Reporting FOGO emissions impacts – Phase II report

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Prepared for

Eastern Alliance for Greenhouse Action

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Author(s)	Piya Nyunt
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Blue Environment Pty Ltd
ABN 78 118 663 997
Suite 209, 838 Collins St, Docklands Vic 3008
Email: blue@blueenvironment.com.au
Web: www.blueenvironment.com.au
Phone: 03 9081 0440

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Abbreviations and glossary

BAU	business-as-usual
CO_2-e	carbon dioxide equivalent
EAGA	Eastern Alliance for Greenhouse Action
FO	food organics
FOGO	food organics and garden organics
GHG	greenhouse gas
GO	garden organics
t	tonnes
WtE	waste to energy

1. Introduction

In February 2025, the Eastern Alliance for Greenhouse Action (EAGA) commissioned Blue Environment to construct a tool that calculates greenhouse gas (GHG) emissions reductions associated with the implementation of household food organics and garden organics (FOGO) collections across its eight member councils:

- City of Boroondara
- Glen Eira City Council
- Knox City Council
- Maroondah City Council
- City of Monash
- Stonnington City Council
- Whitehorse City Council
- Yarra Ranges Shire Council.

Landfilled organics can be a large contributor to a council's emissions profile and establishment of a good FOGO system will make a significant difference over the long-term. This project's objective is to establish robust estimates of emissions reductions related to FOGO services and communicate the impact of diverting food organics (FO) from landfill to communities and stakeholders.

EAGA and its member councils have already undertaken initial work to quantify FOGO collections and emission impacts in **Phase I** of this study. This project represents **Phase II**.

All EAGA councils currently provide FOGO collections to households in their communities, implemented between 2018 and 2023, as summarised in Table 1. The locations of EAGA member councils within Victoria are shown in Figure 1.

Table 1 Summary of current EAGA council FOGO services

Service parameter	Boroondara	Glen Eira	Knox	Maroondah	Monash	Stonnington	Whitehorse	Yarra Ranges
FOGO start date	May 2020	May 2018	April 2023	May 2023	July 2020	April 2020	July 2022	October 2023
FOGO collection frequency	Weekly	Weekly	Weekly	Fortnightly	Weekly	Fortnightly	Fortnightly	Weekly
FOGO service scope	Universal	Universal	Universal (opt-out)	Universal	Universal	Voluntary	Voluntary	Universal
FOGO provider	Bio Gro Composting Facility	Veolia Dandenong South Service Centre	Bio Gro Composting Facility	Bio Gro Composting Facility	Cleanaway South East Organics Facility	Bio Gro Composting Facility	Bio Gro Composting Facility	Bio Gro Composting Facility
Landfill provider	Cleanaway MRL	Cleanaway MRL	Cleanaway MRL	Veolia Hampton Park	Cleanaway MRL	Cleanaway MRL	Cleanaway MRL	Veolia Hampton Park
Waste to energy (WtE)	In medium to long term	Not currently	Not currently	Planned	Planned	Not currently	Not currently	Not currently

Figure 1 A map of Victoria showing EAGA member councils

Source: https://eaga.com.au/about/the-region/

The project requirements were:

- Review existing FOGO data for the 8 EAGA member councils. Supplement identified data gaps using other sources where possible.
- Identify opportunities to improve council data collection and reporting, and provide recommendations for implementation.
- Establish a representative baseline scenario (pre-FOGO) for emissions before FOGO implementation.
- Establish an actual current scenario (post-FOGO) for emissions after FOGO implementation.
- Consult EAGA member councils and other stakeholders to ensure the tool fully satisfies waste reporting needs.
- Model the emissions impact of FOGO programs for each EAGA member council.
- Summarise the project findings in a report.

The key outputs of the project are:

1. A Microsoft Excel tool that calculates emissions reductions associated with the implementation of FOGO programs compared to a pre-FOGO baseline. The tool will allow for easy entry of new tonnage data and variables, with accessible and extractable data outputs and visual representations. A version of the tool is provided for each EAGA council, as well as a summary that collates results for all eight member councils.
2. A report summarising the impact of FOGO programs for each EAGA council and across the region, including organics recovered and emissions saved.

The primary project output is the emissions reduction tool ('EAGA FOGO impacts calculator'), which was developed to be suitable for public release and wider use for the Australian local government sector. This report is submitted together with the calculator to concisely summarise the results.

2. EAGA FOGO impacts calculator

2.1 Model framework

The '**EAGA FOGO impacts calculator**' is a Microsoft Excel tool for local governments that estimates the greenhouse gas emissions reductions associated with the implementation of household FOGO collections. The tool was developed to be suitable for any Australian council. It calculates and compares total emissions associated with household garbage and FOGO materials before and after the introduction of FO / FOGO services. The pre-FOGO baseline can exclude garden organics (GO) collections if the entire organics service is new, or include them if only the food collections are new.

