Regional organic waste mapping in South Australia

Final report

prepared for

Zero Waste SA

by

Blue Environment Pty Ltd

in association with

Tonkin Consulting

16 October 2012

Regional organic waste mapping in South Australia

Final report: P298
16 October 2012

Disclaimer

This report has been prepared for Zero Waste SA in accordance with the terms and conditions of appointment dated 26 April 2012, and is based on the assumptions and exclusions set out in our scope of work. Information in this document is current as of October 2012. This report has been compiled based on secondary information and data provided by other parties; as such it relies on the accuracy of the provided material. Although the data has been reviewed, the information provided was assumed to be correct unless otherwise stated.

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

Blue Environment prints on 100% recycled content paper

Authors
C Wardle, M Hawson

Reviewers
P Lightbody, J Pickin, L Ramsden

Blue Environment Pty Ltd
ABN 78 118 663 997
271 Mont Albert Road, Surrey Hills Vic 3127
email: blue@blueenvironment.com.au
web: www.blueenvironment.com.au
Phone +61 3 9880 7080
+61 3 5426 3536

CONTENTS

Summary ..... **iii**

1. Introduction **1**

2. Project approach **3**

2.1 Project methodology 3
2.2 Survey 3

3. Waste generators **5**

3.1 Respondents 5
3.2 Amount 7
3.3 Seasonal generation 10
3.4 Waste characteristics 10
3.5 Current management 11
3.6 Committed timeframe 14
3.7 Costs & revenue 14
3.8 On-site processing 16
3.9 Other comments 16

4. Waste processors **18**

5. Discussion **19**

6. Conclusions **24**

Appendices

Appendix A Methodology
Appendix B Survey forms
Appendix C Raw data
Appendix D Maps

Tables

Table 1: Solid and liquid waste categories 4
Table 2: Number of responding waste generators by ANZSIC group 6
Table 3: ANZSIC groups represented in survey results ..... **Error! Bookmark not defined.**
Table 4: Amount of solid waste reported by council area (tonnes/year) 8
Table 5: Solid waste generation by ANZSIC division (tonnes/year) 9
Table 6: Estimated organic generation per ANZSIC division (tonnes/year) 21
Table 7: 2016 projected organic generation per ANZSIC division (tonnes/year) 22

Figures

Figure 1: Map of council areas 2
Figure 2: % responses by ANZSIC group 5
Figure 3: Waste type by % 8
Figure 4: Waste generation by ANZSIC group (as % of total organic waste in 3 council areas) 9
Figure 5: Solid waste disposal pathways (%) 12
Figure 6: Solid waste disposal pathways (tonnes/year) 13
Figure 7: Liquid waste disposal pathways (%) 13
Figure 8: Food waste unit costs 14

Figure 9: Garden and vegetation waste unit costs 15
Figure 10: Grape marc unit costs 15

Abbreviations & glossary

ABS	Australian Bureau of Statistics
ANZSIC	Australia and New Zealand Standard Industry Classification
GIS	Geographical information system
ML	megalitres
SME	small to medium enterprise
t	tonnes

Summary

On behalf of Zero Waste SA, Blue Environment undertook a survey to identify organic waste materials generated and processed within three local council areas in South Australia, viz. Adelaide Hills, Barossa and Mt Barker. The objective was to develop a detailed understanding of the current and potential future supply of organic waste material which would be suitable for recycling and resource recovery within the area. A detailed methodology for data gathering was developed and documented, facilitating the same approach to be used by Zero Waste in other areas of the state in future.

Two separate questionnaires were developed: one for waste generators and one for waste processors. A database of potential organisations to be surveyed was developed in conjunction with Zero Waste SA, Adelaide Hills, Barossa and Mt Barker councils, and relevant industry organisations. The organisations were surveyed over four weeks in May-June 2012. Around 400 organisations were approached and 210 survey responses were received, representing a response rate of approximately 53% of all businesses approached, or around 86% of those who agreed to participate in the survey.

Data from the survey was analysed and categorised according to the Australian and New Zealand Standard Industry Classification (ANZSIC) system and the type of organic waste involved. While some industry sectors generating organic waste did not respond to the survey, these were generally sectors with low representation in the region. The industry sectors with highest representation and likely to generate organic waste included cafes and restaurants and wineries and breweries, and their responses accounted for over 41% of completed surveys.

The survey responses accounted for over 22,000 tonnes/year of solid organic waste and over 1,000 ML/year of liquid waste. Of the three council areas, Barossa experienced the largest waste stream (around 10,500 tonnes/year); this was mostly due to grape marc waste generated by wineries in the area. The organic waste stream generated in both Adelaide Hills and Mt Barker council areas was around half of the Barossa total, with around 5,200 tonnes/year and 6,300 tonnes/year generated respectively. These totals included some waste streams, such as council-managed garden waste and biosolids from wastewater treatment plants, not usually accounted for in other estimates of organic waste generated in the commercial and industrial sector.

According to the survey responses, most of the organic waste generated in the region is currently reused or recycled. There are further opportunities for reuse/recycling of food waste, manure/stable waste, grape marc, greasetrap waste and sludge/biosolids. There are also opportunities for reuse/recycling of liquid wastes such as wastewater and dairy waste.

A key theme in the survey responses received was the lack of knowledge (mostly from SMEs) on the waste impacts on their business. Many respondents did not know how much waste they generated, how it was managed or how much it cost their business to do so.

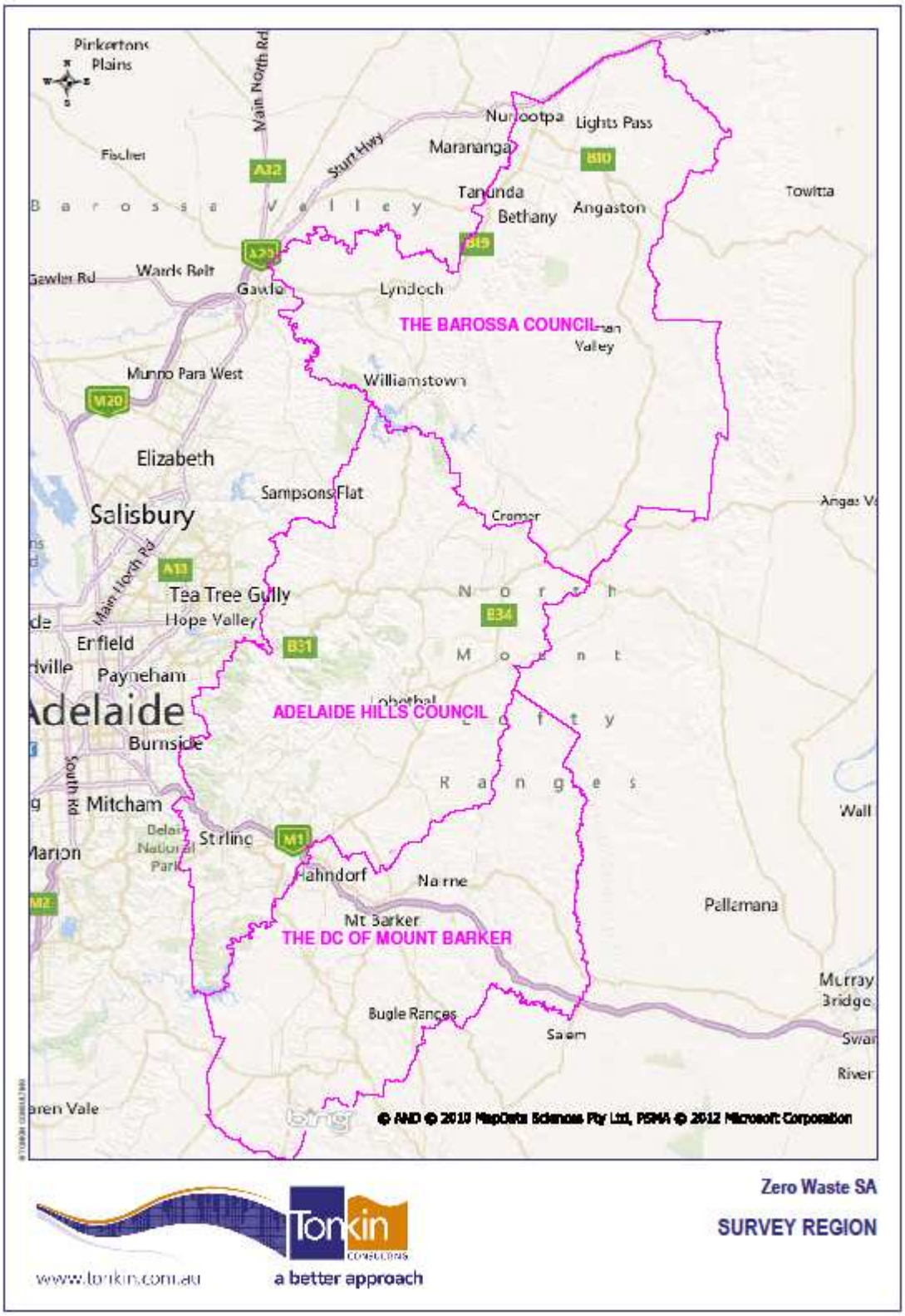
There were a number of other gaps in the information provided by survey respondents, with some questions incomplete or unanswered. Should Zero Waste SA consider repeating the survey in other areas, it is recommended that the survey form be evaluated for ways to simplify the questions so that SMEs are not frightened off by the complexity of questions asked.

1. Introduction

Blue Environment Pty Ltd was commissioned by Zero Waste SA to identify organic waste materials generated and processed within three local council areas in South Australia, viz. Adelaide Hills, Barossa and Mt Barker (refer to Figure 1 for a representation of the council areas). The objective was to develop a detailed understanding of the current and potential future supply of organic waste material which would be suitable for recycling and resource recovery within the area. Having this information will allow Zero Waste SA to facilitate and/or target future resource recovery facilities in the area, contributing to greater diversion of organic waste from landfill, decreasing the generation of methane (a potent greenhouse gas) from landfilled waste and providing a higher contribution to the economy through unlocking the value of waste organics.
The scope of the project entailed:

- developing a methodology for accessing the information (such that any future mapping in other areas could follow the same process)
- identifying potential generators and processors of organic waste within each council area
- conducting a survey of the identified organisations generating and processing organic waste
- analysing and reporting on the information gathered.

Figure 1: Map of council areas



2. Project approach

2.1 Project methodology

A methodology was developed and fine-tuned throughout the project in consultation with Zero Waste SA. The methodology covered activities in five stages:

- building the database
- scope of information sought
- accessing information through surveys
- assessing survey responses and cleansing information provided
- analysing data.

The final methodology is documented in Appendix A.

2.2 Survey

Two survey forms were developed in consultation with Zero Waste SA: one for waste generators and one for waste processors. The survey forms are provided in Appendix B.

An Excel database of potential organisations to be surveyed was developed based on information from various sources (as outlined in the methodology in Appendix A). This list started with over 500 organisations (both waste generators and processors), however a number were found to have ceased trading or declined to participate in the survey. Additional businesses were identified and approached during the survey period.

The survey was carried out over four weeks in May-June 2012. Businesses were approached initially by phone, with follow-up by email (or in some cases by mail). A letter of introduction to the project from Zero Waste SA was emailed to many businesses. The approach is detailed in the project methodology in Appendix A.

In total 400 waste generators and processors were approached (excluding those who could not be contacted within three attempts or were no longer in business). Of these 400 organisations, the following responses were received:

- 142 declined to participate in the survey
- 15 advised they did not generate organic waste
- 33 survey forms were not returned
- 210 responses were received.

This represents a response rate of approximately 53% of all businesses approached, or around 86% of those who agreed to participate in the survey.

Upon return of the survey forms, the businesses were categorised according to the Australian and New Zealand Standard Industry Classification (ANZSIC) system and the type of organic waste generated. The ANZSIC system has a structure that comprises four levels of categorisation: divisions, subdivisions, groups and classes (from broadest to most detailed). There are 17 divisions which are each identified by an alphabetical character; subsequent levels are identified by two, three and four digit codes respectively. For the purposes of this study, businesses were identified to the level of four alphanumerical characters, i.e. to group level.

