



MANSFIELD SHIRE COUNCIL

REVIEW AND AUDIT OF  
PUBLIC WASTE &  
RECYCLING  
INFRASTRUCTURE  
31/01/2022

FINAL REPORT



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### **Acknowledgements:**

Speculo acknowledges the Traditional owners of all the lands on which this audit was conducted, from the Taungurung Nation to the Wurundjeri of the Birrarung Valley. We pay respects to Elders past, present and emerging.

Our unending gratitude to Rebecca Kirley and Shaun Langlands from the Mansfield Shire Council for assisting with the implementation, running and completion of the project.

# Abbreviations

| ABBREVIATION |                                                 |
|--------------|-------------------------------------------------|
| Council      | Mansfield Shire Council                         |
| FOGO         | Food Organics & Green Organics                  |
| Master Plan  | Activating Lake Eildon Master Plan              |
| PPWRI        | Public Place Waste and Recycling Infrastructure |
| RRC          | Mansfield Resource Recovery Centre              |
| Strategy     | Mansfield Waste Management Strategy             |

# Report Snapshot

The Mansfield Shire Council engaged Speculo, a consultancy that specialises in developing bespoke waste management solutions, to conduct an audit of the public waste and recycling infrastructure across the municipality. The audit and subsequent report were designed to determine if the current systems in place are adequate and fit for purpose. The audit objectives were as follows;

- Determine the appropriateness of the current bin locations and the effectiveness to meet the demands of the community and visitors to the area, including cigarette butt bins
- Determine the effectiveness of the sizes and combinations of the current public waste and recycle bins
- Analysis of the type of materials placed in the bins to inform the need for additional recycling systems in areas where recycling is not provided;
- Outline areas for opportunities for the recycling of materials at the point of disposal in a public setting;
- Analyse service frequencies and how cost benefits can be achieved by introducing appropriately sized infrastructure in key locations to cope with demand;
- Develop a three-year plan to implement future public place infrastructure upgrades which meets the requirements of the general public and satisfies Recycling Victoria's A New Economy Strategy.

This report contains the methodology and results of a physical bin-by-bin audit conducted by Speculo from the 2nd of November through to the 30th of November 2021.

While Speculo has provided a number of recommendations for implementation over the next 3 years, there are a number of immediate changes that if made could result in a noticeable difference to the use of Council's public place waste and recycling infrastructure.

The audit was designed and carried out in line with the "Guidelines for Auditing Kerbside Waste in Victoria" (2009) provided by Sustainability Victoria, with an understanding and accounting for the differences in usage between kerbside collection and public waste infrastructure.

The audit included 100 general waste bins, 45 recycling bins and 14 cigarette butt bins. While undertaking the physical portion of the audit, Speculo made observations on the location, presentation, and condition of all public waste infrastructure, which encapsulates all the bin types (General waste, Recycling and Cigarette Butt bins), as well as all associated casings or stands.

## Overview of Bins

- **Mansfield** - 64 General Waste, 36 Recycling, 14 Cigarette Butt Bins
- **Merton** - 2 General Waste Bins
- **Maindample** - 1 General Waste, 1 Recycling Bin
- **Bonnie Doon** - 6 General Waste, 5 Recycling Bins
- **Jamieson** - 20 General Waste, 2 Recycling Bins
- **Kevington** - 2 General Waste Bins
- **Tolmie** - 1 General Waste Bin
- **Goughs Bay** - 4 General Waste, 1 Recycling Bin

## Method

The general waste and recycling bins were individually emptied into the audit trailer, in which the contents were splayed out and photographed for the Advanced Waste And Recycling Enlightener (AWARE) system. This was used to determine the composition and contamination rates of the different waste streams. The contents of each bin would be weighed independently according to their classification in addition to recording the gross and net weight of the bin and the waste within. Pairing this data with a geolocation and presentation rate gave us the clearest picture possible of how a bin was being used and if it was being used correctly.

## Key Results

The total weight of material audited from the Public Place Waste and Recycling Infrastructure was **943.78 kg**. Material from the general waste bins totalled **772.37 kg**, and material from recycling bins totalled **171.41 kg**.

Within the public place general waste bins there was a total of **193.77 kg** of landfill appropriate waste, with **417.63 kg** of material that could be diverted into either glass, recycling or organic waste streams. This accounts for **54%** of the total weight of material found in public place general waste bins. Another **160.97 kg** of other waste, mainly hardware and hazardous waste, was also found in the general waste bins.

The total weight of landfill found in the public place recycling bins was **24.89 kg**, meaning that the current contamination rate of those bins is **14.52%**.

## Insights

-  A large portion of the current PPWRI was not being used correctly, especially the metal bin "stands" that are designed to limit the opening of bin lids
-  Numerous reports of a single truck picking up both types of waste bins on Bonnie Crescent in Bonnie Doon
-  General waste bins paired with recycling bins have significantly less recyclable material in them than those standalone general waste bins.
-  The local communities around The Shire have shown an elevated awareness of waste and are eager to make use of improved facilities

## Recommendations

- 1** Ensure the correct use and operation of existing public place waste and recycling infrastructure.
- 2** Conduct maintenance and repair of the existing infrastructure.
- 3** Introduce new public place waste and recycling infrastructure to ensure more waste is diverted from landfill
- 4** Planning and implementation of Jamieson Pilot Resource Recovery Point
- 5** Phase out cigarette butt bins in line with any new smoke-free precinct policy
- 6** Develop a community waste based education program
- 7** Further consultation and development of advanced waste management system

# Action Plan

| Recommendation based Action Plan                       |                                                                                   | YEAR |
|--------------------------------------------------------|-----------------------------------------------------------------------------------|------|
| 1- Ensure correct operation of existing infrastructure |                                                                                   |      |
| 1.1                                                    | Engage with contractor to determine why "stands" are not being used               | 1    |
| 1.2                                                    | Investigate reports of incorrect collection on Bonnie Crescent                    | 1    |
| 1.3                                                    | Ensure "stands" are being used correctly after discussion with contractor         | 1    |
| 2- Conduct maintenance and repairs                     |                                                                                   |      |
| 2.1                                                    | Mansfield- MF036, MF089 and MF090 are in need of new casing door latches          | 1    |
| 2.2                                                    | Mansfield- MF084 requires deep clean                                              | 1    |
| 2.3                                                    | Jamieson- JS144 has significant burn damage, replace bin.                         | 1    |
| 2.4                                                    | Jamieson- JS131 requires deep clean                                               | 1    |
| 2.5                                                    | Kevington- KV149 has significant damage, replace bin.                             | 1    |
| 3- New infrastructure                                  |                                                                                   |      |
| 3.1                                                    | Create an implementation plan and budget for rollout of 53 new recycling bins     | 1    |
| 3.2                                                    | Install a casing alongside new recycling bin in Kevington                         | 1    |
| 3.3                                                    | Install a single open top casing for the remaining general waste bin in Kevington | 1    |
| 3.4                                                    | Install a casing alongside new recycling bin in Merton                            | 1    |
| 3.5                                                    | Install a single open top casing for the remaining general waste bin in Merton    | 1    |
| 3.6                                                    | Begin installation of priority recycling infrastructure <i>Appendix 9.5</i>       | 1-2  |
| 3.7                                                    | Begin installation of the remainder of new recycling infrastructure               | 2-3  |
| 3.8                                                    | Install bin casing for new infrastructure in Tolmie                               | 2    |
| 3.9                                                    | Install 2 casings for the new infrastructure in Jamieson on Perkins st            | 2    |
| 3.10                                                   | Install 3 casings for the new infrastructure in Jamieson at Riverside Park        | 3    |
| 3.11                                                   | Install new casing and recycling bin just before the bridge walk in Bonnie Doon   | 3    |
| 3.12                                                   | Install new casing on the bins outside the service station on Bonnie Crescent     | 3    |

| Recommendation based Action Plan                                            |                                                                                                                                                                            | YEAR |
|-----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 4- Planning and implementation of Jamieson Pilot Resource Recovery Point    |                                                                                                                                                                            |      |
| 4.1                                                                         | Engage with the local community to solicit comment and recommendations                                                                                                     | 1    |
| 4.2                                                                         | Engage with a waste consultant to develop the system and implementation plan                                                                                               | 1    |
| 4.3                                                                         | Commence the installation of new resource recovery point in Jamieson                                                                                                       | 3    |
| 5- Phase out cigarette butt bins in accordance with any smoke-free policy   |                                                                                                                                                                            |      |
| 5.1                                                                         | Enquire with local laws about a smoke free policy in high pedestrian precincts                                                                                             | 1    |
| 5.2                                                                         | Create a plan and budget for removal of the 14 cigarette butt bins                                                                                                         | 2    |
| 5.3                                                                         | Remove the 14 cigarette butt bins                                                                                                                                          | 3    |
| 6- Develop a community waste based education program                        |                                                                                                                                                                            |      |
| 6.1                                                                         | Begin development of an application based waste education program                                                                                                          | 2    |
| 6.2                                                                         | Rollout waste education application that includes a bin day calendar as well as a "what bin does this go in" camera feature to improve correct individual waste processing | 3    |
| 7- Further consultation and development of advanced waste management system |                                                                                                                                                                            |      |
| 7.1                                                                         | Monitor the Jamieson resource recovery point rollout                                                                                                                       | 3    |
| 7.2                                                                         | Engage consultants to develop and implement an advanced waste management system that take a holistic approach to managing a communities waste within the community itself  | 3    |

# TABLE OF CONTENTS

|                                                       |           |
|-------------------------------------------------------|-----------|
| <b>Abbreviations</b>                                  | <b>3</b>  |
| <b>REPORT SNAPSHOT</b>                                | <b>4</b>  |
| <b>ACTION PLAN</b>                                    | <b>7</b>  |
| <i>Table of contents</i>                              | 9         |
| <i>List of Figures</i>                                | 11        |
| <i>List of Pictures</i>                               | 11        |
| <i>List of Tables</i>                                 | 11        |
| <i>List of Maps</i>                                   | 11        |
| <b>1 INTRODUCTION</b>                                 | <b>12</b> |
| <i>1.1 Public Place Audit Overview</i>                | 13        |
| <i>1.2 The Mansfield shire</i>                        | 14        |
| <i>1.3 Objectives</i>                                 | 15        |
| <i>1.4 Waste Background</i>                           | 15        |
| <i>1.5 Recycling Victoria - A New Economy</i>         | 15        |
| <i>1.6 Current Collection Systems</i>                 | 17        |
| <b>2 METHOD</b>                                       | <b>18</b> |
| <i>2.1 Sample Selection and Collection</i>            | 19        |
| <i>2.2 Geolocation</i>                                | 19        |
| <i>2.3 Sorting</i>                                    | 20        |
| <i>2.4 Classification</i>                             | 20        |
| <b>3 LIMITATIONS</b>                                  | <b>21</b> |
| <b>4 RESULTS</b>                                      | <b>22</b> |
| <i>4.1 Samples Collected</i>                          | 22        |
| <i>4.2 Appearance rate</i>                            | 24        |
| <i>4.3 General waste Bins</i>                         | 26        |
| <i>4.4 Recycling Bins</i>                             | 29        |
| <i>4.5 Cigarette Butt Bins</i>                        | 30        |
| <i>4.6 Recyclables Breakdown</i>                      | 31        |
| <i>4.7 Contamination rates</i>                        | 32        |
| <i>4.8 Hazardous Materials</i>                        | 33        |
| <i>4.9 Landfill Diversion - Current and Potential</i> | 34        |
| <i>4.9.1 Current Diversion</i>                        | 34        |
| <i>4.9.2 Future Diversion</i>                         | 34        |
| <i>4.10 Community Feedback</i>                        | 35        |
| <i>4.10.1 Interviews with public</i>                  | 35        |
| <i>4.10.2 Online Engagement</i>                       | 35        |

|                                                                              |           |
|------------------------------------------------------------------------------|-----------|
| <b>5 ANALYSIS</b>                                                            | <b>36</b> |
| 5.1 Trends                                                                   | 36        |
| 5.2 Insights                                                                 | 37        |
| 5.3 Cost Benefit Analysis                                                    | 38        |
| <b>6 KEY FINDINGS</b>                                                        | <b>40</b> |
| 6.1 Bin Locations                                                            | 40        |
| 6.2 Bin Sizes                                                                | 41        |
| <b>7 RECOMMENDATIONS</b>                                                     | <b>42</b> |
| 7.1 Ensure correct operation of existing infrastructure                      | 42        |
| 7.2 Conduct maintenance and repairs                                          | 43        |
| 7.3 New Infrastructure                                                       | 43        |
| 7.4 Jamieson Pilot Project                                                   | 44        |
| 7.5 Phase out cigarette butt bins                                            | 45        |
| 7.6 Develop a community waste-based education program                        | 45        |
| 7.7 Further consultation and development of advanced waste management system | 46        |
| <b>8 CONCLUSION</b>                                                          | <b>47</b> |
| <b>9 APPENDIX</b>                                                            | <b>48</b> |
| 9.1 Town waste breakdown                                                     | 48        |
| <b>9.2 Bin Identification</b>                                                | <b>50</b> |
| 9.3 Methodology                                                              | 56        |
| 9.4 Recommendation breakdown                                                 | 57        |
| 9.5 Priority Recycling                                                       | 60        |
| 9.6 Interactive bin map                                                      | 60        |
| <b>10 GLOSSARY</b>                                                           | <b>61</b> |
| <b>11 REFERENCES</b>                                                         | <b>63</b> |

## List of Figures

- Figure 1 - Types of bins present in the Shire
- Figure 2 - Average Weight of bins per type per town
- Figure 3 - Visual breakdown of the total weight processed in the general waste stream
- Figure 4 - Visual comparison of amount of recycling found in standalone vs paired general waste bins
- Figure 5 - Material Breakdown of Standalone General Waste Bins vs Paired General Waste Bins
- Figure 6 - Visual representation of standalone general waste bin composition
- Figure 7 - Visual representation of paired general waste bin composition
- Figure 8 - Appearance rates of bins MF033 - MF034
- Figure 9 - Visual representation of the components in the recycling bins
- Figure 10- Average appearance rate of recycling bins in the shire.
- Figure 11 - Visual representation of the components in the recycling stream
- Figure 12 - Visual breakdown of recycling in general waste bins
- Figure 13- Average contamination weight and rates
- Figure 14 - The total weight of all "other materials" and their classification

## List of Pictures

- Picture 1. Breakdown of the Key areas Recycling Victoria is reviewing (Recycling Victoria A New Economy, 2020)
- Picture 2. Victoria's Circular Economy Goals (Recycling Victoria A New Economy, 2020)
- Picture 3. Speculo staff member hoisting a rather full bin into the audit trailer at Tolmie
- Picture 4. The "presentation picture" of bin JS133
- Picture 5. The unopened contents of bin JS133
- Picture 6. The unpacked contents of bin JS133
- Picture 7. MT001 contents as they were found
- Picture 8. MT001 contents after break down
- Picture 8 Photo of MT001, MT002 bins of the stands
- Picture 9. A Cigarette Butt Bin next to Bins
- Picture 10. A standalone Cigarette Butt Bin
- Picture 11-16. The images captured during the cigarette butt bin audit

## List of Tables

- Table 1. Mansfield population- census data 2020 (Home | Mansfield Shire Council | Community profile, (2021)
- Table 2. Breakdown of the current waste schedule (Day/ Frequency)
- Table 3. Classification designations used throughout the audit
- Table 4. Average weight of each type of bin in each town
- Table 5. Sample collected at the Kevington hotel
- Table 6. Overview of sample collection for the town of Mairdample
- Table 7. Average appearance rate for all bins in the Shire
- Table 8. Average/Max/Min appearance rate by town and type of bin
- Table 9. Total weight of waste processed in the general waste stream
- Table 10. Waste breakdown of bins MF033 MF034
- Table 11. Breakdown of the different classifications of recycling
- Table 12. Estimated upfront cost
- Table 13. Estimated ongoing cost of adding new recycling bins

## List of Maps

- Map 1 - Cigarette Butt Bin locations on High St
- Map 2 - General Waste Bins excluding Jamieson and Kevington
- Map 3 - Recycling Bin locations excluding Jamieson

# 1 Introduction

Diamond Waste2Energy Pty Ltd, trading as Speculo ("Speculo") was awarded the contract by the **Mansfield Shire Council (Council)** to undertake an audit of the Public Place Waste and Recycling infrastructure (PPWRI), which includes; 159 bins, consisting of 10 general waste bins, 45 recycling bins and 14 Cigarette Butt bins throughout a number of townships within the Mansfield Shire.