Emissions included in the scope of the tool are those from landfill methane, composting, waste transport and waste handling and processing (including direct emissions and those associated with electricity consumption). A selection of 'avoided emissions' are also estimated and can be included based on user selection. These comprise avoidance associated with recovering landfill gas for electricity, carbon sequestration due to use of compost, residual carbon sequestration in landfill, and replacing fertiliser with compost.

Emissions are presented as the effect of emitted greenhouse gases proportional to the effect of carbon dioxide over a global warming potential timeframe of 100 years[1]. All emissions are calculated as instantaneous but it should be noted processes such as decomposition of carbon under anaerobic conditions in landfills happen over the course of decades.

The tool estimates and compares greenhouse gas emissions from a 'base case' (the pre-FOGO baseline year) and a 'treatment case' (the actual post-FOGO current year), both of which represent a 12-month period. Users can select one of two options under the base case to compare their current scenario against:

- **Baseline** – The baseline is the pre-FOGO year as defined by the user in the model set-up.
- **Business-as-usual** (BAU) – BAU is a projection from the baseline to the current year that estimates where a local council would currently be if it did not implement FOGO. This projection

[1] The tool's default global warming potential timeframe is 100 years, as this is the most commonly used timeframe and used as a standard by the United Nations' Intergovernmental Panel on Climate Change. However, a timeframe of 20 years can be selected by users in the 'Parameters' worksheet.

assumes waste generation grows in line with population and adopts the current year's landfill gas capture rate and electricity emissions factor.

Modelled results are for a single year and do not cumulate emissions across multiple years. However, there is capacity for users to manually track cumulative results over time, as specified in Section 2.2.

As well as emissions, the tool quantifies food collected through household garbage and FOGO bins, which are used to calculate an indicative household food diversion rate[2]. The apparent reduction in the weight of collected garbage and proportion of food in the garbage bin from the implementation of FOGO are also key modelling outputs.

2.2 Model structure

Descriptions of the tool's worksheets are provided in Table 2. User entry cells in the tool are formatted with yellow shading and a red border.

The tool guides users through an initial model set-up stage, then presents results in the '**Dashboard**' worksheet. The tool can be updated each year as new council inputs for collected kerbside waste and bin audits become available. Councils can track annual results over time in the '**Trends**' worksheet.

Table 2 Worksheets in the EAGA FOGO impacts calculator

Worksheet group	Worksheet name	Worksheet description
Contents	Contents	This worksheet describes the workbook and its contents.
Model set-up	1. Council data	This worksheet is used to input key council data for use in the tool.
	2. Garbage composition	This worksheet is used to specify the composition of household garbage bins for use in the tool.
	3. Organics composition	This worksheet is used to specify the composition of household organics bins for use in the tool.
	4. Populations	This worksheet is used to input Australian population data by local government area, for use if the user has not entered specific data on this in the first model set-up worksheet.
	5. Landfill gas	A collection of factors related to landfill methane emissions, which are used to calculate state average landfill methane capture rates, for use if the user has not entered specific data on this in the first model set-up worksheet.
	6. Electricity factors	This worksheet is used to input factors for use in calculating emissions from consumption of purchased or acquired electricity.
Outputs	Dashboard	The EAGA FOGO impacts calculator dashboard. Key inputs and results are shown at the top of the dashboard, with detailed modelling calculations below.
	Trends	This worksheet is for users to manually enter time-series modelling outputs to observe trends over time.
Other inputs	Parameters	A collection of parameters and factors used in this tool. These do not need to be updated annually but should be checked periodically in case, for example, values in the *National Greenhouse and Energy Reporting (Measurement) Determination 2008* have changed.
List and references	Lists	A collection of lists of categories and other typologies that are provided here to be used globally across the workbook.

[2] Household food diversion rate = weight of food in FOGO / (weight of food in FOGO + weight of food in garbage).

A set of key modelling parameters are provided in the dashboard, which users can adjust to immediately observe how this affects the modelling outputs:

- **Baseline or business-as-usual**. This button allows users to toggle between 'baseline' or 'business-as-usual' for the pre-FOGO scenario.
- **Total or per capita**. This allows users to show modelling outputs as total or per capita values.
- **Avoided emissions**. This button allows users to toggle avoided emissions on and off in the modelling outputs. It is recommended avoided emissions are viewed as informational only and excluded from wider emissions reporting.

