Analysis of NSW Food and Garden Bin Audit Data

May 2018

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Executive Summary

The New South Wales Environment Protection Authority (NSW EPA) engaged Rawtec to independently review and analyse kerbside audit results undertaken by councils across NSW. The project objective was to understand the performance of the kerbside general waste and organics recycling services, including outcomes for:

- Diversion of food and garden material from landfill (kilograms per household per week – kg/hh/wk)
- Diversion efficiency (percentage of material diverted via food and garden organics [FOGO] bins)
- FOGO bin contamination levels.

Based on available data from 26 audited areas/councils, performance was measured at the individual household level, by audited area/council and according to the service configuration (bin size and frequency of general waste and organics recycling services). The sections below summarise key findings from this analysis. Recommendations are provided that aim to improve the accuracy and quality of data collected from future kerbside audits.

Overall food and garden organics performance

Across the audited areas/councils, the average proportion of available food and garden organics diverted from landfill was 83%, which is a positive result. This performance is mainly driven by the high volume of garden organics diverted from landfill (see below).

Food waste performance

On average, 38% of available food waste (or 1.20 kg/hh/wk) was diverted from landfill across the audited areas/councils. This performance varied largely across audited areas/councils from 5% to 78% (or 0.17 kg/hh/wk to 2.69 kg/hh/wk).

In general, councils providing a fortnightly general waste collection achieved higher food waste diversion efficiencies compared to those on a weekly general waste service. Additionally, councils providing smaller general waste bins (120/140 litre) achieved higher food waste diversion efficiencies compared to councils with larger general waste bins (240 litre). The configuration that achieved the highest food waste diversion on average was Configuration 4 (small 120/140 litre general waste bins collected fortnightly and large 240 litre FOGO bins collected weekly) at 54%. However, food diversion performance is not only explained by configuration, as food diversion percentage can vary significantly across councils within a service configuration. For example, Configuration 5 (councils with a 240 litre general waste bin collected fortnightly and a 240 litre FOGO bin collected weekly) included one council with a food efficiency of 5% while another council within this configuration achieved a food efficiency of 78%.

Analysis was undertaken to determine if variation in food waste diversion performance within service configurations may be explained by how long the FOGO service had been in place. Services that had been in place longer than one year were found to achieve a high average food efficiency of 45% compared to less established services. However, the average food diversion for councils with a FOGO service longer than a year was below the 'optimal' configuration's food diversion performance (at 54% diversion). Food diversion varied when accounting for differences in the length of service as well as bin configuration. This

highlighted that configuration and length of service are not the only factors influencing the results. Other factors, such as education, are also important for achieving higher food waste diversion outcomes.

Two councils had data that allowed the authors to undertake a bin-by-bin analysis (Council 1 and Council 2). A total of 654 bins were collected across these two councils. The amount of food waste collected in the FOGO bin for Council 1 ranged from 0 to 31 kilograms per bin (average of 1.42 kg per bin). Council 2 food waste ranged from 0 to 11 kilograms per bin (average of 1.03 kg per bin). Interestingly, a large proportion of households (45% and 55% for the two councils) had no food waste in their FOGO bin, with the remaining households using the FOGO bins efficiently.

Garden organics performance

On average, 98% of available garden organics (or 10.14 kg/hh/wk) was diverted from landfill across the audited areas/councils. This high performance was relatively consistent across councils, which varied from 89% to 99% (0.94 – 19.42 kg/hh/wk). There was also consistency in garden organics efficiency across service configurations, which ranged from 94% to 99% (6.90 – 15.04 kg/hh/wk).

The total amount of garden organics generated varied considerably by audited area/council, from 1.06 kg/hh/week up to 20.01 kg/hh/week. This large difference in garden organics generation is expected to be due to differences in rainfall, vegetation levels, block size, population densities and the time of year the audit was undertaken across the audited areas/councils.

FOGO bin contamination levels

On average, contamination of the FOGO bin was 2.6% by weight (0.30 kg/hh/wk) across the audited areas/councils. However, this ranged significantly, from 0.04% up to 17.83%. The top five contaminants by weight were recorded for each audited area/council. Out of these, the most frequently cited contaminants were[1]:

- plastic
- containerised food
- metals
- all other organics (leather, rubber and oils)
- other miscellaneous.

Analysis of contamination levels by service configuration showed that the configurations with the top contamination rates (Configurations 4 and 6) were also those with the highest food waste diversion performance. An analysis was undertaken to check the strength of the correlation between these two factors for all audited areas/councils. It was found that there is weak correlation between contamination level and food waste diversion efficiency.

The bin-by-bin analysis of the two councils which had data available at this level found that Council 1 had a lower average percentage of contamination in FOGO bins (1.3%) compared to all audited areas/councils (2.6%), whereas Council 2 was in line with the average percentage at 2.5%. A large proportion of bins for both councils contained no contamination at all (68% and 87%). Councils may be able to achieve

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[1] Two methods for identifying the top five contaminants were considered. See Section 5.1 for detail on each method.

reductions in contamination through targeting households that are contaminating bins (such as through a bin tagging program) rather than broad education strategies focused on all households.

Conclusion

NSW weekly FOGO services are performing well in diverting organics materials. However, there are opportunities to improve diversion rates through focusing on education around food waste. The less access households have to landfill disposal options (i.e. general waste bins are smaller and collected less frequently) and those with a user selected service for general waste had higher food waste diversion scores on average. Promoting these types of configurations and services could therefore be beneficial for increasing food waste diversion. A key finding from the bin-by-bin data was that approximately 50% of residents are not diverting any food waste. Food waste diversion is therefore more likely to increase significantly by increasing the number of participating households rather than encouraging active participants to be more efficient in their source separation.

Recommendations for future audits

The project scope included examining audit data to assess the integrity of the audit and check for errors, omissions or anomalies. This process identified a few issues with audit methodology and/or data analysis. To prevent future errors and to deliver standardised and comparable audits, it is recommended that the NSW EPA continue to provide guidance to auditors and councils regarding the recommendations outlined below.

A review of the most recent NSW EPA kerbside audit guidelines found that comprehensive guidance is already available, however there are a few areas that could be reinforced or clarified to help auditors, councils and future statewide analysis projects. The following recommendations are made:

1. Continue to emphasise the importance of a randomised sampling approach
2. Ensure future guidelines provide clear guidance on when and how to ensure stratified sampling for Multi-Unit Dwellings
3. Emphasise the importance of representative sample sizes that ensure greater confidence in the data
4. Provide guidance on what typically constitutes contamination in the FOGO bin within the audit guidelines, noting it is sometimes different depending on the council and where the organics is sent. Auditors should clearly define and document what they have regarded as contamination in the FOGO bins in the audit reports, as this would enable a comparison across councils.
5. Support and train auditors on how to calculate waste generation rates in line with existing guidance. Evaluation of the audit data revealed several issues in the calculation of waste generation rates.
6. Record instances of gross contamination in audit reports. Where possible, auditors should compare the results with and without these bins to assess whether the contaminated bins are skewing the data.
7. Emphasise the importance of providing key audit information in audit reports, for example the sample size, and retaining raw data sheets.

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Acronyms

EPA	Environment Protection Authority
FOGO	Food and Garden Organics
Kg/hh/wk	Kilograms per household per week
MUD	Multi-unit dwelling
NSW	New South Wales

Definitions

Diversion efficiency	Weight of waste that is diverted from landfill divided by the weight of waste generated.

1. Introduction

1.1. Background

Kerbside organics recycling services have increased in New South Wales (NSW) over the past decade. The NSW Environment Protection Authority (EPA) supports local councils in the providing kerbside organics services through the Local Government Organics Collection grants program. The services provided by councils vary and can range from garden organics, food and garden organics (FOGO) or food only organics services. Variation also occurs in the bin sizes available to residents and the frequency of collection. Currently, most FOGO services are provided by councils outside of the Sydney Metropolitan area.

As part of the service provision, councils periodically undertake kerbside bin audits. Audits are generally conducted in consideration of the NSW EPA Guidelines for Conducting Household Kerbside Residual Waste, Recycling and Garden Organics Audits in NSW Local Government Areas.

1.2. Project scope

The NSW EPA engaged Rawtec to independently review kerbside audits undertaken by councils. NSW EPA provided audit reports and raw data (where available) for audits undertaken between 2011 and 2017. The data was examined to assess the integrity of the audit and check for errors, omissions or anomalies.

Following the review and any necessary adjustments of the data, analysis was undertaken to understand the performance of the kerbside general waste and organics recycling services. This analysis included estimation of averages and ranges in:

- Kilograms per household per week (kg/hh/wk) of food and garden material diverted via FOGO bins.[2]
- Kg/hh/wk contamination in FOGO bins.[2]
- Percentage efficiency of FOGO bins in diverting organics from landfill.

The data analysis and findings of this report provides a greater understanding of FOGO systems currently operating in NSW and their performance.

Considerations to improve the audit guidelines and future audits have been provided. These have been formulated through the thorough examination of the audit data and guided by errors or anomalies which were consistently found.

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[2] Note the average kg/hh/wk considers the weight of all audited materials divided by the number of bins audited, which is then adjusted for the presentation rate of the bins and frequency of collection.

1.3. Audits and service configurations analysed

A total of 26 kerbside audit results across NSW were analysed which included 8,718 bins (4,811 general waste bins and 3,907 FOGO bins). Four councils/areas only audited general waste bins (not FOGO bins). Of these, only one fit into its own service configuration (see Configuration 1 below) and as such this data set was suitable for some of the analyses. The remaining three audits were removed from the analyses. The remaining 23 audits represented data from 20 councils., as one council conducted four separate audits across different regions. There were a range of service configurations in place and they have been classified as follows for this project:

- Configuration 1: 240 L FOGO fortnightly and small general waste bin (120/140L) weekly.
- Configuration 2: 240 L FOGO weekly and small general waste bin (120/140L) weekly.
- Configuration 3: 240 L FOGO weekly and large general waste bin (240L) weekly.
- Configuration 4: 240 L FOGO weekly and small general waste bin (120/140L) fortnightly.
- Configuration 5: 240 L FOGO weekly and large general waste bin (240L) fortnightly.
- Configuration 6: 240 L FOGO weekly and general waste Other (user select bin size and/or frequency).

Table 1-1 provides a breakdown of audits analysed by service configuration. Analysis was undertaken to identify any differences in performance of FOGO systems across these configurations.

Table 1-1: Number of kerbside audits analysed by service configuration system.

Configuration system	# Kerbside FOGO and general waste audits analysed	Total # bins audited across the system (general waste, FOGO)
Configuration 1: FOGO fortnightly and small general waste bin (120/140L) weekly.	1[3]	216 (216, 0)
Configuration 2: FOGO weekly and small general waste bin (120/140L) weekly.	3	1,548 (738, 810)
Configuration 3: FOGO weekly and large general waste bin (240L) weekly.	3[4]	938 (536, 402)
Configuration 4: FOGO weekly and small general waste bin (120/140L) fortnightly.	4	1,648 (709, 939)
Configuration 5: FOGO weekly and large general waste bin (240L) fortnightly.	7	2,099 (1043, 1,056)
Configuration 6: FOGO weekly and general waste Other (user selected bin size and/or frequency)	5	1,670 (970, 700)
All Configurations	**23**	**8,119 (4,212, 3,907)**
Audit data sets removed from the analysis	3	599 (599,0)
Total including audits removed from the analysis	**26**	**8,718 (4,811, 3,907)**

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[3] General waste audit only, no FOGO audit.
[4] One Council with Configuration 3 provided food waste only collection (no garden organics) and hence was excluded from analysis of garden organics volumes but included in all other analyses

1.4. Aggregated versus bin-by-bin analysis

Two methods are used for auditing kerbside waste and recycling in NSW:

- Aggregated method
- Bin-by-bin method.

The aggregated method involves emptying sampled waste or recycling bins into a waste collection vehicle and sorting through the combined volumes. This method enables analysis of the average waste generation, diversion and contamination levels across the audited area.

Alternatively, the bin-by-bin method involves separately collecting and auditing each bin. This method enables analysis of individual household performance and identification of outliers that may skew averages.

For this project, 18 audited councils/areas used the aggregated method and five used the bin-by-bin method. However, detailed datasets showing performance by bin was only available for two of these audits[5]. Additional analysis was undertaken using the bin-by-bin data for these two councils.

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[5] The other three data sets were provided in an aggregated form that did not allow individual analysis.

2. Overall food and garden organics efficiency

The overall food and garden organics efficiency is the proportion of available food waste and garden organics that is placed into the FOGO bins by residents[6]. The results across all audited areas/councils are presented in Table 2-1 below. On average, households discarded 13.6 kilograms per week of food and garden organics, and placed 83% (11.37 kg/hh/wk) of this material into the FOGO bins. This is a high diversion rate, although it is important to recognise that this rate is driven mostly by garden organics as this comprises a high proportion of FOGO bin contents. Sections 3 and 4 provide further detail on food and garden organics as separate streams.

Table 2-1: Average proportion of food waste and garden organics discarded into FOGO bins[7]

Item	Performance
Average food waste and garden organics discarded into FOGO bins across all audited areas/councils (kg/hh/wk)	11.37
Average food waste and garden organics discarded into FOGO and general waste bins across all audited areas/councils (kg/hh/wk)	13.62
Average food waste and garden organics efficiency	83%[8]

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[6] The efficiency calculation only considers food waste and garden organics in FOGO and general waste bins, whereas another method for calculating the 'diversion rate' would consider the average weight of all contents from the FOGO bins by the average weight of all contents from both FOGO and general waste bins. Although there are other materials in the general waste bin outside of food waste and garden organics that could be discarded into FOGO bins (e.g. serviettes), most of the materials are likely to be comingled recyclables or general waste items and as such, the food waste and garden organics efficiency score is a more accurate reflection of the diversion of these materials from landfill than this other calculation method.