A number of responses showed gaps in information, including information on the amount of waste produced and a lack of uniformity in waste measurements (i.e. the units varied according to container used, or by volume or weight). Accordingly, the survey responses were examined and where possible estimates were made to infill lacking information on the amount of waste generated; these estimates were based on the information provided by the survey respondents and known and/or estimated waste density factors (e.g. to convert volume to weight). Where applicable, the waste density factors used for the calculations are noted in the raw data spreadsheet (Appendix C).

To facilitate analysis, the waste generated was also classified according to type. The categories used for solid waste (recorded in tonnes) and liquid waste (recorded in ML) are summarised in Table 1.

Table 1: Solid and liquid waste categories

SOLID WASTE	LIQUID WASTE
Food waste	Dairy waste
Meat waste	Wastewater
Garden waste	
Vegetation waste	
Grape marc/skins	
Manure/stable waste	
Wood/sawdust	
Sludge/biosolids	
Brewing waste	
Cooking oil	
Greasetrap waste	

Most respondents reported on solid organic waste, however some respondents also reported on liquid waste streams. Where information on liquid waste was provided, it is referenced in the report.
Note that:

- Garden waste is often understood to mean green waste from residential sources; in order to avoid any confusion with similar types of green waste from commercial sources (such as vineyards and nurseries), this report refers to the latter as vegetation waste.
- At the request of Zero Waste SA, cooking oil and greasetrap waste reported in ML was converted to tonnes; these waste types are therefore categorised as solid waste.
- Sludge and biosolids are from both water treatment plants, wastewater treatment plants and other sources such as wineries.

Assessment of the survey responses regarding the amount of waste generated shows that a number of respondents were very uncertain about how much waste they generated. Some respondents said they produced no waste, others said they produced very little. Figures from yet other respondents (particularly small and medium enterprises or SMEs) were based on a variety of 'guesstimates' requiring extrapolation by Blue Environment to derive any useful information. Given the uncertainty around the numbers, all figures on waste amounts in this report have been rounded and should not be considered accurate beyond the nearest hundred.

3. Waste generators

The responses from the survey forms completed by waste generators are provided in raw data form in Appendix C and summarised in the following section.

3.1 Respondents

Survey responses were received from 208 waste generators distributed as follows: Adelaide Hills – 76; Barossa – 55; Mt Barker – 77. The percentage of responses by ANZSIC group is shown in Figure 2. The number of responses per council area is shown in Table 2.

Figure 2: % responses by ANZSIC group

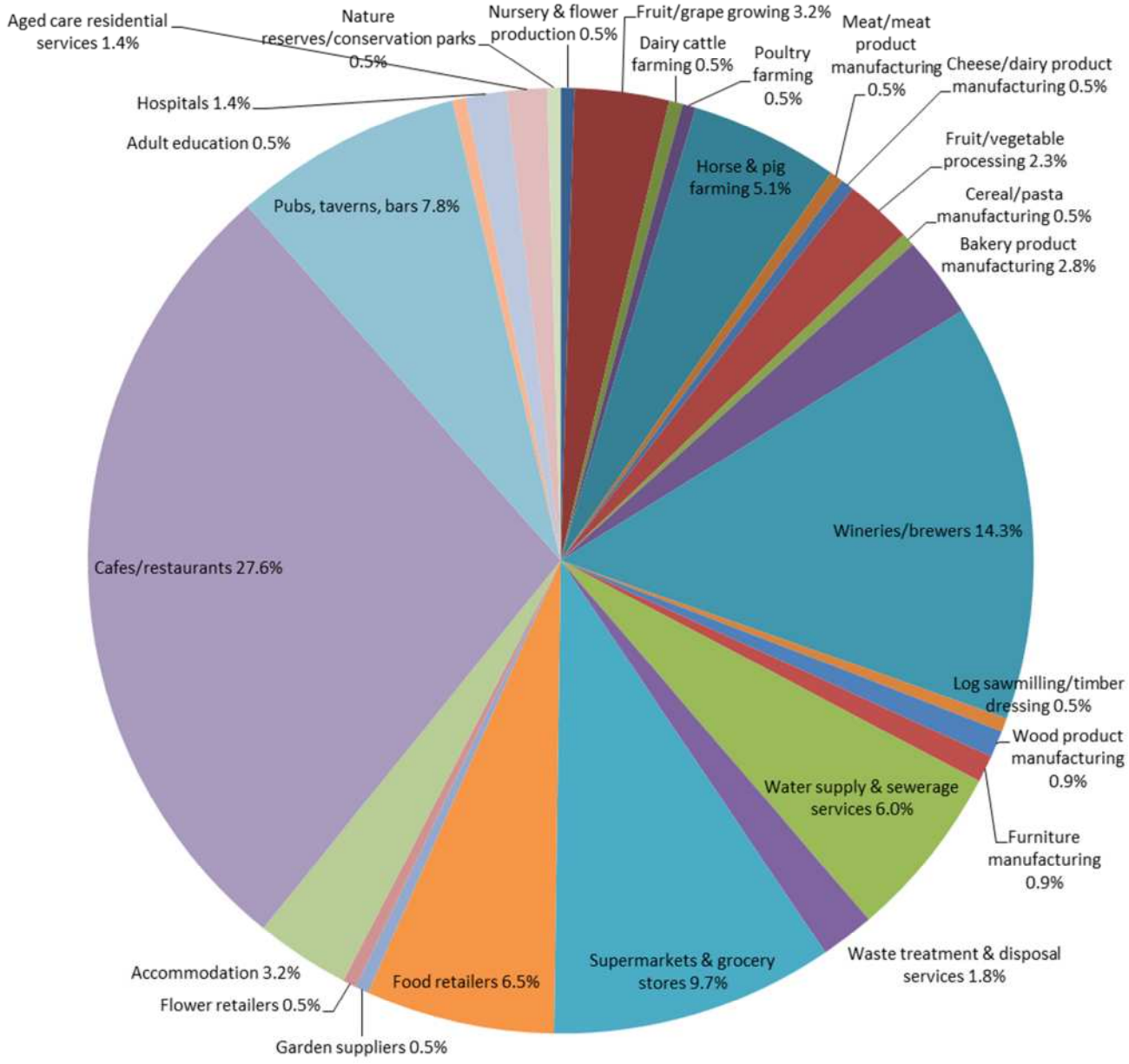


Table 2: Number of responding waste generators by ANZSIC group

ANZSIC code	Group	Adelaide Hills	Barossa	Mt Barker	TOTAL
ANZSIC Division A – Agriculture, forestry and fishing					
A011	Nursery & flower production	1	0	0	1
A013	Fruit/grape growing	2	1	4	7
A016	Dairy cattle farming	0	0	1	1
A017	Poultry farming	0	1	0	1
A019	Horse & pig farming	7	2	2	11
ANZSIC Division C - Manufacturing					
C111	Meat/meat products manufacturing	0	0	1	1
C113	Cheese/dairy product manufacturing	0	1	0	1
C114	Fruit/vegetable processing	3	1	1	5
C116	Cereal/pasta manufacturing	0	1	0	1
C117	Bakery product manufacturing	2	2	2	6
C121	Beverage manufacturing (wineries/brewers)	3	25	1	29
C141	Log sawmilling/timber dressing	1	0	0	1
C149	Wood product manufacturing	1	0	0	1
C251	Furniture manufacturing	0	0	2	2
ANZSIC Division D – Electricity, gas, water and waste services					
D281	Water supply & sewerage services	4	2	6	12
D292	Waste treatment & disposal services	2	0	2	4
ANZSIC Division G – Retail trade					
G411	Supermarkets & grocery stores	9	1	9	19
G412	Food retailers	9	0	5	14
G423	Garden suppliers	0	0	1	1
G427	Flower retailers	0	0	1	1
ANZSIC Division H – Accommodation and food services					
H440	Accommodation	1	6	0	7
H451	Cafes/restaurants	20	9	28	57
H452	Pubs/taverns/bars	10	1	6	17
ANZSIC Division P – Education and training					
P821	Adult education	0	0	1	1
ANZSIC Division Q – Health care and social assistance					
Q840	Hospitals	0	2	1	3
Q860	Aged care residential services	0	0	3	3
ANZSIC Division R – Arts and recreation services					
R892	Nature reserves/conservation parks	1	0	0	1
TOTAL		76	55	77	208

The responses are generally consistent with industry representation in each council area, although some ANZSIC groups with small sample sizes are not represented. Some of the groups identified for the survey but not represented in the survey results are:

- sheep, beef cattle and grain farming
- aquaculture
- seafood processing
- sugar and confectionary manufacturing
- other food product manufacturing
- defence
- sports and physical recreation activities.

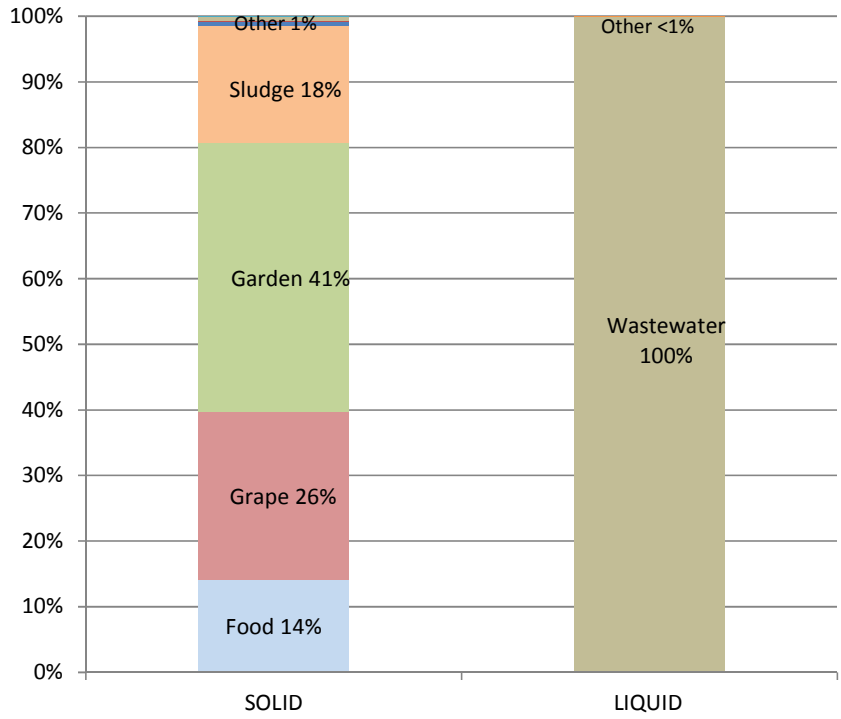
3.2 Amount

Around 63% of generators were able to quantify the amount of waste they produced, or provide sufficient information for Blue Environment to estimate the likely amount. However 37% of respondents were uncertain about the amount of waste they generated or believed they produced very little.

The survey data accounted for over 22,000 tonnes of solid waste generated each year. The type of waste is shown by percentage in Figure 3. Garden waste is the largest component at over 9,000 tonnes/year (or 41%), followed by significant amounts of grape marc/skins (over 5,600 tonnes/year or 26%), sludge/biosolids (almost 4,000 tonnes/year or 18%) and food waste (over 3,100 tonnes/year or 14%). There were also small amounts of vegetation waste, cooking oil, greasetrap waste, meat waste, brewing waste, wood/sawdust and manure/stable waste identified; in total these represented around 300 tonnes/year (or around 2% of the total identified).

Liquid waste generated is also shown by percentage in Figure 3. The predominant liquid waste was wastewater (over 1,000 ML/year), mostly generated from wastewater treatment plants but with smaller amounts from septic tanks and wine-making activities. Small amounts of dairy waste were reported, representing less than half a ML in total per year.

Figure 3: Waste type by %



The amount of solid waste reportedly generated in each of the three council areas is shown in Table 3.