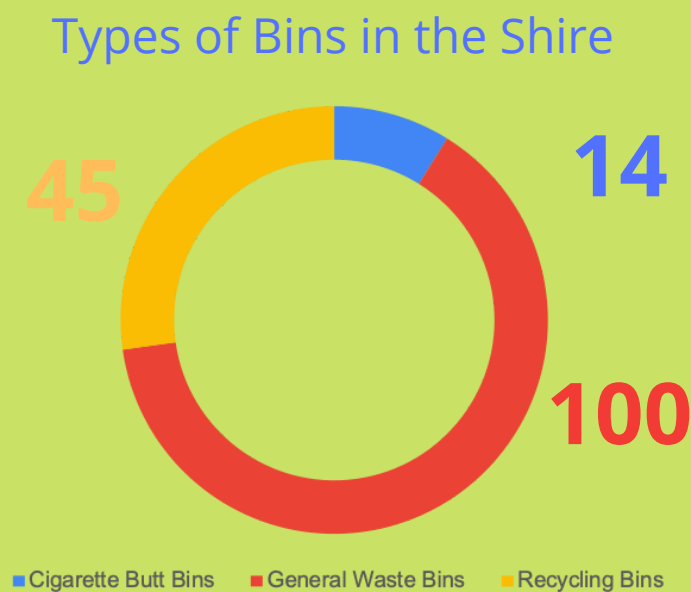


Figure 1 - Types of bins present in the Shire

The aim of the audit and subsequent report is to analyse and recommend changes to the existing PPWRI to make it better suited to the demands of today, as well as prepared for those of the future.

The focus of this report is on the needs of the residents and communities where the PPWRI is located. In order to provide enhanced context, Speculo has attempted to understand and quantify the impact that tourists have during periods of peak visitation, to provide a deeper understanding to those responsible for planning and implementing future changes to the PPWRI.

The **Lake Eildon Tourism Master Plan (Master Plan)** (Ruzzene, Patsouris and Yoo, 2019), produced at the behest of Regional Development Victoria, outlines the desire of the two Shires surrounding Lake Eildon (Mansfield and Murrindindi) to expand their attraction to tourists.

Specifically, the plan identifies that the majority of tourists to the region are campers exploring the natural beauty of the area. While the economic ramifications of this are explored in the **Master Plan**, valuable insights can be drawn as to the effects this will have on the existing PPWRI. The increased demand on the PPWRI by tourists directly impacts residents of the Shire

Speculo contends that this increase in tourism should be met by increased investment in the PPWRI while also ensuring that residents are not subsidising the waste processing of visitors. As such this report contains recommendations to enhance and reinforce the message to visitors, especially campers, that there are two options for the waste they generate; take it **home** or to the **Resource Recovery Centre (RRC)**.

The Lake Eildon region is projected to grow by an additional 604,922 visitors by 2030, to reach 1,474,800 visitors. This highlights the need for both private and public sector investment to provide a unique and attractive experience to service these visitors, including investment in key product gaps, infrastructure and visitor services. - **Lake Eildon Tourism Master Plan**

It is assumed that a portion of the material inside both the Waste and Recycling Bins that make up the current PPWRI could be better sorted at the point of disposal.

Speculo presents a simple analysis of the myriad of factors that come together for each bin in the PPWRI and uses that information and resulting insights to recommend changes to improve the overall efficiency of the current PPWRI.

## 1.1 Public Place Audit Overview

Council sought funding from Sustainability Victoria as part of its overall Mansfield Waste Management Strategy (2020) and in recognition of the added pressure placed on the current public waste infrastructure from an increase in both residential population and visitor numbers. The Victorian Government's legislated target of a four bin system for every resident by the year 2030 is also a major driver of gathering this information.

- **Mansfield** - 64 General Waste, 36 Recycling, 14 Cigarette Butt Bins
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- **Maindample** - 1 General Waste, 1 Recycling Bin
- **Bonnie Doon** - 6 General Waste, 5 Recycling Bins
- **Jamieson** - 20 General Waste, 2 Recycling Bins
- **Kevington** - 2 General Waste Bins
- **Tolmie** - 1 General Waste Bin
- **Goughs Bay** - 4 General Waste, 1 Recycling Bin

The Council is also aware and is seeking guidance through this audit on the matter of the lack of recycling infrastructure compared to general waste infrastructure, particularly in those small townships where no such public place recycling infrastructure is present.

## 1.2 The Mansfield Shire

The Shire has a population of 8,584 that has grown approximately 2% per year since 2001. The Mansfield Shire is located in North-East Victoria, covering 3,844 square kilometres. The Shire is governed and administered by the **Mansfield Shire Council (Council)**.

Within the municipality, over 60% of the total land is designated crown land which is made up of a number of State and National Parks (Mansfield Shire Waste Strategy 2020). The rest of the land is privately held, with only 53% of ratepayers in the Shire being permanent residents.

Table 1 - Mansfield Shire & Township population- census data 2020 (Home | Mansfield Shire Council | Community profile, 2021)

|                                    |         |
|------------------------------------|---------|
| Mansfield Shire Council Population | 9474.00 |
| Mansfield Population               | 5257.00 |

The audit required Speculo to view the current systems in place and to develop a three-year implementation plan for necessary PPWRI upgrades. In three years the MSC is predicted to have a population of **9700**, with that number eclipsing **10,000** by 2030.

Speculo has factored population and visitor growth into the recommended infrastructure improvements.

## 1.3 Objectives

The key requirements of this report are to determine;

- The appropriateness of the current bin locations and the effectiveness to meet the demands of the community and visitors to the area, including cigarette butt bins
- The effectiveness of the sizes and combinations of the current public waste and recycle bins
- Analysis of the type of materials placed in the bins to inform the need for additional recycling systems in areas where recycling is not provided
- Areas for opportunities for the recycling of materials at the point of disposal in a public setting
- Analysis of service frequencies and how cost benefits can be achieved by introducing appropriately sized infrastructure in key locations to cope with demand
- The development of a three-year plan to implement future public place infrastructure upgrades which meets the requirements of the general public and satisfy Recycling Victoria's "A New Economy Strategy".

## 1.4 Waste Background

An in-depth analysis of the state of waste in the Shire can be found in the *Mansfield Shire Waste Strategy 2020-2025*, but for the sake of context, provided below is an excerpt of the Strategy as it pertains to "street bins" which are the PPWRI.

Street bins for general waste and recycling are provided at a number of locations throughout the Shire. General waste street bins are provided in Mansfield Township, Jamieson, Kevington Hotel, Maindample (park), Merton, Bonnie Doon and Goughs Bay. Recycling street bins are only provided in Mansfield Township, Maindample and Bonnie Doon. In total there are 107 general waste bins and 38 recycling bins.

**(Mansfield Shire Waste Strategy, 2020)**

## 1.5 Recycling Victoria - A New Economy

A key inclusion in the scope of this report is the development of a three-year plan to upgrade the PPWRI in the MSC to not only better meet existing demand, but be better prepared for the projected growth in demand.

Speculo has endeavoured to provide Council, and any other interested party, with the deepest understanding of the current waste picture. It is for this reason that a brief summary of Recycling Victoria's A New Economy (Recycling Victoria, 2020) and its effect on the Council and Shire is provided below.

While Council's are not currently required to remove Glass and FOGO from the waste stream, they will be mandated to do so from 2030. This affects both Kerbside and PPWRI. It is vital that this knowledge be at the incorporated in any plan as it is a future requirement that Council will have to meet.

|                                                                                                                                                                                                |                                                                                                                                                                                   |                                                                                                                                                                     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Kerbside reform</b><br>We are changing how Victorians recycle so that materials collected from households are high quality and can be used again to make new products.                      | <b>Stronger recycling oversight</b><br>New Act and new waste authority to make sure our recycling system is reliable and transparent.                                             | <b>New rules to cut waste</b><br>New rules to improve waste sorting and make sure we pay the right amount for disposing of waste in landfill.                       |
| <b>Waste to energy</b><br>We will encourage investment in appropriate waste to energy facilities that reduce the need for landfills.                                                           | <b>High-risk and hazardous waste management</b><br>Make sure risks to the Victorian community and environment from hazardous waste and high-risk sites are properly managed.      | <b>Reducing business waste</b><br>A new Circular Economy Business Innovation Centre will help businesses reduce waste and generate more value with fewer resources. |
| <b>Invest in priority infrastructure</b><br>Victoria will have the right infrastructure to support increased recycling, respond to new bans on waste export and safely manage hazardous waste. | <b>Provide support for local communities and councils</b><br>A new Supporting Victorian Communities and Councils program will support regional growth and community connectivity. | <b>Behaviour change</b><br>Victorians will have the information and tools they need to reduce waste by reusing, sharing, repairing and recycling products.          |

Picture 1. Breakdown of the Key areas Recycling Victoria is reviewing (Recycling Victoria A New Economy, 2020)

The strategy includes a complete overhaul of Victorian recycling systems, with reform to kerbside recycling, the introduction of a container deposit scheme, new investment in industry and the creation of waste management as an essential service.

It is important that that all findings and recommendations be used in a way that moves the MSC further in line with Recycling Victoria's "Circular Economy Goals". Goal 3 clearly outlines the need to further separate

## Victoria's circular economy goals

Victoria's transition to a circular economy will be guided by four goals spanning the life cycle of materials (make, use, recycle and manage). Each goal is designed to maximise value and minimise waste.

- Goal 1 - Design to last, repair and recycle.**  
 Generate less waste in businesses through innovation and design; use recycled materials in products and consider impacts across product life cycles; and support business to explore new circular economy business models ('Make' Chapter).
- Goal 2 - Use products to create more value.**  
 Help people make smart purchasing decisions and extend the life of products and support the reuse economy; repair goods where possible ('Use' Chapter).
- Goal 3 - Recycle more resources.**  
 Reform kerbside collections to generate more value from waste; improve the separation of recyclable materials; develop markets for recovered materials; plan for and boost investment in recycling infrastructure; embed the waste hierarchy in the management of materials; support the development of appropriate waste to energy facilities ('Recycle' Chapter).
- Goal 4 - Reduce harm from waste and pollution.**  
 Protect communities and the environment from high-risk and hazardous wastes ('Manage' Chapter).

Picture 2. Victoria's Circular Economy Goals (Recycling Victoria A New Economy, 2020)

## 1.6 Current Collection System

The current collection system is adequately summarised by the following passage from the *Mansfield Waste Strategy* :

*Mansfield Township bins are emptied daily. Bonnie Doon general waste and recycling are emptied twice per week. All other street bins are emptied at the same time as the kerbside collection for that area. (Mansfield Shire Waste Strategy, 2020)*

This collection system appeared to be accurate except for a number of bins around Bonnie Doon and the Mansfield Recreation Reserve

In addition to the general waste and recycling pickups conducted by Cleanaway, there are 14 Cigarette Butt Bins that are serviced directly by Council staff. These Butts are collected and then disposed of into the general waste stream.

Table 2 - Breakdown of the current waste schedule (Day/ Frequency)

| Township    | General Waste Bin | Recycling Bin    | Cigarette Bin |
|-------------|-------------------|------------------|---------------|
| Bonnie Doon | Tuesday/Weekly    | Tuesday/Weekly   | -             |
| Gough Bay   | Wednesday/Weekly  | Wednesday/Weekly | -             |
| Jamieson    | Monday/Weekly     | Monday/Weekly    | -             |
| Kevington   | Monday/Weekly     | -                | -             |
| Maindample  | Tuesday/Weekly    | Tuesday/Weekly   | -             |
| Mansfield   | Daily             | Daily            | Fortnightly   |
| Merton      | Tuesday/Weekly    | -                | -             |
| Tolmie      | Thursday/Weekly   | -                | -             |

## 2 Method

Speculo completed the audit of all bins that make up the Shire's PPWRI. This was done to establish the best picture of how the public place infrastructure is being utilised. The data gathered will aid Council in making informed decisions regarding future waste infrastructure upgrades. The physical portion of the audit was conducted over a four week period concluding on the 30th November 2021.

The method used to conduct the audit was not the standard "bag and tag", but rather Speculo's unique bin by bin audit system. Using Speculo's proprietary Advanced Waste And Recycling Enlightener (AWARE), the audit team would pull up to the bin's location with the custom built trailer and immediately capture valuable information such as a presentation picture, geolocation and appearance rate.

Picture 3. Speculo staff member hoisting a rather full bin into the audit trailer at Tolmie



Picture 4. The "presentation picture" of bin JS133



Picture 5. The unopened contents of bin JS133



Picture 6. The unpacked contents of bin JS133

Speculo staff attended bins ahead of the collection vehicles, no more than 10 hours before pickup, then the team would proceed to weigh the bin on a platform scale as metrics on the bin's size (litres) and weight would be fed into AWARE, before safely hoisting the bin up and tipping out the contents so that a number of "contents pictures" could be captured and processed.

Due to the high prevalence of big rubbish dumping incidents (where people have put whole bags of waste into a public bin), a number of bins had two contents pictures taken, as demonstrated above by bin JS133. Each bin was designated a unique identification number so that all the data could be easily brought together by the system as well as to allow for direct bin-to-bin comparisons in any future audits of the PPWRI.

## 2.1 Sample Selection and Collection

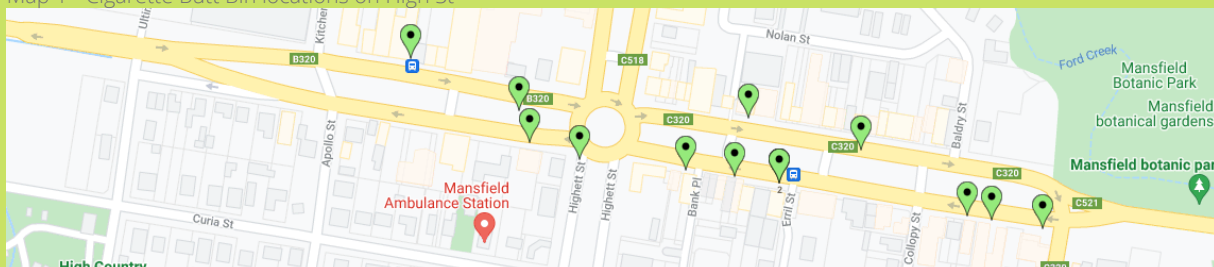
For this audit there was no need to conduct a random sample section as Speculo's stated sample size was always the entirety of the PPWRI. As each bin was audited at the location in which it was presented, there was no logistical exercise in collection that had to be undertaken.

## 2.2 Geolocation

After a presentation picture and appearance rate had been recorded, the audit team would then retrieve highly accurate GPS coordinates and record them along with all other data.

These coordinates do not only provide a sturdy bin verification process, they also allow for an accurate map to be generated showing where all the bins in the Shire are situated. The coordinates were recorded in the following form: **-37.052954, 146.092525**

Map 1 - Cigarette Butt Bin locations on High St



Map 2 - General Waste Bins excluding Jamieson and Kevington



Map 3 - Recycling Bin locations excluding Jamieson and Kevington

## 2.4 Sorting

Once initial data points were recorded, the contents of the bin were splayed out and captured as a "contents picture". For a large number of bins, multiple contents pictures were necessary to gather evidence of large volume disposals (dumping of big rubbish bags into PPWRI), after which Speculo staff meticulously broke down the waste to it's individual components for further "contents pictures". The sorted waste was then assigned the corresponding classification designation before being weighed and returned to the bin.

## 2.5 Classification

|           | PRIMARY CLASSIFICATION CATEGORY | SECONDARY CLASSIFICATION CATEGORY                        | CLASSIFICATION DESIGNATION |
|-----------|---------------------------------|----------------------------------------------------------|----------------------------|
|           | Material Type                   | Material Detail                                          |                            |
| Recycling | Paper                           | Paper / Newspaper                                        | A01                        |
|           |                                 | Cardboard                                                | A02                        |
|           |                                 | Liquid Paperboard (No Foil)                              | A03                        |
|           |                                 | Liquid Paperboard (Foil)                                 | A04                        |
|           |                                 | Other/Mixed                                              | A05                        |
|           | Glass                           | Packaging bottles /containers                            | G01                        |
|           |                                 | Other (pyrex, windscreen)                                | G02                        |
|           | Plastic                         | Code 1-3 (1 PET, 2 HDPE, 3 PVC                           | P01                        |
|           |                                 | Code 4-6 (4 LDPE, 5 Polypropylene, 6 Polystyrene 7 Other | P02                        |
|           |                                 |                                                          |                            |
| Residual  | Metal                           | Aluminium cans/foil                                      | M01                        |
|           |                                 | Steel cans/aerosol cans                                  | M02                        |
|           |                                 | Other                                                    | M03                        |
|           | Organic compostable             | Food / Kitchen                                           | B01                        |
|           |                                 | Garden                                                   | B02                        |
|           |                                 | Other Putrescible                                        | B03                        |
|           | Building materials              | Wood/timber                                              | T01                        |
|           | Clothing/textile/fabric         | Textile/rags                                             | C01                        |
|           | Potentially hazardous           | Paint                                                    | H01                        |
|           |                                 | Fluorescent globes                                       | H02                        |
|           |                                 | Dry cell batteries                                       | E02                        |
|           |                                 | E-Waste                                                  | E01                        |
|           |                                 | Nappies/Hygiene products                                 | H03                        |
|           |                                 | Car batteries                                            | E03                        |
|           |                                 | Household chemicals                                      | H04                        |
|           |                                 | Pharmaceuticals                                          | H05                        |
|           | Other                           | Ceramics                                                 | I01                        |
|           |                                 | Dust/ dirt/ rock/inert                                   | I02                        |
|           |                                 | Ash                                                      | I03                        |
|           |                                 | Special                                                  | I04                        |
|           |                                 | Plastic Bags                                             | P03                        |
|           |                                 | Non recyclable plastic film                              | P04                        |
|           |                                 | Non recyclable hard plastic                              | P05                        |
|           |                                 | Soil                                                     | I05                        |
|           |                                 | Other                                                    | Other                      |

Adjacent is the complete list of classifications that were used throughout the audit and report. These are in line with the recommended classifications provided in Sustainability Victoria's *Guideline for Auditing Kerbside Waste in Victoria* (Sustainability Victoria, 2009).