[7] Note one Council was excluded from the analysis due to collecting food waste only (not garden organics), which would have skewed the results by lowering the average food waste and garden waste discarded in FOGO bins per week (as no garden waste is discarded and traditionally households discard high volumes of this material)

[8] Note this percentage was calculated using a weighted average approach (as opposed to a simple average)

3. Food Waste

Food waste is a key component of the kerbside waste stream, making up an estimated 35% of total waste and recycling volumes[9]. Diverting food waste from landfill represents a significant opportunity to reduce greenhouse gas emissions, turn the waste into valuable products (such as compost) and create jobs in the circular economy.

3.1. Audit data by Council and configuration

Table 3-1 overleaf summarises key outputs from analysis of average food waste diversion volumes (kg/hh/wk) and the percentage of available food waste diverted from landfill via the FOGO bin, by service configuration. Ranges in values (min and max) for average performance of councils are provided for each configuration type.

On average, 38% of available food waste was diverted from landfill across the audited areas/councils. Most of these audits (22 out of 23) were undertaken for councils that have a weekly organics recycling service.

Analysis of food waste performance by service configuration[10] shows, in general, councils providing a fortnightly general waste collection achieved higher food waste diversion efficiencies compared to those on a weekly service. In addition, councils providing smaller general waste bins (120/140 litre) achieved higher food waste diversion efficiencies compared to councils with larger general waste bins (240 litre). The diversion efficiency performance by configuration (highest to lowest) is as follows:[11]

- 54% - Configuration #4: Small bin general waste fortnightly and large bin FOGO weekly.
- 45% - Configuration #6: User-select general waste bin size and/or collection frequency and large bin FOGO weekly.
- 41% - Configuration #5: Large bin general waste fortnightly and large bin FOGO weekly.
- 28% - Configuration #2: Small bin (120/140L) general waste weekly and large bin FOGO weekly.
- 14% - Configuration #3: Large bin (240L) general waste weekly and large bin FOGO weekly.

Performance can vary significantly across audited areas/councils within a service configuration. For example, the food diversion efficiency of councils with Configuration 5 (FOGO weekly and 240 litre general waste fortnightly) ranged from 5% up to 78%. See Figure 3-2 two pages overleaf, which includes each audited area/council (letters A through V), and the average food efficiency performance by configuration.

Analysis was undertaken to determine whether this variation in food waste diversion performance may be explained by how long the FOGO service had been in place (and therefore how familiar residents were with using the service). Areas with a FOGO service for more than a year performed better on average (at 45%) than those in a trial period or those that implemented the service less than a year ago (at 26% and 25% respectively). However, performance varied when accounting for differences in the length of service, as well as configuration. This suggests that service configuration and length of FOGO service are not the

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[9] Environment Protection and Heritage Council (2010), National Waste Report. Accessed at: https://www.environment.gov.au/system/files/resources/af649966-5c11-4993-8390-ab300b081f65/files/national-waste-report-2010.pdf

[10] Average performance for a given configuration was calculated by a weighted average approach (as opposed to a simple average)

[11] Note a small bin is 120 litres or 140 litres and a large bin is 240 litres

only contributing factors to food waste performance and other initiatives, such as the quality of community education and the messaging and delivery method, are likely to also be important for influencing food waste diversion outcomes.

Table 3-1: Average food in FOGO bins, general waste bins and total (kg/hh/wk), diversion efficiency (%) by configuration. The range of values (min and max) is provided in brackets.

Configuration	Food waste in FOGO bin kg/ hh / wk	Food waste in General waste bin kg/ hh / wk	Total food waste kg/ hh / wk	Average Diversion Efficiency (%)[10]
Configuration 1: FOGO fortnightly and small general waste bin (120/140L) weekly.[12]	NA	2.16 NA	NA	NA
Configuration 2: FOGO weekly and small general waste bin (120/140L) weekly.	1.04 (0.37 - 1.88)	2.73 (2.62 - 2.9)	3.77 (3.27 - 4.5)	28% (11% - 42%)
Configuration 3: FOGO weekly and large general waste bin (240L) weekly.[13]	0.49 (0.38 - 0.6)	2.94 (1.01 - 4.08)	3.43 (1.61 - 4.57)	14% (9% - 37%)
Configuration 4: FOGO weekly and small general waste bin (120/140L) fortnightly.[14]	1.50 (0.63 - 2.57)	1.27 (0.81 - 2.19)	2.77 (2.1 - 3.74)	54% (22% - 69%)
Configuration 5: FOGO weekly and large bin (240L) general waste fortnightly.[15]	1.06 (0.17 - 2.69)	1.51 (0.76 - 3.22)	2.57 (1.66 - 4.03)	41% (5% - 78%)
Configuration 6: FOGO weekly and general waste Other (user select bin size and/or frequency)[16]	1.69 (1.31 - 2.55)	2.07 (1.33 - 2.72)	3.76 (2.65 - 4.88)	45% (34% - 52%)
All Configurations	**1.20** **(0.17 - 2.69)**	**1.97** **(0.76 – 4.08)**	**3.16[17]** **(1.61 - 4.88)**	**38%** **(5% - 78%)**

[12] Only one general waste audit was available for councils with Configuration 1 (and no FOGO audits were available). Therefore, calculation of food waste volumes in FOGO bins and total food waste generation were unable to be calculated. Ranges in the average weight of general waste bins for councils in this configuration is also therefore not applicable (given there was only one council analysed).

[13] The analysis above includes one audit where non-randomised sampling was suspected. A separate analysis excluding this audit was undertaken to check its potential impact on the average performance of Configuration 3. It was found that if this audit is removed then the average food waste efficiency for this configuration would increase slightly by 3 percentage points up to 17%.

[14] The analysis above includes two audits where grossly contaminated bins (>20%) were found. A separate analysis excluding these highly contaminated bins was undertaken to check its potential impact on the average performance of Configuration 4. It was found that if these highly contaminated bins are removed, then the average food waste efficiency for Configuration 4 would decrease slightly by 2 percentage points down to 52% due to these bins also containing a high volume of food waste.

[15] Audit data from two councils with configuration 5 were not included in the above analysis as they did not audit FOGO bins (general waste only). If these audits are included, then the average kg/hh/wk of food in general waste bins would be 1.52, which is within the range of values and similar to the average kg/hh/wk of food in general waste achieved.

[16] Audit data from a council with Configuration 6 was not included in the above analysis as they did not audit FOGO bins (general waste only). If this audit is included, then the average kg/hh/wk of food in general waste bins would be 2.18, which is within the range of values and similar to the average kg/hh/wk of food in general waste achieved.

[17] The average total kg/hh/wk of food in all bins does not equate to the food in FOGO bins + food in General waste bins due to the total average not including the Configuration 1 data point (as no FOGO audit was undertaken for this council)

Figure 3-1: Food waste in FOGO bins per audit and configuration (kg/hh/wk), including averages for each configuration[18]
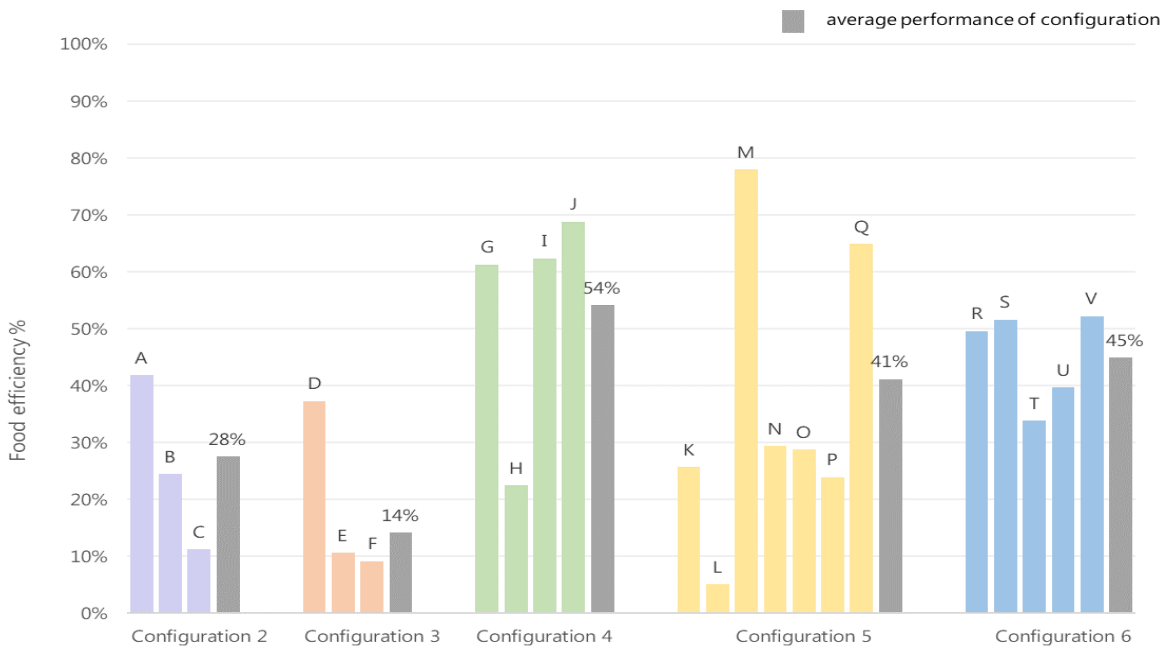
Figure 3-2: Food waste efficiency (% of food waste in FOGO bins out of all food waste discarded), by configuration, including averages for each configuration[18] [10]

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[18] Note that the letter above each data point refers to the Audit ID (see Appendix Two)

3.2. Bin-by-bin data

Table 3-2 below and Figure 3-3 overleaf present bin-by-bin data for food waste in FOGO bins for two councils. Table 3-2 shows that a high proportion of bins did not contain food waste: 55% of Council 1's 436 total audited bins had no food waste present, and 44% of Council 2's 218 total audited bins had no food present. Additional gains in food waste recycling volumes for these councils may be achieved if efforts are focused on encouraging greater participation from households not currently participating.

A surprising finding was that the food waste diversion efficiency and average food volumes (kg/bin) were higher for Council 1 than Council 2, despite a lower proportion of FOGO bins presented with food waste. This suggests that households participating in Council 1 are diverting a higher volume of food waste than those who are participating in Council 2. Council 1 also had a higher proportion of bins containing food volumes above the average food kg/bin (34% versus 29% for Council 2).

The weight of food in each bin ranged from 0 kg/bin at both Councils up to 31 kilograms of food in Council 1 and almost 11 kilograms of food in Council 2. Although this range is relatively large, Figure 3-3 overleaf shows that 75% of bins had less than 2.11 kilograms of food waste for these councils. Also displayed in Figure 3-3 is the number of outliers for each Council (represented by small circles). This shows that approximately 3% of the bins in Council 1 (or 12 bins) were considered outliers (i.e. the weight of the food waste in the bins was significantly higher than the average food waste kg/bin), and 6% for Council 2 (or 14 bins).

Table 3-2: Summary of bin-by-bin data for food

Item	Council 1	Council 2
Configuration	Configuration 4: 120L/140L General waste fortnightly, FOGO weekly	Configuration 4: 120L/140L General waste fortnightly, FOGO weekly
Number of bins sampled	436	218
Length of service	>1 year	<1 year
Bin-by-bin data		
Average kg/bin	1.42	1.03
No. bins with food waste weights above the average food waste kg/bin	147 (34%)	63 (29%)
Min kg/bin (if food present)	0.02	0.01
Max kg/bin	31.00	10.58
% bins with no food present	55%	44%
Interquartile range in Figure overleaf (first and third quarters containing the middle 50% of data points)[19]	(0 - 2.11)	(0 - 1.23)
Aggregated data		
Food waste diversion efficiency %	61%	22%
Average food waste kg/hh/wk	1.29	0.63

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[19] Analysis of the bin-by-bin food weight data showed a left-skewed distribution, not a normal distribution. The standard deviation is therefore not an appropriate measure of variability (or spread) of the distribution. As the data is left skewed, the first and third quartiles were reported, as these give a sense of the asymmetry of the distribution. See https://www.ma.utexas.edu/users/mks/statmistakes/skeweddistributions.html for further details

