Statewide Waste and Resource Recovery Infrastructure Plan

Victoria 2015–44

Sustainability Victoria

State Government Victoria

Statewide Waste and Resource
Recovery Infrastructure Plan

Authorised and published by
Sustainability Victoria,
Level 28, Urban Workshop
50 Lonsdale Street Melbourne
Victoria 3000 Australia

Accessibility
This document is available in PDF
and Word format on the internet at
www.sustainability.vic.gov.au

ISBN 978-1-920825-05-8 (Print)
ISBN 978-1-920825-04-1 (PDF)

Foreword

Victoria's population is growing fast and with it the amount of waste we produce. With the number of Victorians expected to increase from 5.8 million to 8.9 million by 2043 , based on current trends we're likely to see total waste generation almost double from 12.2 million tonnes in 2011-12 to 20.6 million tonnes in 2043-44 .

Although we already recover over 66% of our waste, we still send valuable material to landfill. Recovering more resources will reduce our impact on our environment and climate change, create jobs and bolster our economy. Increasing our recovery also reduces the pressure on our natural resources by reducing our reliance on virgin materials and the water and energy used to process those materials.

To effectively manage the waste we generate, and in doing so protect the public health, community amenity and natural environment we so value, the Victorian Government has developed a long-term plan with a 30-year vision for waste management in Victoria. Strategically planning for this essential service also presents significant opportunities - driving growth in innovation and technology and delivering a boost to the economy by creating jobs and new markets for recovered resources.

The Statewide Waste and Resource Recovery Infrastructure Plan (SWRRIP) will help position Victoria as the national leader in resource recovery and waste management. It provides a roadmap to guide the development of a system that will effectively manage the waste we generate, balancing the provision of this essential service and support for a viable resource recovery industry with the need to protect the community, the environment and reduce greenhouse gas emissions. This plan will help to re-establish this balance by putting care and protection of the environment back on the agenda, as set out in *Our Environment, Our Future.*

We know we need to reduce the demand on our environment and improve resource recovery to ensure the long term viability of the waste system. That is why the Victorian Government, through Sustainability Victoria, is also developing initiatives to drive behaviour change and reduce the generation of waste. But even with these initiatives in place unfortunately we will always produce waste so we still need strategic and integrated infrastructure planning, guided by the principles of environmental justice, closely linked to land use planning and economic development, that the SWRRIP provides.

The SWRRIP is the first integrated plan of its kind in Victoria. It provides an overarching statewide view which supports and guides the development of cascading regional waste and resource recovery implementation plans. These plans also provide the necessary information to identify and strategically plan for the closure of unviable or vulnerable landfills and inform the significant rehabilitation activities for those sites.

Consistent with our commitment to environmental justice principles, we will develop these regional plans with the full participation of the community to inform the priorities and future of waste and resource recovery facilities at the local level. This process will also ensure that impacts on vulnerable or disadvantaged communities are also considered and that unique local needs are addressed.

Having an overarching framework provides long-term certainty and confidence to industry and local government, which will foster private investment in the waste sector, help drive innovation and create jobs. Victoria's waste sector is worth $2.2 billion and employs 8000 people. We estimate that implementation of the SWRRIP is likely to inject an additional $550 million to $800 million into the economy, recover an additional 1.5 million tonnes of materials, and add over 800 jobs.

This strategic, long-term integrated plan, informed by the latest data and developed in conjunction with the community, industry and local government, provides an important opportunity to shape Victoria's future. It will ensure the ongoing protection of our valuable natural environment, deliver positive health and amenity outcomes for the community and boost the state's economy.

I thank all those people and organisations who contributed their ideas to this critical plan. I look forward to realising the goals of the SWRRIP.

The Hon Lisa Neville MP
Minister for Environment, Climate Change and Water

Contents

List of tables

List of Figures

Acronyms and abbreviations

Acronym	Phrase or word
ABS	Australian Bureau of Statistics
BPEM	Best practice environmental management
C&D	Construction and demolition
C&I	Commercial and industrial
DELWP	Department of Environment, Land, Water and Planning
DHHS	Department of Health and Human Services
DEDJTR	Department of Economic Development, Jobs, Transport and Resources
EPA	Environment Protection Authority Victoria
EP Act	Environment Protection Act 1970
LGA	Local government area
MRF	Materials recovery facility
MSW	Municipal solid waste
NSW	New South Wales
PIW	Prescribed industrial waste
RRC/TS	Resource recovery centre/transfer station
RWRRIP	Regional waste and resource recovery implementation plan
PACIA	Plastics and Chemical Industry Association
PIW	Prescribed industrial waste
SIW	Solid industrial waste
SV	Sustainability Victoria
SWRRIP	Statewide Waste and Resource Recovery Infrastructure Plan
VLGAS	Victorian Local Government Annual Survey
VORRS	Victorian Organics Resource Recovery Strategy
VRIAS	Victorian Recycling Industries Annual Survey
WRRG	Waste and resource recovery group
WRR Planning Framework	Victorian Waste and Resource Recovery Planning Framework
WRR region	Waste and resource recovery region

A glossary containing terms and explanations used throughout this document is in Chapter 8.1.

Executive summary

The Statewide Waste and Resource Recovery Infrastructure Plan (SWRRIP) provides Victoria with the long term vision and roadmap to guide future planning for waste and resource recovery infrastructure to achieve an integrated system that:

- effectively manages the expected mix and volumes of waste
- reflects the principles of environmental justice to ensure that impacts on the community, environment and public health are not disproportionately felt across communities
- supports a viable resource recovery industry
- reduces the amount of valuable materials going to landfill.

Victoria's population is growing fast. Since 2000 the population has grown from 4.8 to 5.8 million. By 2043 we anticipate a population of 8.9 million. As a consequence, the amount of waste being generated and requiring management is also increasing. At the current rate of increase, by 2043 total waste generation will rise from 12.2 to 20.6 million tonnes per year.

In 2011–12 over 8 million tonnes of valuable material was recovered from waste streams in Victoria, representing a 66% recovery rate, however 4.1 million tonnes were still sent to landfill. If not managed properly, the materials going to landfill can have a significant impact on communities and environment now and in the long term. They also contain valuable resources which, if recovered, would create jobs, add value to the Victorian economy and minimise potential adverse impacts to community, environment and public health.

Victoria's waste and resource recovery system provides services essential to the community to manage waste and material streams. Maximising resource recovery supports this essential service by diverting as many materials from landfill that can be viably recovered, capturing their resource value and creating jobs that contribute to supporting the economy.

The infrastructure that delivers these services is essential to ensuring Victorian cities and communities are healthy, productive and vibrant. They are as important as other essential infrastructure such as roads and those that supply water and electricity to maintain the functionality of Victoria. It is critical to plan for future waste and resource recovery infrastructure needs to ensure essential services are accessible and maintained with care for the environment.

In 2014 legislative amendments to the *Environment Protection Act 1970* established the Victorian Waste and Resource Recovery Infrastructure Planning Framework. The framework provides the structure for strategic planning for waste and resource recovery that integrates planning at the state level with planning for local and regional communities.

The SWRRIP provides the statewide context and long term vision for improving Victoria's waste and resource recovery infrastructure system. It ensures that the waste and resource recovery services essential to meet the needs of all Victorians are available while supporting innovation and investment in better infrastructure to minimise the impact on the environment and climate change, maximise resources recovered, create jobs and bolster the economy. It has been developed through extensive consultation with local governments, the waste and resource recovery industry and other government departments and agencies. The strategic directions developed through the consultative process will guide strategic planning to meet the infrastructure needs of Victoria and provide certainty to industry on the Victorian Government's plan for the next 30 years.

It is generally local governments, industry, waste and resource recovery groups (WRRGs) and government agencies that plan for, invest in and operate Victoria's waste and resource recovery system. The SWRRIP strategic directions will guide decision making to ensure investment in the right infrastructure mix will achieve the four goals:

- **Goal 1:** Landfills will only be for receiving and treating waste streams from which all materials that can be viably recovered have been extracted.
- **Goal 2:** Materials are made available to the resource recovery market through aggregation and consolidation of volumes to create viability in recovering valuable resources from waste.
- **Goal 3:** Waste and resource recovery facilities including landfills are established and managed over their lifetime to provide best economic, community, environment and public health outcomes for local communities and the state and ensure their impacts are not disproportionately felt across communities.
- **Goal 4:** Targeted information provides the evidence base to inform integrated statewide waste and resource recovery infrastructure planning and investment at the state, regional and local levels by industry, local government, waste and resource recovery groups, government agencies and the broader community.

The Victorian waste and resource recovery sector employs around 8,000 people with an annual turnover of $2.2 billion. The sector is willing and keen to invest in Victoria's waste and resource recovery infrastructure to recover more valuable resources and to reduce and manage residual wastes safely. Facilitating the right conditions to attract this investment is critical to achieving the SWRRIP goals.

In order to achieve this, the SWRRIP strategic directions focus on:

- prioritising resource recovery and consolidating and aggregating material streams to achieve the volumes of quality feedstocks to support viable recovery where it is economically feasible and better community, environment and public health can be demonstrated
- making suitably zoned land available for waste and resource recovery activities for the lifetime of industry investment. This requires planning to ensure there is land available with appropriate buffers and mechanisms in place to protect sites from encroachment by incompatible land uses and the amenity of the surrounding community
- maximising outcomes across the state and recognising that solutions and opportunities will vary depending on the material or waste stream and where they are generated. One size does not fit all and solutions possible in metropolitan areas will not necessarily be appropriate in rural and regional areas. Local planning needs to develop solutions that meet local needs and priorities and provide for cost effective service delivery
- integrated planning at the state, regional and local levels to ensure the priorities of the community, local governments, industry and other governments are all considered when planning for waste and resource recovery infrastructure.

The seven waste and resource recovery groups (WRRGs) across the state, in consultation with their communities, local governments and industry, will each develop a regional waste and resource recovery implementation plan (RWRRIP) that sets out how the relevant infrastructure needs for their region will be met over the next 10 years. In doing so, they will be guided by the SWRRIP strategic directions and the needs and priorities of their local communities. They will also work with neighbouring WRRGs to maximise opportunities to share resources, minimise costs and maximise innovation and job creation.

Victoria's waste management and resource recovery activities are located across the state in a network of 'hubs and spokes'. Hubs are a facility or group of facilities that manage waste and material streams. They can undertake a range of activities including sorting, consolidation, reprocessing or landfill. A hub can consist of one facility or multiple facilities with different activities and functions. Activities within these hubs often support each other. Spokes are the sequence of activities that move materials from waste generators to and from hubs e.g. for collection, transport and sorting.

Hubs are not static. Activities change over time and in the next 30 years some hubs will transition away from waste and resource recovery activities while others, if appropriate may expand. It is important to understand where the current hubs are, and plan for where future hubs should be located. The appropriate land use planning must be undertaken to ensure there are adequate buffers and zoning mechanisms to protect communities from adverse amenity impacts. Planning must also provide enough suitably located and appropriately zoned land for essential waste and resource recovery activities to be undertaken.

The SWRRIP identifies current hubs across Victoria that undertake activities significant to the state's waste and resource recovery system. The RWRRIPs will identify those that are important at the local and regional level. Strategic planning for both current and future hubs of state importance will be undertaken and include targeted consultation with the local community, local government and industry. Each hub of state importance will have an individualised community engagement plan that recognises the important role of involving communities in planning decisions and this impact on the ongoing viability of a hub.

In a market based economy, waste and material streams will flow to where the best economic returns can be achieved. The majority of the waste and material streams generated in the state stay in Victoria for recovery and management and around 86% of the reprocessing occurs in metropolitan Melbourne. In response to international market demand, around 15% of recovered materials are exported overseas for reprocessing, including significant volumes of scrap metal waste, cardboard and paper.

Freedom of trade between the states is enshrined in the Australian Constitution. It is understood materials move across state borders, but there is not currently a good understanding of the extent to which it is happening. It is unlikely that the volume of materials is significant at the state level, though they can be significant for some waste and resource recovery regions. The impact of these movements on local communities and the environment needs to be better understood. The relevant WRRGs will investigate how these movements affect their ability to manage waste and material streams and will identify opportunities to maximise outcomes for their communities as part of developing the RWRRIPs.

In order to determine solutions to achieve the desired outcomes for Victoria's waste and resource recovery system it is important to understand the types and tonnages of materials that need managing. The SWRRIP uses available data to map a picture of the current system at the state level and project how the system is likely to evolve. Further targeted data analysis will be undertaken at the local and regional levels through the development of the RWRRIPs. It is recognised that there are gaps in current available data and ongoing work is underway to improve the quality and granularity of the waste and resource recovery data set. The Waste Data Governance Framework currently being developed by Sustainability Victoria (SV) will develop a framework to improve, strengthen and standardise the collection, storage, analysis and sharing of waste data to inform infrastructure planning.

Maximising resource recovery relies on having the right mix of infrastructure and the right supporting mechanisms. The SWRRIP looks at the current state of recovery in Victoria for the major waste streams and identifies the high level opportunities and barriers for their increased recovery. Complementary work is underway through the development of a comprehensive suite of initiatives that will realise the SWRRIP by:

- leading targeted waste education to facilitate reduced waste generation, improve resource recovery and increase the community's support for waste management and resource recovery infrastructure and services
- stimulating and supporting markets for products made from recovered resources
- improving the recovery of organic material to reduce the community, environment and public health impacts of organic wastes
- facilitating collaborative procurement of waste and resource recovery services and infrastructure for local governments
- facilitating industry and local government investment in new waste and resource recovery infrastructure
- improving the quality, timeliness and accessibility of waste and resource recovery data.

In order to achieve a fully integrated system, with the best possible facilities in the best locations, planning must combine state requirements with the needs and priorities of local and regional communities. The SWRRIP includes a high level overview of the waste and resource recovery system for each of the seven waste and resource recovery regions across the state. These will be further refined through the development of the RWRRIPs, which will then be used to incorporate identified local priorities into the next iteration of this plan.

A critical component of the development of the RWRRIPs will be targeted consultation with the community. It is vital that local communities understand the essential nature of the system. They must be involved in determining the waste and resource recovery priorities for their community, understand the issues and opportunities arising from waste management and resource recovery, and participate in the long term planning. Our commitment to incorporating the principles of environmental justice into waste management and resource recovery means that our engagement with the community must be meaningful and comprehensive. This is essential to build the social licence to operate the infrastructure needed to manage the waste we produce.

Environmental Justice

The principles of environmental justice are based on the concepts of equity and participation. The principles require that environmental benefits and impacts should be distributed proportionately and affected communities should be able to participate in decision making.

For waste and resource recovery planning in Victoria, this means the community must be involved in determining the waste and resource recovery priorities and have opportunities to participate in the decisions and long term planning to establish a safe, integrated waste and resource recovery system.

In recognition of the many parties involved in planning, investing in and operating Victoria's waste and resource recovery system, the SWRRIP was developed through a rigorous consultation process. The draft SWRRIP was released for public consultation in September 2013 through advertisements and promotions seeking feedback from the community, local and state government and industry. Sixteen consultation workshops were held across the state with over 350 attendees and the formal submission process received over 50 written submissions. Feedback from stakeholders was critical to develop this final plan.

Only through partnership and collaboration will the waste and resource recovery system meet the needs of future generations while protecting the community, environment and public health. Development of the SWRRIP has revitalised collaboration between industry, government and communities based on a mutual recognition of the essential service of waste and resource recovery that is provided to Victorians.

1. Overview

1.1 Introduction

The Statewide Waste and Resource Recovery Infrastructure Plan (SWRRIP) provides Victoria with a roadmap to guide future investment in infrastructure to achieve an integrated waste and resource recovery system. The SWRRIP strategic directions guide infrastructure planning that balances the need to provide economically viable and sustainable management services with the need to protect communities and environment.

Victoria's waste and resource recovery system is an essential service that manages our waste and material streams to minimise impacts to community, environment and public health, and supports a viable resource recovery system that reduces the amount of materials going to landfill. The system managed more than 12.1 million tonnes of solid waste and material streams in 2011–12. It includes some 590 businesses employing around 8,000 people and has an annual turnover of more than $2.2 billion.[3] Projections show that with Victoria's growing population, waste and resource recovery infrastructure may need to manage around 20.6 million tonnes of materials and waste by 2043.

Activities occurring within the system include generation, collection and drop-off, sorting, transfer, recovery and reprocessing, export, reuse and disposal of waste materials. It is generally industry, local governments, waste and resource recovery groups (WRRGs) and government agencies that plan and invest in waste and resource recovery infrastructure. Community and businesses both generate waste and material streams, separate some material streams and create demand for recovered materials. The objectives of the Victorian Waste and Resource Recovery Infrastructure Planning Framework (WRR Planning Framework) prescribed by the *Environment Protection Act 1970* (EP Act) ensures that all sectors of the economy are considered in the planning process. In particular it establishes the mechanisms to ensure that the community plays a role in determining the local and regional infrastructure priorities and needs through the development of the Regional Waste and Resource Recovery Implementation Plans (RWRRIPs).

Victoria's waste and the way it is managed can have impacts on the communities and the environment. The SWRRIP strategic directions guide strategic planning to manage and minimise these impacts. This includes recognising the role the waste and resource recovery system plays in both contributing to and mitigating climate change. While greenhouse gas emissions generated by the system contribute only a small fraction of Australia's total emissions, it is important that these emissions are managed and reduced where possible. Implementation of the SWRRIP will include further research into opportunities to reduce greenhouse gas emissions and mitigate the impact of climate change.

Understanding the current waste and resource recovery system and opportunities and issues over the next 30 years is critical to effective planning. The SWRRIP describes the current waste and resource recovery system at the state level and models projections for future trends in waste generation, recovery and landfilling over the next 30 years. For each of the main material streams it provides an overview of the current recovery situation and opportunities and barriers to increasing recovery.

Industry, local and state governments can use this information to make planning and investment decisions. The SWRRIP will also influence policy on land use and transport planning by local governments and Victorian Government agencies, including the Department of Environment, Land, Water and Planning (DELWP) and the Department of Economic Development, Jobs, Transport and Resources (DEDJTR).

Planning for waste and resource recovery infrastructure is inherently linked with planning for other essential services; particularly land use and transport planning. This linkage is to ensure there is enough suitably located land to encourage industry investment in waste and resource recovery over the next 30 years. Planning needs to include mechanisms to ensure the community and environment are protected and incompatible activities are not allowed that might impact on the viability of management and recovery activities.

Victorian Waste and Resource Recovery Infrastructure Planning Framework objectives outlined in the Environment Protection Act 1970:

a. To ensure long term strategic planning for waste and resource recovery infrastructure at the state and regional levels; and

b. To facilitate the integration of statewide directions for the management of wastes and resource recovery infrastructure and regional infrastructure needs; and

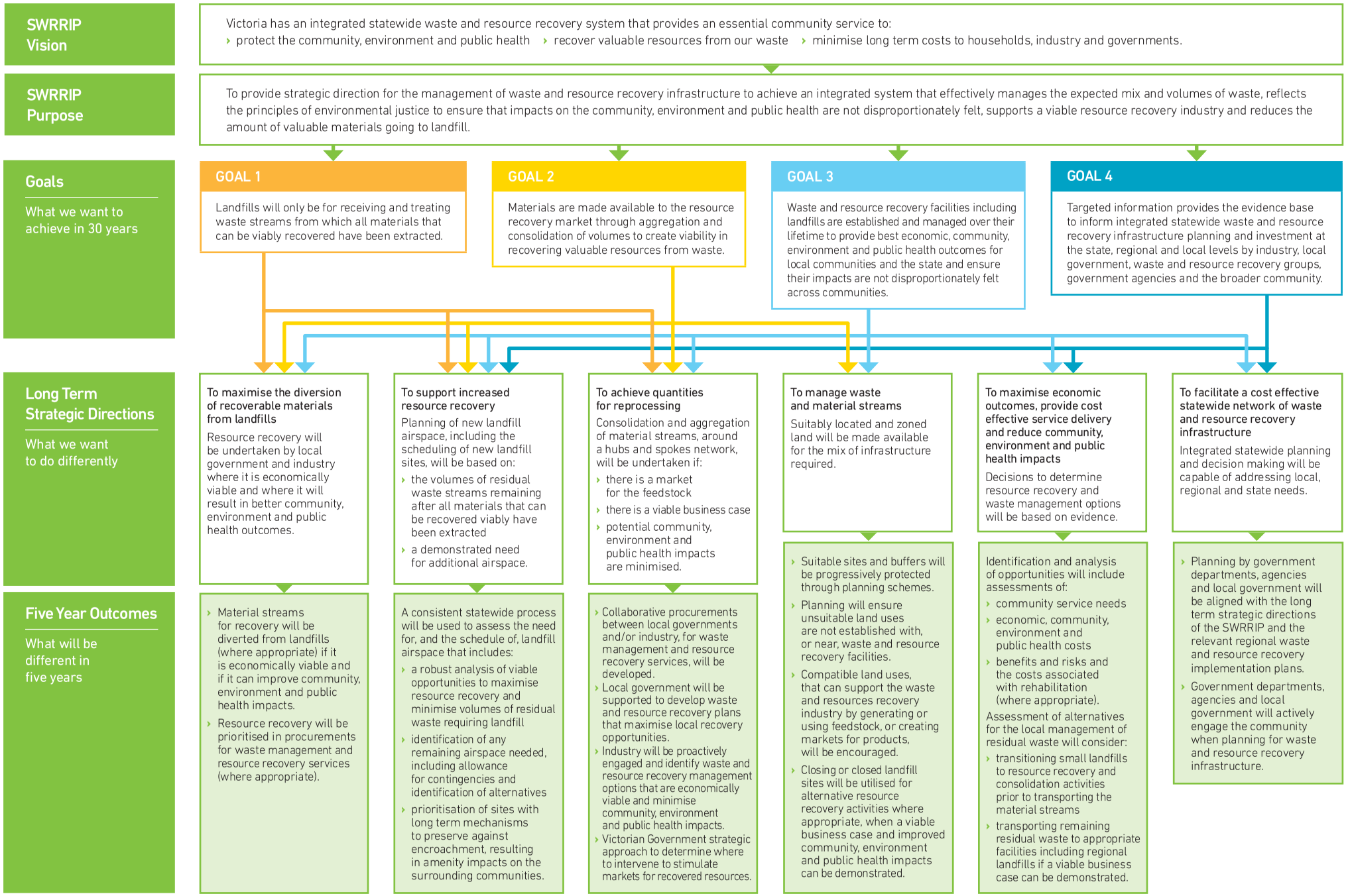
c. To enable waste and resource recovery infrastructure planning to be:
   i) Effectively integrated with land use and development planning and policy; and
   ii) Effectively integrated with transport planning and policy; and

d. To ensure Sustainability Victoria and the waste and resource recovery groups work together to integrate the Statewide Waste and Resource Recovery Infrastructure Plan and the Regional Waste and Resource Recovery Implementation Plans; and

e. To enable waste and resource recovery infrastructure planning to be made at the appropriate level of the framework.

3 Waste Management and Environment, *Inside Waste Industry Report 2011–12*, Gladesville, NSW, June 2011, p. 90.

FIGURE 1.1
SWRRIP VISION, PURPOSE, GOALS, STRATEGIC DIRECTIONS AND OUTCOMES



1.2 Legislative context

In August 2014, the EP Act was amended to establish the Victorian Waste and Resource Recovery Infrastructure Planning Framework. These legislative amendments were introduced by the *Environment Protection and Sustainability Victoria Amendment Act 2014*. The framework facilitates strategic planning for waste and resource recovery that integrates planning at the state level with planning for local and regional communities; this defines the scope of the SWRRIP and RWRRIPs.

The RWRRIPs will provide the strategic planning to ensure that the waste and resource recovery infrastructure needs of their respective region will be met over the next 30 years. This will include describing how the SWRRIP long term strategic directions will be implemented at the local and regional level. Importantly they provide the mechanism to ensure community are involved in the decision making process. Collectively these plans enable Victoria to establish an integrated statewide waste and resource recovery system that:

- effectively manages the expected mix and volumes of waste
- reflects the principles of environmental justice to ensure that impacts on the community, environment and public health are not disproportionately felt across communities
- supports a viable resource recovery industry
- reduces the amount of valuable materials going to landfill.

The SWRRIP also operates within a broad legislative framework and must consider the following acts:

- ***Environment Protection Act 1970:*** Establishes the regulatory framework for environmental protection including the planning framework that informs the SWRRIP. All waste and resource recovery facilities must comply with this Act.
- ***Planning and Environment Act 1987:*** Sets out the objectives of planning in Victoria, which are integral to the Victorian Planning Provisions and reflected in local planning schemes. *The Victorian State Planning Policy Framework* seeks to ensure that all responsible authorities work to achieve the objectives of this Act.
- ***Sustainability Victoria Act 2005:*** Provides for Sustainability Victoria to lead the development and implementation of the SWRRIP. The Act includes principles of environmental justice by requiring decision making processes to effectively integrate both long-term and short-term economic, environmental, social and equity considerations, and the need to facilitate community involvement in decisions and actions on issues that affect the community.
- ***Transport Integration Act 2010:*** Creates a framework for providing an integrated and sustainable transport system that contributes to an inclusive, prosperous and environmentally responsible state. The SWRRIP includes a transport analysis so that transport implications and requirements can be considered.
- ***Local Government Act 1989:*** Establishes the powers and functions of local governments in Victoria. According to the Act, the primary objective of a council is to endeavour to achieve the best outcome for the local community. A council must ensure the most efficient and effective use of resources, and ensure that it provides services in accordance with best value principles. These principles must guide local waste and resource recovery services, as well as any decision to opt into collective infrastructure procurement. Under this Act, a council can pass local laws that reinforce land use planning and municipal waste and resource recovery strategies.

1.3 Scope of the SWRRIP

The scope of the SWRRIP is prescribed by the EP Act. It analyses the statewide waste and resource recovery system and provides direction to inform local and regional planning by WRRGs, local government, industry and other government agencies within Victoria.

The EP Act clearly outlines the objectives of the SWRRIP:

- Identifies and analyses the tonnages and flows (where available) of major material streams at the state level and, where appropriate, at the regional level.
- Models the future generation of waste and materials at the state and regional level (where available) taking into account projected population change over a 30 year timeframe.
- Identifies and analyses the potential waste management and resource recovery infrastructure gaps, opportunities and priorities at the state level.
- Provides strategic direction to help develop the RWRRIPs and other regional and local planning to achieve an integrated statewide waste and resource recovery system.
- Assesses the economic and transport impacts of the strategic directions at the state level.

The requirement to assess the economic impacts of transport occurred during the development of the SWRRIP and, at this stage the SWRRIP contains only initial findings on the economic impacts of transport. The data and outcomes determined through the development of the RWRRIPs will be used to develop the full economic and transport assessments. The SWRRIP will be amended at a later date as part of the SWRRIP/RWRRIP alignment process.

In 2013 an extensive public consultation was conducted that invited feedback from local and state government, business / industry and the community. Figure 1.1: details the goals, strategic directions for planning and what will be different in five years because of the SWRRIP. This was developed as a result of this consultation. The strategic directions will guide planning for waste and resource recovery infrastructure over the next 30 years to achieve an integrated statewide waste and resource recovery system.

1.4 The waste and resource recovery system

The waste and resource recovery system is the essential services provided to meet the needs of all Victorians. In 2011–12, the system managed over 12,176,000 tonnes of materials, included around 590 businesses employing around 8,000 people with an annual turnover of $2.2 billion.

It is generally local governments, industry, waste and resource recovery groups (WRRGs) and government agencies that plan for, invest in and operate Victoria's waste and resource recovery system. However, planning must meet the needs of all system stakeholders. Table 1.1 identifies the major stakeholders and the role they play in the system.

TABLE 1.1
WASTE AND RESOURCE RECOVERY SYSTEM STAKEHOLDERS

Stakeholder	Role in waste and resource recovery system
Community	› Generate recoverable material streams and residual waste as a consequence of household purchases and consumption. › Separate household commingled recyclables and some organics for reprocessing. › Potential market for goods made from recovered materials. › Participate in the decision making process at the local and regional level through the development of the RWRRIPs. › Provide industry with the social licence to operate waste and resource recovery facilities by understanding the need and value of them to their community when they are operated to minimise community, environment and public health impacts.
Businesses, industry and government	› Generate recoverable material streams and residual waste as a consequence of providing goods and services. › Separate some material streams for reprocessing. › Potential market for goods made from recovered material streams.
Manufacturers	› Generate recoverable material streams and residual waste. › Separate material streams for recovery. › Potential users of recovered materials as raw inputs to manufacturing processes.
The waste and resource recovery industry	› Provide collection, transport, sorting and reprocessing, trading and exporting, disposal and resource recovery infrastructure and services. › Plan and invests in the infrastructure that manages waste and resource recovery material streams.
Local governments	› Provide and procure waste and recycling collections, transport, reprocessing and/or disposal to landfill services for their communities either directly or through contractors. › Educate local communities on waste and resource recovery and litter. › Deliver a range of waste and resource recovery related projects on behalf of government. › Undertake strategic land use planning and assess development applications, including applications for waste and resource recovery facilities, high-rise and multi-use developments and the associated waste infrastructure under their planning schemes. › Can choose to purchase goods made from recovered material streams.

Stakeholder	Role in waste and resource recovery system
Waste and resource recovery groups (WRRGs)	› Legislative responsibility to develop the RWRRIPs for their region including developing the infrastructure schedule. › Undertake planning to ensure the future needs of their region are met while minimising the community, environment and public health impacts of waste and resource recovery infrastructure. › Facilitate effective procurement of waste and resource recovery services and infrastructure for their region by working collaboratively with their member local governments, industry, other WRRGs and SV. › Consult with regional stakeholders on their regional plans and educate businesses and communities to reduce waste going to landfill. › Coordinate and support community education. › Help local governments maximise resource recovery, reduce waste and minimise impacts to the community, environment and public health from the management of waste and material streams.
Sustainability Victoria (SV)	› Legislative responsibility to develop the SWRRIP, support the WRRGs to develop their RWRRIPs and to work with the WRRGs to integrate regional and statewide plans. › Develop and implement strategies, frameworks, projects and programs to promote and facilitate the sustainable use of resources to support the SWRRIP implementation. › Develop resources to help local government, WRRGs and industry achieve the objectives of the SWRRIP including procurement guidelines and investment support tools. › Provide data and information to inform waste and resource recovery planning and publish numerous data-related reports including the *Victorian Annual Recycling Industries Survey* and the *Victorian Local Government Annual Survey*.
Environment Protection Authority Victoria (EPA)	› Responsible for controlling pollution by regulating businesses and industry to achieve clean air, healthy water, safe land and minimal disturbance by noise and odour. This includes setting and enforcing standards. › Regulate the waste and resource recovery industry through works approvals and licences as well as other regulatory tools. › Assess works approvals in line with the EP Act, state environment protection polices, regulations and the SWRRIP and RWRRIPs. › Provide guidance documents related to specific technologies or statutory rules as required including the BPEM (Best practice environmental management) for landfills.
Department of Environment, Land, Water and Planning (DELWP)	› Provide policy planning, preparation of legislative amendments, leadership, coordination and oversight of the environment portfolio. › Coordinate policy development and review. › Work with other government departments, particularly the Department of Economic Development, Jobs, Transport and Resources (DEDJTR), the Department of Health and Human Services (DHHS) to maximise investment and employment opportunities and to address the community, environment and public health problems posed by waste. › Coordinate portfolio input into whole of government strategic planning initiatives including amendments to the Victorian Planning Provisions.
Federal government	› Prepare and coordinate the *National Waste Policy.* › Coordinate the *National Product Stewardship Act.*

1.5 Waste and material streams

The waste and material streams managed by the waste and resource recovery system is complex. For the purpose of the SWRRIP waste is categorised as:

- solid waste (which is either putrescible or inert)[4]
- prescribed industrial waste (PIW) also known as hazardous waste
- other waste (including waste emissions to air and water and liquid [trade] waste).

The SWRRIP addresses solid waste only. Whilst the management of PIW and other wastes can intersect with the management of solid waste they are outside the scope of the SWRRIP.

Victoria's waste is made up of many different materials. Some of these have value and can be recovered with the potential for their life to be extended for additional use within the community. Other materials, if not managed properly, can impact the community, environment and public health. Using recovery where it is viable to divert these materials away from disposal reduces both management costs and potential adverse impacts.

The SWRRIP provides guidance for planning which supports a recovery industry that maximises recovery of materials; where there is a positive business case; a sustainable market for the recovered materials; and improved community, environment and public health outcomes can be demonstrated.

To achieve this it is important to understand what is in Victoria's waste streams. The SWRRIP has collected and analysed the data available at a state level to understand the types, tonnages and locations of materials that require management. The SWRRIP has also identified at a strategic level where there may be opportunities to increase recovery. Further work will be undertaken through the development of the RWRRIPs and implementation of the SWRRIP to improve and refine data collection.

Historically data collection has been based on where the waste and material streams are generated using three main sectors: municipal solid waste (MSW), commercial and industrial (C&I) and construction and demolition (C&D). To maximise recovery of materials from waste, the SWRRIP moves away from the sector generation approach to a material stream approach. This requires a shift in the way data is collected which will evolve over time. The SWRRIP categorises waste by material streams where possible but also includes sector data due to this being the predominant reporting method in recent years.

Fill is uncontaminated soil related material that in the waste sector is used for landfill cover, maintenance and remediation. Although difficulties classifying and tracking the management and disposal of fill put it outside the scope, both fill and hazardous waste have been included in the SWRRIP modelling as both affect available landfill airspace and filling schedules of landfills.

4 Putrescible waste readily decomposes whereas inert waste does not.

1.5.1 Waste and resource recovery infrastructure

There are nearly 500 major pieces of infrastructure supporting Victoria's waste and resource recovery system. They represent significant investment by the public and private sector. Chapter 4 undertakes a detailed look at the current system of infrastructure across the state and projects likely future trends. The RWRRIPs will include a breakdown of the infrastructure for each of the waste and resource recovery regions. Maps of their locations can be found on the SV website at **www.sustainability.vic.gov.au**

The system consists of a network of 'hubs and spokes', where 'hubs' are facilities or groups of facilities that process or manage waste and material streams. 'Spokes' are the sequence of activities that move materials from waste generators to hubs e.g. for collection, transporting and sorting.

These hubs will form where:

- conditions attract industry investment
- land suitable for waste and resource activities are available
- access to requisite tonnes of feedstock and distribution networks for the goods and services made from recovered materials support a viable business case for recovery activities.

The location and activities of these hubs is constantly changing and this is influenced by a range of factors including the commodity values of the materials being managed, population growth and community expectations. The activities within hubs often support each other to improve opportunities for recovery and management. The SWRRIP provides guidance for planning decisions that will optimise where future hubs will be located and support establishing compatible activities within hubs to improve the management of waste and material streams. This is discussed further in Chapter 2.2.

Making sure land is available for infrastructure to meet the needs for essential waste and resource recovery services is critical to establishing an effective waste and resource recovery system. For this reason land use planning and infrastructure planning is inherently connected. Planning controls need to ensure that community, environment and public health are protected.

Importantly, establishing an effective hubs and spokes network requires gaining the social licence to undertake waste and resource recovery activities. To achieve this the community needs to recognise the essential nature of the services required be involved in the decision making process; be reassured that facilities will be operated to meet best practice standards to protect from the adverse impact of activities.

Landfills are widely recognised as a critical component of Victoria's waste and resource recovery infrastructure. In the long term, the role of landfills will be to manage waste streams that cannot be viably recovered. The SWRRIP strategic directions guide planning to maximise diversion of materials away from landfills for resource recovery where it is economically viable and when better community and environment outcomes can be achieved.

The SWRRIP strategic directions also recognise that landfills, along with all other waste and resource recovery infrastructure, must be operated and managed to meet community expectations and best practice requirements.

1.5.2 Provision of an essential service

The waste and resource recovery system provides the essential services to manage Victoria's waste and material streams. If these streams are not managed properly they can cause a range of issues including odours, dust, noise, generation of leachate which can contaminate ground water, soil contamination and the generation of greenhouse gases which impact the community and environment.

Integrated strategic planning at the state, regional and local levels will ensure needs and potential gaps in infrastructure are identified and solutions that maximise the outcomes across the state to meet this essential service are developed.

1.5.3 Impact on climate change

One of the biggest challenges to Victoria over the next 30 years will be mitigating and adapting to the impact of climate change. If waste and material streams are not managed properly then it could add further pressure on the sustainability and resilience of communities.

The major cause of greenhouse gas emissions from the waste and resource recovery sector arise from the breakdown of putrescible waste in landfills. When these materials break down they generate by-products, one of which is methane gas. Methane gas is at least 21 times more potent than carbon dioxide and is estimated to account for around 86% of the total greenhouse gases from the waste sector.[5] In addition, the resource recovery industry contributes to the generation of greenhouse gas emissions through the use of energy in the collection, sorting, transporting, processing and remanufacturing of recovered materials.

The National Greenhouse and Energy Report estimates that in 2014, management of residual waste in landfills nationally generated 10.3 million tonnes of CO_2-e, accounting for 1.8% of Australia's total greenhouse gases.[6] While the emissions generated by the waste and resource recovery system contribute only a small fraction of Australia's total emissions, it is important that these emissions are managed and reduced where possible. The industry has already achieved significant improvement in emission generation largely due to the capture of greenhouse gases at landfills. The Australian Bureau of Statistics (ABS) reports that between 1990 and 2008, net emissions from the national waste sector declined by 20%. In 1990, less than 1% of all landfill emissions were recovered. By 2008, this figure had increased to 28%.[7]

Planning aligned with the SWRRRIP strategic directions will establish an infrastructure system that can manage and reduce its greenhouse emissions and potentially provide cost effective opportunities for emissions mitigation. Over the next 30 years this is likely to include:

- diversion of organic materials from disposal at landfill to viable recovery options
- best practice landfill management and gas capture at all landfills. Where viable gas captured will be used to generate energy for use locally or input into the grid
- best practice management and operations of waste and resource recovery facilities that includes energy efficiency
- maximising recovery of material streams that can replace the use of virgin materials that are emission intensive to extract, refine and manufacture.

A particular opportunity for the mitigation of greenhouse gas emission comes from the generation of energy from waste. This can occur using gas captured at landfills or at dedicated energy from waste facilities. Dedicated facilities tend to have better recovery rates than gas capture at landfills. Energy capture is discussed in more detail in Chapter 5.3.1.

Implementation of the SWRRIP will include further investigation into opportunities to reduce greenhouse gas emissions and mitigate the impact of climate change.

5 Environment Victoria, http://environmentvictoria.org.au/content/waste-and-climate-change#.VMAl_bf9mM8

6 Quarterly Update of Australia's National Greenhouse Gas Inventory: June 2014 http://www.environment.gov.au/climate-change/greenhouse-gas-measurement/publications/quarterly-update-australias-national-greenhouse-gas-inventory-june-2014

7 Australian Bureau of Statistics http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by`%20Subject/1370.0~2010~Chapter~Waste%20emissions%20(6.6.6)

1.6 How the SWRRIP will be implemented

1.6.1 Aligning decision making with strategic directions

The goals of the SWRRIP will be realised through integrated planning that sustainably increases resource recovery while ensuring waste and material streams are effectively managed to minimise impacts to the community, environment and public health.

The long term strategic directions outlined in Figure 1.1 have been developed in consultation with local governments, the waste and resource recovery industry and other government agencies. The strategic directions detail what needs to underpin the decisions made by stakeholders when planning for waste and resource recovery infrastructure over the next 30 years. The outcomes set out changes sought over the next five years.

These directions should be considered by everyone involved in waste and resource recovery planning including local and state government, WRRGs, infrastructure owners, operators and investors. In particular the WRRGs will partner with their member local governments and demonstrate in their RWRRIPs how these directions will be implemented at the local and regional level to meet relevant needs and priorities.