Table 3. Classification designations used throughout the audit

# 3 Limitations

Throughout the audit process, there were a number of limitations. The main limitation encountered from the outset was a lack of previous research in this particular field, while as recently as 2017 Council had engaged a consultancy to conduct a kerbside audit, this could only ever serve as context to the insights and recommendations provided within this report.

No previous audit of a similar kind meant that there was no barometer with which to compare the information gathered during this audit.

Another key limitation with this method was only auditing each bin once, a constant audit of a select few bins every month for a year would provide the crucial insight into the seasonal change in PPWRI use by both residents and visitors.

While a smaller more repetitive sample could've formed the basis of this report, Speculo believed that every bin had to be audited to account for large geographical and demographic differences present in the Shire.

With all these limitations, a confidence level is applied to the data indicators but not to every sorting category. Some sorting classifications have a higher degree of variation, such as hazardous materials which varied greatly by amount and weight when found in a bin

Owing to the great variance in the use of PPWRI on a day by day basis, a lower confidence level has been ascribed to ensure results are viable.

- For Merton, Maindample, Tolmie, Kevington, Goughs Bay : confidence level of 90% and an interval of 10% on the data indicators
- For Mansfield, Bonnie Doon and Jamieson: confidence level of 90% and an interval of 5% on the data indicators

## 4 Results

The total weight of material audited from the Public Place Waste and Recycling Infrastructure was **943.78 kg**. Material from the general waste bins totalled **772.37 kg**, and material from recycling bins totalled **171.41 kg**.

Within the public place general waste bins there was a total of **193.77 kg** of landfill appropriate waste, with **417.63 kg** of material that could be diverted into either glass, recycling or organic waste streams. This accounts for **54%** of the total weight of material found in public place general waste bins. Another **160.97 kg** of other waste, mainly hardware and hazardous waste, was also found in the general waste bins.

The total weight of landfill found in the public place recycling bins was **24.89 kg**, meaning that the current contamination rate of those bins is **14.52%**.

### 4.1 Samples Collected

Speculo collected samples from 162 bins over the course of four weeks. All bin samples were weighed according to their waste stream so that an accurate representation of the contents of each bin can be analysed.

Table 4. Average weight of each type of bin in each town

| Average Waste Weight per bin | General Waste Bin (Kg) | Recycling Bin (Kg) |
|------------------------------|------------------------|--------------------|
| Bonnie Doon                  | 7.36                   | 2.58               |
| Gough Bay                    | 27.55                  | 19.92              |
| Jamieson                     | 10.33                  | 17.26              |
| Kevington                    | 5.92                   |                    |
| Maindample                   | 2.70                   | 11.52              |
| Mansfield                    | 4.80                   | 2.57               |
| Merton                       | 34.09                  |                    |
| Tolmie                       | 31.30                  |                    |

As is clear from the table above, additional PPWRI is required in the towns of **Tolmie**, **Merton** and **Goughs Bay**. The number of bins in these towns was relatively small with **1**, **2** and **5** respectively.

To highlight this point, of the samples collected at the Kevington Hotel there was 11.84kg of waste. Only 800 grams of that waste was landfill and the other bin was empty. Replacing one of the general waste bins with a recycling bin would potentially divert 500kg of recycling from landfill every year.

Table 5. Sample collected at the Kevington hotel

| GROSS WEIGHT | EMPTY WEIGHT | LANDFILL WEIGHT | RECYCLABLES WEIGHT | ORGANIC WEIGHT | GLASS WEIGHT | OTHER WEIGHT |
|--------------|--------------|-----------------|--------------------|----------------|--------------|--------------|
| 25.01 kg     | 12.50 kg     | 0.80 kg         | 0.50 kg            | 0.00 kg        | 10.54 kg     | 0.00 kg      |

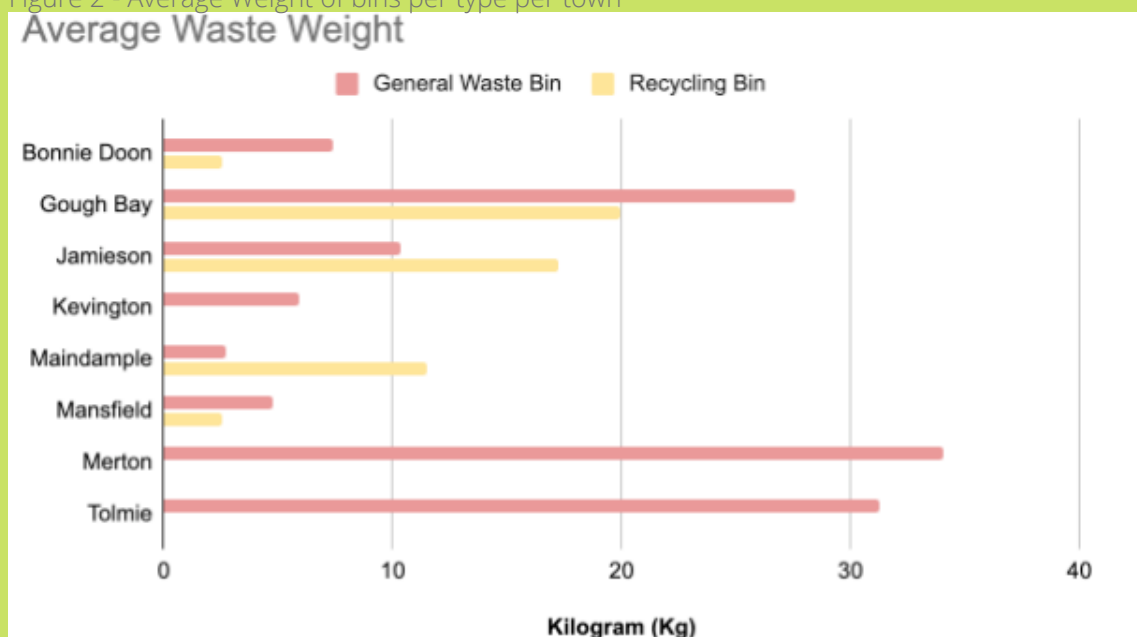
Figure 2 represents the average weight of the samples collected from the general waste and recycling bins per town. It is abundantly clear that along with Kevington, Merton needs a dedicated recycling bin. Merton has 18kg of potential recyclables per week ending up in the General Waste stream. A diversion rate of even 5% would have a tangible impact on the overall PPWRI contamination rates.

Table 6. Overview of sample collection for the town of Maindample

| LANDFILL WEIGHT | RECYCLABLES WEIGHT | ORGANIC WEIGHT | GLASS WEIGHT |
|-----------------|--------------------|----------------|--------------|
| 3.33 kg         | 2.76 kg            | 1.13 kg        | 13.15 kg     |
| 5.60 kg         | 2.97 kg            | 0.72 kg        | 5.21 kg      |

Interestingly, the Maindample bins only appeared at 35% full for the General waste and 40% full for the Recycling but this had no bearing of the weight of the bin as the majority of the composite material was recyclable glass (a highly dense material).

Figure 2 - Average Weight of bins per type per town



Within PPWRI there was a large amount of waste designated for further classification. This waste was mainly found in the general waste bins but there were a number of recycling bins that presented other or hazardous materials

## 4.2 Appearance Rates

The Appearance Rate (AP) is the measure of how full a Bin appears to be. This key metric helps gauge where new PPWRI is needed. Referring to table 11, Jamieson's two recycling bins appeared at an average of **97%** full while their general waste was only at **61%**. The general waste bins in Jamieson all contained significant amounts of recyclables that may have gone into a recycling bin that didn't appear full.

Table 7. Average appearance rate for all bins in the Shire

|                   | Average of Appearance Rate |
|-------------------|----------------------------|
| General Waste Bin | 50%                        |
| Recycling Bin     | 22%                        |
| Grand Total       | 41%                        |

There is also the high prevalence in Jamieson of campers dumping their waste. This is due to the nature of the town being the launch and landing point of many a camping trip. This means that people are eager to unload pent up rubbish as soon as possible after their trip and take the first opportunity. This analysis was corroborated by a resident interview outlined in section 4.9.

Table 8. Average/Max/Min appearance rate by town and type of bin

|                    | Average Appearance Rate | Max Appearance Rate | Minimum Appearance Rate |
|--------------------|-------------------------|---------------------|-------------------------|
| <b>Bonnie Doon</b> |                         |                     |                         |
| General Waste Bin  | 45%                     | 86%                 | 0%                      |
| Recycling Bin      | 19%                     | 70%                 | 0%                      |
| <b>Gough Bay</b>   |                         |                     |                         |
| General Waste Bin  | 92%                     | 98%                 | 85%                     |
| Recycling Bin      | 73%                     | 73%                 | 73%                     |
| <b>Jamieson</b>    |                         |                     |                         |
| General Waste Bin  | 61%                     | 100%                | 3%                      |
| Recycling Bin      | 97%                     | 98%                 | 95%                     |

Table 8 Continued. Average/Max/Min appearance rate by town and type of bin

|                    |            |             |           |
|--------------------|------------|-------------|-----------|
| <b>Kevington</b>   |            |             |           |
| General Waste Bin  | 8%         | 15%         | 0%        |
| <b>Maindample</b>  |            |             |           |
| General Waste Bin  | 35%        | 35%         | 35%       |
| Recycling Bin      | 40%        | 40%         | 40%       |
| <b>Mansfield</b>   |            |             |           |
| General Waste Bin  | 43%        | 105%        | 0%        |
| Recycling Bin      | 16%        | 98%         | 0%        |
| <b>Merton</b>      |            |             |           |
| General Waste Bin  | 108%       | 110%        | 105%      |
| <b>Tolmie</b>      |            |             |           |
| General Waste Bin  | 110%       | 110%        | 110%      |
| <b>Grand Total</b> | <b>41%</b> | <b>110%</b> | <b>0%</b> |

Bins in casings and correctly positioned in the stands were less likely to present as overflowing. This is because the correct use of the additional infrastructure prevents the widespread dumping incidents Speculo has encountered during the audit process.

For example, the appearance rates for Merton and Goughs Bay were high given that no bin was in a casing or correctly returned to its stand. Contrastingly, Bonnie Doon and Maindample had low appearance rates and nearly all bins were enclosed in a casing.

Below in picture 8, the presentation picture of the PPWRI in Merton, bins MT001 & MT002, is evidence of the consistent incorrect return to and use of the existing public place infrastructure.



Picture 8 Photo of MT001, MT002 bins of the stands

## 4.3 General Waste Bins

There was a net total of **772.37kg** of material audited from the general waste bins that form the majority of the PPWRI within the Shire.

A key insight that Council hoped to gain was a comparison between the amount of recyclables in those general waste bins that had a corresponding recycling bin and those general waste bins that had no such corresponding recycling bin. This insight would be used to determine the value of having a paired set of bins (the two types of bins next to each other) and work out how much recycling could be diverted from landfill.

As shown in table 9, across all of the MSC there was a total landfill weight of **193.77kg** in the general waste bins, with **276.59kg** of recycling and glass that has the potential to be diverted with better PPWRI.

Table 9. Total weight of waste processed in the general waste stream

|                   | Landfill Weight (kg) | Recyclables Weight (kg) | Organic Weight (kg) | Glass Weight (kg) | Other Weight (kg) |
|-------------------|----------------------|-------------------------|---------------------|-------------------|-------------------|
| General Waste Bin | 193.77               | 117.19                  | 141.04              | 159.4             | 160.97            |

Figure 3 offers a quick visual composition of all the general waste bins, where a large portion of the recyclables and glass are contained together with all other streams of waste. Reducing and preventing this dumping is crucial if the amount of recycling diverted from landfill is going to be increased.

Figure 3 - Visual breakdown of the total weight processed in the general waste stream

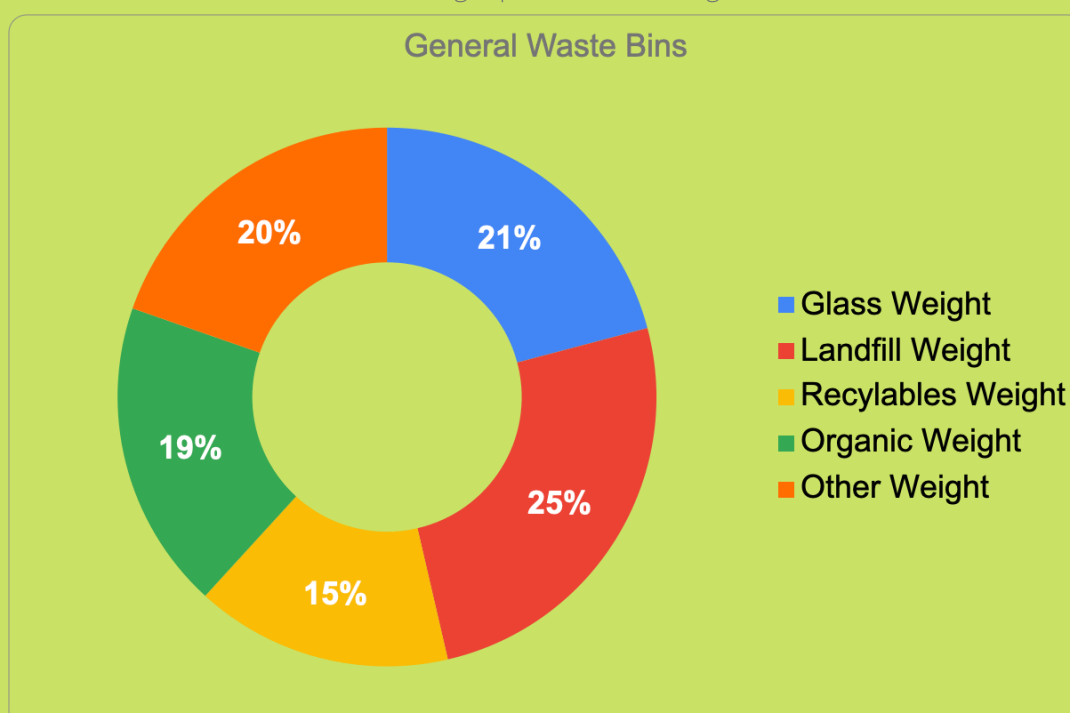


Figure 4- Visual comparison of amount of recycling found in standalone vs paired general waste bins

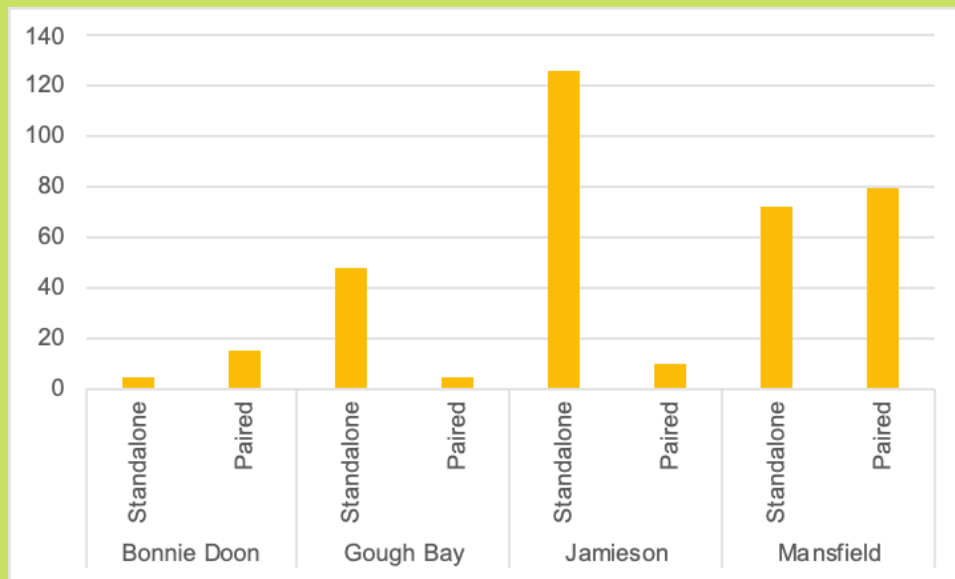
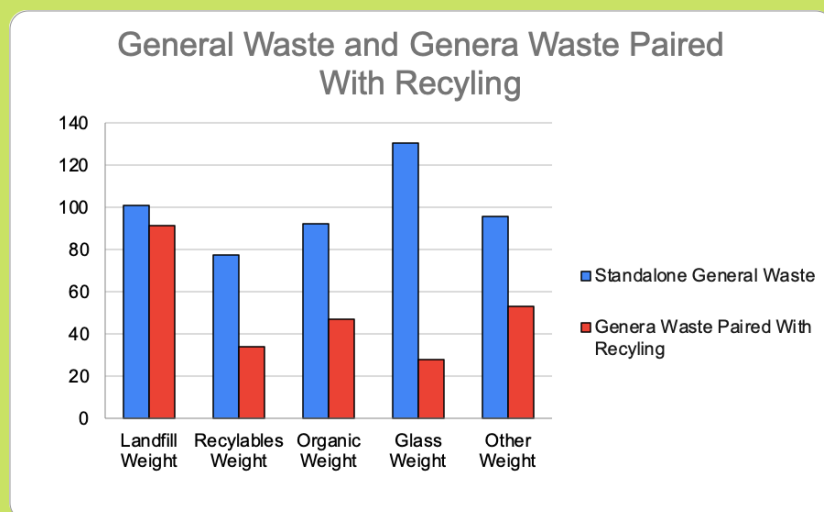


Figure 4 provides an interesting snapshot of the amount of recycling found in standalone general waste bins across the shire. The results of Jamieson and Goughs Bay suggest the need for greater recycling infrastructure in those towns to allow for a better chance of diverting recyclables from landfill.