Note the potential impact of thermal waste to energy is not quantified in the tool because:

- EAGA councils do not yet send garbage to WtE plants, although some intend to in the future
- emissions associated with thermal WtE are dependent on specific facilities' technology (combustion, gasification and pyrolysis technologies or any hybrid variant), which are not yet known in detail
- permissible wastes for WtE are not known for all states and territories.

Expansion of the tool to incorporate WtE may be a potential future improvement.

Please refer to the '**Contents**' worksheet of the tool for further guidance and definitions.

3. Results

Key findings from the modelling are presented in this section, including comparative results for the pre-FOGO business-as-usual scenario **(BAU)** and actual post-FOGO current scenario **(actual)**. Key assumptions and model settings include:

- the actual post-FOGO current year is 2023–24 (implemented in '1. Council data')
- the pre-FOGO scenario is business-as-usual (implemented in 'Dashboard')
- avoided emissions are excluded (implemented in 'Dashboard')
- methane global warming potential is based on a 100-year timeframe (implemented in 'Parameters')
- for EAGA councils without pre-FOGO bin audit data available, the weighted average results from EAGA councils with applicable audit data are adopted (implemented in '2. Garbage composition' and/or '3. Organics composition' where applicable)
- for EAGA councils without diesel usage data for transporting garbage and FOGO, the weighted average results from EAGA councils with applicable diesel data are adopted (implemented in '1. Council data' where applicable)
- as Yarra Ranges introduced FOGO in October 2023, the average garbage and FOGO tonnes collected per month across October 2023 to June 2024 are assumed to be representative for July to September 2023, in order to estimate a more representative post-FOGO current scenario for the purposes of this study (implemented in '1. Council data' where applicable)
- packaged food in audit data is assumed to be 90% food and 10% packaging (with packaging assumed to be inert) (implemented in '2. Garbage composition' and/or '3. Organics composition' where applicable)
- per capita values represent averages across the entire population of a municipality – these approximations may be slightly skewed for councils that do not service all households (e.g. multi-unit dwellings with private waste collections).

Table 3 shows estimated BAU and actual greenhouse gas emissions associated with garbage and FOGO in 2023–24, ordered by most to least difference in BAU and actual emissions. The results indicate the implementation of FOGO has prevented greenhouse gas emissions for all EAGA councils, with estimated savings per council ranging in 2023–24 from 1,800–9,500 tonnes (t) of carbon dioxide equivalent (CO_2-e). Overall savings across the region in 2023–24 are estimated at about 44,000 t CO_2-e.

Table 3 Estimated GHG emissions associated with garbage and FOGO – difference between BAU and actual in 2023–24 by council

Council	Estimated greenhouse gas emissions in 2023–24			
	BAU	Actual	Difference	
	(t CO_2-e)	(t CO_2-e)	(t CO_2-e)	(% of BAU)
Boroondara	19,600	10,200	-9,500	48%
Monash	19,900	12,500	-7,400	37%
Glen Eira	19,100	11,900	-7,200	38%
Yarra Ranges	21,400	14,200	-7,200	34%
Knox	16,900	10,800	-6,200	36%
Whitehorse	17,700	15,000	-2,700	15%
Maroondah	14,500	12,300	-2,100	15%
Stonnington	15,900	14,100	-1,800	11%
Total	**145,000**	**101,000**	**-44,000**	**30%**

The results presented in Table 3 assume a 100-year timeframe for the global warming potential of methane. If a 20-year global warming potential timeframe is applied, the greenhouse gas emissions savings across EAGA councils in 2023–24 are estimated at almost 144,000 t CO_2-e.

Figure 2 presents estimated BAU and actual emissions in 2023–24 in ascending order of estimated actual emissions, while Figure 3 breaks this down on a per capita basis. The per capita estimates range from 57–124 kg CO_2-e/capita, with Boroondara performing the best (lowest emissions per capita).

Figure 2 Estimated GHG emissions associated with garbage and FOGO – BAU and actual in 2023–24 by council