1.6.2 Decision making under the planning and environment regulatory framework

The SWRRIP provides guidance and information for statutory decision makers exercising discretion under planning and environment regulatory frameworks, including planning scheme amendments and planning permits under the *Planning and Environment Act 1987* and decisions of the EPA in relation to works approvals and licences under the EP Act.

The following considerations should guide decision makers when exercising discretion in relation to infrastructure planning decisions (as relevant):

- Consistency with the SWRRIP vision, purpose, goals, long term directions and five year outcomes as described in Figure 1.1.
- The capacity of existing infrastructure to manage the state's waste and materials streams and the impact of decisions on availability of suitably located and zoned land for this purpose.
- Consistency with the objectives of the hubs and spokes model as described in Chapter 2.2 for the provision of waste and resource recovery infrastructure, including the protection of existing hubs of state importance where it is determined that maintenance of the site as a hub provides the best economic, community, environment and public health outcomes for the state.
- The principles of environmental justice and evidence based decision making in relation to waste and resource recovery infrastructure to maximise the positive and minimise the negative long term economic, community, environment and public health impacts of this infrastructure.
- The potential opportunities and inhibitors for recovering the waste streams identified in Chapter 5.3.

1.6.3 Enabling initiatives

To establish the waste and resource recovery system to achieve the SWRRIP's vision, it is important to recognise that decisions to invest in infrastructure are influenced by a range of factors and market conditions.

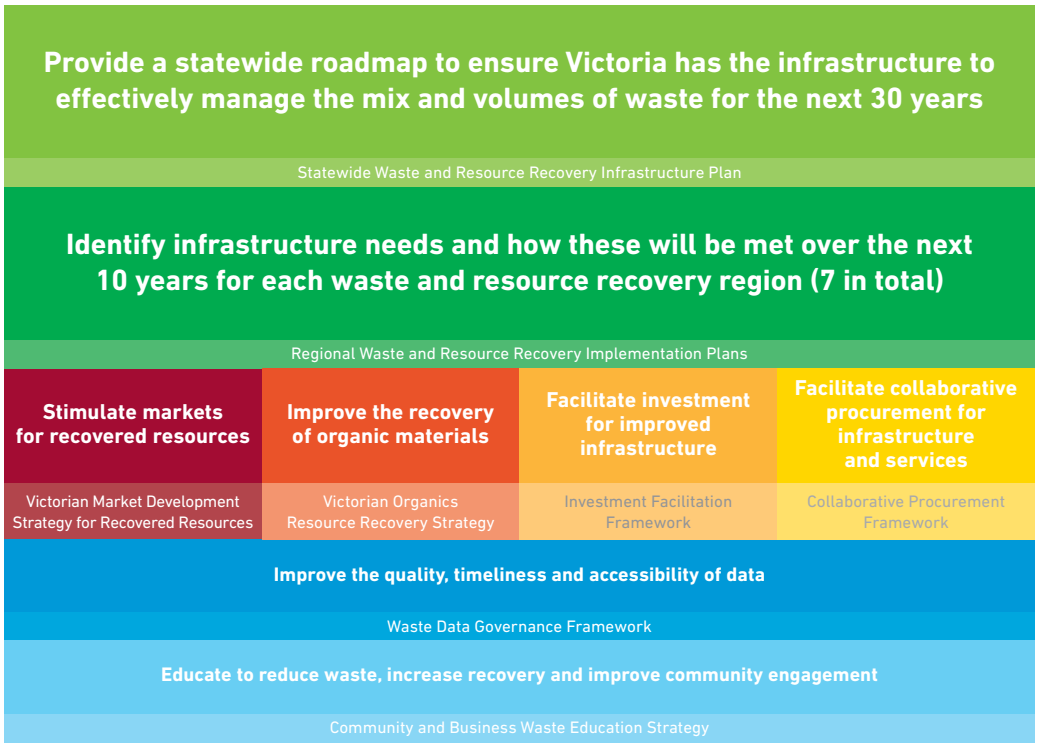
Figure 1.2 shows the suite of priority actions and solutions being developed to support the implementation of the SWRRIP. This work is mostly led by SV (except the development of the RWRRIPs by each respective WRRG). These priorities are:

- ***Victorian Community and Business Waste Education Strategy:*** seeks to provide a coordinated and best practice approach to waste education to ensure Victorian community, businesses, governments and the education sector understand the importance of effective waste management and resource recovery. It will articulate waste educators' (state and local government, industry and educational institutions) roles and responsibilities in waste education, provide a set of agreed principles and approaches for how waste education will be delivered and encourage collaboration between waste educators, generators and receivers. The education strategy will establish an evidence base to facilitate knowledge sharing of best practice waste education principles for stakeholders and innovative approaches for waste educators. The strategy will have a vision and identify agreed outcomes for waste education including; reducing waste generation; improving resource recovery; and increasing the community awareness of the essential nature of waste and resource recovery management services.
  Importantly, this strategy will apply the principles of environmental justice by recognising the influence community concerns and attitudes can and should play in establishing an effective waste and resource recovery system. Through the strategy research will be undertaken and mechanisms developed to inform how the community will be involved and engaged in waste and resource recovery planning.
- ***Victorian Market Development Strategy for Recovered Resources:*** seeks to meet community expectations for resource recovery activities that improve the community, environment and public health, while stimulating markets for the use of recovered materials for positive economic return. It will support conditions for the resource recovery and manufacturing sectors to grow by maximising the value of recovered materials and developing quality products. The market development strategy strives to increase investment and the purchase of products made from recovered materials by promoting their qualities and functionality. The strategy will have a 30 year vision, 10 year strategic outlook and a five year implementation plan.

- ***Victorian Organics Resource Recovery Strategy:*** seeks to balance community expectations to better manage waste to reduce community, environment and public health impacts of organic wastes while maximising the recovery of organic material for positive economic return. It will propose a transition to advanced technologies and improved treatment and processing of organics to minimise the impact on the community, environment and public health. The organics strategy strives to establish the conditions for a thriving organics recovery and processing industry that maximises value through higher quality products, materials and alternative uses. The strategy will have a 30 year vision, 10 year strategic outlook and a five year implementation plan.
- ***Collaborative Procurement Framework:*** seeks to provide practical support to the WRRGs and local government to facilitate collaborative procurement of waste and resource recovery services and infrastructure. It will act as a catalyst for more collaborative procurement for waste and resource recovery services and infrastructure and operate as a broker for the WRRGs and local government. The procurement framework will respond to the individual needs of the WRRGs by providing guidance to identify, assess and plan collaborative procurement. It will also build capability and expertise in collaborative procurement in key organisations including SV, WRRGs, local government and third party service providers.
- ***Investment Facilitation Framework:*** seeks to provide a coordinated, consistent and valuable service that improves Victoria's investment appeal to waste and resource recovery infrastructure investors. It will promote Victoria's waste and resource recovery infrastructure investment opportunities locally and abroad. The investment framework will assist in the delivery of projects with improved technologies to effectively manage Victoria's waste flows and reduce the community, environment and public health and increase the commercial reuse of recovered resources.
- ***Waste Data Governance Framework:*** seeks to articulate the roles and responsibilities across the Victorian Government environment portfolio, local governments and the waste and resource recovery industry for the collection, storage and distribution of waste and resource recovery data. The framework will provide standards and guidelines for the management of waste data to improve, strengthen and standardise the collection, storage, analysis and sharing of waste data. The data governance framework will explore the viability of a central data repository that stores a comprehensive set of waste data and information about waste data flows.

In addition, the *National Waste Policy: Less Waste and More Resources* is a collaborative national approach to managing waste across Australia. The policy sets Australia's waste management and resource recovery direction to 2020 and was agreed to by all state governments.

FIGURE 1.2
KEY INITIATIVES AND OUTCOMES TO REALISE VICTORIA'S INTEGRATED WASTE AND RESOURCE RECOVERY SYSTEM



1.6.4 Victorian Government actions

Both state and local government play a critical role in implementing the SWRRIP. The WRRGs in consultation with local government and community will develop RWRRIPs to implement the SWRRIP strategic directions at the local and regional level. The WRRGs will also support local governments to develop the internal policies and procedures to support their RWRRIPs and the SWRRIP in their area.

Table 1.2 outlines the priority actions for government to implement the SWRRIP over the next five years.

TABLE 1.2
SWRRIP IMPLEMENTATION ACTIONS FOR GOVERNMENT OVER THE NEXT FIVE YEARS

	Action	Who	Timeframe
Goal 1	Landfills will only be used for receiving and treating waste streams from which all materials that can be viably recovered have been extracted.		
1.1	Develop a consistent statewide process to assess the need for additional landfill airspace and the scheduling of new landfill sites to inform the development of the RWRRIPs.	Lead: DELWP, SV, WRRGs	Short term (1 year)
Goal 2	Materials are made available to the resource recovery market through aggregation and consolidation of tonnes to create viability in recovering valuable resources from waste.		
2.1	Provide guidance and establish programs to develop markets for goods and services made from recovered resources.	Lead: SV Support: WRRGs	Short term (1–3 years)
2.2	Provide guidance and develop programs to increase recovery of priority materials such as e-waste and organics including: › optimisation of collection systems › improving the capacity of the recovery industry to separate material streams to improve quality of feedstocks for reprocessing.	Lead: SV Support: DELWP, EPA, WRRGs	Short term (1–3 years)
2.3	Support local governments to procure waste and resource recovery services and infrastructure that will achieve the goals and objectives of the SWRRIP.	Lead: WRRGs and SV	Ongoing
2.4	Provide ongoing support to local government and industry to identify and develop opportunities for recovery of material streams with potential economic value or high environmental and public health risk at the state, regional and local level to inform infrastructure investment decisions including: › potential opportunities and gaps identified in the SWRRIP › opportunities to use cross regional flows to consolidate material streams › opportunities in rural areas where economies of scale may be hard to achieve.	Lead: WRRGs and SV	Medium term (3–5 years)
2. 5	Support local government to develop mechanisms at the local level to ensure adequate long term provision of suitably located and appropriately zoned land for waste and resource recovery activities.	Lead: WRRGs Support: SV	Medium term (3–5 years)

	Action	Who	Timeframe
Goal 3	Waste and resource recovery facilities including landfills are established and managed over their lifetime to provide best economic, community, environment and public health outcomes for local communities and the state and ensure their impacts are not disproportionately felt across communities.		
3.1	Build the capacity of local government to evaluate and identify options for managing material streams including residual waste that provide best economic, community, environment and public health outcomes for the state.	Lead: SV Support: WRRGs	Short term (1–3 years)
3.2	Provide support to industry to improve engagement mechanisms and provide opportunities for community involvement in the planning of waste and resource recovery infrastructure to build the social licence to operate facilities.	Lead: SV, Support: EPA and WRRGs	Short term (1–3 years)
3.3	Provide support to industry to ensure facilities are operated and managed to minimise impact on community, environment and public health.	Lead: SV	Short term (1–3 years)
Goal 4	Targeted information provides the evidence base to inform waste and resource recovery infrastructure planning and investment at the state, regional and local levels by local governments, the waste and resource recovery industry and other government agencies.		
4.1	Develop RWRRIPs that strategically plan for the waste and resource recovery needs of each WRR region for the next 10 years that consider the needs and priorities of local communities and align with the SWRRIP.	Lead: WRRG Support: SV	Short term (1–3 years)
4.2	Provide and share current and relevant data and information with local governments, the waste and resource recovery industry and other government agencies to inform business planning related to waste and resource recovery infrastructure including: › establish a data governance framework to facilitate improved waste and resource recovery data collection, storage and analysis › regular and timely publication of relevant data and case studies › identifying data and information gaps and processes to improve data set › completing the SWRRIP economic and transport analyses following alignment of the RWRRIPs.	Lead: SV Support: Environment portfolio	Short term (1–3 years) + ongoing over the life of the SWRRIP
4.3	Integrate planning requirements and decision making processes for waste and resource recovery infrastructure into the state's land use planning frameworks.	Lead: DELWP Support: SV and WRRGs	TBD
4.4	Develop the process to ensure, where appropriate, that the objectives of programs (e.g. grants programs) delivered across government agencies consider waste and resource recovery planning and SWRRIP goals.	Lead: SV Support: DELWP, EPA, DEDJTR, DHHS	Medium term (3–5 years)
4.5	Engage proactively with industry to facilitate investment in waste and resource recovery infrastructure that supports the SWRRIP goals.	Lead: SV Support: WRRGs	Medium term (3–5 years)
4.6	Develop and implement a strategy to educate community and business on waste and resource recovery to support achieving the goals of the SWRRIP.	Lead: SV	Development: Short term (1–3 years) Implementation: Long term (10 years)
4.7	Investigate opportunities to reduce the generation of greenhouse gas emissions and mitigate the impact of climate change through the way we manage our waste and material streams.	Lead: SV Support: DELWP and EPA	Short term (1–3 years)

1.7 Communication and engagement

The SWRRIP vison to achieve an integrated waste and resource recovery system will only be realised if all sections of the Victorian community are involved in infrastructure planning decisions. To achieve this we need to effectively engage local communities, businesses, industry, the waste and resource recovery sector, and all levels of government including local government and state government departments and agencies.

Underpinning the SWRRIP is an engagement strategy that will, over the next five years, develop the key messages and engagement mechanisms to ensure the right stakeholders are engaged at the right point of the infrastructure planning process. It will use the information gathered through the development of the RWRRIPs and the enabling initiatives outlined in Chapter 1.6.3 to revise and improve engagement mechanisms.

This strategy will be used to support and inform the engagement required to develop and implement the RWRRIPs. Included will be a range of mechanisms and support tools to engage and involve the different stakeholder groups that make up the Victorian community.

Of particular importance to infrastructure planning is gaining from the broader community the acceptance to locate and operate waste and resource recovery facilities where they can provide the best opportunity to minimise impacts on the community, environment and public health, maximise resource recovery and contribute to local economies. Building the social licence to operate will require a long term approach and needs to include:

- reassurance to the community that waste and resource recovery facilities will be operated to meet community expectations and regulatory requirements
- developing an understanding in the community of the essential nature of waste and resource recovery services to support viable communities and protect the environment and public health
- mechanisms to involve the community in planning for waste and resource recovery services.

The Victorian Community and Business Waste Education Strategy discussed in Chapter 1.6.3, explores the role of the social licence to operate and gaining community acceptance further.

1.7.1 Hubs of state importance

As discussed in Chapter 1.5.1, within the waste and resource recovery system is a network of waste and resource recovery hubs. In Chapter 2.2.1, a number of hubs of state importance have been identified as the current activities occurring within the hub are an important component of the state system.

However these hubs are not static and will change over time. Some of these hubs will transition out of waste and resource recovery to other activities, whilst others, where appropriate may expand. Involving the community in the future planning for these hubs is critical to ensure that the effectiveness of the waste and resource recovery system is optimised.

1.8 Monitoring and evaluation

SV has developed a monitoring and evaluation plan to track how the SWRRIP is progressing and its impact on Victoria's waste and resource recovery system. The plan includes a combination of regularly monitoring indicators, mid-term evaluation/review and a final evaluation/review. A continual improvement process will be used to progressively incorporate review findings and feedback to improve delivery and implementation.

Table 1.3 outlines the top level indicators proposed to monitor the SWRRIP. These are supplemented by a suite of other indicators that incorporate SV internal program monitoring requirements and existing reporting requirements.

Some of this data is already being collected by SV or other government agencies. SV will design a program to ensure all the appropriate data is collected and collated for efficient evaluation and reporting.

Some data will be reported annually through existing surveys including the *Victorian Recycling Industries Annual Survey* (VRIAS) and the *Victorian Local Government Annual Survey* (VLGAS). SV has committed to providing a mid-term and a five year review that will include reporting progress towards achieving the SWRRIP goals.

TABLE 1.3
TOP LEVEL MONITORING AND EVALUATION INDICATORS

	Proposed indicators	Data source	Timing
1	Percentage of local governments and industry that report use of waste and resource recovery infrastructure data and information to inform investment decisions.	Surveys, interviews and questionnaires	Mid-term and five year review
2	Money invested (and/or jobs created) by local governments and industry in new or upgraded infrastructure as a result of data and information available.	Surveys, interviews and questionnaires	Mid-term and five year review
3	Percentage of volume of identified materials: › landfilled › recovered › consolidated (for transport).	› VRIAS › VLGAS › SV internal data › Surveys and questionnaires	Annual, mid-term and five year review
4	Percentage of licensed waste management facilities with environmental breaches.	EPA data	Mid-term and five year review

Note: The mid-term review will take place at around the 2.5 year mark.

2. Maximising opportunities

Over the next 30 years the Victorian waste and resource recovery system must balance the need to provide economically viable and sustainable waste management services, with the need to minimise the impact of waste and materials on communities and the environment.

To achieve this, the Statewide Waste and Resource Recovery Infrastructure Plan (SWRRIP) purpose statement is to facilitate the right conditions to attract investment in the required infrastructure to:

- protect the community, environment and public health
- recover valuable resources from our wastes contributing to the economy
- minimise long term costs to households, industry and government.

The recovery of resources from materials that would otherwise be disposed of is key to planning for the next 30 years. Some of the material we dispose to landfill, if not managed properly, can impact on the community, environment and public health. In addition, tied up in our waste are resources that can be recovered for reuse within our community.

Some materials pose more risk than others and often these materials also contain valuable resources but recovery is not economically viable. For example, when organic materials breakdown they can produce odours, leachate, greenhouse gases and attract vermin. However they also contain nutrients and energy value that could be recovered. Similarly e-waste contains heavy metals and mercury vapour that could pose a risk to the community and environment if disposal is not managed properly but also copper, aluminium and rare earth metals which have recovery value.

Diverting materials from landfill for viable recovery creates opportunities from potential risks and importantly the generation of jobs that contribute to the economy. However, recovery must only be undertaken when there is a viable business case — where there is a demonstrated market for the goods or services made from the recovered materials and better community, environment and public health outcomes can be demonstrated. Otherwise adverse impacts can occur including stockpiling of materials and the failure of recovery businesses.

This chapter looks at the mechanisms that can be applied across all levels of infrastructure planning to achieve the integrated waste and resource recovery system that will deliver the desired goals of the SWRRIP.

2.1 SWRRIP strategic directions

The SWRRIP long term strategic directions describe the key planning directions to be achieved over the next 30 years. These directions will inform the decisions made by everyone involved in waste and resource recovery infrastructure planning in Victoria. The outcomes detailed in Figure 1.1 set planning expectations for the next five years.

2.1.1 Maximising resource recovery

Fundamental to the SWRRIP is establishing the mechanisms to maximise resource recovery. It proposes that where there is an economic business case for recovery, a demonstrated market for the recovered materials and improved community and environment outcomes, then recovery should be considered mainstream.

The recovery industry already recovers around 66% of the materials generated by Victorian households, businesses and industry. Making resource recovery a priority when planning and procuring for waste and resource recovery services will support increased recovery activity. Local and state government can use their purchasing power to increase the market for goods and services made from recovered materials by including it as a priority in procurements.

The SWRRIP identifies a number of opportunities to increase recovery of individual material streams as discussed in Chapter 5. The five year outcomes detailed in Figure 1.1 prioritise increasing resource recovery at landfill sites and collaborative procurements for residual waste management particularly by local governments.

When developing their regional waste and resource recovery implementation plans (RWRRIPs) the waste and resource recovery groups (WRRGs) will work with their communities, member local governments, industry and neighbouring WRRGs to investigate these and identify other opportunities in their regions.

2.1.2 New landfill airspace

Historically landfills have provided a cheaper option for managing waste than many resource recovery options. Landfill airspace has been readily and cheaply available. To support resource recovery, planning for future landfill airspace will be based on the airspace required to manage the tonnes of residual waste expected after all materials that can be viably recovered have been extracted. WRRGs will determine the need for new landfill airspace within a region in partnership with their member local governments as part of developing the RWRRIPs.

Sustainability Victoria (SV), the Department of Environment, Land, Water and Planning (DELWP) and the Environment Protection Authority (EPA) Victoria are working with the WRRGs to develop a robust and consistent statewide approach to developing landfill schedules for inclusion in the RWRRIPs. This process includes:

- analysing the capacity of existing infrastructure
- identifying opportunities to increase recovery to minimise landfill requirements
- identifying the remaining landfill needs and how best to meet them.

Contingency planning will be built in so that WRRGs can meet the waste and resource recovery infrastructure needs of their region over at least the next 10 years, as per their legislative responsibility.[8]

8 *Environment Protection Act 2014*, Section 50BA.

2.1.3 Aggregating and consolidating material streams

Consolidating and aggregating material streams provides the feedstock needed to support viable resource recovery and best practice residual waste management. The tonnes required vary depending on the material stream and are strongly influenced by commodity values and contamination levels. Establishing the hubs and spokes network, described in Chapter 2.2, allows aggregation and consolidation at local hubs which feed into regional and state hubs. Recovery will occur along the network where it is viable to do so.

Consolidation and aggregation needs to be supported by demand for the feedstock being created. Without demand, perverse outcomes such as stockpiling can occur which can have negative community, environment and public health impacts. SV is currently developing the *Victorian Market Development Strategy for Recovered Resources* that will provide a framework to stimulate statewide markets for recovered resources by reducing barriers and developing the right conditions for material and product markets to grow and mature in Victoria.

Using municipal solid waste as a base load for feedstocks

Local governments collect and manage a substantial percentage of Victoria's waste and material streams through their kerbside and municipal services. Some of these material and residual waste streams provide predictable tonnages with a relatively consistent composition. There is an opportunity to offer these to the waste and resource recovery industry as base load feedstocks that can be supplemented with materials from the construction and demolition (C&D) as well as commercial and industrial (C&I) sectors. There are two potential mechanisms to build on this:

- WRRGs facilitate collaborative procurements with neighbouring and/or other local governments along major transport routes to aggregate and consolidate waste and material streams. Participating local governments would need to clearly identify and articulate their priorities and service needs and allow industry to participate in determining the most viable options to meet the desired outcomes.
- WRRGs support local governments to develop waste and resource recovery plans that align with their RWRRIP and maximise resource recovery at the local scale.

Opportunities at a local scale

Consolidation is not always practical when tonnages are small and large transport distances affect economic viability, particularly in rural and regional areas. However, opportunities to activate local resource recovery to meet community expectations and incorporate local priorities should be encouraged wherever possible. WRRGs and local governments will work with local communities to identify and capture opportunities through the process of developing their RWRRIPs.

Opportunities could include:

- using material streams from the local and surrounding areas e.g. timber or agricultural waste
- encouraging community activated schemes based on community initiatives and involvement where protocols can be put in place to ensure community, environment and public health impacts are appropriately managed
- identifying the infrastructure required to effectively store and/or consolidate individual material to achieve the tonnage necessary for viable collection and transport to a suitable recovery facility. This varies with each material stream and needs to consider any impact on community amenity and public health during storage. Storing materials for consolidation should only occur when there is a market for the tonnes collected. Long term stockpiling undermines existing markets and can affect the community, environment and public health. Collaborative procurements with neighbouring local governments for research into opportunities and for reprocessing services could improve viability.

2.1.4 Providing suitable land for waste and resource recovery activities

Managing waste and material streams is essential to support viable communities. If not done strategically, perverse outcomes will occur. Land use planning plays a fundamental role in this through:

- ensuring there are appropriate buffers around facilities to protect communities and the environment from potential adverse impacts such as dust, noise and odours
- ensuring there is land available for waste and resource recovery activities. Most of the investment in infrastructure over the next 30 years will be made by industry and to attract this investment, industry needs surety that land will be available over the term of the investment
- ensuring the appropriate planning controls to prevent the establishment of incompatible land uses near waste and resource recovery facilities which could impact on the functionality of the site.

It is critical that land use planning and waste and resource recovery planning are integrated to protect the community, environment and public health and the functionality of Victoria's waste and resource recovery system.

Two tiers of protection are required:

- **Identify and recognise existing sites and suitable land for waste and resource recovery activities in state land use planning schemes:** Alignment is required between waste and resource recovery planning and land use and transport planning at the state level. This will ensure existing sites and suitable land for waste and resource recovery activities are identified, recognised and protected in local land use planning schemes.
- **Protect existing sites and planning for future sites at the local level:** WRRGs will work in partnership with member local governments to identify sites that need to be protected as part of developing the RWRRIPS. This includes identifying waste and resource recovery hubs, discussed in Chapter 2.2.

2.1.5 Evidence based decision making

The principle of evidence based decision making underpins the SWRRIP. It is critical to base infrastructure planning decisions on evaluated evidence to ensure the options chosen are sustainable and provide the best long term community, environment and public health outcomes.

In regards to infrastructure this should include:

- identifying and analysing opportunities based on an assessment of community service needs and community, environment public health and financial costs as well as economic benefits and risks over the life of the opportunity including the cost of rehabilitation where appropriate
- assessing alternatives to local management of residual waste, for example transitioning small landfills into resource recovery and consolidation activities prior to transport of material streams and remaining residual waste to appropriate facilities and regional landfills. This should be considered whenever a viable business case and improved community, environment and public health outcomes can be demonstrated.

2.1.6 The role of waste minimisation and behaviour change

Whilst the purpose of the SWRRIP is to focus on achieving an integrated infrastructure system, it recognises that supporting communities and businesses to reduce the amounts of waste generated will be critical to managing waste and material streams over the next 30 years.

The wastes we generate are a consequence of the way we use resources, design and manufacture goods and the purchasing patterns of consumers. Influencing any one of these will minimise the amount of wastes generated, reducing the pressure on infrastructure and reducing the impacts on the community, environment and public health.

The *Victorian Community and Businesses Waste Education Strategy* discussed in Chapter 1.6.3 prioritises using education and behaviour change to minimise waste generation and improve the production processes of goods and services.

2.1.7 Integrated planning by government

Integrated planning ensures that planning decisions at all levels address local, regional and state needs and priorities. The priorities of local and regional areas will be defined by the WRRGs and their member local governments based on community expectations and needs. These priorities will play an important role in how the waste and resource recovery system looks and operates.

Achieving an integrated resilient and functional system will be achieved by:

- Aligning planning objectives at all levels with the long term directions of the SWRRIP and relevant RWRRIPs through:
  - close partnerships between SV, WRRGs and planning authorities throughout the development of the RWRRIPs
  - member local governments working together to determine the priorities and desired outcomes to be articulated in their RWRRIP
  - member local governments participating in the process to realise opportunities for their region
  - local governments and WRRGs consulting with their communities throughout the process of developing and implementing their RWRRIPs.
- Aligning planning for waste and resource recovery infrastructure across government including considering the:
  - requirements for waste and resource recovery infrastructure when developing government policies such as land use and transport planning
  - SWRRIP strategic directions in the design of government programs.
- Improved collection and dissemination of relevant data and information to inform planning including:
  - establishing a data governance framework to provide standards and guidelines for the collection, storage analysis and dissemination of data and information
  - integration of the SWRRIPs and RWRRIPs to inform planning at all levels
  - identification of data and information gaps and processes to improve data sets.

The waste and resource recovery system has to protect the community from adverse impacts and involve them in the planning process. Community understanding of well-planned and managed waste and resource recovery services is critical to understand how essential they are and this has been overlooked in the past. It is the community that will provide the social licence to operate waste and resource recovery facilities.

The SWRRIP implementation will include the development of mechanisms to improve community engagement and their involvement in the decision making process. As part of the development of the RWRRIPs, the WRRGs and member local governments will be engaging with their community to determine needs and priorities.

2.2 Waste and resource recovery hubs

The 'hubs and spokes' network of infrastructure facilitates the consolidation of individual material streams to achieve the tonnages that attract industry investment. Developing hubs will facilitate an integrated system that maximises resource recovery and achieves optimal economic, community, environment and public health outcomes for the state.

A hub is a facility or group of facilities that manage or recover waste or material streams. The location and size of hubs vary — a local hub could consist of a series of bins allowing consolidation and collection of recyclables where there is no commingled collection service or it could be a local resource recovery centre that consolidates materials with some separation prior to transport to a regional facility. A state hub could include a mix of infrastructure at a larger scale that sorts, consolidates and reprocesses a range of materials significant at the state level.

Spokes are the sequence of activities that move materials from waste generators to (and from) hubs e.g. for collection, transport and sorting. The length of the spoke and hence the location of the hub for a particular material stream is influenced by the impact of transport costs on the margin of return for that particular material stream.

An ideal hub has the appropriate buffers to support the waste and resource activities occurring at that location. It has well established feeding spokes and good access to transport networks. It is co-located or in close proximity to complementary activities that provide feedstocks or markets for the products and services made from the activities or share and utilise the same buffers. It is viable, minimising community, environment and public health impacts and contributes to the local and state economy.

In reality, it will often be industry investment decisions that determine the location of hubs. They are not static — activities and locations change over time in response to market and community demands. They are influenced by population growth, commodity prices, technology improvements, fluctuations in manufacturing and the closure of existing infrastructure such as landfills.

Ideally future planning for waste and resource recovery infrastructure will optimise the location of hubs to where they can minimise impacts on the community, environment and public health and maximise contributions to the local and state economies. It needs to encourage the co-location of compatible activities that can support and enhance the ability to increase recovery and improved management of waste.

Community concerns and attitudes can strongly influence the provision and establishment of waste and resource recovery infrastructure and will directly influence the viability of a hub. Facility owners and operators need to work directly with communities impacted by any individual hub to gain from them their trust, acceptance of operations and involve them in the planning for future activities. This is called the social licence to operate. The Community and Business Waste Education Strategy discussed in Chapter 1.6.3 explores this theory further.

Over the next 30 years some of our existing hubs will transition out of waste and resource recovery activities, others, where appropriate may expand and new hubs will form. Better planning for existing and future hubs will help ensure that the appropriate buffers and protection is in place to minimise any impact to communities and the environment. Importantly, it will ensure there is adequate land available for investment in the infrastructure required to provide the essential services required to manage waste and material streams.

Understanding where existing hubs are located and the role they currently play in managing waste and materials streams is critical to informing future planning. Often these hubs are well developed with existing buffers and support spokes and could support future activities. Any forward planning needs to investigate if this role should change, and consider the following:

- What activities currently occur at the hub?
- What are the community expectations around the future of the hub?
- What are the implications of reducing or ceasing activities at the hub? How would this affect provision of cost effective services to the local community and the state? How would this affect the material streams currently being managed or recovered at the hub? What would the cost be to the local community and the state?
- Should the hub be expanded or transition to other waste and resource recovery activities more compatible with community expectations or even to completely different land uses?
- What are the implications of expanding the hub? What are the potential economic benefits? What are the possible impacts to the community, environment and public health? Does the site have the appropriate buffers to provide long term viability?
- Is it appropriate to preserve the site in planning schemes for the long term?
- What value does the hub currently provide and what is the predicted value in the future?

Table 2.1 outlines criteria to indicate where the impact would be if activities occurring at existing hubs were to change. The criteria help determine at what level(s) to carry out the appropriate planning.

These criteria are not definitive and should be applied as a 'best fit'. An individual hub does not need to meet all criteria or functions. Hubs are discussed further in Chapter 6.1.1 from the perspective of local and regional planning to achieve an integrated statewide waste and resource recovery system.

TABLE 2.1
CASCADING CRITERIA FOR WASTE AND RESOURCE RECOVERY HUBS

Level	Criteria
State importance	› The hub manages or processes a significant proportion of one or more material streams for the state. › The type of materials managed or reprocessed at the hub are of economic value to the state's economy or pose a significant risk to economic, community, environment and public health outcomes if not recovered. › It is an existing hub with established spokes for one or more materials. It is an integral component of the supply and/or processing chain across multiple regions or the state. If the functionality of the hub was compromised, it would put pressure on the viability of upstream or downstream industries. › The hub has access to generators, markets, ports or transport infrastructure. › The hub is in a location compatible with waste management and resource recovery activities and has capacity for future waste management and resource recovery activities.
Regional importance	› The hub manages or processes a significant proportion of one or more material streams for the waste and resource recovery region or adjacent regions. › The type of materials managed or reprocessed at the site are of economic value to the region or adjacent regions or pose a significant risk to economic, community, environment and public health outcomes if not recovered. › It is an existing hub with established spokes for one or more materials. If the functionality of the site was compromised it would put pressure on the viability of upstream and downstream industries within the region. › The hub is in a location compatible with waste management and resource recovery activities and has capacity for future waste management and resource recovery activities. › The hub enables aggregation or consolidation of material streams from within the region or adjacent regions prior to transport to a regional hub for reprocessing or disposal. › The hub may facilitate some reprocessing within the region or in the close proximity.
Local importance	› The hub manages or processes a significant proportion of one or more material streams for the local community. › The hub is an integral component of the local infrastructure. If the functionality was compromised it would reduce the ability of the local community to manage its waste streams and recover resources. › The hub enables aggregation or consolidation of material streams at the local level prior to transport to a regional or state hub for reprocessing or disposal. › The type of materials managed or reprocessed at the site might be of economic value to the local community or pose a significant risk to economic, community, environment and public health outcomes if not recovered.

2.2.1 Existing hubs important to the state system

Table 2.2 lists the existing hubs by waste and resource recovery region (WRR region) that currently undertake activities or manage one or more waste or material streams significant at the state level. Hubs that are important at regional and local levels will be identified in RWRRIPs. Any impact on the functionality of these sites would make it more difficult to manage the state's waste management and resource recovery system. This list of hubs is not definitive. It reflects current activities, the location and activities within hubs will change over time. The purpose of identifying hubs is to initiate the discussions required to plan for future activities at these hubs. It does not imply that these hubs or their related activities will or should remain the same. The future role of these hubs will be determined through local planning and the development of the RWRRIPs. It will include targeted consultation with surrounding communities and the waste and resource recovery industry. Identifying these sites also informs land use and transport planning at the state level.

As previously discussed, gaining from the community the social licence to operate facilities is critical to the viability of the hub. Because the hubs identified in Table 2.2 are important to the state system each will have an individualised community engagement plan that recognises the important role of involving communities in planning decisions and this impact on the ongoing viability of a hub. This is outlined in more detail in Chapter 1.7.1 and will be an important part of the implementation of both the SWRRIP and RWRRIPs over the next five years.

TABLE 2.2
EXISTING HUBS OF STATE IMPORTANCE

WRR region and location	Why it is important to the state system
Metropolitan Melbourne	
The Brooklyn Precinct	› This precinct is a significant existing hub for metals and C&D reprocessing for the state. With well established spokes, it reprocesses around 40% of the state's metals and more than one million tonnes of C&D waste per year. › Due to its location in the metropolitan area, the closed landfill sites within the precinct offer potential sites for future suitable waste and resource recovery activities subject to meeting planning requirements and EPA approval and should be considered when planning at both the state and local level. › Pressure from residential encroachment and incompatible industrial and commercial activities need to be considered when planning future activities on this site. If the precinct is to be maintained as a hub then planning needs to preserve adequate buffer distances and ensure that the activities within the precinct are compatible and conducted in a manner that does not impact on the community, environment and public health of surrounding land users. › Community engagement is needed to determine the outcomes for this hub including potential benefits to the community of this site remaining available for resource recovery activities, and to reassure the community that activities will have minimal impact on local amenity.
Werribee Landfill, Wyndham	› This landfill is a significant residual municipal solid waste (MSW) residual waste hub currently taking around 10% of Victoria's municipal waste from the metropolitan Melbourne and regional areas. It has potential airspace for about 60 years and is located close to major transport routes. › There is high potential to expand resource recovery activities, particularly organics recovery, sharing the existing buffers at the site, subject to meeting planning requirements and EPA approval. › Land around the landfill was included within the Urban Growth Boundary, an outcome advocated by Wyndham City Council. The council have also indicated their desire to see the land around the landfill put to logistics and manufacturing use, however this is not currently reflected in the Wyndham Planning Scheme. › It is located in a growth area and pressure from residential encroachment could impact on the functionality of the site. If the site is to be maintained in the long term as a hub then planning needs to preserve adequate buffer distances and ensure that incompatible land uses are not established in proximity to the hub and that activities on the site are conducted in a manner that does not impact on the community, environment and public health of surrounding land users. › Community engagement is needed to determine the outcomes for this hub including potential benefits to the community of this site remaining available for resource recovery activities, and to reassure the community that activities will have minimal impact on local amenity.

WRR region and location	Why it is important to the state system
Deer Park Precinct TPI Landfill and Boral Quarry	› This site is the largest MSW landfill in the state and reprocesses significant tonnes of C&D materials and organics. › It is well located close to the metropolitan Melbourne area and major transport routes. › There is potential to expand all activities onsite, including organics reprocessing, using existing buffers subject to meeting planning requirements and EPA approval. › Urban encroachment and balancing community expectations in relation to the operation of the site is a future risk to the functionality of the site. If the site is to be maintained in the long term as a hub then planning needs to ensure the preservation of adequate buffer distances and that incompatible land uses are not established in proximity to the hub and activities on the site are conducted in a manner that does not impact on the community, environment and public health of surrounding land users. › Community engagement is needed to determine the outcomes for this hub including potential benefits to the community of this site remaining available for resource recovery activities, and to reassure the community that activities will have minimal impact on local amenity.
Laverton Precinct	› This precinct is a major metals reprocessing hub for the state and reprocesses significant tonnes of C&D materials. › It has well established spokes for metals and C&D and its position close to major transport routes and the Port of Melbourne makes it well located to service the metropolitan Melbourne area. › While there is some capacity for expansion, the main value to the state system is to preserve the land for appropriate resource recovery activities. The risk that residential encroachment may impact on the functionality of the site needs to be managed by ensuring that there are adequate buffers and that activities within the precinct are compatible with surrounding land uses. These activities should be conducted in a manner that does not impact on the community, environment and public health of surrounding land users. › The Truganina Employment Precinct Structure Plan was published in December 2009 and subsequently incorporated into the Wyndham Planning Scheme. It envisages that the land to the west of the Laverton precinct will be zoned principally for industrial uses, with some pockets of business zone land to the south-west of the precinct. › Community engagement is needed to determine the outcomes for this hub including potential benefits to the community of this site remaining available for resource recovery activities, and to reassure the community that activities will have minimal impact on local amenity.
Cooper Street Precinct, Epping	› This precinct is a significant organics hub accepting garden organics, mainly from the metropolitan area. It is also the only C&D hub for northern metropolitan Melbourne. › It is well located to service Melbourne, being close to major transport routes and has the capacity to expand all major activities, particularly organics. › Pressure from residential encroachment and incompatible industrial and commercial activities could impact on the functionality of this site. If it is to be maintained in the long term as a hub then planning needs to preserve adequate buffer distances and ensure that activities within the precinct are compatible and conducted in a manner that does not impact on the community, environment and public health of surrounding land users. › Community engagement is needed to determine the outcomes for this hub including potential benefits to the community of this site remaining available for resource recovery activities, and to reassure the community that activities will have minimal impact on local amenity.