Figure 5 provides a breakdown of the differences in the material composition of standalone vs paired waste bins. This clearly shows that by providing people with the option to sort waste, they will actively breakdown the waste into all streams, not just recycling. This is a promising indicator that the future transition of resource recovery points to a four bin system that would yield a much higher quality waste stream.

Figure 5- Material Breakdown of Standalone General Waste Bins vs Paired General Waste Bins



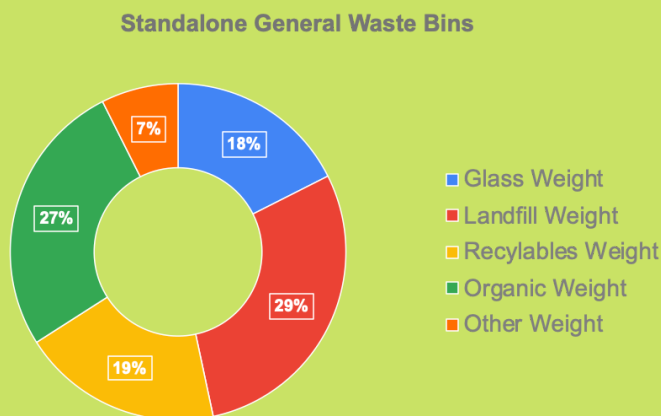


Figure 6 - Visual representation of standalone general waste bin composition

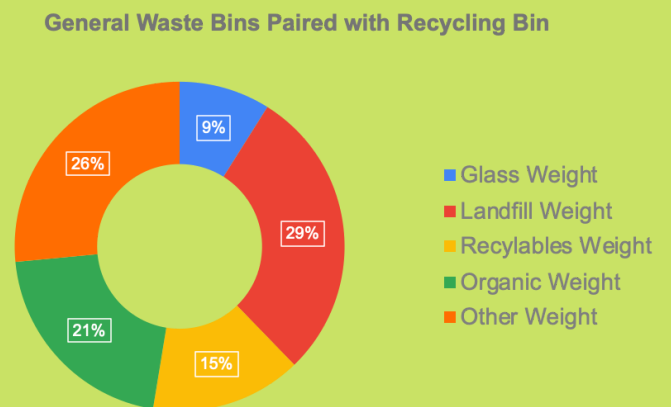


Figure 7 - Visual representation of paired general waste bin composition

In instances where there are both general waste and recycling bins paired together, people do make more of an active effort to separate their waste, with **4% less** recycling ending up in the the landfill stream. But interestingly, both the standalone and paired general waste bins have the same proportion of landfill weight, sitting steady at **29%**.

As per *figures 6 and 7*, the amount of glass diverted from landfill is **9%** better in paired general waste bins, meaning that there is a **13%** reduction in the amount of recyclable material going to landfill. A majority of that weight being made up of glass, reinforcing the eventual transition to introducing glass bins for kerbside and PPWRI.

The key hindrance to paired bins, is that when the general waste bin reaches a 100% appearance rate, the paired recycling bin become the next closest outlet for every sort of waste. Take for example figure 8 below, bins MF033 and MF034.



Figure 8 - Appearance rates of bins MF033 - MF034

|       | LANDFILL WEIGHT | RECYCLABLES WEIGHT | ORGANIC WEIGHT | GLASS WEIGHT | OTHER WEIGHT |
|-------|-----------------|--------------------|----------------|--------------|--------------|
| MF033 | 8.59kg          | 0.3kg              | 1.75kg         | -            | 6.64kg       |
| MF034 | 1.93kg          | 0.71kg             | 0.65kg         | 0.47kg       | -            |

Table 10. Waste breakdown of bins MF033 MF034

## 4.4 Recycling Bins

A net total of **171.41kg** of material was audited from the 45 recycling bins that make up the the the recycling portion of the Shire's PPWRI. Of this **132.72kg** was recyclable, constituting **77%** of the total volume.

A key point to note is that the majority of the weight in recycling bins is glass, further reinforcing the need for Council to eventually offer public place glass collection.

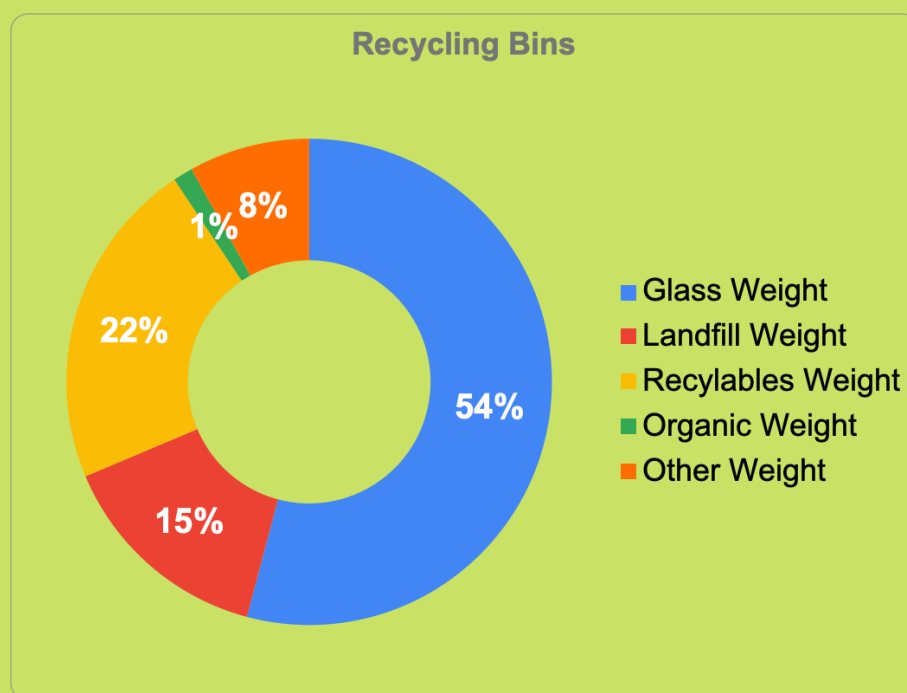


Figure 9 - Visual representation of the components in the recycling bins



Figure 10 - Average appearance rate of recycling bins in the shire.

The results of the audit have shown that the average appearance rate of recycling bins was **22%** across the shire. Those recycling bins that were of a significantly higher appearance rate had a nearly full if not overflowing general waste bin paired with it.

## 4.5 Cigarette Butt Bins

There are fourteen cigarette butt disposal bins located on the Mansfield Township High Street. These are mainly placed near general or recycling bins to prevent butts still alight from being disposed of incorrectly. These butts are a considerable fire hazard to the flammable waste located in the adjacent general waste and recycling bins, with the potentially for serious incident to occur.



Picture 9. A Cigarette Butt Bin next to Bins

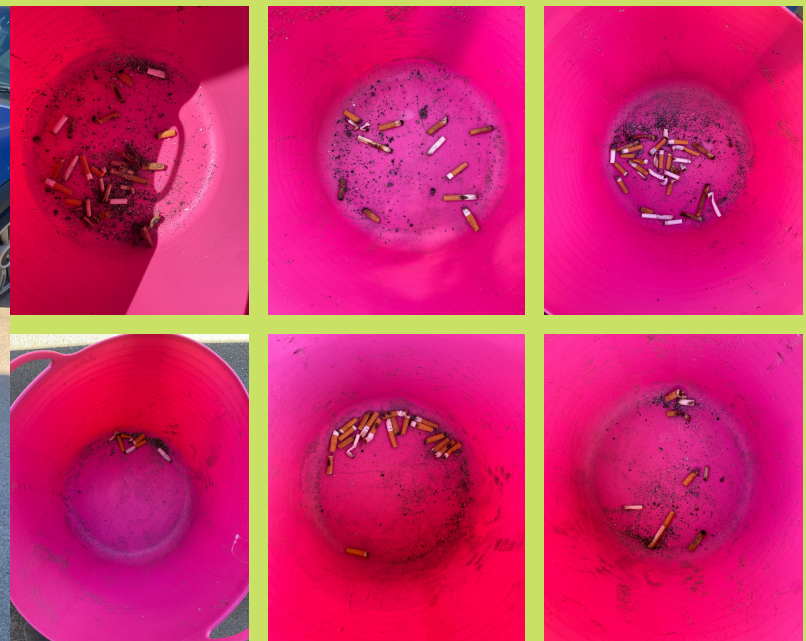
The only location on the Mansfield High St that another cigarette butt bin would be useful is by bin MF047 the central carpark opposite the Mansfield Bus Terminal bin location with a large number of cigarette butts in all four bins in the vicinity (MF044, MF045, MF046, MF047).

The total weight of butts collected was **257 grams**. With an average of **18.36 grams** of butts per bin.

No butt bin had an appearance rate greater than **4 %**, indicating that the length of time between pickups can be a reasonably long one.



Picture 10. A standalone Cigarette Butt Bin



Picture 11-16. The images captured during the cigarette butt bin audit

## 4.6 Recyclables Breakdown

The recycling waste stream from the bins in the PPWRI was found to have a contamination rate of **23%**. The reasons for this are discussed in section 4.4.

Once you remove glass from the recycling stream, the weight breakdown dramatically changes. Aluminium cans weighed on average **15 grams/can**, meaning it would require 13 cans to equal the standard 330ml glass bottle weight of **190 gram**. Encouraging the use of cans when exploring the Shire not only reduces the end tonnage of yearly waste processing, it makes engaging in outdoor activities safer for everyone.

### Components of recyclables

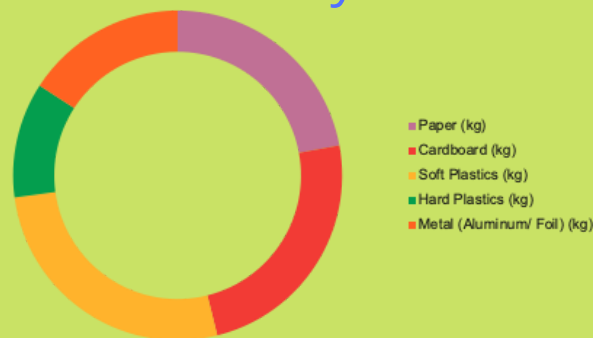
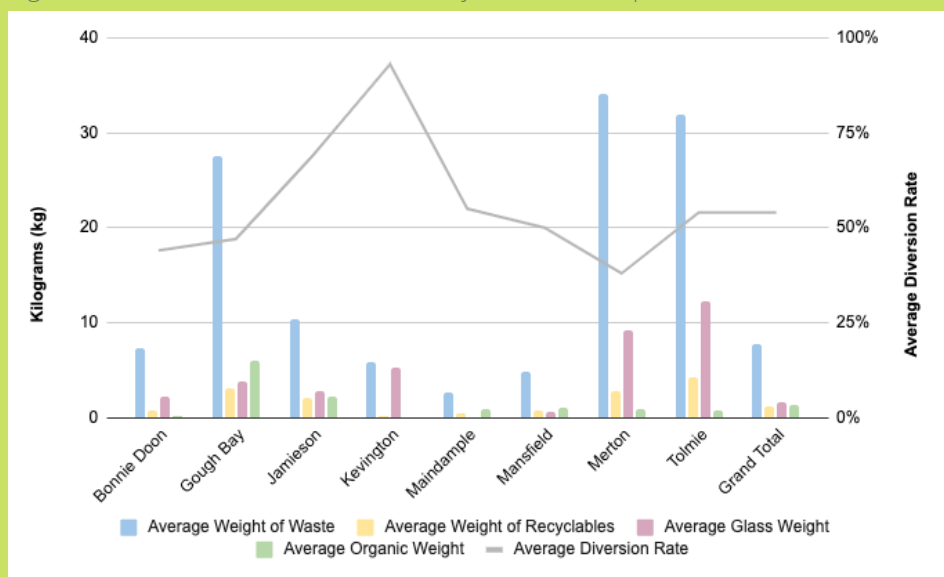


Figure 11- Visual representation of the components in the recycling stream

Figure 12- Visual breakdown of waste by classification per town



| Total (Kg) | Paper (kg) | Cardboard (kg) | Soft Plastics (kg) | Hard Plastics (kg) | Metal (Aluminum/ Foil) (kg) |
|------------|------------|----------------|--------------------|--------------------|-----------------------------|
| 155.51     | 34.34      | 37.38          | 41.59              | 17.58              | 24.62                       |

Table 11. Breakdown of the different classifications of recycling

## 4.7 Contamination Rates

The contamination rate of the public place recycling infrastructure stands at **15%**. While low, a concerted effort must still be made to better educate those who use the public place infrastructure, whether they be a resident or visitor.

Goughs Bay suffered the worst contamination rate of the entire audit, with bin (GB157) being **41%** contaminated. This would be immediately bettered if correct return of bins to the existing PPWRI, specifically the existing two-bin stand located outside the Goughs Bay General Store, was enforced.