Table 3: Amount of solid waste reported by council area (tonnes/year)

	Adelaide Hills	Barossa	Mt Barker	TOTAL
Food waste	530	310	2,270	3,110
Meat waste	80	ng	60	140
Garden waste	1,810	3,540	3,680	9,030
Vegetation waste	small	small	20	20
Cooking oil	10	10	40	60
Greasetrap waste	ng	10	nr	10
Grape marc/skins	nr	5,660	ng	5,660
Manure/stable waste	50	40	30	120
Wood/sawdust	30	ng	nr	30
Sludge/biosolids	2,700	980	280	3,960
Brewing waste	10	ng	ng	10
TOTAL	5,220	10,550	6,380	22,150

Note: all figures approximate
nr = no response from identified generators
ng = no generators identified in council area
small = less than 10 tonnes

The majority of the wastewater reported (1,000 ML/year) was produced in the Mt Barker council area, with only 10 ML/year produced in the Barossa council area. The small amounts of liquid dairy waste originated from both Mt Barker and Barossa council areas.

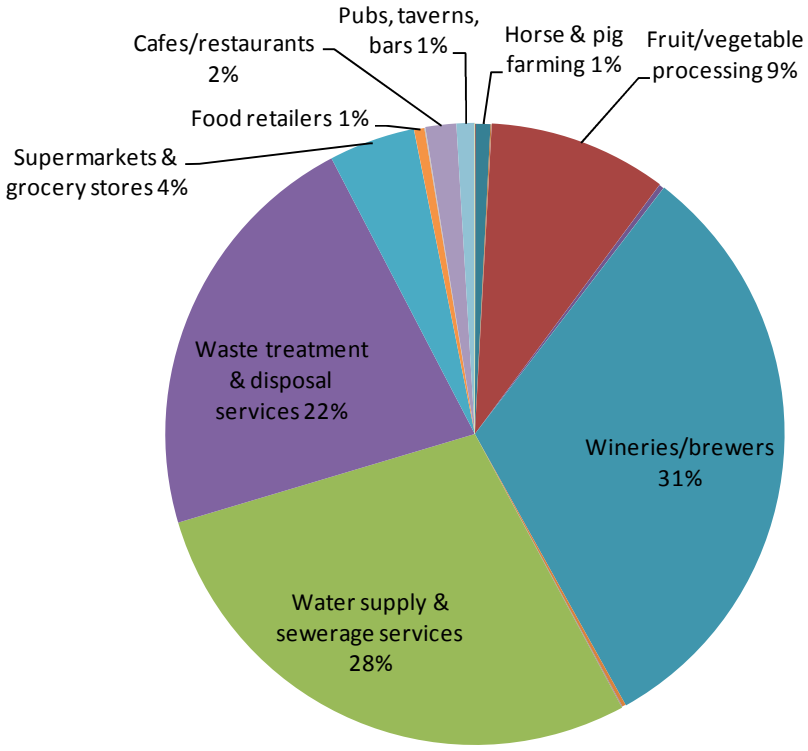
The waste generation has been identified by ANZSIC division in Table 4, and is expressed by sub-sector as a percentage in Figure 4. This information shows that wineries/breweries is the most significant industry sector (generating 31% of the total waste identified by respondents), followed closely by water supply & sewerage services (28% of total waste), and waste treatment & disposal services (22% of total waste).

Table 4: Solid waste generation by ANZSIC division (tonnes/year)

	Adelaide Hills	Barossa	Mt Barker	Total
Agriculture, forestry & fishing	40	40	40	120
Manufacturing	70	5,700	1,570	7,340
Electricity, gas, water & waste services	4,520	4,520	3,970	13,010
Retail trade	430	0	520	950
Accommodation & food services	160	200	280	640
Health care & social assistance	0	90	0	90
TOTAL	5,202	10,550	6,380	22,150

Note: Figures are rounded

Figure 4: Waste generation by ANZSIC group (as % of total organic waste in 3 council areas)



Note: excludes sectors representing less than 1% of total waste generation

3.3 Seasonal generation

Fifty-three respondents (25%) reported some seasonality in their pattern of waste generation, with the seasonality related to the type of their activity:

- Wineries produce grape marc in late summer to autumn (February – May), with the number of crushes and the length of the vintage period dependent on the size of the winery and/or harvest. One winery reported more variability year on year rather than seasonal, i.e. the size of the harvest (and hence the amount of waste) differed greatly according to climate conditions from one year to the next.
- Vegetation waste from pruning of vineyards generated peak waste amounts but different vineyards reported carrying out pruning in different seasons. Some pruned in autumn (a reported total of approximately 5 tonnes), others in winter (an area of approximately 50 hectares, not translated into tonnage), and some carried out an additional minor pruning in summer.
- Olive groves generated pruning waste in spring (although some noted they pruned every second year, alternating sections of the grove).
- Other vegetation waste peaks varied, with some fruit growers carrying out pruning in winter, council facilities experiencing high garden waste drop-off in spring, and those organisations with large gardens (e.g. some wineries and large hotels) generating more waste in autumn.
- The peak waste generation of stables and horse farms is variable according to the organisation, with some only stabling horses in winter and others in spring to summer. Stables have noted that the number of horses stabled can vary across the year quite apart from the season.
- Dairy waste peaked in autumn and spring.
- Food waste from fruit processing was higher in summer.

Some other survey respondents noted that waste generation could vary according to sales, e.g. florists reported higher sales and increased waste at peak times such as Mothers' Day, Valentine's Day and when they service weddings (which can vary throughout the year), and supermarkets reported some waste peaks subject to the type of weekly specials offered.

3.4 Waste characteristics

Only 18 out of 208 respondents (9%) had any knowledge of the specific characteristics of their waste, and this almost entirely related to its moisture content. While most respondents generally knew what went into their organic waste stream (e.g. vegetable peelings, coffee grounds, grape skins, etc), they had almost no additional knowledge.

Wastewater treatment plants knew the characteristics of the sludge/biosolids and wastewater they generated, quite probably due to the regulatory requirements around management of this waste stream. Characteristics reported included:

- key constituents – aluminium, bacteria, nutrients
- moisture content – around 98%
- contaminants – aluminium (14%), nutrients (21%)
- type of contaminants – aluminium, nitrogen, phosphorous, bacteria
- density – 1.1 kg/m^3.

Some wineries reported a moisture content of between 25% and 60% in their grape marc, although others noted that it depended on the grape variety and climate conditions from year to year. Another

winery noted they had not had the grape marc analysed and therefore had no knowledge of its moisture content.

Dairy waste was reported with varying moisture contents – 45-80% for cheese, 80-90% for yoghurt and 95% for whey.

Other moisture contents reported were for bread waste (40-50%), fruit processing waste (10%), horse manure and stable waste (10%), wood waste (80%) and supermarket food waste (80%).

Only one supermarket made any estimate of contamination, reporting 20% contamination of its food waste.

One sawmill nominated the density of its waste sawdust at 900 kg/m^3.

3.5 Current management

Respondents nominated a range of different methods of management for their organic waste, as discussed below.

Reuse

Approximately 18% of respondents reported using food waste for animal feed. These were mostly private arrangements (e.g. to animals belonging to staff) and involved a range of cafes/restaurants, hotels and bakeries, as well as a supermarket and aged care facility. Around 1,500 tonnes/year were taken from one business by a feedlot fodder producer, and one supermarket's waste was used to feed local animals. The amount of waste involved ranged up to 1,700 tonnes/year for all businesses that reused some of their waste, although some of the food waste was segregated for other processing or disposal (e.g. vegetable scraps were fed to animals but coffee grounds were either composted or disposed in general waste bins and sent to landfill).

Around 38 tonnes of organic waste from wineries, breweries and butchers was reused as animal fodder.

Approximately 0.25 ML/year of liquid dairy waste was used for animal fodder or directly applied to land to reduce fungi growth.

Recycling

Around 40 tonnes/year of food waste was composted; this was also carried out by owners/staff rather than transported to commercial composters.

All vegetation waste was reportedly composted or mulched. Most generators undertook this on-site or via staff/private arrangements. Garden waste from council drop-off facilities and vegetation waste from nurseries was composted by a commercial contractor; this accounted for over 5,500 tonnes/year (or 60%) of the garden and vegetation waste generated in the three council areas.

Around 5,000 tonnes/year of grape marc/skins was composted or processed, the majority of which was done off-site by commercial processors. Around 400 tonnes/year was applied direct to land at the vineyard site.

Over 90% of meat waste (around 130 tonnes/year) was collected and processed at Port Adelaide to produce tallow products and fertiliser (and possibly biodiesel).

Where horse manure and stable waste is collected, it is generally applied to land as fertiliser and sometimes sold; this accounts for around 100 tonnes/year.

Approximately 86% (around 30 tonnes/year) of wood waste is sold as kindling and firewood.

Most of the sludge/biosolids produced in the three council areas was generated at water and sewerage treatment plants controlled by SA Water. This waste was variously composted, processed via anaerobic digestion, used for site rehabilitation or applied direct to vineyards.

The majority of the cooking oil and greasetrap waste reported as generated was collected for recycling; this represents around 70 tonnes/year. Four businesses gave their cooking oil away to be used as biofuel.

Around 10 ML/year of wastewater was used for irrigation of woodlots or pasture; this was generated by a mix of council septic systems and wineries.

Landfill/Disposal

The rest of the reported waste was either landfilled or disposed of at a liquid waste treatment facility, which includes over 1,300 tonnes/year of food waste (around half of the food waste reported) and around 500 tonnes/year of sludge from one water treatment plant.

The different destinations of the organic waste are summarised in the following figures. Solid waste destinations are shown by percentage and by total tonnes/year in Figures 5 and 6. Liquid waste destinations are shown by percentage in Figure 7.

Figure 5: Solid waste destinations (%)

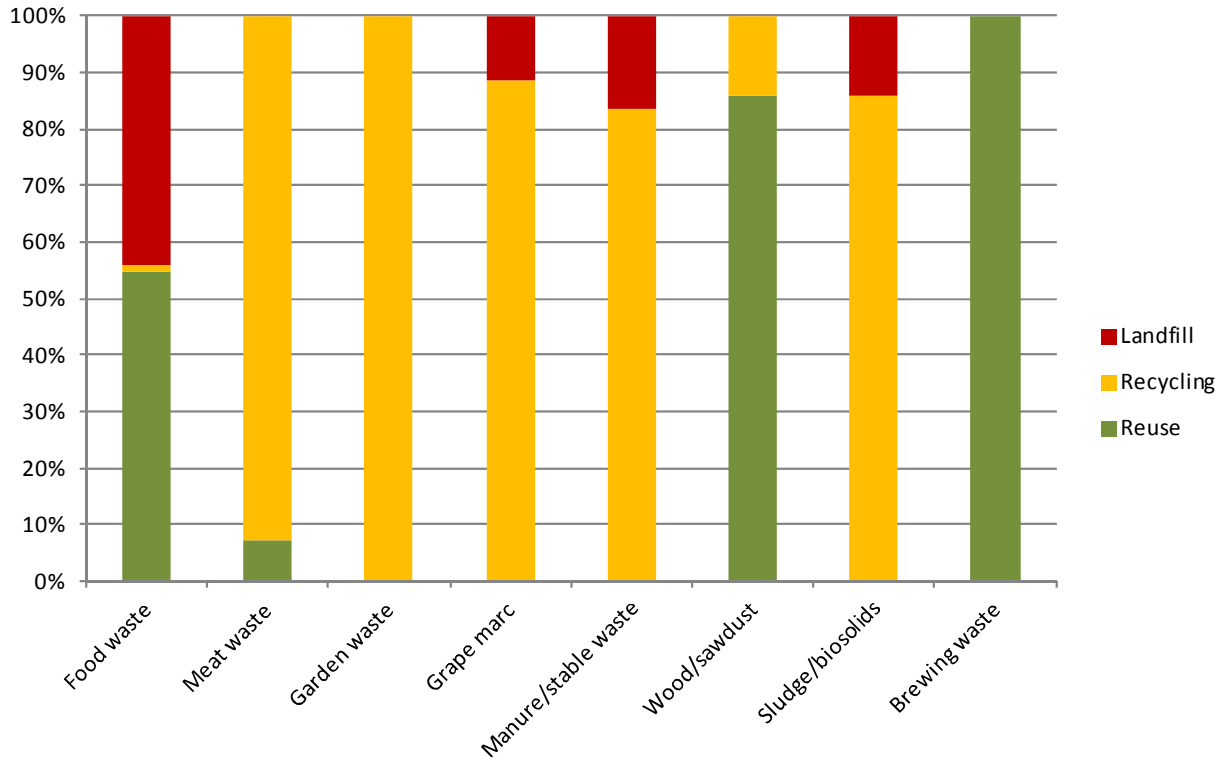


Figure 6: Solid waste destinations (tonnes/year)