Food waste in FOGO bins - Council 1 vs Council 2
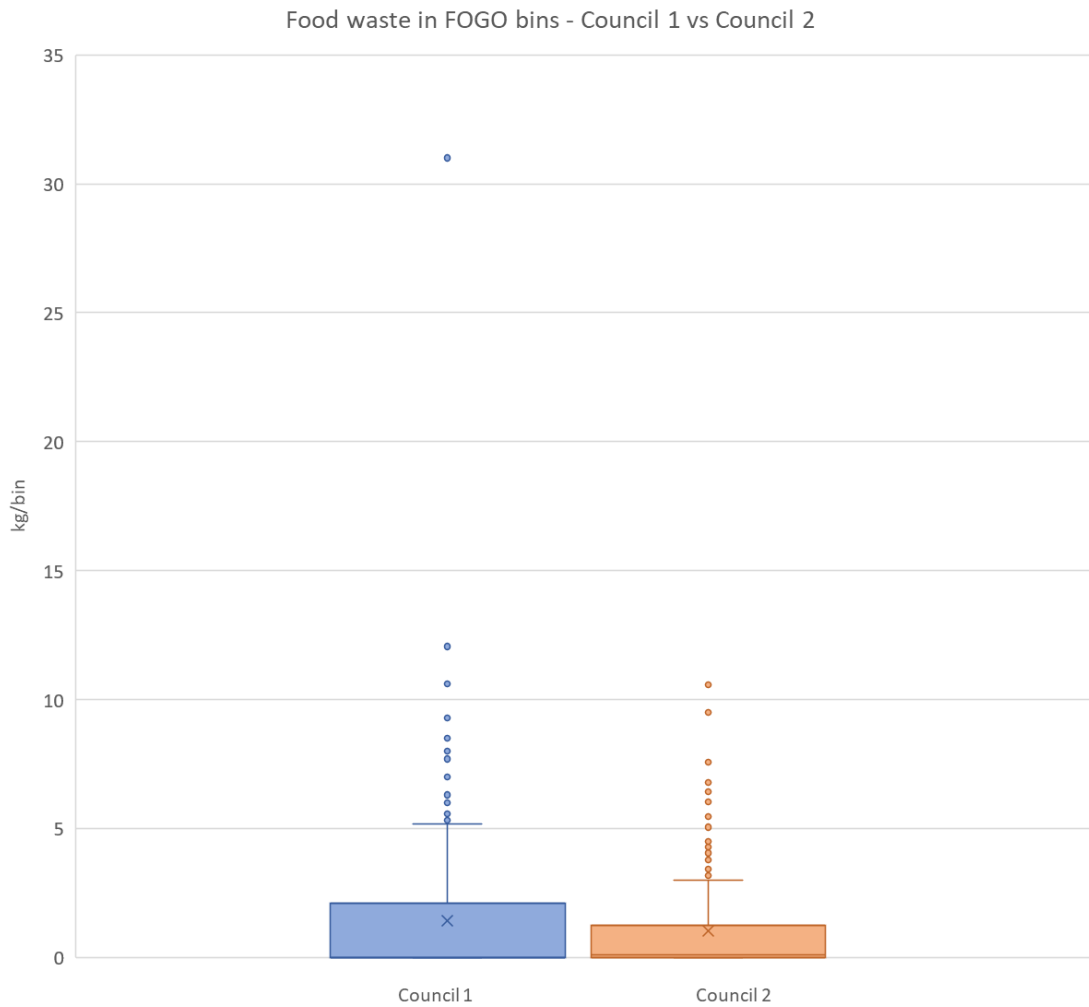
Figure 3-3: A box and whisker plot of the bin-by-bin data for food waste in FOGO bins. Note the rectangle is the interquartile range (IQR) and comprises 50% of the data, the 'x' is the average and the whisker edge captures data within 1.5 times the width of the IQR (any data points outside of this range are considered outliers and are represented by small coloured circles). The median is the line within the rectangle which cannot be seen for Council 1 as it is 0 kg/bin.

4. Garden Organics

4.1. Audit data by Council and configuration

Table 4-1 overleaf provides key outputs from analysis of garden organics diversion volumes (kg/hh/wk) and the percentage of available garden organics diverted from landfill via the general waste stream (%), by service configuration[20]. Ranges in values (min and max) for average performance of councils are provided for each configuration type.

The total amount of garden organics generated varies considerably by council, from 1.06 kg/hh/week up to 20.01 kg/hh/week. This large difference in garden waste generation is likely due to differences in rainfall, vegetation levels, block sizes and population densities. The time of year that the audit took place could also impact the results.

On average, 98% of available garden organic waste was diverted from landfill across the audited areas/councils. Analysis of garden waste performance by service configuration shows there is little difference in diversion efficiency performance, ranging between 94% and 99%. See Figure 4-2 two pages overleaf. There was also little variation in performance at individual council level, which ranged from 89% up to 99%.

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[20]Average performance for a given configuration was calculated by a weighted average approach (as opposed to a simple average).

Table 4-1: Average garden organics in FOGO bins, general waste bins and total (kg/hh/wk), diversion efficiency (%) by configuration. Note that the range of values (min and max) is provided in brackets.

Configuration	Garden organics in FOGO bin kg/ hh / wk	Garden organics in General waste bin kg/ hh / wk	Total garden organics kg/ hh / wk	Average Diversion Efficiency (%)[20]
Configuration 1: FOGO fortnightly and small general waste bin (120/140L) weekly. [21]	NA	0.01 NA	NA	NA
Configuration 2: FOGO weekly and small general waste bin (120/140L) weekly.	12.50 (3.21 - 19.32)	0.25 (0.15 - 0.43)	12.75 (3.38 - 19.75)	98% (95% - 99%)
Configuration 3: FOGO weekly and large general waste bin (240L) weekly.[22, 23]	15.04 (10.66 - 19.42)	0.97 (0.59 - 1.35)	16.01 (12.01 - 20.01)	94% (89% - 97%)
Configuration 4: FOGO weekly and small general waste bin (120/140L) fortnightly[24].	7.51 (0.94 - 11.84)	0.11 (0.06 - 0.13)	7.62 (1.06 - 11.96)	99% (89% - 99%)
Configuration 5: FOGO weekly and large general waste bin (240L) fortnightly.[25]	11.55 (9.36 - 12.96)	0.21 (0.1 - 0.64)	11.76 (9.46 - 13.59)	98% (95% - 99%)
Configuration 6: FOGO weekly and general waste Other (user select bin size and/or frequency) [26]	6.90 (3.13 - 11.25)	0.12 (0.02 - 0.3)	7.01 (3.15 - 11.32)	98% (97% - 99%)
All Configurations	**10.14** (0.94 - 19.42)	**0.24** (0.01 - 1.35)	**10.39**[27] (1.06 - 20.01)	**98%** (89% - 99%)

[21] Only one general waste audit was available for Configuration 1 (and no FOGO audits were available). The calculation of garden organics volumes in FOGO bins and total garden organics generation was unable to be calculated. Ranges in the average weight of general waste bins for councils in this configuration is also therefore not applicable (given there was only one council analysed).

[22] Removed audit data from one council with this configuration as it had food bins only (no garden waste accepted) and is therefore not relevant.

[23] Non randomised sampling was suspected in one audit with Configuration 3. A separate analysis excluding this audit was undertaken to check its potential impact on the average performance of Configuration 3. If this audit is removed then the average garden organics efficiency for this configuration would reduce to 89%.

[24] This analysis includes two audits where grossly contaminated bins (>20%) were found. A separate analysis excluding these highly contaminated bins was undertaken to check its potential impact on the average performance of Configuration 4. Removing these highly contaminated bins had no significant impact on garden organics diversion efficiency.

[25] Audit data from two councils with Configuration 5 was not included as the councils did not audit FOGO bins (general waste only). If this data were included, then the average kg/hh/wk of garden organics in general waste bins would be 0.20, which is within the range of values and similar to the average kg/hh/wk of food in general waste achieved.

[26] Audit data from a council with Configuration 6 was not included as the council did not audit FOGO bins (general waste only). If this were included, the average kg/hh/wk of garden in general waste bins would be 0.15, which is within the range of values and similar to the average kg/hh/wk of garden in general waste achieved above.

[27] The average total kg/hh/wk of garden in all bins does not equate to the garden in FOGO bins + garden in general waste bins due to the total average not including the Configuration 1 data point (as no FOGO audit was undertaken for this Council)
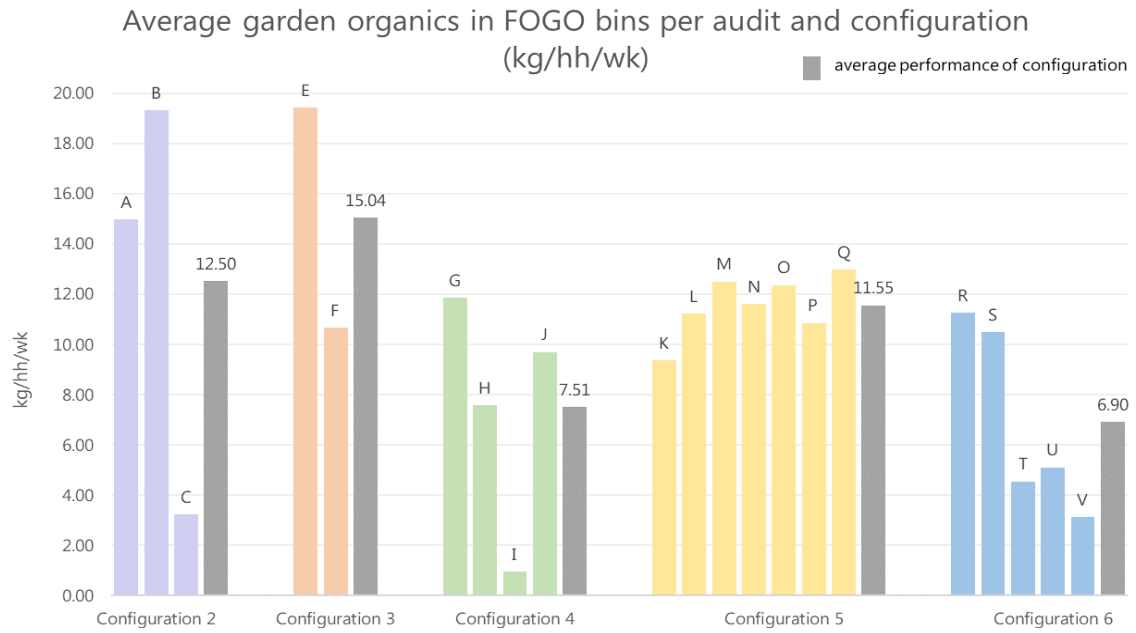
Figure 4-1: Garden organics in FOGO bins by configuration (kg/hh/wk), including averages for each configuration[18] [28]
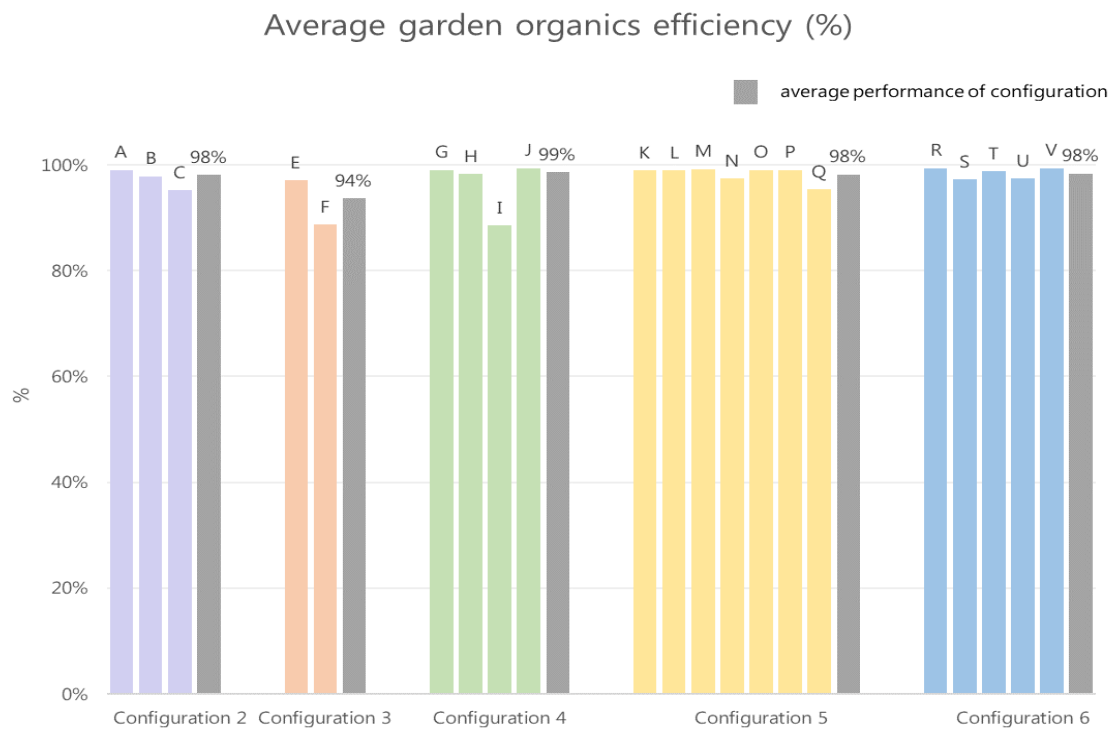
Figure 4-2: Garden organics efficiency (% of garden organics in FOGO bins out of all garden organics discarded), by audit and by configuration[18] [20] [28]

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[28] Note Audit D is not included here due to insufficient data

4.2. Bin by bin data

The bin-by-bin data for garden organics in FOGO bins for two councils is presented below[29]. The average kilograms of garden organics per FOGO bin is similar across the two councils (at 13.00 kg and 12.32 kg per bin respectively). The maximum weight of garden organics in a bin differed across the two councils, with 71 kilograms and 46 kilograms for Councils 1 and 2 respectively. However, the middle 50% of garden organics per bin was similar across the two councils (0.99kg to 21.8 kg for Council 1 and 3.44kg to 19.59kg for Council 2).

Interestingly, 20% of the bins for Council 1 did not contain any garden organics, despite the bins being sampled from low density housing. This compared to 2% for the other council, which had 10% multi-unit dwellings. The reasons for this low presentation of garden waste in FOGO bins could not be identified but is perhaps due to the number of garden organics drop off locations within Council 1.

Figure 4-3 overleaf displays the box and whisker plots for the two councils. This includes the number of outliers, which is less than 1% of the bins in Council 1 (4 bins had volumes of garden organics significantly higher than the average), and less than 1% of bins in Council 2 (or 2 bins).

Table 4-2: Summary of bin-by-bin data for garden organics

Item	Council 1	Council 2
Configuration	Configuration 4: 120L/140L General waste fortnightly, FOGO weekly	Configuration 4: 120L/140L General waste fortnightly, FOGO weekly
Number of bins sampled	436	218
Length of service	>1 year	<1 year
Bin-by-bin data		
Average kg/bin	13.00	12.32
No. bins with garden organics weights above the average garden organics kg/bin	147 (34%)	63 (29%)
Min kg/bin (if garden organics present)	0.04	0.03
Max kg/bin	70.95	45.60
% bins with no garden organics present	20%	2%
Interquartile range in figure overleaf (first and third quarters containing the middle 50% of data points)[30]	(0.99 - 21.8)	(3.44 - 19.59)
Aggregated data		
Garden organics diversion efficiency	99%	98%
Average garden organics kg/hh/wk	11.84	7.56

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[29] Three bin-by-bin data sets were not analysed as the data was only provided in an aggregated format.