WRR region and location	Why it is important to the state system
Wollert Hansen Quarry and Landfill	› This site is a major supplier of landfill airspace for MSW from metropolitan Melbourne with potential airspace for about 65 years. › It is well located on the urban fringe and close to major transport routes. › Urban encroachment is a future risk to the functionality of the site. If the site is to be maintained as a hub in the long term, any planning needs to preserve adequate buffer distances and ensure that activities within the precinct are compatible and conducted in a manner that does not impact on the community, environment and public health of surrounding land users. › The Metropolitan Planning Authority and Whittlesea City Council have prepared Whittlesea Planning Scheme Amendment C187, that deals with the development of land adjoining the Wollert Hansen Quarry and Landfill. It will incorporate the Wollert Precinct Structure Plan (April 2015) into the Planning Scheme and will be on exhibition through May 2015 with a planning panel to hear submissions in August 2015. The plan will set out how a large area of land adjoining the quarry and landfill to the west will be developed. › Future planning should also consider co-location on the site of compatible activities including waste and resource recovery activities that can share buffers and access routes.
Kingston/Clayton/ Dingley Precinct	› This precinct has a long history associated with waste and resource recovery and has been a significant hub for the surrounding area for organics, landfill and C&D processing. Part of the hub is located in the South East Green Wedge and part of it is zoned industrial. › Its location and access to transport networks has made it strategically important to the statewide waste and resource recovery system. › The landfills within the hub are anticipated to close within seven years, with putrescible waste landfills anticipated to close within three to five years. As a result the waste streams currently managed at the hub will require alternative management options. The strategic location of the existing industrially zoned land, combined with other suitably zoned and buffered land in the area, provide an ongoing opportunity to use part of the existing hub for support services, including sorting and consolidation infrastructure for these streams prior to transport for reprocessing or landfill. This could also generate the opportunity to develop complementary reprocessing activities that increase diversion of material streams from landfills, and provide local job opportunities, recovery options, increased provision of services to the surrounding area, and generate economic value from recoverable resources. Future activities would be subject to meeting planning requirements and local government and EPA approval. › The Kingston City Council adopted the *Kingston Green Wedge Plan* in 2012. The position of the council is that no part of the hub should exist in the green wedge. In July 2014, a supporting resolution was passed by the council to give effect to this outcome and sent to the former Planning Minister, Matthew Guy, for consideration to pursue the *Kingston Planning Scheme Amendment C143*. Exhibition of the amendment occurred in September and October 2014, following which the amendment went to a planning panel to hear submissions in March 2015. At the time of writing the amendment is under consideration. › Pressure from surrounding residential activities and community expectations must be considered when planning future activities on the industrial zoned land. Planning needs to preserve adequate buffers and prevent the establishment of incompatible land uses that could impact on the functionality of the site. › If the industrial zoned land in the Kingston/Clayton/Dingley Precinct is to be maintained as a hub then any activities established or maintained on or close to the precinct would need to demonstrate best practice operations and be conducted in a manner that reduces and manages impacts on the community, environment and public health of the surrounding area. › Community engagement is needed to determine the outcomes for this hub including potential benefits to the community of the industrially zoned land remaining available for resource recovery activities, and to reassure the community that activities will have minimal impact on local amenity.

WRR region and location	Why it is important to the state system
Hallam Road, Hampton Park	› This site is a major hub for C&I and C&D reprocessing and for residual MSW from metropolitan Melbourne and regional areas. › It is well located close to major transport hubs and potential markets. › Pressure from residential encroachment and incompatible industrial and commercial activities could affect the functionality of this site. If the site is to be maintained as a hub in the long term, any planning needs to preserve adequate buffer distances and ensure that incompatible land uses are not established in proximity to the hub and that activities within the precinct are conducted in a manner that does not impact on the community, environment and public health of surrounding land users. › Community engagement is needed to determine the outcomes for this hub including potential benefits to the community of this site remaining available for resource recovery activities, and to reassure the community that activities will have minimal impact on local amenity.
Lyndhurst Landfill, Taylors Road, Lyndhurst	› The site is the only remaining landfill for prescribed industrial waste (PIW) in metropolitan Melbourne. PIW is outside the scope of the SWRRIP but this site is listed as it is critical to managing these wastes and contaminated soils and is listed in the Metropolitan Landfill Schedule 2009. › As the site is already involved in waste management activities, there is an opportunity to co-locate additional compatible resource recovery activities on the site that can share buffers, subject to meeting planning requirements and EPA approval. › If this site is to be maintained in the long term as a hub then planning needs to ensure the preservation of adequate buffer distances and that the activities within the precinct are compatible and conducted in a manner that does not impact on the community, environment and public health of surrounding land users. › Community engagement is needed to determine the outcomes for this hub including potential benefits to the community of this site remaining available for resource recovery activities, and to reassure the community that activities will have minimal impact on local amenity.
Ordish Road Precinct, South Dandenong	› This is a major hub for organics, C&D reprocessing and commingled C&I recovery activities. › It has well established spokes and is well located with compatible activities. › Pressure from residential encroachment and incompatible industrial and commercial activities could impact on the functionality of this site. If this site is to be maintained in the long term as a hub then planning needs to ensure the preservation of adequate buffer distances and that the activities within the precinct are compatible and conducted in a manner that does not impact on the community, environment and public health of surrounding land users. › Community engagement is needed to determine the outcomes for this hub including potential benefits to the community of this site remaining available for resource recovery activities, and to reassure the community that activities will have minimal impact on local amenity.
Owens Illinois, Spotswood	› This facility is the only reprocessor of recovered glass into new container glass in Victoria. It currently takes mixed sorted coloured glass from across the state and performs some beneficiation activities. If it was no longer able to take this material, there may be no other viable alternative other than to export interstate.
SKM Materials Recovery Facility (MRF), Coolaroo	› This facility is the largest MRF in Victoria, accepting commingled recyclable streams from metropolitan and regional areas.
Veolia Organics Facility, Bulla	› This is a major organics reprocessing hub accepting MSW mixed organics from 11 local governments in the north west area of metropolitan Melbourne. It is the largest in-vessel composting facility in the state. › If this site is to be maintained in the long term as a hub then planning needs to ensure the preservation of adequate buffer distances, that incompatible uses are not established in proximity to the hub and that the activities within the precinct are compatible and conducted in a manner that does not impact on the community, environment and public health of surrounding land users.

WRR region and location	Why it is important to the state system
Citywide Resource Recovery Centre, Footscray	› This is a major consolidation point for the inner metropolitan area handling significant tonnes of mainly C&I and C&D materials.
Barwon South West	
Corangamite Landfill, Naroghid	› This landfill accepts both MSW and solid industrial waste (SIW) from outside the Barwon South West waste and resource recovery (WRR) region. › If this site is to be maintained in the long term as a hub then planning needs to ensure the preservation of adequate buffer distances and that the activities within the precinct are compatible and conducted in a manner that does not impact on the community, environment and public health of surrounding land users.
Gippsland	
Gippsland Water's Soil and Organics Recycling Facility, Dutson Downs	› This facility is a major organics reprocessing hub and accepts garden organics from the Metropolitan WRR region and the surrounding regions. Its composting processes use a range of other organic waste streams including biosolids, food waste, petroleum hydrocarbon, animal fats and some liquid PIW. › It is well located in terms of distance from sensitive land uses and unlikely to be threatened by residential encroachment.
Goulburn Valley	
Western Composting, Shepparton	› This is a hub for organics processing and accepts garden organics for in-vessel composting from the surrounding regions. It is co-located with compatible activities and has effective buffers to increase organics processing activities. › If this site is to be maintained in the long term as a hub then planning needs to ensure the preservation of adequate buffer distances, that incompatible uses are not established in proximity to the hub and that the activities within the precinct are compatible and conducted in a manner that does not impact on the community, environment and public health of surrounding land users.
Ellwaste Patho Landfill, Echuca	› This landfill services a number of local government areas and cross regional flows from the Grampians Central West and Loddon Mallee WRR regions. It could potentially accept more MSW and SIW streams.
Cosgrove Landfill, Shepparton	› This landfill serves a large population centre and a significant food processing sector that operates in the greater Shepparton region. It also accepts C&I waste from surrounding areas including Benalla.

WRR region and location	Why it is important to the state system
Grampians Central West	
Statewide Landfill, Stawell	› This landfill accepts significant quantities of SIW from outside the region. › Functionality should be managed by preserving adequate buffers and planning that ensures the establishment of compatible activities conducted in a manner that does not impact on the community, environment and public health of surrounding area.
Maddingley Brown Coal Landfill, Bacchus Marsh	› This site accepts significant amounts of SIW from the Metropolitan WRR region. › It is the only landfill currently accepting shredder flock. If it ceased to accept shredder flock it would severely affect reprocessing of end-of-life cars and whitegoods. › Functionality should be managed by preserving adequate buffers and planning that ensures the establishment of compatible activities conducted in a manner that does not impact on the community, environment and public health of surrounding land users.
Loddon Mallee	
Eaglehawk Landfill, Bendigo	› The Allstone Quarry is a major hub for C&D reprocessing. › The Eaglehawk Landfill on the site is expected to run out of airspace in 2021 and will be closed. This provides an opportunity to transition the landfill space to additional resource recovery activities, particularly those related to consolidating, sorting and transferring material streams. Planning needs to preserve adequate buffers and prevent the establishment of incompatible land uses that could impact on the functionality of the site. › If this site is to be maintained in the long term as a hub then planning needs to ensure the preservation of adequate buffer distances, that incompatible uses are not established in proximity to the hub, and that the activities within the precinct are compatible and conducted in a manner that does not impact on the the community, environment and public health of surrounding land users. › Significant community engagement is needed to demonstrate and explain the benefits to the community of this site remaining available for resource recovery activities, and reassurance that activities will have minimal impact on local amenity.
Mildura Landfill, Mildura	› This landfill services the Mildura area. › If this landfill closed or reduced functionality, there would be limited alternatives, due to the cost of transporting wastes to other regional landfills in Victoria. The only viable alternative would most likely be to transport wastes interstate.

2.3 Opportunities to increase recovery of material streams

Increasing the amount of resources recovered from individual material streams requires market demand for products made from the recovered materials. Without this demand, and sustainable markets, recovery industries are not viable. Developing this demand relies on demand from consumers for goods, services and products made from recovered materials. SV is currently developing the *Victorian Market Development Strategy for Recovered Resources* to provide a framework to support the right conditions for strong, competitive resource recovery markets for the goods and services made from recovered materials. The expected completion date for the strategy is late 2015. Any gaps in infrastructure required to support market development identified in the strategy will be incorporated into future iterations of the SWRRIP.

The SWRRIP analysis looked at the major material streams to identify potential opportunities to increase recovery. This analysis is summarised in Table 2.3 and discussed in more detail in Chapter 5.

TABLE 2.3
POTENTIAL OPPORTUNITIES FOR RESOURCE RECOVERY IDENTIFIED IN THE SWRRIP

Material stream	Potential opportunity
Organics	
In 2011–12 approximately 2,439,000 tonnes of organic waste were generated in Victoria. About 1,461,000 tonnes ended up in landfill representing an estimated loss to the economy of $30 million dollars per year. Approximately 929,000 tonnes of what was generated was food waste of which only about 31,000 tonnes were recovered for reprocessing with the remaining 898,000 tonnes sent to landfill. Approximately 760,000 tonnes was garden organics of which 500,000 tonnes were recovered for reprocessing and approximately 260,000 tonnes sent to landfill.	Use food waste streams with low levels of contamination, particularly from commercial sources, as base loads to produce energy, refuse derived fuels and other related products.
	Recover the organic component in residual waste. In the short term (next five years) recovery opportunities are likely to be realised through a combination of: › developing processes to treat the residual waste stream using a mechanical biological process that recovers energy before disposal of the residue to landfill › sending the residual waste stream to landfills with best practice gas capture and energy recovery.
	Use of food waste to supplement anaerobic digestion of sewage at wastewater treatment plants to produce energy. This is an opportunity likely to eventuate in the next five years. Studies are required to determine viability, logistics, potential contamination issues, use of the digestate and the amount of food waste that could be successfully recovered in this way.
Wood and timber	
In 2011–12 about 415,000 tonnes of timber waste were generated and about 112,000 tonnes recovered for reprocessing. The remaining 303,000 tonnes were sent to landfill.	Increase the capture and recovery of wood and timber from the C&D and C&I sectors by improving source separation, collection service provision and sorting infrastructure.
	Increase recovery of untreated timber for shredding and processing into briquettes, pellets or dry woodchips for use as a fuel for domestic heating and industrial processes.
Paper, cardboard, glass and plastics (commingled streams)	
Paper and cardboard	
In 2011–12 about 2,143,000 tonnes of paper and cardboard waste were generated and about 1,665,000 tonnes recovered for reprocessing. The remaining 478,000 tonnes were sent to landfill.	Improve ability to separate from the commingled recyclable streams by improving the capacity of sorting infrastructure at MRFs.
	Build capacity of MRFs to separate C&I sector streams.
	Reduce contamination through education of generators and providing signage and bins.

Material stream	Potential opportunity
Glass	
In 2011–12 about 276,000 tonnes of glass waste were generated and about 195,000 tonnes recovered for reprocessing. The remaining 81,000 tonnes were sent to landfill.	Investment by reprocessors in new colour sorting technologies that can sort down to smaller sizes and reduce the generation of fines. Agree on specifications with container glass manufacturers and invest in required infrastructure so that fines and glass sand can be used as feedstock for manufacturing new glass. Expand markets for the use of glass sand products including for asphalt production, concrete, and trench embedment — these have potential to create opportunities for regional glass reprocessing hubs.
Plastics	
In 2011–12 about 570,000 tonnes of plastic waste (of all codes) were generated and about 149,000 tonnes recovered for reprocessing. The remaining 421,000 tonnes were sent to landfill. An estimated 150,000 to 200,000[7] tonnes of shredder flock is generated each year and is a significant proportion of the waste going to landfill from the C&I sector.	Invest in infrastructure to collect, sort and reprocess plastics to significantly increase recovery of a range of plastics including: › film plastics used for consumer packaging › rigid plastics used in the C&D sector (which can be recovered during renovation, refurbishment and demolition of residential and commercial buildings) › film plastics used in the logistics sector.
	The residual shredded material (shredder flock) from the end of life reprocessing of cars and whitegoods is largely composed of mixed plastics. There is a potentially viable opportunity to recover energy but requires further investigation by industry into the tonnes and infrastructure required for an economically viable business case.
Tyres and rubber	
Research suggests that significant tonnes of tyre rubber are not being reprocessed each year in Victoria.[8]	Tyre rubber represents a potential opportunity for recovery. Additional research is required to develop viable options but is likely in the short term to include use in road base.
Concrete, brick and asphalt	
In 2011–12 about 4,415,000 tonnes of concrete, bricks and asphalt waste generated and about 3,502,000 tonnes recovered for reprocessing. The remaining 913,000 tonnes were sent to landfill.	Increase access to reprocessing infrastructure in regional Victoria including the Latrobe Valley, Ballarat, the Goulburn Valley and south west Victoria.
Residual waste	
In 2011–12 around 4,162,000 tonnes of residual waste were sent to landfill.	Reducing the amount of residual waste requires a multi-pronged approach including: › improving source separation at all levels including households and businesses to reduce contamination › improving the sorting capabilities of transfer stations, resource recovery centres, material recovery facilities and at landfill sites prior to disposal › investing in resource recovery technologies.
	Opportunities to pre-treat residual waste streams to recover energy and heat prior to disposal to landfill are of interest but require further research into suitable technologies and long term viability.

9 Sustainability Victoria, *Emerging Market Analysis*, prepared by Hyder Consulting, Melbourne, May 2014.
10 Sustainability Victoria, *An Options Framework for End of Life Tyres*, prepared by PricewaterhouseCoopers, June 2013.

2.4 Economic and transport impacts

The SWRRIP strategic directions were developed to guide decisions making by organisations that plan for, invest in and operate Victoria's waste and resource recovery system. The directions recognise that these decisions will ultimately lead to achieving an integrated waste and resource recovery system that maximises the economic value of waste while minimising the community, environment and public health impacts of our waste streams.

The *Environment Protection Act 1970* requires SV to undertake a strategic economic assessment of the options for waste and resource recovery and an analysis of the transport impacts arising from the movement of waste and materials.

SV has analysed the high level economic assessment and transport impacts of the SWRRIP. The initial findings will be used to inform more comprehensive research along with regional considerations that will be identified through developing the RWRRIPs. SV will incorporate the findings of this research into the SWRRIP as part of the SWRRIP/RWRRIP alignment process.

2.4.1 Economic assessment

The high level assessment developed a scenario where in 30 years an additional 1,500,000 tonnes of materials were being diverted from landfill for recovery each year. These additional tonnes are over and above what would occur under a business as usual approach that maintains current trends of generation, recovery and landfill. It assumes that implementation of the SWRRIP will require investment in additional infrastructure to increase Victoria's capacity to recover the additional material streams.

The estimate from this analysis indicates that a capital investment of between $550 and $810 million in 2014 in resource recovery infrastructure could be required over the next 30 years. This is over and above the investment required to maintain business as usual. This could potentially lead to around 830 new jobs over the next 30 years.

This assessment does not represent a full economic assessment of the SWRRIP, or a cost benefit analysis of waste and resource recovery options for Victoria and the results should be considered as indicative only.

For more information about the economic assessment including assumptions, methodology and findings download the document at **www.sustainability.vic.gov.au/SWRRIP**

2.4.2 Transport impacts from the movement of waste and material streams

SV with support from the former Victorian Government Department of Transport Planning and Local Infrastructure, analysed congestion impacts from the movement of residual waste, commingled recyclables and garden organics collected via municipal kerbside services to their first destination points. The data was gathered directly from local governments via surveys.

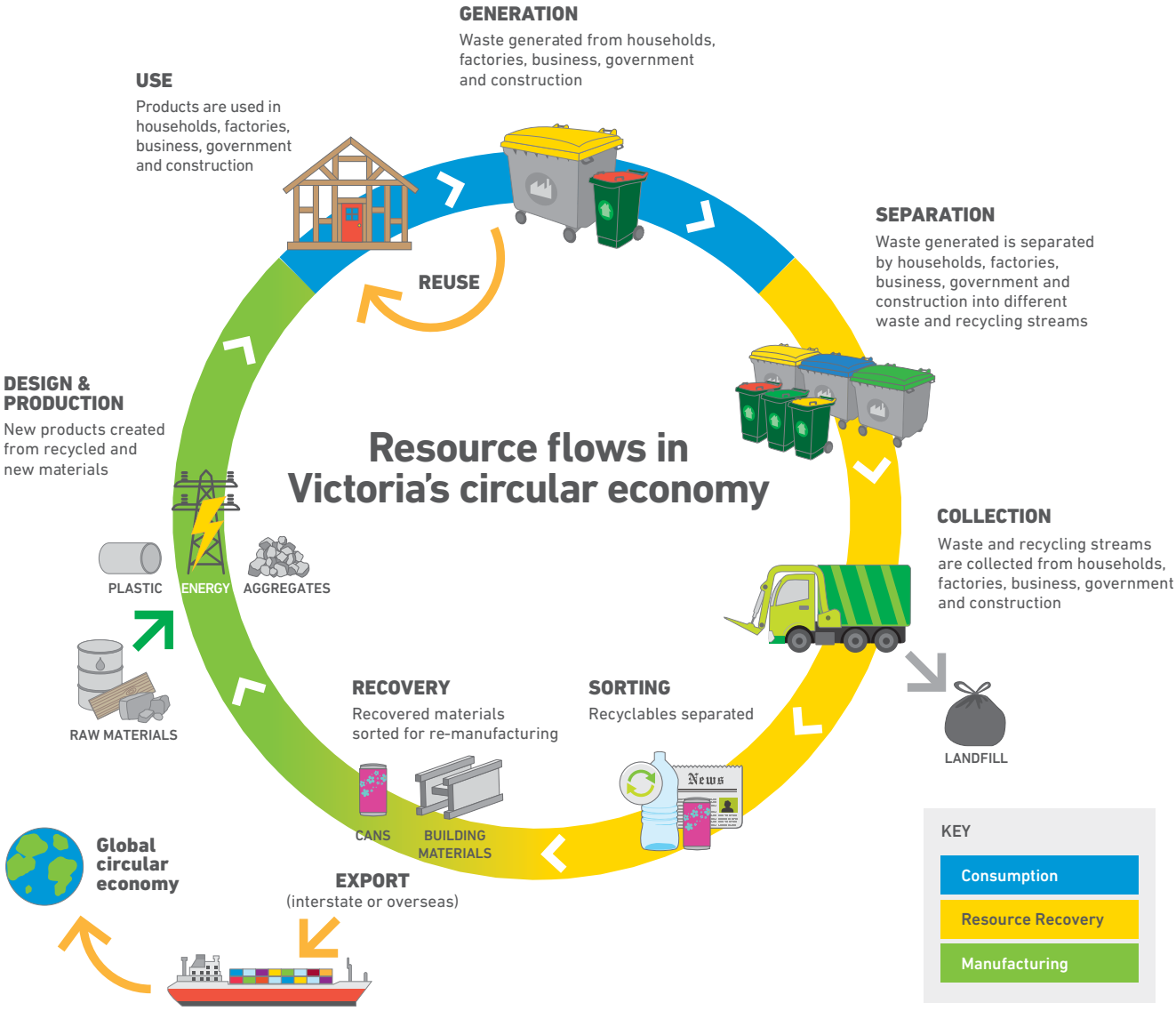
This analysis indicates that the cost to the Victorian economy of increased congestion caused by the movement of these streams is around $2.5 million annually. This cost takes into consideration the cost to other road users for their lost time while in traffic and the cost of operating vehicles for a longer period of time due to traffic congestion. When viewed in consideration of all other vehicles on the road in Victoria, this constitutes less than 0.2% of the overall congestion costs in Victoria and less than 0.005% of the total distance travelled by freight vehicles in Victoria each year.

This analysis will be used to inform a more comprehensive analysis including developing the methodology to capture additional impacts to congestion and movements of other waste streams besides MSW. At the time of publishing this document, the data available on movement of wastes was not sufficiently comprehensive or robust to analyse all material streams. Data was available on the movement of materials collected via kerbside services to their first destination point, usually to a transfer station, resource recovery facility or landfill as these movements are managed through local government contracts. However, data on materials collected from the C&I and C&D sectors is limited. These are generally managed through contracts directly between generators and service providers and the data is not available to SV.

3. Materials managed by the waste and resource recovery system

Victoria's waste and resource recovery system managed over 12,176,000 tonnes of material in 2011–12 at over 500 sites. These include small facilities accepting individual waste streams, complex reprocessors providing goods and materials made from recovered materials and best practice landfills servicing large areas of the state. Figure 3.1 shows the activities undertaken as part of the waste and resource recovery system.

FIGURE 3.1
WASTE AND RESOURCE RECOVERY SYSTEM ACTIVITIES



3.1 Data considerations

The main sources of data in this chapter are the *Victorian Local Government Annual Survey* (VLGAS), the *Victorian Recycling Industries Annual Survey* (VRIAS) and landfill levy receipt data.

The following data considerations are relevant to this chapter:

- Tonnes landfilled are derived from landfill levy data supplied by EPA and do not include prescribed industrial waste (PIW). There has been no allowance for daily cover which must be considered when comparing figures with those in earlier drafts of the Statewide Resource Recovery Infrastructure Plan (SWRRIP). Previously landfill figures were adjusted to remove a 15% allowance for daily cover.
- Sustainability Victoria (SV) used modelling to estimate generation tonnages using the sum of the state landfill tonnes and state tonnes reprocessed using VRIAS data. Because this modelling uses landfill data, generation tonnages will differ from those in previous drafts of the SWRRIP due to no allowance being made for daily cover.
- The recovered tonnes, unless stated, refer to tonnes of materials entering reprocessing facilities. This is not a direct correlation to how much was reprocessed as there is no data on tonnes stockpiled by reprocessors or tonnes landfilled by reprocessors. For this reason, quantities are referred to as *recovered*, rather than *reprocessed*.
- SV collected much of the data from industry sources and cannot provide a breakdown by waste and resource recovery region (WRR region). SV used modelling to estimate regional tonnes using a combination of state totals, landfill audit compositions and Australian Bureau of Statistics population figures. Accuracy of information and data depends on the source. SV verified information and data where possible, but all data should be considered as indicative only and provided as a guide or estimate of true values, unless otherwise stated.
- Most data is rounded for ease of reading. This may result in minor discrepancies between totals and line items. Graphs, charts and modelling were generated using non-rounded data. Any exceptions are referenced.

Further information on the data sources can be found in Chapter 8.2.

3.2 Material streams and tonnes

3.2.1 Main material streams

Based on modelled data, Victoria generated an estimated 12,176,000 tonnes of waste in 2011–12, of which around 8,014,000 tonnes were recovered (66% by weight) and around 4,162,000 tonnes were sent to landfill.

To increase resource recovery it is necessary to understand the tonnages of individual materials streams being generated, many of which are generated by more than one sector. This will inform planning to aggregate material streams to attain the economies of scale needed to support investment in viable reprocessing facilities.

Table 3.1 describes the main material streams generated, recovered and landfilled in Victoria in 2011–12.

3.2.2 Residual waste

Residual waste is the material that remains after everything that can be viably recovered has been extracted. It is the volume of material that goes to landfill. It contains a mix of material streams and some if not managed properly, pose a risk to the community, environment, and public health. This adds to complexity (and cost) of management protocols required to ensure that the community and environment are protected for the long term.

There are also a lot of valuable resources tied up in the residual waste stream. Extraction of these resources may not currently be economically viable for a number of reasons, including the complex nature of the waste stream making separation of individual materials problematic.

Opportunities to achieve the best residual waste management outcomes, meet service requirements and support increased resource recovery may include:

- Develop the capacity of landfill owners, particularly regional local governments, to evaluate future options for waste management services for their communities that meet community expectations, maximise return on investment and improve community, environment and public health outcomes. This includes fully understanding the financial, economic, environment and social costs of construction, operation, maintenance and rehabilitation of landfills to meet best practice environmental management. Identifying more cost effective options to manage residual waste could result in the closure of some smaller landfills.
- Increase capacity to pre-sort and screen materials at landfill sites to maximise diversion of materials with economic value or of high risk. This includes developing resource recovery and transfer infrastructure to support consolidation of material streams prior to transporting to regional processing centres. In some situations localised reprocessing may be viable onsite or closely located.
- Transition suitably located sites with landfills exempt from licensing and landfills scheduled for closure over the next 10 years to best practice resource recovery and consolidation activities where it is economically viable and better community, environment and public health outcomes can be demonstrated.

TABLE 3.1
MAIN MATERIALS GENERATED, RECOVERED AND LANDFILLED IN 2011–12 (TONNES)

Materials		Generated[a]	Recovered	Landfilled	Materials recovered (%)
Organics	Food waste	929,000	31,000	898,000	3
	Garden waste	760,000	500,000	260,000	66
	Wood/timber	415,000	112,000	303,000	27
	Other organics[b]	335,000	335,000	<1,000	n/a
Commingled recyclables	Paper/cardboard	2,143,000	1,665,000	478,000	78
	Glass	276,000	195,000	81,000	71
	Plastics	570,000	149,000	421,000	26
Tyres and rubber[c]		55,000	49,000	6,000	89
Metals		1,540,000	1,470,000	70,000	95
Concrete/bricks/asphalt		4,415,000	3,502,000	913,000	79
Textiles		160,000	5,000	155,000	3
Other		576,000	0	576,000	n/a
Totals		**12,176,000**	**8,014,000**	**4,162,000**	**66**

a Modelled data.

b Includes agricultural waste, sawdust, bark and woodchips.

c Data for tyre and rubber streams is incomplete and should not be considered as a true representation of the current state for this material stream (see Chapter 5.3.3).

Source: Sustainability Victoria, *Victorian Local Government Annual Survey,* 2011–12.

3.2.3 State trends

Figure 3.2 shows the trends in the tonnes of materials generated, recovered and landfilled since 2003–04. It shows that resource recovery rates have grown steadily in the past nine years. This is due to strong markets for some material streams.

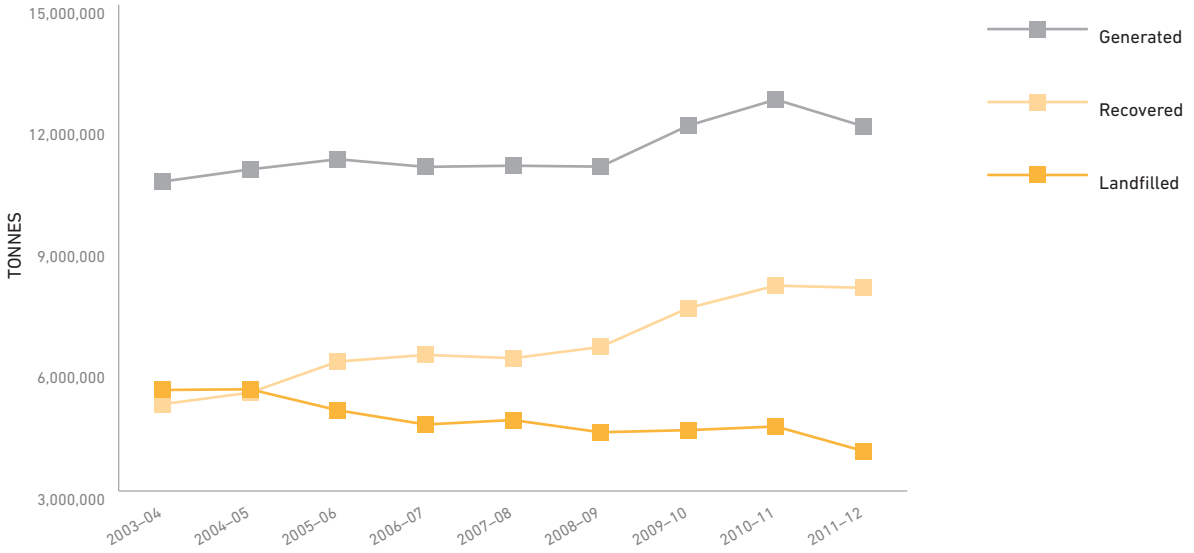
In 2011–12, the amount of waste generated decreased by around 321,000 tonnes (3%) compared to 2010–11. We have not yet analysed why this occurred but it is likely to reflect a decrease of around 622,000 tonnes (13%) in material sourced from the construction and demolition (C&D) sector generated over the same period. It is unclear if this trend will continue.

3.2.4 Future projections

Past trends and population predictions are used to project the tonnes of materials that will need to be managed over the next 30 years. The lack of detailed data and the assumptions underpinning the modelling, give indicative outputs and a general idea of the expected tonnes, rather than a prediction of actual tonnages. Further details on the modelling can be found in Chapter 8.2.

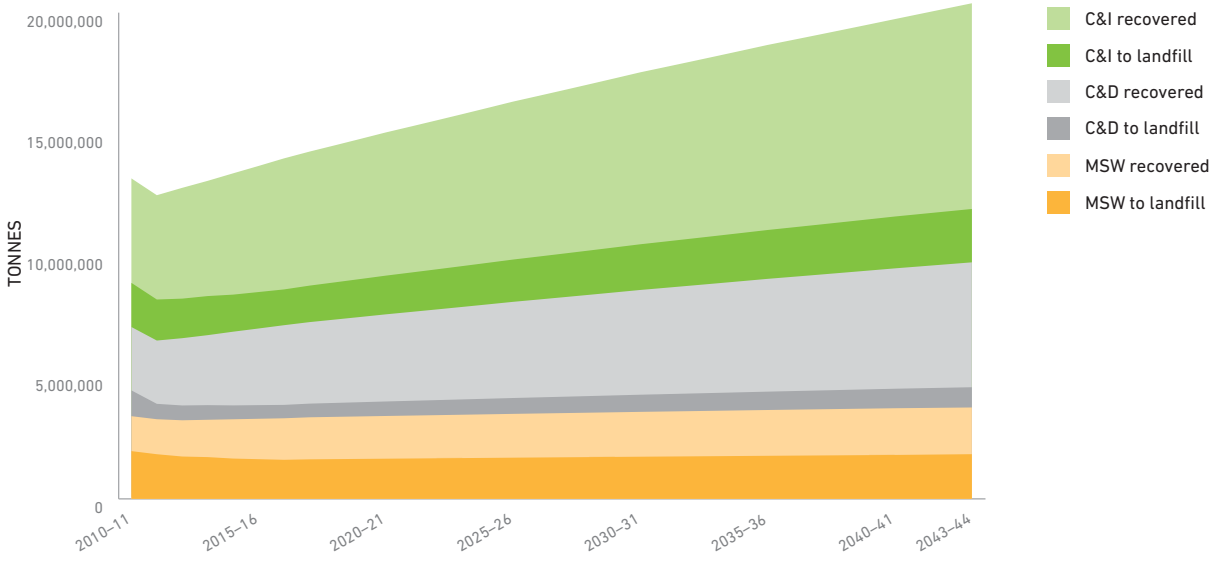
Figure 3.3 shows projected generation of sector streams expected over the next 30 years under a business as usual scenario where the recovery rate of the last 10 years is maintained. The SWRRIP strategic directions aim to increase the recovery rate over and above this.

FIGURE 3.2
TRENDS FOR MATERIALS RECOVERED, LANDFILLED AND WASTE GENERATED PER YEAR FROM 2003–04 TO 2011–12 (TONNES)



Source: Sustainability Victoria, *Victorian Recycling Industries Annual Survey*, 2011–12.

FIGURE 3.3
PROJECTED WASTE RECOVERED AND LANDFILLED, BUSINESS AS USUAL SCENARIO, FROM 2010–11 TO 2043–44 (TONNES)



Source: Sustainability Victoria, *Waste and Resource Recovery Projection Model*, v1.1, 2013.

3.3 Main generating sectors

Historically, we have collected waste and resource recovery data based on the sector generating the waste, as shown in Table 3.2. It will take time to change data collection methods to focus on and gather data that provides more information on individual material streams.

Table 3.3 shows the tonnages of materials generated by each of the major sectors in 2011–12. By weight the C&D sector generates the most, reflecting the heavy nature of many of their waste streams such as concrete, bricks and asphalt.

TABLE 3.2
MAIN WASTE GENERATING SECTORS

Sector		Waste generated by...
Municipal solid waste (MSW)		Households, including hard waste, recyclables, organics and residual waste (also known as garbage). Local government activities, such as emptying litter bins, sweeping streets and maintaining parks, as well as municipal C&D work.
Solid industrial waste (SIW)	Commercial and industrial (C&I)	Food, beverage and tobacco enterprises, food retailers, accommodation providers, cafes and restaurants, property and business service enterprises, public sector agencies, education institutions, manufacturers and industry.
	Construction and demolition (C&D)	Residential, civil and commercial C&D enterprises.

TABLE 3.3
WASTE GENERATED BY SECTOR AND MATERIAL TYPE IN 2011–12 (TONNES)

Materials		MSW	C&I	C&D	Totals
Organics	Food waste	646,000	282,000	<1,000	929,000
	Garden waste	589,000	143,000	27,000	760,000
	Wood/timber	25,000	268,000	122,000	415,000
	Other organics[a]	70,000	265,000	<1,000	335,000
Commingled recyclables	Paper/cardboard	666,000	1,470,000	7,000	2,143,000
	Glass	187,000	89,000	<1,000	276,000
	Plastics	233,000	317,000	20,000	570,000
Tyres and rubber[b]		1,000	53,000	<1,000	54,000
Metals		249,000	1,116,000	175,000	1,540,000
Concrete/bricks/asphalt		105,000	235,000	4,075,000	4,415,000
Textiles		52,000	97,000	12,000	160,000
Other		495,000	74,000	6,000	576,000
Totals		**3,321,000**	**4,408,000**	**4,447,000**	**12,176,000**

a Includes agricultural waste, sawdust, bark and woodchips.

b Data for tyre and rubber streams is incomplete and should not be considered as a true representation of the current state for this material stream (see Chapter 5.3.3).

Note: All generated data is modelled.

Source: Sustainability Victoria, *Victorian Local Government Annual Survey 2011–12*.

3.3.1 Municipal solid waste

How it enters the system

Most household waste materials enter the system through services provided by local governments. Many local governments contract these services out to third party service providers. Local governments provide data annually to SV for inclusion in the VLGAS, making it fairly robust.

The most common services include kerbside collections for residual waste, commingled recyclables, garden organics, hard waste collections and drop-off facilities at resource recovery centres and transfer stations (RRC/TSs). Materials collected via kerbside collection systems can be consolidated at RRC/TSs prior to transport to the appropriate materials recovery facility (MRF), reprocessor or landfill.

In regional areas, materials dropped off and collected at RRC/TSs play a large role in supplementing kerbside collection systems particularly for garden organics. According to VLGAS data in 2011–12, 17% of municipal streams enter the system through RRC/TSs and drop-off facilities in regional areas compared to 6% in metropolitan Melbourne. Materials collected at drop-off centres vary with each facility ranging from specific material streams and e-waste to commingled recyclables, organics and residual waste.

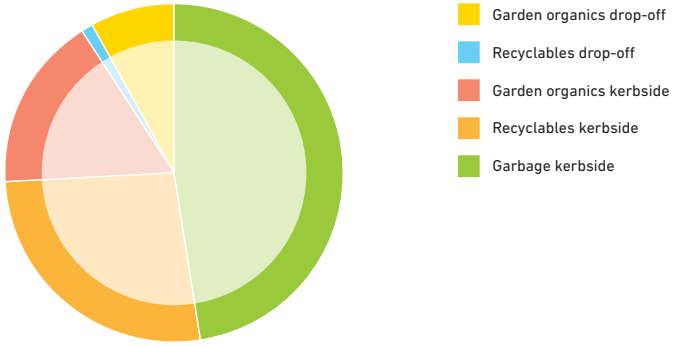
Materials from RRC/TSs, drop-off facilities and MRFs that cannot be reprocessed economically go to landfill. Because of the organic component in the residual waste stream, MSW must go to landfills that accept putrescible waste. Figure 3.4 shows the composition of MSW by collection service.

Tonnes and material types

Table 3.4 shows the tonnages of MSW waste materials generated, recovered, and landfilled in 2011–12. It shows that of the 3,321,000 tonnes generated, 1,527,000 tonnes (46%) was recovered with the remaining 1,795,000 tonnes sent to landfill.

While the vast majority of materials are generated in metropolitan Melbourne and larger urban centres the composition is fairly consistent across the state.

FIGURE 3.4
COMPOSITION OF MSW BY COLLECTION SERVICE IN 2011–12



Source: Sustainability Victoria, *Victorian Local Government Annual Survey 2011–12*.

TABLE 3.4
MSW GENERATED, RECOVERED AND LANDFILLED BY MATERIAL STREAM IN 2011–12 (TONNES)

Materials		Generated[a]	Recovered	Landfilled
Organics	Food waste	646,000	<1000	646,000
	Garden organics	590,000	457,000	133,000
	Wood/timber	25,000	20,000	5,000
	Other organics[b]	70,000	70,000	<1,000
Commingled recyclables	Paper/cardboard	666,000	471,000	196,000
	Glass	187,000	136,000	51,000
	Plastics	233,000	66,000	167,000
Tyres and rubber[c]		1,000	1,000	0
Metals		249,000	218,000	31,000
Concrete/bricks/asphalt		105,000	83,000	23,000
Textiles		52,000	4,000	48,000
Other		495,000	<1,000	495,000
Totals		**3,321,000**	**1,527,000**	**1,795,000**

a Modelled data.

b Includes agricultural waste, sawdust, bark and woodchips.

c Data for tyre and rubber streams is incomplete and should not be considered as a true representation of the current state for this material stream (see Chapter 5.3.3).

Source: Sustainability Victoria, *Victorian Local Government Annual Survey 2011–12*.

Table 3.5 shows the main items recovered from MSW. In 2011–12 the largest single stream of material recovered from MSW was garden organics, representing 47% of the total materials recovered through these services.

Over 80% of the commingled recyclables collected through kerbside systems across the state are managed at MRFs in the Metropolitan WRR region. In 2011–12, they received an estimated 437,000 tonnes from metropolitan local governments and 182,000 tonnes from regional local governments.

Trends

Figure 3.5 shows the trends for MSW generated, recovered and landfilled since 2002–03. It also projects the likely trends based on past patterns for the next 30 years. These projections are based on predicted trends in kerbside collection amounts as this is the largest component of MSW and there is good data available.

Due to expected population growth, we are unlikely to see a decrease in the short term in the amount of MSW generated. However, increases in the recovery rate should see a change in the ratio of materials recovered to materials landfilled.