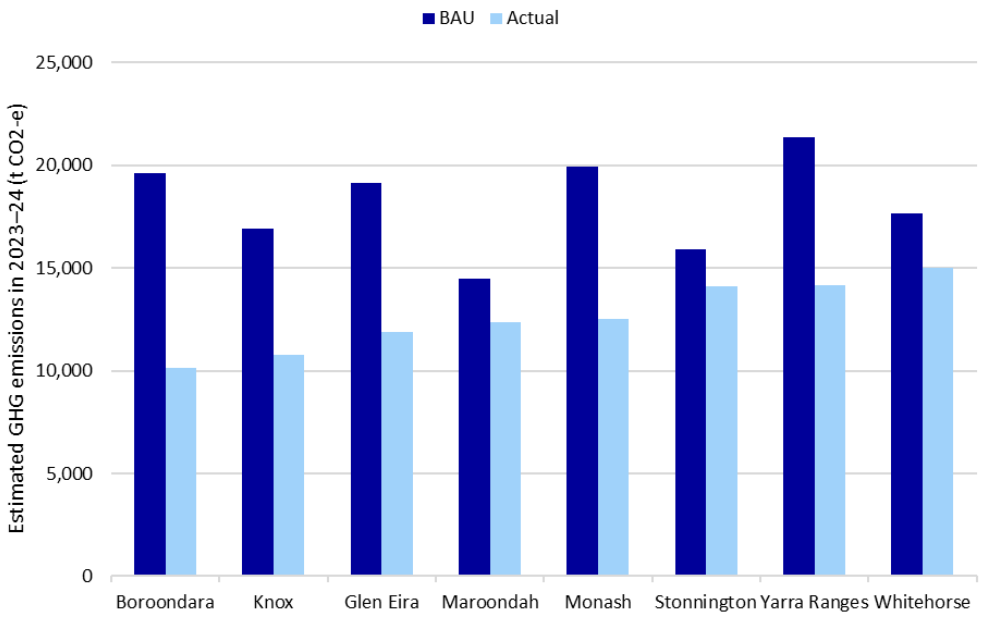
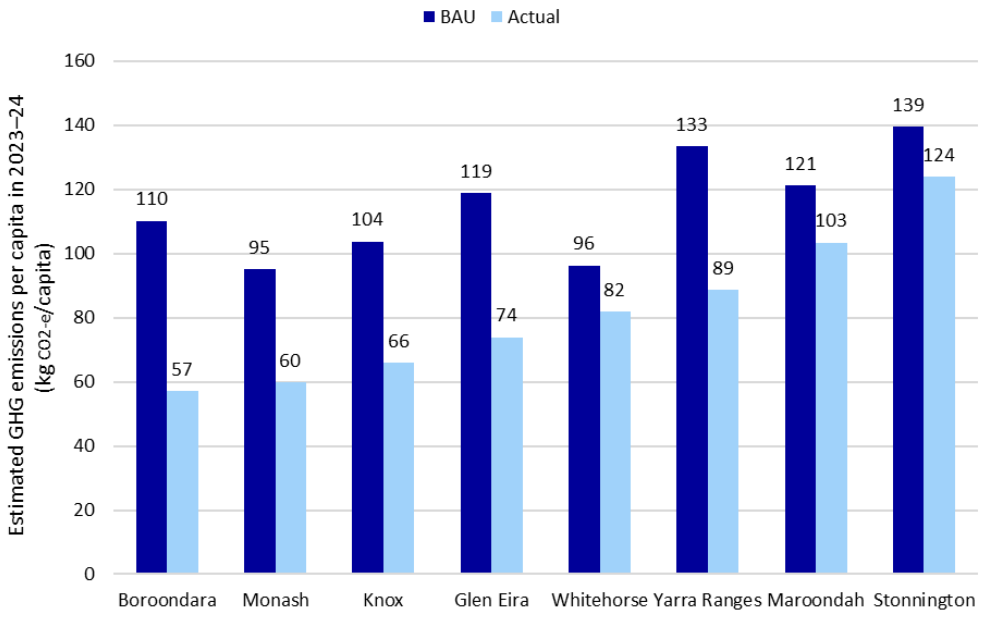


Figure 3 Estimated GHG emissions associated with garbage and FOGO per capita – BAU and actual in 2023–24 by council



The following two charts show the difference between estimated BAU and actual emissions in 2023–24, with Figure 4 showing the impact of FOGO service collection frequency and Figure 5 showing the impact of FOGO service scope. The data suggests the provision of both weekly and universal FOGO are associated with a better performing service and greater emissions savings.

Figure 4 *Estimated GHG emissions associated with garbage and FOGO – difference between BAU and actual in 2023–24 by council, showing the impact of FOGO service collection frequency*