[30] Analysis of the bin-by-bin food weight data showed a left-skewed distribution, not a normal distribution. The standard deviation is therefore not an appropriate measure of variability (or spread) of the distribution. As the data is left skewed, the first and third quartiles were reported, as these give a sense of the asymmetry of the distribution. See https://www.ma.utexas.edu/users/mks/statmistakes/skeweddistributions.html for further explanation behind this approach.
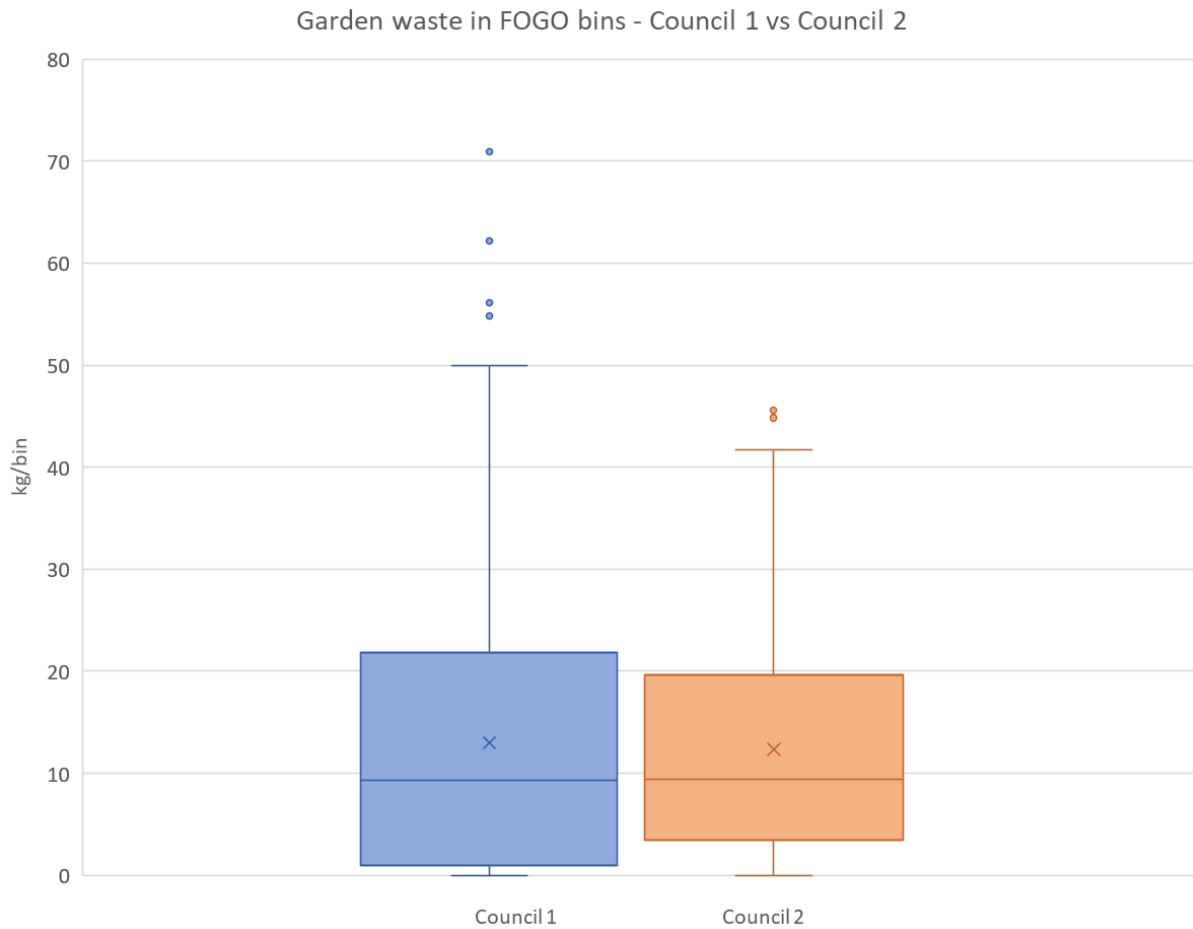
Figure 4-3: Box and whisker plot of the bin-by-bin data for garden organics in FOGO bins. Note the rectangle is the interquartile range (IQR) and comprises 50% of the data, the x is the average and the whisker edge captures data within 1.5 times the width of the IQR on either side of the IQR (data points outside of this range are considered outliers). The median is the line within the rectangle.

5. Contamination

Contamination of FOGO bins is undesirable because it requires further processing, incurs higher costs to remove the contaminants and/or results in a lower value recycled product.

Materials that are considered contaminants can vary from council to council, depending on the specifications of organics processors. For this project, a set of standard contaminants was agreed with the NSW EPA to enable comparison of contamination levels across audits. Refer to Appendix 1 for contamination classifications. Each audit raw data set was assessed and adjusted if required to reflect these. Some audit reports and data sets did not clearly state what was considered contamination, and Rawtec spent some time assessing the raw data in detail to ensure consistent contaminants were reported across all audits for the purposes of this project.

Most data sets received were in aggregated bin format as opposed to bin-by-bin data. As such, grossly contaminated bins were not able to be identified and potentially removed to assess the impact these bins were having on the data sets and whether the grossly contaminated bins were skewing the data.

5.1. Audit data by Council and configuration

The top five contaminants by weight were recorded for each audited area/council. The authors then used two methods to assess the top five contaminants. The first involved a counting methodology where the number of times the contaminants appeared in the top five was summed and the top ranked reported. Using this method, the most frequently cited contaminants were:

- plastic
- containerised food (e.g. glass and plastic containers and the food they contained)
- metals
- all other organics (leather, rubber and oils)
- other miscellaneous (e.g. bagged materials, bulky household goods).

An alternative method involved summing the weight (kg/hh/wk) of the contaminants that appeared in the top five heaviest contaminants in each audit (rather than counting the number of times each contaminant appeared in the top five heaviest contaminants). This method found the top contaminants were:

- miscellaneous (e.g. bagged materials, bulky household goods)
- earth-based materials
- containerised food (e.g. glass and plastic containers and the food they contained)
- plastic
- all other organics (leather, rubber and oils).

Table 5-1 overleaf provides key outputs from analysis of average contamination volumes (kg/hh/wk) and the percentage of contamination (%) in the FOGO bins, by service configuration. Ranges in values (min and max) for average performance of councils are provided for each configuration type.

On average, the level of contamination of the FOGO bin was 2.6% by weight across the audited areas/councils. Although this value ranged significantly, from 0.04% up to 17.83%, the middle 50% of contamination rates across audited areas/councils fell between a much narrower range (1.2% to 5.3%).

Note that bin-by-bin data suggests contamination appears to be driven by a low proportion of the population, which is discussed in Section 5.2.

Analysis of contamination levels by service configuration shows that the configurations with the top contamination rates (Configurations 4 and 6) were also those with the highest food waste diversion performance. An analysis was undertaken to check the strength of the correlation between these two factors for the audited councils and the correlation was found to be weak. See Figure 5-2 overleaf.

Table 5-1: Average contamination in FOGO bins (kg/hh/wk), average contamination as a percentage of FOGO bin weight (%), and most common contaminants by configuration.

Configuration	Contamination in FOGO bin Kg/hh/week	Contamination in FOGO bin (%)[31]	Most common contaminants cited
Configuration 2: FOGO weekly and small General waste bin (120/140L) weekly.	0.23 (0.04 – 0.57)	1.7% (0.37% - 3.27%)	• Containerised food • Plastic • Earth-based • Miscellaneous
Configuration 3: FOGO weekly and large General waste bin (240L) weekly.	0.17 (0.1 - 0.25)	1.5% (1.25% - 12.74%)	• Plastics • Metals • All Other organics • Containerised Food
Configuration 4: FOGO weekly and small General waste bin (120/140L) fortnightly.	0.25 (0.01 – 0.6)	2.6% (0.04% - 17.83%)	• Plastics • Metals • Miscellaneous
Configuration 5: FOGO weekly and large General waste bin (240L) fortnightly.	0.20 (0.09 – 0.44)	1.6% (0.74% - 2.74%)	• Plastics • Containerised food • Metals
Configuration 6: FOGO weekly and General waste Other (user select bin size and/or frequency)	0.60 (0.29 – 0.83)	6.4% (2.28% - 12.36%)	• Plastic • Containerised food • All Other Organics • Miscellaneous
All Configurations	**0.30** **(0.01 – 0.83)**	**2.6%** **(0.04% - 17.83%)**	• Plastic • Containerised food • Metals • All Other organics • Miscellaneous

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[31]Average performance for a given configuration was calculated by a weighted average approach (as opposed to a simple average).
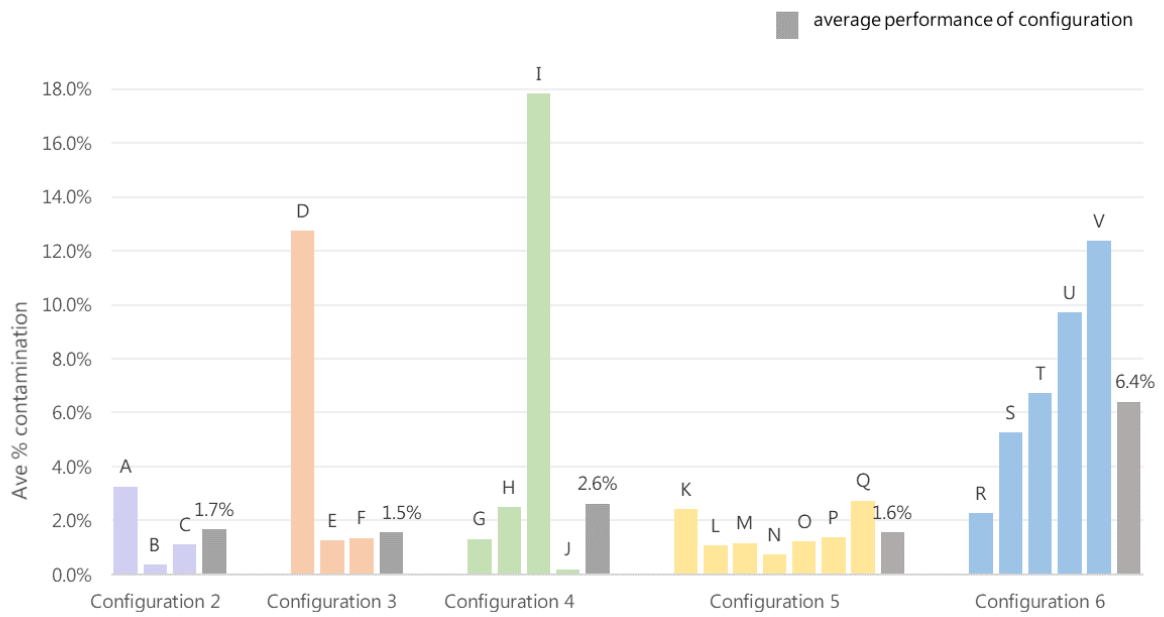
Figure 5-1: Average contamination in FOGO bins (% of bin weight) by audit and by configuration[18] [31]

Figure 5-2: Correlation between contamination of FOGO bin (%) and food waste diversion efficiency (%) for audited councils/areas

5.2. Bin-by-bin data

A high proportion of bins did not contain any contamination (two thirds of the bins from Council 2 and 87% of the bins from Council 1). This is reflected in Table 5-2 below and Figure 5-3 overleaf. Most data points sit in the '0 kg/bin' range. Figure 5-3 also shows the remaining contamination weights per bin are evenly spread from 0 through to 3+ kg/bin. One bin in Council 1's data had 44 kilograms of earth-based contaminants which can be considered a very high volume of contamination.

Analysis was undertaken to estimate the average weight of contamination only in bins that contained contamination. In these cases, the average kilograms of contamination per bin was 1.62 and 1.10 for Councils 1 and 2 respectively (versus 0.20 and 0.35 kilograms when all bins are considered). This suggests that when a household does contaminate FOGO bins, the volumes are much higher (in the cases below, 3 – 8 times more) than the average kilograms per households when considering an entire council.

