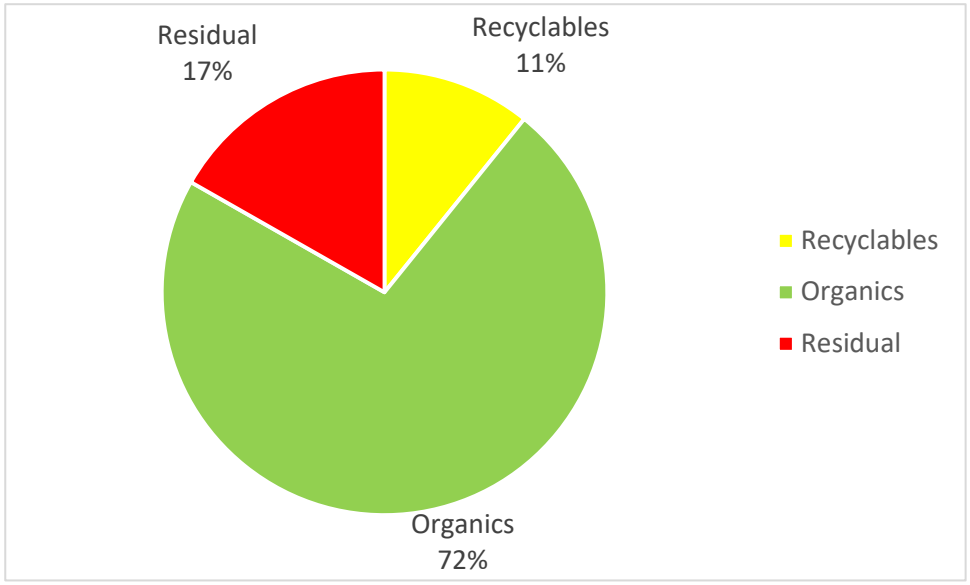


2.2 Bin composition

2.2.1 Rubbish bin composition

The baseline audit demonstrated that a substantial proportion of the rubbish bin can be diverted to either a FOGO bin, or correctly placed within the recycling bin. The audit indicates that 83% of the waste in the rubbish bin could be diverted, as presented in Figure 2.

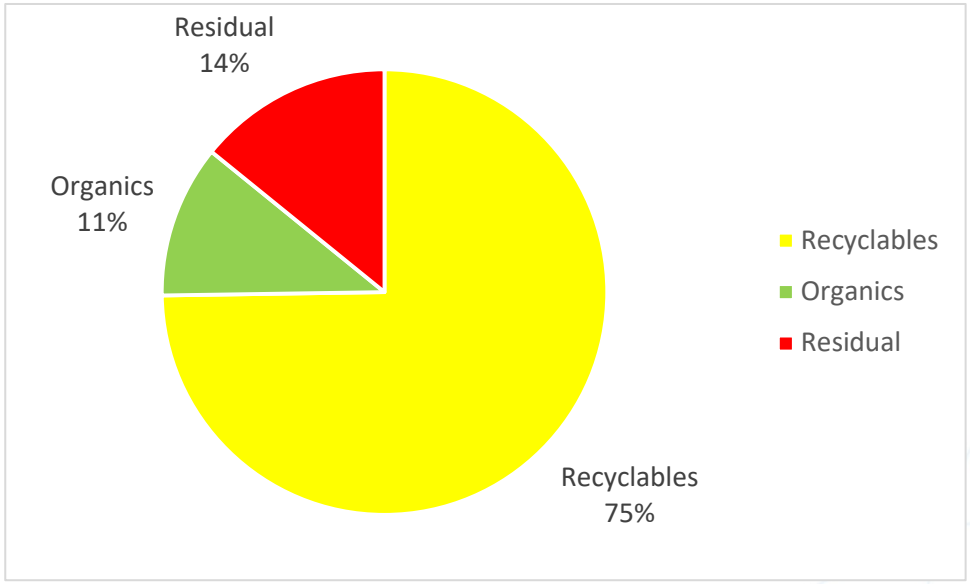
Figure 2: Baseline rubbish waste bin composition - June 2017



2.2.2 Recycling bin composition

The audit of the recycling bin revealed that there is about 25% contamination of the bin, with 11% of the bin able to be diverted into the FOGO bin. Details are shown in Figure 3. Note that organics includes non recyclable paper and cardboard.

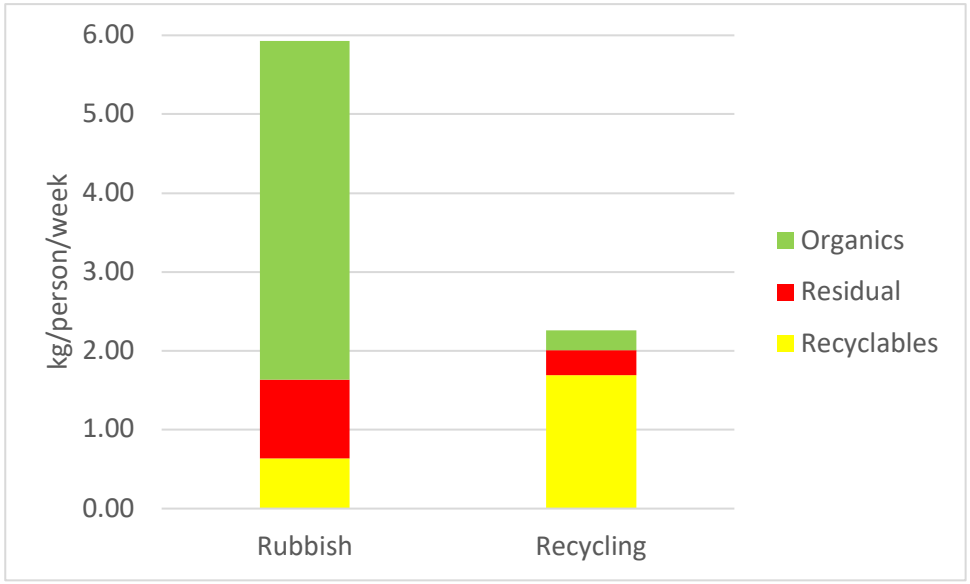
Figure 3: Recycling bin composition - June 2017



2.2.3 Waste stream composition

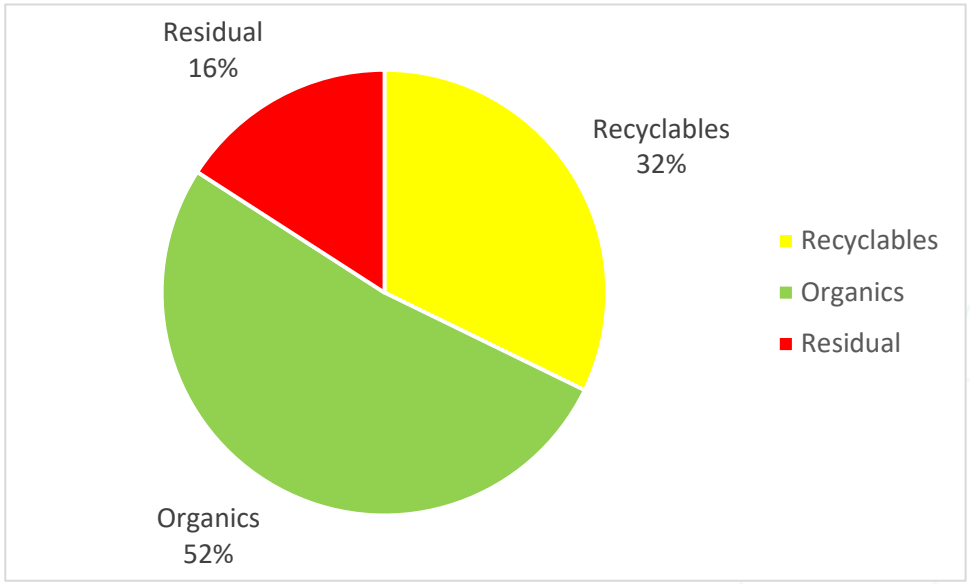
Combining the chart of the weight of waste collected per bin (Figure 1) with the waste composition charts (Figure 2 and Figure 3) enables a chart of waste composition per bin to be derived. The waste composition per bin is presented in Figure 4.

Figure 4: Waste composition per bin per person – pre-trial



This, in turn, enables an overall composition of the waste stream to be prepared, grouped into the three waste streams offered under a FOGO service – organics, recycling and rubbish. This combined composition is presented in Figure 5.

Figure 5: Overall waste stream composition - June 2017

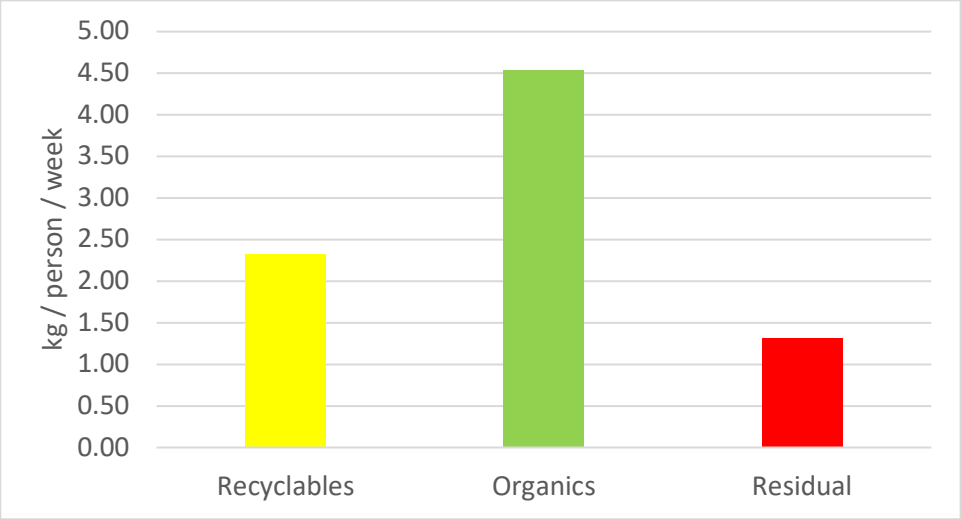


The audit demonstrated that over half of the waste stream is able to be collected in a FOGO bin.

2.3 Tonnages available for diversion

The composition and tonnage analysis enables an estimate of the total tonnages available for diversion in each of the bins. This is a useful metric for measuring the performance of the trial.