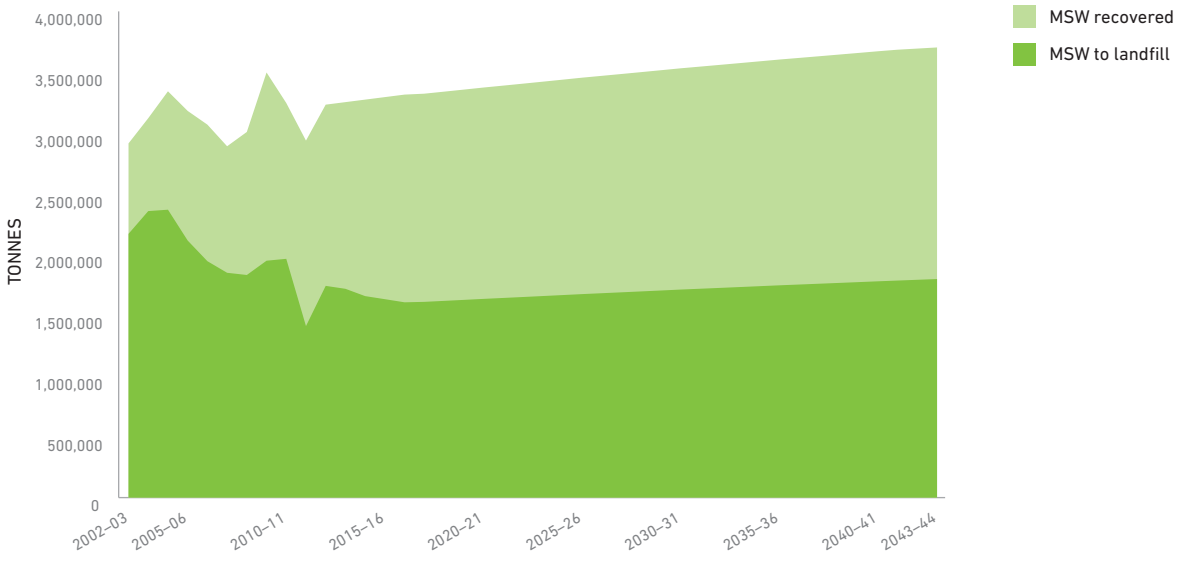
TABLE 3.5
MSW RECOVERED BY ITEM AND COLLECTION SERVICE IN 2011–12 (TONNES)

Main materials recovered	Kerbside	Drop-off	Totals
Plastic containers	50,000	1,000	51,000
Paper	390,000	13,000	403,000
Glass containers	159,000	3,000	162,000
Steel cans	14,000	3,000	17,000
Aluminium cans	7,000	0	7,000
Garden organics	397,000	180,000	577,000
Totals	**1,016,000**	**200,000**	**1,216,000**

Note: The data is incomplete as it does not include materials recovered from RRC/TS residual waste, local government operations and hard waste collections. This accounts for the difference in the total amounts recovered in Table 3.4

Source: Sustainability Victoria, *Victorian Local Government Annual Survey 2011–12*.

FIGURE 3.5
PAST TRENDS AND FUTURE PROJECTIONS OF MSW GENERATED, RECOVERED AND LANDFILLED FROM 2002–03 TO 2043–44 (TONNES)



Note:

Actual tonnage used for 2002–03 to 2011–12. Tonnes post 2011–12 represent projections based on past trends.

The amount generated is the sum of the amounts landfilled and recovered.

Source: Sustainability Victoria, *Victorian Waste and Resource Recovery Projection Model*, v1.1, 2013.

Driving increased recovery

The fact that most MSW is managed by local government contracts allows councils to play a major role in increasing resource recovery and providing better service delivery to their ratepayers. There are several ways to drive increased recovery:

- Local governments can partner with other councils to consolidate and amalgamate their individual material streams and work with their waste and resource recovery groups (WRRGs) to jointly procure services. Greater amounts of some material streams provide service providers with more surety of supply for a given time period on which to base their business model. Councils would need to consider existing long term contracts and managing lead times.
- Local governments work with their communities, neighbouring local governments and WRRGs to determine local and regional priorities and desired outcomes from waste and resource recovery service provision. Priorities could include levels of service, community expectations, using innovative recovery techniques, ensuring end destinations comply with best practice management protocols and local job creation. This allows industry to respond to the desired outcomes when tendering for services and develop options that are both commercially viable and meet local government requirements.
- Local governments can work with householders and businesses to improve source separation to reduce contamination in the commingled and organics bins and reduce the amount of recyclable materials in the residual waste bin.

Recovering more food waste would reduce the quantity of waste going to landfill. Research shows that around 36% of the contents of household residual waste bins in Victoria is food waste.[11] This represents lost value to the householder who has paid for underused food and who ultimately may pay higher rates due to management costs at landfill being passed back to the householder. The *Victorian Organics Resource Recovery Strategy* discussed in Chapter 5 will explore opportunities to recover more food waste.

Increasing resource recovery from the MSW sector will be driven by demand for the products and services made from recovered materials. The *Victorian Market Development Strategy for Recovered Resources* as discussed in Chapter 5 will identify the mechanisms required to support strong market demand. Local governments can play a large role by looking at their own purchasing power and working with their community to make informed purchasing decisions.

11 Sustainability Victoria, *Victorian Statewide Garbage Bin Audits: Food, Household, Chemicals and Recyclables,* 2014.

3.3.2 Commercial and industrial

How it enters the system

The majority of C&I material enters the waste and resource recovery system via contracts directly between generators and service providers. These tend to be more short term than those in the MSW sector. Destination points are generally controlled by the service provider who will shop for the lowest landfill, MRF or reprocessor gate fees. As a result the data on the destination points of individual materials lacks robustness.

Collected material streams are generally taken to specific C&I and C&D RRC/TSs for pre-sort and segregation. These tend to be less complex than their MSW counterparts. The quality of feedstock entering a facility plays a large role in the ability to recover individual streams. Improved outcomes are achieved when dry recyclables are collected separately from liquid and putrescible streams.

Generators see removing residual waste as part of core management practice, but many are unaware of the true cost of disposing of this waste and its impact on their business overheads. Participation in resource recovery activities are influenced by:

- awareness and understanding of the potential benefits from resource recovery
- the cost of collection services
- ease of accommodating sorting and additional infrastructure on-site
- corporate environmental policy that prioritises resource recovery.

Tonnes and material types

Table 3.6 shows the tonnes of C&I materials generated, recovered and landfilled in 2011–12. It shows that of the 4,408,000 tonnes generated, 2,941,000 tonnes (67%) were recovered with the remaining 1,467,000 tonnes were sent to landfill.

Paper/cardboard and metals were the most generated types of C&I waste in Victoria in 2011–12. These streams also had high recovery rates of 78% and 95% respectively due to established markets. The 'Other' organics streams listed in Table 3.6 consists largely of agricultural materials, sawdust, bark and woodchips and is primarily reprocessed for compost and soil conditioners.

The C&I sector is the major source of recovered food organics with feedstock coming mostly from the food manufacturing sector. These feedstocks can have low contamination rates and consistent supply tonnes, making them attractive as base loads for reprocessing. C&I recovery increased by 37% in 2011–12 largely due to a new organics reprocessor being established.

Driving increased recovery

Increasing resource recovery from the C&I sector needs to include:

- working with generators to encourage and improve source separation and to reduce contamination
- improving collection services to provide cost effective services to generators and reduce contamination through the collection process
- developing markets for products and services made from recovered materials. The *Victorian Market Development Strategy for Recovered Resources* discussed in Chapter 5 will investigate this further.

TABLE 3.6
C&I WASTE GENERATED, RECOVERED AND LANDFILLED BY MATERIAL STREAM IN 2011–12 (TONNES)

Material		Generated[a]	Recovered	Landfilled
Organics	Food waste	282,000	31,000	251,000
	Garden organics	143,000	40,000	103,000
	Wood/timber	268,000	76,000	191,000
	Other organic[b]	264,000	264,000	<1,000
Commingled recyclables	Paper/cardboard	1,470,000	1,195,000	275,000
	Glass	89,000	59,000	30,000
	Plastics	317,000	80,000	237,000
Tyres and rubber[c]		53,000	47,000	6,000
Metals		1,116,000	1,084,000	32,000
Concrete/bricks/asphalt		235,000	64,000	171,000
Textiles		97,000	1,000	96,000
Other		74,000	0	74,000
Total		**4,408,000**	**2,941,000**	**1,467,000**

a Modelled data.

b Includes agricultural waste, sawdust, bark and woodchips.

c Data for tyre and rubber streams is incomplete and should not be considered as a true representation of the current state for this material stream (see Chapter 5.3.3).

Source: Sustainability Victoria, *Victorian Local Government Annual Survey 2011–12*.

3.3.3 Construction and demolition

How it enters the system

Similar to C&I, waste and material streams from the C&D sector enter the system through commercial contracts between services providers and generators. These contracts change relatively frequently responding to market forces such as commodity value and gate prices at reprocessors and landfills. Demand for C&D waste services varies considerably, particularly in response to the phasing of large infrastructure and residential development projects.

As with C&I material streams, most C&D materials are handled by specialised RRC/TSs. C&D waste tends to be heavier and transport and movement of materials are minimised wherever possible due to the additional cost of moving heavy materials.

Tonnes and material types

Table 3.7 shows the tonnes of C&D materials generated, recovered and landfilled in 2011–12. It shows that of the 4,447,000 tonnes generated, 3,547,000 tonnes (80%) were recovered and the remaining 899,000 tonnes of residual material were sent to landfill.

As Table 3.7 shows, 92% of generated C&D waste consists of concrete, bricks and asphalt (which are heavy). A total of 71% of C&D waste was generated in the metropolitan Melbourne area — a similar proportion to C&I waste and MSW.

In 2011–12 there was a 15% decrease in the amount of C&D waste generated compared to 2010–11[12] and an 8% decrease in the proportion recovered. Since 2007–08 there has been a 15% decrease in tonnes recovered. Industry sources suggest that this is directly attributable to reduced construction activity in Victoria.

12 Sustainability Victoria, *Victorian Recycling Industries Annual Survey 2011–12*, Melbourne, 2013.

TABLE 3.7
C&D WASTE GENERATED, RECOVERED AND LANDFILLED BY MATERIAL STREAM IN 2011–12 (TONNES)

Material		Generated[a]	Recovered	Landfilled
Organics	Food waste	<1,000	0	<1,000
	Garden waste	27,000	4,000	24,000
	Wood/timber	122,000	16,000	106,000
	Other organics[b]	<1,000	<1,000	<1,000
Commingled recyclables	Paper/cardboard	7,000	0	7,000
	Glass	<1000	0	<1,000
	Plastics	20,000	3,000	17,000
Tyres and rubber[c]		<1,000	<1,000	<1,000
Metals		175,000	169,000	7,000
Concrete/bricks/asphalt		4,075,000	3,355,000	720,000
Textiles		12,000	0	12,000
Other		6,000	0	6,000
Totals		**4,447,000**	**3,547,000**	**899,000**

a Modelled data.

b Includes agricultural waste, sawdust, bark and woodchips.

c Data for tyre and rubber streams is incomplete and should not be considered as a true representation of the current state for this material stream (see Chapter 5.3.3).

Source: Sustainability Victoria, *Victorian Local Government Annual Survey 2011–12*.

Trends

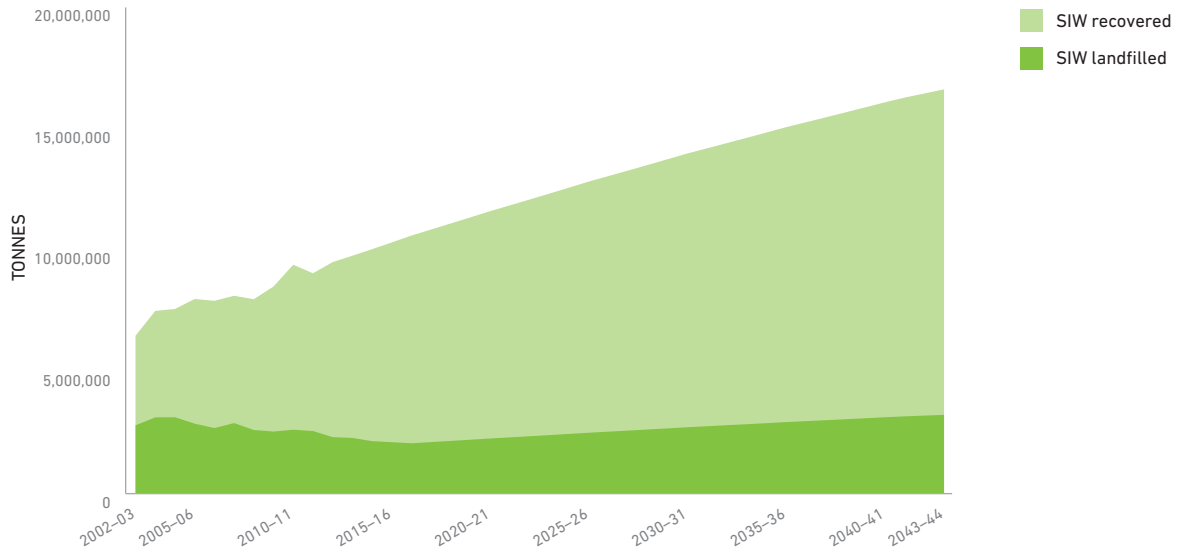
Trend data is based on landfill levy receipts which are collected for solid industrial waste (SIW) which is a combination of C&I and C&D streams. Figure 3.6 shows the trends for SIW generated, recovered and landfilled since 2002–03. It also projects the likely trends based on past patterns out to the year 2043–44. A rough estimate of the split between C&I and C&D based on landfill audits can be obtained by using the ratio of 62:38 C&D to C&I waste.

Increases in SIW are likely to be affected by construction and manufacturing activity particularly large scale infrastructure and land development projects.

Driving increased recovery

To increase resource recovery from the C&D sector we need to overcome the low commodity value of many material streams and the high transport costs, which can make viable consolidation difficult. Additionally most C&D material streams are considered inert and can access solid inert landfills which tend to have lower gate fees. This makes disposal to landfill relatively inexpensive compared to many reprocessing options. The *Victorian Market Development Strategy for Recovered Resources* discussed in Chapter 5 will investigate options to increase resource recovery.

FIGURE 3.6
PAST TRENDS AND FUTURE PROJECTIONS OF SIW GENERATED, RECOVERED AND LANDFILLED FROM 2002–03 TO 2043–44 (TONNES)



Notes:

Actual tonnages are used for 2002–03 to 2011–12. Tonnes post 2011–12 represent projections based on past trends.

The amount generated is the sum of the amounts landfilled and recovered.

Source: Sustainability Victoria, *Victorian Waste and Resource Recovery Projection Model*, v1.1, 2013.

3.4 Where material streams are generated, landfilled and reprocessed

Where material streams are generated varies across the state. While the composition of MSW streams remains fairly consistent, the components in C&I and C&D streams are influenced by factors such as land use activities, types of manufacturing and the extent of building activities.

The available data only allows for a high level estimate of the regional breakdown of materials generated and recovered as shown in Table 3.8. Landfill levy data allows us to identify the amount of residual waste landfilled in a particular WRR region but this includes materials flowing into the WRR region from other areas across the state.

Similarly, the data on materials recovered for reprocessing in each WRR region, relates to reprocessors in the WRR region and includes materials flowing into the region for reprocessing. The generation data is modelled on a combination of state totals and population statistics. More information on the data considerations can be found in Chapter 8.2.

As shown in Table 3.8, around 73% of waste and material streams are generated in the Metropolitan WRR region. According to VRIAS data, around 86%[13] of material stream reprocessing occurs in the Metropolitan WRR region. The available data does not allow for a detailed analysis of the movement of all material streams across the state. Some flows are detailed in Chapter 7 and more details will be included in the RWRRIPs. However, there are some general trends:

- The Metropolitan WRR region contains reprocessing hubs for most material streams. This reflects its large population, manufacturing base and access to transport systems and ports. It is supported by a network of spokes and smaller hubs that feed into the Metropolitan WRR region.
- There is a significant flow of commingled recyclables from across the state to the MRFs in the Metropolitan WRR region.
- The relatively high commodity value of metals allows it to be transported over greater distances, resulting in Melbourne (particularly the Laverton area) becoming the processing hub with collection spokes extending throughout Victoria.
- The economically viable distance to transport waste concrete, brick and related demolition materials is in the range of 30–50 km. As a result processing hubs are spread across the state with major hubs in the Laverton/Brooklyn, Epping, Clarinda and Dandenong areas in the Metropolitan WRR region, and in Geelong, Ballarat, Bendigo and Traralgon in regional Victoria. Most regions include smaller reprocessing hubs catering to the local market.
- There are significant flows of paper and cardboard into the Metropolitan WRR region for reprocessing and export overseas.
- Most glass from across the state is transported and sorted in the Metropolitan WRR region. While there are small local and regional markets for glass fines, the only glass container reprocessor is in metropolitan Melbourne.

13 Sustainability Victoria, *Victorian Recycling Industries Annual Survey 2011–12*, Melbourne, 2013.

TABLE 3.8
WASTE GENERATED, RECOVERED AND LANDFILLED BY WRR REGION IN 2011–12 (TONNES)

WRR region	Generated[a]	Recovered[c]	Landfilled[b]	% of state generation
Metropolitan	8,859,000	5,900,000	2,959,000	73
Barwon South West	790,000	544,000	246,000	7
Gippsland	510,000	387,000	123,000	4
Goulburn Valley	520,000	347,000	173,000	4
Grampians Central West	929,000	380,000	548,000	7
Loddon Mallee	365,000	277,000	88,000	3
North East	210,000	178,000	32,000	2
Totals	**12,182,000**	**8,014,000**	**4,168,000**	**100**

a Modelled data.

b Revised landfill levy data (as at June 2014) was used to determine the regional tonnes. As a result the total state tonnes generated and landfilled is different to the figure quoted in material streams tables.

c Based on tonnes of materials entering reprocessing facilities in each region.

3.5 Export and cross border flows

In a market based economy, material steams flow to wherever the best economic outcomes can be achieved. Freedom of trade between the states is also enshrined in the Australian Constitution.

Most material streams and waste generated in Victoria remains in the state for reprocessing and management. However, some are exported overseas and some streams move across state borders. The data relating to these flows is limited but the SWRRIP preliminary analysis and the VRIAS identified the following:

Export flows

Around 1,150,000 tonnes of recovered materials (15%) were exported overseas for reprocessing. In 2011–12 this included:

- 414,000 tonnes of scrap metal waste
- 645,000 tonnes of paper and cardboard
- 1,000 tonnes of textiles (synthetic)
- 90,000 tonnes of plastics
- 470 tonnes of wood.[14]

In addition, it is estimated that in Victoria approximately 23,000 tonnes of waste tyres were exported in 2012–13 however research suggests that the actual export figure may be greater.[15]

Cross border flows

Preliminary investigations undertaken to develop the SWRRIP estimated around 50,000 tonnes of materials currently flow across the Victorian border each year for management or recovery, most under contract to facilities in New South Wales (NSW). In addition, an estimated 200,000 tonnes of materials flowed into Victoria for reprocessing, mainly from NSW to reprocessors close to the border.[16] While these tonnes are low at the state level, these movements can be significant for some WRR regions.

While destination end points for waste materials will be determined by many factors, there are some issues and complexities around moving materials out of the state:

- In some situations, the end destinations may not need to meet regulatory requirements in line with those in Victoria. This could increase potential community, environment and public health impacts for the destination.
- Disposing of residual waste outside of Victoria avoids the landfill levy. This levy is in place to support Victoria's resource recovery markets and to divert materials from landfill to recover economic value. Deliberately avoiding landfilling in Victoria for cheaper landfill options interstate undermines Victoria's approach to waste management and resource recovery.
- The gate fees offered by interstate service providers can be cheaper than in Victoria which undermines the Victorian market. The loss of these tonnages could present lost opportunities for Victorian service providers.
- For some border towns the closest service provider is across the border and alternatives within the state are not economically viable.

Further work is required to understand this complex issue. Where relevant, the regional waste and resource recovery implementation plans (RWRRIPs) will address this issue as discussed in the regional summaries in Chapter 7.

14 Australian Bureau of Statistics, International Trade Data, Financial Year 2011–12.
15 Sustainability Victoria, *Emerging Materials Market Analysis*, prepared by Hyder Consulting, May 2014
16 Sustainability Victoria, *Victorian Recycling Industries Annual Survey 2011–12*, Melbourne, 2013.

4. Infrastructure supporting the waste and resource recovery system

Victoria's waste and resource recovery system is underpinned by a complex network of infrastructure that collects, sorts, recovers and disposes of waste and material streams. Establishing an integrated system that protects the community, environment and maximises the economic value of waste will require infrastructure that increases resource recovery. Better collection systems are required and improved sorting and reprocessing abilities to maximise diversion of material away from landfills.

To achieve this, investment attraction in the right mix of infrastructure is needed and planning for infrastructure that follows the Statewide Waste and Resource Recovery Infrastructure Plan (SWRRIP) strategic directions as outlined in Figure 1.1.

4.1 Data considerations

The main sources of data in this chapter are the *Victorian Recycling Industries Annual Survey* (VRIAS), the *Victorian Local Government Annual Survey* (VLGAS) and waste and resource recovery groups (WRRGs).

The following data considerations are relevant to this chapter:

- There is fairly robust data on material streams collected via municipal kerbside collection systems but limited data on commercial and industrial (C&I) and construction and demolition (C&D) streams.
- Infrastructure numbers date from June 2014.
- Maps of waste and resource recovery infrastructure dated March 2013 can be found on the Sustainability Victoria (SV) website at **www.sustainability.vic.gov.au**

More information on surveys and data considerations can be found in Chapter 8.2.

4.2 Types of infrastructure

Table 4.1 details the types of infrastructure that make up Victoria's waste and resource recovery system.

TABLE 4.1
TYPES OF INFRASTRUCTURE SUPPORTING THE WASTE AND RESOURCE RECOVERY SYSTEM

Type	Characteristics
Collection infrastructure: Infrastructure to collect and transfer waste materials at the point of generation	
Kerbside bins and collection	› Collections from households of residual waste, garden organics and commingled recyclables; hard waste collections; and kerbside collection from businesses and other commercial premises. › Includes services provided by local governments and their service and commercial providers.
Skip bin	› Large bin provided by a private contractor to collect and remove bulk waste from households, businesses, schools, commercial premises and hospitals.
Tip truck	› Truck used to remove large amounts of mainly commercial and industrial waste.
Resource recovery infrastructure: Infrastructure to facilitate recovery of materials and resources	
Drop-off centres and charity bins	› Recovers selected materials and goods mainly dropped off by householders for recycling and reuse. › May include aggregation for transport to a resource recovery centre or transfer station.
Resource recovery centres/transfer stations (RRC/TS)	› Receives, sorts and/or consolidates a range of material streams (depending on the facility) including hard, organic and residual waste and commingled recyclables for transport for materials recovery, processing or disposal to landfill. › Accepts materials from all sectors and can be publically or privately owned and operated. › May include a resale centre.
Materials recovery facility (MRF)	› Sorting, consolidation and transfer. › Receives and sorts household and business commingled recyclables. › Compacts and bales, or consolidates materials and sends to reprocessing facilities. › May include a resale centre.
Reprocessing infrastructure: Infrastructure to recover materials and resources	
Organic reprocessing facility	› A facility that biologically reprocesses organic matter, yielding a variety of products including stabilised organic residues for use as a soil additive, heat and renewable energy. › Includes both windrow and in-vessel technologies.
Waste to energy facility	› A facility that uses waste or refuse derived fuels as a feedstock to produce a useful end product with market value such as heat and electricity. › Technologies can include anaerobic digestion and heat processing such as pyrolysis and gasification.
Other reprocessors	› A facility that changes the physical structure and properties of a waste material that would otherwise be sent to landfill adding financial value to the processed material. Without reprocessing, the beneficial use of the material would be lost.
Disposal infrastructure: Infrastructure established as the final repository of waste materials	
Landfill	› A site for the disposal of waste into the ground. › May include a RRC/TS or resale shop.
Incinerator	› Disposal by burning. › A site that disposes of waste by burning it, without producing a useful end product.

4.3 Existing infrastructure

Currently there are nearly 500 infrastructure sites supporting Victoria's waste and resource recovery system. Table 4.2 provides a breakdown of numbers by waste and resource recovery region (WRR region). Maps showing the location of these sites (dated March 2013) can be found on the SV website at **www.sustainability.vic.gov.au**

TABLE 4.2
NUMBER OF WASTE AND RESOURCE RECOVERY INFRASTRUCTURE BY WRR REGION

WRR regions	RRC/TS standalone	RRC/TS at landfill	MRFs	Reprocessors	Licensed landfills	Landfills exempt from licensing	Totals
Metropolitan	36	6	7	48	20	0	**117**
Barwon South West	38	9	2	7	7	4	**67**
Gippsland	50	5	3	4	7	3	**72**
Goulburn Valley	35	1	1	3	5	0	**45**
Grampians Central West	60	5	2	5	4	7	**83**
Loddon Mallee	29	17	2	5	5	12	**70**
North East	19	3	1	5	3	2	**33**
Totals	**267**	**46**	**18**	**77**	**51**	**28**	**487**

Note: There are an additional 39 plastic reprocessors in Victoria. This data is collected by the Plastics and Chemical Industry Association who do not participate in VRIAS.

Source: Sustainability Victoria, unpublished dataset, 2014.

4.4 Collection systems

4.4.1 Municipal collection services

Services provided by local governments are responsible for managing 3,321,000 tonnes of waste and resource recovery materials. A total of 96% of Victorian households have access to kerbside garbage collection and 95% to recycling collection. The most common system is a weekly 120 or 140 litre (L) garbage service with a fortnightly 240 L commingled recyclable service. Table 4.3 summarises the main municipal services offered across Victoria.

Future trends

Future trends in municipal collection services are likely to include collecting food waste as local governments respond to community expectations and the drive to increase the diversion of organic material from landfills. Currently only a small number of local governments offer food waste collection services. The *Victorian Organics Resource Recovery Strategy* as discussed in Chapter 5.3.1 will explore options to increase recovery of food waste.

Changes to C&I and C&D collection systems will be driven by market demand. One of the big barriers is competition for the space required to pre-sort and store waste and material streams at generating facilities.

Demand from reprocessors for feedstock will influence the availability and cost of collection services. For example, if the demand for products made from lightweight aggregate increases there will be a corresponding demand for feedstock and collection providers will offer more services.

TABLE 4.3
MUNICIPAL COLLECTION SERVICES IN VICTORIA

Service	Details
Kerbside garbage	› Residual garbage. › Bin sizes include 80, 120, 140 and 240 L with 120 L being the most common. › Weekly collection services are the most common. › Offered by all local governments and available to 96% of households.
Kerbside commingled	› Commingled glass, metals, plastic and paper/cardboard. › Bin sizes include 120 and 240 L bins. › Predominantly fortnightly collection of 240 L bins (89% of services). › Offered by all local governments and available to 95% of households.
Kerbside garden organics	› Garden organic materials (not food waste). › Bins (when used) range from 120 to 240 L bins with 240 L most common. Tied bundles are also widely used. › 21 local governments offer a mandatory collection (weekly, fortnightly or monthly), 24 local governments offer an opt-in collection (fortnightly or monthly) and 16 local governments offer an on-call service often in conjunction with an opt-in service. › Predominant system is a 240 L bin collected fortnightly (66% of services). › Offered by 48 of the 79 local governments and available to 49% of households.
Hard waste collections	› Solid waste (non-putrescible) that is not accepted or does not fit into garbage bins such as white goods. › Service provision ranges from set number per year (1, 2 or 6) to on-call. › Offered by 40 of the 79 local governments.
Drop-off services	› Materials accepted vary greatly depending on the site and can include glass, steel, plastics, paper, cardboard, e-waste, chemicals, garden organics and residual waste. › Play a significant role in rural areas where access to kerbside services may be limited.

4.5 Resource recovery centres, transfer stations and drop-off facilities

The main functions of RRC/TSs are to aggregate, sort and consolidate waste and material streams collected through kerbside collection services from households and businesses, and waste dropped off directly at facilities. While the majority handle municipal sourced waste and material streams there are a growing number that specifically service the C&I and C&D sectors.

Facilities across the state vary significantly in size, types of services offered and materials accepted. In remote areas, RRC/TSs may be limited to a small trailer that is emptied or collected periodically. In some cases, they sit in front of a landfill so that recyclables that would otherwise be landfilled can be removed. Many RRC/TSs and landfills have retail shops to sell diverted materials.

Many RRC/TSs sort and consolidate garden organics and kerbside commingled recyclables into quantities that are economically viable to transport, either for reprocessing or disposal of the residual to landfill. In metropolitan Melbourne, some dedicated facilities consolidate kerbside residual waste for bulk transport to landfill or reprocessing.

In regional areas, facilities are mostly owned by local governments. Some contract management out to private service providers. In metropolitan Melbourne, eight of the 42 facilities are privately owned. Private facilities are more likely to accept non-municipal waste. Some MRF operators also operate transfer stations to consolidate materials going to their MRFs.

An important function of RRC/TSs and drop-off facilities is to enhance kerbside collection systems. This is especially important in regional areas, where kerbside systems may be limited or non-existent.

4.5.1 State overview

In Victoria, there are 267 stand-alone RRC/TSs and 46 RRC/TSs attached to landfills. Table 4.4 shows recovery facilities by type and by WRR region. Maps of infrastructure including RRC/TSs can be found at **www.sustainability.vic.gov.au**

TABLE 4.4
NUMBER OF RESOURCE RECOVERY FACILITIES BY TYPE AND WRR REGION

WRR region	Stand-alone RRC/TS	RRC/TSs at landfill	Totals
Metropolitan	36	6	42
Barwon South West	38	9	47
Gippsland	50	5	55
Goulburn Valley	35	1	36
Grampians Central West	60	5	65
Loddon Mallee	29	17	46
North East	19	3	22
Totals	**267**	**46**	**313**

4.5.2 Trends

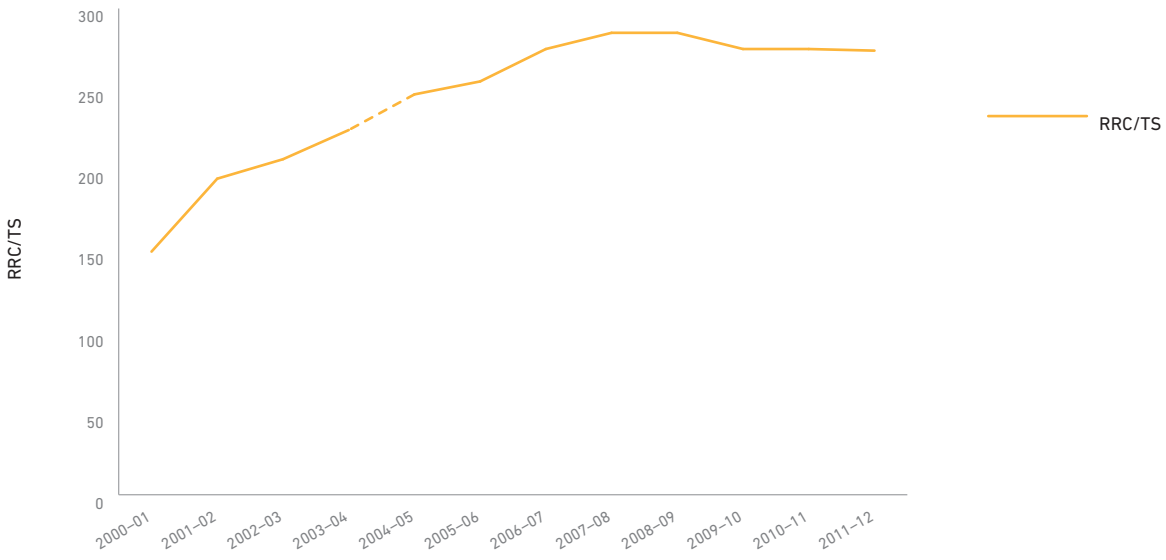
As Figure 4.1 shows, there has been a large increase in the numbers of publicly owned and operated RRC/TSs since 2000–01. This growth corresponds to a decrease in the number of landfills.

We expect the number of RRC/TSs to increase over the next 30 years, particularly in rural and regional areas. This will support local governments to:

- increase resource recovery activities at all landfills
- transition smaller landfills to resource recovery and consolidation activities prior to transport of material streams to appropriate resource recovery facilities and regional landfills. This should be undertaken whenever better economic, community, environment and public health outcomes can be demonstrated.

The future location of RRC/TSs will be influenced by a number of factors including appropriately located land being available for both privately and publically owned facilities and historical siting of facilities. While maximising access is a major priority, using sites with suitable buffers and compatible activities should be considered. Using parts of existing and closed landfills where appropriate offers several advantages. They often have existing buffers and access points and keeping the site active can provide a return on investment to the owner during and after rehabilitation.

FIGURE 4.1
TRENDS IN THE NUMBER OF RRC/TSS FROM 2000–01 TO 2011–12



Note: No data was collected for the 2003–04 period but the trend has been extrapolated from existing data and shown as a dashed line.

Source: Sustainability Victoria, *Victorian Local Government Annual Survey 2011–12*.

4.6 Materials recovery facilities

A MRF receives, separates and consolidates material streams to produce feedstocks for reprocessing. Most of Victoria's MRFs are designed to separate household and commercial commingled recyclables into material streams, including plastics, paper and cardboard, glass, steel and aluminium. They usually use a mechanical process to separate materials using characteristics such as weight, size, magnetism and optical density.

In Victoria there are 18 MRFs, seven of which are located in metropolitan Melbourne and receive feedstock from metropolitan and regional areas. All MRFs are privately owned and operated. Several operators own more than one MRF across the state.

Table 4.5 shows the location of the MRFs by WRR region. Maps of infrastructure including MRFs can be found at **www.sustainability.vic.gov.au**.

The metropolitan MRFs are much larger in scale than their regional counterparts and rely more on advanced mechanical sorting equipment. Several regional MRFs operate as an Australian disability enterprise, employing people with a disability. These facilities use hand picking to a greater extent than other MRFs e.g. The Victorian Aid to The Mentally Ill (VATMI) operates three MRFs as Australian disability enterprises in regional Victoria, with the largest in Bendigo.

TABLE 4.5
NUMBER OF MRFS BY WRR REGION

WRR region	MRFs
Metropolitan	7
Barwon South West	2
Gippsland	3
Goulburn Valley	1
Grampians Central West	2
Loddon Mallee	2
North East	1
Totals	**18**

4.6.1 Trends

The degree to which a MRF can separate and recover individual material streams depends on the technology used. Materials that cannot be viably sorted are either sent to landfill or stockpiled for later rework when the technology at the site has been upgraded. Advancements in technology are expected to reduce stockpiling and tonnes of residual waste going to landfill. However, a business case in support of technology upgrades would most likely need to be supported by larger amounts of feedstocks which in turn would require bigger MRFs. Several smaller regional MRFs have already closed in favour of transporting material streams to larger facilities in regional centres and the metropolitan area.

Most of Victoria's MRFs are commonly described as 'clean' MRFs as they generally only accept commingled materials that have already been separated at the source from municipal collection services.

MRFs that sort and recover materials from residual waste streams are often referred to as 'dirty' MRFs reflecting their need to handle the putrescible organic component in the residual waste stream. The number of MRFs able to handle residual waste from households and C&I sources will most likely increase as the technology improves and can capture recoverable components in the residual waste stream.

Most current MRFs are designed around the three bin kerbside collection system which limits their ability to accept C&I and C&D waste. There is potential to invest in technologies that allow MRFs to accept and sort appropriately sourced streams from the C&I sector to augment the MSW flows and vice versa.

Existing C&I MRFs in Victoria recover significantly lower percentages of recyclables from their feedstock than MSW MRFs. The financial viability and recovery rate of C&I MRFs could be increased by including other waste derived products such as refuse derived fuels from the residue of the sorting process.

4.7 Landfills

In 2011–12 Victorian landfills managed around 4,168,000 tonnes of waste materials. Around another 436,000 tonnes of prescribed industrial waste (PIW) went to licensed landfills throughout Victoria in 2011–12. In most cases, this was Category C contaminated soil[17] which can go to landfill. PIW is outside the scope of the SWRRIP except in relation to its impact on available landfill airspace and is not discussed in detail. Information on the management of PIW can be found on the EPA website at **www.epa.vic.gov.au**

Table 4.6 lists the general types of landfills considered in the SWRRIP. The regulations and policies governing all aspects of landfill sites from siting, waste categorisation and site rehabilitation stem from the *Environment Protection Act 1970* (EP Act). These documents can be located on the EPA website.

17 All prescribed industrial waste intended for landfill disposal must be classified into one of three categories depending on the level of hazard. Category A is the highest hazard and Category C is the lowest hazard.

4.7.1 Statewide overview

There are 79 landfills operating in Victoria — 51 licensed landfills and 28 landfills exempt from licensing. All landfills exempt from licensing are located in regional Victoria.

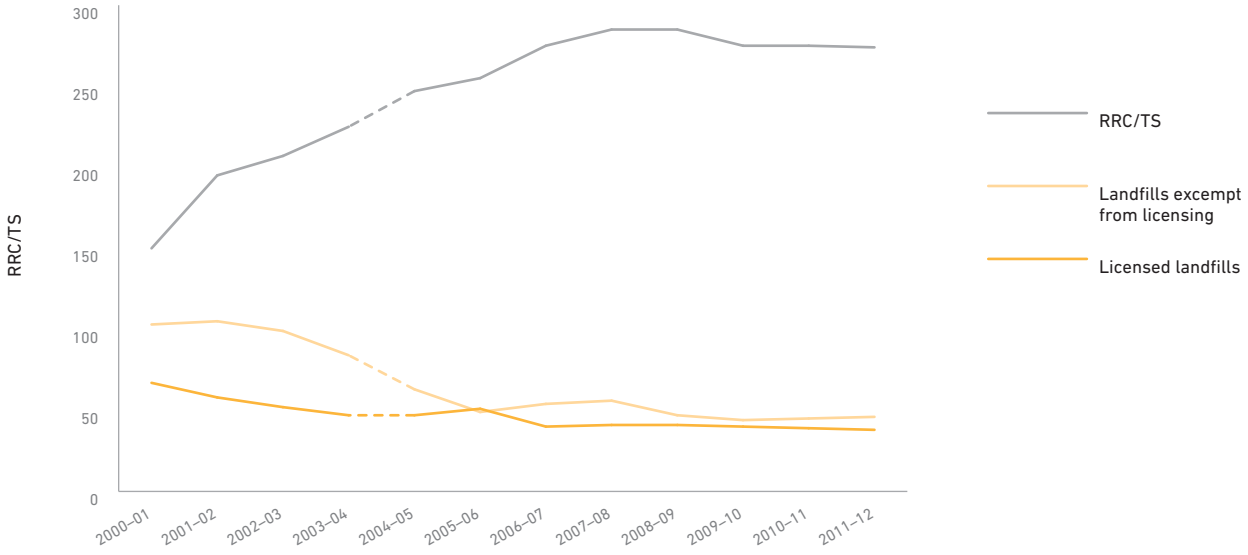
Figure 4.2 shows the steady decrease in the number of licensed landfills and landfills exempt from licensing in the past ten years. Until recently this decline was matched by a steady increase in the numbers of RRC/TSs. This is due to:

- increased government and community interest in recycling and resource recovery from waste materials
- greater provision of recycling services to households and businesses
- increased regulatory requirements for environmental performance by landfills, leading to the closure of smaller landfills and waste being transferred to larger regional facilities.

TABLE 4.6
TYPES OF LANDFILLS CONSIDERED IN THE SWRRIP

Type of landfill	General description
Landfills exempt from licensing	› Servicing populations of less than 5,000. › Accept a range of material streams including putrescible and solid inert materials.
Solid inert landfills	› Accept non-hazardous solid waste, including municipal and industrial waste which do not readily decompose and therefore generate low levels of landfill gas, odour and landfill leachate.
Putrescible landfills	› Accept a range of materials including food waste and organic waste from gardens. Readily decomposes thereby generating significantly more landfill gas, odour and landfill leachate.

FIGURE 4.2
TRENDS IN THE NUMBER OF LANDFILLS AND RRC/TSS FROM 2000–01 TO 2011–12



Note: No data was collected for 2003–04. The trend was extrapolated from existing data and is shown as a dashed line.
Source: Sustainability Victoria, *Victorian Local Government Annual Survey 2011–12*.