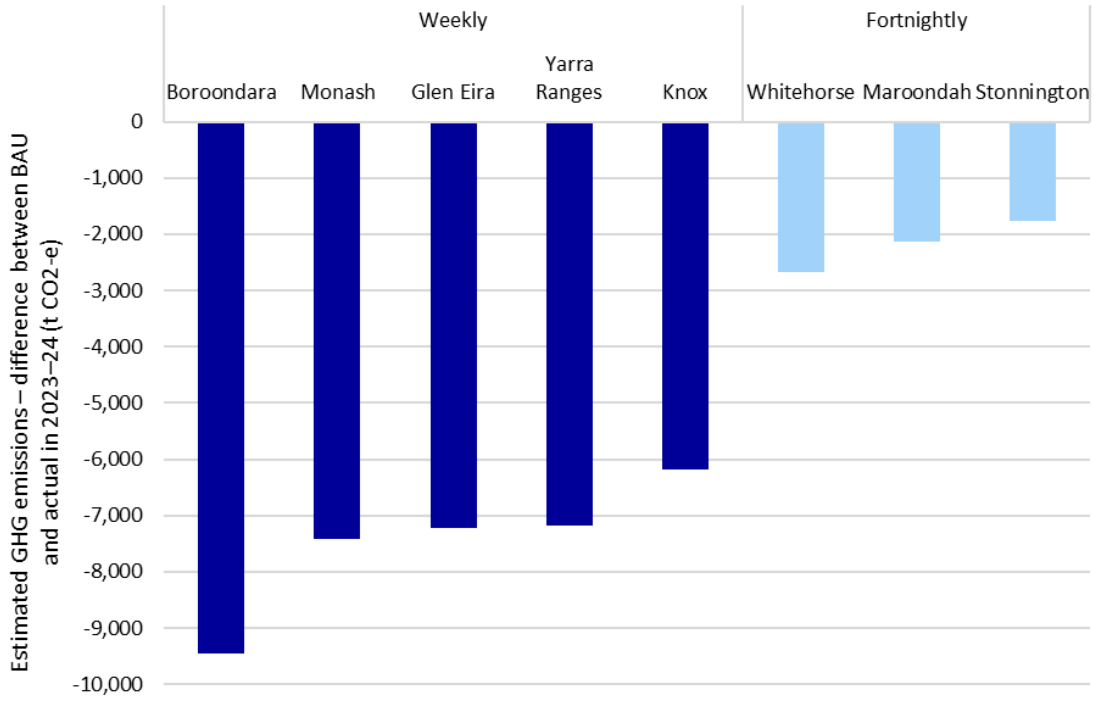


Figure 5 *Estimated GHG emissions associated with garbage and FOGO – difference between BAU and actual in 2023–24 by council, showing the impact of FOGO service scope*

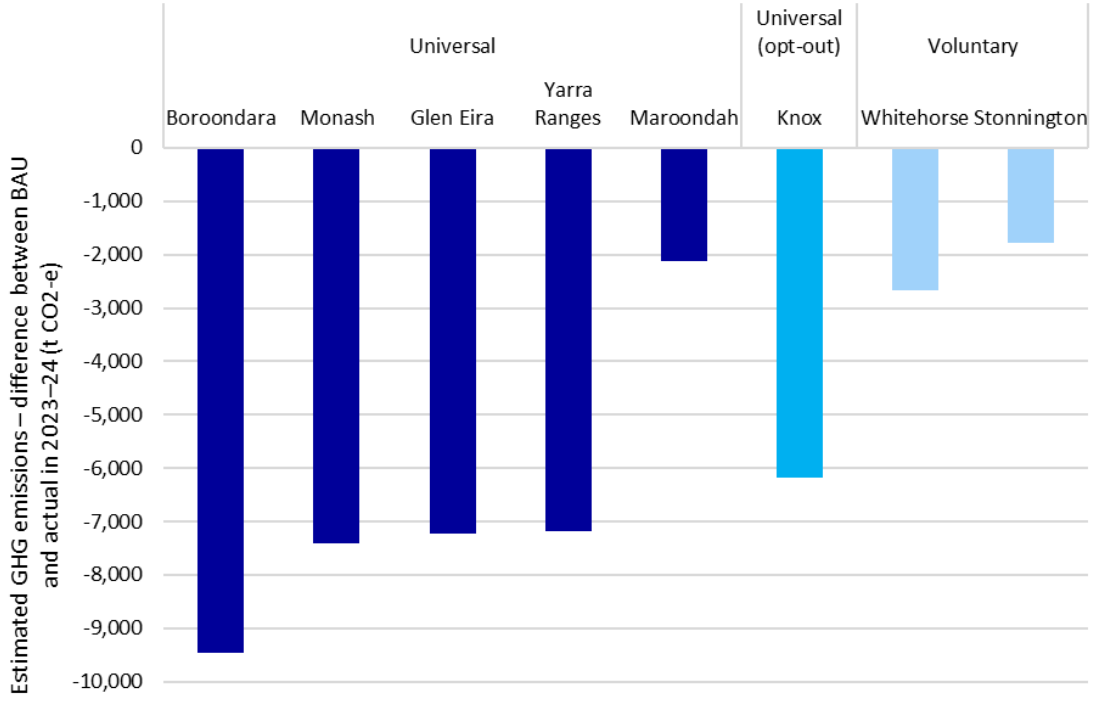


Figure 6 presents actual collected garbage and FOGO per capita in 2023–24 by bin type, while Figure 7 shows collected food per capita only. Data is presented in order of lowest to highest overall quantities per capita. The garbage and FOGO collections per council range from 234–333 kg/capita, with Whitehorse showing the lowest waste generation rates and Yarra Ranges the highest. Food collections per council range from 48–93 kg/capita.