Figure 6: Modelled waste diversion amounts from June 2017 audit



2.4 Bin capacity

During the second round of the bin tagging program, the capacity used of each bin was recorded and the following noted regarding bin capacity used:

- FOGO: 39% (weekly collection)
- Recycling: 72% (fortnightly collection)
- Residual: 71% (fortnightly collection)

There was some variation across the trial area, particularly in relation to the FOGO bin which was more full in suburbs with larger block sizes (41% in Bicton and Mt Pleasant), where the bins might be expected to be filled more with garden waste. This capacity data suggests that, even where people have sufficient land to establish their own compost bin, they would prefer to have garden waste removed through a FOGO service.

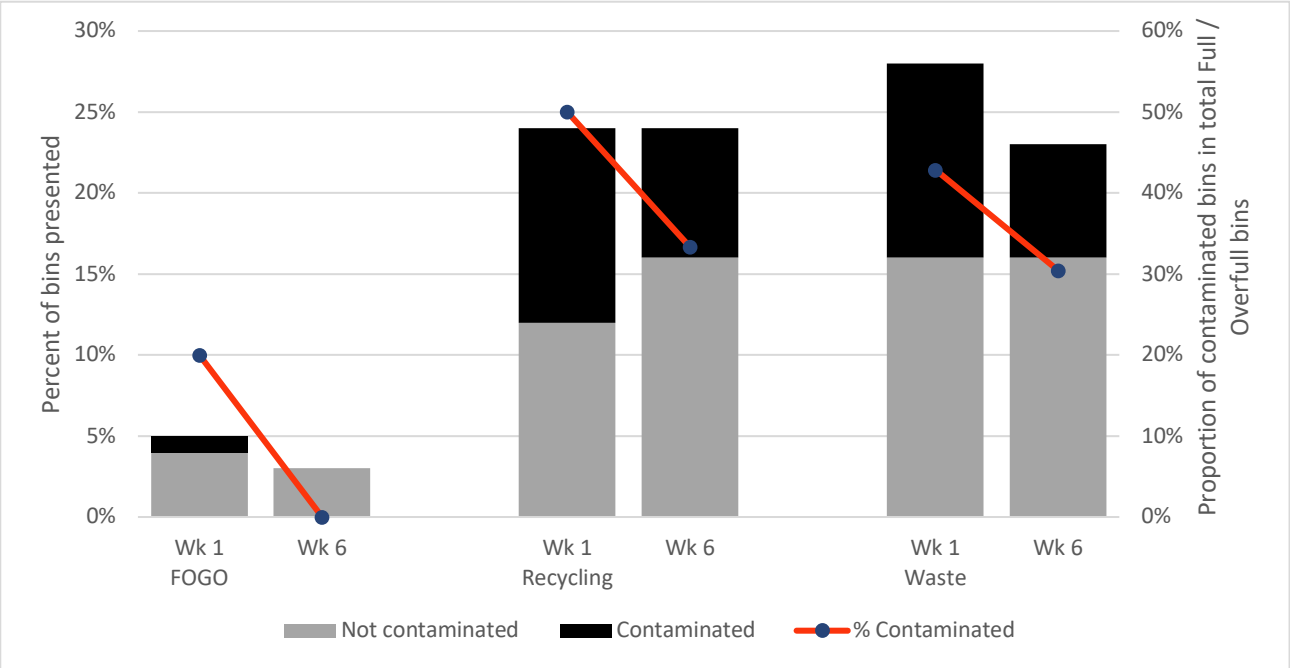
Officers also recorded the percentage of bins presented that were either full or overfull ("F/OF"), classified on the basis of whether they were contaminated or not contaminated.

This data enabled an understanding of:

1. How much of the F/OF bin is due to contamination
2. Whether the proportion of F/OF bins that are contaminated reduces with education effort
3. If further bin capacity is required

Figure 7 shows the changes in the number of F/OF bins that were "not contaminated" and "contaminated".

Figure 7: Week 1 vs Week 6 Full and Overfull bins



The data suggests that the education and bin tagging efforts had the effect of helping people put their waste in the correct bin, thus reducing the number of bin capacity issues. Where bin capacity issues continued, they were less likely due to contamination and the proportion of contaminated bins in the F/OF bins observed decreased in all waste streams.

3 Trial implementation

3.1 Preparation

In preparation for the FOGO trial, the SMRC Communications Manager consulted with several organisations to assist in designing the trial. The organisations consulted were:

- WA Local Government Association
- City of Stirling
- East Waste (SA)
- City of Cockburn
- City of Burnside (SA)
- Clarence Valley Council (NSW)

The SMRC also arranged a study tour of key case studies for FOGO services to gather learnings from their experience. The study tour included inspections of FOGO services run by:

- Albury City Council (NSW)
- City of Penrith (NSW);
- East Waste (SA);
- Jeffries (organics processor, SA);
- Cleanaway (NSW);
- Veolia (VIC); and
- SUEZ (NSW).

The inspections included tours of FOGO processing facilities to understand the extent and type of contamination, as well as how that contamination is managed.

The project team also received briefings from MRA's Ron Wainberg and Leslie Mallinson in Perth.

3.2 Trial design

The FOGO trial was implemented within the City of Melville, gathering data that could be extrapolated across the rest of the participant Councils (Melville, Fremantle and East Fremantle). The FOGO trial subset was selected based on the following criteria:

- Diverse demographics, considering specifically:
    - Average weekly household income;
    - Percentage of the population from a non-English speaking background;
    - Households with children younger than 15;
    - Median household size; and
    - Median age.
- Each area currently collected in a single waste collection run (ie no change to bin collection days)

A total of 6,760 households were selected to participate in the trial. Melville has about 42,300 households across the Local Government Area (LGA).

Whilst bin collection days were not changed through the FOGO trial, bin collection frequencies were as summarised in Table 1. A key change was shifting recycling bins to fortnightly and offering a 360 L recycling bin in order to reduce the number of bins collected each week.

Table 1: Collection frequencies pre- and post FOGO trial

Bin	Pre-trial	Post trial
Rubbish	Weekly	Fortnightly
Recycling	Weekly	Fortnightly
FOGO		Weekly

The existing rubbish bins were removed and replaced with new red-lidded bins rather than simply replacing the lid. This decision was made based on experience in other Councils where re-lidding bins was ineffective. A new bin creates a powerful reinforcement that the service has changed.

3.3 Communications

Communications for the trial was coordinated between the City of Melville and the SMRC, and involved extensive communications across a range of media to ensure that the trial message was received.

The key message for the trial is that FOGO is the next step on from a recycling bin, and that Council wants to ensure that nothing goes to landfill that can't be put to good use.

In addition to the overarching message, a simple tagline was devised around how to use the FOGO bin: "if it didn't grow, it's not FOGO". This simple decision making rule is supplemented by details on which specific wastes can go into a FOGO bin.

The communications were undertaken in four phases:

- Pre-lead in: 11/04/17 to 21/08/17
- Lead-in: 22/08/17 to 08/10/17
- Settle-in period: 09/10/17 to 13/11/17
- Ongoing support: 13/11/17 to September 2018

The communication actions undertaken for each phase are summarised in Table 2 to Table 4.

Table 2: Pre-lead in communications actions

Area	Product/Service	Actions completed
Key stakeholder information	Councillor information	Inform councillors on upcoming changes to kerbside collection
	Council staff training: • Collection drivers/operations • Customer service staff	Provide staff either directly or indirectly involved in the project with relevant information to process requests
	SMRC Staff training	Provide all SMRC staff likely to be involved in communications and operations with training and information.
	Key stakeholders	Provide key stakeholders with necessary information about the upcoming trial
Promotion and advertising	Initial announcement	Announce trial/staged rollout of 3-bin FOGO system for councils with accompanying video.
	Local media	Utilise community newspapers to advertise upcoming changes
	Website and social media promotions	Promote the upcoming changes via the Recycle Right and Council websites, and social media channels
	Melville mosaic magazine	Provide regular updates in Melville's 'Mosaic' magazine

The pre-lead in communications provided a solid base of awareness before the lead-in to the trial, facilitating the lead-in communications described in Table 3.

Table 3: Lead in communication actions

Area	Product/Service	Actions completed
Key stakeholder information	Staff and key stakeholder updates	Host meetings with staff and key stakeholder as required
Resident communication	Letter to residents	Provide all residents participating in the trial with a detailed letter and flyer outlining the upcoming changes
	Community information night	Provide Community Information nights for trial residents

Area	Product/Service	Actions completed
	Deliver Rollout information package	Deliver the rollout packages with the delivery of new bins to residents, including 1 x A5 Booklet and one Waste Calendar
Promotion and advertising	Website and social media promotions	Promote the upcoming changes via the Recycle Right and Council websites, and social media channels
	Video for residents	Create second video, to explain to residents how to use the new system
	Local Media	Utilise local media to advertise upcoming changes
	Melville mosaic magazine	Provide regular updates in Melville's 'Mosaic' magazine

Communications during the settle-in period, ie shortly after residents had received their new service, was targeted to increasing residents' understanding of the service, seeking to ensure that residents understood what the new service was all about. Specific actions undertaken during the period are detailed in Table 4.

Table 4: Settle in period communication actions

Area	Product/Service	Actions completed
Key stakeholder information	Communications and Operations meetings	Meetings between communications representatives from Melville and the SMRC, alongside project steering group
Resident communication	Public Enquiries	Continued and ongoing support of complex enquiries surrounding the trial
	Melville talks	Provide an opportunity for dialogue between residents
Promotion and advertising	Media Releases	Produce media releases as required
	Melville mosaic magazine	Provide regular updates in Melville's 'Mosaic' magazine
	Local Media	Promote trial across local media

Finally, the support period runs through until the end of the trial, and is intended to ensure that the trial continues to be monitored and appropriately supported. This period keeps communications channels open, and is the long term "steady state" communication action.