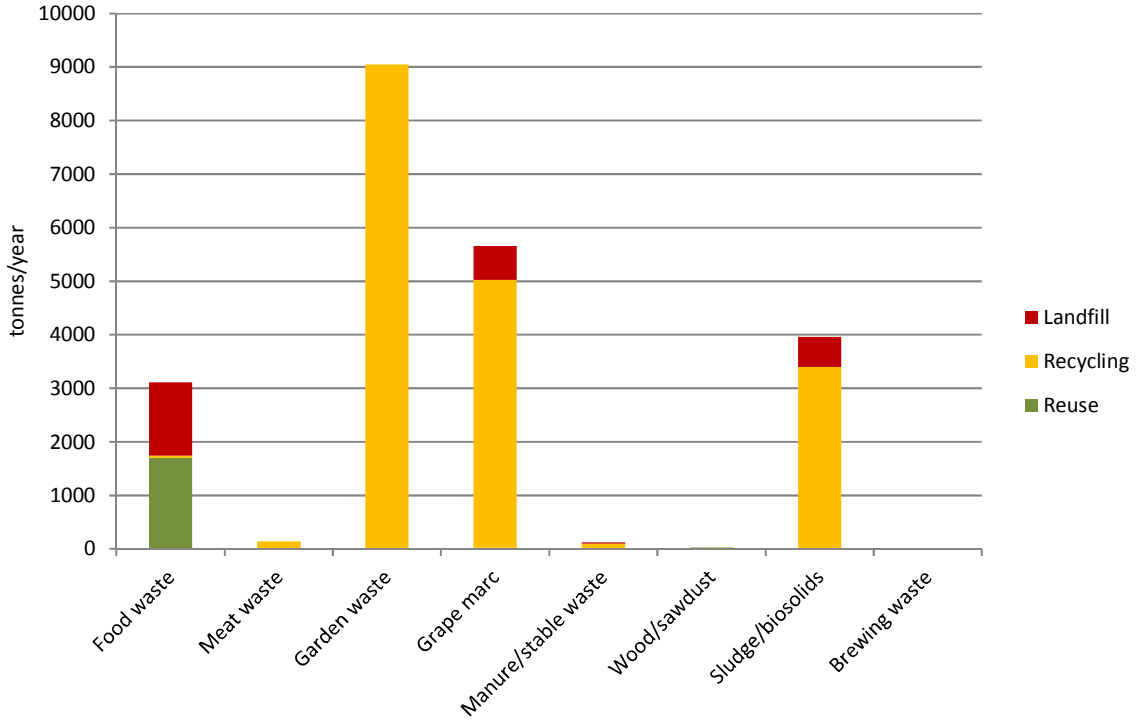
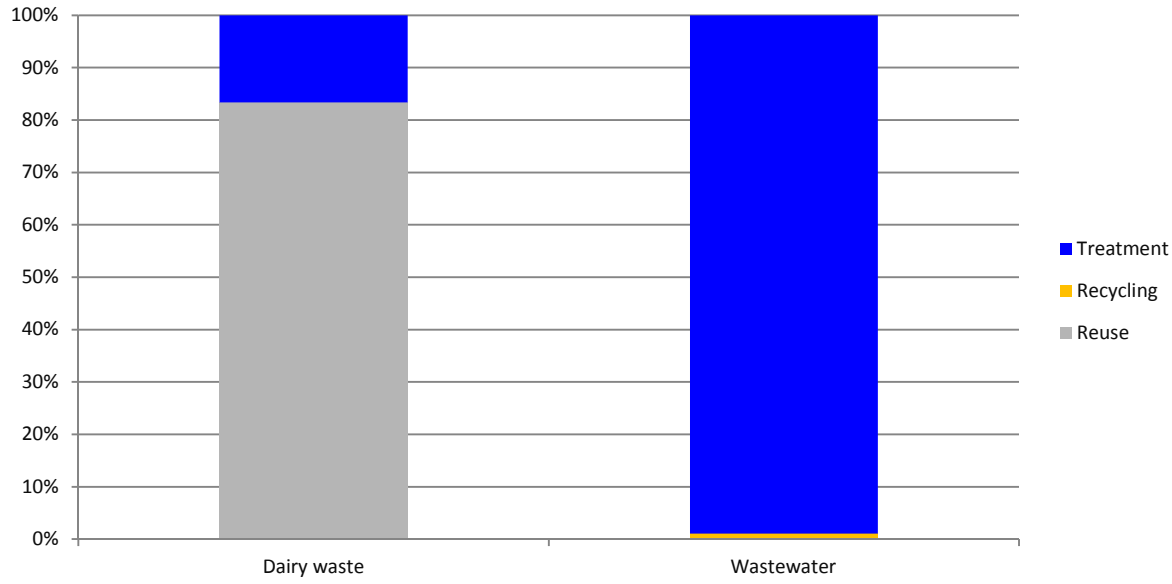


Figure 7: Liquid waste destinations (%)



3.6 Committed timeframe

Around half of the reported amount of food waste is collected on a daily or weekly arrangement. Only three food waste producers (1%) reported contract periods of one year or more; most generators had casual or on-going arrangements for waste collection.

A few small businesses reported using council kerbside collections for recycling of vegetation waste.

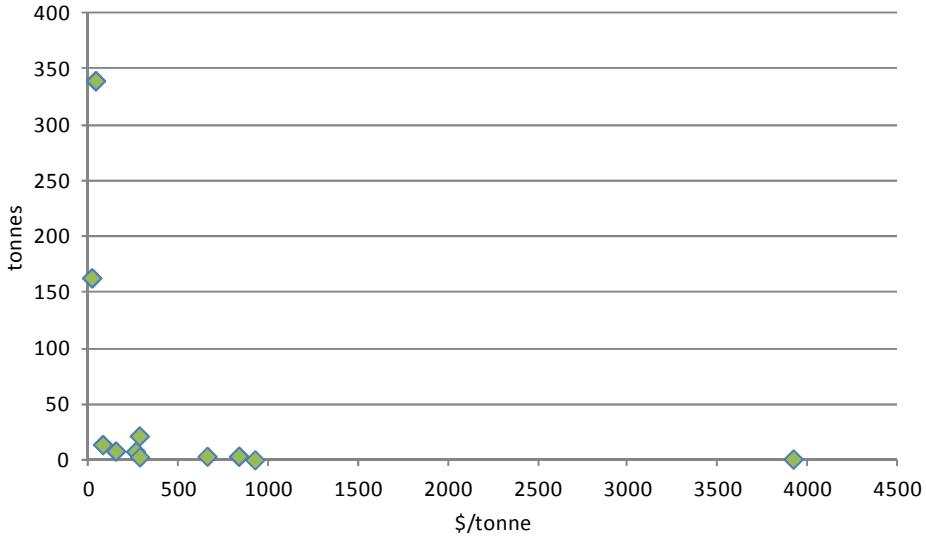
3.7 Costs & revenue

Costs

Approximately 50% of respondents did not know or provide any information on their waste management costs. Another 34% advised that their waste costs were zero; this generally applied to internal arrangements (e.g. waste composted or mulched on site, staff took waste home for animals, etc). The remaining 16% of respondents who provided information reported unit costs as discussed below.

Unit costs reported for food waste are shown in Figure 8 and were highly variable.

Figure 8: Food waste unit costs (as reported)

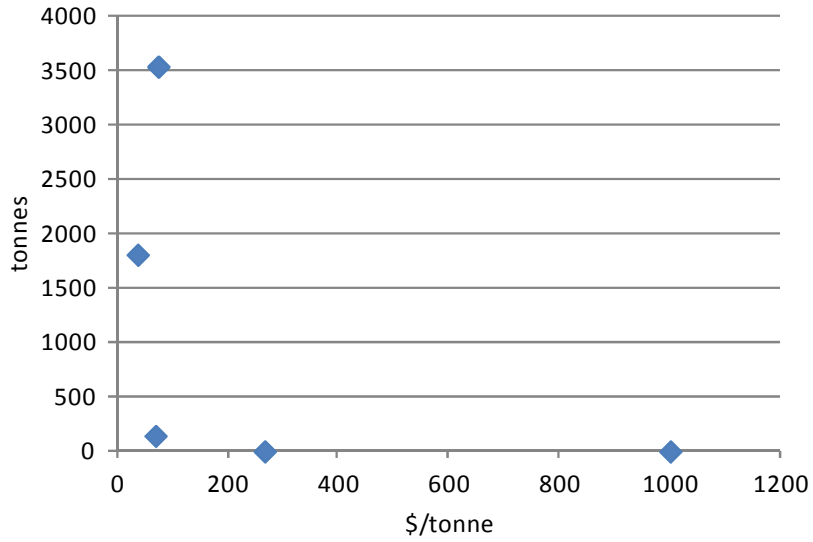


In some cases, respondents provided information on food waste volumes but provided costs for total waste management; hence the calculated unit costs were very high (over $500/tonne) and did not correctly reflect the true cost of organic waste management. There was greater confidence that cost figures from smaller businesses (e.g. cafes) reflected mostly food waste; these generally were below $250/tonne.

The aggregation of food waste costs into total waste management costs is a reflection that those businesses who reported such costs largely dispose of food waste into bins for general waste, which is subsequently deposited in landfill. Where food waste was reused (e.g. as animal stockfeed) or recycled (e.g. composted), there were generally no disposal costs involved.

Vegetation waste costs were generally reported separately, where arrangements for separation were in place. The reported unit costs for garden waste and vegetation waste are shown in Figure 9.

Figure 9: Garden and vegetation waste unit costs (as reported)

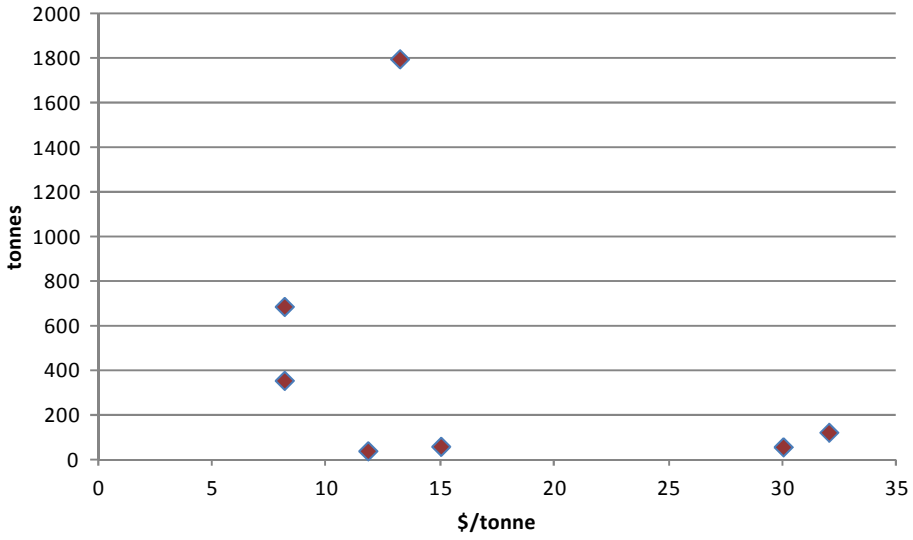


The lower unit costs (less than $100/tonne) related to council processing costs for garden waste dropped off at transfer station facilities (which excludes transport costs and incorporates economies of scale from large tonnages involved). The higher unit costs ($265-1,000/tonne) were those paid by nurseries and fruit growers for smaller amounts of vegetation waste and incorporated collection costs.

There was only one reported cost for each of wood/sawdust waste, sludge/biosolids and meat waste, and it is not clear how indicative these figures are given the small sample size.

Costs reported for management of grape marc were more uniform, as shown in Figure 10.

Figure 10: Grape marc unit costs (as reported)



The grape marc which relates to these reported costs would appear to be managed by different processors who collect the waste from wineries. It would appear there is some off-set of costs depending on individual arrangements, i.e. whether the generator pays only transport costs, or transport and disposal costs, or whether the generator is also a supplier of alcohol to the processor.