4.7.2 Operating landfills

Table 4.7 shows location by WRR region and ownership type of the 51 licensed landfills and the 28 landfills exempt from licensing operating in Victoria. Maps of all the operating landfills in Victoria can be found on the SV website at **www.sustainability.vic.gov.au**

There are another 10 private landfills which are not included in the SWRIPP as they receive waste exclusively from a single source, usually the owner/generator. There are an additional 25 landfills licensed by EPA that do not currently receive waste. From a planning perspective, these landfills are considered to be closed in the SWRRIP.

Most licensed operating landfills in regional Victoria are owned by local governments. These landfills tend to be smaller than those in the Metropolitan WRR region. The most notable exception is the Maddingley Brown Coal Landfill at Bacchus Marsh in the Grampians Central West WRR region that accepts solid industrial waste (SIW) almost exclusively from metropolitan Melbourne.

Overall, landfills exempt from licensing manage a small proportion of the state's waste with most accepting less than 10,000 tonnes per year. Nevertheless, they are critical to the local system and local planning needs to reflect this by providing solutions to managing residual waste at the local level.

4.7.3 Landfill capacity

Landfill planning and management needs to consider the rate at which remaining available airspace will be depleted through disposal of waste to the landfill. This is important given that siting and obtaining the required planning and EPA approvals for a new landfill can take up to five years. A number of landfills operate in conjunction with operational quarries and estimates of available airspace need to be periodically updated.

The region summaries in Chapter 7 include the estimated closure dates of landfills in each region to inform the analysis of future landfill needs for the region. At the state level, Victoria has enough airspace for projected landfill tonnages for the next 30 years. However, there are several localities within individual WRR regions that are projected to have landfill capacity issues in the short term. Options for meeting any gaps in these areas will be explored through the development of the regional waste and resource recovery implementation plans (RWRRIPs).

TABLE 4.7
NUMBER OF OPERATING LANDFILLS INCLUDING LICENSED LANDFILLS AND LANDFILLS EXEMPT FROM LICENSING BY WRR REGION

WRR region	Licensed landfills		Landfills exempt from licensing	Totals
	Local gov't owned	Privately owned		
Metropolitan Melbourne	4	16	0	20
Barwon South West	6	1	4	11
Gippsland	7	0	3	10
Goulburn Valley	5	0	0	5
Grampians Central West	2	2	7	11
Loddon Mallee	5	0	12	17
North East	3	0	2	5
Totals	**32**	**19**	**28**	**79**

Note: All landfills exempt from licensing except for one are owned by local government.

Source: Sustainability Victoria, unpublished dataset, 2014.

4.7.4 Residual waste flows

Historically many landfills were located close to generation points because of the putrescible nature of the materials and cost of transport. This was particularly the case for residual municipal waste.

Community expectations of the protection of the environment and human safety in the management of waste have led to increased landfill management regulation. This has increased the management costs of landfills. Consequently, landfills have required larger tonnes of residual waste to underpin the viable management of best practice landfills. This has resulted in the closure of a number of smaller landfills and transport of residual waste over greater distances to larger regional landfills.

SIW generally, but not always, follows the same flow as MSW. Disposal of SIW is generally by short term contracts, which means that service providers can change frequently and waste tends to follow the 'lowest cost at the time' solution, taking into account gate fees and transport costs.

The percentage of MSW versus SIW received at landfills can indicate movement of landfill waste in and out of an area. EPA landfill data shows that SIW comprises on average about 65% of all waste disposed of at landfills. If the percentage of SIW in a particular area varies significantly from this, it suggests movement of waste in or out of the area.

Available data on flows of waste to landfill across the state indicate that residual waste travels up to 120 km from its point of generation to disposal; about a three hour round trip. Further investigation is required to understand the factors influencing the viability of moving residual waste over longer distances including the impact on the transport network.

4.7.5 Regulation of landfills

Landfills provide an important service to businesses and the community. However, if landfills are not managed properly, they can cause problems for those living in the surrounding areas and the environment. To protect the environment, EPA regulates all landfill sites in Victoria.

All landfill sites must adhere to requirements in the EP Act. This includes adhering to the *Waste Management Policy (Siting, Design and Management of Landfills)* (the landfill WMP).

In accordance with the landfill WMP, an operator can apply for a landfill site licence exemption. Operators of sites exempt from licensing should use EPA's *Landfills exempt from licensing guideline* (Publication number 1563, April 2014) to demonstrate compliance with the landfill WMP. This guideline provides direction regarding the siting, design, operation, rehabilitation and aftercare of small municipal landfills that are exempt from holding an EPA licence.

Landfill sites issued with a works approval or licence must comply with the *Best Practice Environmental Management: Siting, Design, Operation and Rehabilitation of Landfills* (landfill BPEM). The landfill BPEM sets out the objectives and outcomes for all licensed landfills which accept fill, putrescible, solid inert and Category C PIW.

Licensed landfill operators are required to have an auditor acknowledge that the design and construction of new cells and landfills comply with EPA's landfill BPEM requirements. Operators must allow sufficient time to design, construct and obtain approvals for new cells to ensure ongoing provision of adequate airspace. In the past, this process has taken longer than expected and has led to less than optimal temporary arrangements such as overtaking existing cells and transporting some waste to another landfill.

EPA monitors the landfill industry to ensure compliance with the EP Act. Operators of landfills sites and occupiers of closed sites who fail to comply with legislation can face prosecution.

Adherence to legislative requirements ensures Victoria's current and future facilities and waste services are well sited, well built and operated at the highest standards, enabling EPA to deliver the community, environment and public health benefits expected by Victorians.

4.7.6 Future landfill planning and scheduling

Future landfill planning will focus on:

- Achieving the long term purpose of landfills to only be for managing residual waste after all materials that can be viably recovered have been extracted.
- All landfills meeting or aspiring to meet best practice management and the community expectation that landfills minimise their impact on the community, environment and public health.
- WRRGs ensuring that the waste and resource recovery infrastructure needs of their region are met over at least the next 10 years as per their legislative responsibility.[18]

To achieve this, planning for future airspace will be based on the tonnes of residual waste remaining after all materials that can be viably recovered have been extracted, with appropriate allowances for contingencies. We need to consider that realising both resource recovery opportunities and new landfill airspace can take many years. Solutions for residual waste during this period need to be available to meet service requirements.

Scheduling new landfills will be managed through the infrastructure schedules that will be developed as part of the RWRRIPs. A consistent approach across all WRR regions will be used to identify the location and sequence for filling and operating landfill sites. When completed, the schedules will replace any existing schedules in metropolitan and regional waste management plans.

4.7.7 Future trends

In the long term we expect the number of smaller licensed landfills and landfills exempt from licensing to decrease in favour of a move towards larger regional landfills. New landfills when established will need to:

- Demonstrate a need for additional airspace servicing a region.
- Operate to maximise diversion of materials that can be economically recovered and give rise to better outcomes for the community, environment and public health.
- Be larger to attract the economies of scale required to support increased management costs to meet community expectations and BPEM requirements.

As a result, we are likely to see residual waste transported over larger distances. To support this, we need to improve recovery of materials in the residual stream prior to consolidation to minimise transport costs.

As discussed, landfills are facing increased management costs to meet community expectations and best practice management requirements. Consequently, many local governments are reviewing the financial viability of their landfills, particularly small landfills in regional Victoria.

This is supported by EPA research in 2012–13[19] which looked at financial modelling of operations at individual sites under a number of potential future scenarios. It also took into account the environmental risk profile of each site. The research showed that, as a general rule, operating costs were likely to be higher if a landfill:

- has shallow cell depth
- accepts less than 25,000 tonnes per year
- only accepts waste from their local area.

It is strongly recommended that local governments operating landfills with these characteristics assess the options that will best meet the service needs for their community while providing the best outcomes to the community, local government and state. In some situations better outcomes may be achieved by transitioning sites to resource recovery and consolidation activities prior to transporting material streams to the appropriate hubs for reprocessing or regional landfills. While the decision to maintain a local landfill lies with the operating local government, such a decision needs to be informed by appropriate research.

18 *The Environment Protection and Sustainability Victoria Act 2014*, Section 50BA.

19 Environment Protection Authority, *Rural Landfill Risk Assessment Report*, 2013 (Unpublished)

4.7.8 Closed landfills

Landfill sites continue to pose environmental risks for a significant period of time after waste acceptance has ceased. Possible risks include:

- Contamination of groundwater, stormwater or surface waters with leachate, a liquid formed by rainwater and decomposing waste.
- Migration of landfill gas, formed during the decomposition of waste, into the surrounding ground and atmosphere, causing odours.
- Inappropriate or incomplete capping, leading to infiltration of rainwater that generates large volumes of leachate.
- Insufficient assessment of risk due to a lack of appropriate ongoing aftercare management, maintenance, monitoring and reporting.

To reduce these risks, EPA requires the occupier of a site to undertake ongoing aftercare until the site no longer poses a risk to human health or the environment. The period of time for aftercare management (from when a site is closed) is a minimum of:

- 10 years for sites exempt from licensing
- 30 years for licensed sites.

Rehabilitation and aftercare management requirements for landfills exempt from licensing are listed in the *Landfills exempt from licensing guidelines* (Publication number 1563, April 2014).

EPA requires operating licensed landfills to be progressively rehabilitated in accordance with the landfill BPEM. During the post closure phase of the landfill, the landfill WMP requires operators to undertake ongoing management of a landfill site including leachate and gas extraction operations. Once a landfill stops receiving waste and is in the aftercare phase, EPA issues a supporting pollution abatement notice (PAN) to develop rehabilitation and aftercare management plans. Once these plans have been submitted, EPA issues a post-closure PAN and the licence can be revoked.

The post-closure PAN sets out EPA requirements for monitoring, auditing and managing the landfill site post-closure and typically applies for at least 30 years. Post-closure PANs vary according to the risks the landfill poses to the local community and environment. Detailed information about post-closure PAN requirements can be found in the *EPA Closed Landfill Guidelines* (Publication number 1490, December 2012).

There are currently about 90 closed landfill sites which have a supporting PAN or a post-closure PAN. EPA is currently assessing the number of historical closed landfill sites requiring these notices.

5. Reprocessing

Reprocessing is the physical conversion of a waste material into a usable product. It is a critical component of the waste and resource recovery system as it returns recovered materials for use back into the community. There are 116 major reprocessors in Victoria as shown in Table 5.1. These facilities accepted an estimated 8,014,000 tonnes in 2011–12.

Reprocessors are supported by feedstocks supplied by a network of businesses that collect and sort materials including public and privately owned resource recovery centres and transfer facilities (RRC/TSs) and scrap metal yards. In addition to the major facilities listed in Table 5.1, there are at least another 50 facilities that collect and sort mixed waste materials and 18 that recover and resell demolition items and timber.

Increasing the capacity of the Victorian reprocessing industry is pivotal to achieving the goals of the Statewide Resource Recovery Infrastructure Plan (SWRRIP). The viability of reprocessing is underpinned by having a pull from the market for the products made from recovered materials and a reliable supply of feedstock of suitable quantity and quality for reprocessing.

As discussed in this chapter the Victorian waste recovery industry is already actively recovering materials where it is viable to do so. The SWRRIP strategic directions provide a range of planning mechanisms that over the next 30 years will support and build the reprocessing industry including prioritising recovery in procurements, facilitating the consolidation and aggregation of material streams and planning to ensure land is available for waste and resource recovery activities.

However, there are many materials that are currently disposed of that could be reused in the community. Supporting recovery of these materials is a priority if they also could pose a risk to the community, environment and public health if not managed properly.

SV is currently developing a suite of initiatives as discussed in Chapter 1.6 to support implementation of the SWRRIP. These will identify a range of mechanisms and appropriate intervention points in the waste and resource recovery system to address barriers to support increased recovery and reprocessing.

Of particular relevance to this chapter is the *Victorian Market Development Strategy for Recovered Resources*. It will establish a framework to facilitate stronger demand for the goods and services made from recovered materials. That is — the pull from the market required to support increased recovery. The market development strategy will complement the information currently available in this section of the SWRRIP. The expected completion date for the strategy is late 2015.

5.1 Data considerations

The main source of data in this chapter is the *Victorian Recycling Industries Annual Survey* (VRIAS) in 2011–12. Additional data was sourced from waste and resource recovery groups (WRRGs), old recycling databases, and phone conversations and site visits to businesses that collect and reprocess solid industrial waste (SIW). While most businesses willingly provided information about the types and quantities of materials they handle, some chose not to participate. Consequently, the data is comprehensive and a good representation of the Victorian reprocessing industry but is not complete.

The following data considerations are relevant to this chapter:

- The recovered tonnes, unless stated, refer to the tonnes of materials entering reprocessing facilities. This is not a direct correlation to how much was reprocessed as there is no data on tonnes stockpiled or landfilled by reprocessors. For this reason, quantities are referred to as *recovered*, rather than *reprocessed*.
- Textiles data was considered as a subsection of organics data in previous publications. As most of the recovered textiles are synthetic it is now considered as a category of its own but detailed data is limited.
- Infrastructure numbers date from June 2014.
- Maps of waste and resource recovery infrastructure can be found on the Sustainability Victoria (SV) website at **www.sustainability.vic.gov.au**

More information on surveys and data considerations can be found in Chapter 8.2.

TABLE 5.1
NUMBER OF MAJOR REPROCESSORS IN VICTORIA

Facility type	Number
Organics (incl. timber)	31
Paper, cardboard and glass	8
Plastic	39
Metal	5
Concrete brick and asphalt	25
Tyres and rubber	6
Other	2
Totals	**116**

5.2 Material quantities

In 2011–12, 8,014,000 tonnes of material were recovered of which 44% came from the construction and demolition (C&D) sector, 37% from the commercial and industrial (C&I) sector and 19% from municipal solid waste (MSW). The greatest percentages of materials recovered were concrete and brick (79%), metals (95%) and paper and cardboard (80%).

Table 5.2 shows the main material streams recovered for reprocessing in 2011–12.

Over the next 30 years the composition of Victoria's waste streams will change in line with consumer buying patterns. In particular there is expected to be a large increase in the amount of product waste discarded by households and businesses, such as e-waste, which is comprised of products such as televisions, computers washing machines and other whitegoods. This is discussed in more detail in Chapter 5.3.6

Recovery of these waste streams can be problematic as they are made up of many different components and materials that require complex sorting and separation before they can be reprocessed. Product Stewardship Schemes such as the National Television and Computer Recycling Scheme discussed in Chapter 5.3.6 can be effective in supporting increased recovery. These schemes develop partnerships in which the sectors involved in design, manufacture, distribution or use, and disposal of the product seek to ensure that value is recoverable from the product at its end of life.

TABLE 5.2
MATERIALS GENERATED, RECOVERED AND LANDFILLED BY MATERIAL STREAM IN 2011–12 (TONNES)

Material		Generated[a]	Recovered	Landfilled	Percentage recovered (%)
Organics	Food waste	929,000	31,000	898,000	3
	Garden organics	760,000	500,000	260,000	66
	Wood/timber	415,000	112,000	303,000	27
	Other organics[b]	335,000	335,000	<1,000	n/a
Commingled recyclables	Paper/cardboard	2,143,000	1,665,000	478,000	78
	Glass	276,000	195,000	81,000	71
	Plastics	570,000	149,000	421,000	26
Tyres and rubber[c]		55,000	49,000	6,000	89
Metals		1,540,000	1,470,000	70,000	95
Concrete/bricks/asphalt		4,415,000	3,502,000	913,000	79
Textiles		160,000	5,000	155,000	3
Other		578,000	<1,000	578,000	n/a
Total		**12,176,000**	**8,014,000**	**4,162,000**	**66**

a Modelled data.

b Includes agricultural waste, sawdust, bark and woodchips.

c Data for tyre and rubber streams is incomplete and should not be considered as a true representation of the current state for this material stream (see Chapter 5.3.3).

Source: Sustainability Victoria, *Victorian Local Government Annual Survey 2011–12*.

5.3 Recovery by material stream

Of the 8,014,000 tonnes of materials recovered in Victoria for reprocessing in 2011–12 approximately:

- 85% stayed in the state
- 2.5% was received from interstate
- less than 1% was imported from overseas
- less than 1% was sent interstate for reprocessing
- 15% was exported overseas for reprocessing.[20]

5.3.1 Organic materials

Organic materials are plant or animal matter from domestic or industrial sources. They are putrescible in nature and when they decompose they present a number of risks that if not managed properly, can impact on the community, environment and public health. These include the:

- generation of odours that can be offensive
- generation of leachate that can contaminate waterways
- generation of methane adding to greenhouse gas emissions
- attraction of vermin and pests which can transfer pathogens.

Organics also contain valuable resources including nutrients and energy. Diverting organic material away from landfill, where recovery is viable has the potential to return these to the community for further use, contribute to the Victorian economy and importantly, reduce potential adverse impacts to the community and environment.

SV is currently developing the *Victorian Organics Resource Recovery Strategy* (VORRS) to facilitate a viable, profitable organics reprocessing industry. It will set a 30 year vision to achieve increased economic, environmental, community amenity and public health benefits through better management of organic waste systems, processes and markets for recycled organic products.

The VORRS provides a 10 year strategic outlook and a five year action plan to minimise the environmental, community amenity and public health impacts of organic waste by increasing recovery and maximising economic value from recovered organics.

Not all organic materials enter the waste and resource recovery system. The VORRS ***w***ill explore potential opportunities for aggregating and consolidating municipal and C&I food and garden waste and other waste that generally falls outside of the existing solid waste stream.

The VORRS will address some of the major challenges of organics recycling by changing the way we look at organic waste. It will focus on the complex relationships between generation, collection, processing and the products that can viably be made available to end markets. It will consider the implications across all parts of the supply chain and provide the information and direction required to enable better decision making, while acknowledging the responsibilities along the supply chain. It will show how and where local and state government, the waste industry, businesses and community could do things more effectively to protect the environment and public health by creating a strong, sustainable market for this resource.

Once developed, the VORRS will provide a more rigorous and comprehensive investigation and analysis of the opportunities and barriers to the recovery of organics. It will set the strategic direction to change the dynamic of the organics recovery industry.

The findings in the VORRS will complement the information currently available in this section of the SWRRIP. The expected completion date for the strategy is mid 2015.

Table 5.3 shows the main categories of organic waste currently used for data collection.

20 Sustainability Victoria, *Victorian Recycling Industries Annual Survey 2011–12*, Melbourne, 2013.

TABLE 5.3
MAIN CATEGORIES OF ORGANIC WASTE

Category	Sources	
Food waste	Municipal food waste	Mainly from households through kerbside collection systems.
	Pre-consumer	Material from manufacturing and food processing plants.
	Post-consumer	Material from restaurants and food services.
Garden organics	Mainly from household and municipal activities.	
Timber	Includes structural, packaging and treated timber, and sawdust mainly from the C&I and C&D sectors.	
Other	Waste from agricultural activities (including manure and crop residue).	

TABLE 5.4
MAJOR ORGANIC REPROCESSORS IN VICTORIA

Material	WRR region	Company name	Location
Food waste	Metropolitan	Organic Environmental Solutions	Dandenong South
		Peerless Holdings	Braybrook
	Goulburn Valley	Resource Resolution	Girgarre
	Grampians Central West	Castlegate James	Ballarat
	Loddon Mallee	Scatoplus	Newbridge
Garden organics	Metropolitan	Enviromix	Dingley
		Mornington Peninsula Shire Council	Fingal
		Mornington Peninsula Shire Council	Tyabb
		Natural Recovery Systems	Dandenong
		Pinegro	Deer Park
		SITA	Epping
		TPI	Dingley
	Barwon South West	Bellarine Trees	Geelong
		Camperdown Compost	Camperdown
		Corangamite Regional Landfill Composting	Camperdown
		Statewide (Austral Group)	Warrnambool
	Goulburn Valley	Biomix	Stanhope
		Corio Waste (Western Composting)	Shepparton
	Grampians Central West	Calleja Transport (Maddingley Brown Coal)	Bacchus Marsh
	North East	Greenchip	Wodonga
Mixed organics	Metropolitan	Veolia	Bulla
	Gippsland	Gippsland Water's Soil and Organics Recycling Facility	Dutson Downs
		Pinegro	Morwell
Other organics	Loddon Mallee	Rivcow	Charlton
Timber	Metropolitan	Bark King	Montrose
		Mossrock	Epping
		Plain Pallet Sales	Braeside
		Spotswood Holdings	Yarra Glen
		Urban Timber	Brooklyn
		Waste Converters	Dandenong South
	North East	D& R Hendersons	Benalla

Recovery of organic waste increased from 651,000 tonnes in 2001–02 to 978,000 tonnes in 2011–12. The amount of organic waste recovered increased at an average rate of 32,700 tonnes per year during that period, with significant annual variations due in part to the influence of climatic conditions on the generation of garden organics (which dominate organic waste recovery).

For a breakdown of organic materials generated, recovered and landfilled in 2011–12, refer to Table 5.2 at the start of this chapter.

Organic reprocessing covers a range of activities including composting, mulching, salvage (of timber) and resale. Most of the major organic reprocessors are in Melbourne. Table 5.4 lists the major organic reprocessors in Victoria by material and waste and resource recovery region (WRR region). Maps of the locations of the major organic reprocessors can be found on the SV website at **www.sustainability.vic.gov.au**

The putrescible nature of organic materials requires amendment protocols to ensure risks to the community, environment and public health are managed appropriately for each of the streams. We need to consider the following when exploring reprocessing opportunities:

- The movement of organic materials, in particular food and garden waste, can cause biosecurity issues related to the spreads of contaminants, weeds, plant viruses and pathogens.
- Reprocessing options need to be supported by efficient and cost effective collection systems that manage the potential community, environment and public health impacts.
- To be viable, material reprocessing needs consistent tonnes of low contaminated feedstocks. The tonnes required depend on the type and scale of technology being used.
- Contamination of feedstock affects the ability to reprocess and the quality of the end product. Upstream source separation needs to be well managed.
- Reprocessing facilities must be located on sites with appropriate buffers and zoning. They must be designed, operated and managed to meet EPA regulatory requirements, land use planning requirements and community expectations.
- Recovery and reprocessing should only be considered when there is a market for the end product and better community, environment and public health impacts can be achieved.

Food waste

Increasing recovery of food waste is important for the following reasons:

- Food waste is highly putrescible in nature and can cause community, environment and public health risks in landfill.
- Food waste contains nutrients and energy value which is lost when disposed of at landfill.

It also highlights that the composition of food waste is different to garden waste and the processing options may be different to those available for garden waste.

Current data relating to food waste is limited for both tonnes generated and recovered. Small amounts of food waste are being combined with garden organics for composting. Some streams from C&I sources are used as feedstock for livestock.

Table 5.5 explores some of the high level opportunities to increase recovery of food waste in the next five to 10 years. As discussed previously, this will be examined in more detail in the VORRS.

A significant amount of food is wasted in the period after manufacturing and before it reaches the consumer, due to damage during distribution and retail and by being past its due date or best before date. Facilities including Castlegate James in Ballarat turn some meat-free streams into feedstock additives.

Some food waste is recovered for human consumption if suitable (e.g. by Second Bite and FareShare) but the tonnages are very small.

TABLE 5.5
POTENTIAL OPPORTUNITIES AND INHIBITORS TO INCREASE RECOVERY OF FOOD WASTE

Potential opportunities	Potential inhibitors
- Use food waste streams with low levels of contamination, particularly from commercial sources, as base loads to produce energy, refuse derived fuels and other related products. - Appropriate technologies and viability needs to be determined on a case-by-case basis as the economics are influenced by contamination levels, the cost of transporting feedstock, commodity value and market demand for products.	- While technology is proven overseas it is not yet proven on a large scale in Victoria. - Collection systems need to be established that manage potential community, environment and public health impacts. - Feedstock contamination can cause issues in both the operation of reprocessing technology and the quality of end products.
- Process food waste with low contamination — particularly from commercial sources with sewage sludge — at wastewater treatment plants. - Several Victorian water authorities are currently exploring anaerobic digestion processes that will treat combined sewage sludge and food waste to produce energy and an organic output that with further processing can be used as a soil conditioning product.	- While technology is proven overseas it is not yet proven on a large scale in Victoria. - Collection systems need to be established that manage potential community, environment and public health impacts. - Feedstock contamination can cause issues in both the operation of reprocessing technology and the quality of end products.
- Recover the energy component from residual MSW streams prior to disposal to a BPEM landfill.	- While this is occurring overseas further industry research is required to identify appropriate technology for the Victorian context. - Contamination can cause serious issues with the functionality of technology.
- Encourage household, community and community-driven composting schemes at the local level. They may not provide large volume solutions but they can have additional lifestyle and community development benefits.	- Ongoing support to maintain community interest. - Systems in place to ensure risks to community, environment and public health are minimised and managed.

Garden organics

Recovery of garden organics accounts for about half of all reprocessed organics material in Victoria. In 2011–12 around 500,000 tonnes or 66% of garden organics was recovered for reprocessing in Victoria. Of this, 451,000 tonnes[21] was collected through municipal collection services.[22]

Composting is likely to remain the most viable option for reprocessing garden organics for some time. However, composting can potentially affect the amenity of surrounding land uses particularly through the generation of odour. Facilities must use best practice technology and land use planning protection buffers around existing and potential locations for organics processing facilities. Support mechanisms include:

- Local governments identifying and protecting current and potential future sites through planning schemes where appropriate.
- Co-location of organics facilities with compatible activities including landfills and waste water facilities where appropriate.
- Encouraging compatible land uses to provide feedstock or use the products produced from the organics processing facilities.

Another significant barrier to effective composting is contamination of feedstocks which affects the quality of the end product. Any composting activity needs to be supported by upstream education programs to improve source separation and contamination rates.

Table 5.6 explores some of the high level opportunities to increase recovery of garden waste in the next five to 10 years. As discussed, this will be examined in more detail in the VORRS.

Strong market demand for the products made from reprocessed garden organics is critical to achieving increased recovery. Barriers to building this market include contamination of the end product, consistency of nutrient levels and surety of supply and cost. The *Victorian Market Development Strategy for Recovered Resources* will investigate the barriers and determine the mechanisms needed to develop this market.

21 Sustainability Victoria, *Victorian Local Government Annual Survey 2011–12*, Melbourne, 2013.
22 In the draft SWRRIP, we cited that around 815,000 tonnes of garden organics were recovered for reprocessing in 2010–11. This was incorrect due to double counting and the correct figure was 422,000 tonnes.

TABLE 5.6
POTENTIAL OPPORTUNITIES AND INHIBITORS TO INCREASE RECOVERY OF GARDEN ORGANICS

Potential opportunities	Potential inhibitors
› Set up collaborative procurements between local governments for reprocessing solutions for kerbside collected garden organics as demonstrated by the successful procurements facilitated by the Metropolitan WRRG.	› Complexities around establishing procurements with multiple partners. › Potential biosecurity risks if materials need to be transported to achieve aggregation. › Market demand for end products.
› Diversify feedstocks for composting. With appropriate management, material streams including food organics, biosolids and some liquids can be successfully combined with garden organics for composting. In most situations this will require advanced composting technologies to ensure management protocols can be met.	› Management protocols need to be rigorously maintained to ensure impacts to the community, environment and public health are minimised and facilities are operated to meet best practice, regulatory requirements and community expectations. › High cost of advanced composting technologies compared to conventional windrow composting and landfill. › Mechanisms are required to control upstream contamination which affects ability to compost and quality of end products.
› Compost garden organics on farms to produce soil enhancers to supplement or replace fertilizer use. If managed properly, this can provide local solutions in regional areas although higher value options should be explored first and source separated material streams with very low contamination need to be available. › Contamination levels in municipal garden waste are generally too high to be suitable for on-farm composting. › On-farm composting may require a planning permit and EPA works approval and licence depending on the size of the operation. Mechanisms need to be established to ensure EPA regulations are met and to prevent substandard practices impacting on the viability of properly managed operations.	› Strict processes must be in place to ensure the control of adverse community, environment, and public health impacts including adequate environmental motoring. › Farmers require access to supportive composting expertise and ongoing education programs. › Contamination is a major problem causing environmental impact and inferior product quality largely due to poor sorting before materials arrive at the farm. It requires investment in infrastructure and better sorting to reduce source material contamination.

Wood and timber

Around 112,000 tonnes of timber was recovered for reprocessing in 2011–12. This represents only 27% of the estimated timber waste generation.

Most untreated timber is chipped for particle board manufacture, mulch or woodchips, or shredded for animal bedding. There are some localised markets for high quality recycled timber such as hardwood flooring and structural timber. However, recovery is generally only considered viable when large tonnes are available e.g. when a warehouse, rather than a residential house, is demolished.

The traditional markets for timber waste are mulch for the home garden, landscaping and large road projects. Road projects are the larger market for recovered timber, but it is also prone to boom-bust cycles. Mulch is a mature market with some growth opportunities, potentially not enough, however, to increase timber recovery to the desired level.

In 2011–12 an estimated 113,000 tonnes of wood and timber waste consisted of timber treated with preservation chemicals.[23] These chemicals can cause issues in both reprocessing and in the use of end products. As a result, significant tonnes of untreated timber are landfilled.

Safely reprocessing treated timber to ensure it poses no community, environment and public health risks is expensive and not currently commercially viable. As a result all treated timber goes to landfill.

Increasing the recovery of timber relies on improving source separation and collection services. Table 5.7 lists some of the potential opportunities and inhibitors to increasing recovery of timber waste. This will be explored further in the *Victorian Market Development Strategy for Recovered Resources*.

Increasing organics recovery

As discussed, increasing the recovery of organics has multiple benefits including minimising impacts to the community, environment and public health and contributing to the Victorian economy. The mechanisms to facilitate increased recovery will vary depending on the type of organic material, technology required for recovery and reprocessing and the desired outcome.

A major gap is the ability of the industry to collect and sort organic streams to provide reprocessors with access to reliable and consistent quality feedstocks. Investment in the infrastructure that will be required to improve this can be supported by mechanisms such as local government procurement clusters. These clusters have the potential to generate large tonnages that are attractive to industry investment supported by kerbside collections of a number of local governments. The Metropolitan WRRG has already successfully carried out several joint procurements for organics collected through kerbside systems.

Energy capture

The capture of energy from organics in Victoria's waste streams can provide improved outcomes for the community, environment and public health, in particular, reducing greenhouse gases. Whilst best practise landfill management requires landfills to have gas capture, dedicated energy from waste plants have much higher recovery rates than gas capture at landfills.

The recovery industry cites a number of reasons that currently limit investment in energy from waste infrastructure. These include lack of access to reliable feedstocks of sufficient quantity and quality to support a viable business case, lack of demand for the energy products produced and difficulty in securing agreements with power companies to access the electricity grid.

23 Sustainability Victoria, *Emerging Materials Market Analysis*, prepared by Hyder Consulting, May 2014.

TABLE 5.7
POTENTIAL OPPORTUNITIES AND INHIBITORS TO INCREASE RECOVERY OF TIMBER WASTE

Potential opportunities	Potential inhibitors
› Shred and process recovered untreated timber into briquettes, pellets or a dry woodchip for use as a fuel source for domestic heating and in industrial processes.	› Infrastructure needs to be established to support source separation and collection and diversion of timber from landfill at transfer stations, resource recovery centres and landfill sites.
› Use untreated timber to fuel energy from waste processes that extract a highly combustible synthetic gas (syngas) as well as heat. › Further investigation is required to translate international examples into the Victorian context to demonstrate a positive business case.	› Sourcing the required tonnes of quality feedstocks to underpin viable recovery is problematic due to the lack of collection and sorting systems. › Due to the potential generation of emissions, protocols are required to ensure facilities and operations meet regulatory requirements.
› Capture tonnes of materials from C&D and C&I waste streams by improving source separation, collection service provision and sorting infrastructure to make tonnes of quality feedstock available for reprocessing.	› To reduce the impact of transport costs on the return on investment, shredding prior to transport is generally required. › Comprehensive education and supportive infrastructure is required to improve source separation particularly at C&D sites.

5.3.2 Paper, cardboard, glass and plastics (commingled recyclables)

Table 5.2 at the start of this chapter shows the tonnages of commingled paper, glass and plastic waste generated, recovered and landfilled and the percentage recovered in 2010–11.

A total of 63% of these materials are generated from the C&I sector and 33% from the MSW sector. Paper, cardboard, glass and plastics are grouped together primarily because they are collected from the MSW sector through the commingled kerbside collection system and separated at MRFs, which influences the way data is managed.

Material streams from the C&I sector are more likely to be source separated at the point of generation, where the business producing the waste separates it into a dedicated bin for collection. Some materials are collected as a mixed recyclable stream which is then sorted in a similar way by the MRFs used for household commingled recyclables.

Paper and cardboard

Overall, recovery of cardboard and paper is good and sits at 78% across Victoria. There was a 31% increase in recovery in 2011–12 compared to the previous year largely driven by increased amounts exported overseas to meet demand from China and in response to an increased global paper price.

Melbourne is the major reprocessing hub for paper and cardboard. The majority of the material collected in Victoria is transported to Melbourne for processing or export. Paper fibre is a sufficiently valuable commodity and recovered paper and cardboard can be economically transported over considerable distances.

Table 5.8 shows the major paper and cardboard reprocessing facilities in Victoria.

The main categories of paper and cardboard recovered for reprocessing in Victoria are cardboard and paper used for packaging (boxes), newspapers, magazines, and printing and writing paper.

Table 5.9 outlines the major opportunities to increase recovery of paper and cardboard.

TABLE 5.8
MAJOR PAPER AND CARDBOARD REPROCESSORS IN VICTORIA

WRRG region	Company name	Suburb
Metropolitan	Huhtamaki	Preston
	Visy Paper	Clayton
North East	Visy Board	Wodonga

TABLE 5.9
POTENTIAL OPPORTUNITIES TO INCREASE PAPER AND CARDBOARD RECOVERY

Potential opportunities
› Improve ability to separate from commingled recyclable streams by improving sorting capacity of infrastructure at MRFs.
› Build capacity of MRFs to separate paper and cardboard from C&I sector streams.
› Reduce contamination by educating waste generators and providing signage and bins.

Glass

Most of the glass (71%) recovered for reprocessing in 2011–12 was from glass containers. Around 70% of this was collected through municipal kerbside systems.

Kerbside collected glass is generally a mix of cullet (broken glass) and fines (small pieces of glass). It is sorted by colour and size through a process called beneficiation to produce the cullet required for reprocessing into glass containers. Colour separation is critical for feedstocks for container glass production.

Glass fines, including those too small to be effectively colour separated in the beneficiation process, are used to generate products to replace sand in asphalt production, concrete or trench and pipe embedment, glass wool insulation and non-slip surfaces. There are currently large stockpiles of glass fines in metropolitan Melbourne. Developing viable options to use these tonnes is a priority.

Sheet and laminated glass accounted for around 9% of the glass recovered in 2011–12 and is mainly from windscreens, broken windows and offcuts from the manufacture of glass products. This is likely to reach reprocessors in larger pieces and can be easier to sort. The lamination process however reduces the ability to reprocess the glass.

Melbourne is the glass reprocessing hub for Victoria. Table 5.10 shows the major glass reprocessors in Victoria.

Container glass is collected throughout Victoria and transported to Melbourne for reprocessing. The current price for mixed glass makes transporting glass waste from the furthest parts of the state to Melbourne a marginal proposition, and local markets for crushed glass products are emerging. It is also likely that some glass containers from western Victoria are going to South Australia to claim the redeemable container deposit, but there is no evidence that it is happening in significant tonnages.

Reprocessing of glass in Victoria for containers largely depends on the ability of Owens Illinois Glass to take colour sorted glass as feedstock to manufacture new container glass. For this reason, Owens Illinois Glass is identified as a site of state importance to the waste and resource recovery system. If it could no longer accept recovered glass, then significant tonnes would either be stockpiled, landfilled or exported interstate or overseas if the commodity value allowed.

Table 5.11 outlines the major opportunities and inhibitors to increase recovery of glass in Victoria.

TABLE 5.10
MAJOR GLASS REPROCESSORS IN VICTORIA

WRR region	Company name	Suburb	Service
Metropolitan	Owens Illinois Glass	Spotswood	Manufactures container glass using a portion of recovered glass
	Potters Australia	Laverton	Produce a sand replacement product
	SKM	Coolaroo	Glass beneficiation
	Visy Glass	Laverton	Glass beneficiation

TABLE 5.11
POTENTIAL OPPORTUNITIES AND INHIBITORS TO INCREASE RECOVERY OF GLASS

Potential opportunities	Potential inhibitors
› Invest in new colour sorting technologies that can sort down to smaller sizes and reduce the generation of fines. › Agree on specifications with container glass manufacturers and invest in required infrastructure so that fines and glass sand can be used as feedstock for manufacturing new glass. › Expand markets for glass sand products. These markets could potentially create opportunities for regional glass reprocessing hubs.	› Commingled kerbside recyclable collection leads to excessive glass breakage which is exacerbated by compaction and increased lightweight glass packaging. › The cost of new technologies to improve beneficiation versus the cost of the commodity value for glass. › Minimal collection systems for the C&D sector and insufficient collection systems for the C&I sector. › Contamination levels require education and supporting infrastructure to improve source separation.

Plastics

Victoria is home to about half of Australia's plastics reprocessors and recycles a significant proportion of Australia's recovered plastics. The Plastics and Chemical Industries Association (PACIA) identified 37 plastic reprocessors in Victoria, 35 of which are in metropolitan Melbourne, making it the major reprocessing hub for plastics in Victoria.

While the amount of plastics recovered has increased from 92,000 tonnes in 2001–02 to 149,000 tonnes in 2011–12 it still only accounts for 26% of the plastic waste generated. Most of this plastic, (95%) came from the MSW and C&I sectors, in the form of plastic containers (types 1–7) and packaging film plastics. Around 90,000 tonnes or 60% of this was exported for reprocessing. The rest is mostly sorted, shredded, chipped and turned into a range of plastic products.

Table 5.12 outlines potential opportunities to increase the recovery of plastics. Increasing recovery will require the infrastructure to support collection, sorting and reprocessing of additional tonnes. Compacting to decrease material volume is likely to be required to reduce the impact of transport costs on the return on investment.

TABLE 5.12
POTENTIAL OPPORTUNITIES TO INCREASE RECOVERY OF PLASTICS

Opportunities
› Invest in the infrastructure required to collect, sort and reprocess tonnes of: – rigid plastics recovered from renovations, refurbishment and demolition of residential and commercial buildings – flexible plastics used for consumer packaging and in logistics.
› Take advantage of their high calorific value and use plastics as feedstock for refuse derived fuels or energy plants, particularly where contamination and size of plastic pieces makes sorting difficult, including residual waste streams. Industry research would help identify commercially viable options.
› Recover energy from shredder flock; the mix of plastics, glass and rubber left over from reprocessing cars and white goods. Around 150,000–200,000[23] tonnes of shredder flock is generated every year and is a significant component of the tonnes landfilled by the C&I sector. Further research into viable technologies in the Australian context is required.
› Increase recovery of film plastics by developing processes to enable the effective collection and consolidation of tonnages to support viable reprocessing options. Film plastics in general, and agricultural film in particular, are increasing in use and tonnes are expected to grow significantly in the next five years. Contamination is an issue particularly from soil and organic materials.

24 Sustainability Victoria, *Emerging Materials Market Analysis*, prepared by Hyder Consulting, May 2014.

5.3.3 Tyres and rubber

According to the *Victorian Local Government Annual Survey 2011–12*, Victoria recovered 49,000 tonnes of tyres and rubber in 2011–12, as detailed in Table 5.2 at the start of this chapter. However, this only represents the amount of materials entering reprocessing facilities. A recent report commissioned by SV estimated that approximately 88,000 tonnes of end of life tyres were produced in Victoria in 2013 of which 20% was recycled, 26% exported and 54% stockpiled or illegally dumped.[25]

Table 5.13 lists the major tyre reprocessors in Victoria. Metropolitan Melbourne is the major tyre and rubber reprocessing hub in Victoria.