Table 5: Support period communication actions

Area	Product/Service	Action completed
Key stakeholder information	Communications meetings	Meetings between communications representatives from each council and the SMRC
	Briefing to elected members	Project update and bin tagging information presented to elected members
	Project updates	Provide trial participants with an update on the project's successes and shortcomings as available and required
Resident communication	Public Enquiries	Continued and ongoing support of enquiries surrounding the trial
	Update Recycle Right App	Update the Recycle Right App to make information accessible for trial residents
	Bin Tagging Program	Inspect and provide feedback to 35% of residents
	Survey	Survey residents to provide feedback during the trial
	Melville talks	Provide an opportunity for dialogue between residents
	English as a second language	Engage residents with English as a second language to understand barriers/gain feedback and tailor solutions (ONGOING)
	Support for Multi-Unit Developments (MUDs)	Investigate issues and explore solutions and further education for residents with shared bins in MUDs
Promotion and advertising	Media Releases	Produce media releases as required
	Local media	Promote trial across local media
	Council building information and promotions	Utilise council space to advertise and outline results of trial.
	Melville mosaic magazine	Provide regular updates in Melville's 'Mosaic' magazine
	Website and social media promotions	Promote further information, key messages etc. via relevant websites and on social media
Workshops and events	Workshops and tours	Ongoing community workshops and tours

This comprehensive and well-planned communications approach ensured that the service had the best chance possible at success. Residents were made aware of the trial service well before it commenced, and then were closely guided through its implementation.

3.4 Bin audit and education program

The SMRC implemented a bin audit and education program as part of the FOGO trial. The program was undertaken in two rounds, the first from February to March 2018, and the second from April to June 2018.

The program was aimed at educating residents about how to use the new system using a process of tagging bins that did or did not meet the sorting requirements. This provided residents with direct feedback to improve their efforts at home. Data was collected on the number of bins used correctly before and after the tagging.

Methodology

Areas of between 180 and 260 properties were selected in each of the five trial suburbs for each round of audits. The selection was based on a number of factors including historical contamination rates, level of customer enquiries, housing type and density and demographics.

The numbers of bins tagged are summarised in Table 6.

Table 6: Bins tagged in waste audit program

Round	Bins tagged
1	1,305
2	1,157
Total	**2,462**

Each week for 6 weeks, Community Waste Education Officers visually inspected the contents of each selected household's FOGO, recycling and general waste bin presented for collection and recorded details of any contamination present in each bin and the level of contamination.

Following the inspection, a 'happy' or 'sad' tag was placed on the bin's handle, providing feedback and more detailed information about how well the residents were using the bins or what could be improved. An example of the happy FOGO tag is showed in Figure 8.

Figure 8: Happy FOGO bin tag - front and back

In the instances where households were consistently displaying incorrect behaviour and high levels of contamination in the FOGO and recycling bins following several visits, the bin was taped shut and not collected. A tag informing the resident that the bin would not be collected was attached to the bin, listing the contaminants and requesting it be removed before contacting Melville to have the bin emptied.

The number of bins taped shut in each round is presented in Table 7. Decreasing proportions of bins taped shut suggest improved overall resident compliance.

Table 7: Bins taped shut in waste audit program

Round	Bins taped shut	Percentage of audited bins
1	34	2.6%
2	18	1.6%
Total	**52**	**2.1%**

Results

Each suburb showed consistent improvement in correct behaviour across all three bins over the tagging period as presented in Figure 9 and Figure 10.

Figure 9: Correct use of bins Round 1 - Week 1 vs Week 6

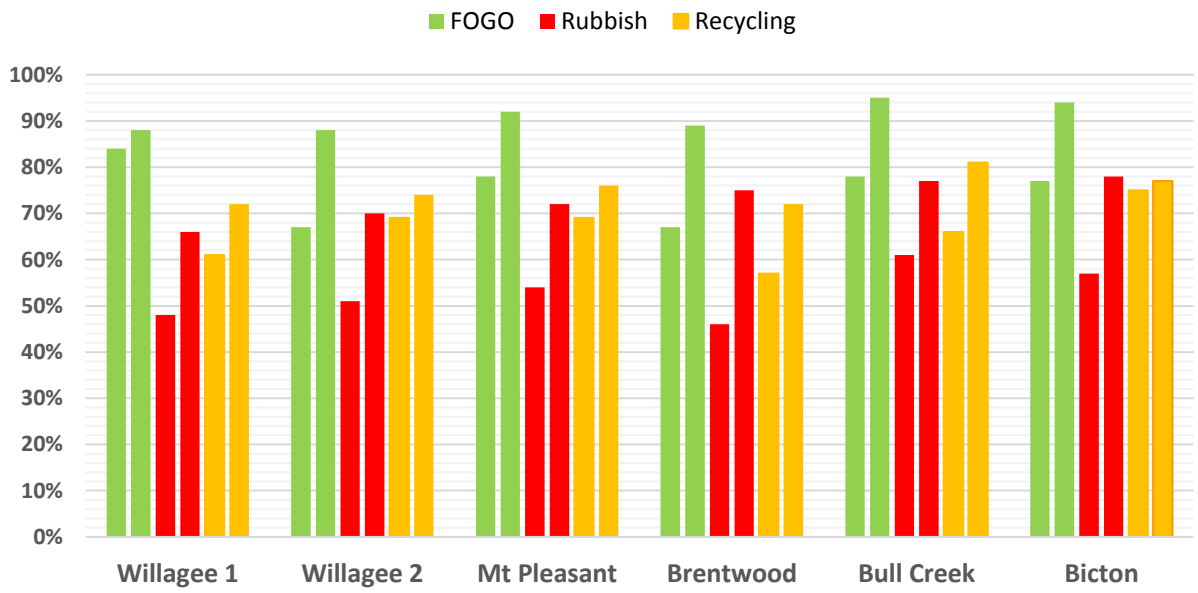
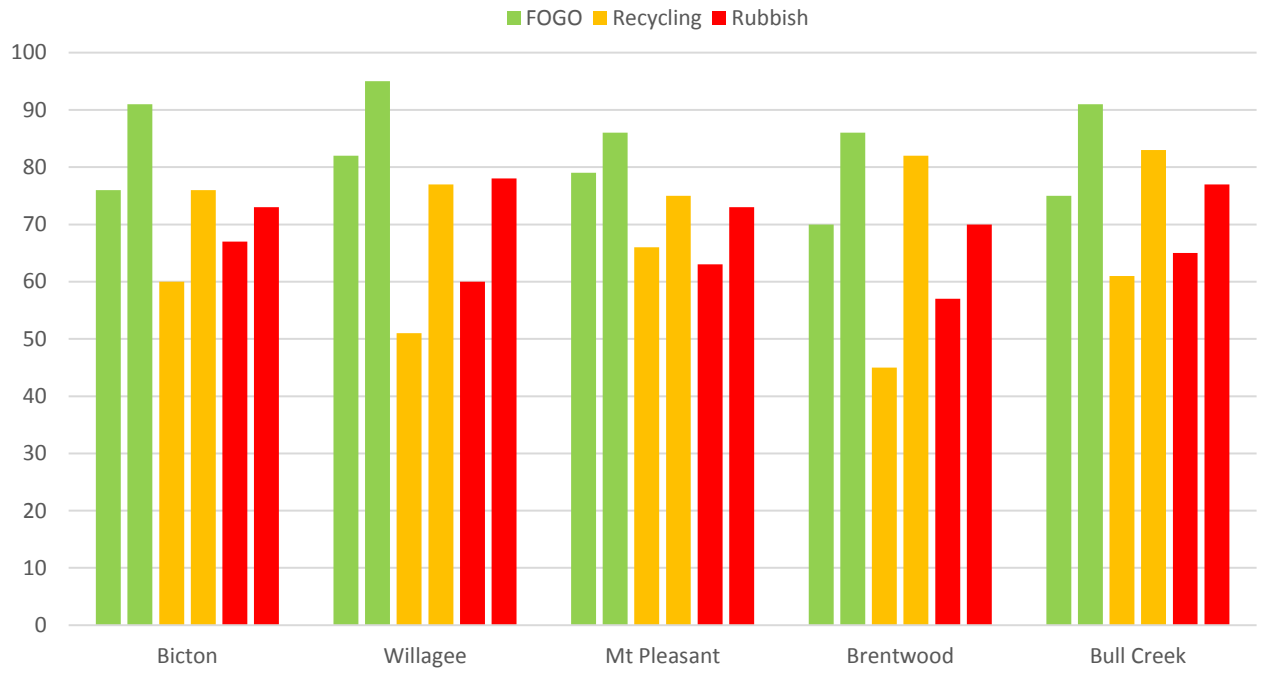


Figure 10: Correct use of bins Round 2 - Week 1 vs Week 6



These results support the general conclusion that bin tagging is a highly effective way of communicating with residents. The community engagement through the bin tagging is highly specific and leads to improvement in all aspects of waste management.

In all but one case, the FOGO bin has the greatest degree of compliance both before and after bin tagging. This is most likely due to a combination of factors:

1. The messaging is simple. If it grew, it goes in the bin. Recycling and rubbish bins have a complex array of materials that can and cannot be placed in the bin. This complexity is reflected in comments around recycling of hard vs soft plastics.
2. The FOGO service is new, and so the messaging around how to use it has not been confused by past messaging. Both the recycling and rubbish bin have seen changes in messaging, and show considerable variance between the SMRC Councils and other parts of Perth.

Retaining the simple message for FOGO is highly recommended. Furthermore, the introduction of FOGO should be used to also simplify messaging around recycling and rubbish bins.

Waste survey results also suggest that the bin tagging has a “halo effect”, with more people aware of the bin tags than actually received them. This is because the bin tag is publicly visible, and is one of the key benefits of using bin tags rather than a similar message in the letterbox (for instance).

3.5 Community feedback

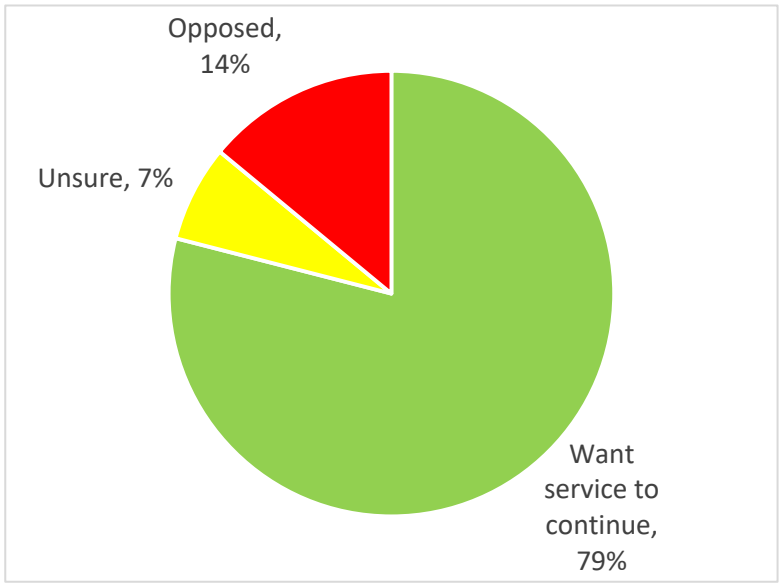
3.5.1 Community perception survey

The SMRC devised a resident survey to investigate community perceptions on the FOGO service amongst those who were in the trial area. The survey was developed in conjunction with Catalyse, a communications consultant, which was also engaged to conduct the survey.