The spread of collected quantities by bin type varies across councils. Stonnington shows notably high quantities of collected garbage, while Knox and Yarra Ranges show notably high quantities of collected FOGO. The high FOGO collections for Knox and Yarra Ranges are likely attributable to these councils being further from Melbourne (see Figure 1) in 'greener' areas with households with large gardens, although collected food for these councils are also estimated to be relatively high.

Figure 6 Collected garbage and FOGO per capita in 2023–24 by council by bin type

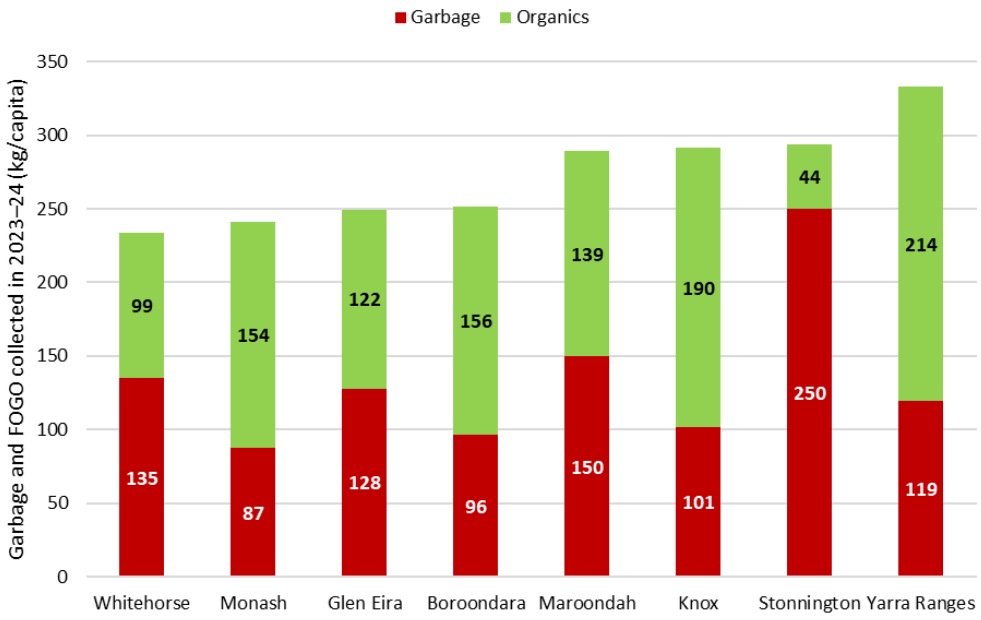
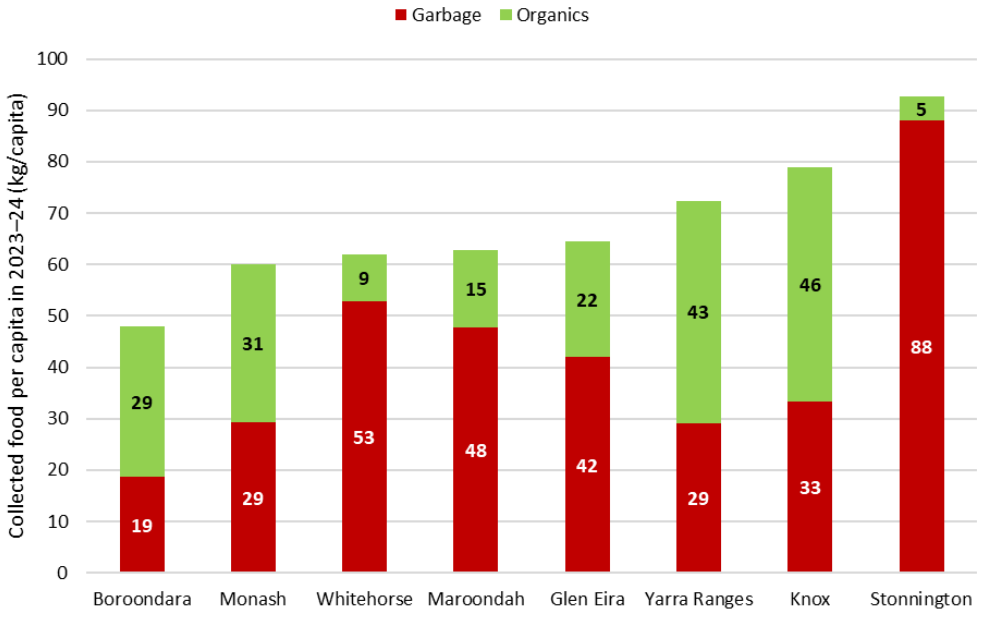


Figure 7 Collected food per capita in 2023–24 by council by bin type



The following two charts hone in on the effectiveness of FOGO services and why certain councils appear to perform better than others. Figure 8 shows the difference between estimated BAU and actual garbage collections in 2023–24, ordered by highest to lowest difference. The results correlate with results for emissions savings (see Figure 2). Boroondara, for example, has seen a marked decrease in garbage collections since introducing its FOGO service, and that reduction is associated with significant emissions savings, primarily through lower food-related methane releases from landfill.