In Victoria, whole tyres are not allowed in landfills. Current processing includes shredding to recover the metal and rubber which is used to make soft surfaces (such as playground surfaces) or exported for recycling overseas.

The report also estimated that in Victoria 20% of whole tyres are reprocessed, 26% are exported overseas and 54% are stockpiled or the destination is unknown. This suggests about 47,000 tonnes a year of tyres are unaccounted for and likely stockpiled or exported. The Victorian Government environment portfolio is taking an integrated approach to addressing the problems of waste tyre management. EPA is seeking to establish regulations to manage the fire risk from inappropriate storage of end-of-life tyres via a Regulatory Impact Statement, while SV is working on current and potential markets.

5.3.4 Metals

In 2011–12, 1,470,000 tonnes of metals were recovered in Victoria. This was around 95% of the 1,540,000 tonnes generated. Metals reprocessing is driven by the international commodity value and the value of the Australian dollar. Industry has invested in the recovery infrastructure needed to keep pace with the growth in generation of waste metals. This is expected to continue for the foreseeable future, due to the high commodity value of ferrous and non-ferrous metals.

Metals reprocessing facilities in Victoria receive metals in many forms e.g. aluminium cans, batteries, car bodies, steel cans and lead pipes. Reprocessing ranges from simply crushing and baling for export, to shredding and blending into end products such as alloys and ingots.

Table 5.14 shows the major metal reprocessors in Victoria. Laverton North in Melbourne is the only metals reprocessing hub in Victoria.

The metals reprocessing sector is a significant contributor of C&I waste to landfill due to all the non-metal components sent for shredding, such as plastics, glass and rubber from end-of-life items such as cars and white goods. This material is known as shredder flock, an estimated 140,000 tonnes of which is generated each year.

TABLE 5.13
MAJOR TYRE AND RUBBER REPROCESSORS IN VICTORIA

WRR region	Company name	Suburb
Metropolitan	C&N Ruggiero	Footscray
	Flexitec	Oakleigh South
	GP Embelton	Coburg
	Tyre Crumb	Broadmeadows
	Tyrecycle	Somerton
Gippsland	Rubber Trough	Warragul

TABLE 5.14
MAJOR METAL REPROCESSORS IN VICTORIA

WRR region	Company name	Suburb
Metropolitan	Norstar Steel Recyclers	Laverton North
	OneSteel	Laverton North
	Sims Aluminium	Laverton North
	Sims Australian Refined Alloys	Laverton North
	Sims Metal	Laverton North

25 Sustainability Victoria, *Emerging Materials Market Analysis*, prepared by Hyder Consulting, May 2014.

5.3.5 Concrete, brick and asphalt

In 2011–12, 3,502,000 tonnes of concrete, bricks and asphalt were recovered in Victoria which is around 79% of the 4,415,000 tonnes generated. While the percentage recovered remained around the same compared to 2010–11 the volume recovered decreased by 692,000. There was a corresponding decrease in the amount generated. This is most likely directly attributable to reduced construction activity.

Facilities that reprocess concrete, brick and asphalt in Victoria mostly crush and screen it to produce recycled aggregate materials which are then blended for end uses such as road base. Plasterboard is a related material that is also collected. It can be crushed to create more plasterboard, or sold to the agricultural sector as a soil conditioner.

Current recovery focuses on commercial demolition. Metal reinforcing used in concrete is also recovered during the crushing process and improves the financial viability of concrete recycling operations. Over the past decade, the industry has written specifications for its recycled aggregates, which VicRoads have adopted for using recycled aggregates as road base in major road construction projects. The industry has also developed and implemented inspection protocols and systems to minimise asbestos contamination of C&D waste sent for recycling.

Table 5.15 shows the major concrete, brick and related materials reprocessors in Victoria. These reprocessors are distributed across the state.

Concrete, brick and asphalt reprocessing is a high volume, low margin business that faces competition from virgin quarry materials. It is probable that recovery rates of these very heavy materials have probably increased in tandem with increases to the landfill levy. The industry has invested significantly in reprocessing capacity over the past decade with all the major reprocessors investing in new facilities at existing and new sites.

As Melbourne's population grows, especially in the south east (Cardinia and Casey) and north and west (Whittlesea, Hume, Melton and Wyndham), there is likely to be demand for further infrastructure investment.

In regional Victoria, the major population centres have reasonable infrastructure for processing concrete, brick and related materials, although some challenges remain:

- The Ballarat region has large stockpiles of unprocessed materials which may be partly due to the lack of a strong market for recycled aggregate products.
- The Gippsland region needs further investment in recycling infrastructure, particularly in Latrobe.
- Regional Victoria needs further facilities to collect and stockpile concrete with periodic processing by mobile crushing and screening equipment. These facilities will only be viable if they can identify and manage asbestos contaminated material, especially from residential demolition and renovation projects.

TABLE 5.15
MAJOR CONCRETE, BRICK OR ASPHALT REPROCESSORS IN VICTORIA

WRR Region	Company	Location
Metropolitan	Alex Fraser Group	Epping
	Alex Fraser Group	Clarinda
	Alex Fraser Group	Laverton North
	Barro Group	North Sunshine
	Boral Limited	Deer Park
	Boral Limited	Port Melbourne
	Boral Limited	Somerton
	City Circle Demolition Pty Ltd	Brooklyn
	City Circle Demolition Pty Ltd	Dandenong
	Citywide Service Solutions Pty Ltd	Campbellfield
	Delta Group	Sunshine
	Ecobricks	Clayton
	SITA	Hampton Park
	Sunshine Groupe	Brooklyn
	Waste Converters	Dandenong
Barwon South West	Central Recyclers	Lara
	Local Mix	Geelong
	Regional Recycle	Geelong
Gippsland	Gippsland Concrete Recycling	Traralgon
Grampians Central West	ChrisBev	Ballarat
	KKC Recycling (Light weight construction and demolition)	Ballarat
Loddon Mallee	Allstone Quarries	Eaglehawk
	Hopley Demolition	Bendigo
North East	Mansfield Construction	Mansfield
	Trevor Jackson	Wodonga

5.3.6 E-waste

E-waste comprises of electronic equipment with a plug or battery that requires a current to operate that has reached its end of life. It includes televisions, computers, monitors and whitegoods such as fridges and washing machines.

The Victorian Government is currently investigating mechanisms to ban e-waste from landfills because:

- The amount of e-waste being generated is growing in line with our increased use of electronic equipment, shorter lifespan of products and rapid technological change. It is estimated that just for televisions and computers the tonnes generated in Australia will grow from around 138,000 tonnes in 2012–13 to 223,000 tonnes in 2023–24. This could put significant pressure on waste management infrastructure.
- E-waste contains materials that if not managed properly can pose risks to the community, environment and public health.
- Even though e-waste does contain valuable resources the economic business case for recovery is not currently viable.

To complement the ban on e-waste from landfills, there will need to be a coordinated approach to develop a sustainable industry for the recovery of e-waste materials with commodity. This can be achieved by:

- Exploring options to create certainty for the recycling industry through regulatory controls such as a landfill ban on e-waste.
- Support for the industry to establish effective collection and consolidation systems.
- Support for the industry to develop the capacity to separate and sort component materials to provide the feedstocks required by the reprocessing industry.
- Developing a market for the recovered materials to ensure stockpiling does not occur.
- Promoting understanding of the issues within the community.

Currently recycling of e-waste in Victoria (and nationally) is centred on televisions and computers. Victoria supports the National Television and Computer Recycling Scheme. This is the first co-regulatory product stewardship scheme established under the *National Product Stewardship Act 2011*. It requires the television and computer industries to fund collection and recycling of a proportion of the televisions and computers disposed of in Australia each year. Further information on the scheme can be found at **www.environment.gov.au/protection/national-waste-policy/television-and-computer-recycling-scheme**

Since the scheme began in 2012 an estimated 20,000 tonnes of material has been collected in Victoria. Supporting this, 229 collection points were established across the state. It should be noted that it is a requirement for participation in the national scheme, that collection facilities must meet certain standards to ensure safe handling of material. This includes protecting materials from weather and employing effective occupational health and safety measures. The Victorian Government provided assistance to industry and local government to meet these standards.

6. Local and regional planning for an integrated statewide system

The Statewide Waste and Resource Recovery Infrastructure Plan (SWRRIP) provides a framework to support an integrated statewide infrastructure system that effectively manages Victoria's waste and resource recovery streams. Establishing this system requires integration and alignment of planning objectives at the local level with objectives at regional and state levels.

The waste and resource recovery groups (WRRGs) and local governments are responsible for most regional and local planning. WRRGs develop regional waste and resource recovery implementation plans (RWRRIPs) and local governments plan for municipal waste management at the local level.

The SWRRIP sets out high level strategic directions to be considered whenever planning for waste and resource recovery infrastructure in Victoria as shown in Figure 1.1. The WRRGs will integrate SWRRIP strategic directions into planning decisions at the local and regional levels by working with local governments to develop the RWRRIP for their region. The RWRRIPs will set out how the waste and resource infrastructure needs for the region will be met over the next 10 years.

6.1 Infrastructure planning by local government

In 2011–12, approximately 3,321,000 tonnes of waste and material streams were managed through local government contracts and services.[26] The infrastructure supporting this is a combination of local government and private sector investment. Land-use planning needs to ensure that this system continues and enhances the ability to minimise long term community, environment and public health impacts while maximising economic return to the community.

Local governments can contribute to this by working with relevant stakeholders to effectively involve the community in waste and resource recovery planning and in the process educate the community on the essential nature of waste and resource recovery services. Approaches to do this include:

- Engaging the community to determine the priorities and options for waste and resource recovery services over the next 30 years to inform the development of the RWRRIPs.
- Working with relevant WRRG and other local governments to develop their regional RWRRIP, including identifying regional and local community priorities and aligning with the SWRRIP strategic directions.
- Developing local policies and guidelines to support their RWRRIP and incorporate the SWRRIP strategic directions including:
  - waste and resource recovery management plans for their local government area
  - local land use planning that makes suitable land available for waste and resource recovery activities and preserve community amenity.
- Participating in collaborative procurements for waste and resource recovery services that aggregate and consolidate municipal solid waste (MSW) tonnes under local government contracts. This will work towards achieving tonnes of material streams that support viable reprocessing or best practice management options.
- Basing all decisions related to waste and resource recovery planning on evidence that identifies the long term economic, community, environment and public health impacts over the life of the facility including rehabilitation where appropriate.

Ultimately local government is responsible for deciding how to manage material streams and residual waste collected through municipal services in their area. The SWRRIP strategic directions consider planning decisions that allow local governments to choose management options that:

- minimise long term community, environment and public health impacts
- provide the best economic outcomes for the council
- provide cost effective service delivery for the community.

26 Sustainability Victoria, *Victorian Local Government Annual Survey 2011–12*, Melbourne, 2013.

6.1.1 The hubs and spokes network

The hubs and spokes network is discussed in detail in Chapter 2.2. This approach ensures that land is suitably zoned and protected from the encroachment of incompatible land uses. It has multiple benefits to local areas including:

- protecting the community, environment and public health from adverse impacts including noise, odour and dust
- encouraging industry investment by providing greater confidence that their activities can be undertaken over the life of the investment
- contributing to the local economy by encouraging development of hubs of compatible industries that supplement waste and resource recovery activities by providing feedstocks or using services and materials made from recovered streams.

Victoria's waste and material streams already move around the state to where they can be most economically managed or reprocessed. It is likely that this will increase to facilitate aggregating and consolidating sufficient tonnes to support increased resource recovery and best practice management of residual waste.

The hubs and spokes network is made up of a cascading series of hubs supported by the spokes that move materials to where they will be ultimately recovered or managed.

This network consists of the following components:

- **Local hubs** are the first point of consolidation and local recovery for the community. They are likely to include transfer stations, resource recovery centres and resale shops. Due to the increasing cost of operating, managing and rehabilitating best practice landfills, over time local hubs are unlikely to include landfills. They will probably include the ability to pre-sort and consolidate local residual waste streams prior to transport for recovery or landfill.
- **Regional hubs** service both their local area and their region. They receive material streams from surrounding local hubs and their local area. They most likely include a higher order of infrastructure and include one or more facilities undertaking sorting and/or recovery and possibly reprocessing. Regional landfill hubs undertake pre-sorting and some recovery before best practice residual waste management.
- **State hubs** provide a service to the local area, region and state. They receive consolidated material streams from both local and regional hubs and undertake higher order recovery, reprocessing or management. They can be made up of one facility or a number of facilities that support each other.

It is important that local governments are aware of the hubs in their area and the role they play in the waste and resource recovery system including their contribution to the local economy and service provision. Community concerns and sentiment can impact on the viability of a hub. Local government has an important role to play to work with the owners and operators of facilities within hubs to engage local communities, gain their trust and acceptance of operations and involve them in the future planning for the hub.

The location of hubs and activities at hubs will change over time in response to community sentiment, commodity values and the closure of surrounding facilities such as landfills and manufacturing plants that provide feedstocks. It is important that local governments are aware of the hubs in their area and the role they play in the waste and resource recovery system including their contribution to the local economy and service provision.

Over the next 30 years many existing hubs will transition to non-waste and resource recovery related activities, some may expand and others will form. Optimising the location of hubs to where they provide the best opportunity to minimise impacts on the community, environment and public health and maximise resource recovery, provides a number of benefits including contributing to the local and state economy and supporting a sustainable resource recovery industry.

The SWRRIP identifies existing hubs of state importance and those of regional importance where significant cross regional flows may occur. Any impact on the functionality of these sites is likely to affect the waste and resource recovery system at the state level, which needs to be recognised when making local and regional planning decisions.

When developing the RWRRIPs, local governments and WRRGs will identify additional hubs of regional importance and those of local importance within their regions. Local governments and their WRRGs will need to consider the following:

- What activities currently occur at the hub?
- What are the community expectations around the future of the hub?
- What are the implications of reducing or ceasing activities at the hub? How would this affect provision of cost effective services to the local community and the state? How would this affect the material streams currently being managed or recovered at the hub? What would the costs be to the local community and the state?
- Should the hub be expanded or transitioned to other waste and resource recovery activities more compatible with community expectations or even to completely different land uses?
- What are the implications of expanding the hub? What are the potential economic benefits? What are the possible impacts to the community, environment or public health? Does the site have the appropriate buffers to provide long term viability?
- Is it appropriate to preserve the site in planning schemes for the long term and what is the process to achieve this?
- What value does the hub currently provide and what is the predicted value in the future?

It should be noted that the hub discussion in the SWRRIP only applies to existing hubs and does not consider whether hubs or the activities therein, have the ability to meet regulatory requirements and community expectations. These also need to be considered when planning for the future of these sites.

Table 6.1 outlines the criteria used to identify what role a hub plays in the waste and resource recovery system. It guides where the appropriate level of planning for future activities undertaken at each hub should occur e.g. at the state, regional or local level. If the hub is considered to be of state importance then planning decisions will have implications for the statewide system. Correspondingly, decisions about hubs of regional importance will affect the region and hubs of local importance will affect local communities.

These criteria are not definitive and should be applied as a 'best fit' guide to trigger thinking around future planning. An individual hub does not need to meet all criteria or functions. As previously discussed a hub may represent a precinct, an individual site or a facility.

TABLE 6.1
CASCADING CRITERIA FOR WASTE AND RESOURCE RECOVERY HUBS

Level	Criteria
State importance	› The hub manages or processes a significant proportion of one or more material streams for the state. › The type of materials managed or reprocessed at the hub are of economic value to the state's economy, or pose a significant risk to the community, environment and public health if not recovered. › It is an existing hub with established spokes for one or more materials. It is an integral component of the supply andor processing chain across multiple regions or the state. If the functionality of the hub was compromised, it would put pressure on the viability of upstream or downstream industries. › The hub has access to generators, market, port or other transport infrastructure. › The hub is in a location compatible with waste management and resource recovery activities, and has capacity for future waste management and resource recovery activities.
Regional importance	› The hub manages or processes a significant proportion of one or more material streams for the waste and resource recovery region or adjacent regions. › The type of materials managed or reprocessed at the site are of economic value to the region or adjacent regions, or pose a significant risk to the community, environment and public health if not recovered. › It is an existing hub with established spokes for one or more materials. If the functionality of the site was compromised it would put pressure on the viability of upstream and downstream industries within the region. › The hub is in a location compatible with waste management and resource recovery activities and has capacity for future waste management and resource recovery activities. › The hub enables the aggregation or consolidation of material streams from within the region or adjacent regions prior to transport to a regional hub for reprocessing or disposal. › The hub may facilitate some reprocessing within the region or within close proximity.
Local importance	› The hub manages or processes a significant proportion of one or more material streams for the local community. › The hub is an integral component of the local infrastructure. If the functionality was compromised it would reduce the ability of the local community to manage its waste streams and recover resources. › The hub enables the aggregation or consolidation of material streams at the local level prior to transport to a regional or state hub for reprocessing or disposal. › The type of materials managed or reprocessed at the site might be of economic value to the local community or pose a significant risk to the community, environment and public health if not recovered.

6.2 Waste and resource recovery groups

There are seven WRRGs in Victoria who have a legislative responsibility to plan for the future needs of waste and resource recovery infrastructure within their region. Figure 6.1 shows the location of the waste and resource recovery regions.

Prior to August 2014 there was one metropolitan and 12 regional waste management groups. These groups played a pivotal role in developing the SWRRIP by providing data on their regions and input into developing the SWRRIP strategic directions. This input was critical to transitioning to the new waste and resource recovery regions (WRR regions) and will be critical to developing the RWRRIPs. Chapter 8.2 lists the local government areas in both the old waste management regions and the new WRR regions.

The WRRGs have a legislative responsibility to develop the RWRRIPs to set out how the waste and resource recovery infrastructure needs of their region will be met over a 10 year period. The RWRRIPs describe how the long term strategic directions outlined in Figure 1.1 will be implemented at the local and regional level taking into account local and regional considerations.

Development of the RWRRIPs plays a critical role in ensuring that all sectors of the waste resource recovery system are involved in infrastructure planning decisions. It is the primary mechanism to involve the community in determining the priorities and options for their local and regional communities. The WRRGs will work in partnership with their member councils to develop the appropriate mechanisms to engage and involve the community at all stages of the development of their respective RWRRIPs.

Chapter 7 provides an overview of the data collected from each waste and resource recovery region during development of the SWRRIP. WRRGs can use this data as a starting point when developing RWRRIPs to form a more comprehensive picture on the current and future infrastructure requirements for each region.

WRRGs will work closely with their local government members, community, industry, other WRRGs, EPA, and SV to develop the RWRRIPs. Once all the RWRRIPs are published the SWRRIP will be amended to incorporate and reflect the finding of the RWRRIPs.

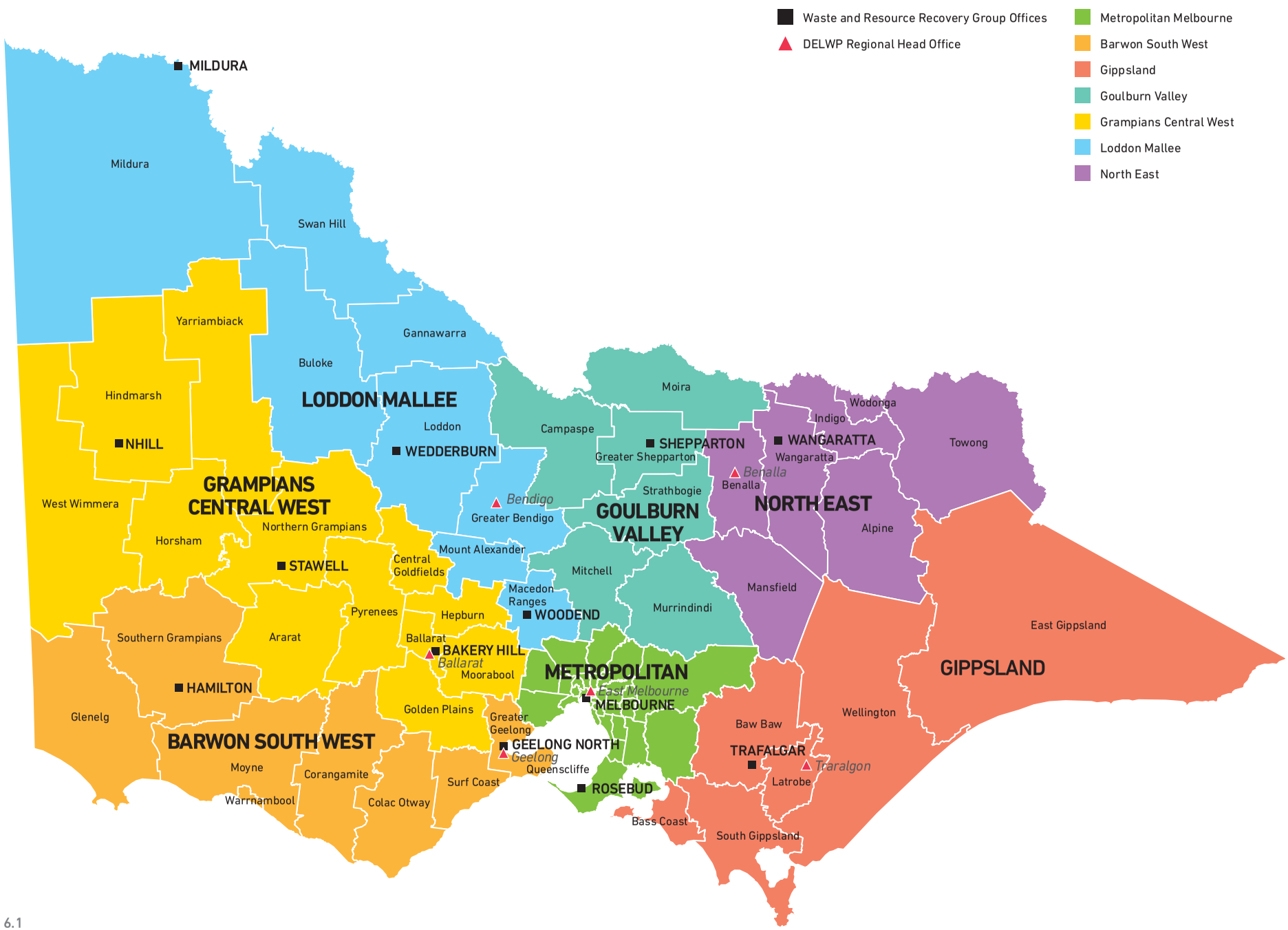


FIGURE 6.1
WASTE AND RESOURCE RECOVERY REGIONS IN VICTORIA

7. Waste and resource recovery region summaries

This chapter provides a summary of the available data on the infrastructure and material stream flows for the seven waste and resource recovery regions (WRR regions). It looks at future pressures on existing resources and potential opportunities to increase resource recovery. This data can be used to inform local planning and develop the regional waste and resource recovery implementation plans (RWRRIPs). The recommendations were identified as part of the analysis and consultation during development of the Statewide Waste and Resource Recovery Infrastructure Plan (SWRRIP).

7.1 Data considerations

The main sources of data in this chapter are the *Victorian Recycling Industries Annual Survey 2011–12* (VRIAS), the *Victorian Local Government Annual Survey 2011–12* (VLGAS), the *Victorian Waste and Resource Recovery Projection Model* (v1.1, 2013) and discussion with waste and resource recovery groups (WRRGs), local governments and industry in each region.

Data has been verified where possible but should be considered as an indication only. The data will be further refined as part of the process to develop the RWRRIPs.

The following data considerations are relevant to this chapter:

- State generation tonnes are the sum of state landfill tonnes obtained from landfill receipts and state tonnes reprocessed using VRIAS data. These tonnes should be considered as estimates.
- Regional generation tonnes are the sum of a proportion of the total state recovered tonnes (from VRIAS) based on Australian Bureau of Statistics population data for the region, and the tonnes landfilled in that region using EPA landfill data. These tonnes should be considered as modelled data.
- The estimated landfill tonnes for each region represent the tonnes deposited at landfills in that region, which also includes material flows into the region. These figures do not include any flows of residual waste out of the region. Tonnes are derived from landfill levy data supplied by EPA and do not include prescribed industrial waste (PIW). They have not been adjusted to allow for any daily cover. This accounts for discrepancies with figures quoted in other reports that can include PIW and may make allowance for daily cover.
- Tonnes reprocessed for each region represent the tonnes of materials entering the major reprocessing facilities in a particular region. They do not necessarily reflect what is generated in the region and do not equate to tonnes reprocessed, as they do not include materials that may be stockpiled within a facility or tonnes sent to landfill from a facility. They only include tonnes from reprocessors that participate in VRIAS.
- Infrastructure numbers date from June 2014.
- Anticipated closure dates for landfills are estimated based on feedback received from landfill owners, operators and WRRGs. They are indicative only and detail the potential availability of existing sites over the next 30 years. They do not reflect how much space is actually approved through works approval or other planning mechanisms. Actual closure dates will be reviewed as part of the development of the RWRRIPs and depend on many factors including the community need for landfill, planning permit requirements, EPA works approval processes and commercial decisions made by the owners of individual sites.

Further information on data sources can be found in Chapter 8.2.

7.2 Statewide overview

Table 7.1 shows the amount of waste generated and landfilled for each WRR region in 2011–12.

Waste and resource recovery facilities in Victoria

In Victoria there are 267 standalone resource recovery centres/transfer stations (RRC/TSs), 46 RRC/TSs at landfills, 18 materials recovery facilities (MRFs), 77 reprocessors, 51 licensed landfills and 32 landfills exempt from licensing. The type and numbers of infrastructure varies between regions as shown in Table 7.2.

TABLE 7.1
STATE SUMMARY OF WASTE GENERATED, RECOVERED AND LANDFILLED IN 2011–12 (TONNES)

WRR region	Generated	Recovered	Landfilled	% of state generation
Metropolitan	8,859,000	5,900,000	2,959,000	73
Barwon South West	790,000	544,000	246,000	7
Gippsland	510,000	387,000	123,000	4
Goulburn Valley	520,000	347,000	173,000	4
Grampians Central West	929,000	380,000	548,000	7
Loddon Mallee	365,000	277,000	88,000	3
North East	210,000	178,000	32,000	2
Totals	**12,182,000**	**8,014,000**	**4,168,000**	**100**

Notes:

Generation data is modelled.

Recovered data is based on tonnes entering reprocessing facilities in each region.
It does not include organic materials mulched and used locally at transfer stations and tonnages of plastics reprocessed.

Revised landfill levy data (as at June 2014) was used to determine the regional tonnages. As a result, the total volume of waste generated and landfilled is different to the figures given in earlier tables referring to material streams.

TABLE 7.2
NUMBER OF WASTE AND RESOURCE RECOVERY INFRASTRUCTURE BY WRR REGION

WRR region	RRC/TS standalone	RRC/TS at landfills	MRFs	Reprocessors	Licensed landfills	Landfills exempt from licensing	Total
Metropolitan	36	6	7	48	20	0	117
Barwon South West	38	9	2	7	7	5	68
Gippsland	50	5	3	4	7	5	74
Goulburn Valley	35	1	1	3	5	0	45
Grampians Central West	60	5	2	5	4	9	83
Loddon Mallee	29	17	2	5	5	13	71
North East	19	3	1	5	3	2	33
Totals	**267**	**46**	**18**	**77**	**51**	**32**	**491**

Note: There are an additional 39 plastic reprocessors in Victoria. This data is collected by the Plastics and Chemical Industry Association who do not participate in VRIAS.

Reprocessing facilities in Victoria

Table 7.3 lists the total number of major reprocessors by material type and by WRR region.

Landfills in Victoria

As discussed in Chapter 4.7.8, EPA require landfills to be progressively rehabilitated once landfilling operations cease. EPA have identified 88 closed landfills in Victoria that have supporting post-closure pollution abatement notices (PANs) and 135 that have closed but are yet to be issued with post-closure PANs. EPA is currently assessing closed landfills in Victoria. Table 7.4 lists the number of identified closed landfills in each WRR region.

TABLE 7.3
NUMBER OF MAJOR REPROCESSORS BY MATERIAL TYPE AND WRR REGION

WRR region	Organics	Paper, cardboard and glass	Metals	Concrete, bricks or asphalt	Tyres and rubber	Other	Total
Metropolitan	16	7	5	15	5	0	48
Barwon South West	4	0	0	3	0	0	7
Gippsland	2	0	0	1	1	0	4
Goulburn Valley	3	0	0	0	0	0	3
Grampians Central West	2	0	0	2	0	1	5
Loddon Mallee	2	0	0	2	0	1	5
North East	2	1	0	2	0	0	5
Totals	**31**	**8**	**5**	**25**	**6**	**2**	**77**

Notes:

Recovered data is based on tonnes entering reprocessing facilities in each region. It does not include organic materials mulched and used locally at transfer stations and tonnages of plastics reprocessed.

There are an additional 39 plastic reprocessors in Victoria. This data is collected by the Plastics and Chemical Industry Association who do not participate in VRIAS.

TABLE 7.4
NUMBER OF CLOSED LANDFILLS BY WRR REGION

WRR region	With supporting post-closure PANs	Requiring supporting post-closure PANs	Totals
Metropolitan	48	25	73
Barwon South West	6	21	27
Gippsland	10	21	31
Goulburn Valley	10	14	24
Grampians Central West	5	23	28
Loddon Mallee	6	23	29
North East	3	8	11
Totals	**88**	**135**	**223**

7.3 Metropolitan WRR region

Based on modelled data, an estimated 8,859,000 tonnes of wastes were generated in the metropolitan WRR region in 2011–12, representing 73% of the state total. In the same period 2,959,000 tonnes of residual waste went to landfills in the region.[27]

The region incorporates the local government areas (LGA) listed in Table 7.5.

7.3.1 Important hubs in the state system

Reflecting its large population base and close proximity to manufacturing and ports, a significant proportion of the state's waste and materials streams are managed within the metropolitan region. As a result, the Metropolitan WRR region contains a large number of existing hubs important to the waste and resource recovery system as listed in Table 7.6.

Table 2.2 in Chapter 2 describes why these sites are important to the state system. The Metropolitan RWRRIP will identify hubs of regional and local importance.

Procurement clusters

The Metropolitan WRRG has defined three outer metropolitan local government procurement clusters (with similar kerbside collection systems) and one inner metropolitan cluster (municipalities with higher population densities, where a three bin system is not practical or viable because of lower generation rates of garden organics, limited space, greater traffic flows and more congestion).

TABLE 7.5
LGAS IN THE METROPOLITAN WRR REGION

LGAs	
Banyule City Council	Maroondah City Council
Bayside City Council	Melbourne City Council
Boroondara City Council	Melton Shire Council
Brimbank City Council	Monash City Council
Cardinia Shire Council	Moonee Valley City Council
Casey City Council	Moreland City Council
Darebin City Council	Mornington Peninsula Shire Council
Frankston City Council	Nillumbik Shire Council
Glen Eira City Council	Port Phillip City Council
Greater Dandenong City Council	Stonnington City Council
Hobsons Bay City Council	Whitehorse City Council
Hume City Council	Whittlesea City Council
Kingston City Council	Wyndham City Council
Knox City Council	Yarra City Council
Manningham City Council	Yarra Ranges Shire Council
Maribyrnong City Council	

TABLE 7.6
HUBS OF STATE IMPORTANCE IN THE METROPOLITAN WRR REGION

Hub	Location
Citywide Resource Recovery Centre and Transfer Station	Dynon Road, Footscray
Cooper Street precinct	Epping
Deer Park precinct (including Boral Quarry)	Ravenhall
Hallam Road precinct	Hampton Park
Clayton/Dingley precinct	Clayton/Dingley
Laverton precinct	Laverton
Lyndhurst Landfill, Taylors Road	Lyndhurst
Ordish Road precinct	South Dandenong
Owens Illinois, glass reprocessor	Spotswood
SKM Materials Recovery Facility	Coolaroo
The Brooklyn precinct	Brooklyn
Veolia Organics facility	Bulla
Werribee Landfill	Wyndham
Wollert Hansen Quarry and Landfill	Woolert

27 Estimated tonnes landfilled do not include PIW in the SWRRIP. Figures are derived from landfill levy data supplied by EPA and there is no allowance made for daily cover.

7.3.2 Resource recovery

Number and type of facilities

There are 49 resource recovery facilities including 36 standalone RRC/TSs, six RRC/TS located at landfills and seven MRFs in the Metropolitan WRR region as shown in Table 7.7.

Materials accepted

Facilities in the Metropolitan WRR region accept commingled recyclables, garden organics, timber, concrete, bricks, metals, cork, polystyrene, white goods, textiles, mattresses, fluorescent tubes, batteries, gas bottles, household chemicals, paint, cooking oil, motor oil, car batteries, tyres, oil filters, televisions, computers, CD/DVDs, mobile phones, electrical cables and other electrical equipment.

Some facilities incorporate recycled goods shops (such as the Knox Transfer Station Recycled Goods Shop, the Darebin Resource Recovery Centre's Outlook Market and the resale shop at the Mornington Resource Recovery Centre). Materials resold include furniture, timber, bricks and building materials, clothes, toys and games, tools, collectables and bric-a-brac, books and household items.

Mornington Peninsula has three drop-off sites with hoppers for residents to leave household waste and recycling. Rye and Tyabb also collect drumMUSTER containers.

Resource recovery material flows

The SWRRIP analysis identified some significant flows of materials related to resource recovery activities in the Metropolitan WRR region including those detailed in Table 7.8. The Metropolitan RWRRIP will include further analysis of material flows.

TABLE 7.8
ESTIMATED SIGNIFICANT FLOWS OF RESOURCE RECOVERY MATERIALS IN THE METROPOLITAN WRR REGION

Material flows
80,000 tonnes a year of commingled recyclables from regional areas for processing at metropolitan MRFs.
10,000 tonnes of waste plasterboard to Western Gypsum (Grampians Central West region) for reprocessing.
5,000 tonnes of out-of-date and off-specification food waste to Castlegate James in Ballarat (Grampians Central West) for conversion to feedstock.
52,000 tonnes of organics to the Soil and Organic Recycling Facility at Dutson Downs at Longford (Gippsland region).

Future considerations

When developing the Metropolitan RWRRIP, planning for resource recovery infrastructure will need to consider the following:

- Population growth corridors in peri-urban areas need to be serviced, particularly in the Casey, Cardinia, Wyndham, Melton, Hume and Whittlesea LGAs.
- High rise and multi-unit dwellings need more options to increase resource recovery.
- The closure of landfills in the Clayton/Kingston areas and on the Mornington Peninsula has increased the need for sorting and consolidation infrastructure.
- Some materials flow from the outer metropolitan area to RRC/TSs in neighbouring WRR regions including to Kinglake, Broadford and Yea in the Goulburn Valley WRR region. While tonnage may be small, managing these flows needs to be considered when developing the relevant RWRRIPs. The Metropolitan WRRG should work with the appropriate WRRGs to determine the extent and impact of these flows.
- Significant tonnes of commingled recyclables from other WRR regions are currently separated and sorted at MRFs in the Metropolitan WRR region. The drive to increase recovery rates is likely to see investment in more sophisticated sorting and separation technologies at these facilities. As a result, the need for larger feedstock tonnes to achieve the economies of scale may make regional municipal solid waste (MSW) commingled contracts more attractive to metropolitan-based MRF operators.
- Increasing resource recovery from commercial and industrial (C&I) businesses requires improved provision of targeted collection, sorting and separation services and infrastructure.
- There is potential to increase recovery at RRC/TSs particularly the larger regionally significant RRC/TSs identified in the Metropolitan RWRRIP. Opportunities could include working with collection service providers and RRC/TS owners and operators to match collection services directly with reprocessors using sorting and separation infrastructures at the RRC/TS. These opportunities are likely to require provision of both infrastructure and support to reduce contamination and maximise production of good quality feedstock for reprocessors.

TABLE 7.7
NUMBER OF RESOURCE RECOVERY FACILITIES BY LGA IN THE METROPOLITAN WRR REGION

LGA	RRC/TS stand-alone	RRC/TS at landfill	MRFs	Total
Banyule City Council	1	0	1	2
Bayside City Council	1	0	0	1
Boroondara City Council	2	0	0	2
Brimbank City Council	2	0	0	2
Cardinia Shire Council	1	0	0	1
Casey City Council	0	1	1	2
Darebin City Council	1	0	1	2
Frankston City Council	0	0	0	0
Glen Eira City Council	0	0	0	0
Greater Dandenong City Council	1	0	2	3
Hobsons Bay City Council	0	0	0	0
Hume City Council	2	0	1	3
Kingston City Council	1	2	0	3
Knox City Council	2	0	0	2
Manningham City Council	0	0	0	0
Maribyrnong City Council	0	0	0	0
Maroondah City Council	1	0	0	1
Melbourne City Council	1	0	0	1
Melton Shire Council	1	0	0	1
Monash City Council	1	0	0	1
Moonee Valley City Council	1	0	0	1
Moreland City Council	1	0	0	1
Mornington Peninsula Shire Council	5	2	0	7
Nillumbik Shire Council	1	0	0	1
Port Phillip City Council	1	0	0	1
Stonnington City Council	1	0	0	1
Whitehorse City Council	1	0	0	1
Whittlesea City Council	2	0	0	2
Wyndham City Council	0	1	1	2
Yarra City Council	1	0	0	1
Yarra Ranges Shire Council	4	0	0	4
Totals	**36**	**6**	**7**	**49**

7.3.3 Reprocessing

An estimated 5,900,000 tonnes of recovered material entered reprocessing facilities in the Metropolitan WRR region in 2011–12.[28] The majority was reprocessed by the facilities in Table 7.9. This corresponds to over 86% (by weight) of the total materials being reprocessed in the state. It is the only hub for a number of material streams including metals and glass for bottle reprocessing.

In addition to this list there are 35 major plastic reprocessors in the metropolitan region.

7.3.4 Residual waste

Landfills in the Metropolitan WRR region received an estimated 2,959,000 tonnes of waste in 2011–12. Under a business as usual approach, this is projected to increase to about 3,818,000 tonnes in 2041–42.[29]

28 Based on VRIAS data which does not include tonnes of materials entering plastic reprocessors as the Plastics and Chemicals Industries Association do not participate in the VRIAS.

29 Estimated tonnes landfilled do not include PIW in the SWRRIP. Figures are derived from landfill levy data supplied by EPA and there is no allowance made for daily cover.

TABLE 7.9
MAJOR REPROCESSORS IN THE METROPOLITAN WRR REGION

Material	Company name	Location
Food waste	Peerless Holdings	Braybrook
	Organic Environmental Solutions	Dandenong South
Garden organics	Enviromix	Dingley
	Natural Recovery Systems	Dandenong
	SITA	Epping
	Pinegro	Deer Park
	TPI	Dingley
	Mornington Peninsula Shire Council	Fingal
	Mornington Peninsula Shire Council	Tyabb
Mixed organics	Veolia	Bulla
Timber	Bark King	Montrose
	Mossrock	Epping
	Plain Pallet Sales	Braeside
	Urban Timber	Brooklyn
	Waste Converters	Dandenong South
	Spotswood Holdings	Yarra Glen
Glass	Visy Glass	Laverton
	Potters Australia	Laverton
	Owens Illinois	Spotswood
	SKM	Coolaroo
	Colmax Glass	Dandenong
Paper and cardboard	Huhtamaki	Preston
	Visy Paper	Clayton
Metal	Norstar Steel Recyclers	Laverton North
	OneSteel	Laverton North
	Sims Aluminium	Laverton North
	Sims Australian Refined Alloys	Laverton North
	Sims Metal	Laverton North
Tyres and rubber	Tyrecycle	Somerton
	Tyre Crumb	Broadmeadows
	C&N Ruggiero	Footscray
	GP Embelton	Coburg
	Flexitec	Oakleigh South
Concrete, bricks or asphalt	Alex Fraser Group	Laverton North
	Alex Fraser Group	Clarinda
	Alex Fraser Group	Epping
	Barro Group	North Sunshine
	Boral Limited	Deer Park
	Boral Limited	Port Melbourne
	Boral Limited	Somerton
	City Circle Demolition Pty Ltd	Brooklyn
	City Circle Demolition Pty Ltd	Dandenong
	CityWide Service Solutions Pty Ltd	Campbellfield
	Delta Group	Sunshine
	Ecobricks	Clayton
	SITA	Hampton Park
	Sunshine Groupe	Brooklyn
	Waste Converters	Dandenong

Operating landfills

There are 20 licensed operational landfills and no landfills exempt from licensing in the Metropolitan WRR region, as shown in Table 7.10.