The survey was conducted in April 2018, with all households in the trial area invited to complete a scorecard to evaluate the 3-bin FOGO collection service. Of those surveyed, 30% provided a valid response. The strong response rate meant there was minimal sampling error.

The headline survey result was that 79% of the respondents want the FOGO service to continue. This result is very high, particularly given a FOGO service demands a high degree of interaction from residents. More detail of the FOGO acceptance results is provided in Figure 11.

Figure 11: Survey results – views of FOGO service

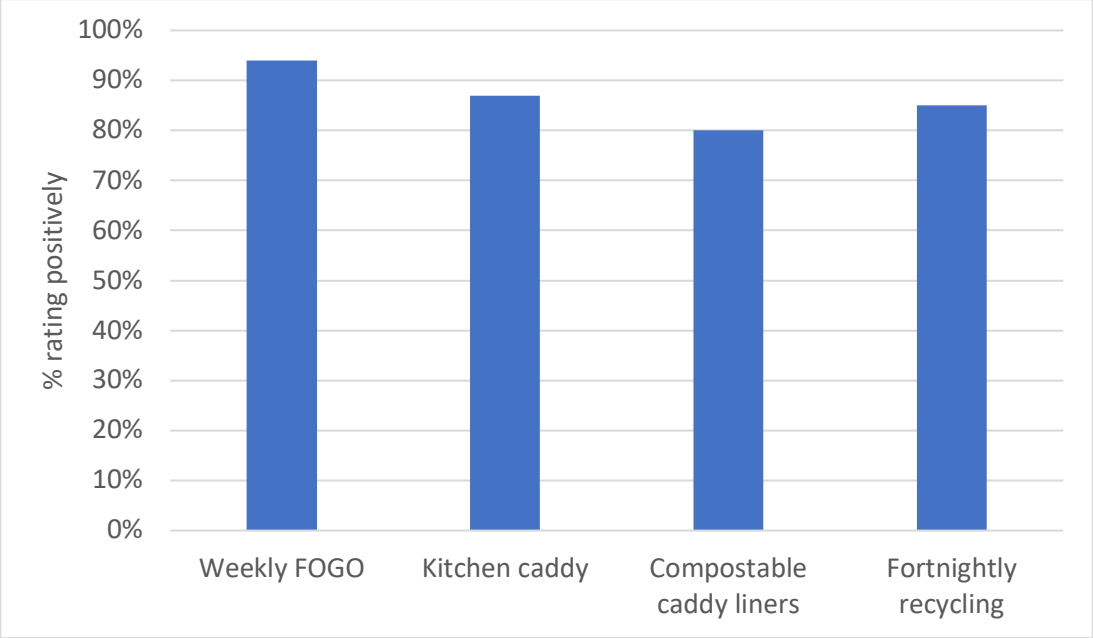


The survey acceptance is also higher than the 71% acceptance of FOGO reported in a survey conducted for the Metropolitan Waste and Resource Recovery Group (MWRRG) in Victoria. The MRRWG survey was of people who do not currently have a FOGO service, suggesting that strong communication coupled with seeing the service in action removes some of the fears around FOGO.

Both surveys confirm that the community has a high degree of acceptance of a FOGO service. This is perhaps contrary to the generally held views of waste managers.

The survey also gathered information on satisfaction with elements of the service, all of which were rated very highly as presented in Figure 12.

Figure 12: Positive ratings for elements of FOGO service



3.5.2 Resident interactions

A significant outcome from the bin audit and education program was the ability to engage closely with residents. Their feedback is important to understand for future communication efforts, and is tabulated in Table 8 by key message. Feedback is collated from survey responses and resident enquiries.

Table 8: Summary of resident interactions from bin tagging program

Theme	Issue	Comments
System design	Collection frequency	Dissatisfaction with fortnightly collection of the red bin due to smell over the two weeks. Residents wanting bigger red bin/weekly collection of red bin. Red bin should be size of FOGO and vice versa. Fortnightly collections of rubbish bins just a cost-cutting exercise.
	Compostable bags	How and where to get more compostable bags. Issues with the compostable bags breaking down too quickly. Compostable bags were too flimsy. Disliked the smell of the bags themselves (aggravated allergies).
	Recycling service	Dissatisfaction with having to rinse recycling items as they feel it's very time consuming. No space for larger recycling bin. Belief that materials were no longer being recycled due to issues with China.

Theme	Issue	Comments
		Should be collected weekly.
	Hazardous materials	Dissatisfied with advice to take items like batteries and paint tins to drop off points as it is seen as too difficult for small or single items.
Resident behaviour change	Contamination management	Teenagers/husband/parents not doing the right thing. Being penalised via a 'sad' tag for items they had not placed in their bin, believing that the non-compliant waste was put there by their neighbours or passers-by (ie cups from fast food chain).
	Hygiene / cleanliness	How to keep the FOGO bin clean and issues with cockroaches, ants and maggots.
Communication	Messaging	Confusion for people from a non-English speaking background (NESB), and the need for closer engagement, typically using family members as interpreters, to overcome the fear that their bin may not be collected or they would be fined. Confusion around the recycling of plastics, including definition of 'hard' vs 'soft' plastics, and which should go into the rubbish vs recycling bin. Receiving a 'sad' tag for using a plastic bin liner that was taped to the bin and thus secured.
	Waste audit process	Relief to have a 'happy face' tag in the second or third weeks as they had been upset to receive the 'sad face' tag in week one. Dissatisfaction with being 'singled out' to be part of the tagging area. Claims the tags were 'patronising' and gave them the feeling of 'being back at school'. Felt that the tagging was focusing on minor issues with the bins.

Each theme is dealt with slightly differently:

- **System design** items need to be taken into account when deciding which services are to be provided to specific households, including allowing for flexibility in service provision.
- **Resident behaviour change** items need to be addressed in future waste education campaigns, as they identify areas where residents need more support in using the FOGO service.
- **Education** items need to be considered in the execution of future education campaigns to further improve the understanding of the FOGO service.

3.6 Learnings

3.6.1 Compostable bags

The trial revealed that different brands of compostable bag have different longevity in service. The FOGO trial ended up also testing three different compostable bags:

- Biobag (initially provided with the trial)
- Biotuff
- Compostapak

The preliminary, relatively informal, conclusion was that the Biotuff and Compostapak bags lasted several days longer than the Biobag. This was significant because the extra longevity meant that the bag did not leak into the bin before its collection.

The full scale introduction of a FOGO service should evaluate different bags under criteria to be agreed between the member Councils, the SMRC and the final composting processor. Indicative criteria include:

- Longevity, avoiding the bag leaking at a household level
- Ease of differentiation, enabling the pre-sort to readily distinguish between compostable and non-compostable bags
- Performance within a composting facility, ensuring that the bag will break down at a commercial scale composting facility

3.6.2 Bin tagging

In the initial weeks of the tagging program the team utilised a third tag for the FOGO bin which featured a ‘quizzical’ face and the headline ‘We didn’t see any food in your FOGO bin’.

The intent of the tag was to use it in situations where only green waste was observed in FOGO, and informed residents that the bin was for food as well as garden waste.

A number of residents who received this tag perceived it as negative, complaining as they felt they were being told off for not putting food in the bin. In several cases the residents noted that food waste was in the bin, although not visible under the garden waste, and felt they hadn’t deserved the quizzical tag as they had been doing the right thing.

This feedback highlighted the difficulties in using the ‘quizzical’ tag. Instead of using the ‘quizzical’ tag, the ‘all food waste’ icon on the FOGO ‘happy face’ tag was highlighted where only garden waste was observed in the bin. This continued to communicate the desired message, but removed connotations of ‘doing the wrong thing’.

3.6.3 Bin capacity issues

The shift to a fortnightly collection of residual and recycling bins led to residents identifying a number of concerns in relation to bin capacity.

Residual waste bin

Where residents contacted Melville to report that they had insufficient residual waste capacity, Melville would talk the resident through options for how to optimise bin capacity. This discussion included details on what could go into the recycling and FOGO bins.

Where this discussion did not resolve the issue, a further audit was undertaken. Of 257 audits completed, 148 households warranted an additional residual waste bin. That is, 2.2% of the households in the trial area warranted an additional residual waste bin.

Recycling bin

The fortnightly recycling collection was coupled with a free 360 L recycling bin on request. The community survey identified that only 59% of the residents in the trial area were aware of the larger bin.

A total of 1,162 larger recycling bins were distributed, representing 17% of households in the trial area. With more promotion of the availability of the larger recycling bin, it is expected that the take-up would increase to over 20% of the population. The greater participation in a larger recycling bin may also reduce concerns around insufficient residual waste bin capacity.

3.6.4 Multi-Unit Dwellings (MUDs)

High levels of contamination were observed at several large Multi Unit Dwellings (MUDs) within the trial area. In order to understand the causes of the contamination, SMRC officers conducted assessments at five complexes participating in the FOGO trial.

Table 9: Multi-Unit Dwellings assessment

Units	FOGO bins		Recycling bins		Residual bins		Total bins	
	Count	Units/bin	Count	Units/bin	Count	Units/bin	Count	Units/bin
36	6	6.0	9	4.0	14	2.6	29	1.2
36	10	3.6	11	3.3	16	2.3	37	1.0
27	6	4.5	7	3.9	14	1.9	27	1.0
21	8	2.6	9	2.3	14	1.5	31	0.7
12	3	4.0	4	3.0	10	1.2	17	0.7

The objective of the assessment was to:

1. Understand potential service delivery improvements at MUDs; and
2. Design future FOGO services for MUDs.

Potential service delivery improvements

- Letter drop to all residents to advise of correct use of bins, as much of the MUDs contamination appears to be from lack of separation at the source;
- Use letter drop to call for feedback through interviews/surveys, assess for potential spokesperson/champion;
- Produce and install signage for each complex to clearly state which items should go in which bin – bin stickers and wall signage for shared bin areas;
- Group bins into set areas for FOGO, red and recycling; and
- Consider providing larger red bins to alleviate the issue of large items wrongly being placed in the FOGO or recycling bins due to insufficient capacity.