Figure 9 shows the proportion (by weight) of each council's household garbage bin that is food in 2023–24. The chart is ordered from least to most food, with values ranging from 19–39%. Boroondara's audit data suggests its average garbage bin contained the least food out of the EAGA councils at 19%.

Figure 8 Collected garbage – difference between BAU and actual in 2023–24 by council

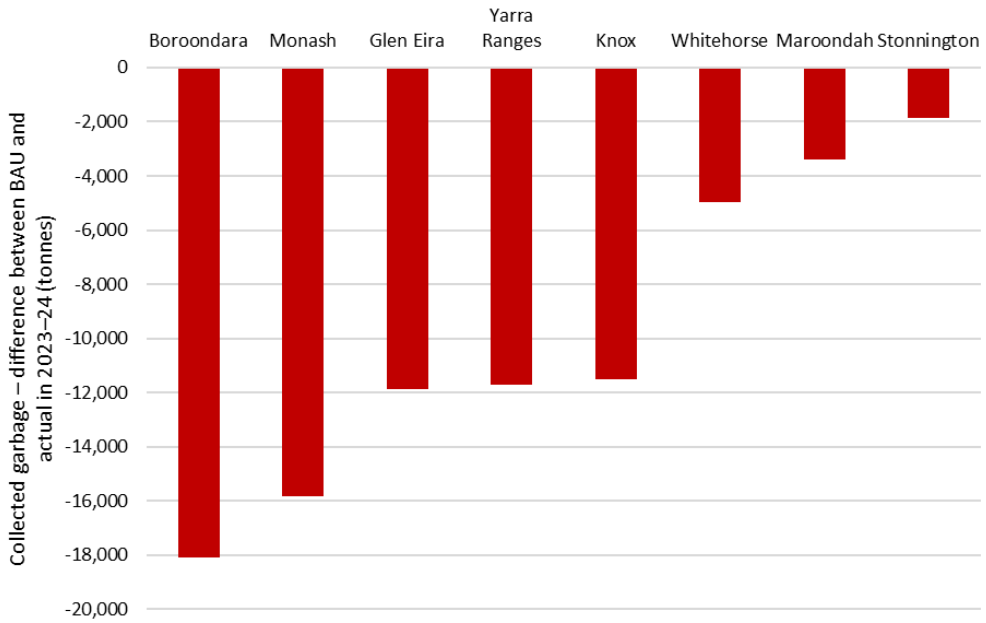


Figure 9 Proportion of the household garbage bin that is food in 2023–24 by council