Figure 13- Average contamination weight and rates

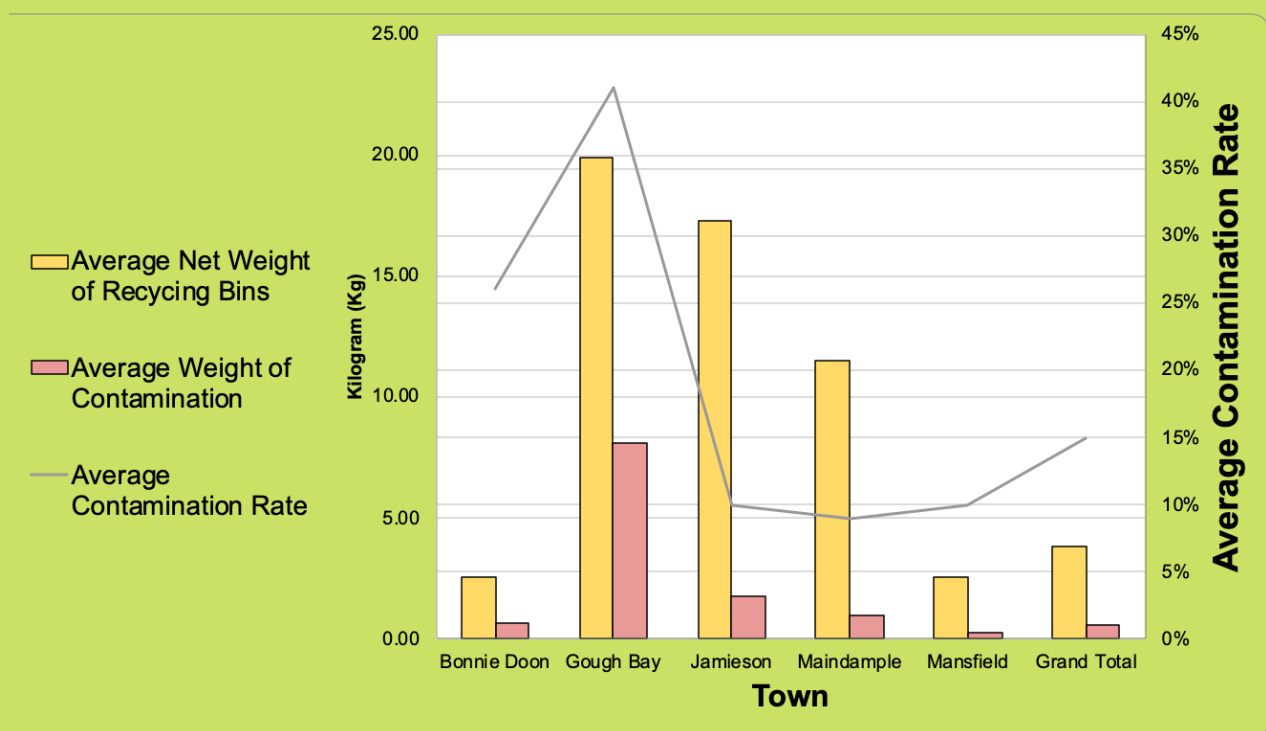


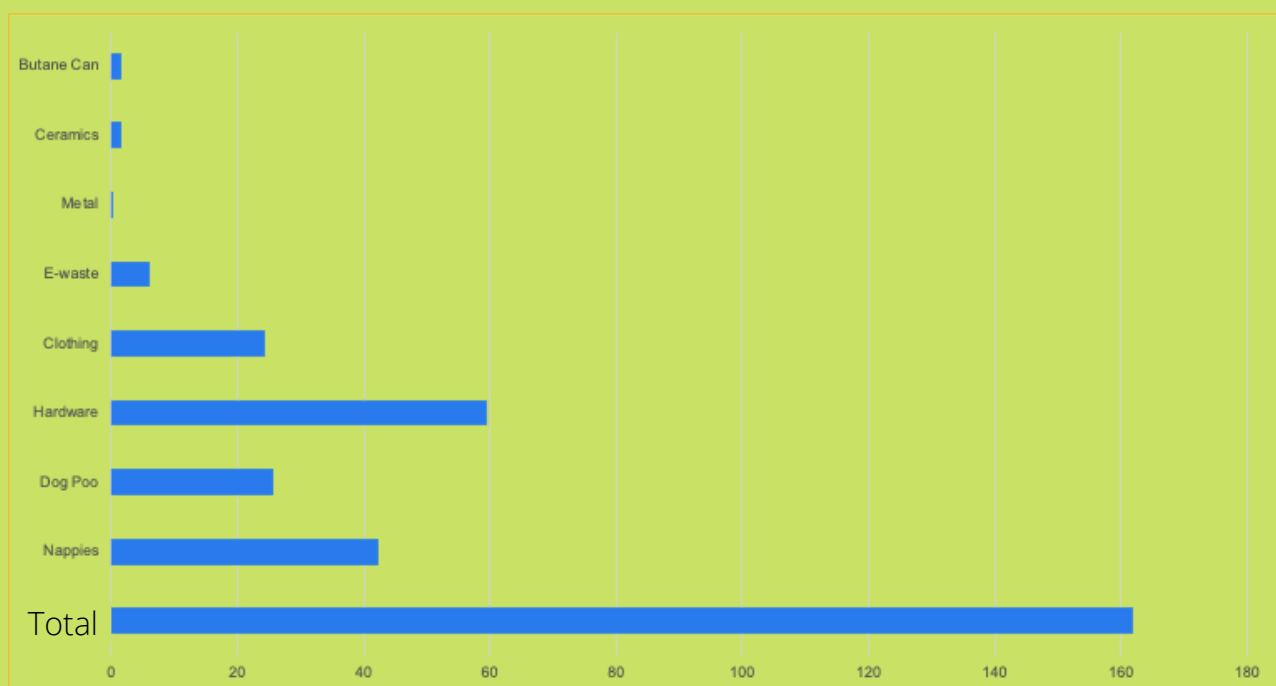
Figure 13 indicates the outsized impact that Goughs Bay's contamination rate has on the Shire's contamination rate. When removed from the analysis, the average contamination rate drops from **15%** down to a **10%**.

## 4.8 Hazardous Materials

The hazardous materials found in the waste stream were usually confined to the general waste bins throughout the PPWRI. The only exception to this being a number of butane cans in both the general waste and recycling bins. This was more likely to occur in those towns campers first return through after a trip. With Jamieson, and in particular bin JS136, being used to dispose of a large number of butane canisters.

Below, Figure 14 illustrates the breakdown of all "other" waste, which is the waste that needed further classification at pickup. Of this waste, only the butane cans (M02) and hardware waste (T01) were truly hazardous.

Figure 14 - The total weight of all "other materials" and their classification



A total of 16 Butane cans were found during the audit. Education directed at this issue should be considered when developing the education application, *recommendation 6.1*.

A total of **38.96kgs** of Nappies (HO3) were found, mostly at bins where significant large bag dumping occurred, especially the bins at Merton (MT001/MT002) which had a combined **31.01kgs** of nappies.

## 4.9 Landfill Diversion - Current and Potential

### 4.9.1 Current Diversion

A total of **130kgs** of recycling was diverted from landfill in the 45 recycling bins that were audited. This shows that recycling bins throughout MSC play an important role in diverting large amounts of waste per year.

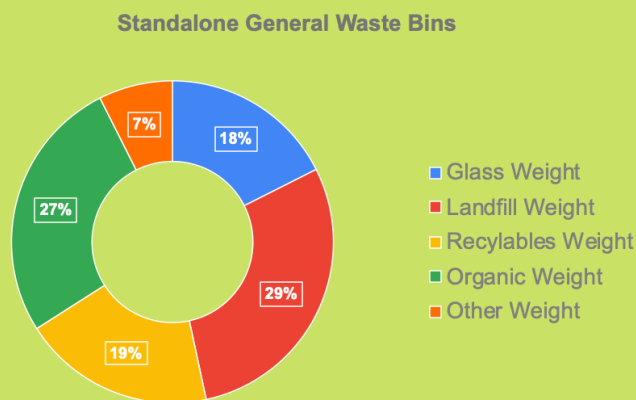


Figure 6 - Visual representation of standalone general waste bin composition

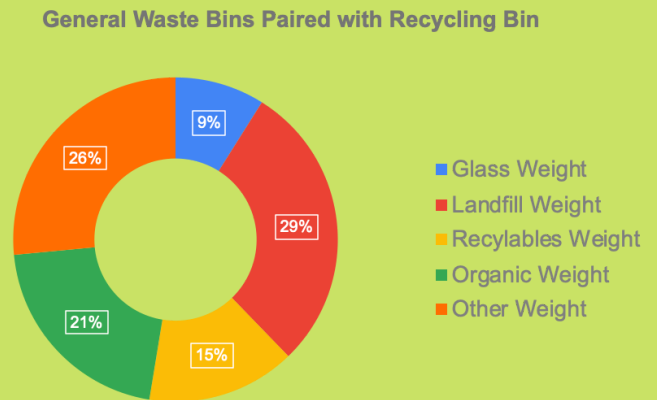


Figure 7 - Visual representation of paired general waste bin composition

### 4.9.2 Future Diversion

It is well understood that a greater number of recycling bins joining general waste bins around The Shire would divert more recyclables from landfill back towards being reprocessed and featuring in the economy once again.

To counter the increased cost of servicing a greater number of recycling bins, advanced bin shells that provide live data on weight and appearance rate could then inform local collection service of the optimum day to pickup that specific bin. A locally based waste processor would account for a great enough saving from the reduced amount of pickups that would be required as well as the truncated travel distance compared to competitors.

Future local waste processing is a goal that once reached, would allow residents waste to be injected back into the local community as products, without ever having to leave the borders of the The Shire.

## 4.10 Community Feedback

### 4.10.1 Interviews with public

In order to protect the identities of those members of the community who went out of their way to provide insight into the state of the PPWRI within The Shire this report conceals their identity and refers to them only through nondescript acronyms. These residents of The Shire also provided indispensable perspective on a number of draft recommendations that helped shape the recommendations in this report.

**Jamieson Resident (JR)** was spoken to on the night of the 28th of November (28/11/2021). JR came out to Riverside Park to discuss the prevalence of large bag dumping that occurs at all the bins in Riverside Park, as well as in other bins around Jamieson. She also provided an account of the impromptu private green waste processor that has been set-up by local residents. This private service was reported to be causing divisions amongst the community due to selectiveness of admission. The burning of green waste on DELWP land is also not an ideal outcome.

JR's main point was that in towns like Jamieson, which has repeatedly been evacuated due to fire danger, it is vital to make disposal of green waste as easy as possible to encourage good property maintenance amongst the entire community.

The revelation that waste was such a hot topic of discussion and that proactive residents have already begun taking matters into their own hands provides valuable context to this report.

**Bonnie Doon Person (BDP)** came up to Speculo staff in the early evening of 15th of November (15/11/2021) while they were auditing the various aspects of the PPWRI on Bonnie Cres in Bonnie Doon. BDP alerted Speculo that the bins directly out the front of the service station were regularly inundated by large bag dumping from campers returning from holiday.

BDP proceeded to alert staff that they and a number of other members of the public had witnessed the practice of the waste collection truck emptying both bins into the same truck. The insinuation was that it was such a prevalent practise it had become an exceedingly common topic of conversation.

### 4.10.2 Online Engagement

A number of online responses submitted by the community and emails to waste management staff following up on quires have been submitted, their topics and requests involved everything from cigarette bins to extra recycling bins. This feedback has been taken onboard and incorporated into a number of recommendations made below.

# 5 Analysis

One of the key trends observed was the high percentage of total waste by weight (approximately 81%) attributed to the general waste bins and only 19% attributed to the recycling waste bins. The hypothesis as to why this is the case is due to the incorrect use of infrastructure leading to large amounts of dumping in those particular bins.

## 5.1 Trends

It is evident that material from general waste bins accounted for **81%** of the total waste by weight while the amount of recycling by weight accounted for **19%**. Through further investigation it was also found that the general waste bins have a higher average presentation rate than those of recycling bins, **50%** and **22%** respectively.

The correlation between the amount of recyclables in a general waste bin and whether that waste bin is a standalone bin or is paired (has a recycling bin next to it) is self-evident. General waste bins that have a corresponding recycling bin have a lower percentage of recyclables in them compared to those general waste bins that are standalone.

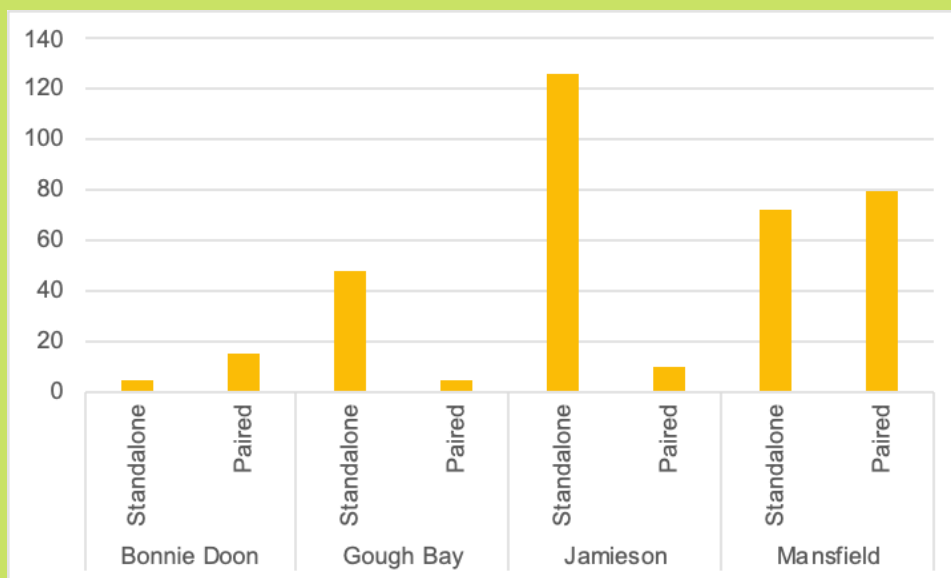


Figure 4- Visual comparison of amount of recycling found in standalone vs paired general waste bins

## 5.2 Insights

-  The first insight gleaned from the audit's early days, and only reinforced as it progressed, was that none of the small metal stands put in place to limit the opening of a bin's lid were being used at all. It became clear that there was a strong correlation between bin's that weren't on their stands and large bag dumping. Unfortunately as there were no bins on that were correctly placed in the stand, there is no data with which to gauge how much of a difference these stands make.
-  The reports of a single truck picking up both the general waste and recycling bins are a cause for concern.
-  There exists a great opportunity to further increase the diversion rate of recyclables from landfill. The existing recycling bins divert a large volume and a cost effective solution to adding more recycling bins with less frequent pickups will be recommended to capitalise on this opportunity.
-  A full general waste bin that is paired with a recycling bin can cause the latter bin to begin accumulating waste streams that would otherwise go in a general waste bin. This occurred when the general waste bin of the pair became full.
-  Those in the community that were happy to talk to the audit staff were the greatest proof that residents are hungry for change and would readily use more advanced PPWRI, especially in the smaller townships.

## 5.3 Cost Benefit Analysis

To fully understand the advantages and outlay of Speculo's recommendation to the MSC, a cost benefit analysis has been conducted. Included is a detailed breakdown of the costs and impacts associated with the first and second year of the action plan. All costs associated with any recommendation beyond the second year are too dependent on variables beyond reasonably accurate accounting, thus Speculo estimates that these costs could range from \$50,000-\$250,000 depending on the amount of recommendations actioned.

The total cost of the recommendations are broken up into two key areas, the upfront costs and the ongoing costs associated with the changes. The upfront costs are directly associated with the new bins and new steel bin encasings, while the ongoing costs are the increased costs connected with the MSC contract with their waste pickup contract and the associated variables.

The key upfront and ongoing costs in Speculo's first and second year recommendations are:

1. Replacing two broken bins (2x 240L)
2. Implementation of 53 new recycling bins (2x80L, 14x120L 37x240L)
3. Increasing the total number of bins encased in a shell by 12 (10 double bin shells, 2 single bin shells)
4. Increasing the size of five general Waste bins (3x from 120L to 240L, 2X from 80L to 120L)

Shown in Table 12 is the breakdown the materials and the costs required for materials. The total that is required to be purchased equate to \$9,880.

| Item                                     | Amount Required | Cost      | Total       |
|------------------------------------------|-----------------|-----------|-------------|
| 240L Bin (AWASTE, 2022)                  | 42              | \$ 89.00  | \$ 3,738.00 |
| 120L Bin (AWASTE, 2022)                  | 16              | \$ 74.00  | \$ 1,184.00 |
| 80L Bin (AWASTE, 2022)                   | 2               | \$ 69.00  | \$ 138.00   |
| Double Steel Bin Encasing (vidaXL, 2022) | 10              | \$ 430.00 | \$ 4,300.00 |
| Single Steel Bin Encasing (vidaXL, 2022) | 2               | \$ 260.00 | \$ 520.00   |
| Total                                    | -               | -         | \$ 9,880.00 |

Table 12. Estimated upfront cost

The second component of the costs connected with Speculo's recommendation, is the ongoing effect on the MSC's budget. The largest elements of the reoccurring charges are the collection costs, waste disposal costs and the contamination rate charge. While the bin collection costs are predictable, the other elements vary on the number of tourists that visit the Shire at on any given day as well as their recycling knowledge.

To simplify the ongoing costs and to include the many variables, Speculo has used the figures from the Mansfield Shire Waste Strategy 2020 Report, which details the average cost of a general waste bin and recycling bin. These numbers allow for any variables to be minimized across a year, accounting for any outlier events such as public holidays or farmer markets. Through using these costs, Speculo have estimated that the ongoing costs will be an extra \$5,313 per year as shown in Table 13.

| Ongoing Costs                             | Amount Required | Cost      | Total              |
|-------------------------------------------|-----------------|-----------|--------------------|
| New 240L Recycling Bin                    | 37              | \$ 105.00 | \$ 3,885.00        |
| New 120L Recycling Bin                    | 14              | \$ 52.67  | \$ 737.38          |
| New 80L Recycling Bin                     | 2               | \$ 35.32  | \$ 70.64           |
| Increasing 120L to 240L General Waste Bin | 3               | \$ 169.34 | \$ 508.02          |
| Increasing 80L to 120L General Waste Bin  | 2               | \$ 56.45  | \$ 112.90          |
| <b>Total</b>                              | -               | -         | <b>\$ 5,313.94</b> |

Table 13. Estimated ongoing cost of adding new recycling bins

The total cost associated with Speculo's recommendations is an estimated \$9,880 in upfront material and another \$5,313.94 each year ongoing.

To understand the benefits of the recommendations put forward by Speculo, it has been assumed that people will shift their waste disposal habits to a higher compliance rate, as they would have the ability to place rubbish into the correct waste stream. For the purpose of looking into the benefits, Speculo has assumed that the compliance rate will be 100%. Using this assumption, the average weight of a general waste bin will be reduced by 54% equating to approximately 1.3 tonnes per week or 67.6 tonnes per year.