Table 5-2: Summary of bin-by-bin data for contamination

Item	Council 1	Council 2
Configuration	Configuration 4: 120L/140L general waste fortnightly, FOGO weekly	Configuration 4: 120L/140L general waste fortnightly, FOGO weekly
Number of bins sampled	436	218
Length of service	> 1 year	< 1 year
Bin-by-bin data		
Average kg/bin	0.20	0.35
Min kg/bin (if contamination present)	0.01	0.01
Max kg/bin	44.00	15.91
% bins with no contamination present	87%	68%
Average contamination (kg/bin) all bins with contamination present	1.62	1.10
Interquartile range (first and third quarters containing the middle 50% of data points)[32]	(0 - 0)	(0 - 0.02)
Aggregated data		
Average contamination %	1.3%	2.5%
Average kg/hh/wk	0.19	0.22

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[32] Analysis of the bin-by-bin food weight data showed a left-skewed distribution, not a normal distribution. The standard deviation is therefore not an appropriate measure of variability (or spread) of the distribution. As the data is left skewed, the first and third quartiles were reported, as these give a sense of the asymmetry of the distribution. See https://www.ma.utexas.edu/users/mks/statmistakes/skeweddistributions.html for further details

Contamination comparison across Councils - percentage breakdown by bin weight range
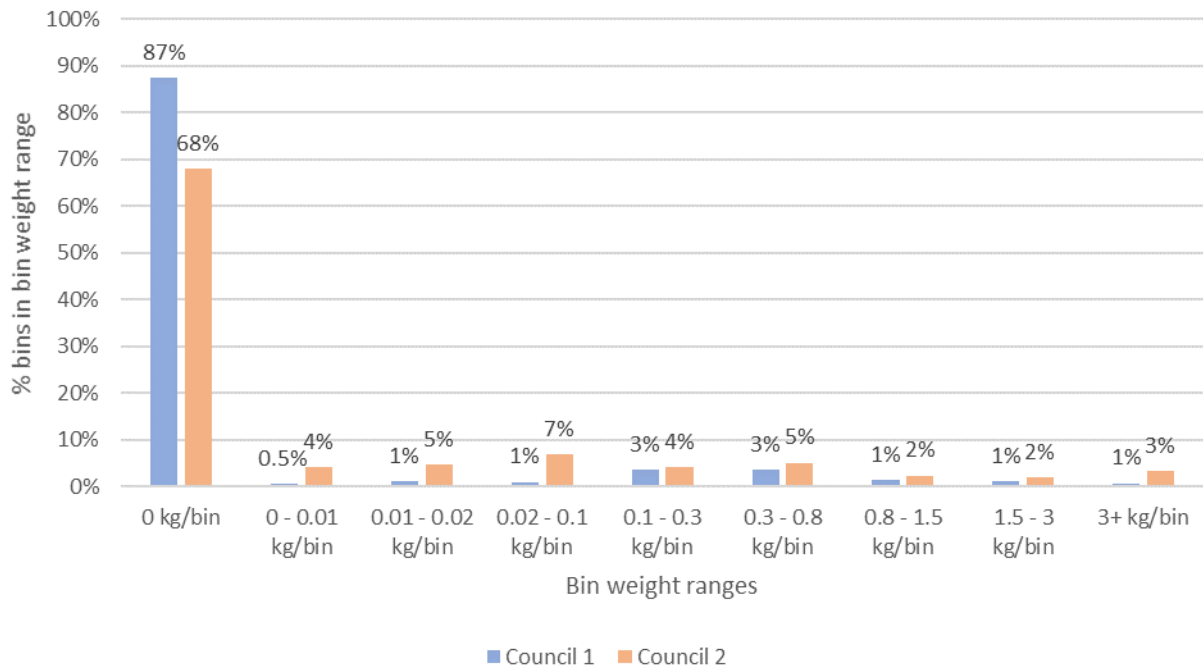
Figure 5-3: Percentage breakdown of bin contamination weight ranges by Council

6. Key findings and Recommendations

6.1. Performance of FOGO systems

This project identified the performance of FOGO systems at the individual household level, by council, and according to the service configuration (bin size and frequency of general waste and organics recycling services).

Overall, the analysis considered data from 26 audits, of which three were removed. The remaining 23 audits (20 councils) included a total of 8,119 FOGO and general waste bins collected from NSW households. On average, residents were found to be diverting 83% of their food waste and garden organics by weight into FOGO bins.

When it comes to food waste, it was found that:

- 38% of available food waste (1.20 kg/hh/wk) was diverted from landfill across the audited areas/councils. This performance ranged significantly across councils from 5% to 78%.
- The average food efficiency across configurations ranged from 14% to 54%. In general, councils providing a fortnightly general waste collection achieved higher food waste diversion efficiencies compared to those on a weekly service. In addition, councils providing smaller general waste bins (120/140 litre) achieved higher food waste diversion efficiencies compared to councils with larger general waste bins (240 litre).
- Performance can vary significantly by council within a service configuration. Therefore, service configuration is not the only contributing factor to food waste diversion performance.
- Analysis was undertaken to determine whether variation in food waste diversion performance may be explained by how long the FOGO service had been in place (and therefore how familiar residents were with using the service). On average, longer established FOGO services performed better (45% compared to 25% for services established less than one year ago and 26% for those in a trial period) but performance was found to vary across councils with the same length of service or with the same service configuration.
- As such, other factors, such as waste education, are expected to be important for influencing food waste diversion outcomes.
- The bin-by-bin analysis revealed that only 32% of bins contained volumes of food greater than the average kg/bin of food across all bins, and a large proportion of households (45% and 55% for the two councils) had no food waste in their FOGO bin. Additional gains in food waste recycling volumes for these councils may be achieved if efforts are focused on encouraging greater participation for those not currently using the service.

With regard to garden waste:

- 98% (ranging from 89% to 99% across audits) of available garden organics (10.14 kg/hh/wk) was diverted from landfill across the audited areas/councils.
- This high performance was relatively consistent across councils and system configurations. Average performance by service configuration ranged between 94% and 99% diversion.
- The total amount of garden organics generated varied considerably by council, from 1.06 kg/hh/week up to 20.01 kg/hh/week. This large difference in garden waste generation is likely

due to differences in rainfall, vegetation levels and population densities, and the time of year the audit was taken across the audited councils/areas.

On FOGO bin contamination:

- On average, contamination of the FOGO bin was 2.6% by weight (0.30 kg/hh/wk) across the audited areas/councils. However, this ranged significantly by from 0.04% up to 17.83% (although note that the middle 50% of contamination rates across all audited areas/councils was a much smaller range, falling between 1.17% and 5.26%).
- The most common top contaminants presented across audited councils were plastic, containerised food, all other organics (leather, rubber and oils), metals, and other miscellaneous.
- When considering contaminants by weight, the top five were miscellaneous (e.g. bagged materials, bulky household goods), earth-based materials, containerised food (e.g. glass and plastic containers and the food they contained), plastic and all other organics.
- The bin-by-bin analysis of two councils found a large proportion of bins contained no contamination (at 68% and 87% for Councils 1 and 2 respectively). Reductions in contamination for these councils may be achieved by targeting households that contaminate (such as through a bin tagging program). Education campaigns or other behaviour change strategies that target all residents may be less effective given the majority of the population appear to not be contaminating their FOGO bins.

Other considerations:

- The above analysis demonstrates that the average food waste diversion and contamination rates vary greatly across councils and configurations.
- Bin-by-bin audits enable the most comprehensive analysis to be undertaken and the best understanding of variance within a council. As a number of residents may not be actively participating in the FOGO service, overall averages across the audit do not necessarily reflect those who are engaged in diverting food and garden organics via FOGO bins or the proportion of residents who are contaminating FOGO bins. This type of data can help guide education campaigns and other methods for influencing behaviour.

NSW Councils appear to be performing well regarding diverting organics materials via FOGO bins. However, there are opportunities to improve diversion rates by focusing on food waste. Higher performing councils appear to be those with less available general waste disposal options for residents (i.e. general waste bins are smaller or collected less frequently), or that offer a user selected service. Approximately 50% of residents are not diverting any food waste and only approximately 30% of residents are contaminating FOGO bins. Tailoring education campaigns to focus on these individuals may be more effective than continuing broader interventions targeting all residents.

6.2. Improving quality of future audits

The project scope included examination of audit data to assess the integrity of the audit and check for errors, omissions or anomalies. This process identified a few issues with some audits relating to their audit methodology and/or data analysis. Cleansing of the data was undertaken were possible prior to data analysis for this study. To prevent these errors from being repeated in future audits, it is recommended that the NSW EPA provide further guidance to auditors and councils.

The NSW kerbside audit guidelines (2012 edition) provide comprehensive guidance. However, there are a few areas that could be reinforced or clarified to help auditors, councils and state-wide analysis projects. The following recommendations are therefore made for consideration by the NSW EPA.

1. Continue to emphasise the importance of a randomised sampling approach

Some audits did not appear to take a randomized sampling approach. This included instances of samples being taken directly from waste collection vehicles on their regular run or collection of bins only from one or two streets. Whilst this may appear random, it doesn't necessarily provide a sample that is representative of the council's demographics.

2. Ensure that future guidelines provide clear guidance on when and how to ensure stratified sampling for Multi-Unit Dwellings

Several councils did not undertake appropriate sampling of Multi-Unit Dwellings within their area. The 2012 audit guidelines state, "Any MUD greater than a three storey walk up should be excluded from the analysis as the methodology expressed in these Guidelines is not suitable." A more suitable standard methodology has not been published in NSW.

3. Emphasise the importance of large sample sizes to ensure greater confidence in the data

A range of councils audited a smaller sample size than the guidelines recommended. It is understood that this may have been due to sample size calculation based on variability in previous audits or cost constraints. Appendix 3 of the 2012 guidelines provides the two approaches for determining sample size, i.e. using either the default recommendation for sample size as well as the option to depart from this if previous audits enable calculation of variability and estimation of a sample size that will achieve the same level of data confidence. However, analysis for this project has shown significant variation between households and councils, therefore a sample size below the guideline's default 220 sample size may lead to less accurate results.

4. Clearer definition of contamination

It is recommended that definitions of what is generally considered contamination for each waste stream be provided in audit guidelines. It is noted that there may be exceptions to the rule and councils should confirm with processors and composters what is regarded as contamination.

Authors of audit reports should provide a clear distinction of what has been considered contamination in their reports, as there were instances where it was unclear as to what had been regarded as contamination, and clearly stating these would allow an easier comparison of results across councils.

5. Provide clear guidance on the calculation of waste generation rates

Evaluating audit data revealed several issues in the calculation of waste generation rates. This included not considering presentation rates and not adjusting to account for the service frequency. The most recent version of the guidelines has expanded guidance and example calculations for estimating waste generation rates. It may be beneficial to facilitate a training session to ensure that auditors are familiar with the different methods for correct calculation of waste generation rates.

6. Record instance of gross contamination

Consider including direction around recording instances where bins contain gross levels of contamination. These should be included in the audit report. Additionally, with the bin by bin method, the performance of the system should be provided considering both the inclusion and exclusion of gross contamination.

7. Emphasise the need for providing audit information in the report and retention of raw data

Several reports lacked information regarding the audit that could have been used to confirm the data. Missing data included details such as the number of bins sampled, bins presented, and bins collected. Without this information the data is often unable to be independently verified. Auditors and councils should ensure that all raw data collected during the audit process is retained so that it can be returned to. It is recommended that the guidelines highlight the importance of including all information regarding the audit design and process as well as retaining all raw data that is collected.

Appendix 1 – Contamination Classification

	Material Classification	Considered as contamination for this project	Not regarded as contamination for this project
Paper	Newspaper		X
	Magazine/Brochures	X	
	Misc. Packaging	X	
	Corrugated Cardboard		X
	Cardboard/Package Board		X
	Liquid Paperboard Containers	X	
	Disposable Paper Products		X
	Print/Writing/Office Paper		X
	Composite (mainly paper)		X
	Nappies Disposable	X	
	Contaminated Soiled Paper		X
Organics	Food/Kitchen		X
	Garden/Vegetation		X
	Other Putrescible		X
	Wood/Timber		X
	Textile/ Rags	X	
	Leather	X	
	Rubber	X	
	Oils	X	
Glass	Glass Beverage Containers	X	
	Glass Non-Beverage Containers/Other Packaging Glass	X	
	Miscellaneous/ Other Glass	X	
	Mixed Glass / Fines	X	
Plastic	PET Beverage Containers	X	
	PET Packaging (excluding beverage containers)	X	
	PET Other Non Beverage / Non Packaging	X	
	HDPE Beverage Containers	X	
	HDPE Packaging (excluding beverage containers)	X	
	HDPE Other Non Beverage / Non Packaging	X	
	PVC Beverage Containers	X	
	PVC Other Non Beverage / Non Packaging	X	

	Material Classification	Considered as contamination for this project	Not regarded as contamination for this project
Plastic	PVC Packaging (excluding beverage containers)	X	
	LDPE Packaging	X	
	LDPE Non-Packaging	X	
	PP Packaging	X	
	PP Non-Packaging	X	
	PS & EPS Packaging	X	
	PS & EPS Non-Packaging	X	
	Other plastics	X	
	Composite (mostly plastic)	X	
Ferrous	Steel Beverage Containers	X	
	Steel Packaging (excluding beverage containers)	X	
	Steel Other Non-Packaging	X	
	Composite (mostly ferrous)	X	
Non-Ferrous	Aluminium Beverage Containers	X	
	Aluminium Packaging (excluding beverage containers)	X	
	Aluminium Non-Packaging	X	
	Other Non-Packaging	X	
	Non-ferrous Composite (mostly non-ferrous)	X	
Hazardous	Paint	X	
	Fluorescent tubes	X	
	Dry cell and car batteries (non-rechargeable)	X	
	Dry cell and car batteries (rechargeable)	X	
	Vehicle batteries *	X	
	Household chemicals	X	
	Asbestos	X	
	Clinical Pathogenic Infectious	X	
	Gas Bottles	X	
	Hazardous Other	X	
Building Waste	Building materials and fittings	X	

	Material Classification	Considered as contamination for this project	Not regarded as contamination for this project
Earth Based	Ceramics, Dust, Dirt, Rock, Inert Ash	X	
E-Waste	Computer Equipment	X	
	TVs	X	
	Mobile Phones		
	Electrical Items and Peripherals*	X	
	Toner Cartridges	X	
Misc.	Containerized Food & Liquid	X	
	Other (specify)	X	

Appendix 2 – Audit Vignettes

The following pages include the Audit Vignettes, which provide detail about each of the audit data points referred to in the report above.