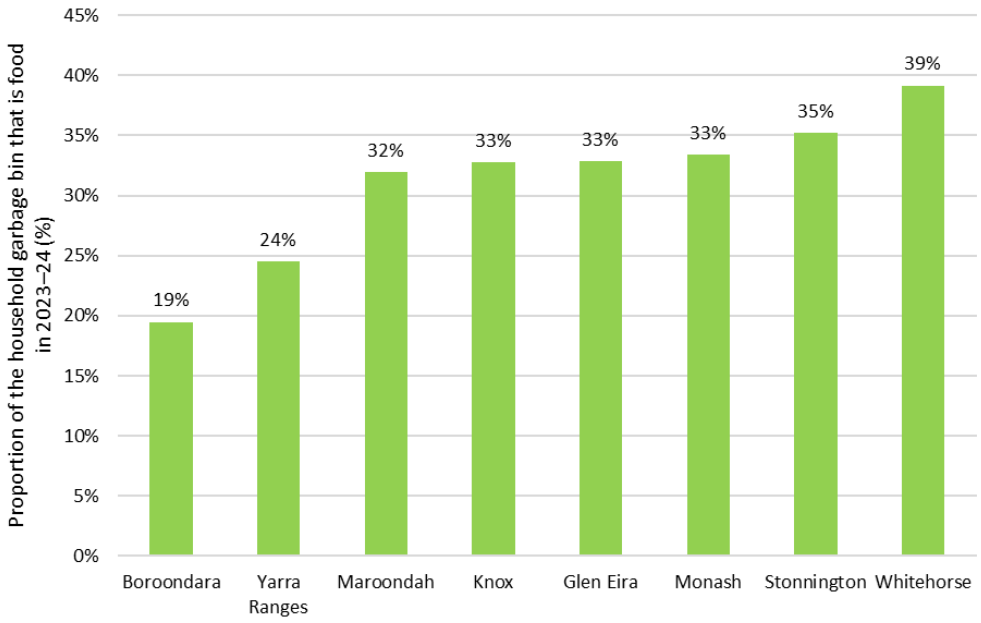
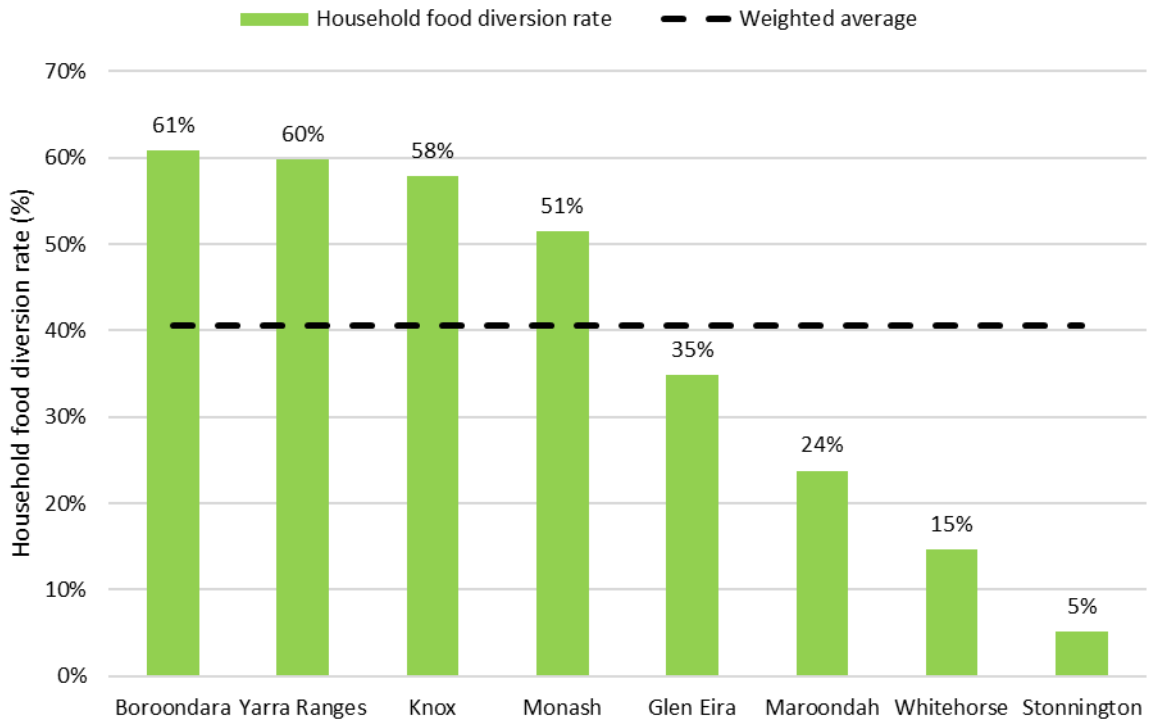


Figure 10 presents estimated household food diversion rates in 2023–24 by council in order of highest to lowest value. The diversion rate is calculated as the weight of food in the FOGO bin divided by the weight of food in the FOGO and garbage bin. There is relatively high variability across councils, with rates ranging from 5–61%. The weighted average was 41%.

The diversion rate is largely driven by the quantity of collected garbage and the proportion of collected garbage that was food. It provides a reasonable indicative view of the overall performance of the FOGO system, but it is worth noting the introduction of FOGO has beneficially impacted all EAGA councils in terms of greenhouse gas emissions reductions and diversion of organics from landfill, even those with relatively low current food diversion rates.

Figure 10 Estimated household food diversion rates in 2023–24 by council



4. Recommendations

Key recommendations for EAGA's member councils are provided below.

1. To maximise emissions reductions from your FOGO service, maintain or implement universal weekly FOGO collections as part of your standard household waste service, combined with ongoing education.
2. Aim to collect local household bin audit data on a regular basis. The ideal pace is annually.
3. Request annual landfill gas capture rates as a part of your contract with your landfill provider. This is a valuable datapoint and should be made available to you as a customer. We note none of the eight EAGA councils were able to provide landfill gas capture rates as part of this project.
4. Use the EAGA FOGO impacts calculator and update it annually. We recommend reporting results using the business-as-usual scenario with avoided emissions excluded.