Figures provided for disposal of liquid waste types were highly variable and based on low sample size for each type. The data did not provide meaningful information on unit costs.

Revenue

The majority of respondents (over 88%) did not receive any revenue from their waste stream; an additional 2% were not sure whether they did or not. Another 2% of respondents identified that, while they did not receive revenue, they received some benefit, e.g. through avoided costs in purchasing fertiliser or mulch or reduced costs for composting.

Of the remaining respondents:

- 3% reported a small revenue stream from their waste but were unsure of exactly how much it was
- revenue was received by butchers whose meat waste was collected by arrangement or sold for animal fodder. used cooking oil generated by cafes and restaurants was sold to processors (rates unknown but reportedly small)
- some horse manure was sold by stables (generally on an *ad hoc* basis with variable revenue)
- sawdust was sold for mulch and wood waste/off-cuts sold as firewood (rate unknown).

3.8 On-site processing

Forty-three respondents (20%) reported some form of on-site processing of waste, although a number reported more than one method of processing being carried out on site.

The most predominantly reported method was direct application to land, followed closely by mulching and composting. The responses provided, however, would indicate some confusion about the correct description of the activities carried out, e.g. in some cases it would appear that respondents believed stockpiling large amounts of waste equated to composting. Two respondents also reported using worm farms.

Mulch, fertiliser, stockfeed and firewood were the products reported, the majority of which was used on-site or by staff/family members. No figures for costs or savings were provided.

3.9 Other comments

A handful of survey respondents made other comments, either on how little waste they produced or on particular waste issues they were finding problematic. The issues included:

- A reported stockpile of 20,000 old treated pine posts that no-one knew what to do with.
- Another respondent produced many 25 L plastic containers; they did not fit in their normal recycling bin and were unhappy that the local transfer station charged $50/dozen to accept them.
- Another noted that they threw a lot of food waste away due to the corporate policy of only selling food within a limited time from production.
- Waste whey was a problem waste stream for one dairy farm. The cost of a powdering plant was too high for a small organisation like them, and they were unable to make cooperative arrangements with a larger dairy.

- Another producer believed there was a solution to waste oil, and was exploring uses in cosmetics and wood oil.

4. Waste processors

There were three private waste processors identified in the region: all located in the Barossa council area. Of these, only one agreed to participate in the survey and therefore, due to commercial confidentiality constraints, the information provided cannot be published in this public report.

One nursery reported that its vegetation waste was collected by a contractor outside the study area and transported for composting. There was no other waste identified as being processed by other processors outside the region.

The District Council of Mt Barker does process approximately 550 tonnes/year of garden waste dropped off at the Windmill Hill transfer station, however none of the waste generators surveyed reported taking their garden waste there. This garden waste stream is derived overwhelmingly from the residential sector and is separate to the waste streams identified by survey respondents.

5. Discussion

The data gathered during the survey was transposed to a geographical information system (GIS) for mapping. While not all data was sufficiently meaningful or comprehensive for mapping, a range of maps showing location, ANZSIC type, waste type, amount and seasonality were developed and are provided in Appendix D.

There are a number of data gaps and issues that should be considered in utilising the survey results to provide a framework of organic waste generation and processing in the Adelaide Hills, Barossa and Mt Barker areas.

Survey response

While the response rate to the survey was reasonably high, there are a number of organisations likely to produce large amounts of organic waste that did not wish to participate. Some of the organisations and/or sectors who did not participate in the survey were as follows:

- some key organisations likely to have relatively significant organic waste streams declined to participate
- a number of wineries advised they were too busy in the late/post-vintage season to respond
- there was no representation from some groups identified for the survey, such as sheep, beef cattle and grain farming, aquaculture, seafood processing, sugar and confectionary manufacturing, other food product manufacturing, defence and sports and physical recreation activities
- there was low representation from some sectors such as furniture makers, poultry farmers, dairy cattle farming, fruit/grape growing, nurseries, hospitals and residential aged care facilities

There were also large gaps in information provided by survey respondents. Some themes were evident:

- large companies which produced significant amounts of waste were closely aware of how much waste they generated, how it was managed and what it cost to do so
- some national companies had national waste management systems in place, and local offices were not able to provide information at a local level
- small businesses generally had a low knowledge base on all aspects of waste management, including how much they generated and how much it cost to manage
- many businesses could not provide detailed information regarding the seasonality of their waste generation.

Based on the lack of responses provided on completed survey forms, it would appear that the detail of information requested in the survey overwhelmed many respondents. It seems that many people completing the survey did not have a wide understanding of waste issues, found the questions quite complex or did not have the knowledge requested. There were a number of businesses who declined to participate because they said they produced no waste at all - an unlikely and/or unrealistic scenario.

Some of these reactions may reflect the high representation of SMEs in the region. SMEs generally have less time and/or resources to address issues seen as peripheral to their main business operations. If waste disposal is reasonably easy to arrange and does not feature as a major cost to the business, there is less impetus to put alternative recycling systems in place or spend time understanding their waste stream in detail.

Based on the survey responses, it would appear that there is significant commitment to reuse and recycling at a local level, with internal systems for diversion to stockfeed or composting at many

businesses. However some caution should be used in accepting all such comments as evidence of diversion activities actually occurring. Past survey experience shows that respondents sometimes outline what they would like to do, not necessarily what they actually do, or over-estimate the occurrence of activities that only happen sporadically. The survey responses may also be skewed and not representative of all businesses: it is more likely to get responses from people who do reuse/recycle and less likely to get survey responses from people who do not.

Consideration should also be given to the nature of the Adelaide Hills, Barossa and Mt Barker regions before extrapolating this information to other areas of the state. The locations surveyed may reflect the nature of the communities in the area, e.g. people often move to urban fringe locations because they are committed to environmental issues and are more likely to recycle. The same may not hold true for other council areas.

Total organics in region

While the amount of organic waste identified in the survey does not necessarily equate to all organic waste generated in the three council areas, the survey does provide an indication of the relative importance in each industry sector in organics generation in each council area. The results reflect the nature of the businesses in the region; for example, the high representation of wineries in the Barossa is responsible for a large grape marc waste stream, and the relatively high number of cafes and restaurants catering to tourist and local populations in Adelaide Hills and Mt Barker may explain the higher food waste stream in those areas.

Some analysis has been done on benchmarking the survey data with organics investigations in other regions. Studies in Victoria have identified potential solid organic waste generation rates in relevant waste-generating ANZSIC sectors; these rates have been extrapolated to the Adelaide Hills, Barossa and Mt Barker areas based on Australian Bureau of Statistics data on the number of employees per sector. The results are shown in Table 5.

Note that this information is based on second party data and there is uncertainty about the accuracy of the figures; these are derived from a small number of commercial and industrial waste audits that were not statistically validated. The estimates have been developed as a way of identifying sectors that are likely to be major sources of organics, and the numbers should not be relied upon; rather, they should be used as an indication of the relative generation by sector.

Table 5: Estimated organic generation per ANZSIC division (tonnes/year)

	Adelaide Hills	Barossa	Mt Barker	Total	Ranking
Agriculture, forestry & fishing	0	0	0	0	
Mining	0	0	0	0	
Manufacturing	580	890	430	1,900	2
Electricity, gas, water & waste services	0	0	0	0	
Construction	30	10	20	60	8
Wholesale trade	40	20	20	80	7
Retail trade	230	120	250	600	4
Accommodation & food services	660	570	630	1,860	3
Transport, postal & warehousing	30	30	30	90	6
Information media & telecommunications	< 10	< 10	< 10	< 30	9
Financial & insurance services	< 10	< 10	< 10	< 30	9
Rental, hiring & real estate services	10	< 10	< 10	< 30	9
Professional, scientific & technical services	0	0	0	0	
Administrative & support services	0	0	0	0	
Public administration & safety	0	0	0	0	
Education & training	250	90	130	470	5
Health care & social assistance	1,230	430	840	2,500	1
Arts & recreation services	< 10	< 10	< 10	< 30	9
Other services	< 10	< 10	< 10	< 30	9
TOTAL	3,050	2,160	2,350	7,560	

Notes:

1. These figures are indicative only and are used to identify the most significant waste generating sectors within each council area only.

2. ABS 2006 census and 2001 data on number of employees in each business sector have been used for estimating forward projections to the present time as the relevant 2011 ABS data is not yet available.

3. The solid waste generation units used to estimate tonnage/employee/year are from Nolan ITU 2002.

4. Employment figures were derived from ABS data for total employment in the study area.

These figures were further extrapolated to 2016 based on projected population growth, in order to provide some indication of potential availability of organics waste streams in the future. These projections are shown in Table 6.

Table 6: 2016 projected organic generation per ANZSIC division (tonnes/year)

	Adelaide Hills	Barossa	Mt Barker	Total
Agriculture, forestry & fishing	0	0	0	0
Mining	0	0	0	0
Manufacturing	590	1,000	430	2,020
Electricity, gas, water & waste services	0	0	0	0
Construction	30	10	20	60
Wholesale trade	40	30	30	100
Retail trade	230	130	290	650
Accommodation & food services	610	650	740	2,000
Transport, postal & warehousing	30	30	30	90
Information media & telecommunications	< 10	< 10	< 10	< 30
Financial & insurance services	< 10	< 10	< 10	< 30
Rental, hiring & real estate services	10	< 10	< 10	< 30
Professional, scientific & technical services	0	0	0	0
Administrative & support services	0	0	0	0
Public administration & safety	0	0	0	0
Education & training	260	100	150	510
Health care & social assistance	1,370	500	1,040	2,910
Arts & recreation services	< 10	< 10	< 10	< 30
Other services	< 10	< 10	< 10	< 30
TOTAL	3,160	2,450	2,730	8,340

Notes:

1. These figures are indicative only and are used to identify the most significant waste generating sectors within each council area only.

2. ABS 2006 census and 2001 data on number of employees in each business sector have been used for estimating forward projections to 2016 as the relevant 2011 ABS data is not yet available.

3. The solid waste generation units used to estimate tonnage/employee/year are from Nolan ITU 2002.

4. Employment figures were derived from ABS data for total employment in the study area.

Comparison of the estimates in Tables 5 and 6 with the survey responses in Table 4 shows that the current waste stream far exceeds the existing and projected estimates. However there are a number of anomalies between the data sets which need to be considered:

- current data in Table 4 includes residential garden waste streams managed by councils; this is usually excluded from industry estimates
- waste from agricultural and forestry activities is often managed on-site and therefore not identified as a waste that could be diverted from landfill
- sludge/biosolids from wastewater treatment plants (included in electricity, gas, water & waste services ANZSIC division) is also often managed on-site and not disposed to landfill.

Excluding these waste streams (totalling around 13,000 tonnes/year), the survey data in Table 5 is more in alignment with estimates used in other jurisdictions. On this basis, then, the projections in Table 7 may still hold true. This would indicate a relatively small increase (less than 1,000 tonnes/year) on current organic waste generation in the short term. This could readily be managed by capacity growth in existing reuse/recycling facilities rather than a major increase in the number of waste/processing facilities managing organic waste.

However this is subject to no more than steady growth patterns for current industries in each council area. If large new industries are established or there is high growth in an existing industry, this is likely to affect infrastructure needs in the region.

Opportunities for landfill diversion

Figures 5 and 6 show that there is potential for further diversion of solid organic waste in some areas, particularly food waste (generated by the café and restaurant sector), manure/stable waste (from the horse farming sector, as well as potentially from other sectors such as poultry farmers, who did not participate in the survey), grape marc and sludge/biosolids (mostly from the grape growing sector).

6. Conclusions

The survey generally received a good response rate (53% of all businesses approached) and businesses in Adelaide Hills, Barossa and Mt Barker council areas appeared receptive (and often committed) to reuse and recycling of organic waste.

While some industry sectors generating organic waste did not respond to the survey, these were generally sectors with low representation in the region. The industry sectors with highest representation and likely to generate organic waste included cafes and restaurants and wineries and breweries, and their responses accounted for over 41% of completed surveys.