Audit A

Service Configuration		Audit details	
Red lid **Landfill** 120L Weekly Collection	Green lid **FOGO** 240L Weekly Collection	Length of FOGO Service at time of audit	Trial
		Date:	September 2016
		Method:	Aggregated
		Sample size:	
		Red lid bin:	206
		FOGO:	206
		Matched pairs:	Yes

Audit findings

Food Waste (Average hh/pw)	Garden Waste (Average hh/pw)	FOGO efficiency
4.50 kg 42% is recycled	15.12 kg 99% is recycled	79% recovery

Estimated average volumes[1]

	FOGO bin *Average Kg/hh/wk*	General waste bin *Average Kg/hh/wk*	Total *Average Kg/hh/wk*	FOGO Efficiency *(% diverted from landfill via FOGO)*
Food Waste	1.88	2.62	4.50	42%
Garden Waste	14.97	0.15	15.12	99%
Other acceptable materials[2]	0.11	1.62	1.73	7%
Total Organics[3]	**16.97**	**4.39**	**21.35**	**79%**

Contamination		Top 5 contaminants - kg/hh/pw		
Weight	**Percentage**	1	Earth Based	0.409
0.57 kg/hh/wk	3.27%	2	Building Waste	0.067
		3	Containerised Food	0.048
		4	Plastic	0.022
		5	Non-Compostable Organics (e.g. Textiles)	0.012

1. Totals may not equate due to rounding
2. Includes Other putrescible, Wood/Timber. Newspaper, Corrugated Cardboard, Cardboard/Package Board, Disposable Paper Products, Print/Writing/Office Paper, Composite, Contaminated Soiled Paper
3. The total weight of organic material in the bin, not the total weight of all materials in the bin

Audit B

Service Configuration		Audit details	
Red lid **Landfill** 140L	Green lid **FOGO** 240L	Length of FOGO Service at time of audit	Trial
Weekly Collection	Weekly Collection	Date:	November 2011
		Method:	Aggregated
		Sample size:	
		Red lid bin:	400
		FOGO:	400
		Matched pairs:	No

Audit findings

Food Waste (Average hh/pw)	Garden Waste (Average hh/pw)	FOGO efficiency
3.52 kg 24% is recycled	19.75 kg 98% is recycled	82% recovery

Estimated average volumes[1]

	FOGO bin *Average Kg/hh/wk*	General waste bin *Average Kg/hh/wk*	Total *Average Kg/hh/wk*	FOGO Efficiency *(% diverted from landfill via FOGO)*
Food Waste	0.86	2.66	3.52	24%
Garden Waste	19.32	0.43	19.75	98%
Other acceptable materials[2]	0.04	1.49	1.53	3%
Total Organics[3]	**20.22**	**4.58**	**24.8**	**82%**

Contamination | Top 5 contaminants - kg/hh/pw

Weight	Percentage			
0.08 kg/hh/wk	0.37%	1	Miscellaneous	0.055
		2	Containerised Food	0.015
		3	Comingled Containers	0.005
		4	NA	
		5	NA	

1. Totals may not equate due to rounding
2. Includes Other putrescible, Wood/Timber. Newspaper, Corrugated Cardboard, Cardboard/Package Board, Disposable Paper Products, Print/Writing/Office Paper, Composite, Contaminated Soiled Paper
3. The total weight of organic material in the bin, not the total weight of all materials in the bin

Audit C

Service Configuration		Audit details		
Red lid Landfill 120L Weekly Collection	**Green lid FOGO** 240L Weekly Collection	Length of FOGO Service at time of audit		**Trial**
		Date:		**May 2017**
		Method:		**Aggregated**
		Sample size:		
		Red lid bin:		**132**
		FOGO:		**204**
		Matched pairs:		**Yes**

Audit findings

Food Waste (Average hh/pw)	Garden Waste (Average hh/pw)	FOGO efficiency
3.27 kg 11% is recycled	3.38 kg 95% is recycled	45% recovery

Estimated average volumes[1]

	FOGO bin *Average Kg/hh/wk*	General waste bin *Average Kg/hh/wk*	Total *Average Kg/hh/wk*	FOGO Efficiency *(% diverted from landfill via FOGO)*
Food Waste	0.37	2.90	3.27	11%
Garden Waste	3.21	0.16	3.38	95%
Other acceptable materials[2]	0.05	1.32	1.37	4%
Total Organics[3]	**3.63**	**4.39**	**8.02**	**45%**

Contamination

Weight	Percentage
0.04 kg/hh/wk	1.12%

Top 5 contaminants - kg/hh/pw

1	Miscellaneous	0.020
2	Earth Based	0.015
3	Plastic	0.003
4	Glass	0.001
5	Non-Compostable Paper (e.g. Magazines)	0.001

1. Totals may not equate due to rounding
2. Includes Other putrescible, Wood/Timber. Newspaper, Corrugated Cardboard, Cardboard/Package Board, Disposable Paper Products, Print/Writing/Office Paper, Composite, Contaminated Soiled Paper
3. The total weight of organic material in the bin, not the total weight of all materials in the bin

Audit E

Service Configuration

Red lid **Landfill**
240L
●●●●
Weekly Collection

Green lid **FOGO**
240L
●●●●
Weekly Collection

Audit details

Length of FOGO Service at time of audit	**> 1 Year**
Date:	**March/April 2017**
Method:	**Aggregated**
Sample size:	
Red lid bin:	**206**
FOGO:	**158**
Matched pairs:	**No**

Audit findings

Food Waste (Average hh/pw)	Garden Waste (Average hh/pw)	FOGO efficiency
4.57 kg 11% is recycled	20.01 kg 97% is recycled	75% recovery

Estimated average volumes[1]

	FOGO bin *Average Kg/hh/wk*	**General waste bin** *Average Kg/hh/wk*	**Total** *Average Kg/hh/wk*	**FOGO Efficiency** *(% diverted from landfill via FOGO)*
Food Waste	0.48	4.08	4.57	11%
Garden Waste	19.42	0.59	20.01	97%
Other acceptable materials[2]	0.09	1.86	1.95	5%
Total Organics[3]	**19.99**	**6.53**	**26.52**	**75%**

Contamination

Weight	Percentage
0.25 kg/hh/wk	1.25%

Top 5 contaminants - kg/hh/pw

1	Non-Compostable Organics (e.g. Textiles)	0.150
2	Plastic	0.026
3	Earth Based	0.026
4	Metals	0.018
5	Non-Compostable Paper (e.g. Magazines)	0.016

1. Totals may not equate due to rounding
2. Includes Other putrescible, Wood/Timber. Newspaper, Corrugated Cardboard, Cardboard/Package Board, Disposable Paper Products, Print/Writing/Office Paper, Composite, Contaminated Soiled Paper
3. The total weight of organic material in the bin, not the total weight of all materials in the bin

Audit F

Service Configuration

Red lid **Landfill**
240L
Weekly Collection

Green lid **FOGO**
240L
Weekly Collection

Audit details

Length of FOGO Service at time of audit	< 1 Year
Date:	March 2017
Method:	Aggregated
Sample size:	
Red lid bin:	220
FOGO:	220
Matched pairs:	Unsure

Audit findings

Food Waste (Average hh/pw)	Garden Waste (Average hh/pw)	FOGO efficiency
4.11 kg 9% is recycled	12.01 kg 89% is recycled	64% recovery

Estimated average volumes[1]

	FOGO bin *Average Kg/hh/wk*	General waste bin *Average Kg/hh/wk*	Total *Average Kg/hh/wk*	FOGO Efficiency *(% diverted from landfill via FOGO)*
Food Waste	0.38	3.74	4.11	9%
Garden Waste	10.66	1.35	12.01	89%
Other acceptable materials[2]	0.50	1.35	1.85	27%
Total Organics[3]	**11.53**	**6.44**	**17.97**	**64%**

Contamination

Weight	Percentage
0.16 kg/hh/wk	1.35%

Top 5 contaminants - kg/hh/pw

1	Plastic	0.045
2	Non-Compostable Organics (e.g. Textiles)	0.033
3	Glass	0.018
4	Containerised Food	0.016
5	Metals	0.015

1. Totals may not equate due to rounding
2. Includes Other putrescible, Wood/Timber. Newspaper, Corrugated Cardboard, Cardboard/Package Board, Disposable Paper Products, Print/Writing/Office Paper, Composite, Contaminated Soiled Paper
3. The total weight of organic material in the bin, not the total weight of all materials in the bin

Audit G

Service Configuration

Red lid **Landfill**

140L

● ● ● ●

Fortnightly Collection

Green lid **FOGO**

240L

● ● ● ●

Weekly Collection

Audit details

Length of FOGO Service at time of audit	> 1 Year
Date:	March 2011
Method:	Bin-by-Bin
Sample size:	
Red lid bin:	222
FOGO:	436
Matched pairs:	No

Audit findings

Food Waste (Average hh/pw)	Garden Waste (Average hh/pw)	FOGO efficiency
2.10 kg 61% is recycled	11.96 kg 99% is recycled	89% recovery

Estimated average volumes[1]

	FOGO bin *Average Kg/hh/wk*	General waste bin *Average Kg/hh/wk*	Total *Average Kg/hh/wk*	FOGO Efficiency *(% diverted from landfill via FOGO)*
Food Waste	1.29	0.81	2.10	61%
Garden Waste	11.84	0.12	11.96	99%
Other acceptable materials[2]	0.82	0.74	1.56	52%
Total Organics[3]	**13.95**	**1.68**	**15.62**	**89%**

Contamination

Weight	Percentage
0.19 kg/hh/wk	1.32%

Top 5 contaminants - kg/hh/pw

1	Earth Based	0.101
2	Non-Compostable Paper (e.g. magazines)	0.037
3	Plastic	0.017
4	Metals	0.010
5	Glass	0.007

1. Totals may not equate due to rounding
2. Includes Other putrescible, Wood/Timber. Newspaper, Corrugated Cardboard, Cardboard/Package Board, Disposable Paper Products, Print/Writing/Office Paper, Composite, Contaminated Soiled Paper
3. The total weight of organic material in the bin, not the total weight of all materials in the bin

Audit H

Service Configuration

Red lid **Landfill**	Green lid **FOGO**
140L	240L
●●● (red)	●●●● (green)
Fortnightly Collection	**Weekly** Collection

Audit details

Length of FOGO Service at time of audit	**< 1 Year**
Date:	**February 2017**
Method:	**Bin-by-Bin**
Sample size:	
Red lid bin:	**215**
FOGO:	**218**
Matched pairs:	**Yes**

Audit findings

Food Waste (Average hh/pw)	Garden Waste (Average hh/pw)	FOGO efficiency
2.83 kg 22% is recycled	7.69 kg 98% is recycled	69% recovery

Estimated average volumes[1]

	FOGO bin *Average Kg/hh/wk*	General waste bin *Average Kg/hh/wk*	Total *Average Kg/hh/wk*	FOGO Efficiency *(% diverted from landfill via FOGO)*
Food Waste	0.63	2.19	2.83	22%
Garden Waste	7.56	0.13	7.69	98%
Other acceptable materials[2]	0.26	1.51	1.77	15%
Total Organics[3]	**8.46**	**3.83**	**12.29**	**69%**

Contamination

Weight	Percentage
0.22 kg/hh/wk	2.50%

Top 5 contaminants - kg/hh/pw

1	Miscellaneous	0.107
2	Earth Based	0.070
3	Non-Compostable Paper (e.g. Magazines)	0.017
4	Plastic	0.009
5	Metals	0.005

1. Totals may not equate due to rounding
2. Includes Other putrescible, Wood/Timber. Newspaper, Corrugated Cardboard, Cardboard/Package Board, Disposable Paper Products, Print/Writing/Office Paper, Composite, Contaminated Soiled Paper
3. The total weight of organic material in the bin, not the total weight of all materials in the bin

Audit I

Service Configuration		Audit details	
Red lid **Landfill** 120L • • • Fortnightly Collection	Green lid **FOGO** 240L • • • • Weekly Collection	Length of FOGO Service at time of audit	**< 1 Year**
		Date:	**May 2016**
		Method:	**Aggregated**
		Sample size:	
		Red lid bin:	**220**
		FOGO:	**220**
		Matched pairs:	**Yes**

Audit findings

Food Waste (Average hh/pw)	Garden Waste (Average hh/pw)	FOGO efficiency
2.40 kg 62% is recycled	1.06 kg 89% is recycled	61% recovery

Estimated average volumes[1]

	FOGO bin *Average Kg/hh/wk*	General waste bin *Average Kg/hh/wk*	Total *Average Kg/hh/wk*	FOGO Efficiency *(% diverted from landfill via FOGO)*
Food Waste	1.50	0.90	2.40	62%
Garden Waste	0.94	0.12	1.06	89%
Other acceptable materials[2]	0.34	0.71	1.05	32%
Total Organics[3]	**2.77**	**1.74**	**4.51**	**61%**

Contamination / Top 5 contaminants - kg/hh/pw

Weight	Percentage		Top 5 contaminants	
0.60 kg/hh/wk	17.83%	1	Miscellaneous	0.361
		2	Containerised Food	0.107
		3	Non-Compostable Organics (e.g. Textiles)	0.044
		4	Building Waste	0.031
		5	Disposable Nappies	0.027

1. Totals may not equate due to rounding
2. Includes Other putrescible, Wood/Timber. Newspaper, Corrugated Cardboard, Cardboard/Package Board, Disposable Paper Products, Print/Writing/Office Paper, Composite, Contaminated Soiled Paper
3. The total weight of organic material in the bin, not the total weight of all materials in the bin

Audit J

Service Configuration

Red lid **Landfill**
140L
Fortnightly Collection

Green lid **FOGO**
240L
Weekly Collection

Audit details

Length of FOGO Service at time of audit	> 1 Year
Date:	September 2017
Method:	Aggregated
Sample size:	
Red lid bin:	52
FOGO:	65
Matched pairs:	No

Audit findings

Food Waste (Average hh/pw)	Garden Waste (Average hh/pw)	FOGO efficiency
3.74 kg 69% is recycled	9.75 kg 99% is recycled	86% recovery

Estimated average volumes[1]