Overall, the key benefits, to the MSC is a reduction in the contamination rate cost, landfill waste and a reduction in any environmental cost associated with the MSC. Speculo also believes that an indirect benefit to the MSC will be a potential reduction in any Scope 1,2 or 3 emissions that the council incur.

# 6 Key Findings

The key findings of this report are focussed on the question of whether or not the existing PPWRI is adequate and fit for type. To ascertain this, a review of the existing bin locations as well as the size of bin in those locations has been conducted.

## 6.1 Bin Locations

This report has uncovered a number of issue regarding the appropriateness of the current bin locations and the effectiveness to meet the demands of the community and visitors to the area, including cigarette butt bins. The existing recycling infrastructure is effective but not adequate, more general waste bins need to have an accompanying recycling bin installed to increase diversion of recyclables from landfill.

New recycling infrastructure, both bins and shells, rapidly need to be introduced into small townships that have no existing public place recycling systems. Specifically the towns of, **Merton, Tolmie and Kevington**, with Merton requiring new bins as the existing ones are already 240 litre bins.

Other large towns are also in need of additional recycling infrastructure include **Jamieson and Goughs Bay** as a priority, and **Mansfield** in the medium term.

The vast majority of bins are already in effective and optimum locations, with their good placement being undone by poor procedure, the need for bins of both varieties to be correctly returned to their holding infrastructure is paramount. There were only a couple of occasions when a shell was not locked properly and had swung open but there was not one occasion where the existing stand had been used correctly.

A community contribution pointing out the lack of a bin at the Highett St end of Botanical Park was reinforced after the audit of bin (MF087) which had **6.22kgs** of dog poo (BO3). This meant dog poo (BO3) made up **91.87%** of the total weight of materials in the bin itself, which had a weight of **6.77kg**. It is therefore going to be recommended to place an 80 litre general waste bin at the Highett St end of Botanical Park.

## 6.2 Bin Sizes

The general waste bin at 122 High St Mansfield (MF038) is an 80 litre general waste bin that really requires a **120/240 litre** bin instead and the general waste bin opposite the bakery on the middle strip (MF036) is a 120 litre bin that needs to be upgraded to a **240 litre** bin. Both of these bins experienced a **105%** appearance rate which is a large factor in determining appropriate bin sizing.

The 120 litre general waste bin outside "Noodle House" at 63 High St Mansfield (MF064) had an **85%** appearance rate which can be deemed fit for type, but the 80 litre general waste bin in the central strip opposite "Noodle House" (MF065) had a **100%** appearance rate. This bin should be upgraded to a **120 litre** bin so that it is better suited to the demand of the area. Watching numerous people pickup takeaway to go eat in the central strip provided the reason why bin (MF065) was so full. Its contents contained a notably large volume of recycling, **33.3%** of its total weight to be precise.

Bin (MF089), a standalone general waste bin just to the north of the Highett St public toilets, should be upgraded from a **120 litre** bin to a **240 litre** bin owing to its appearance rate of **101%**.

There were no other bins, general waste or recycling, that appeared over 100% full. But that does not mean that certain bins don't need upgrading. On the 30th of November (30/11/2021) there was a Christmas themed musical performance that took place on a tiled area in the central strip between "The commercial Hotel" and "The Mansfield Hotel". Given that this common space is regularly used for community events, upgrading the existing **120 litre** recycling bin (MF078) to a **240 litre** bin is advised.

It would be worthwhile for a staff member of MSC's waste management team to review the locations of community events and determine if there is any PPWRI nearby that may be impacted by repeated events in the vicinity. The Mansfield Farmers Market would be an ideal candidate for a staff member to review the appearance rate of amongst and around the site of the market opposite the Delatite Hotel.

# 7 Recommendations

The basis of the following recommendations was formed with a single, simple and salient goal at its core. *Strive to make those behaviours which are desired as easy as possible while making those undesired behaviours exceedingly difficult or expensive.* It agreeably surmises the core of the recommendations below.

As a result of this audit, Speculo has obtained an in-depth understanding of the Mansfield Shire Council's public place waste and recycling infrastructure. Combining that knowledge with interviews from the community has revealed the way that residents and tourists use the current PPWRI and the way they would like to use it.

The recommendations that follow are summaries to accompany the 3 year action plan found on **page 7**. For further explanation of any recommendation please refer to *Appendix 9.4*.

## 7.1 Ensure correct operation of existing infrastructure

It is highly recommended that council contact the contracted collection service provider responsible for waste pickup and processing and request that the obligation to return bins to the existing infrastructure be fulfilled. This small and cost free step for Council could immediately reduce the prevalence of large bag dumping as the "stands" prevent the lid fully opening, restricting access to the hooked up bin.

| 1   | Ensure correct operation of existing infrastructure                       | YEAR |
|-----|---------------------------------------------------------------------------|------|
| 1.1 | Engage with contractor to determine why "stands" are not being used       | 1    |
| 1.2 | Investigate reports of incorrect collection on Bonnie Crescent            | 1    |
| 1.3 | Ensure "stands" are being used correctly after discussion with contractor | 1    |

## 7.2 Conduct maintenance and repairs

Throughout the audit, any damage or issues with any part of the public place waste and recycling infrastructure was compiled with the explicit intention of recommending a number of repairs or replacements. From broken shells to damaged bins, here is a comprehensive list of all notable issues;

| 2   | Conduct maintenance and repairs                                          | YEAR |
|-----|--------------------------------------------------------------------------|------|
| 2.1 | Mansfield- MF036, MF089 and MF090 are in need of new casing door latches | 1    |
| 2.2 | Mansfield- MF084 requires deep clean                                     | 1    |
| 2.3 | Jamieson- JS144 has significant burn damage, replace bin.                | 1    |
| 2.4 | Jamieson- JS131 requires deep clean                                      | 1    |
| 2.5 | Kevington- KV149 has significant damage, replace bin.                    | 1    |

## 7.3 New Infrastructure

The scope of new infrastructure required is vast but simple. It is Speculo's recommendation that every standalone general waste bin in the PPWRI be paired with a recycling bin. That equates to **53 bins** over **3 years** if Council were to implement the full extent of this recommendation. In the case that Council chooses to add a select number of recycling bins there is a priority list found in *appendix 9.5* that outlines the 10 highest priority locations that require recycling infrastructure.

In addition to the new bins, it is recommended that Council purchase and install **10** double bin casings in various locations around the shire. The installation of **2** single bin casings for Kevington and Merton, which can be repurposed from Mansfield High Street when new casings are installed, would compliment a sturdy new 3 bin system in each of those towns.

Once the extent of the recommended additions are complete, it is highly advised that a continuous rollout of new bin casings is pursued by Council until such a time that a new advanced waste strategy has been determined.

Recommendation 3.1 involves **53** new recycling bins, **14** of which should be **120L** bins, **37** should be **240L** bins and **2** should be **80L** bins. These sizes correspond to the standalone general waste bins with which the new recycling bins will be paired. The **53 bins** can be broken up into three stages; the **2** new bins in Merton and Kevington, the **10 bin** priority list where recycling pairings are most needed and the **41** remaining bins that can be introduced at a more convenient pace.

| 3    | New Infrastructure                                                                | YEAR |
|------|-----------------------------------------------------------------------------------|------|
| 3.1  | Create an implementation plan and budget for rollout of 53 new recycling bins     | 1    |
| 3.2  | Install a casing alongside new recycling bin in Kevington                         | 1    |
| 3.3  | Install a single open top casing for the remaining general waste bin in Kevington | 1    |
| 3.4  | Install a casing alongside new recycling bin in Merton                            | 1    |
| 3.5  | Install a single open top casing for the remaining general waste bin in Merton    | 1    |
| 3.6  | Begin installation of priority recycling infrastructure <i>Appendix 9.5</i>       | 2    |
| 3.7  | Begin installation of the remainder of new recycling infrastructure               | 3    |
| 3.8  | Install bin casing for new infrastructure in Tolmie                               | 2    |
| 3.9  | Install 2 casings for the new infrastructure in Jamieson on Perkins st            | 2    |
| 3.10 | Install 3 casings for the new infrastructure in Jamieson at Riverside Park        | 3    |
| 3.11 | Install new casing and recycling bin just before the bridge walk in Bonnie Doon   | 3    |
| 3.12 | Install new casing on the bins outside the service station on Bonnie Crescent     | 3    |
| 3.13 | Review <i>Bin Sizes (page 41)</i> and rollout larger bins accordingly             | 2-3  |

If the first recommendation to use existing infrastructure correctly cannot be achieved, the timeline to rollout new bin casings should be advanced and potentially altered to ensure those areas where stands are removed are improved as a matter of priority

## 7.4 Jamieson Pilot Project

When Council decides to trial new advanced waste processing systems it should be duly noted and long remembered that the residents of **Jamieson** are not only hyper-conscious of their waste already, but are actively engaged in private prototype waste solutions.

| 4   | Jamieson Pilot Project                                                       | YEAR |
|-----|------------------------------------------------------------------------------|------|
| 4.1 | Engage with the local community to solicit comment and recommendations       | 1    |
| 4.2 | Engage with a waste consultant to develop the system and implementation plan | 1    |
| 4.3 | Commence the installation of new resource recovery point in Jamieson         | 3    |

## 7.5 Phase out cigarette butt bins

This recommendation is contingent on decisions by Council, specifically, should Council ever decide to follow the example of a number of other regional hubs and ban smoking in and around the main pedestrian precinct.

If such a decision were to be taken, a phased reduction and eventual removal of the cigarette butt bins on High st, Mansfield is recommended. One option is a staggered reduction to coincide with the date of the ban and another option is to wait a week after the ban takes affect before removing all 14.

| 5   | Phase out cigarette butt bins                                                  | YEAR |
|-----|--------------------------------------------------------------------------------|------|
| 5.1 | Enquire with local laws about a smoke free policy in high pedestrian precincts | 1    |
| 5.2 | Create a plan and budget for removal of the 14 cigarette butt bins             | 1-2  |
| 5.3 | Remove the 14 cigarette butt bins                                              | 2-3  |

## 7.6 Develop a community waste-based education program

While there are a number of community based waste education programs, their effectiveness at changing behaviour is negligible at best. Speculo is recommending the development of an application that is free to download for residents and has a myriad of uses now and in the future. The education portion of the application would involve an interactive breakdown of how each waste stream is processed and what items should go in which bin. This feature could be further complimented with a "What's my Waste?" feature that uses a phone camera to determine what bin a particular item of waste should go in.

An automatic bin night reminder calendar will be optional for people who want to be notified on or before bin night. This feature can then be used to notify people of future bin rollouts that can be complimented by the education section of the application to inform people on how to use their new bins. It will be important to build the application on a flexible framework that will allow easy evolution in accordance with any changes to the waste management strategy.

| 6   | Develop a community waste-based education program                                                                                                                          | YEAR |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 6.1 | Begin development of an application based waste education program                                                                                                          | 2    |
| 6.2 | Rollout waste education application that includes a bin day calendar as well as a “what bin does this go in” camera feature to improve correct individual waste processing | 3    |

## 7.7 Further consultation and development of advanced waste management system

With the implementation of a pilot Resource Recovery Point in Jamieson, attention should be paid to how successful the uptake is and what community feedback of the new system

An advanced waste system that financially incentivises people to change their behaviour is achievable with the right combination of smaller advances throughout the waste management process. Reducing costs for ratepayers would only be possible if the council could reduce the cost of waste collection and processing. This cost to Council as of 2019-2020, is \$2,222,497 per year. Developing and implementing a collection of advanced waste solutions concurrently has the potential to acutely reduce that annual cost to council.

| 7   | Further consultation and development of advanced waste management system                                                                                                  | YEAR |
|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 7.1 | Monitor the Jamieson resource recovery point rollout                                                                                                                      | 3    |
| 7.2 | Engage consultants to develop and implement an advanced waste management system that take a holistic approach to managing a communities waste within the community itself | 3    |

## 8 Conclusion

When Speculo began this audit, there were many issues that were expected to be found and a number of hypotheses that could be teased out at the early stages about how the PPWRI was being used. While the data has validated a majority of them, it became evident that there are also a number of instantly resolvable issues that would make a tangible impact if acted upon.

The proper use of stands by the contracted waste collection service is not only something that is contractually obliged, but an action that would negate the largest issue found throughout the audit: dumping of large waste bags.

With good habits and the right choices people can live in such a way that they would not have to put their bin out each week. If there was a system to easily request a weekly pickup and reward those that reduced their waste imagine how efficient that communities waste management would become. Add on to that financial incentives designed to reward people for meticulously sorting their waste accurately into 1 of their 4 mandated bins.

There has to be a greater incentive to change. What better way than to introduce new resource recovery points with a pricing model for waste that would for next 5 years steadily climb for certain streams and ease for others, slowly bringing community behaviour in to line with the goals that have been set by the MSC's *Waste Management Strategy* as well as Recycling Victoria's *A New Economy*.

This would already be a tangible reality if every individual and level of government had the same awareness and sense of responsibility for the challenge at hand. But that's not how life works, start small, start quietly. Build humbly knowing that there will be hurdles and setbacks along the way, but if the right balance is struck, it is not only the Mansfield Shire Council that will reap the rewards.

Besides, you can never have too many reasons to put yourself on the map...

# 9 Appendix

## 9.1 Town Waste Breakdown

|                                 | General Waste Bin | Recycling Bin | Total |
|---------------------------------|-------------------|---------------|-------|
| <b>Bonnie Doon</b>              |                   |               |       |
| Average Landfill Weight (Kg)    | 3.478             | 0.670         | 2.202 |
| Average Recyclables Weight (Kg) | 0.768             | 1.740         | 1.210 |
| Average Organic Weight (Kg)     | 0.252             | 0.016         | 0.145 |
| Average Glass Weight (Kg)       | 2.235             | 0.154         | 1.289 |
| Average Other Weight (Kg)       | 0.625             | 0.000         | 0.341 |
| <b>Gough Bay</b>                |                   |               |       |
| Average Landfill Weight (Kg)    | 5.915             | 8.090         | 6.350 |
| Average Recyclables Weight (Kg) | 3.120             | 0.860         | 2.668 |
| Average Organic Weight (Kg)     | 6.038             | 1.130         | 5.056 |
| Average Glass Weight (Kg)       | 3.840             | 9.840         | 5.040 |
| Average Other Weight (Kg)       | 8.638             | 0.000         | 6.910 |
| <b>Jamieson</b>                 |                   |               |       |
| Average Landfill Weight (Kg)    | 2.460             | 1.790         | 2.399 |
| Average Recyclables Weight (Kg) | 2.105             | 2.450         | 2.138 |
| Average Organic Weight (Kg)     | 2.254             | 0.215         | 2.060 |
| Average Glass Weight (Kg)       | 2.783             | 6.025         | 3.092 |
| Average Other Weight (Kg)       | 0.706             | 6.775         | 1.381 |
| <b>Kevington</b>                |                   |               |       |
| Average Landfill Weight (Kg)    | 0.400             | -             | 0.400 |
| Average Recyclables Weight (Kg) | 0.250             | -             | 0.250 |
| Average Organic Weight (Kg)     | 0.000             | -             | 0.000 |
| Average Glass Weight (Kg)       | 5.270             | -             | 5.270 |
| Average Other Weight (Kg)       | 0.000             | -             | 0.000 |
| <b>Maindample</b>               |                   |               |       |
| Average Landfill Weight (Kg)    | 1.210             | 1.020         | 1.115 |
| Average Recyclables Weight (Kg) | 0.540             | 0.860         | 0.700 |

|                                 |        |       |       |
|---------------------------------|--------|-------|-------|
| Average Organic Weight (Kg)     | 0.950  | 0.000 | 0.475 |
| Average Glass Weight (Kg)       | 0.000  | 9.640 | 4.820 |
| Average Other Weight (Kg)       | 0.000  | 0.000 | 0.000 |
| <b>Mansfield</b>                |        |       |       |
| Average Landfill Weight (Kg)    | 1.331  | 0.246 | 0.940 |
| Average Recyclables Weight (Kg) | 0.777  | 0.621 | 0.721 |
| Average Organic Weight (Kg)     | 1.078  | 0.017 | 0.696 |
| Average Glass Weight (Kg)       | 0.562  | 1.680 | 0.964 |
| Average Other Weight (Kg)       | 0.962  | 0.009 | 0.652 |
| <b>Merton</b>                   |        |       |       |
| Average Landfill Weight (Kg)    | 4.465  | -     | 4.465 |
| Average Recyclables Weight (Kg) | 2.865  | -     | 2.865 |
| Average Organic Weight (Kg)     | 0.925  | -     | 0.925 |
| Average Glass Weight (Kg)       | 9.180  | -     | 9.180 |
| Average Other Weight (Kg)       | 16.655 | -     | 16.55 |
| <b>Tolmie</b>                   |        |       |       |
| Average Landfill Weight (Kg)    | 3.95   |       | 3.95  |
| Average Recyclables Weight (Kg) | 3.6    |       | 3.6   |
| Average Organic Weight (Kg)     | 0.75   |       | 0.75  |
| Average Glass Weight (Kg)       | 12.25  |       | 12.25 |
| Average Other Weight (Kg)       | 10.75  |       | 10.75 |