The survey responses accounted for over 22,000 tonnes/year of solid organic waste and over 1,000 ML/year of liquid waste. Of the three council areas, Barossa experienced the largest waste stream (around 10,500 tonnes/year); this was mostly due to grape marc waste generated by wineries in the area. The organic waste stream generated in both Adelaide Hills and Mt Barker council areas was around half of the Barossa total, with around 5,200 tonnes/year and 6,300 tonnes/year generated respectively. These totals included some waste streams, such as council-managed garden waste and biosolids from wastewater treatment plants, not usually accounted for in other estimates of organic waste generated in the commercial and industrial sector.

According to the survey responses, most of the organic waste generated in the region is currently reused or recycled. There are further opportunities for reuse/recycling of food waste, manure/stable waste, grape marc, greasetrap waste and sludge/biosolids. There are also opportunities for reuse/recycling of liquid wastes such as wastewater and dairy waste.

A key theme in the survey responses received was the lack of knowledge (mostly from SMEs) on the waste impacts on their business. Many respondents did not know how much waste they generated, how it was managed or how much it cost their business to do so.

There were a number of other gaps in the information provided by survey respondents, with some questions incomplete or unanswered. Should Zero Waste SA consider repeating the survey in other areas, it is recommended that the survey form be evaluated for ways to simplify the questions so that SMEs are not frightened off by the complexity of questions asked.

Appendix A
Methodology

REGIONAL ORGANIC WASTE MAPPING IN SOUTH AUSTRALIA
FINAL METHODOLOGY
5 July 2012

STAGE 1: BUILDING THE DATABASE

- Access Australian Bureau of Statistics data on representation of industries (by ANZSIC classification) in each council area
- Approach council officers in waste, planning, economic development and other areas as applicable to the relevant council; seek data and input on stakeholders from:
    - community directories
    - business networks
    - local knowledge
- Conduct internet searches of business directories (e.g. yellow pages, truelocal, dlook, sensis) and key word Google searches
- Approach local business organisations (e.g. chambers of commerce), seeking data and input on stakeholders
- Approach relevant government departments and organisations (e.g. Forestry SA, water utilities) seeking data and input on stakeholders
- Approach relevant industry associations (e.g. Olives SA Association, Australian Wine & Brandy Corporation, Nursery & Garden Industry Association), seeking data and input on stakeholders. Seek their commendation of the project intent and encourage participation by their members (e.g. by newsletter/email)
- Identify stakeholders based on waste industry knowledge (e.g. compost producers, organics processors) or approach industry bodies as necessary (e.g. Compost SA)
- Establish database in Microsoft Excel spreadsheet (separate spreadsheet for each council), recording the following for each business:
    - company/business name
    - ANZSIC classification
    - location address
    - contact name
    - contact details (phone, email)
- Where there are gaps in information (e.g. contact name, details), phone business and request details
- Compare data across different data sets to identify information gaps and fill as necessary (e.g. ABS industry representation by number/size)
- Provide draft database to Zero Waste SA and discuss any gaps.

STAGE 2: SCOPE OF INFORMATION

- Develop separate questionnaires for generators and processors in draft form
- Establish final content of questionnaires in collaboration with Zero Waste SA; fine-tune as necessary
- Refer to separate questionnaire forms for scope of information requested.

STAGE 3: ACCESSING INFORMATION

- Contact each business as follows:
    - initial phone conversation to explain project, seek contact/email address (if necessary) and gain consent to participate
    - email questionnaire (and introductory letter from Zero Waste SA as necessary)
    - follow-up subject to business response:

    - if completed questionnaire is emailed, check responses – if no information gaps, thank them for responding; if any information gaps or questionable responses, contact by phone and discuss
    - if no response within 1 week, follow-up by phone, seeking responses to each question – thank them for participating
    - if no response from business, make 3 attempts at contact before giving up
- Add information to spreadsheet
- If additional businesses relevant to the project are identified in conversation, add details to the database and contact.

STAGE 4: ASSESSING RESPONSE & CLEANSING INFORMATION

- Assess response rate as a whole, by sector and location. Where response not considered satisfactory, continue survey by targeting sector, business, location etc. as necessary.
- Consider initial waste amounts covered in survey responses to date; if large amounts not addressed, target large generators/processors as necessary.
- Identify processors nominated in survey responses; consider the need for further liaison with processors outside the targeted region.
- Assess data provided for accuracy and logic
- Clarify with survey respondents where data does not make sense, is not provided or is unclear
- Where information is not known by respondents, determine likely response based on supplementary information provided by liaison (e.g. additional emails/conversations)
- Convert anomalous data into meaningful/useful data (e.g. waste amounts, common units)
- Classify businesses according to ANZSIC categories
- Classify waste types.

STAGE 5: ANALYSING INFORMATION

- Analyse data by individual council area; additional analysis by region as appropriate
- Aggregate and compare data; analysis will depend on responses but likely to include:
    - ANZSIC classification – refer to ABS data to determine percentage covered by size
    - amount generated – volume, tonnage, from production/on-site treatment process
    - proportional contribution to total organics from respondents, comparison to industry benchmarks from previous studies
    - material type – solid, sludge, moisture content, contamination (where known)
    - location and distribution
    - generation variability – seasonal variations, industry trends, peaks
    - current management method – on-site, transport, recovery, landfill disposal
    - management pathway – generator, processor, disposal end-point
    - processing method – technology, products
    - markets – local/intra-interstate, market segment
    - other factors subject to information received
- Provide graphical and GIS figures as relevant.

Appendix B
Survey forms

REGIONAL ORGANIC WASTE MAPPING IN SOUTH AUSTRALIA

QUESTIONNAIRE

25 May 2012

FOR ORGANIC WASTE GENERATORS		
1	Business name	
2	Business address - Lot/number, street name, town - If rural address, UBD reference, road name/distance, grid reference	
3	Sites where waste generated - Lot/number, street name, town - If rural address, UBD reference, road name/distance, grid reference	
4	Type of business	
5	Organic waste generated: - type (commonly known name) -source (process/processes) - is the waste a mixture of types (Y/N) - if Y, estimate proportions - state (solid/liquid/sludge) Repeat for each waste type	
6	Amount produced - production (annual) - units (tonnes/cubic metres/other) - how quantities measured (weighbridge, contractor charges, estimated) - what factor influences annual production (year to year) - is the quantity increasing/decreasing/stable -explain	
7	Is production seasonal (Y/N) If seasonal generation: - when is the season - seasonal quantities (month, quantity)	
8	Characteristics (where known) - key constituent/s - moisture content - % contamination - type of contaminants - density - other	

9	Current reuse/disposal management -amount managed by contractor - amount disposed to landfill (name landfill) - amount recovered/recycled by processor (name processor) - amount land application (type/location) - onsite or related site or business (describe/location) - other (If different methods used, please name all & identify % weight/volume for each)	
10	Committed timeframe - for each reuse/disposal path is it - casual/monthly - annual - other - if a management agreement is in place, how long for/remaining time?	
11	Cost - disposal - treatment/management - other - total	
12	Revenue - disposal - treatment/management - other - total	
13	Other issues/comments	
Please complete the following section if you process your organic waste on-site		
14	Type of process used - direct application on land - mulching - composting - waste to energy - other (please specify)	
15	Products - type of products • compost • fertiliser • mulch	

	• stockfeed • other (please specify) - internal costs/savings	
16	Markets - amount of internal use - amount of external use (excess) - location (local, national, international) - segment • agriculture • forestry • landscaping • site remediation • energy production • other (please specify)	

REGIONAL ORGANIC WASTE MAPPING IN SOUTH AUSTRALIA

QUESTIONNAIRE

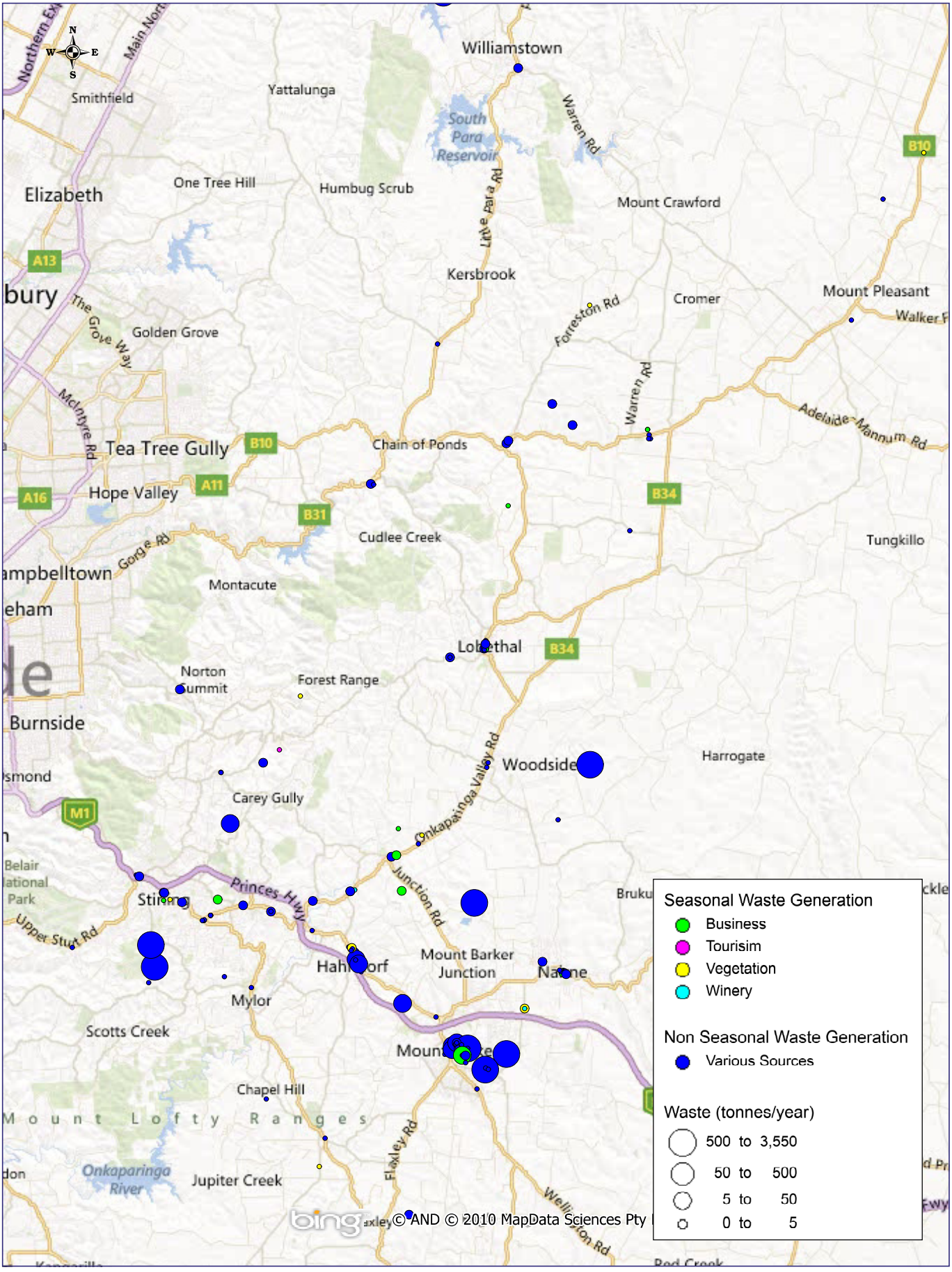
25 May 2012

FOR ORGANIC WASTE PROCESSORS		
1	Business name	
2	Business address - Lot/number, street name, town - If rural address, UBD reference, road name/distance, grid reference	
3	Site where processed - Lot/number, street name, town - If rural address, UBD reference, road name/distance, grid reference	
4	Type of business	
5	Source of organic waste: - type (commonly known name) - source (producer/s, location) - source (process / processes) - is the waste a mixture of types (Y/N) - if yes, estimate proportions - state (solid/liquid/sludge) Repeat for each waste type (only provide breakdown by producer if known/practical)	
6	Amount processed - production (annual) - units (tonnes/cubic metres/other) - what factor influences annual production (year to year) - is the quantity increasing/decreasing/stable -explain	
7	Is production seasonal (Y/N) If seasonal : - when is the season - seasonal quantities (month, quantity)	
8	Type of process used - windrow composting - static pile composting - in-vessel composting - anaerobic digestion -combustion/incineration	