	FOGO bin *Average Kg/hh/wk*	General waste bin *Average Kg/hh/wk*	Total *Average Kg/hh/wk*	FOGO Efficiency *(% diverted from landfill via FOGO)*
Food Waste	2.57	1.17	3.74	69%
Garden Waste	9.69	0.06	9.75	99%
Other acceptable materials[2]	0.04	0.84	0.88	4%
Total Organics[3]	**12.30**	**2.07**	**14.37**	**86%**

Contamination

Weight	Percentage
0.01 kg/hh/wk	0.04%

Top 5 contaminants - kg/hh/pw

1	Miscellaneous	0.002
2	Plastic	0.001
3	Metals	0.001
4	Glass	0.001
5	NA	NA

1. Totals may not equate due to rounding
2. Includes Other putrescible, Wood/Timber. Newspaper, Corrugated Cardboard, Cardboard/Package Board, Disposable Paper Products, Print/Writing/Office Paper, Composite, Contaminated Soiled Paper
3. The total weight of organic material in the bin, not the total weight of all materials in the bin

Audit K

Service Configuration

Red lid **Landfill**
240L
Fortnightly Collection

Green lid **FOGO**
240L
Weekly Collection

Audit details

Length of FOGO Service at time of audit	< 1 Year
Date:	**March 2017**
Method:	**Aggregated**
Sample size:	
Red lid bin:	**220**
FOGO:	**220**
Matched pairs:	**Unsure**

Audit findings

Food Waste (Average hh/pw)	Garden Waste (Average hh/pw)	FOGO efficiency
1.66 kg 26% is recycled	9.46 kg 99% is recycled	81% recovery

Estimated average volumes[1]

	FOGO bin *Average Kg/hh/wk*	General waste bin *Average Kg/hh/wk*	Total *Average Kg/hh/wk*	FOGO Efficiency *(% diverted from landfill via FOGO)*
Food Waste	0.43	1.24	1.66	26%
Garden Waste	9.36	0.10	9.46	99%
Other acceptable materials[2]	0.68	1.06	1.73	39%
Total Organics[3]	**10.46**	**2.39**	**12.86**	**81%**

Contamination

Weight	Percentage
0.26 kg/hh/wk	2.42%

Top 5 contaminants - kg/hh/pw

1	Containerised Food	0.125
2	Plastic	0.070
3	Glass	0.058
4	Metals	0.005
5	Non-Compostable Paper (e.g. Magazines)	0.000

1. Totals may not equate due to rounding
2. Includes Other putrescible, Wood/Timber. Newspaper, Corrugated Cardboard, Cardboard/Package Board, Disposable Paper Products, Print/Writing/Office Paper, Composite, Contaminated Soiled Paper
3. The total weight of organic material in the bin, not the total weight of all materials in the bin

Audit L

Service Configuration

Red lid **Landfill**
240L
● ● ● ●
Fortnightly Collection

Green lid **FOGO**
240L
● ● ● ●
Weekly Collection

Audit details

Length of FOGO Service at time of audit	< 1 Year
Date:	**March 2017**
Method:	**Aggregated**
Sample size:	
Red lid bin:	**220**
FOGO:	**220**
Matched pairs:	**Unsure**

Audit findings

Food Waste (Average hh/pw)	Garden Waste (Average hh/pw)	FOGO efficiency
3.40 kg 5% is recycled	11.32 kg 99% is recycled	75% recovery

Estimated average volumes[1]

	FOGO bin *Average Kg/hh/wk*	General waste bin *Average Kg/hh/wk*	Total *Average Kg/hh/wk*	FOGO Efficiency *(% diverted from landfill via FOGO)*
Food Waste	0.17	3.22	3.40	5%
Garden Waste	11.20	0.11	11.32	99%
Other acceptable materials[2]	0.51	0.69	1.20	42%
Total Organics[3]	**11.88**	**4.03**	**15.91**	**75%**

Contamination

Weight	Percentage
0.13 kg/hh/wk	1.07%

Top 5 contaminants - kg/hh/pw

1	Plastic	0.083
2	Glass	0.021
3	Non-Compostable Organics (e.g. Textiles)	0.014
4	Metals	0.009
5	Disposable Nappies	0.001

1. Totals may not equate due to rounding
2. Includes Other putrescible, Wood/Timber. Newspaper, Corrugated Cardboard, Cardboard/Package Board, Disposable Paper Products, Print/Writing/Office Paper, Composite, Contaminated Soiled Paper
3. The total weight of organic material in the bin, not the total weight of all materials in the bin

Audit M

Service Configuration

Red lid **Landfill**
240L
Fortnightly Collection

Green lid **FOGO**
240L
Weekly Collection

Audit details

Length of FOGO Service at time of audit	> 1 Year
Date:	October 2017
Method:	Aggregated
Sample size:	
Red lid bin:	100
FOGO:	100
Matched pairs:	Yes

Audit findings

Food Waste (Average hh/pw)	Garden Waste (Average hh/pw)	FOGO efficiency
3.45 kg 78% is recycled	12.59 kg 99% is recycled	86% recovery

Estimated average volumes[1]

	FOGO bin *Average Kg/hh/wk*	General waste bin *Average Kg/hh/wk*	Total *Average Kg/hh/wk*	FOGO Efficiency *(% diverted from landfill via FOGO)*
Food Waste	2.69	0.76	3.45	78%
Garden Waste	12.49	0.10	12.59	99%
Other acceptable materials[2]	0.05	1.72	1.77	3%
Total Organics[3]	**15.23**	**2.58**	**17.81**	**86%**

Contamination

Weight	Percentage
0.18 kg/hh/wk	1.17%

Top 5 contaminants - kg/hh/pw

1	Containerised Food	0.165
2	Plastic	0.010
3	Metals	0.002
4	Building Waste	0.001
5	Non-Compostable Organics (e.g. Textiles)	0.001

1. Totals may not equate due to rounding
2. Includes Other putrescible, Wood/Timber. Newspaper, Corrugated Cardboard, Cardboard/Package Board, Disposable Paper Products, Print/Writing/Office Paper, Composite, Contaminated Soiled Paper
3. The total weight of organic material in the bin, not the total weight of all materials in the bin

Audit N

Service Configuration

Red lid **Landfill**	Green lid **FOGO**
240L	240L
● ● ● ●	● ● ● ●
Fortnightly Collection	**Weekly** Collection

Audit details

Length of FOGO Service at time of audit	**> 1 Year**
Date:	**March 2017**
Method:	**Aggregated**
Sample size:	
Red lid bin:	**150**
FOGO:	**150**
Matched pairs:	**Yes**

Audit findings

Food Waste (Average hh/pw)	Garden Waste (Average hh/pw)	FOGO efficiency
1.66 kg 29% is recycled	11.92 kg 97% is recycled	84% recovery

Estimated average volumes[1]

	FOGO bin *Average Kg/hh/wk*	General waste bin *Average Kg/hh/wk*	Total *Average Kg/hh/wk*	FOGO Efficiency *(% diverted from landfill via FOGO)*
Food Waste	0.49	1.18	1.66	29%
Garden Waste	11.61	0.31	11.92	97%
Other acceptable materials[2]	0.13	0.85	0.98	14%
Total Organics[3]	**12.23**	**2.33**	**14.57**	**84%**

Contamination

Weight	Percentage
0.09 kg/hh/wk	0.74%

Top 5 contaminants - kg/hh/pw

1	Building Waste	0.034
2	Plastic	0.026
3	Earth Based	0.016
4	Disposable Nappies	0.008
5	Containerised Food	0.007

1. Totals may not equate due to rounding
2. Includes Other putrescible, Wood/Timber. Newspaper, Corrugated Cardboard, Cardboard/Package Board, Disposable Paper Products, Print/Writing/Office Paper, Composite, Contaminated Soiled Paper
3. The total weight of organic material in the bin, not the total weight of all materials in the bin

Audit O

Service Configuration

Red lid Landfill
240L
Fortnightly Collection

Green lid FOGO
240L
Weekly Collection

Audit details

Length of FOGO Service at time of audit	> 1 Year
Date:	March 2017
Method:	Aggregated
Sample size:	
Red lid bin:	151
FOGO:	151
Matched pairs:	Yes

Audit findings

Food Waste (Average hh/pw)	Garden Waste (Average hh/pw)	FOGO efficiency
2.02 kg 29% is recycled	12.48 kg 99% is recycled	83% recovery

Estimated average volumes[1]

	FOGO bin Average Kg/hh/wk	General waste bin Average Kg/hh/wk	Total Average Kg/hh/wk	FOGO Efficiency (% diverted from landfill via FOGO)
Food Waste	0.58	1.44	2.02	29%
Garden Waste	12.36	0.12	12.48	99%
Other acceptable materials[2]	0.22	1.06	1.28	17%
Total Organics[3]	**13.16**	**2.63**	**15.78**	**83%**

Contamination

Weight	Percentage
0.16 kg/hh/wk	1.23%

Top 5 contaminants - kg/hh/pw

1	Containerised Food	0.072
2	Building Waste	0.047
3	Miscellaneous	0.020
4	Earth Based	0.014
5	Plastic	0.007

1. Totals may not equate due to rounding
2. Includes Other putrescible, Wood/Timber. Newspaper, Corrugated Cardboard, Cardboard/Package Board, Disposable Paper Products, Print/Writing/Office Paper, Composite, Contaminated Soiled Paper
3. The total weight of organic material in the bin, not the total weight of all materials in the bin

Audit P

Service Configuration

Red lid **Landfill**
240L
Fortnightly Collection

Green lid **FOGO**
240L
Weekly Collection

Audit details

Length of FOGO Service at time of audit	> 1 Year
Date:	March 2017
Method:	Aggregated
Sample size:	
Red lid bin:	150
FOGO:	150
Matched pairs:	Yes

Audit findings

Food Waste (Average hh/pw)	Garden Waste (Average hh/pw)	FOGO efficiency
1.76 kg 24% is recycled	10.95 kg 99% is recycled	82% recovery

Estimated average volumes[1]

	FOGO bin Average Kg/hh/wk	General waste bin Average Kg/hh/wk	Total Average Kg/hh/wk	FOGO Efficiency (% diverted from landfill via FOGO)
Food Waste	0.42	1.34	1.76	24%
Garden Waste	10.84	0.10	10.95	99%
Other acceptable materials[2]	0.13	1.08	1.21	11%
Total Organics[3]	**11.39**	**2.52**	**13.92**	**82%**

Contamination

Weight	Percentage
0.16 kg/hh/wk	1.38%

Top 5 contaminants - kg/hh/pw

1	Building Waste	0.078
2	Containerised Food	0.051
3	Plastic	0.019
4	Metals	0.004
5	Glass	0.002

1. Totals may not equate due to rounding
2. Includes Other putrescible, Wood/Timber. Newspaper, Corrugated Cardboard, Cardboard/Package Board, Disposable Paper Products, Print/Writing/Office Paper, Composite, Contaminated Soiled Paper
3. The total weight of organic material in the bin, not the total weight of all materials in the bin

Audit Q

Service Configuration	Audit details	
	Length of FOGO Service at time of audit	> 1 Year
Red lid **Landfill** 240L ●●●● **Fortnightly** Collection / Green lid **FOGO** 240L ●●●● **Weekly** Collection	Date:	September 2017
	Method:	Aggregated
	Sample size:	
	Red lid bin:	52
	FOGO:	65
	Matched pairs:	No

Audit findings

Food Waste (Average hh/pw)	Garden Waste (Average hh/pw)	FOGO efficiency
4.03 kg 65% is recycled	13.59 kg 95% is recycled	82% recovery

Estimated average volumes[1]

	FOGO bin *Average Kg/hh/wk*	General waste bin *Average Kg/hh/wk*	Total *Average Kg/hh/wk*	FOGO Efficiency *(% diverted from landfill via FOGO)*
Food Waste	2.62	1.42	4.03	65%
Garden Waste	12.96	0.64	13.59	95%
Other acceptable materials[2]	0.13	1.31	1.44	9%
Total Organics[3]	**15.70**	**3.36**	**19.07**	**82%**

Contamination / Top 5 contaminants - kg/hh/pw

Weight	Percentage		Top 5 contaminants - kg/hh/pw	
0.44 kg/hh/wk	2.74%	1	Miscellaneous	0.250
		2	Non-Compostable Organics (e.g. Textiles)	0.125
		3	Plastic	0.025
		4	Hazardous	0.022
		5	Metals	0.012

1. Totals may not equate due to rounding
2. Includes Other putrescible, Wood/Timber. Newspaper, Corrugated Cardboard, Cardboard/Package Board, Disposable Paper Products, Print/Writing/Office Paper, Composite, Contaminated Soiled Paper
3. The total weight of organic material in the bin, not the total weight of all materials in the bin

Audit R

Service Configuration		Audit details	
Red lid **Landfill**	Green lid **FOGO**	Length of FOGO Service at time of audit	**> 1 Year**
140L or 240L	240L	Date:	**February 2017**
Fortnightly Collection	Weekly Collection	Method:	**Aggregated**
		Sample size:	
		Red lid bin:	**215**
		FOGO:	**215**
		Matched pairs:	**Yes**

Audit findings

Food Waste (Average hh/pw)	Garden Waste (Average hh/pw)	FOGO efficiency
2.65 kg 50% is recycled	11.32 kg 99 % is recycled	84% recovery

Estimated average volumes[1]

	FOGO bin *Average Kg/hh/wk*	General waste bin *Average Kg/hh/wk*	Total *Average Kg/hh/wk*	FOGO Efficiency *(% diverted from landfill via FOGO)*
Food Waste	1.31	1.33	2.65	50%
Garden Waste	11.25	0.07	11.32	99%
Other acceptable materials[2]	0.03	1.02	1.06	3%
Total Organics[3]	**12.59**	**2.43**	**15.02**	**84%**