## 9.2 Bin Identification

| BIN ID | TYPE      | R&G<br>Together | TOWNSHIP    | STREET ADDRESS                           | GPS (latitude, longitude) |
|--------|-----------|-----------------|-------------|------------------------------------------|---------------------------|
| MT01   | General   | No              | Merton      | 8289 Maroondah Hwy,                      | -36.977092, 145.711169    |
| MT02   | General   | No              | Merton      | 8289 Maroondah Hwy,                      | -36.977092, 145.711169    |
| BD03   | General   | Yes             | Bonnie Doon | 75 Arnot Street                          | -37.025905, 145.853242    |
| BD04   | Recycling | Yes             | Bonnie Doon | 75 Arnot Street                          | -37.025905, 145.853242    |
| BD05   | General   | Yes             | Bonnie Doon | 6 Bonnie Cres                            | -37.026252, 145.854894    |
| BD06   | Recycling | Yes             | Bonnie Doon | 6 Bonnie Cres                            | -37.026252, 145.854894    |
| BD07   | General   | Yes             | Bonnie Doon | 10 Bonnie Cres                           | -37.026423, 145.854182    |
| BD08   | Recycling | Yes             | Bonnie Doon | 10 Bonnie Cres                           | -37.026423, 145.854182    |
| BD09   | General   | Yes             | Bonnie Doon | 10 Bonnie Cres                           | -37.026366, 145.854106    |
| BD010  | Recycling | Yes             | Bonnie Doon | 10 Bonnie Cres                           | -37.026366, 145.854106    |
| BD011  | General   | Yes             | Bonnie Doon | 1563 Maroondah Hwy                       | -37.026208, 145.859807    |
| BD012  | Recycling | Yes             | Bonnie Doon | 1563 Maroondah Hwy                       | -37.026208, 145.859807    |
| BD013  | General   | No              | Bonnie Doon | 1631 Maroondah Hwy                       | -37.028333, 145.868928    |
| MD014  | General   | Yes             | Maindample  | Mainample Community<br>Park (30 Main St) | -37.026675, 145.940574    |
| MD015  | Recycling | Yes             | Maindample  | Mainample Community<br>Park (30 Main St) | -37.026675, 145.940574    |
| MF016  | Cigarette | -               | Mansfield   | 10 High St                               | -37.052954, 146.092525    |
| MF017  | Cigarette | -               | Mansfield   | 14 High St                               | -37.05288, 146.092007     |
| MF018  | Cigarette | -               | Mansfield   | 31-33 High street                        | -37.052316, 146.090685    |
| MF019  | Cigarette | -               | Mansfield   | 45 High street                           | -37.0525795, 146.0898617  |
| MF020  | Cigarette | -               | Mansfield   | 56 High Street                           | -37.0525795, 146.0898617  |
| MF021  | Cigarette | -               | Mansfield   | 64 High Street                           | -37.0525348, 146.0894101  |
| MF022  | Cigarette | -               | Mansfield   | 78 High Street                           | -37.0524808, 146.0889179  |
| MF023  | Cigarette | -               | Mansfield   | 90 High street                           | -37.0522589, 146.0873441  |
| MF024  | Cigarette | -               | Mansfield   | 137 High Street                          | -37.0515804, 146.0861386  |
| MF025  | Cigarette | -               | Mansfield   | 90 High street                           | -37.0520047, 146.0872365  |
| MF026  | Cigarette | -               | Mansfield   | 69 high st                               | -37.0520591, 146.0895503  |
| MF027  | Cigarette | -               | Mansfield   | 22 High Street                           | -37.0528508, 146.0917567  |
| MF028  | Cigarette | -               | Mansfield   | 88 High St,<br>(Courthouse)              | -37.0523925, 146.0878393  |

|       |           |     |           |                              |                          |
|-------|-----------|-----|-----------|------------------------------|--------------------------|
| MF029 | Cigarette | -   | Mansfield | 117 High St (Tourist Centre) | -37.0509184, 146.0827787 |
| MF030 | General   | Yes | Mansfield | 7 High St                    | -37.05253, 146.091901    |
| MF031 | Recycling | Yes | Mansfield | 7 High St                    | -37.05253, 146.091901    |
| MF032 | General   | Yes | Mansfield | 10 High St                   | -37.052954, 146.092525   |
| MF033 | General   | Yes | Mansfield | 14 High St                   | -37.05288, 146.092007    |
| MF034 | Recycling | Yes | Mansfield | 14 High St                   | -37.05288, 146.092007    |
| MF035 | General   | No  | Mansfield | 26 High street               | -37.052646, 146.091393   |
| MF036 | General   | Yes | Mansfield | 31-33 High Street            | -37.052316, 146.090685   |
| MF037 | Recycling | Yes | Mansfield | 31-33 High Street            | -37.052316, 146.090685   |
| MF038 | General   | No  | Mansfield | 122 High st                  | -37.051896, 146.08502    |
| MF039 | General   | Yes | Mansfield | 112 High st                  | -37.0520601, 146.0858921 |
| MF040 | Recycling | Yes | Mansfield | 112 High st                  | -37.0520601, 146.0858921 |
| MF041 | General   | No  | Mansfield | 112 High Street              | -37.0519459, 146.0859434 |
| MF042 | General   | No  | Mansfield | 102 High Street              | -37.0519732, 146.0862364 |
| MF043 | General   | No  | Mansfield | 139 High Street              | -37.0517197, 146.0862765 |
| MF044 | General   | Yes | Mansfield | 137 High Street              | -37.0516168, 146.0861278 |
| MF045 | Recycling | Yes | Mansfield | 137 High Street              | -37.0516168, 146.0861278 |
| MF046 | General   | No  | Mansfield | 125 High st                  | -37.0516660, 146.0864446 |
| MF047 | General   | Yes | Mansfield | 111 High st                  | -37.0517554, 146.0870146 |
| MF048 | Recycling | Yes | Mansfield | 111 High st                  | -37.0517554, 146.0870146 |
| MF049 | General   | No  | Mansfield | 95-97 High St (Delatite Pub) | -37.0518993, 146.0878578 |
| MF050 | General   | No  | Mansfield | 90 High St                   | -37.0519884, 146.0872483 |
| MF051 | General   | Yes | Mansfield | 90 High St (Post Office)     | -37.0522587, 146.0873555 |
| MF052 | Recycling | Yes | Mansfield | 90 High St (Post Office)     | -37.0522587, 146.0873555 |
| MF053 | General   | No  | Mansfield | 88 High St (Courthouse)      | -37.0523092, 146.0877099 |
| MF054 | General   | No  | Mansfield | 17 High St                   | -37.0522774, 146.0912411 |
| MF055 | General   | Yes | Mansfield | 31 High St                   | -37.0522191, 146.0907432 |
| MF056 | Recycling | Yes | Mansfield | 31 High St                   | -37.0522191, 146.0907432 |
| MF057 | General   | No  | Mansfield | 20 High St                   | -37.0528468, 146.0918000 |
| MF058 | General   | Yes | Mansfield | 93 High St                   | -37.0519087, 146.0885773 |

|       |           |     |           |                              |                          |
|-------|-----------|-----|-----------|------------------------------|--------------------------|
| MF059 | Recycling | Yes | Mansfield | 93 High St                   | -37.0519087, 146.0885773 |
| MF060 | General   | Yes | Mansfield | 69 High st                   | -37.0520481, 146.0893243 |
| MF061 | Recycling | Yes | Mansfield | 69 High st                   | -37.0520481, 146.0893243 |
| MF062 | General   | No  | Mansfield | 67 High st                   | -37.0521805, 146.0893149 |
| MF063 | General   | No  | Mansfield | 65 High st                   | -37.0520435, 146.0895798 |
| MF064 | General   | No  | Mansfield | 63 High st                   | -37.0520569, 146.0897202 |
| MF065 | General   | No  | Mansfield | 63 High st                   | -37.0522252, 146.0897873 |
| MF066 | General   | Yes | Mansfield | 49 High st                   | -37.0521153, 146.0901538 |
| MF067 | Recycling | Yes | Mansfield | 49 High st                   | -37.0521153, 146.0901538 |
| MF068 | General   | No  | Mansfield | 45 High St                   | -37.0521623, 146.090238) |
| MF069 | General   | Yes | Mansfield | 4 Chenery St                 | -37.0531708, 146.0927944 |
| MF070 | Recycling | Yes | Mansfield | 4 Chenery St                 | -37.0531708, 146.0927944 |
| MF071 | General   | Yes | Mansfield | 46 High St                   | -37.0524420, 146.0900559 |
| MF072 | Recycling | Yes | Mansfield | 46 High St                   | -37.0524420, 146.0900559 |
| MF073 | General   | No  | Mansfield | 47 High St                   | -37.0526127, 146.0901370 |
| MF074 | General   | No  | Mansfield | 47 High St                   | -37.0525918, 146.0898953 |
| MF075 | General   | Yes | Mansfield | 56 High St                   | -37.0523529, 146.0892465 |
| MF076 | Recycling | Yes | Mansfield | 68 High St                   | -37.0523529, 146.0892465 |
| MF077 | General   | Yes | Mansfield | 84 High St                   | -37.0522747, 146.0887553 |
| MF078 | Recycling | Yes | Mansfield | 84 High St                   | -37.0522747, 146.0887553 |
| MF079 | General   | Yes | Mansfield | 23 Highett St                | -37.0518172, 146.0881525 |
| MF080 | Recycling | Yes | Mansfield | 23 Highett St                | -37.0518172, 146.0881525 |
| MF081 | General   | Yes | Mansfield | Bellview Court (In the Park) | -37.059641, 146.092364   |
| MF082 | Recycling | Yes | Mansfield | Bellview Court (In the Park) | -37.059641, 146.092364   |
| MF083 | General   | Yes | Mansfield | Cemetery (near gazebo)       | -37.064291, 146.084068   |
| MF084 | Recycling | Yes | Mansfield | Cemetery (near gazebo)       | -37.064291, 146.084068   |
| MF085 | General   | No  | Mansfield | Cemetery                     | -37.064591, 146.085083   |
| MF086 | General   | No  | Mansfield | Cemetery (Exit Point)        | -37.064884, 146.085112   |
| MF087 | General   | No  | Mansfield | 22 Somerset Cr.              | -37.048514, 146.091644   |
| MF088 | General   | No  | Mansfield | 23 Highett Street            | -37.051456, 146.08802    |

|       |           |     |           |                                             |                        |
|-------|-----------|-----|-----------|---------------------------------------------|------------------------|
| MF089 | General   | No  | Mansfield | 24 Highett Street                           | -37.051483, 146.088235 |
| MF090 | General   | No  | Mansfield | Shop 1/20 Highett Street                    | -37.051222, 146.088603 |
| MF091 | General   | No  | Mansfield | Shop 18 Highett Street                      | -37.05077, 146.088667  |
| MF093 | General   | Yes | Mansfield | 177 High St, (Tourist Centre)               | -37.050939, 146.082967 |
| MF094 | Recycling | Yes | Mansfield | 177 High St, (Tourist Centre)               | -37.050939, 146.082967 |
| MF095 | General   | Yes | Mansfield | 175 High St, (Tourist Centre)               | -37.050795, 146.083375 |
| MF096 | Recycling | Yes | Mansfield | 175 High St, (Tourist Centre)               | -37.050795, 146.083375 |
| MF097 | General   | No  | Mansfield | 175 High St, (Park in Tourist Centre)       | -37.051036, 146.083847 |
| MF098 | General   | No  | Mansfield | 175 High St, (Park in Tourist Centre)       | -37.051036, 146.083847 |
| MF099 | General   | Yes | Mansfield | 7 Erril St                                  | -37.052970, 146.090091 |
| MF100 | Recycling | Yes | Mansfield | 7 Erril St                                  | -37.052970, 146.090091 |
| MF101 | General   | Yes | Mansfield | 12 Erril St                                 | -37.053165, 146.089851 |
| MF102 | Recycling | Yes | Mansfield | 12 Erril St                                 | -37.053165, 146.089851 |
| MF103 | General   | Yes | Mansfield | In the Park near Mt battery Rd              | -37.052886, 146.095958 |
| MF104 | Recycling | Yes | Mansfield | In the Park near Mt battery Rd              | -37.052886, 146.095958 |
| MF105 | General   | Yes | Mansfield | 4 High St (in the Park next to the toilets) | -37.052322, 146.094646 |
| MF106 | Recycling | Yes | Mansfield | 4 High St (in the Park to the toilets)      | -37.052322, 146.094646 |
| MF107 | General   | Yes | Mansfield | 4 High St (in the Park)                     | -37.052715, 146.094886 |
| MF108 | Recycling | Yes | Mansfield | 4 High St (in the Park)                     | -37.052715, 146.094886 |
| MF109 | General   | Yes | Mansfield | 4 High St (in the Park)                     | -37.052715, 146.094886 |
| MF110 | Recycling | Yes | Mansfield | 4 High St (in the Park)                     | -37.052715, 146.094886 |
| MF111 | General   | Yes | Mansfield | 5 Victoria St                               | -37.056348, 146.084056 |
| MF112 | Recycling | Yes | Mansfield | 5 Victoria St                               | -37.056348, 146.084056 |
| MF113 | General   | Yes | Mansfield | 7 Ryan St (in the Park)                     | -37.056601, 146.084291 |
| MF114 | Recycling | Yes | Mansfield | 7 Ryan St (in the Park)                     | -37.056601, 146.084291 |

|       |           |     |           |                                    |                        |
|-------|-----------|-----|-----------|------------------------------------|------------------------|
| MF115 | General   | Yes | Mansfield | 2 Apollo St (in the Park)          | -37.053627, 146.085521 |
| MF116 | Recycling | Yes | Mansfield | 2 Apollo St (in the Park)          | -37.053627, 146.085521 |
| MF117 | General   | Yes | Mansfield | 33 Highett St (outside Playground) | -37.054154, 146.087196 |
| MF118 | Recycling | Yes | Mansfield | 33 Highett St (outside Playground) | -37.054154, 146.087196 |
| MF119 | General   | Yes | Mansfield | 33 Highett St (Inside Playground)  | -37.053901, 146.087104 |
| MF120 | Recycling | Yes | Mansfield | 33 Highett St (Inside Playground)  | -37.053901, 146.087104 |
| MF121 | General   | Yes | Mansfield | 13 Apollo St (Rec Reserve)         | -37.054470, 146.085342 |
| MF122 | Recycling | Yes | Mansfield | 13 Apollo St (Rec Reserve)         | -37.054470, 146.085342 |
| MF123 | General   | Yes | Mansfield | Rec Reserve                        | -37.054895, 146.085856 |
| MF124 | Recycling | Yes | Mansfield | Rec Reserve                        | -37.054895, 146.085856 |
| MF125 | General   | Yes | Mansfield | Rec Reserve                        | -37.054938, 146.086181 |
| MF126 | Recycling | Yes | Mansfield | Rec Reserve                        | -37.054938, 146.086181 |
| MF127 | General   | Yes | Mansfield | Rec Reserve                        | -37.054884, 146.086734 |
| MF128 | Recycling | Yes | Mansfield | Rec Reserve                        | -37.054884, 146.086734 |
| MF129 | General   | Yes | Mansfield | 37 Highnett St                     | -37.055226, 146.087045 |
| MF130 | Recycling | Yes | Mansfield | 37 Highnett St                     | -37.055226, 146.087045 |
| JS131 | General   | Yes | Jamieson  | 20 Perkins st                      | -37.30213, 146.137721  |
| JS132 | Recycling | Yes | Jamieson  | 20 Perkins st                      | -37.30213, 146.137721  |
| JS133 | General   | No  | Jamieson  | 15 Perkins St                      | -37.301998, 146.137695 |
| JS134 | General   | Yes | Jamieson  | 19 Perkins St                      | -37.302128, 146.13791  |
| JS135 | General   | Yes | Jamieson  | 19 Perkins St                      | -37.302128, 146.13791  |
| JS136 | Recycling | Yes | Jamieson  | 19 Perkins St                      | -37.302128, 146.13791  |
| JS137 | General   | No  | Jamieson  | 25 Perkins St                      | -37.302155, 146.138107 |
| JS138 | General   | No  | Jamieson  | 25 Perkins St                      | -37.302332, 146.138327 |
| JS139 | General   | No  | Jamieson  | Perkins St/ 25 Nash St             | -37.302744, 146.138536 |
| JS140 | General   | No  | Jamieson  | 41 Perkins St                      | -37.303732, 146.14097  |
| JS141 | General   | No  | Jamieson  | 41 Perkins St                      | -37.303682, 146.141002 |
| JS142 | General   | No  | Jamieson  | Riverside Park                     | -37.303323, 146.14155  |