The Metropolitan WRR region has two main catchment areas — south east and north west. Currently, the south east catchment has about eight years of landfill capacity remaining and the north west has considerably more. The Mornington Peninsula area currently operates as a smaller catchment of its own.

In addition to the listed landfills, Stevenson Brothers Industries (SBI) are currently applying for planning and works approval for a solid inert waste landfill at Cranbourne.

TABLE 7.10
OPERATING LANDFILLS IN THE METROPOLITAN WRR REGION

Catchment	Site name (former/ future EPA licence number)	Location	Owner	Wastes accepted	Anticipated close date
South east	Clayton Regional Landfill (ES20872/11719)	Clayton South	Glen Eira, Monash, Stonnington, Whitehorse and Boroondara city councils	Putrescible and solid inert	2018
	SITA Hallam (ES33144/74643)	Hampton Park	SITA	Putrescible and solid inert	2038
	SITA Lyndhurst (74643)	Lyndhurst	SITA	Putrescible, solid inert and PIW	2030
	TPI Fraser Rd (EM28818/9089)	Clayton South	TPI	Putrescible and solid inert	2017
	TPI Deals Road (ES49849/12512)	Clayton South	TPI	Putrescible and solid inert	2016
	TPI Heatherton Sands (ES552/14536)	Moorabbin	TPI	Solid inert	2016
	TPI Clarinda Landfill (ES45017/12412)	Clarinda	TPI	Solid inert	2017
	TPI Victory Road (ES41912339)	Clarinda	TPI	Solid inert	2016
	Glen Landfill (ES22749/11818)	Langwarrin	Glen	Solid inert	2016
North west	TPI Melbourne Regional Landfill (ES37288/12160)	Ravenhall	Boral	Putrescible and solid inert	> 30 years
	Werribee Landfill (ES492/12483)	Werribee	Wyndham City Council	Putrescible and solid inert	> 30 years
	Hanson Landfill (ES41808/12309)	Wollert	Hanson	Putrescible, solid inert and PIW	> 30 years
	Riddell Rd Landfill (ES465/12450)	Sunbury	Hume City Council	Putrescible and solid inert	2031
	Altona North Landfill (ES26227/11940)	Altona North	Alton North Landfill P/L	Solid inert	2024
	BTQ Group Sunbury (ES21321/11758)	Bulla	BTQ Group	Solid inert	2024
	Western Land Reclamation (ES26594/11972)	Brooklyn	Sunshine Corporation	Solid inert	2020
	Barro Kealba (80195)	Brimbank	Barro Group	Solid inert	2040
	Hi Quality (ES46084/45279)	Bulla	Hi Quality	Solid inert	2020
Mornington Peninsula	Devil Bend Landfill (EM30017/45248)	Tuerong	Grosvenor Lodge Pty Ltd	Solid inert	2022
	Rye Landfill (ES453/70367)	Rye	Mornington Peninsula Shire Council	Putrescible	2017

Note: Category C soils and PIW are outside the scope of the SWRRIP.

Source: Metropolitan Waste and Resource Recovery Group.

Closed landfills

EPA has currently identified 73 closed landfills in the Metropolitan WRR region. Forty-eight of these have post-closure pollution abatement notices (PANs) and 25 still require post-closure PANs. Closed landfill numbers and the process for replacing and rehabilitating landfill sites will be discussed further in the Metropolitan RWRRIP.

Residual waste flows

There is significant movement of residual waste across the Metropolitan WRR region. For MSW, there are clear catchments based around the SITA Hallam, Boral, Wollert and Werribee landfills. The Rye Landfill is predominately used for disposal of MSW from the Mornington Peninsula area.

There is insufficient data to map flows of residual solid industrial waste (SIW) within the Metropolitan WRR region. It is likely that some SIW moves from the east side of Melbourne to landfills on the west side as waste generators and transport businesses seek to minimise transport costs and gate fees. Devil Bend Landfill is primarily an inert landfill receiving materials from the Mornington area and from metropolitan Melbourne.

Individual flows identified in the SWRRIP analysis are detailed Table 7.11. The Metropolitan RWRRIP will include further analysis of material flows.

TABLE 7.11
ESTIMATED SIGNIFICANT FLOWS OF RESIDUAL WASTE IN THE METROPOLITAN WRR REGION

Residual waste flows
About 50% of Geelong's MSW is transported to the Werribee Landfill for disposal, following the closure of the Corio Landfill in Geelong at the end of 2011. It is likely that a significant amount of SIW from Geelong also goes to Werribee.
Macedon Ranges Shire Council transports its MSW to the Sunbury Landfill for disposal. SIW from the Macedon Ranges area is also likely to be transferred to Melbourne for disposal, although the landfill destinations are not known.
Moorabool Shire Council transports its MSW to the Werribee Landfill for disposal.
Baw Baw Shire Council transports its MSW to the SITA Hallam Landfill for disposal following the closure of the Trafalgar Landfill in 2011–12. It is also likely that SIW from Baw Baw is transported to Melbourne for disposal.
In 2012 SIW was transported from the Smythesdale Landfill to Melbourne for disposal as a result of the delay in approving a new landfill cell at Smythesdale.
Residual waste from the Colac Resource Recovery Centre (Barwon South West region) goes to the Werribee Landfill.
Residual waste from the Greater Geelong City Council RRC/TS (Barwon South West region) goes to the Werribee Landfill.
Residual waste from Macedon Ranges RRC/TSs (Loddon Mallee region) goes to the Sunbury Landfill.
Substantial movement of SIW (mainly from the north west Metropolitan area) goes to the Maddingley Brown Coal Landfill in Bacchus Marsh in the Grampians Central West region.

Future considerations

When developing the Metropolitan RWRRIP, planning for landfill infrastructure will need to consider the following:

In the south east metropolitan area

The closure of a number of existing landfills in the Clayton/Kingston area in the next seven years will result in a projected reduction of available airspace of around 1,000,000 tonnes per year by 2020. These landfills currently receive a range of residual wastes including MSW, industrial and solid inert.

This is an emerging capacity gap threatening the short and long term ability to manage residual waste from this area. The Metropolitan WRRG is working with local governments and industry to develop solutions. This will include a registration of interest process to identify the most viable options to manage this volume of material. This will be underpinned by collaborative procurements for services by a number of local governments in the south east of Melbourne using long term contracts for MSW streams to establish tonnes that attract industry investment.

It is unlikely that viable long term options to meet this need will include a landfill in the proximity of existing landfills. As a result, residual waste will need to be transported to alternative landfill(s) probably located some distance from existing landfills, which would involve longer transport distances.

Future infrastructure requirements include sites and facilities to reduce the transport of tonnes through sorting, consolidation and potentially some recovery of materials from the residual waste, prior to transporting to reprocessors or alternative landfills. Using part of the soon to be closed and industrially zoned landfill sites to support resource recovery activities should be explored in a close partnership between the community, local governments and the Metropolitan WRRG.

Due to large tonnes generated, and the potential for some materials to be managed outside the Metropolitan WRR region, solutions need to be evaluated based on their impact and potential benefits to the statewide system and other WRR regions. This should include:

- Considering opportunities for regional areas to access resource recovery and landfill hubs.
- The impact of a large landfill servicing the metropolitan area but located in a regional area on an existing landfill hub including the process of scheduling sites in neighbouring region's RWRRIPs.
- The potential impact on the transport network of moving large tonnes of material streams.
- Close consultation with local governments and WRRGs in neighbouring WRR regions and SV when developing the final options.

In the outer metropolitan areas

Anecdotal evidence collected during the SWRRIP consultation process suggests that there is some informal small scale movement of residual waste to landfills in adjoining regions. While tonnes may be small on the metropolitan scale, they could put pressure on operating costs of these landfills. Where relevant, they should be considered when developing RWRRIPs. The Metropolitan WRRG should work with neighbouring WRRGs to identify these flows and determine the extent and impact of the issue.

In the Mornington Peninsula area

The expected closure of the Rye Landfill in 2017 and Devil Bend Landfill in 2022 presents an emerging capacity need in this area. The Mornington Peninsula Shire Council is currently exploring options for ongoing use of the site including increasing the life of the Rye Landfill. The Mornington Peninsula Shire Council supported by the Metropolitan WRRG should evaluate the costs and benefits to them and their community of a range of options including:

- participating in collaborative procurement for services with neighbouring local governments
- reducing residual waste by increasing resource recovery prior to disposal at an alternative landfill.

The solution is unlikely to include establishing hubs of regional significance for either resource recovery or landfill. The viability of these hubs would depend on flows of materials from the greater metropolitan area and would be competing with established existing hubs.

A more viable solution is likely to include establishing local hubs that feed the spokes supporting existing hubs or establishing new hubs in the metropolitan area supported by the volume of materials needed for economies of scale. Research into solutions needs to recognise that local landfills can provide benefits to the community that are hard to evaluate on purely economic terms.

When developing the Metropolitan RWRRIP, the Metropolitan WRRG and Mornington Peninsula Shire Council should work together to further understand the long term role of the Rye and Devil Bend landfills.

7.4 Barwon South West WRR region

Based on modelled data, an estimated 790,000 tonnes of waste were generated in the Barwon South West WRR region in 2011–12 representing 7% of the state's total. In the same period, 246,000 tonnes of residual waste went to landfills in the region.[30]

The region incorporates the LGAs detailed in Table 7.12.

7.4.1 Important hubs in the state system

There is one existing hub of importance to the waste and resource recovery system as detailed in Table 7.13.

Table 2.2 in Chapter 2 describes why this hub is important to the state system. Hubs of regional and local importance will be detailed in the Barwon South West RWRRIP.

30 Estimated tonnes landfilled do not include PIW in the SWRRIP. Figures are derived from landfill levy data supplied by EPA and there is no allowance made for daily cover.

7.4.2 Resource recovery

Number and type of facilities

There are 49 resource recovery facilities with 38 standalone RRC/TSs including four small drop-off facilities, nine RRC/TSs at landfills and two MRFs in the Barwon South West WRR region as shown in Table 7.14.

TABLE 7.12
LGAS IN THE BARWON SOUTH WEST WRR REGION

LGAs	
Colac Otway Shire Council	Queenscliffe Borough Council
Corangamite Shire Council	Southern Grampians Shire Council
Glenelg Shire Council	Surf Coast Shire Council
Greater Geelong City Council	Warrnambool City Council
Moyne Shire Council	

TABLE 7.13
HUBS OF STATE IMPORTANCE IN THE BARWON SOUTH WEST WRR REGION

Hubs	Location
Corangamite Landfill	Naroghid

TABLE 7.14
NUMBER OF RESOURCE RECOVERY FACILITIES BY LGA IN THE BARWON SOUTH WEST WRR REGION

LGA	RRC/TSs standalone	RRC/TSs at landfill	MRFs	Total
Colac Otway Shire Council	7	1	0	8
Corangamite Shire Council	5	1	0	6
Glenelg Shire Council	3	3	0	6
Greater Geelong City Council	2	1	2	5
Moyne Shire Council	9	1	0	10
Queenscliffe Borough Council	0	0	0	0
Southern Grampians Shire Council	7	1	0	8
Surf Coast Shire Council	3	1	0	4
Warrnambool City Council	2	0	0	2
Totals	**38**	**9**	**2**	**49**

Notes:

The Visy MRF in Geelong currently processes relatively small quantities of commercially sourced recyclables.

Resale shops operate at the Drysdale and North Geelong resource recovery centres and the Hamilton landfill.

The RRC/TSs in the Warrnambool LGA are privately owned.

Materials accepted

Facilities in the Barwon South West WRR region accept commingled recyclables, garden organics, timber, metal, tyres, concrete, bricks, mattresses, e-waste, drumMUSTER farm chemical containers, batteries, oil, mattresses, hard plastics and tyres. Selected sites accept additional items such as mattresses, furniture, timber and fluorescent tubes.

Facilities in the Corangamite, Glenelg, Moyne, and Southern Grampians shire areas provide services to residents in rural communities to supplement kerbside collection services and provide waste services within 20 km of most residents.

Cross regional flows

The SWRRIP analysis did not identify any significant flows of materials for resource recovery activities into the Barwon South West WRR region from other regions. The RWRRIP will investigate this further.

Future considerations

When developing the Barwon South West RWRRIP, planning for resource recovery infrastructure will need to consider the following:

- Infrastructure is required to meet service needs in population growth areas including Armstrong Creek.
- The closure of several landfills is likely to require RRC/TSs to facilitate sorting and consolidation prior to transport of the remaining residual waste to a regional landfill. Appropriate opportunities to use the closed landfill sites should be explored when developing the Barwon South West RWRRIP.
- There is an opportunity to increase recovery of garden organics using cross regional flows from Geelong, Ballarat and Bendigo. If established, this would need to be supported by the appropriate RRC/TS infrastructure. When developing the RWRRIP the Barwon South West WRRG should consult with the WRRGs of these regions to explore this opportunity.
- There is some anecdotal evidence of small amounts of material streams flowing across the Victorian/South Australian border. While these may not have much impact at a regional scale they could have an impact at the local scale and should be explored further when developing the Barwon South West RWRRIP.

TABLE 7.15
MAJOR REPROCESSORS IN THE BARWON SOUTH WEST WRR REGION

Material	Company name	Location
Garden organics	Bellarine Trees	Geelong
	Statewide (Austral Group)	Warrnambool
	Camperdown Compost	Camperdown
	Corangamite Regional Landfill Composting	Camperdown
Concrete, bricks or asphalt	Regional Recycle	Geelong
	Local Mix	Geelong
	Central Recyclers	Lara

7.4.3 Reprocessing

An estimated 544,000 tonnes of recovered materials entered reprocessing facilities in the Barwon South West WRR region in 2011–12.[31] The majority was reprocessed by the facilities in Table 7.15.

In addition to this, there is one plastic reprocessor in the Barwon South West WRR region.

Future considerations

When developing the Barwon South West RWRRIP, planning for reprocessing will need to consider the following:

- The SWRRIP analysis identified an opportunity to increase recovery of garden organics using cross regional flows from Geelong, Ballarat and Bendigo. If established, this would need to be supported by the appropriate RRC/TS infrastructure. Barwon South West WRRG should work with neighbouring WRRGs to explore potential opportunities to maximise organics recovery including collaborative procurement for services.
- The Hays Road precinct in Geelong, incorporating the Point Henry and Hays Road industrial areas is recognised as significant in the region. It is a hub for a range of resource recovery activities including organics and construction and demolition (C&D) reprocessing and a key MSW transfer station. The WRRG should consider the future management options of this site in the RWRRIP along with other sites of regional significance to ensure activities occurring at the site can be managed in the long term.
- The Fyansford (Moltoni) Landfill is already a significant regional C&D reprocessing hub for the area. The existing solid inert landfill on the site is anticipated to be full in about 2018. Even if capacity is increased there may be further opportunities to increase resource recovery activities at the site. The WRRG should work with the Greater Geelong City Council to ensure that long term planning preserves adequate buffer distances and does not allow incompatible land uses that could impact on the functionality of the site.
- The Heales Road industrial estate in Geelong provides a future opportunity as it includes the C&I resource recovery centre owned by SITA and Central Recyclers. It has good access to the Melbourne transport network and offers alternatives for Melbourne markets for recovery of material streams from the C&I sector.

31 Based on VRIAS data which does not include tonnes of materials entering plastic reprocessors as the Plastics and Chemicals Industries Association do not participate in this survey.

7.4.4 Residual waste

Landfills in the Barwon South West WRR region received an estimated 246,000 tonnes of waste in 2011–12.[32] Under a business as usual approach, this is projected to increase to about 483,000 tonnes in 2041–42.

Operating landfills

Table 7.16 shows seven licensed landfills and four landfills exempt from licensing operating in the Barwon South West WRR region.

Closed landfills

EPA has currently identified 28 closed landfills in the Barwon South West WRR region. Six of these have post-closure PANs and 22 still require post-closure PANs. Closed landfill numbers and the process for replacing and rehabilitating landfill sites will be further discussed in the Barwon South West RWRRIP.

32 Estimated tonnes landfilled do not include PIW in the SWRRIP. Figures are derived from landfill levy data supplied by EPA and there is no allowance made for daily cover.

TABLE 7.16
OPERATING LANDFILLS IN THE BARWON SOUTH WEST WRR REGION

	Site name (former/future EPA licence number)	Location	Owner	LGA serviced by landfill	Anticipated close date
Licensed Landfills	Alvie (ES41784/12281)	Alvie	Colac Otway Shire Council	Colac Otway Shire Council	2022
	Corangamite (ES38232/12192)	Naroghid	Corangamite Shire Council	Colac Otway Shire Council, Corangamite Shire Council, Golden Plains Shire Council, Moyne Shire Council, Warrnambool City Council	> 30 years
	Portland (HS776/22492)	Portland	Glenelg Shire Council	Glenelg Shire Council	2016
	Drysdale (HS1672/72476)	Drysdale	Greater Geelong City Council	Borough of Queenscliffe, Greater Geelong City Council	2028
	Moltoni (ES22882/11848)	Fyansford	Moltoni Corporation Pty Ltd	Greater Geelong City Council	2018
	Hamilton (HS1483/20720)	Hamilton	Southern Grampians Shire Council	Southern Grampians Shire Council	2037
	Anglesea (HS539/21470)	Anglesea	Surf Coast Shire Council	Surf Coast Shire Council	2017
Landfills exempt from licensing	Casterton	Casterton	Glenelg Shire Council	Glenelg Shire Council	2016
	Dartmoor	Dartmoor	Glenelg Shire Council	Glenelg Shire Council	2015
	Nelson	Nelson	Glenelg Shire Council	Glenelg Shire Council	2015
	Killarney	Killarney	Moyne Shire Council	Moyne Shire Council	2025

Residual waste flows

The SWRRIP analysis identified some significant flows of residual waste in the Barwon South West WRR region including those detailed in Table 7.17. The RWRRIP will undertake further analysis of material flows.

Future considerations

When developing the Barwon South West RWRRIP, planning for landfill infrastructure needs to consider the following:

- The main landfill in the Geelong region (Corio Landfill operated by the Greater Geelong City Council) closed at the end of 2011. Corio Landfill received around 150,000 tonnes a year of solid waste plus a significant quantity of PIW. Closing this landfill has increased tonnages received at the Drysdale and Fyansford (Moltoni) landfills, as well as increasing transport to Werribee Landfill in the metropolitan area.
- The SWRRIP analysis identified the Drysdale landfill as regionally significant. It services the greater Barwon area and receives significant tonnages. If residential encroachment or incompatible land use activities affected its functionality, it would affect the regional system. The site is already involved in waste management activities so could co-locate additional compatible resource recovery activities on the site to share buffers. The WRRG should explore future options for the site including increasing resource recovery activities if a positive business case can be demonstrated. The WRRG should work with the Greater Geelong City Council to ensure long term viability to conduct waste and resource recovery activities at the site.
- The Fyansford (Moltoni) Landfill is a privately operated inert landfill at Fyansford. While its current capacity is due to be filled by 2018, the operator may be in the process of applying to EPA for future capacity. The WRRG should work with the Greater Geelong City Council to ensure that long term planning preserves adequate buffer distances and does not allow incompatible land uses that could impact on the functionality of the site.
- The Alvie Landfill is scheduled for closure in 2022. The SWRRIP identified options for the site and for managing residual waste with improved long term outcomes for the local council and community. Colac Shire Council has started exploring options. The investigation should identify costs, benefits, risks and long term security for the council and ratepayers of a range of options including:
  - transitioning the site to a RRC/TS and organics reprocessing facility and transporting the remaining consolidated residual waste to regional landfills
  - establishing RRC/TSs and organic reprocessing in other suitable locations and transporting the remaining consolidated residual waste to regional landfills
  - establishing a replacement landfill in the area.
- The Anglesea Landfill is due for closure in 2017. Identifying solutions for the residual waste stream currently going to the site is an immediate priority. Possible options include transitioning the site to RRC/TS activities and transporting the remaining consolidated residual waste to a larger landfill.
- The Naroghid Landfill near Camperdown is a medium-sized rural landfill. The landfill risk assessment report identified potential for the landfill to expand to become regionally significant. The Barwon South West RWRRIP should analyse options to transition smaller landfills in the WRR region to RRC/TS activities and transporting the remaining consolidated residual waste to Naroghid where a positive business case can be demonstrated.
- The Portland Landfill is planned for closure in 2016. The council is currently investigating future options to manage the site and residual waste streams from the area. Options to explore should include transitioning the site to resource recovery and consolidation activities prior to transport for reprocessing and the reminder to a regional landfill.
- Hamilton Landfill is a small landfill that may be affected when the Portland Landfill is closed. Further options for this site including investigation of the flows within the area should be explored.
- Anecdotal evidence collected during the SWRRIP consultation process suggests that there is some informal small scale movement of residual waste to landfills from the Metropolitan WRR region to landfills in adjoining regions. While tonnes may be small, they could put pressure on operating costs of these landfills and where relevant should be considered when developing the Barwon South West RWRRIP.
- The Barwon South West RWRRIP will consider the future need for additional landfill airspace in the region, including:
  - an assessment of the existing capacity of the current infrastructure to manage future residual waste projections
  - identifying options to increase resource recovery to reduce landfill need and residual waste management options for the remaining gap that provide the best economic, community, environment and public health outcomes.

TABLE 7.17
ESTIMATED SIGNIFICANT RESIDUAL WASTE FLOWS IN THE BARWON SOUTH WEST WRR REGION

Residual waste flows
About 50% of MSW from Geelong is transported to Werribee Landfill for disposal following the closure of the Corio Landfill in Geelong at the end of 2011. A significant amount of SIW from Geelong is also transported to Werribee Landfill.
Residual waste from the Colac Resource Recovery Centre is transported to Werribee Landfill.
MSW from Colac Otway Shire, Golden Plains Shire, Moyne Shire and Warrnambool City goes to the Corangamite Landfill at Naroghid.
SIW from outside Corangamite Shire is thought to go to Naroghid, based on the high percentage of SIW received at the landfill. This could be due to the low gate fee and available airspace compared to other landfills in south west Victoria.

7.5 Gippsland WRR region

Based on modelling, an estimated 510,000 tonnes of waste were generated in the Gippsland region in 2011–12 representing 4% of the state total. In the same period 123,000 tonnes of residual waste were sent to landfills in the region.[33]

The region incorporates the LGAs detailed in Table 7.18.

7.5.1 Important hubs in the state system

There is one existing hub of importance to the waste and resource recovery system as detailed in Table 7.19.

Table 2.2 in Chapter 2 describes why this hub is important to the state system. Hubs of regional and local importance will be detailed in the Gippsland RWRRIP.

7.5.2 Resource recovery

Number and type of facilities

There are 58 resource recovery facilities, including 50 standalone RRC/TSs, with 15 drop-off facilities, five RRC/TSs at landfill and three MRFs in the Gippsland WRR region as shown in Table 7.20.

Materials accepted

Facilities in the Gippsland WRR region accept commingled recyclables, garden organics, timber, metal, tyres, concrete, bricks, mattresses, e-waste, televisions and related items, furniture, mattresses, expanded polystyrene, hard plastics, oil, whitegoods and tyres. Some facilities accept fluorescent tubes and batteries. A number of locations offer drumMUSTER collection services.

Future considerations

The transfer trailers in East Gippsland for domestic waste are essential for residents in remote areas who have no other waste management options.

Several landfills in the Gippsland WRR region are scheduled for closure in the short term. Options for ensuring continued waste services to the community will be assessed in consultation with the respective local governments and communities as part of the Gippsland RWRRIP.

33 Estimated tonnes landfilled do not include PIW in the SWRRIP. Figures are derived from landfill levy data supplied by EPA and there is no allowance made for daily cover.

TABLE 7.18
LGAS IN THE GIPPSLAND WRR REGION

LGAs	
Bass Coast Shire Council	Latrobe City Councils
Baw Baw Shire Council	South Gippsland Shire Council
East Gippsland Shire Council	Wellington Shire Council

TABLE 7.19
HUBS OF STATE IMPORTANCE IN THE GIPPSLAND WRR REGION

Hub	Location
Gippsland Water's Soil and Organics Recycling Facility	Dutson Downs

TABLE 7.20
NUMBER OF RESOURCE RECOVERY FACILITIES BY LGA IN THE GIPPSLAND WRR REGION

LGA	RRC/TS Standalone	RRC/TS at landfill	MRF	Totals
Bass Coast Shire Council	2	1	1	4
Baw Baw Shire Council	4	0	0	4
East Gippsland Shire Council	24	2	1	27
Latrobe City Council	7	0	1	8
South Gippsland Shire Council	5	1	0	6
Wellington Shire Council	8	1	0	9
Totals	**50**	**5**	**3**	**58**

Notes:

The Bass Coast Resource Recovery Centre is co-located at the Grantville Landfill. Bass Coast Shire Council closed their transfer station at Rhyll in June 2013.

This includes 13 transfer trailers for residents in remote areas as drop-off points for domestic waste only. There is also a resale shop at the Lakes Entrance Landfill.

There are three drop-off centres for garden organics in the Latrobe City Council area.

7.5.3 Reprocessing

An estimated 387,000 tonnes of recovered material entered reprocessing facilities in the Gippsland region in 2011–12.[34] The majority was reprocessed by the facilities listed in Table 7.21.

Future considerations

Australian Paper (Nippon Paper Group) in Maryvale is installing a paper recycling plant that can process up to 80,000 tonnes of waste paper per year. This should be included in the Gippsland RWRRIP.

While there is adequate concrete, brick and asphalt recycling infrastructure in the region there is an issue with stockpiling. The WRRG and member local governments should work with EPA to investigate this issue and develop potential mechanisms to reduce stockpiling for inclusion in the RWRRIP.

7.5.4 Residual waste

The Gippsland WRR region generated an estimated 123,000 tonnes of waste requiring disposal to landfill in 2011–12.[35] Under a business as usual approach, this is projected to increase to about 196,000 tonnes in 2041–42.

34 Based on VRIAS data which does not include tonnes of materials entering plastic reprocessors as the Plastics and Chemicals Industries Association do not participate in this survey.

35 Estimated tonnes landfilled do not include PIW in the SWRRIP. Figures are derived from landfill levy data supplied by EPA and there is no allowance made for daily cover.

Operating landfills

There are seven licensed landfills and three landfills exempt from licensing operating in the Gippsland WRR region as shown in Table 7.22.

In addition to the landfills listed in Table 7.22 there are two privately owned landfills:

- Gippsland Water's Soil and Organics Recycling Facility at Dutson Downs accepts naturally occurring radioactive materials and commercial asbestos only.
- Australian Papers Landfill at Maryvale caters only for waste streams generated onsite, most of which is prescribed industrial waste.

TABLE 7.21
MAJOR REPROCESSORS IN THE GIPPSLAND WRR REGION

Material	Company name	Location
Mixed organics	Gippsland Water's Soil and Organics Recycling Facility	Dutson Downs
	Pinegro	Morwell
Concrete, bricks or asphalt	Gippsland Concrete Recycling	Traralgon
Tyres and rubber	Rubber Trough	Warragul

Note: Pinegro accepts bark, paper pulp waste and sawdust.

TABLE 7.22
OPERATING LANDFILLS IN THE GIPPSLAND WRR REGION

	Site name (former/future EPA licence number)	Location	Owner	LGA serviced by landfill	Anticipated close date
Licensed landfills	Grantville (ES37130/12129)	Grantville	Bass Coast Shire Council	Bass Coast Shire Council	> 30 years
	Bairnsdale (LS169/24430)	Bairnsdale	East Gippsland Shire Council	East Gippsland Shire Council	> 30 years
	Lakes Entrance (LS2/72667)	Lakes Entrance	East Gippsland Shire Council	East Gippsland Shire Council	2018
	Hyland Highway (LS65990/25565)	Loy Yang	Latrobe City Council	Latrobe City Council	2027
	Koonwarra (LS61989/24873)	Koonwarra	South Gippsland Shire Council	South Gippsland Shire Council	2037
	Kilmany (LS28/72786)	Kilmany	Wellington Shire Council	Wellington Shire Council	> 30 years
	Maffra (LS159/72611)	Maffra	Wellington Shire Council	Wellington Shire Council	> 30 years
	Cann River	Cann River	East Gippsland Shire Council	East Gippsland Shire Council	2020
	Orbost	Orbost	East Gippsland Shire Council	East Gippsland Shire Council	2015
	Rosedale	Rosedale	Wellington Shire Council	Wellington Shire Council	> 20 years

Closed landfills

EPA has currently identified 33 closed landfills in the Gippsland WRR region. Ten of these have post-closure PANs and 23 still require post-closure PANs. Closed landfill numbers and the process for replacing and rehabilitating landfill sites will be discussed further in the Gippsland RWRRIP.

Landfill waste flows

The SWRRIP analysis identified flows of residual waste in the Gippsland WRR region including those detailed in Table 7.23. The RWRRIP will undertake further analysis of material flows.

TABLE 7.23
ESTIMATED SIGNIFICANT RESIDUAL WASTE FLOWS IN THE GIPPSLAND WRR REGION

Residual waste flows
Due to interruptions to the availability of landfill airspace in both Latrobe City and Baw Baw Shire in 2011, a significant quantity of SIW has flowed to the adjoining Kilmany Landfill and to metropolitan landfills over the past three years. The permanent closure of the Trafalgar Landfill in Baw Baw Shire dramatically affected the movement of SIW out of the region. The continued supply of landfill airspace to service C&I waste generators in Baw Baw Shire should be further investigated in the Gippsland RWRRIP.

Future considerations

When developing the Gippsland RWRRIP, planning for landfill infrastructure needs to consider the following:

- The closure of landfills in the south east of the Metropolitan WRR region may cause greater flows of residual waste into neighbouring WRR regions including Gippsland. This will significantly affect the region and will require close consultation between the Gippsland and Metropolitan WRRGs as well as comprehensive engagement with local governments and the community. The potential benefits and drawbacks to the current Gippsland waste and resource recovery system should be explored.
- East Gippsland Shire Council has closed a number of landfills over the past few years including Benambra, Gelantipy, Bonang, Mallacoota and Bendoc, with Orbost and Lakes Entrance scheduled to close in the short term. The intent is to replace them with RRC/TSs and transport the remaining consolidated residual waste to a larger landfill facility in the municipality. Options for these waste streams will be developed as part of the Gippsland RWRRIP with the potential for waste to be directed to the Bairnsdale Landfill.
- The Hyland Highway Landfill is the approved landfill for the Latrobe City and Baw Baw LGAs and is therefore regionally significant. This should be identified and supported in the Gippsland RWRRIP.
- Landfills in Gippsland have been in a state of transition over the past five years. A large number of landfills have closed in recent years. The future Gippsland RWRRIP will need to prioritise the continued short to medium term use of key, well designed and well managed landfill facilities as well as identifying and assessing infrastructure to replace landfills to improve the efficiency and effectiveness of resource recovery.

7.6 Goulburn Valley WRR region

Based on modelling, an estimated 520,000 tonnes of waste were generated in the Goulburn Valley WRR region in 2011–12, representing 4% of the state total. In the same period 173,000 tonnes of residual waste were sent to landfills in the region.[36]

The region incorporates the LGAs listed in Table 7.24.

7.6.1 Important hubs in the state system

There are three existing hubs of importance to the state waste and resource recovery system in the Goulburn Valley WRR region as shown in Table 7.25.

Table 2.2 in Chapter 2 describes why these hubs are important to the state waste and resource recovery system. Hubs of regional and local importance will be detailed in the Goulburn Valley RWRRIP.

Cross border flows

Stakeholder consultation and the SWRRIP analysis identified the need to further assess the quantities and impact of the movement of material streams across the border of New South Wales (NSW) and Victoria. Preliminary analysis estimates that approximately 50,000 tonnes of materials (predominantly residual waste) is transported from Victoria to landfills in NSW probably influenced by lower gate fees in NSW and longer distances to transport to appropriate landfills in Victoria. There is evidence of some materials entering Victoria for reprocessing from NSW.

While these tonnes may not be significant to the state system, they do impact on the WRR regions along the NSW — Victoria border. When developing their RWRRIPs, the North East, Loddon Mallee and Goulburn Valley WRRGs should work with SV to quantify the issue and determine any impact and the appropriate management mechanisms.

36 Estimated tonnes landfilled do not include PIW in the SWRRIP. Figures are derived from landfill levy data supplied by EPA and there is no allowance made for daily cover.

7.6.2 Resource recovery

Number and type of facilities

There are 37 resource recovery facilities, including 35 standalone RRC/TSs with three small drop-off facilities, one RRC/TSs at a landfill and one MRF in the Goulburn Valley WRR region, as shown in Table 7.26.

Materials accepted

Facilities in the Goulburn Valley WRR region accept commingled recyclables, garden organics, mattresses, tyres, whitegoods, scrap metals, timber, drumMUSTER containers and silage wrap through the Plasback farm plastics recycling program.

Facilities in larger municipalities also accept e-waste, televisions and related items, furniture, hard plastics, batteries, oil and metals.

TABLE 7.24
LGAS IN THE GOULBURN VALLEY WRR REGION

LGAs	
Campaspe Shire Council	Moira Shire Council
Greater Shepparton City Council	Murrindindi Shire Council
Mitchell Shire Council	Strathbogie Shire Council

TABLE 7.25
HUBS OF STATE IMPORTANCE IN THE GOULBURN VALLEY WRR REGION

Hub	Location
Cosgrove Landfill	Shepparton
Ellwaste Patho Landfill	Echuca
Western Composting, Organics reprocessor	Shepparton

TABLE 7.26
NUMBER OF RESOURCE RECOVERY FACILITIES BY LGA IN THE GOULBURN VALLEY WRR REGION

LGA	RRC/TS standalone	RRC/TS at landfill	MRFs	Totals
Campaspe Shire Council	8	0	1	9
Greater Shepparton City Council	3	0	0	3
Mitchell Shire Council	4	0	0	4
Moira Shire Council	8	1	0	9
Murrindindi Shire Council	5	0	0	5
Strathbogie Shire Council	7	0	0	7
Totals	**35**	**1**	**1**	**37**

Notes:

In the Campaspe LGA there are two unmanned transfer stations at Colbinabbin and Toolleen operated by local residents.

The Echuca RRC/TS operates as the Echuca Environment Centre.

There are resale shops at Wallan Landfill and Shepparton Resource Recovery Centre. Three of the RRC/TSs operated by the Strathbogie Shire Council are drop-off points for household waste and recyclables.

Resource recovery material flows

The SWRRIP analysis identified some significant flows of resource recovery materials in the Goulburn Valley WRR region including those detailed in Table 7.27. The RWRRIP will include further analysis of material flows.

Future considerations

The extent and impact of the movement of materials into the region from the outer metropolitan area to facilities including Kinglake, Wallan, Broadford and Yea needs to be determined for inclusion in the Goulburn Valley RWRRIP. Consultation with the Metropolitan WRRG is required to determine the best solutions to meet service needs.

7.6.3 Reprocessing

An estimated 347,000 tonnes of materials were reprocessed in the Goulburn Valley WRR region in 2011–12 with the majority being reprocessed by the facilities listed in Table 7.28.

There is also one plastics reprocessor in the Goulburn Valley WRR region.

Future considerations

In recognition of the strong food manufacturing activities in the region, the RWRRIP should prioritise opportunities to increase recovery of food organics. The Goulburn Valley WRRG should work with industry, local government and neighbouring WRRGs to explore options when developing their RWRRIP.

There is also an opportunity to increase recovery of food organics and recyclable packaging by working with the food manufacturing and wholesale sector to depackage out-of-spec and out-of-date products. This will be explored further in the RWRRIP.

7.6.4 Residual waste

Landfills in the Goulburn Valley WRR region received an estimated 173,000 tonnes of waste in 2011–12.[37] Under a business as usual approach, this is projected to remain fairly constant over the next 30 years.

Operational landfills

There are five licensed landfills and no landfills exempt from licensing operating in the Goulburn Valley WRR region as shown in Table 7.29.

Closed landfills

EPA has currently identified 24 closed landfills in the Goulburn Valley WRR region. Ten of these have post-closure PANs and 14 still require post-closure PANs. Closed landfill numbers and the process for replacing and rehabilitating landfill sites will be discussed further in the Goulburn Valley RWRRIP.

Landfill waste flows

The SWRRIP analysis identified some significant flows of residual waste in the Goulburn Valley WRR region including those detailed in Table 7.30. The RWRRIP will undertake further analysis of material flows.

TABLE 7.27
ESTIMATED SIGNIFICANT FLOWS OF RESOURCE RECOVERY MATERIALS IN THE GOULBURN VALLEY WRR REGION

Material flows
Significant flow of out-of-spec/out-of-date packaged food into the region from the across the state.

TABLE 7.28
MAJOR REPROCESSORS IN THE GOULBURN VALLEY WRR REGION

Material	Company name	Location
Food waste	Resource Resolution	Girgarre
Garden organics	Biomix	Stanhope
	Corio Waste (Western Composting)	Shepparton

37 Estimated tonnes landfilled do not include PIW in the SWRRIP. Figures are derived from landfill levy data supplied by EPA and there is no allowance made for daily cover.

TABLE 7.29
OPERATING LANDFILLS IN THE GOULBURN VALLEY WRR REGION

	Site name (former/future EPA licence number)	Location	Owner	LGA served by landfill	Anticipated close date
Licensed landfills	Patho (ES24721/11908)	Patho	Ellwaste Echuca	Buloke Shire Council, Campaspe Shire Council, Central Goldfields Shire Council, City of Greater Bendigo	> 30 years
	Cosgrove (ES35898/12099)	Shepparton	Greater Shepparton City Council	Greater Shepparton City Council	2037
	Hildene (ES58410/70781)	Seymour	Mitchell Shire Council	Mitchell Shire Council, Strathbogie Shire Council	2032
	Cobram (ES69514/15500)	Cobram	Moira Shire Council	Moira Shire Council	> 30 years
	Alexandra (ES31673/12039)	Alexandra	Murrindindi Shire Council	Murrindindi Shire Council	2027

Future considerations

When developing the Goulburn Valley RWRRIP, planning for landfill infrastructure will need to consider the following:

- The Cosgrove Landfill in Shepparton is significant to the state, serving a large population centre and a sizeable food processing industry in the greater Shepparton region. While there is adequate airspace for the medium term, there is limited airspace associated with the current operation of the Cosgrove Landfill. This landfill is sited adjacent to an operational quarry and there is potential for considerable new airspace in the quarried areas. The Greater Shepparton City Council and the Goulburn Valley WRRG have started looking at future options for this site which will be included in the RWRRIP.
- The Patho Landfill near Echuca is changing from being a medium-sized regional landfill to an important cross regional facility.
- The Hildene Landfill has available airspace until around 2032. The SWRRIP analysis suggests Hildene could become a regional landfill accepting materials from both within and outside the area. The Mitchell Shire Council and the Goulburn Valley WRRG have started looking at future options for this site which will be included in the RWRRIP.