	-pyrolysis/gasification - other (please specify)	
9	Products - type of products • compost • fertiliser • mulch • stockfeed • other (please specify) - price	
10	Major markets - location (local, national, international) - segment • agriculture • forestry • landscaping • site remediation • energy production • other (please specify)	
11	Other issues/comments	

Appendix C
Raw data

Appendix D
Maps



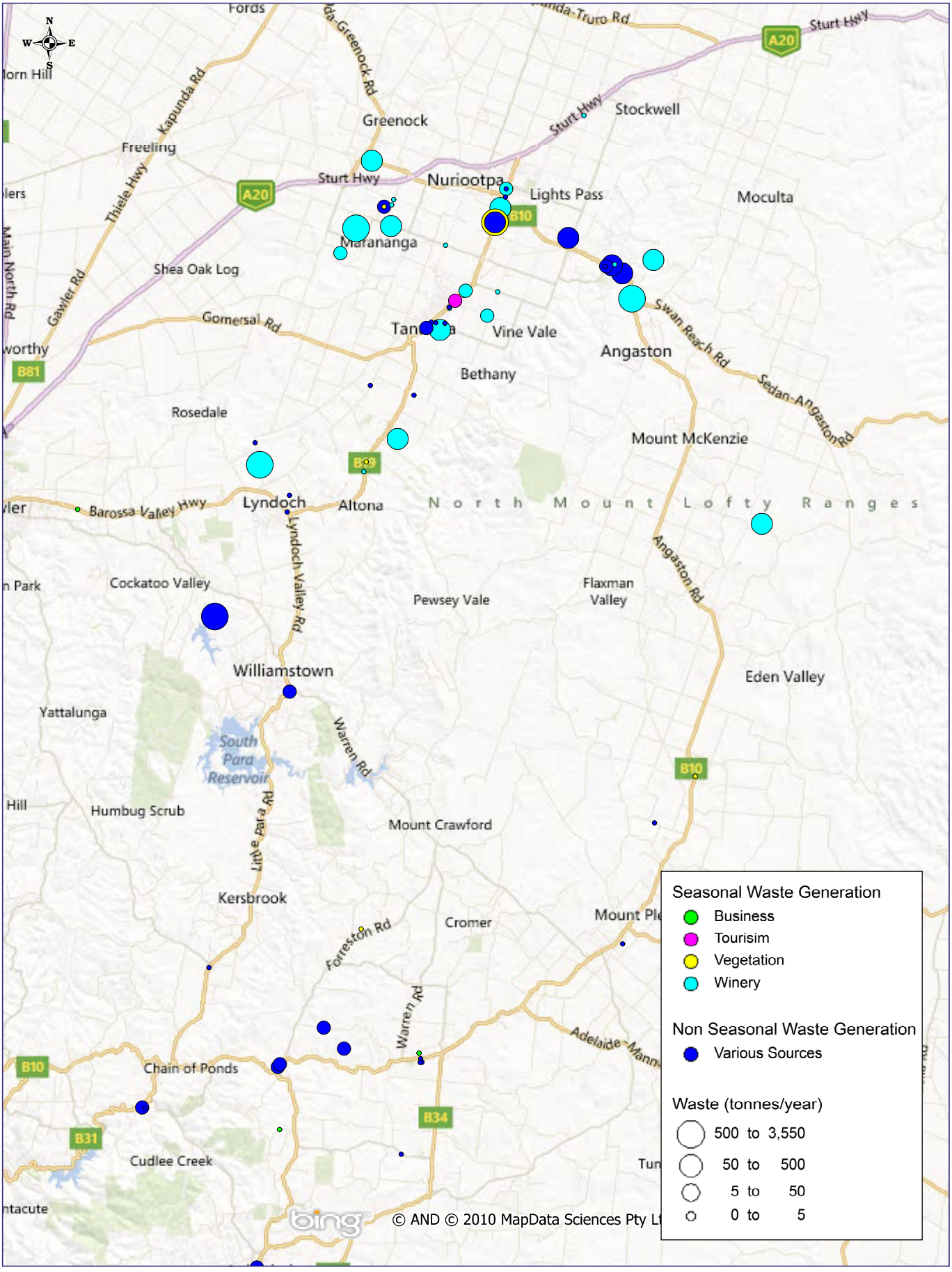
Zero Waste SA

ORGANIC WASTE SEASONALITY & QUANTITY
ADELAIDE HILLS COUNCIL

Tonkin CONSULTING

www.tonkin.com.au

a better approach



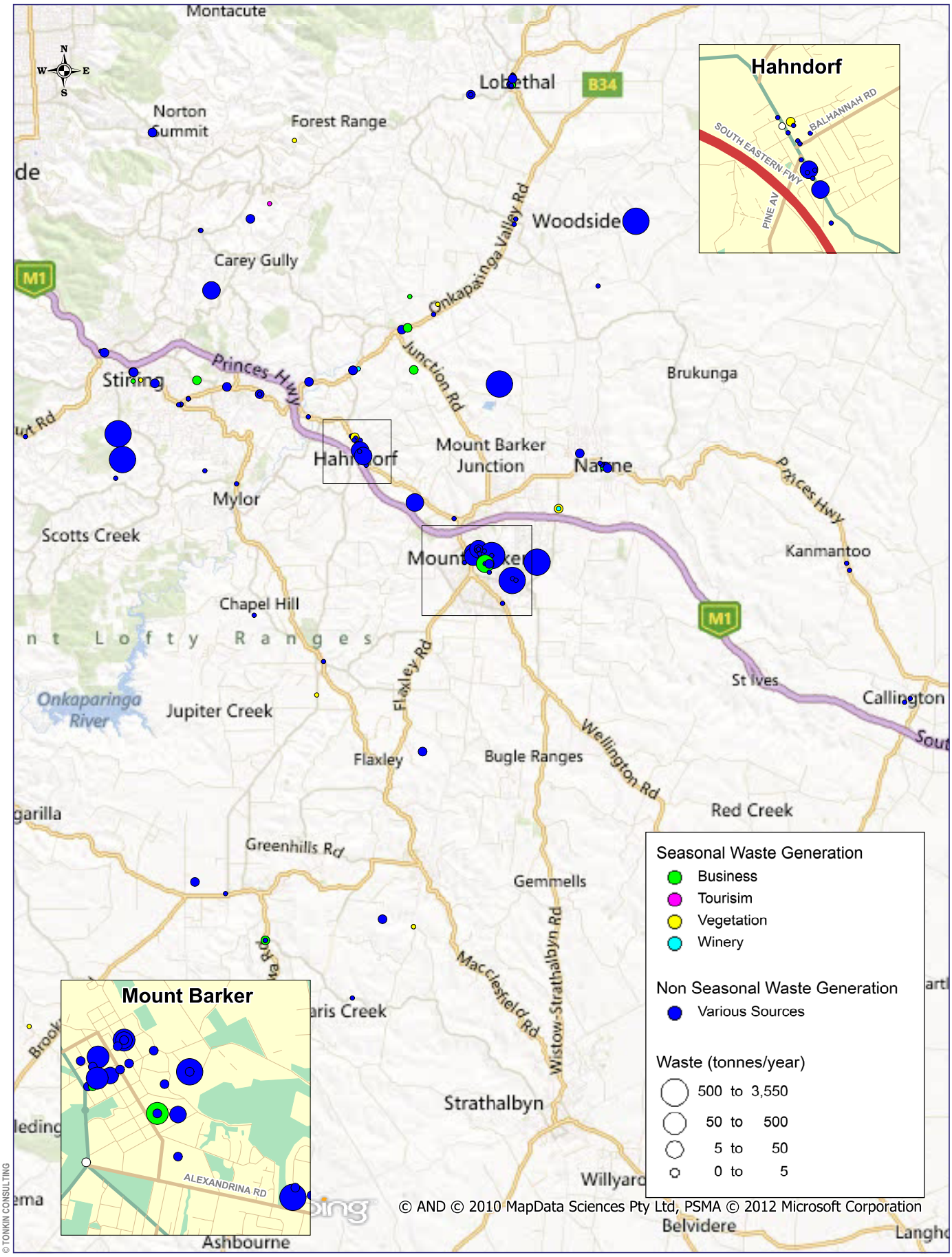
Zero Waste SA

ORGANIC WASTE SEASONALITY & QUANTITY
BAROSSA COUNCIL

Tonkin CONSULTING

www.tonkin.com.au

a better approach