Future design considerations:

- Identify all complexes which will be participating in future rollouts of the FOGO system;
- Assess number of bins/layout of bins at all complexes identified as participating in the rollout;
- Conduct audit of current usage and consider bin ratios/sizes required based on usage data;
- Engage residents prior to rollout to determine current attitudes and behaviours toward waste and identify potential barriers to using the service; and
- Engage with residents to implement bin configurations inside the complex which will work for them.

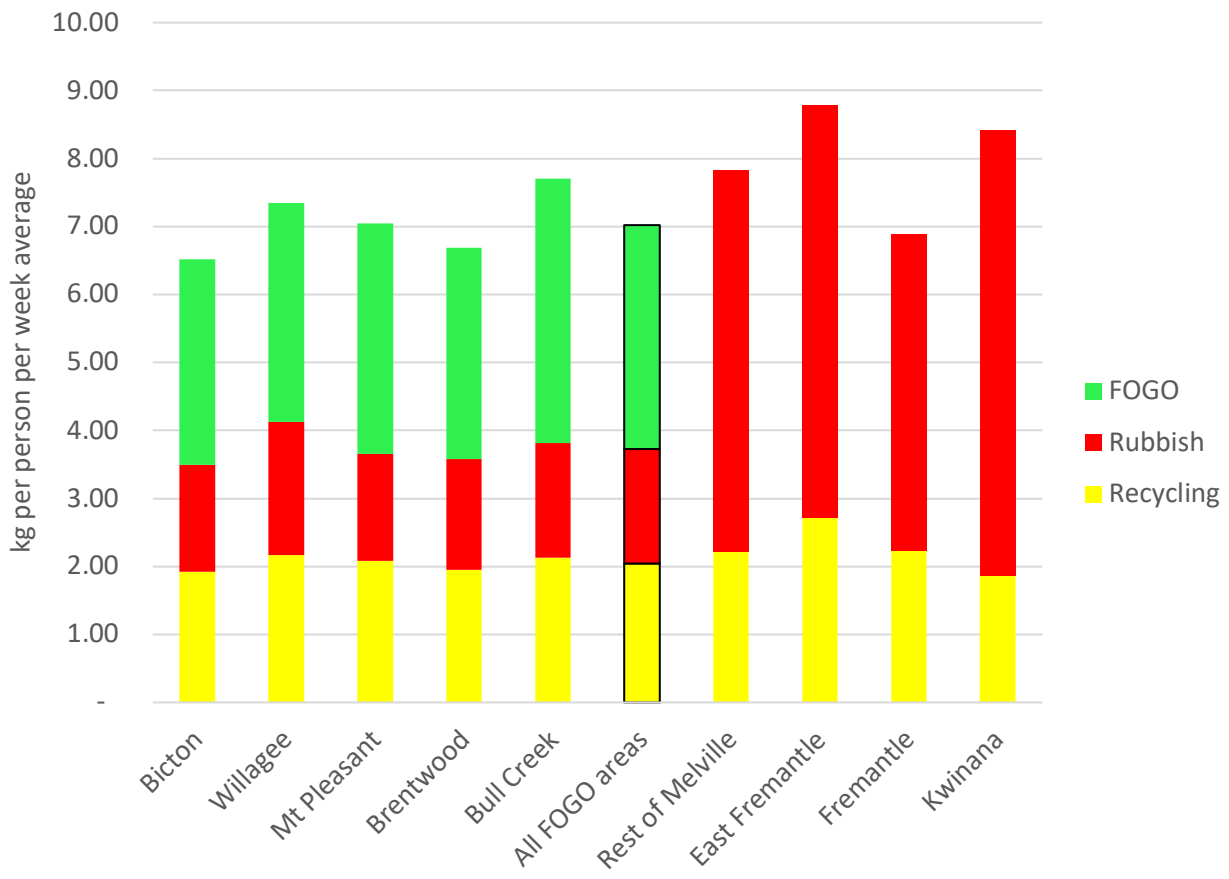
The SMRC has received grant funding from the Waste Authority to further investigate service provision to MUDs, and will test the service delivery improvements and design considerations as part of this project.

4 The situation after the trial

4.1 Totals collected

Over the duration of the FOGO trial, the FOGO areas generated less waste for collection, and substantially less residual waste for disposal. The waste collected in each trial area, as well as the waste collected in non-trial areas, is presented in Figure 13.

Figure 13: Detailed FOGO trial results – October 2017 to June 2018



The detailed results above are summarised in Table 10.

Table 10: Summary FOGO trial results (kg per person per week average) – Nov 2017 to May 2018

	FOGO trial (kg/person/wk)	Remainder Melville (kg/person/wk)	Difference (kg/person/wk)	Difference (%)
Recycling	2.04	2.21	-0.24	-8%
Rubbish	1.68	5.61	-3.93	-70%
FOGO	3.29	-	+3.29	-
Total	**7.02**	**7.83**	**-0.8**	**-10%**

The key total waste collected results are:

1. **A 70% reduction in residual waste**. This reinforces the audit observation of substantial quantities of organics in the rubbish bin.
2. **A 10% reduction in recycling**. This may be due to the shift to fortnightly recycling creating a lack of recycling capacity for residents, and was addressed by offering all residents the option of a larger 360L recycling bin at no additional cost.
3. **An 10% reduction in total waste**. The trial seems to have resulted in a reduction in waste generation when compared with the rest of Melville rather than simply shifting waste from one bin to another.

Whilst the exact causes for the reduction in overall waste generation can only be guessed at, a plausible explanation is that the trial has made residents more aware of their waste generation, and specifically their food waste generation. This result may also be a short-term response, and should be watched further before acting on it.

4.2 Bin composition audits

4.2.1 FOGO contamination

An audit was conducted of the FOGO bin in June/July 2018, and observed a contamination[1] rate of 2.6%, less than half the 4% assumed for modelling purposes.

As shown in Table 11, the result is in the middle of the range of contamination rates for other FOGO services around Australia, and very low for services in metropolitan areas.

Table 11: Contamination rates for Australian FOGO services

Council/Area	State	Metro / rural	Physical contamination (% by weight)
Moira Shire	Vic	Rural	0.5%
Corowa	Vic	Rural	0.7%
Indigo	Vic	Rural	0.8%
Parkes, Forbes, Bathurst	NSW	Rural	1%
Lismore	NSW	Rural	1%
Ballina	NSW	Rural	1%
Grafton	NSW	Rural	1%
Orange	NSW	Rural	1%
Wangaratta Rural City	Vic	Rural	1.3%
Albury	NSW	Rural	1-3%
Byron Shire	NSW	Rural	2%

[1] Contamination is understood as “non compostable materials”. For instance, paper and cardboard is not considered contamination, nor is earth, even though they are not food or garden organics.

Council/Area	State	Metro / rural	Physical contamination (% by weight)
Wodonga	Vic	Rural	2%
Benalla Rural City	Vic	Rural	2.1%
FOGO trial	WA	Metro	2.6%
Richmond Valley	NSW	Rural	3%
Bunbury	WA	Metro	2-5%
Penrith	NSW	Metro	4.7%
Greater Shepparton	Vic	Rural	5.7%
Strathbogie Shire	Vic	Rural	7.8%
Metro Adelaide	SA	Metro	5-10%

Whilst low, these levels of contamination are sufficiently high that the FOGO must be pre-sorted before it is composted. The pre-sort will remove glass, plastic and other gross contaminants. It will also make the sorted waste more attractive for composters.

4.2.2 Processing residual

Composting of the FOGO in the WCF resulted in 22.3% residuals, comprising the 2.6% of non-compostable materials and 19.7% of compostable materials screened out of the final compost. This 19.7% is the processing residual.

The compostable materials screened out of the final compost are woody materials too large to pass through the primary screens in the initial digestion phase of the WCF process. At a large scale commercial composting facility, these materials would not be expected to be disposed of as residual waste, but rather decontaminated prior to being:

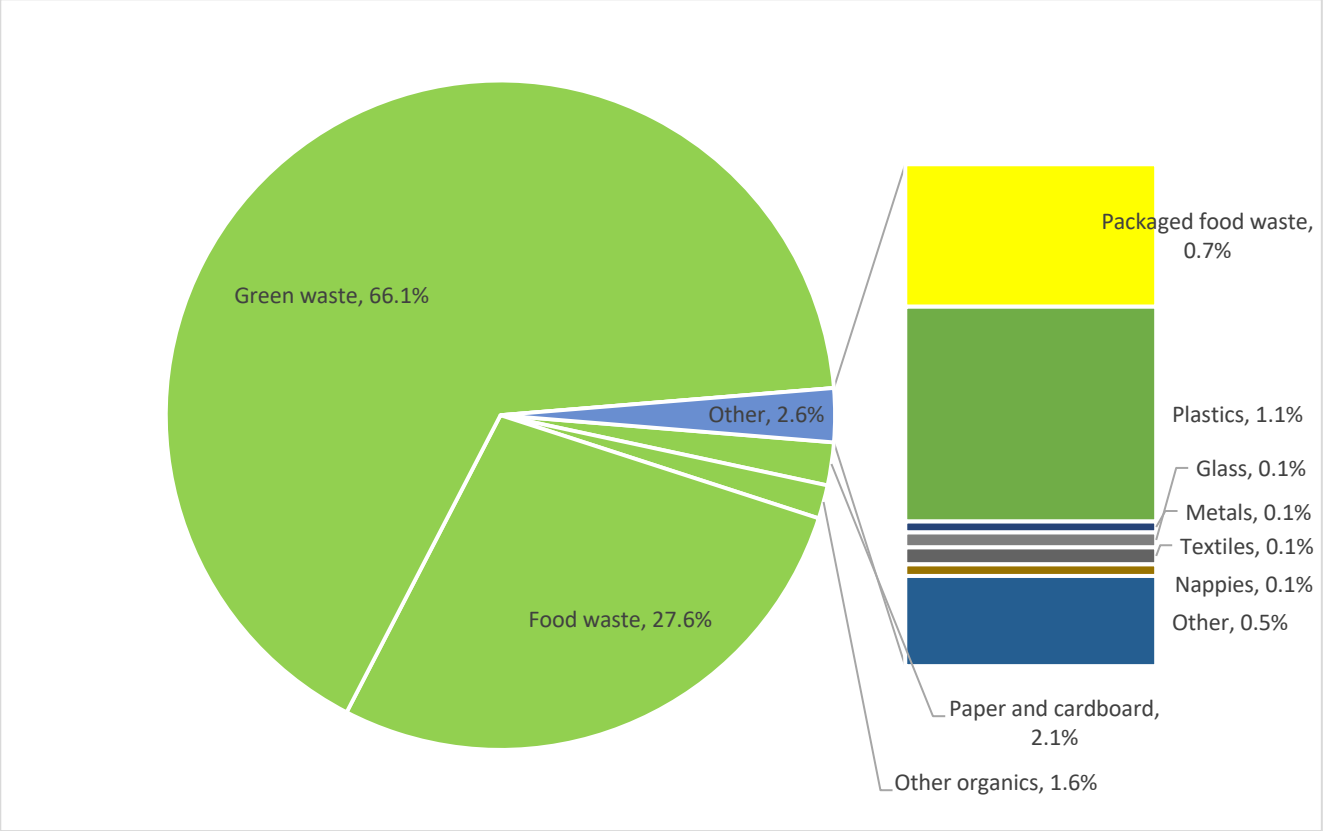
1. Sold as a coarse mulch
2. Shredded and composted; or
3. Composted whole to provide structure material to the composting process.