Contamination / Top 5 contaminants - kg/hh/pw

Weight	Percentage		Top 5 contaminants	
0.29 kg/hh/wk	2.28%	1	Building Waste	0.126
		2	Containerised Food	0.102
		3	Plastic	0.020
		4	Hazardous	0.014
		5	Miscellaneous	0.012

1. Totals may not equate due to rounding
2. Includes Other putrescible, Wood/Timber. Newspaper, Corrugated Cardboard, Cardboard/Package Board, Disposable Paper Products, Print/Writing/Office Paper, Composite, Contaminated Soiled Paper
3. The total weight of organic material in the bin, not the total weight of all materials in the bin

Audit S

Service Configuration		Audit details	
Red lid **Landfill** 140L or 240L	Green lid **FOGO** 240L ●●●● Weekly Collection	Length of FOGO Service at time of audit	**> 1 Year**
		Date:	**March 2017**
		Method:	**Bin-by-Bin**
		Sample size:	
		Red lid bin:	**385**
		FOGO:	**161**
		Matched pairs:	**Yes**

Audit findings

Food Waste (Average hh/pw)	Garden Waste (Average hh/pw)	FOGO efficiency
2.88 kg 52% is recycled	10.77 kg 97% is recycled	84% recovery

Estimated average volumes[1]

	FOGO bin *Average Kg/hh/wk*	General waste bin *Average Kg/hh/wk*	Total *Average Kg/hh/wk*	FOGO Efficiency *(% diverted from landfill via FOGO)*
Food Waste	1.49	1.39	2.88	52%
Garden Waste	10.47	0.30	10.77	97%
Other acceptable materials[2]	0.45	0.75	1.20	38%
Total Organics[3]	**12.41**	**2.44**	**14.85**	**84%**

Contamination | Top 5 contaminants - kg/hh/pw

Weight	Percentage			
0.69 kg/hh/wk	5.26%	1	Earth Based	0.232
		2	Plastic	0.193
		3	Non-Compostable Organics (e.g. Textiles)	0.077
		4	Disposable Nappies	0.055
		5	Non-Compostable Paper (e.g. Magazines)	0.033

1. Totals may not equate due to rounding
2. Includes Other putrescible, Wood/Timber. Newspaper, Corrugated Cardboard, Cardboard/Package Board, Disposable Paper Products, Print/Writing/Office Paper, Composite, Contaminated Soiled Paper
3. The total weight of organic material in the bin, not the total weight of all materials in the bin

Audit T

Service Configuration	Audit details	

Service Configuration

Red lid **Landfill**
140L or 240L

Green lid **FOGO**
240L
●●●●
Weekly Collection

Audit details

Length of FOGO Service at time of audit	> 1 Year
Date:	November 2015
Method:	Aggregated
Sample size:	
Red lid bin:	100
FOGO:	98
Matched pairs:	Unsure

Audit findings

Food Waste (Average hh/pw)	Garden Waste (Average hh/pw)	FOGO efficiency
3.90 kg 34% is recycled	4.59 kg 99% is recycled	62% recovery

Estimated average volumes[1]

	FOGO bin *Average Kg/hh/wk*	General waste bin *Average Kg/hh/wk*	Total *Average Kg/hh/wk*	FOGO Efficiency *(% diverted from landfill via FOGO)*
Food Waste	1.32	2.59	3.90	34%
Garden Waste	4.53	0.05	4.59	99%
Other acceptable materials[2]	0.12	1.05	1.17	10%
Total Organics[3]	**5.97**	**3.69**	**9.66**	**62%**

Contamination / Top 5 contaminants - kg/hh/pw

Weight	Percentage		Top 5 contaminants - kg/hh/pw	
0.43 kg/hh/wk	6.72%	1	Miscellaneous	0.247
		2	Non-Compostable Organics (e.g. Textiles)	0.045
		3	Plastic	0.038
		4	Glass	0.029
		5	Containerised Food	0.021

1. Totals may not equate due to rounding
2. Includes Other putrescible, Wood/Timber. Newspaper, Corrugated Cardboard, Cardboard/Package Board, Disposable Paper Products, Print/Writing/Office Paper, Composite, Contaminated Soiled Paper
3. The total weight of organic material in the bin, not the total weight of all materials in the bin

Audit U

Service Configuration		Audit details	
Red lid Landfill 140L or 240L	**Green lid FOGO** 240L Weekly Collection	Length of FOGO Service at time of audit	**> 1 Year**
		Date:	**March 2016**
		Method:	**Aggregated**
		Sample size:	
		Red lid bin:	**160**
		FOGO:	**116**
		Matched pairs:	**Unsure**

Audit findings

Food Waste (Average hh/pw)	Garden Waste (Average hh/pw)	FOGO efficiency
4.51 kg 40% is recycled	5.24 kg 97% is recycled	67% recovery

Estimated average volumes[1]

	FOGO bin Average Kg/hh/wk	General waste bin Average Kg/hh/wk	Total Average Kg/hh/wk	FOGO Efficiency (% diverted from landfill via FOGO)
Food Waste	1.79	2.72	4.51	40%
Garden Waste	5.10	0.13	5.24	97%
Other acceptable materials[2]	0.13	0.66	0.79	16%
Total Organics[3]	**7.02**	**3.52**	**10.53**	**67%**

Contamination / Top 5 contaminants - kg/hh/pw

Weight	Percentage		Top 5 contaminants	
0.75 kg/hh/wk	9.71%	1	Miscellaneous	0.423
		2	Non-Compostable Organics (e.g. Textiles)	0.148
		3	Disposable Nappies	0.067
		4	Plastic	0.048
		5	Containerised Food	0.030

1. Totals may not equate due to rounding
2. Includes Other putrescible, Wood/Timber. Newspaper, Corrugated Cardboard, Cardboard/Package Board, Disposable Paper Products, Print/Writing/Office Paper, Composite, Contaminated Soiled Paper
3. The total weight of organic material in the bin, not the total weight of all materials in the bin

Audit V

Service Configuration		Audit details	
Red lid **Landfill** 140L or 240L	Green lid **FOGO** 240L Weekly Collection	**Length of FOGO Service at time of audit**	**> 1 Year**
		Date:	**May 2016**
		Method:	**Aggregated**
		Sample size:	
		Red lid bin:	**110**
		FOGO:	**110**
		Matched pairs:	**Unsure**

Audit findings

Food Waste (Average hh/pw)	Garden Waste (Average hh/pw)	FOGO efficiency
4.88 kg 52% is recycled	3.15 kg 99% is recycled	66% recovery

Estimated average volumes[1]

	FOGO bin *Average Kg/hh/wk*	**General waste bin** *Average Kg/hh/wk*	**Total** *Average Kg/hh/wk*	**FOGO Efficiency** *(% diverted from landfill via FOGO)*
Food Waste	2.55	2.33	4.88	52%
Garden Waste	3.13	0.02	3.15	99%
Other acceptable materials[2]	0.24	0.64	0.89	27%
Total Organics[3]	**5.92**	**3.00**	**8.91**	**66%**

Contamination		Top 5 contaminants - kg/hh/pw		
Weight	**Percentage**	**1**	Miscellaneous	0.627
0.83 kg/hh/wk	12.36%	**2**	Plastic	0.063
		3	Containerised Food	0.060
		4	Non-Compostable Organics (e.g. Textiles)	0.036
		5	Metals	0.017

1. Totals may not equate due to rounding
2. Includes Other putrescible, Wood/Timber. Newspaper, Corrugated Cardboard, Cardboard/Package Board, Disposable Paper Products, Print/Writing/Office Paper, Composite, Contaminated Soiled Paper
3. The total weight of organic material in the bin, not the total weight of all materials in the bin

Audit W

Service Configuration		Audit details	
Red lid **Landfill** 120L ●●●● Weekly Collection	Green lid **FOGO** 240L ●○○○ Fortnightly Collection	Length of FOGO Service at time of audit	**< 1 Year**
		Date:	**August 2015**
		Method:	**Bin-by-Bin**
		Sample size:	
		Red lid bin:	**216**
		FOGO:	**Did Not Audit**
		Matched pairs:	**No**

Audit findings

Food Waste (Average hh/pw)	Garden Waste (Average hh/pw)	FOGO efficiency
NA	NA	NA

Estimated average volumes[1]

	FOGO bin *Average Kg/hh/wk*	General waste bin *Average Kg/hh/wk*	Total *Average Kg/hh/wk*	FOGO Efficiency *(% diverted from landfill via FOGO)*
Food Waste	NA	2.16	NA	NA
Garden Waste	NA	0.01	NA	NA
Other acceptable materials[2]	NA	0.70	NA	NA
Total Organics[3]	NA	**2.87**	NA	NA

Contamination / Top 5 contaminants - kg/hh/pw

Weight	Percentage			
NA	NA	1	NA	NA
		2	NA	NA
		3	NA	NA
		4	NA	NA
		5	NA	NA

1. Totals may not equate due to rounding
2. Includes Other putrescible, Wood/Timber. Newspaper, Corrugated Cardboard, Cardboard/Package Board, Disposable Paper Products, Print/Writing/Office Paper, Composite, Contaminated Soiled Paper
3. The total weight of organic material in the bin, not the total weight of all materials in the bin

Council X

Service Configuration		Audit details	
Red lid **Landfill** 140L or 240L Weekly Collection	Green lid **FOGO** 240L Weekly Collection	**Length of FOGO Service at time of audit**	No FOGO, garden organics only
		Date:	**October 2011**
		Method:	**Bin-by-Bin**
		Sample size:	
		Red lid bin:	**240**
		FOGO:	**Did Not Audit**
		Matched pairs:	**Yes (Recycling)**

Audit findings

Food Waste (Average hh/pw)	Garden Waste (Average hh/pw)	FOGO efficiency
NA	NA	NA

Estimated average volumes[1]

	FOGO bin *Average Kg/hh/wk*	General waste bin *Average Kg/hh/wk*	Total *Average Kg/hh/wk*	FOGO Efficiency *(% diverted from landfill via FOGO)*
Food Waste	NA	2.72	NA	NA
Garden Waste	NA	0.30	NA	NA
Other acceptable materials[2]	NA	1.37	NA	NA
Total Organics[3]	NA	**4.39**	NA	NA

Contamination		Top 5 contaminants - kg/hh/pw		
Weight	**Percentage**	**1**	NA	NA
NA	NA	**2**	NA	NA
		3	NA	NA
		4	NA	NA
		5	NA	NA

1. Totals may not equate due to rounding
2. Includes Other putrescible, Wood/Timber. Newspaper, Corrugated Cardboard, Cardboard/Package Board, Disposable Paper Products, Print/Writing/Office Paper, Composite, Contaminated Soiled Paper
3. The total weight of organic material in the bin, not the total weight of all materials in the bin

Council Y

Service Configuration		Audit details	
Red lid **Landfill** 240L Fortnightly Collection	Green lid **FOGO** 240L Weekly Collection	Length of FOGO Service at time of audit	> 1 Year
		Date:	November 2016
		Method:	Aggregated
		Sample size:	
		Red lid bin:	145
		FOGO:	Did Not Audit
		Matched pairs:	No

Audit findings

Food Waste (Average hh/pw)	Garden Waste (Average hh/pw)	FOGO efficiency
NA	NA	NA

Estimated average volumes[1]

	FOGO bin Average Kg/hh/wk	General waste bin Average Kg/hh/wk	Total Average Kg/hh/wk	FOGO Efficiency (% diverted from landfill via FOGO)
Food Waste	NA	1.30	NA	NA
Garden Waste	NA	0.21	NA	NA
Other acceptable materials[2]	NA	0.91	NA	NA
Total Organics[3]	NA	**2.41**	NA	NA

Contamination / Top 5 contaminants - kg/hh/pw

Weight	Percentage			
NA	NA	1	NA	NA
		2	NA	NA
		3	NA	NA
		4	NA	NA
		5	NA	NA

1. Totals may not equate due to rounding
2. Includes Other putrescible, Wood/Timber. Newspaper, Corrugated Cardboard, Cardboard/Package Board, Disposable Paper Products, Print/Writing/Office Paper, Composite, Contaminated Soiled Paper
3. The total weight of organic material in the bin, not the total weight of all materials in the bin

Council Z

Service Configuration		Audit details	
Red lid **Landfill** 240L ●●●● Fortnightly Collection	Green lid **FOGO** 240L ●●●● Weekly Collection	**Length of FOGO Service at time of audit**	**< 1 Year**
		Date:	**November 2016**
		Method:	**Bin-by-Bin**
		Sample size:	
		Red lid bin:	**214**
		FOGO:	**Did Not Audit**
		Matched pairs:	**Unsure**

Audit findings

Food Waste (Average hh/pw)	Garden Waste (Average hh/pw)	FOGO efficiency
NA	NA	NA

Estimated average volumes[1]

	FOGO bin *Average Kg/hh/wk*	General waste bin *Average Kg/hh/wk*	Total *Average Kg/hh/wk*	FOGO Efficiency *(% diverted from landfill via FOGO)*
Food Waste	NA	1.77	NA	NA
Garden Waste	NA	0.08	NA	NA
Other acceptable materials[2]	NA	0.77	NA	NA
Total Organics[3]	NA	**2.63**	NA	NA

Contamination		Top 5 contaminants - kg/hh/pw		
Weight	**Percentage**	1	NA	NA
NA	NA	2	NA	NA
		3	NA	NA
		4	NA	NA
		5	NA	NA

1. Totals may not equate due to rounding
2. Includes Other putrescible, Wood/Timber. Newspaper, Corrugated Cardboard, Cardboard/Package Board, Disposable Paper Products, Print/Writing/Office Paper, Composite, Contaminated Soiled Paper
3. The total weight of organic material in the bin, not the total weight of all materials in the bin

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