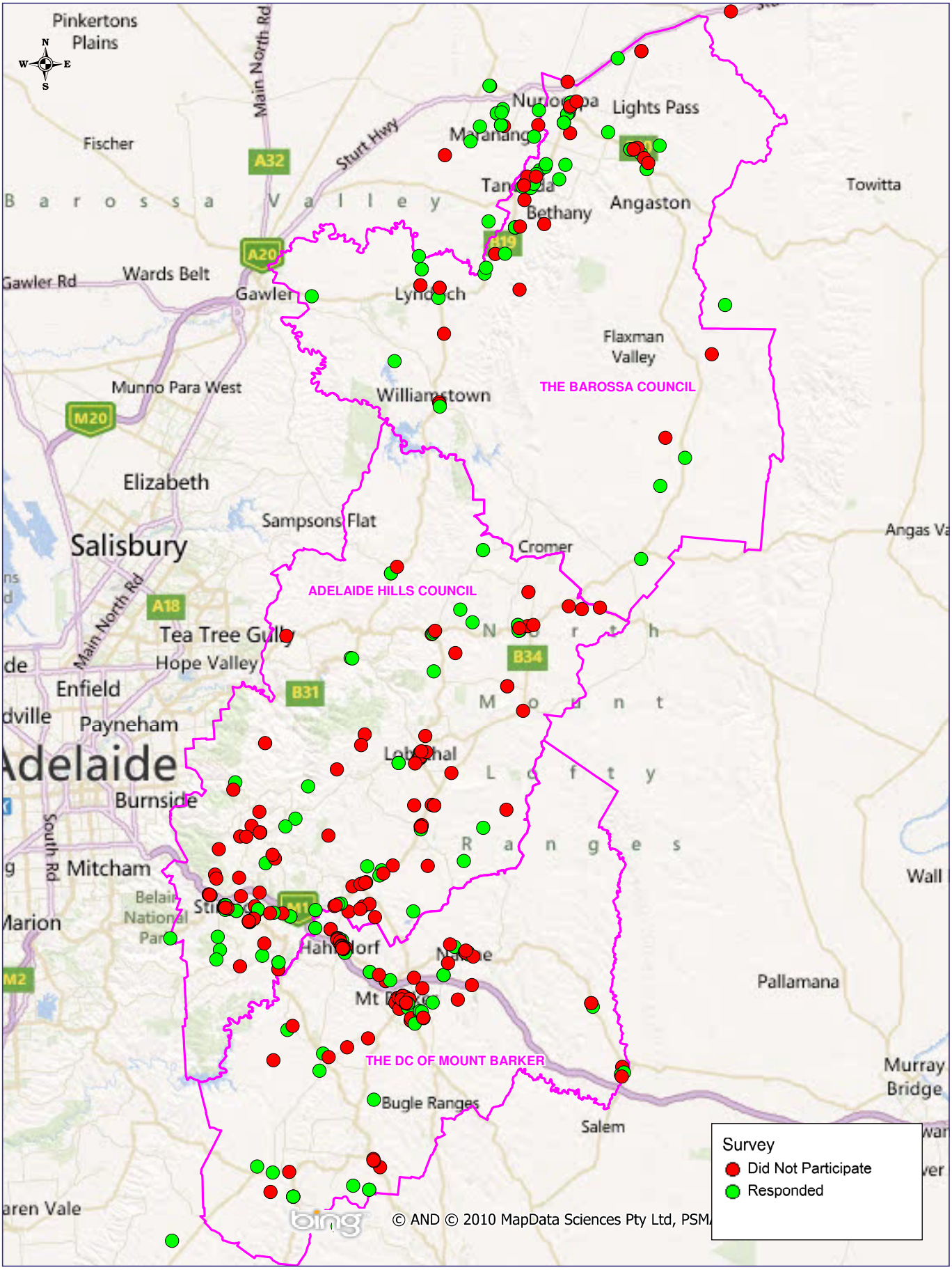
Zero Waste SA

ORGANIC WASTE SEASONALITY & QUANTITY
MOUNT BARKER COUNCIL

Tonkin CONSULTING

www.tonkin.com.au

a better approach

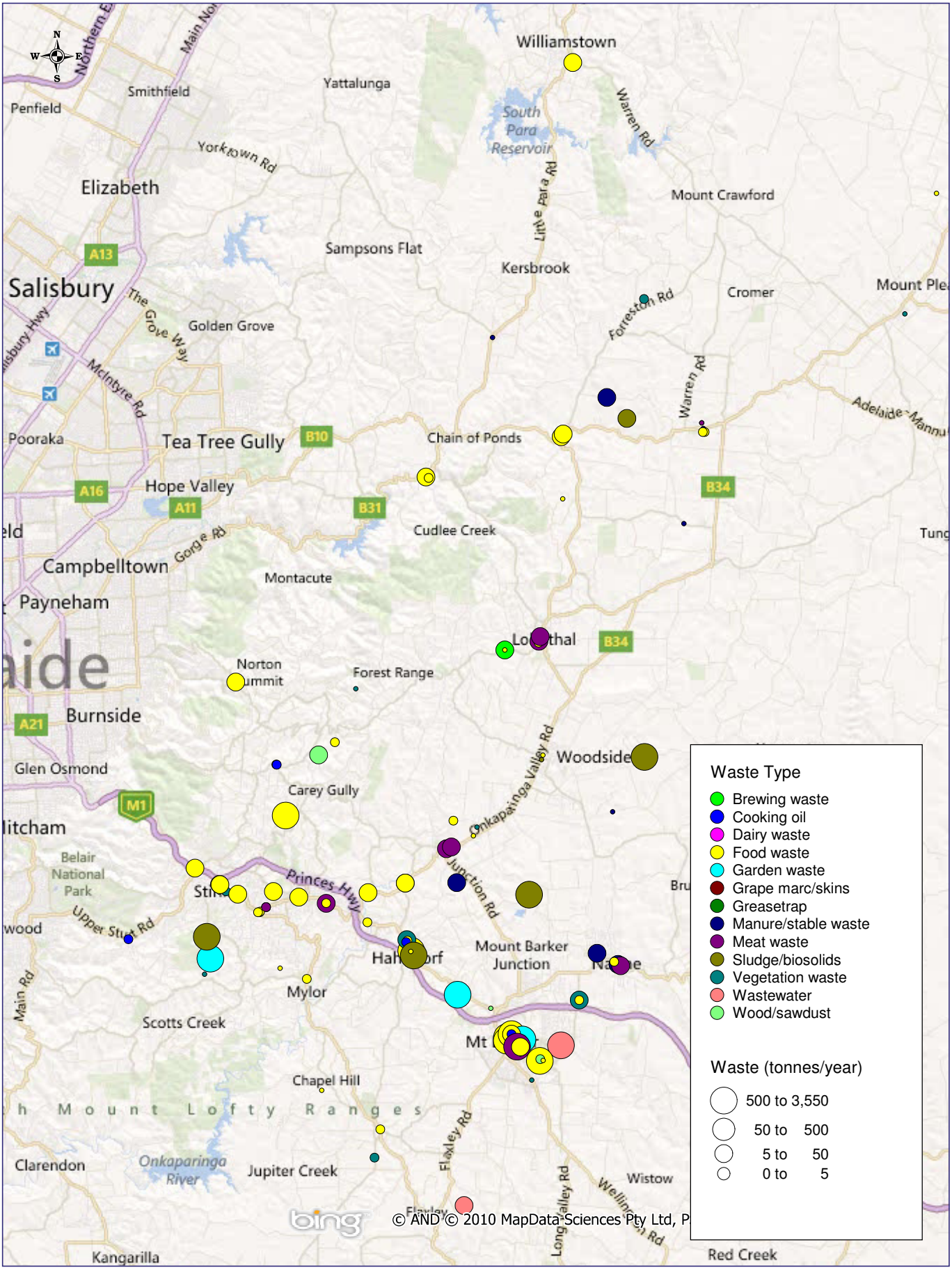


www.tonkin.com.au

a better approach

Zero Waste SA

SURVEY RESPONSES



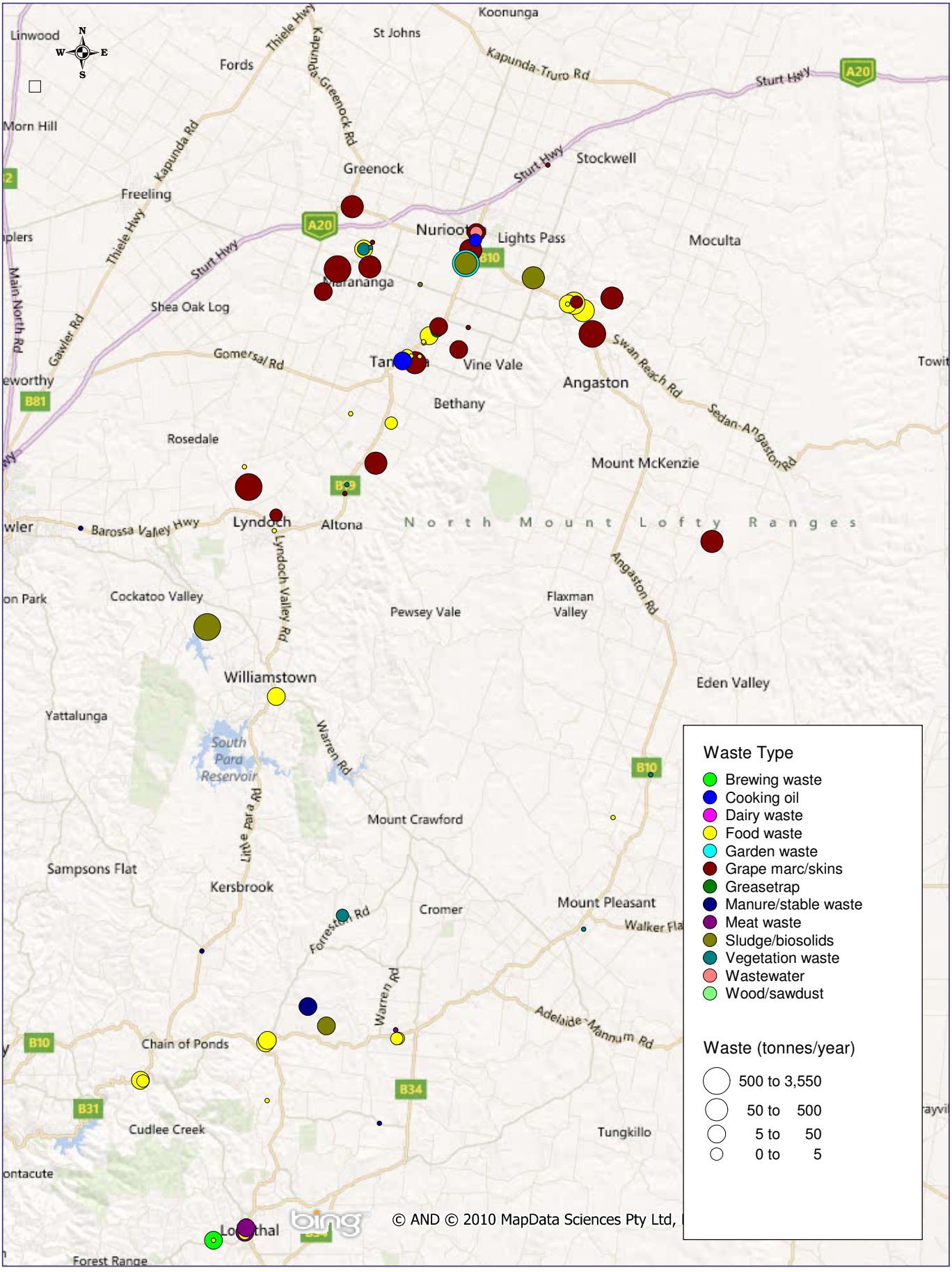
Zero Waste SA

ORGANIC WASTE TYPE & QUANTITY
ADELAIDE HILLS COUNCIL

Tonkin CONSULTING

www.tonkin.com.au

a better approach



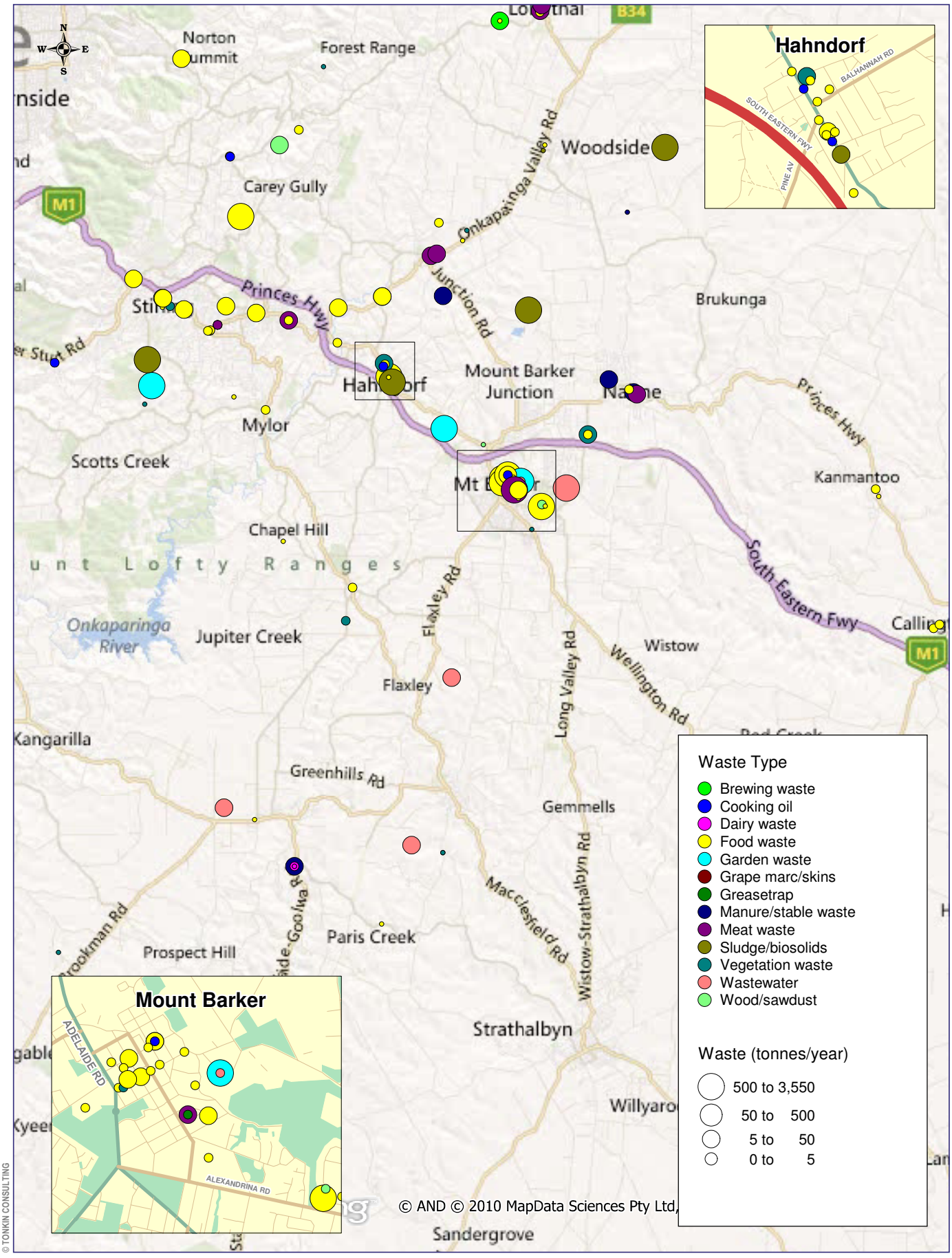
© TONKIN CONSULTING

Zero Waste SA

ORGANIC WASTE TYPE & QUANTITY
BAROSSA COUNCIL

www.tonkin.com.au

a better approach



Zero Waste SA

ORGANIC WASTE TYPE & QUANTITY
MOUNT BARKER COUNCIL

Tonkin CONSULTING

www.tonkin.com.au

a better approach