Because of this range of uses for large woody materials, the ultimate processing residual will be substantially lower than the 19.7% reported at the WCF.

4.2.3 FOGO bin composition

An audit of the FOGO bin in June/July 2018, presented in Figure 14 provides more detail on the types of contamination, as well as the proportions of food to garden waste.

Figure 14: Composition of FOGO bin – June / July 2018

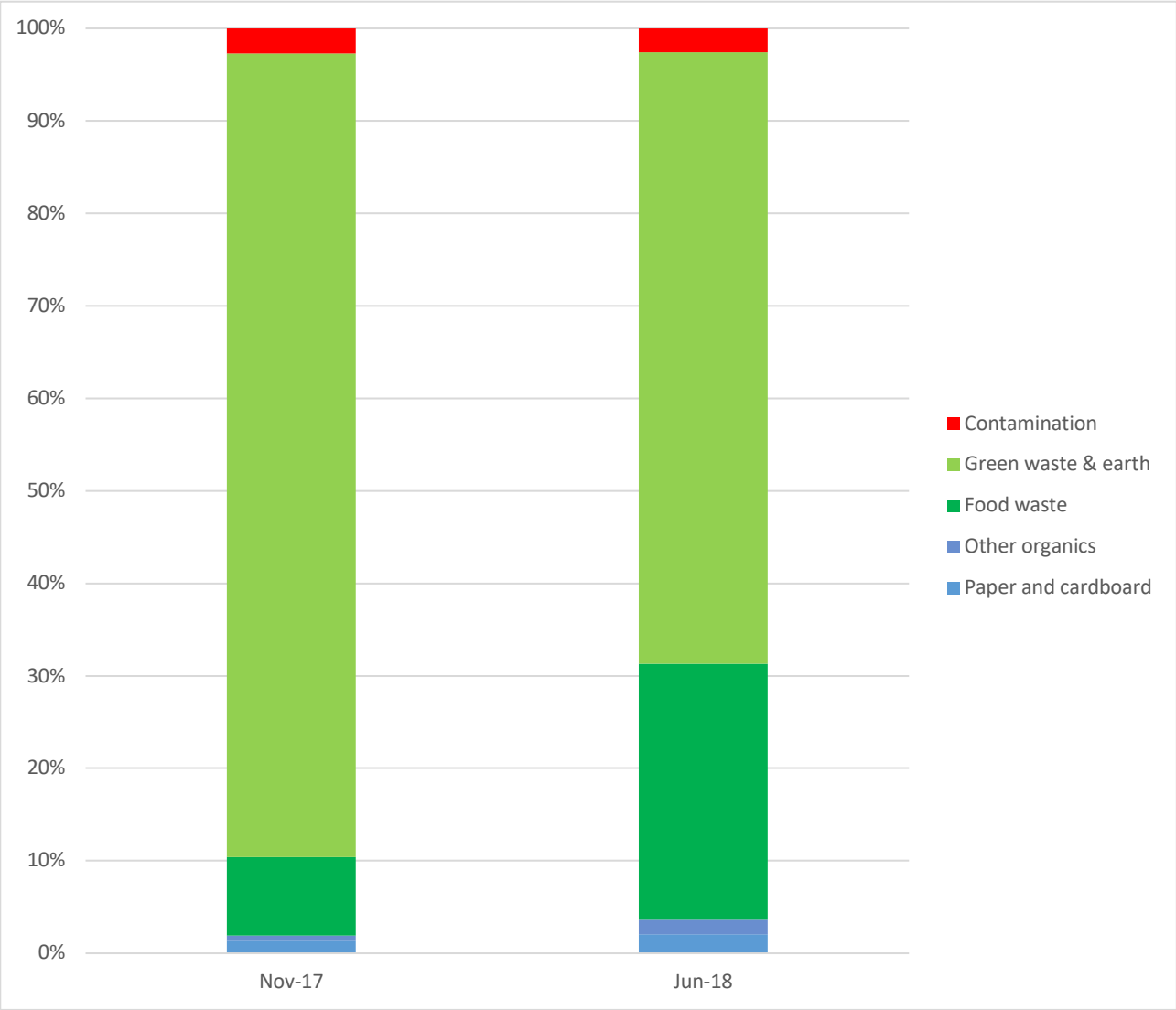


At the time of the audit, the majority of the organics collected were garden waste. There are two parts garden waste for every one part food waste. The chart also demonstrates that some non food or garden waste is compostable, leaving plastics, metals, glass and a number of other material groups as contamination.

The composition of the FOGO bin changed over the course of the trial, and particularly in relation to the proportions of garden and food waste. This is likely due to the accumulation of communication and education messaging gradually leading to behaviour change at the household level.

Figure 15 shows the composition of the FOGO bin at audits conducted in November 2017 and June 2018. The low percentage of food in the November 2017 audit is likely attributable to the sampling from large stockpiles after receival at the waste composting facility. This process may have led to food becoming incorporated with green waste during the sub sample separation process. In the June 2018 audit samples were taken at kerbside with no sampling issues.

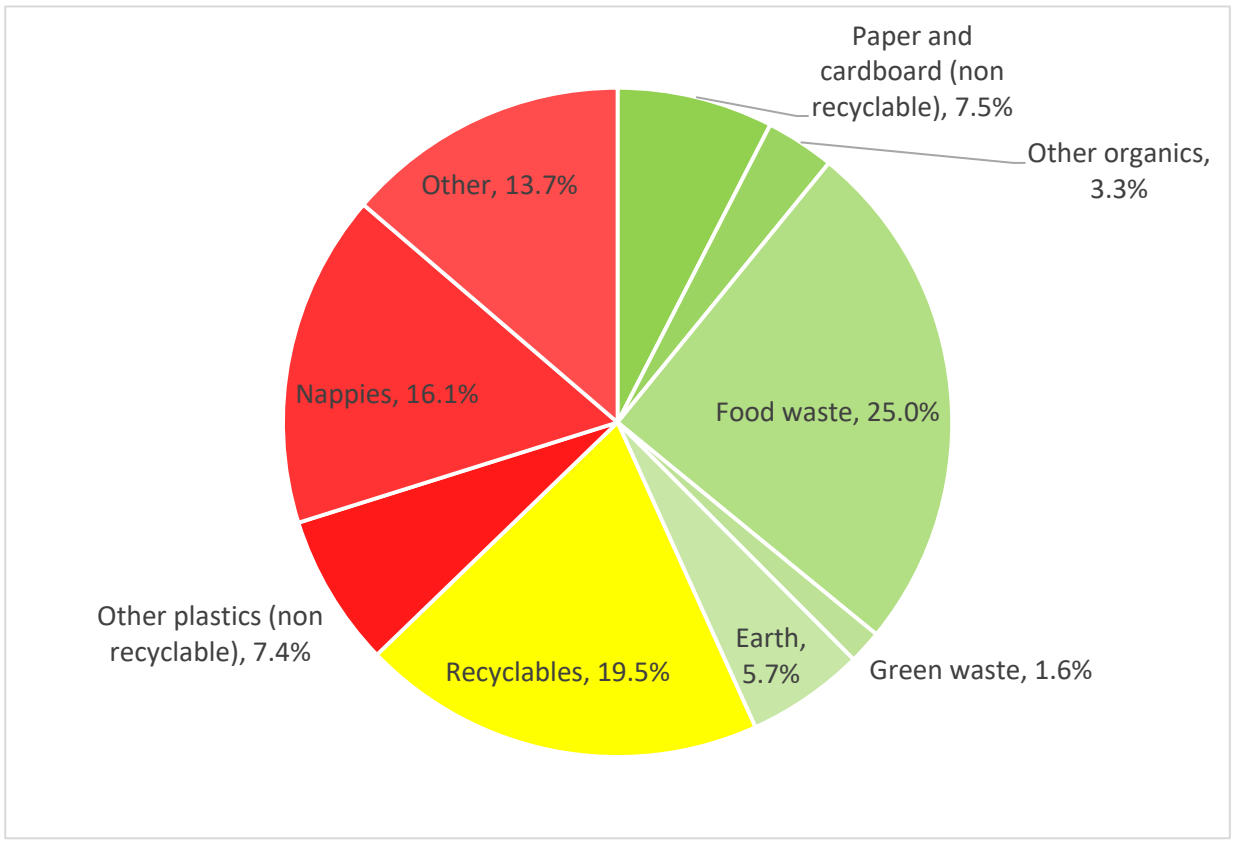
Figure 15: FOGO bin composition - November 2017 and June 2018



4.2.4 Rubbish bin composition

An audit of the rubbish bin in the FOGO trial area shows the waste types remaining in the bin.