|       |           |     |           |                                     |                        |
|-------|-----------|-----|-----------|-------------------------------------|------------------------|
| JS143 | General   | No  | Jamieson  | Riverside Park                      | -37.303229, 146.141658 |
| JS144 | General   | No  | Jamieson  | Riverside Park                      | -37.303028, 146.141538 |
| JS145 | General   | No  | Jamieson  | Riverside Park                      | -37.30283, 146.141574  |
| JS146 | General   | No  | Jamieson  | Riverside Park                      | -37.302795, 146.141489 |
| JS147 | General   | No  | Jamieson  | 160 Jamieson-Iicola road (Cemetery) | -37.301157, 146.150025 |
| KV149 | General   | No  | Kevington | Kevington Hotel                     | -37.358109, 146.162031 |
| KV150 | General   | No  | Kevington | Kevington Hotel                     | -37.358109, 146.162031 |
| TL151 | General   | No  | Tolmie    | 2808 Mansfield-Whitfield Rd         | -36.917831, 146.265563 |
| GB153 | General   | No  | Gough Bay | 46 Bayside Blvd (Picnic Point)      | -37.187914, 146.070266 |
| GB154 | General   | No  | Gough Bay | 46 Bayside Blvd (Picnic Point)      | -37.187914, 146.070266 |
| GB155 | General   | No  | Gough Bay | 46 Bayside Blvd (Picnic Point)      | -37.187914, 146.070266 |
| GB156 | General   | Yes | Gough Bay | 4 Main St (General Store)           | -37.180734, 146.067336 |
| GB157 | Recycling | Yes | Gough Bay | 4 Main St (General Store)           | -37.180734, 146.067336 |
| JS158 | General   | No  | Jamieson  | Picnic Area, 5 Grey St              | -37.304249, 146.135215 |
| JS159 | General   | No  | Jamieson  | Picnic Area, 5 Grey St              | -37.304249, 146.135215 |
| JS160 | General   | No  | Jamieson  | Picnic Area, 5 Grey St              | -37.304249, 146.135215 |
| JS161 | General   | No  | Jamieson  | Picnic Area, 5 Grey St              | -37.304249, 146.135215 |
| JS162 | General   | No  | Jamieson  | Picnic Area, 5 Grey St              | -37.304249, 146.135215 |

## 9.3 Methodology

### Collection Procedures

A total of 146 bins, plus 14 cigarette bins, will be audited over a two week period for this bin-by-bin audit. Speculo staff will drive around in the hours before scheduled waste collection and unload each bin into the specifically designed trailer fit for purpose. Before each bin is weighed, a "presentation picture" is taken to record the condition staff found the bin and its casing in, if it had one. The team will then enter an identification number in the system and designate an appearance rate (% of capacity used) for each bin before processing. The contents of the bin will be splayed out into a designated area of the trailer to allow the optical sensor to capture an image of the contents of the bin before staff begin the sorting and classification procedures.

### Sorting Procedures

Once the A.W.A.R.E program has digested the data, any unrecognised objects or questionable materials will be flagged for further hands on identification. The trailer contains a chute to allow for the filling of buckets should a weight determination be required. All of the items in the bin will receive a classification designation automatically through the system or manually through a team member. The classification designations can be found in the next section. Once waste has been sorted, the chute will be utilised to return the waste into its original bin before it is weighed and returned.

### Classification of Material

The material types used in this audit generally adhere to those provided by the Victorian Guidelines for Auditing Kerbside Waste, but we expect there to be instances of unusual waste encounters so our system has the capacity to add new classifications as we progress with the audit. These new classifications, if any, will be made clear in the final report on the audit. Where there is contamination of a certain bin (especially recycling) the contaminants will be identified and designated along with the non contaminated waste

### Waste Analysis

All bin data will be captured and entered into our system, manual entries and identifiers will utilise MS excel. As council is focussed on the potential for diverting waste from bins without an accompanying recycling bin, each existing bin pair will be analysed consecutively and grouped to allow for a direct comparison of contamination with those bins that are standalone general waste. Analysis will also look at total compositions, breakdown of categories, standard deviation as well as the bin capacity remaining and weights. As bins will be identified it will be easy to compare geographic locations to identify the presence of trends in certain townships.

### Workplace Health and Safety

Speculo is committed to maintaining a safe work environment by adhering to strict workplace health and safety requirements. Key considerations for this audit will be:

- Allowing ample time to sort the waste. This prevents staff from rushing and reduces the risk of a workplace accident or injury occurring
- Employing staff who are experienced in sorting of waste and who are well trained in safety matters related to the task
- Providing appropriate Personal Protective Equipment (PPE) for sorting including gloves, safety boots and protective overalls
- Scheduling breaks and providing staff with cold drinking water and snacks
- Ensuring JustWaste staff are up to date with the relevant immunisation schedules
- Providing a suitable space for the sorting procedure to take place. The designated area is accessible by car and trailer for the delivery of audit materials, undercover with a concrete floor, and is open and well ventilated
- Ensuring an adequate means of disposal for the audited materials.

## 9.4 Recommendation Breakdown

### 1 - Ensure correct operation of existing infrastructure

It is highly recommended that council contact the contracted service provider responsible for waste pickup and processing and request that the obligation to return bins to the provided infrastructure be fulfilled. This small and cost free step for Council, will immediately reduce the amount people dumping waste into these bins.

Not only do these bags take up a large portion of the bin by both weight and percentage full, they rarely, if ever, have just a single waste stream inside them, pushing contamination rates higher. The perfect example of this is in *Figure 13*, which reveals that Goughs Bay's single recycling bin, that was not hooked into its stand, had a **41%** contamination rate.

### 2 - Conduct maintenance and repairs

- **Mansfield** - General waste bin **MF036**, which is located on the centre strip opposite the "Mansfield Bakery" has a broken door latch that needs repair. Recycling bin **MF084** in the cemetery carpark need urgent cleaning. General waste bins **MF089** outside the Highett St public toilets and **MF090** at 20 Highett St both have faulty or broken latches preventing them from closing securely.
- **Jamieson** - Bin **JS131**, a general waste bin outside the post office at 20 Perkins St Jamieson, needs urgent cleaning due to a large layer of dirt caked to the bottom of the bin. **JS144**, one of the general waste bins along riverside park, has hot ash damage on the lower quarter of the bin.
- **Kevington** - Bin **KV149**, outside the Kevington Hotel, has a large crack running down half the side of it.

### 3 - New Infrastructure

**Tolmie** Speculo highly recommends the installation of a new, or return of the previously existing, general waste bin in Tolmie at the public toilet opposite the local pub. And to accompany those two bins with a recycling bin, given that there was 4.35kg of recycling found in the lone general waste bin (TL151). Moreover, TL151 had an appearance rate of 110% and had the highest prevalence of dumping on the ground next to and around the bin. The recommendation includes a shell for two of the three bins, leaving one general waste bin available for large bag dumping as it is better for the bags to be in a bin rather than on the ground.

Clear messaging about how to properly discard of all streams of waste in a manner that catches the eye on a notice board would complement the installation of a shell structure around the pair of bins. Once infrastructure is installed, conducting a 4 week weekly audit over a peak period would allow the MSC to see if having shelled bins is preventing the large bag dumping that has been widespread and especially bad in the outermost townships.

- **Jamieson** - Two new 120 litre recycling bins need to join bins along Riverside Park. One new recycling bin should be placed along the main drag on Perkins St
- **Merton** - A new recycling bin on the stand with an existing general waste and a new recycling bin in a shell between the park and service station, with a shell.
- **Kevington** - Replace one general waste bin with a 240 litre recycling bin
- **Goughs Bay** - Install a new recycling bin and double shell at Picnic Point, put an existing landfill bin the shell too. Add 120 litre recycling t o stand with remaining bin.

## 4 - Jamieson Pilot Program

The reasons for this heightened engagement amongst residents are many and varied, two of the most prominent are that the real and increasing fire danger compels people to be more aware of their green waste, and that the dialogue surrounding waste in Jamieson could devolve into disharmony rapidly if not soothed. It is for these reasons that Speculo recommends any plans and trials of new PPWRI, including resource recovery points and incentive programs, be piloted in Jamieson.

Not only would this action provide satisfaction to disgruntled residents, it would be a perfect proving ground for any infrastructure big or small. A quiet and removed town will always by nature be the most expensive to service, meaning that if the financial sustainability of a project can be achieved in Jamieson, it is likely to succeed everywhere else. The relatively poor mobile internet connection in Jamieson may at first appear to be a hindrance to the aspirational idea of a digital council service card. However, if it could be made to work in Jamieson it would likely work everywhere else in the shire.

## 5 - Phase out cigarette butt bins

A number of Victorian local councils have banned smoking in outdoor areas not covered by state legislation. Ixxix For example, Frankston City Council has banned smoking in designated outdoor areas of the Frankston central activity district; Surf Coast Shire, City of Port Phillip and Hobsons Bay City Councils have banned smoking on beaches; and Moreland City Council has banned smoking at playgrounds. From October 2011 Monash City Council extended its ban on smoking at playgrounds to include within 10 metres of the entrance to buildings on designated council land (including schools, sporting grounds, council offices and community centres) and at designated council events. Ixxx

Melbourne City Council has also banned smoking in a number of areas, including The Causeway, Howey Place, Block Place, Equitable Place, Goldsbrough Lane, QV Melbourne, City Square, Collins Way, Fulham Place, and the Tan and Princes Park running tracks. ("15.7 Legislation to ban smoking in public spaces - Tobacco in Australia", 2022)

## 6 - Develop a community waste-based education program

A number of Victorian councils have created a number of different ways to educate and engage the public:

For example, the Greater Shepparton City Council offers a "Follow your rubbish" tours plus other education events and services such as School talks on recycling and waste minimisation, engaging Schools in their own bin audits and offer waste-free school programs. (Council, 2022)

## 7- Consultations on advanced infrastructure

It is vital that Council begin incorporating advanced waste solution ideas into the existing Waste Management Strategy. Focus needs to shift from a large RRC with Kerbside and PPWRI to a system of Resource Recovery Points that incorporates a large number of automated bins and linked incentive programs.

## 7 - Better Suited Resource Recovery Systems

Speculo recommends Council engage in developing a plan to install new resource recovery points that are automated with a large variety of bins to put selected waste into. If Council could educate residents and visitors alike then the behaviour change required to make this process economically sustainable would occur.

Speculo recognises that any new behaviour, or change in existing one, takes time and effort, thus to further incentivise and kickstart these new helpful habits, it is recommended that serious thought be given to the idea of using virtual and digital council services cards. These could be used to reimburse residents via the reduction of rates, offering the community a financial incentive to forging new waste management behaviours.

Visitors could be encouraged to sign up for virtual Mansfield Shire Council Visitors Accounts, a service that could be developed into a user friendly App in partnership with Alpine resorts and other bodies responsible for enacting the **Lake Eildon Master Plan**.

Not only would these accounts and their digital cards provide visitors with the ability to use any new resource recovery points, it would allow them to get credited the amount a resident would get reimbursed for correctly sorting waste. This credit could then be spent on a whole manner of discounts around the Shire, including and especially tourist related activities.

If implemented correctly, the gamification of waste management and the accumulation of a balance of credit only expendable in the designated geographic area (Just Mansfield Shire or both Mansfield and Murrindindi) would only serve to encourage people to return again soon

Given that council is currently considering options as to the refurbishment or moving of the current RRC, we would recommend that due consideration be given to reimagining the scale of waste collection. Smaller more intimate resource recovery points in conjunction with a larger resource recovery centre would strike the perfect balance and provide the optimum method of changing peoples behaviour enough to make local waste processing financially viable.

## 7 - Advanced Bin Shells

An appearance rate sensor that would allow for the most efficient system of collecting bins as the information regarding their fullness would be readily available. This could be done in a cost effective manner by a small local collection and processing system, but does require the successful changing of behaviour that other recommendations hope to achieve through their cumulative affects in order to be cheap enough to maintain.

Speculo recommends further consultation into the manufacturing and use of an advanced bin shell that could potentially contain a scale and appearance sensor. This ongoing and up to date data would allow for tremendous learnings and precise management of the waste system with the Shire.

Another option, is to place qr-code on the bin as shown in photo 17, that would inform the council when a bin would be required to be picked up. While, this is a cheaper alternative, it would require constant community input and if bins are not placed correctly could lead to more pickups and increase rates of dumping.

## 9.5 Priority Recycling

| BIN ID | TYPE    | TOWNSHIP  | STREET ADDRESS                | GPS (latitude, longitude) | Waste weight (Kg) | Recyclables Weight (Kg) |
|--------|---------|-----------|-------------------------------|---------------------------|-------------------|-------------------------|
| GB154  | General | Gough Bay | Picnic Point                  | -37.187914, 146.070266    | 26.74             | 8.15                    |
| JS138  | General | Jamieson  | 25 Perkins St                 | -37.302332, 146.138327    | 18.31             | 7.34                    |
| MF062  | General | Mansfield | 77 High St                    | -37.0521805, 146.0893149  | 12.6              | 4.27                    |
| TL151  | General | Tolmie    | 2808 Mansfield-Whitfield Rd   | -36.917831, 146.265563    | 31.95             | 4.25                    |
| JS141  | General | Jamieson  | 41 Perkins St                 | -37.303682, 146.141002    | 13.26             | 4                       |
| JS158  | General | Jamieson  | Picnic Area, 5 Grey St        | -37.304249, 146.135215    | 13.04             | 3.75                    |
| JS133  | General | Jamieson  | 15 Perkins St                 | -37.301998, 146.137695    | 22.66             | 3.6                     |
| JS143  | General | Jamieson  | Riverside Park, 38 Perkins St | -37.303229, 146.141658    | 7.71              | 3.6                     |
| JS144  | General | Jamieson  | Riverside Park, 38 Perkins St | -37.303028, 146.141538    | 13.67             | 3.15                    |
| JS161  | General | Jamieson  | Picnic Area, 5 Grey St        | -37.304249, 146.135215    | 10.31             | 3.15                    |

## 9.6 Interactive Bin Map

For a detailed interactive map of all the bins that have been audited in the Mansfield Shire council please see below:

<https://batchgeo.com/map/e0c430762a8f53116031d79370941bc0>

# 10 Glossary

**Baseline-** A set of data values that can serve as a comparison

**Benchmark-** A reference by which performance can be measured or judged

**Calibration-** The process of checking or adjusting the accuracy of a measuring instrument that will be used in the audit

**Council-** The elected body that represents the community at Local Government Level

**Commissioning agent-** The party for whom the audit is conducted, and who sets the audit scope and brief in consultation with recycler and auditors.

**Contamination-** Any item that is not allowed in a kerbside sample and / or any item that cannot be recovered at a recycling facility

**Due diligence-** The level of judgement, care, prudence, determination, and activity that a person would reasonably be expected to undertake to ensure; a safe working environment; a data quality assurance program; kerbside audit integrity; and avoidance of conflict of interest.

**Full collection cycle-** The collection of samples from public waste infrastructure over a number of weeks and on different days to ensure that data collection is not biased or compromised

**Global Pandemic-** This refers to the ongoing Covid-19 pandemic that has changed much of how we view work-life balance

**Green organics stream-** All material placed in the green waste wheelie sample for the purposes of green waste resource recovery

**Key performance indicator-** The quantifiable measure that can be used to track performance and progress towards a goal

**OH&S-** Occupational Health and Safety

**MRF-** Materials Recovery Facility

**Per household method-** The sample by sample analysis of all household waste and resource streams (also known as 'bag and tag').

**PET-** The acronym for polyethylene terephthalate, which is high gloss, crackresistant, transparent plastic used largely in making carbonated beverage bottles

**Quality assurance-** A system for evaluating performance

**Recycling stream-** All material placed in the recycling wheelie sample for the purposes of recycling.

**Sample-** The total amount of wheelie samples that will be collected for the audits

**Seasonal influence-** The effect that seasons have on waste and recycling profile

**The Shire-** This refers to the entire municipality of the Mansfield Shire

**Standard operating procedure-** The prescribed processes and sequence of events that will be followed routinely

**Waste stream-** All material placed in the general waste bin for the purposes of landfill disposal

# 11 References

Ruzzene, M., Patsouris, A. and Yoo, N. (2019) Activating Lake Eildon Master Plan. [online] Urban Enterprise. Available at: <<https://www.murrindindi.vic.gov.au/files/assets/public/documents/roads-streets-bridges/lake-eildon-masterplan.pdf>> [Accessed 12 November 2021].

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