Figure 16: Composition of rubbish bin in FOGO trial area - June / July 2018



The audit results show that there is an even greater potential for recovery from the rubbish bin through ongoing education and stakeholder engagement to drive the following messages:

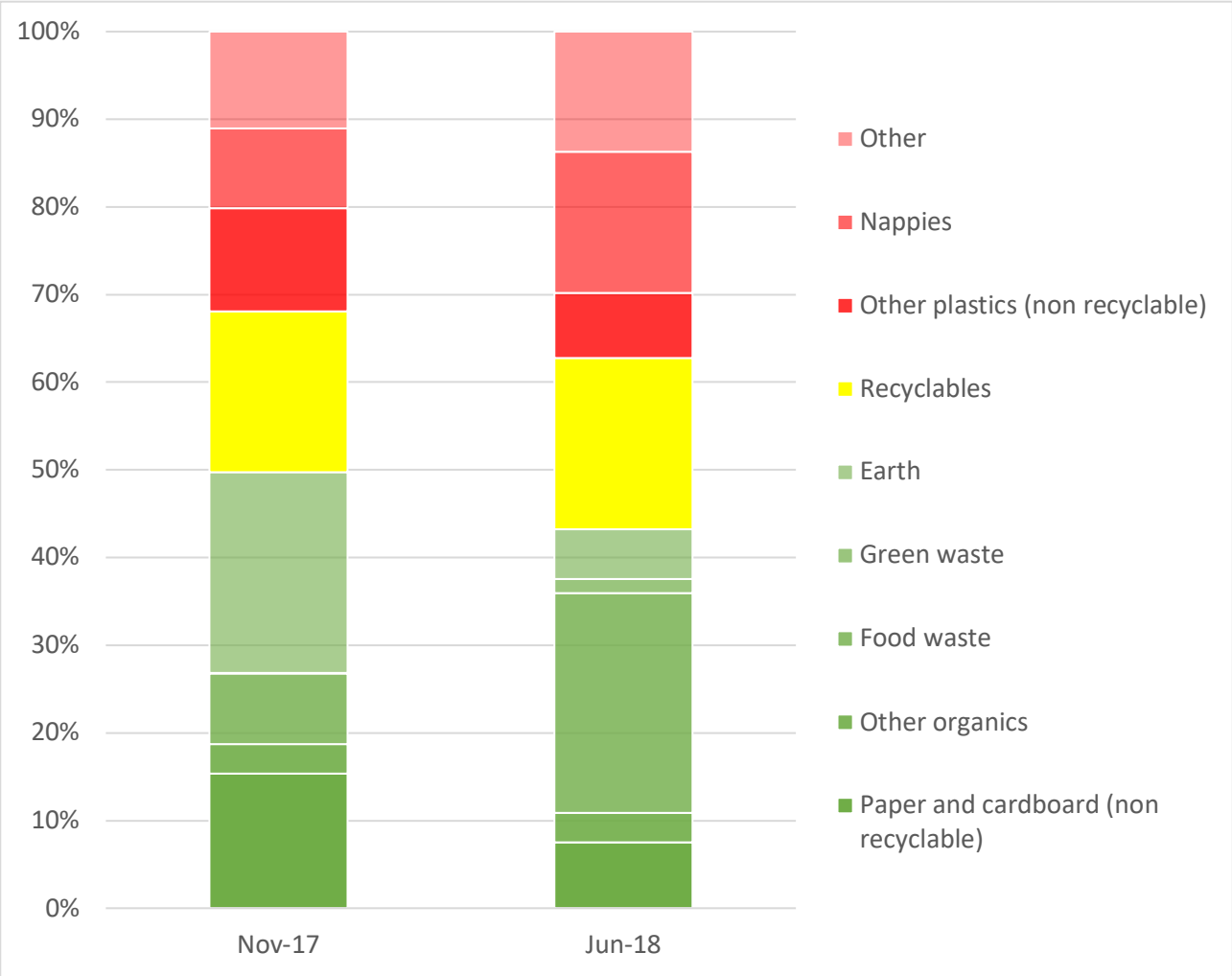
1. Putting earth into the FOGO bin (5.7%)
2. Putting non-recyclable paper and cardboard into the FOGO bin (7.5%)
3. Putting food waste, green waste and other organics into the FOGO bin (29.9%)
4. Putting all recyclables into the recycling bin (19.5%)

These messages are primarily related to the FOGO bin, and improved use of the FOGO bin would, in itself, divert 43% of the waste in the rubbish bin. Including improved recycling sorting lifts diversion to almost two thirds of the waste in the rubbish bin.

As for the FOGO bin, the rubbish bin composition changed over the course of the trial with a general trend for a decreasing proportion of organics and increasing proportion of residuals. Again, this likely due to gradual behaviour change at the household level.

Figure 17 shows the composition of the rubbish bin at audits conducted in November 2017 and June 2018.

Figure 17: Rubbish bin composition - November 2017 and June 2018



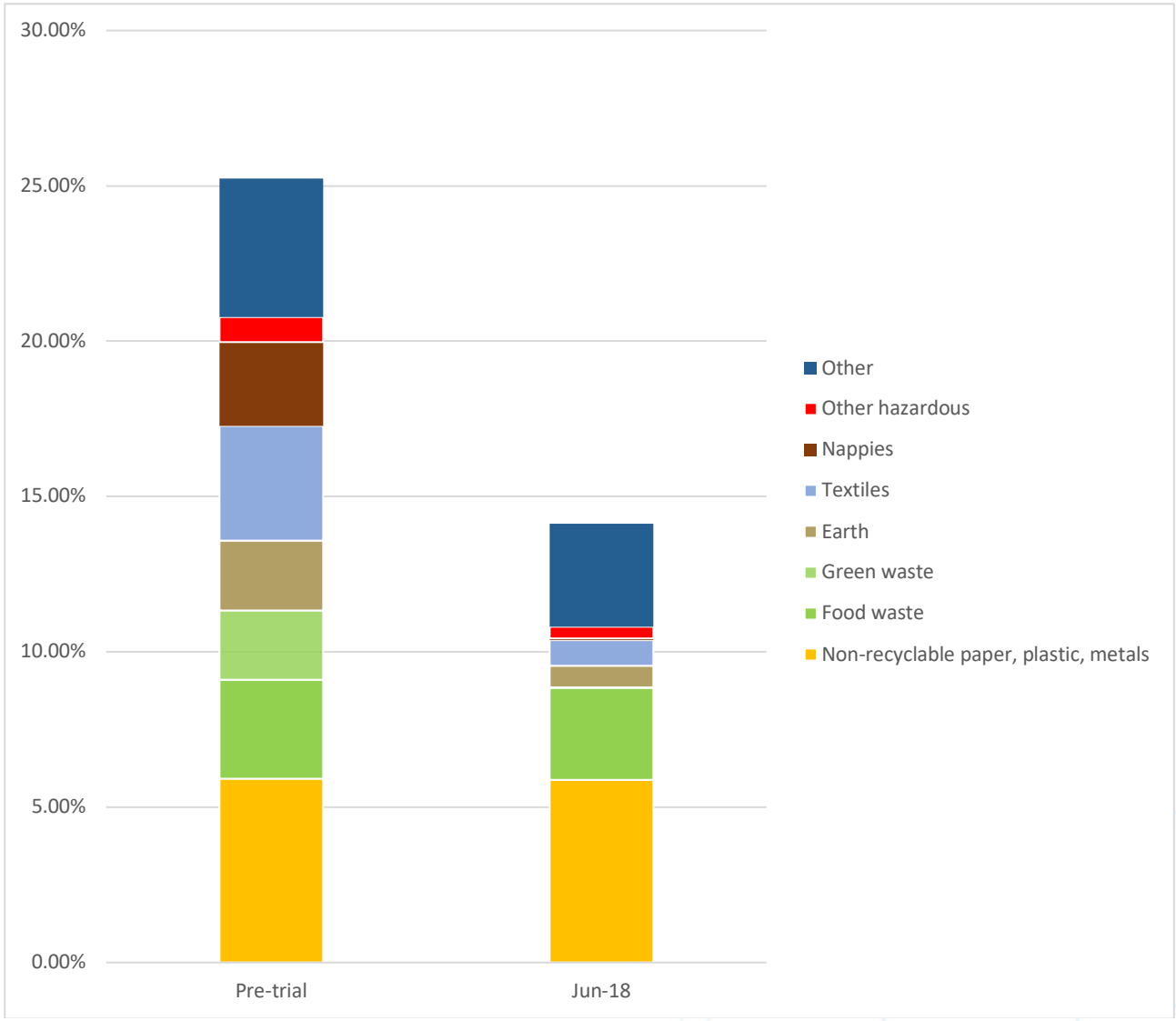
4.2.5 Recycling bin composition

Audits of the recycling bin in the FOGO trial area before and after the trial commenced show a significant change in the amount and composition of non-recyclable materials in the bin. Figure 18 shows the change in recycling bin non-recyclables, demonstrating both a reduction in non-recyclable waste, but also reductions in the following key non-recyclable contaminants:

- Textiles (3.7% to 0.8%)
- Nappies (2.7% to 0.05%)
- Other hazardous materials (0.8% to 0.4%)

The significant reduction in earth and green waste is likely due to a one-off pre-trial spike in these contaminants. A single recycling bin in the pre-trial audit sample had been filled with green waste and soil, and given the relatively small overall weights of contamination, had a disproportionate effect on composition.

Figure 18: Recycling bin composition - Pre-trial and June 2018



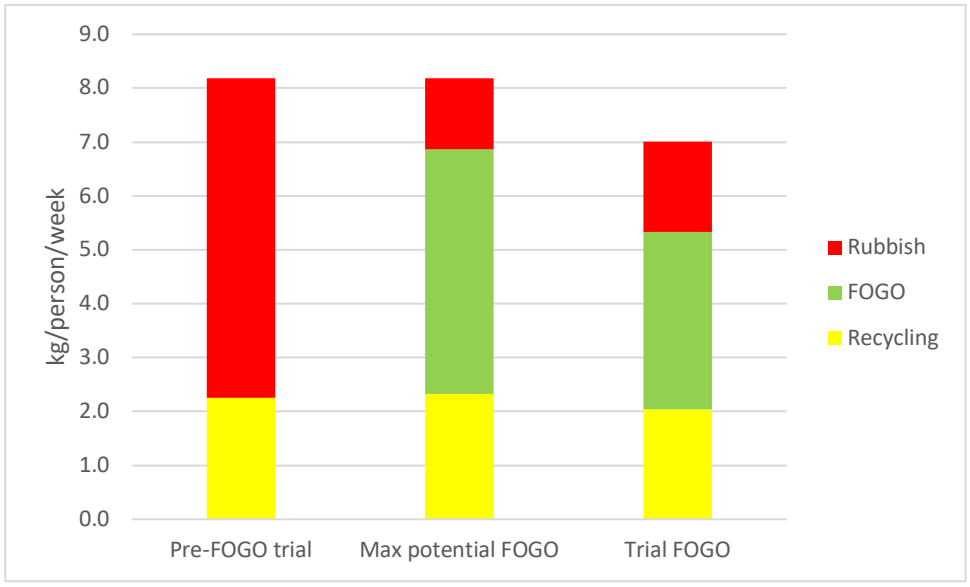
4.3 Comparison against June 2017 audit data

The June 2017 audit data enabled a model diversion profile to be developed. The results from the trial are compared against the model diversion profile, as well as the actual results from the June 2017 audit. This enables an understanding of how the expected results are reflected in the actual data from the trial.

4.3.1 Kerbside waste generation per capita

The total weight collected in each bin for both the June 2017 audit and the FOGO audits conducted during June/July 2018 are compared against the maximum potential waste diversion profile modelled from the June 2017 audit. This data is presented in Figure 19. The key comparison is between the "Max potential FOGO" and "Trial FOGO" results.

Figure 19: Actual vs modelled bin weight profile



The data shows that the recycling bin weight is essentially unchanged at around 2 kg/person/week. The FOGO trial indicates that there remains a small amount of recyclables lost to the rubbish bin.

There is also imperfect sorting of rubbish into the FOGO bin, with a larger proportion of rubbish in the trial FOGO bin than might be achieved if waste was perfectly sorted. This observation is supported by the waste composition data for the residual waste bin, which shows that an additional 43% of waste could be diverted into the FOGO bin.

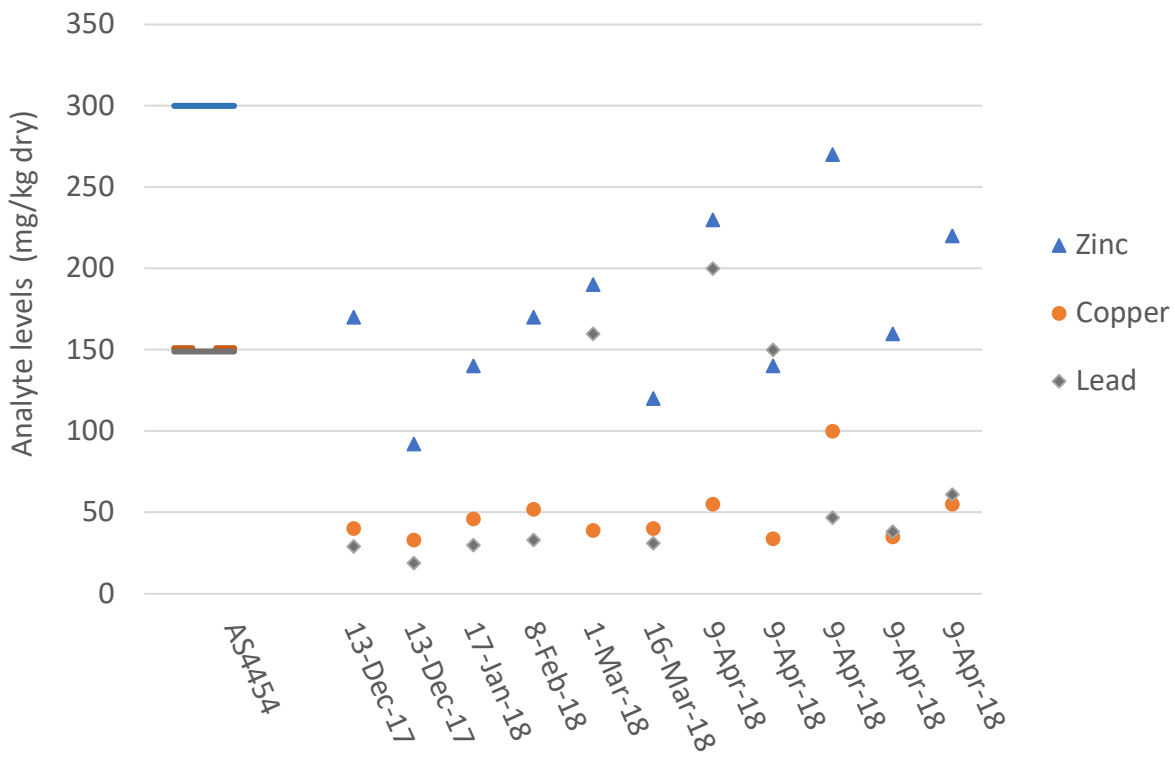
Finally, there is an observed reduction in total generation before and during the trial, as well as between trial and non-trial areas. This reduction may be due to the additional focus on food waste leading to people being more attentive to their food waste generation in general.

4.4 FOGO compost analysis and suitability for markets

Analysis of compost generated from FOGO demonstrates that, with the exception of the marginal exceedance of lead on two occasions, the results are within the AS 4454 contamination limits for unrestricted grade compost. The lead exceedances may have been due to cross contamination by residual MSW when processing the FOGO material as separate batches through the digesters.

Thus, the product is both largely free of physical and chemical contaminants.

Figure 20: FOGO compost batch heavy metal analysis



4.5 Trial costs

4.5.1 One-off costs

The SMRC spent approximately $87,000 on one-off costs associated with the trial. Distributed across the population of participating Councils, this equates to $1.51/household. Costs were associated with:

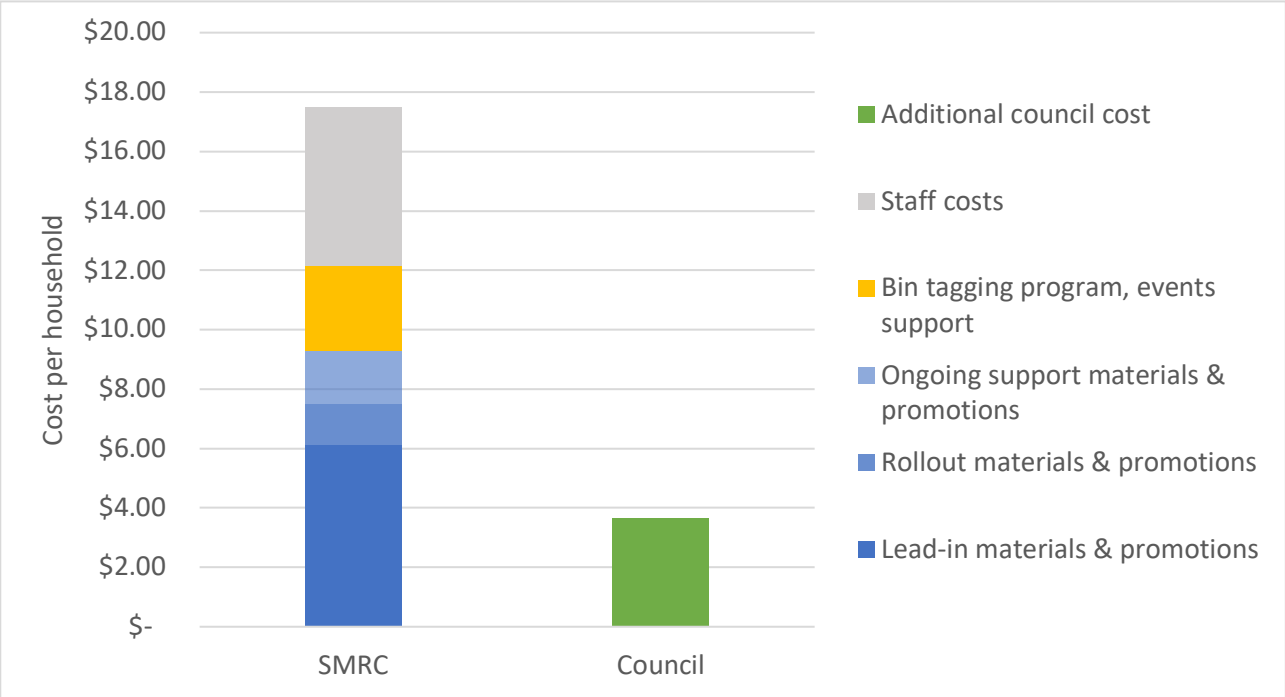
- Resident survey
- Staff costs
- Independent revew

4.5.2 Communication and education

The communication and education costs for the trial are presented in Figure 21, broadly grouped in terms of:

- Materials and promotion
- Bin tagging and events support
- Staff costs
- Council costs (aggregated promotion and staff costs for Melville)

Figure 21: Trial communication and education costs



The education and communication costs for the trial cost $21.14 per household. It is expected that the full scale implementation will be slightly lower per household, and more evenly distributed between the SMRC and participating Councils.

4.6 Performance against risks identified in SWMP

With the data gathered from the trial, the initial SWMP can be evaluated to understand the success or otherwise of the trial, and thus whether a full scale FOGO service is supported.

Table 12: FOGO trial performance against SWMP

Metric	SWMP	Actual	Evaluation
Overall diversion rate	57%	64.4%	✓
NPV of total processing cost	$520.77	Awaiting data	
Total project cost per input tonne	$277/tonne	Awaiting data	

Financial information was not able to be gathered through the trial because no tender for processing of FOGO was accepted. Accordingly, the cost metrics could not be evaluated.

5 Conclusions

The data demonstrates that the trial of a FOGO service in Melville has been a success. It has outstripped key expectations for the service, including:

1. The amount of waste diversion achieved;
2. Community acceptance of the new service, including:
    a. Community responsiveness to behaviour change messaging (specifically bin tagging); and
    b. The amount of contamination observed; and
3. Cost to process.

It also appears to have led to some unexpected benefits. In particular, it appears that the FOGO service has led to reduced generation of organic and food waste overall. This needs further monitoring before any definitive conclusions can be drawn.

The thorough approach taken to communicating and educating the community is a significant reason for the success of the trial. The FOGO message is simple, and it is readily communicated broadly.

This trial clearly demonstrates the substantial benefits in replacing the WCF, currently reaching the end of its life, with a comprehensive FOGO service across all participant Councils.

Such a service substantially reduces the risk profile for Councils, as it involves minimal Council run infrastructure. A cleaned-up FOGO product, decontaminated through a pre-sort process, can be composted with other organic waste. There are several commercial composters able to accept such a product, thus creating competitive tension in the market and potentially reducing composting costs.

The steps to be taken by SMRC from here are:

- Define the extent of the FOGO service, considering how to deal with MUDs and other housing configurations
- Present the results of the trial for Melville, Fremantle and East Fremantle to resolve to adopt a FOGO service
- Commence communication activities with the local communities
- Procure bins, kitchen caddies and compostable bags for all of the participating Councils
- Procure contracts for the provision of FOGO collections where this is not intended to be provided in-house
- Secure contracts for the supply of commercially generated FOGO

MRA recommends the SMRC and the participating Councils spend the next 12-24 months focused on the successful implementation of the new FOGO service.