TABLE 7.30
ESTIMATED SIGNIFICANT LANDFILL FLOWS IN THE GOULBURN VALLEY WRR REGION

Residual waste flows
The Patho Landfill receives cross regional flows including: - around 45,000 tonnes of residual waste from Bendigo in the Loddon Mallee WRR region - a small tonnage of MSW from Buloke Shire Council and Central Goldfields Shire Council RRCs - significant tonnage of MSW from parts of the Loddon Mallee and Grampians Central West WRR regions, as well as from Campaspe Shire.
The Patho Landfill receives significant flows from outside the region, including: - from the Gannawarra Shire Council — based on anecdotal evidence and the very low percentage of SIW (0.06%) received at the Kerang Landfill - flows from the north east of Victoria using triple hooklift combinations to leverage transport efficiencies.
C&I waste from Benalla and Wangaratta most likely goes to the Cosgrove Landfill in Shepparton based on the low percentages of SIW received at the Benalla and Bowser landfills. The percentage of SIW accepted at the Cosgrove Landfill is 60% which is higher than the regional average of 42%.

7.7 Grampians Central West WRR region

Based on modelling, an estimated 929,000 tonnes of waste was generated in the Grampians Central West WRR region in 2011–12, representing 7% of the state total. In the same period 548,000 tonnes of residual waste were sent to landfills in the region[38] including significant flows from the Metropolitan WRR region.

The region incorporates the LGAs detailed in 7.31.

7.7.1 Important hubs in the state system

There are two existing hubs of importance to the waste and resource recovery system as detailed in Table 7.32.

Table 2.2 in Chapter 2 describes why these hubs are important to the state system. Hubs of regional and local importance will be detailed in the Grampians Central West RWRRIP.

7.7.2 Resource recovery

Number and type of facilities

There are 67 resource recovery facilities, including 60 standalone RRC/TSs, five RRC/TSs at landfill and two MRFs in the Grampians Central West WRR region as shown in Table 7.33.

Materials accepted

Facilities in the Grampians Central West WRR region accept commingled recyclables, garden organics, mattresses, tyres, whitegoods, e-waste, televisions and related items, furniture, timber, hard plastics, agricultural plastics (such as grain bags), drumMUSTER containers, batteries, oil and metals. Silage wrap is collected at Yarriambiack.

Four RRC/TS in Hindmarsh and eight in West Wimmera accept domestic quantities of asbestos.

Future considerations

When developing the Grampians Central West RWRRIP, planning for waste and resource recovery infrastructure will need to consider the following:

- Records show that in parts of the Grampians Central West WRR region (Horsham, Hindmarsh, West Wimmera, Northern Grampians and Yarriambiack shire councils) the garden organics collected are stockpiled and were sometimes burnt in the recent past. Alternative options should be explored in the Grampians Central West RWRRIP.
- Councils offer different services. For example, Ballarat accepts clean excavated materials at some sites whereas Golden Plains and Hepburn accept e-waste, televisions and expanded polystyrene. Some facilities across the area offer drumMUSTER collection services. The WRRG should work with the local governments to explore options to integrate services across the region.
- Several landfills in the Grampians Central West WRR region are scheduled for closure in the short term. The WRRG should work with the owners of these facilities to identify sites where transition from landfill to RRC/TS activities will provide improved economic, community, environment and public health outcomes.

TABLE 7.31
LGAS IN THE GRAMPIANS CENTRAL WEST WRR REGION

LGAs	
Ararat Rural City Council	Horsham Rural City Council
Ballarat City Council	Moorabool Shire Council
Central Goldfields Shire Council	Northern Grampians Shire Council
Golden Plains Shire Council	Pyrenees Shire Council
Hepburn Shire Council	West Wimmera Shire Council
Hindmarsh Shire Council	Yarriambiack Shire Council

TABLE 7.32
HUBS OF STATE IMPORTANCE IN THE GRAMPIANS CENTRAL WEST WRR REGION

Hub	Location
Maddingley Brown Coal Landfill	Bacchus Marsh
Statewide Landfill	Stawell

38 Estimated tonnes landfilled do not include PIW in the SWRRIP. Figures are derived from landfill levy data supplied by EPA and there is no allowance made for daily cover.

TABLE 7.33
NUMBER OF RESOURCE RECOVERY FACILITIES BY LGA IN THE GRAMPIANS CENTRAL WEST WRR REGION

LGA	RRC/TSs standalone	RRC/TSs at landfill	MRFs	Totals
Ararat Rural City Council	8	0	0	8
Ballarat City Council	2	0	0	2
Central Goldfields Shire Council	4	0	0	4
Golden Plains Shire Council	0	0	0	0
Hepburn Shire Council	3	0	1	4
Hindmarsh Shire Council	7	0	0	7
Horsham Rural City Council	8	0	1	9
Moorabool Shire Council	3	0	0	3
Northern Grampians Shire Council	4	1	0	5
Pyrenees Shire Council	6	0	0	6
West Wimmera Shire Council	9	0	0	9
Yarriambiack Shire Council	6	4	0	10
Totals	**60**	**5**	**2**	**67**

Notes:

There are resale shops at Horsham, Stawell, Creswick, Daylesford and Trentham.

Northern Grampians Shire has a community-run recycling centre at Marnoo and a privately owned recycling centre at St Arnaud.

The Dimboola Lions Club process the majority of the cardboard for Hindmarsh Shire.

Hindmarsh Shire Council provides a series of centralised bins for separating household recyclables at the Netherby and Yanac RRC/TSs.

7.7.3 Reprocessing

An estimated 380,000 tonnes of recovered material entered reprocessing facilities in the Grampians Central West WRR region in 2011–12.[39] The majority was reprocessed by the facilities listed in Table 7.34.

In addition to the above activities, the Horsham, Yarriambiack, Northern Grampians and Ararat shire councils reprocess additional concrete, bricks and asphalt using a mobile crusher that crushes the material onsite for reuse.

Axis Worx is a not-for-profit organisation located at Horsham. They are establishing a glass crusher that will use glass fines sourced from the region to produce sand replacement for use in road base and concrete.

Future considerations

When developing the Grampians Central West RWRRIP, planning for reprocessing infrastructure will need to consider the following:

- The Grampians Central West WRR region has a major issue related to stockpiling of tyres sourced from across the state and even anecdotally interstate. This is an issue of statewide significance. Local governments, industry, SV and EPA need to work together to explore opportunities to manage and reduce this stockpile.
- The WRRG's glass recovery project has potential to reprocess significant glass tonnages in the Horsham and neighbouring council areas. The RWRRIP should include this project and its potential replication.
- The SWRRIP analysis identified an opportunity to increase recovery of garden organics using cross regional flows from Geelong, Ballarat, Bendigo and potentially Shepparton. If established, this would need to be supported by the appropriate RRC/TS infrastructure. The WRRG should work with the neighbouring WRRG to explore opportunities to maximise organics recovery including collaborative procurement for services. Investigating alternative modes of transport including rail could be considered as part of this.
- The cost of transporting materials affects the viability of reprocessing individual material streams. Future planning should consider alternatives including rail and backloading road transport vehicles.

7.7.4 Residual waste

An estimated 548,000 tonnes of waste were sent to landfills in the Grampians Central West WRR region in 2011–12.[40] Under a business as usual approach, this is projected to decrease to about 187,000 tonnes in 2041–42. However, if the flows from the metropolitan WRR region continue, this estimate could be considerably higher.

Operating landfills

There are four operating licensed landfills and seven operating landfill exempt from licensing in the Grampians Central West WRR region as shown in Table 7.35.

Closed landfills

EPA has currently identified 28 closed landfills in the Grampians Central West WRR region. Five of these have post-closure PANs and 23 still require post-closure PANs. Closed landfill numbers and the process for replacing and rehabilitating landfill sites will be discussed further in the Grampians Central West RWRRIP.

Landfill waste flows

The SWRRIP analysis identified some significant flows of residual waste in the Grampians Central West WRR region including those detailed in Table 7.36. The RWRRIP will undertake further analysis of material flows.

TABLE 7.34
MAJOR REPROCESSORS IN THE GRAMPIANS CENTRAL WEST WRR REGION

Material	Company name	Location
Food waste	Castlegate James	Ballarat
Garden organics	Calleja Transport (Maddingley Brown Coal)	Bacchus Marsh
Concrete, bricks or asphalt	ChrisBev	Ballarat
	KKC Recycling	Ballarat
Other	Axis Worx	Horsham

Notes:

KKC Recycling reprocess lightweight C&D materials.

Axis Worx reprocess a range of material streams including e-waste and polystyrene.

39 Based on VRIAS data which does not include tonnes of materials entering plastic reprocessors as the Plastics and Chemicals Industries Association do not participate in this survey.

40 Estimated tonnes landfilled do not include PIW in the SWRRIP. Figures are derived from landfill levy data supplied by EPA and there is no allowance made for daily cover.

TABLE 7.35
OPERATING LANDFILLS IN THE GRAMPIANS CENTRAL WEST WRR REGION

	Site name (former/future EPA licence number)	Location	Owner	LGA serviced by landfill	Anticipated close date
Licensed landfills	Smythesdale (ES27678/12008)	Smythesdale	Ballarat City Council	Ballarat City Council, Hepburn Shire Council, Pyrenees Shire Council	2037
	Maddingley Brown Coal (ES90/45288)	Bacchus Marsh	Calleja	Metropolitan Melbourne	2030
	Dooen, via Horsham (ES353/12067)	Dooen, via Horsham	Horsham Rural City Council	Hindmarsh Shire Council, Horsham Rural City Council, West Wimmera Shire Council, Yarriambiack Shire Council	> 30 years
	Statewide (ES39783/70183)	Bellellen	Statewide Waste	Ararat Rural City, Central Goldfields Shire Council, Northern Grampians Shire Council	2032
Landfills exempt from licensing	Bamganie	Lethbridge	Bamganie P/L	Golden Plains Shire	No data
	Rokewood	Rokewood	Golden Plains Shire Council	Parts of the Golden Plains Shire Council area	No data
	Hard Hills	St Arnaud	Northern Grampians Shire Council	Northern Grampians Shire Council	2016
	Patchewollock	Patchewollock	Yarriambiack Shire Council	Yarriambiack Shire Council	No data
	Tempy	Tempy	Yarriambiack Shire Council	Yarriambiack Shire Council	No data
	Warracknabeal	Warracknabeal	Yarriambiack Shire Council	Yarriambiack Shire Council	No data
	Yaapeet	Yaapeet	Yarriambiack Shire Council	Yarriambiack Shire Council	No data

Notes:

Marnoo landfill operated by Northern Grampians Shire Council, and Sheep Hills and Lah Lah operated by Yarriambiack have closed.

The date of closure of the Hard Hills Landfill is to be determined.

Future considerations

When developing the Grampians Central West RWRRIP, planning for landfill infrastructure will need to consider the following:

- The Statewide Landfill at Bellellen is regionally significant, particularly for SIW. The WRRG should work with Northern Grampians Shire Council to preserve the functionality of the site through adequate planning for suitable buffers and establishing compatible activities. This should include opportunities to increase resource recovery on the site.
- The Maddingley Brown Coal Landfill in Bacchus Marsh is of state importance due to its close proximity to the metropolitan Melbourne area and the tonnes of SIW accepted from Melbourne. The WRRG should work with Moorabool Shire Council to preserve the functionality of the site through adequate planning for suitable buffers and establishing compatible activities. This should include opportunities to increase resource recovery on the site.
- The Dooen Landfill in Horsham is a significant regional landfill servicing the needs of several surrounding councils for MSW and most likely some SIW. The WRRG should work with Horsham Rural City Council to preserve the functionality of the site through adequate planning for suitable buffers and establishing compatible activities. This should include opportunities to increase resource recovery on the site.
- The Smythesdale Landfill is regionally significant, accepting putrescible waste from a number of local governments in the area. The WRRG should work with Golden Plains Shire Council to preserve the functionality of the site through adequate planning for suitable buffers and establishing compatible activities. This should include opportunities to increase resource recovery on the site.
- The unlicensed Hard Hills Landfill is scheduled for closure in the short term. The owner and local governments should work with the WRRG to explore cost effective options to manage residual waste from these locations in a way that meets service needs and provides best practice residual waste management. This should include options to transition the site to resource recovery and consolidation prior to transport to a larger regional landfill.
- The Northern Grampians, Yarriambiack and Golden Plains shire councils should be encouraged to investigate options to transition their remaining landfills exempt from licensing towards RRC/TS activities prior to transport of the remaining consolidated residual waste to a larger regional landfill, wherever it improves economic, community, environment and public health outcomes.

TABLE 7.36
ESTIMATED SIGNIFICANT FLOWS OF RESIDUAL WASTE IN THE GRAMPIANS CENTRAL WEST WRR REGION

Residual waste flows
There are no licensed landfills in the Hindmarsh and West Wimmera Shire Council areas. Hindmarsh and West Wimmera councils transport their MSW to the Dooen Landfill in Horsham. It is highly likely that SIW from these council areas is also transported to the Dooen Landfill.
MSW from Ararat Rural City Council and Central Goldfields Shire Council goes to the Statewide Landfill.
The Statewide Landfill receives 61% SIW which is higher than the state average of 42%, suggesting SIW from outside Northern Grampians Shire Council area is being received.
The Smythesdale Landfill accepts putrescible waste from most of the former Highlands area.
The Maddingley Brown Coal Landfill accepts significant tonnes of SIW from the metropolitan Melbourne area.
The Bamganie Landfill is a specialist landfill for disposal of waste from the veterinary sector (deceased animals). The site recently received a planning permit for an 80,000 tonnes per year gasification facility.

7.8 Loddon Mallee WRR region

Based on modelling, an estimated 365,000 tonnes of waste were generated in the Loddon Mallee WRR region in 2011–12, representing 3% of the state total. In the same period, 88,000 tonnes of residual waste were sent to landfills in the region.[41]

The Loddon Mallee region incorporates the LGAs listed in Table 7.37.

7.8.1 Important hubs in the state system

There are two existing hubs of importance to the waste and resource recovery system as detailed in Table 7.38.

Table 2.2 in Chapter 2 describes why these hubs are important to the state system. Hubs of regional and local importance will be detailed in the Loddon Mallee RWRRIP.

7.8.2 Cross border flows

Stakeholder consultation and SWRRIP analysis identified the need to further assess quantities and impacts of the movement of material streams across Victorian borders. While further work is required to fully understand the extent and impact of cross border flows, preliminary investigations identified the following cross border flows in the Loddon Mallee region:

- Around 300 tonnes per year of recyclable materials flows from Wakool Shire (NSW) to the VATMI MRF in Bendigo.
- Around 50 tonnes per year of recyclable materials flows from Wakool Shire (NSW) to Swan Hill.
- Between 600–1000 cubic metres per year of C&I waste flows from Swan Hill City Council to the Euston Landfill (NSW).
- Around 15,000 tonnes per year of C&D and C&I residual waste flows from the Mildura region to the Buronga Landfill (NSW).
- Undetermined tonnes of materials flow to South Australia mainly related to the South Australian container deposit levy.

While these tonnes may not be significant to the state system, they do affect the WRR regions particularly along the NSW/Victorian border. When developing RWRRIPs, the North East, Loddon Mallee and Goulburn Valley WRRGs and SV will work to quantify the issue, determine the impact and develop appropriate management mechanisms. This should include engaging with industry to develop appropriate solutions.

7.8.3 Resource recovery

Number and type of facilities

There are 48 resource recovery facilities, including 29 standalone RRC/TSs, 17 RRC/TSs located at landfills, and two MRFs in the Loddon Mallee WRR region as shown in Table 7.39.

Materials accepted

Facilities in the Loddon Mallee WRR region accept commingled recyclables, garden organics, scrap metal, tyres, concrete, bricks, e-waste, batteries, oil, mattresses, silage, household waste and unwanted furniture. DrumMUSTER services are available at selected landfills and transfer stations across the area.

The retail shops at the Eaglehawk Landfill and Swan Hill landfill sell recovered materials from hard waste and other diverted items.

The RRC/TS in the Mildura Rural City Council area support resource recovery in outlying areas by providing sorting and consolidating functions on a small scale which are then aggregated at the Mildura, Ouyen or Murrayville landfills. Four of these are hard waste compounds that only collect materials typical of kerbside hard waste collections such as white goods and furniture.

The Aroundagain retail shop at the Mildura Landfill is run by the Christie Centre which is a not-for-profit organisation.

The Ouyen and Murrayville landfills have some resource recovery accepting and separating green waste, steel, tyres, timber, cardboard, paper polystyrene, plastics, e-waste, vehicle batteries and automotive oil. Both have drumMUSTER collection capability.

All the landfills in Buloke, Gannawarra, Loddon and Swan Hill LGAs (except Denyers Road at Kerang) accept e-waste for recycling. The resale centre at Swan Hill Landfill accepts timber, doors, window frames, tiles, pavers and bricks, furniture and other household items.

Cross regional flows

The SWRRIP analysis identified some significant flows of resource recovery material streams in the Loddon Mallee WRR region including those detailed in Table 7.40. The RWRRIP will undertake further analysis of material flows.

TABLE 7.37
LGAS IN THE LODDON MALLEE WRR REGION

LGAs	
Buloke Shire Council	Macedon Ranges Shire Council
Gannawarra Shire Council	Mildura Rural City Council
Greater Bendigo City Council	Mount Alexander Shire Council
Loddon Shire Council	Swan Hill Rural City Council

TABLE 7.38
HUBS OF STATE IMPORTANCE IN THE LODDON MALLEE WRR REGION

Hub	Location
Eaglehawk Landfill	Bendigo
Mildura Landfill	Mildura

41 Estimated tonnes landfilled do not include PIW in the SWRRIP. Figures are derived from landfill levy data supplied by EPA and there is no allowance made for daily cover.

Future considerations

When developing the Loddon Mallee RWRRIP, planning for resource recovery infrastructure will need to consider the following:

- The closed landfill sites at Manangatang, Piangil, Ultima and Wycheproof now operate as transfer stations.
- The MRF facility in Mildura mainly services the local area.
- The SWRRIP identified an opportunity to increase recovery of garden organics using cross regional flows. If established, this would need to be supported by the appropriate RRC/TS infrastructure. The Eaglehawk Landfill servicing Bendigo is due for closure around 2021. A preferred solution would involve increased resource recovery to reduce the amount of replacement landfill airspace required. Additional resource recovery infrastructure would be required.
- There are a number of landfills in the Loddon Mallee WRR region scheduled for closure in the short term. The Loddon Mallee RWRRIP should facilitate transition of these sites from landfill to RRC/TS activities where appropriate.

7.8.4 Reprocessing

An estimated 277,000 tonnes of recovered materials entered reprocessing facilities in the Loddon Mallee WRR region in 2011–12 with the majority of this being reprocessed by the facilities detailed in 7.41.[42]

In addition to the reprocessors listed there are two plastic reprocessing facilities in the region including Integrated Recycling in Mildura.

Future considerations

The SWRRIP analysis identified an opportunity to increase recovery of garden organics using cross regional flows from Geelong, Ballarat, Bendigo and potentially Shepparton. This is already being explored by Bendigo, Ballarat and Geelong. When developing the Loddon Mallee RWRRIP the WRRG should continue to work with neighbouring WRRGs to explore potential opportunities to maximise organics recovery including collaborative procurement for services.

42 Based on VRIAS data which does not include tonnes of materials entering plastic reprocessors as the Plastics and Chemicals Industries Association do not participate in this survey.

TABLE 7.39
NUMBER OF RESOURCE RECOVERY FACILITIES BY LGA IN THE LODDON MALLEE WRR REGION

LGA	RRC/TS standalone	RRC/TS at landfill	MRF	Totals
Buloke Shire Council	2	5	0	7
Gannawarra Shire Council	4	0	0	4
Greater Bendigo City Council	2	2	1	5
Loddon Shire Council	2	4	0	6
Macedon Ranges Shire Council	3	0	0	3
Mildura Rural City Council	12	3	1	16
Mount Alexander Shire Council	1	1	0	2
Swan Hill Rural City Council	3	2	0	5
Totals	**29**	**17**	**2**	**48**

Notes:

Retail shops operate at the Eaglehawk Landfill RRC/TS, Mildura RRC/TS, Goornong and Strathfieldsaye RRC/TSs and the Heathcote and Swan Hill landfills.

There is a resource recovery centre at Barham in the Wakool Shire, NSW that services Gannawarra.

TABLE 7.40
ESTIMATED SIGNIFICANT RESOURCE RECOVERY MATERIAL FLOWS IN THE LODDON MALLEE WRR REGION

Material flows
Over 350 tonnes of recyclable materials was received at the VATMI MRF in Bendigo from Wakool Shire Council in NSW in 2012–13.
Around 50 tonnes of recyclable materials went to Swan Hill from Wakool Shire Council in NSW in 2012–13 which was then transported to Melbourne.
All Gannawarra and some of Wakool's recyclables are received at VATMI MRFs in Bendigo and/or Stawell.

TABLE 7.41
MAJOR REPROCESSORS IN THE LODDON MALLEE WRR REGION

Material	Company name	Location
Food waste	Scatoplus	Newbridge
Other organics	Rivcow	Charlton
Concrete, bricks or asphalt	Hopley Demolition	Bendigo
	Allstone Quarries	Eaglehawk
Other	Epsom Environmental Services	Bendigo

7.8.5 Residual waste

Landfills in the Loddon Mallee WRR region received an estimated 88,000 tonnes of waste in 2011–12.[43] Under a business as usual approach, this is projected to remain fairly constant over the next 30 years.

43 Estimated tonnes landfilled do not include PIW in the SWRRIP. Figures are derived from landfill levy data supplied by EPA and there is no allowance made for daily cover.

Operating landfills

There are five licensed landfills and 12 landfills exempt from licensing currently operating in the Loddon Mallee WRR region as shown in Table 7.42.

TABLE 7.42
OPERATING LANDFILLS IN THE LODDON MALLEE WRR REGION

	Site name (former/future EPA licence number)	Location	Owner	LGA serviced by landfill	Anticipated close date
Licensed landfills	Denyers Road (ES38707/70151)	Kerang	Gannawarra Shire Council	Gannawarra Shire Council	> 30 years
	Eaglehawk (ES397/46490)	Bendigo	Greater Bendigo City Council	Greater Bendigo City Council	2021
	Mildura (HS1302/19951)	Mildura	Mildura Rural City Council	Mildura Rural City Council	> 30 years
	Castlemaine (ES24499/11879)	Castlemaine	Mount Alexander Shire Council	Mount Alexander Shire Council	2034
	Swan Hill (HS622/72505)	Swan Hill	Swan Hill Rural City Council	Swan Hill Rural City Council	2037
Landfills exempt from licensing	Birchip	Birchip	Buloke Shire Council	Buloke Shire Council	2023
	Charlton	Charlton	Buloke Shire Council	Buloke Shire Council	2017
	Culgoa	Culgoa	Buloke Shire Council	Buloke Shire Council	2023
	Donald	Donald	Buloke Shire Council	Buloke Shire Council	2025
	Heathcote	Heathcote	Greater Bendigo City Council	Greater Bendigo City Council	2035
	Boort	Boort	Loddon Shire Council	Loddon Shire Council	2023
	Inglewood	Inglewood	Loddon Shire Council	Loddon Shire Council	2017
	Newbridge	Newbridge	Loddon Shire Council	Loddon Shire Council	2023
	Pyramid Hill	Pyramid Hill	Loddon Shire Council	Loddon Shire Council	2023
	Murrayville	Murrayville	Mildura Rural City Council	Mildura Rural City Council	2021
	Ouyen	Ouyen	Mildura Rural City Council	Mildura Rural City Council	2022
	Robinvale	Robinvale	Swan Hill Rural City Council	Swan Hill Rural City Council	2023

Notes:

The Boundary Bend Landfill operated by Swan Hill Rural City Council closed in 2014.

All landfills except Denyers Road at Kerang have RRC/TSs attached to the site.

All landfills in the Buloke and Loddon LGAs accept e-waste for recycling.

The Heathcote Landfill also has recovery centre capacity.

Closed landfills

EPA has currently identified 30 closed landfills in the Loddon Mallee WRR region. Six of these have post-closure PANs and 24 still require post-closure PANs. Closed landfill numbers and the process for replacing and rehabilitating landfill sites will be discussed further in the Loddon Mallee RWRRIP.

Landfill waste flows

The SWRRIP analysis identified some significant flows of residual waste in the Loddon Mallee WRR region including those detailed in Table 7.43. The RWRRIP will undertake further analysis of material flows.

Future considerations

- The Eaglehawk Landfill in Bendigo is near the end of its life and due for closure around 2021. Future options for the site should include using the existing site to increase resource recovery activities to reduce the amount of residual waste requiring disposal to landfill.
- The Heathcote Landfill has available airspace until 2035. However, the SWRRIP analysis suggests that further investigation is required in the medium term on the benefits of transitioning activities to resource recovery and consolidation prior to transporting the remaining consolidated residual waste to a regional landfill.
- Landfills exempt from licensing in the former Central Murray area collectively accept about 50% of what goes to the two licensed landfills, equivalent to 7,500 tonnes based on 2010–11 landfill receipts. The landfills exempt from licensing at Manangatang, Piangil and Ultima have now closed and the sites have transitioned to transfer stations. Four more landfills exempt from licensing are planned for closure over the next four years, which could reduce the number of years of available capacity at licensed landfills.
- As more landfills exempt from licensing close in the area, Swan Hill and Kerang will probably take more material than previously accepted. Alternatively, the waste could be transported to a landfill outside the area.
- The Denyers Road Landfill in Kerang is not open to the public and is used almost exclusively to dispose of MSW collected in Gannawarra Shire. While tonnes of SIW have recently increased, the percentage is still below the regional average, suggesting SIW had moved out of the area, probably to Patho in the Goulburn Valley WRR region.
- The Castlemaine Landfill has available airspace until 2034. However, the SWRRIP analysis suggests that further research into future options for the Castlemaine Landfill could identify options with improved outcomes for the council and community. This research should recognise that local landfills can have community benefits that cannot be evaluated based on economics alone. The council will ultimately decide whether to keep the landfill operating. This decision should be based on informed research including the costs and benefits of:
  - increasing resource recovery and maintaining the landfill at the current site
  - transitioning the site to RRC/TS activities and transporting the consolidated residual waste to a larger regional landfill.

TABLE 7.43
SIGNIFICANT RESIDUAL WASTE FLOWS IN THE LODDON MALLEE WRR REGION

Residual waste flows
About half of the 90,000 tonnes of residual waste generated in Bendigo each year goes to the Patho Landfill in the Goulburn Valley WRR region due to delays in constructing the final cell at Eaglehawk Landfill and a desire to prolong the available airspace at Eaglehawk.
The SIW from Buloke, Gannawarra, Loddon and Swan Hill councils is most likely transported to the Patho Landfill. Residual waste from the Buloke Shire RRC/TS is also transported to the Patho Landfill.
Macedon Ranges Shire Council transports MSW to Sunbury Landfill in the Metropolitan WRR region for disposal. SIW from the Macedon Ranges is also likely to be transferred to Melbourne for disposal, although the landfill destinations are unknown.
An estimated 15,000 tonnes per year of SIW from Mildura goes to the Buronga Landfill in NSW, possibly due to regional NSW landfills not applying a levy.
An estimated 600–1000 cubic metres of SIW mainly from commercial sources from the Swan Hill Rural City Council is transported to the Euston Landfill in NSW.

7.9 North East WRR region

Based on modelling, an estimated 210,000 tonnes of waste were generated in the North East WRR region in 2011–12, representing 2% of the state total. In the same period, 32,000 tonnes of residual waste were sent to landfills in the region.[44]

The region incorporates the LGAs and alpine resort management areas detailed in Table 7.44.

7.9.1 Important hubs in the state system

There are no existing hubs of importance to the state system in the North East region. There are two hubs of regional importance that accept significant cross regional flows as described in Table 7.45.

Hubs of regional and local importance will be detailed in the North East RWRRIP.

7.9.2 Cross border flows

Stakeholder consultation and SWRRIP analysis identified the need to further assess the quantities and impact of the movement of material streams across the NSW-Victorian border. While further work is required to fully understand the extent and impact of the cross border flows preliminary investigations identified the following:

- Approximately 9,000 tonnes per year of residual MSW flows from City of Wodonga to Albury Landfill.
- Approximately 3,000 tonnes per year of residual MSW flows from Indigo Shire Council to Albury Landfill.
- Approximately 500 tonnes per year of residual MSW flows from Towong Shire Council to Albury Landfill.
- Approximately 20,000 tonnes per year of C&D and C&I residual waste flow from north east border towns to the Albury Landfill.

While these flows may not be significant to the state system, they do affect the WRR regions particularly along the NSW-Victorian border. When developing RWRRIPs, the North East, Loddon Mallee and Goulburn Valley WRRGs and SV will work to quantify the issue and determine any impact and appropriate management mechanisms.

7.9.3 Resource recovery

Number and type of facilities

There are 23 resource recovery facilities, including 19 standalone RRC/TSs, three RRC/TSs at landfill, and one MRF in the North East WRR region as shown in Table 7.46.

Materials accepted

Larger facilities in the North East WRR region accept commingled recyclables, garden organics, whitegoods, scrap metal, tyres, concrete, e-waste, televisions and related items, timber, batteries, oil, mattresses, tyres and silage wrap. Smaller, more remote facilities accept limited materials. DrumMUSTER services are available at selected landfills and transfer stations across the area.

Future considerations

If the planned composting facility is established in Gerogery in NSW it is likely to receive garden and some food waste from parts of the North East WRR region. When developing the North East RWRRIP the WRRG will need to consider the impact on existing infrastructure.

TABLE 7.44
LGAS AND ALPINE RESORT MANAGEMENT AREAS IN THE NORTH EAST WRR REGION

LGAs and alpine resort management areas	
Alpine Shire Council	Towong Shire Council
Benalla Rural City Council	Wangaratta Rural City Council
City of Wodonga	Falls Creek Alpine Resort Management Board
Indigo Shire Council	Mount Buller and Mount Stirling Alpine Resort Management Board
Mansfield Shire Council	Mount Hotham Alpine Resort Management Board

Note: *The Environment Protection Act 1970* includes Falls Creek, Mount Hotham, Mount Buller and Mount Stirling alpine resort management boards as municipal districts constituting the North East WRR region.

TABLE 7.45
HUBS OF CROSS REGIONAL IMPORTANCE IN THE NORTH EAST WRR REGION

Hubs
Visy Board in Wodonga reprocesses cardboard from across the state.
Wangaratta MRF accepts commingled recyclables for the Goulburn Valley WRR region.

44 Estimated tonnes landfilled do not include PIW in the SWRRIP. Figures are derived from landfill levy data supplied by EPA and there is no allowance made for daily cover.

7.9.4 Reprocessors

An estimated 178,000 tonnes of recovered material entered reprocessing facilities in the North East WRR region in 2011–12 with the majority being reprocessed by the facilities detailed in Table 7.47.[45]

Cross regional flows

The SWRRIP analysis identified some significant flows of materials for reprocessing in the North East WRR region including those detailed in Table 7.48. The RWRRIP will undertake further analysis of material flows.

Future considerations

The North East WRRG should investigate options to increase recovery of food and garden organics when developing the RWRRIP. The WRRG should work with local governments to explore options including opportunities to consolidate tonnes through collaborative procurements for services.

TABLE 7.47
MAJOR REPROCESSORS IN THE NORTH EAST WRR REGION

Material	Company name	Location
Concrete, bricks or asphalt	Mansfield Construction	Mansfield
	Trevor Jackson	Wodonga
Garden organics	Greenchip	Wodonga
Paper and cardboard	Visy Board	Wodonga
Timber	D&R Hendersons	Benalla

TABLE 7.48
ESTIMATED SIGNIFICANT FLOWS OF MATERIALS FOR REPROCESSING IN THE NORTH EAST WRR REGION

Material flows
The VISY Board in Wodonga is reported to receive significant tonnes of cardboard and paper from across Victoria and NSW.
Trevor Jackson is reported to receive significant tonnes of C&D material from NSW.

45 Based on VRIAS data which does not include tonnes of materials entering plastic reprocessors as the Plastics and Chemicals Industries Association do not participate in this survey.

TABLE 7.46
NUMBER OF RESOURCE RECOVERY FACILITIES BY LGA IN THE NORTH EAST WRR REGION

LGA	RRC/TSs standalone	RRC/TSs at landfill	MRFs	Total
Alpine Shire Council	2	1	0	3
Benalla Rural City Council	0	1	0	1
City of Wodonga	1	0	0	1
Indigo Shire Council	2	0	0	2
Mansfield Shire Council	2	0	0	2
Towong Shire Council	1	1	0	2
Wangaratta Rural City Council	8	0	1	9
Mt Buller, Mt Hotham, Falls Ck Alpine Resorts	3	0	0	3
Totals	**19**	**3**	**1**	**23**

Notes:

The Alpine Shire Council is installing skips for domestic quantities of asbestos at the Porepunkah Transfer Station.

Mansfield Shire Council operates a roadside facility at Woods Point.

Towong Shire Council operates small sheds containing recycling bins for community use at Mitta Mitta Recreation Reserve, Eskdale Primary school, Talgarno Gap Road, Granya Recreation Reserve, Lucyvale Road, Tallangatta Creek Road and Corryong-Benambra Road.

Wangaratta has a privately operated recycle shop/salvage business that primarily receives C&D materials.

Wodonga has a resale centre operated by a not-for-profit organisation.

7.9.5 Residual waste

Landfills in the North East WRR region received an estimated 32,000 tonnes of waste in 2011–12.[46] Under a business as usual approach, this is projected to increase to about 54,000 tonnes in 2041–42. However, it should be noted that these figures do not include movement of materials across the NSW/Victorian border. The North East WRRG will further analyse the data and flow of materials when developing their RWRRIP.

Operating landfills

There are three licensed landfills in the North East WRR region and two landfills exempt from licensing as shown in Table 7.49.

Closed landfills

EPA has currently identified 11 closed landfills in the North East WRR region. Three of these have post-closure PANs and eight still require post-closure PANs. Closed landfills numbers and the process for replacing and rehabilitating landfill sites will be discussed further in the North East RWRRIP.

Landfill waste flows

The SWRRIP analysis identified some significant flows of residual waste in the North East WRR region including those detailed in Table 7.50. The RWRRIP will undertake further analysis of material flows.

46 Estimated tonnes landfilled do not include PIW in the SWRRIP. Figures are derived from landfill levy data supplied by EPA and there is no allowance made for daily cover.

Future considerations

The Benalla, Bowser and Myrtleford landfills are all relatively small and geographically close. The North East RWRRIP should include an approach to develop the long term plan for these landfills. Options to be explored include:

- increasing resource recovery activities at these sites before disposal of residual waste
- transitioning one or more sites to RRC/TS activities prior to transporting the consolidated residual waste to other sites
- focusing one site on resource recovery and organics reprocessing and establishing a landfill hub for the region at the other site.

While the Albury landfill is technically outside of the North East WRR region it receives significant amounts of residual MSW and SIW generated in the region. The North East RWRRIP needs to consider the impact of the landfill either closing or refusing to accept material streams from across the border. Additionally potential changes in the charging regime in NSW may impact on the business case supporting current arrangements and the WRRG should work with member local governments to identify the most cost effective options.

TABLE 7.50
ESTIMATED SIGNIFICANT RESIDUAL WASTE FLOWS IN THE NORTH EAST WRR REGION

Residual waste flows
In 2012–13 around 50,000 tonnes of waste were transferred from the North East WRR region to Albury in NSW consisting of: › around 12,000 tonnes of MSW flow from the Wodonga, Indigo and Towong RRC/TSs. › around 21,000 tonnes of C&D and C&I.
Significant quantities of C&I waste are probably transported to the Cosgrove Landfill near Shepparton, based on the low percentage of SIW received at Benalla (23%).

TABLE 7.49
OPERATING LANDFILLS IN THE NORTH EAST WRR REGION

	Site name (former/future EPA licence number)	Location	Owner	LGA serviced by landfill	Anticipated close date
Licensed landfills	Myrtleford (ES505/13111)	Myrtleford	Alpine Shire Council	Alpine Shire Council	> 30 years
	Benalla (ES503/12560)	Benalla	Benalla Rural City Council	Benalla Rural City Council, Mansfield Shire Council	2037
	Bowser (HS1349/20025)	Wangaratta	Wangaratta Rural City Council	Wangaratta Rural City Council	2022
Landfills exempt from licensing	Cobungra Landfill	Cobungra	Mount Hotham Resort Management Board	Mount Hotham Resort Management Board	No data
	Corryong	Corryong	Towong Shire Council	Towong Shire Council	No data

Note: The very small Cobungra Landfill is owned and operated by Mount Hotham resort. It is used solely for disposal of waste from the resort due to low viability of other options including transport to a larger regional landfill.

8. Appendices

8.1 Glossary

Term	Explanation
Airspace	The remaining capacity of a landfill.
Anaerobic digestion (AD)	Biological breakdown by microorganisms of organic matter, in the absence of oxygen, into biogas (a mixture of carbon dioxide and methane) and digestate (a nutrient-rich residue).
Beneficiation	An optical sorting process used to separate different colours of container glass to produce cullet for reprocessing and mixed fines.
Landfill BEPM: (Best practice environmental management)	Facility management in line with EPA publication in *Best Practice Environmental Management – siting, design, operation and rehabilitation of landfills*.
Biogas	A gas generated by breaking down organic matter in the absence of oxygen, such as occurs in landfills. Biogas is typically comprised of 60% methane and 40% carbon dioxide, and can be used as an energy source.
Biomass	Biological material that is not fossilised, including forest and mill residues, agricultural crops and waste, wood and wood waste, animal waste, livestock operation residues, aquatic plants, fast growing trees and plants.
Biosolids	Biosolids are considered to be organic solids derived from sewage treatment processes that are in a state that they can be managed to sustainably utilise their nutrient, soil conditioning, energy, or other value (achieve minimum EPA standards for classification as T3 and C2 biosolids). The solids that do not meet these criteria are defined as sewage sludge.
Buffer zone	Buffer zones, or separation distances, aim to minimise the off-site impacts of sensitive land uses arising from unintended, industry generated odour and dust emissions. A buffer zone is an area of land outside the operating area of a facility that is set aside to maintain an adequate distance between the facility and sensitive land uses (such as residential development) so those uses are not adversely affected by noise, odour or dust. The land may or may not be owned by the facility owner.
Category C contaminated soil	Refer to Prescribed waste and prescribed industrial waste (PIW)
Collection system	System for collecting materials from the kerbside, including bin type and collection frequency.
Commingled recyclables	Materials combined generally for the purposes of collection, mainly through municipal collection services. Includes plastic bottles, other plastics, paper, glass and metal containers. Commingled recyclable materials require sorting after collection before they can be recycled. Can also be called commingled materials.
Commercial and industrial (C&I) waste	Solid inert waste generated from trade, commercial and industrial activities including the government sector. It includes waste from offices, manufacturing, factories, schools, universities, state and government operations and small to medium enterprises e.g. food waste.
Composting	The process whereby organic materials are microbiologically transformed under controlled aerobic conditions to create a pasteurised and stabilised organic product for application to land.
Construction and demolition (C&D) waste	Solid inert waste generated from residential and commercial construction and demolition activities e.g. bricks and concrete.
Clean fill	Material that has no harmful effects on the environment. This material is a natural soil material and does not contain any chemicals or other materials such as concrete rubble. Also called fill material.
Cullet	Sorted glass feedstock resulting from the beneficiation process of mixed container glass. Generally consists of sorted streams of amber, flint and green glass of particle size greater that 5–10 mm depending on the capacity of the beneficiation plant.

Term	Explanation
Daily cover	The layer of compressed soil or earth which is laid on top of a day's deposition of waste on an operational landfill site. The cover helps prevent interaction between waste and air, reducing odours and creating a firm base for vehicles to work on.
Delamination	The process of splitting a composite material into its component parts e.g. laminated glass.
Department of Environment, Land, Water and Planning (DELWP)	A Victorian government department providing policy planning, preparation of legislative amendments, leadership coordination and oversight of the environment portfolio.
Digestate	A nutrient-rich residue remaining after the anaerobic digestion of a biodegradable feedstock.
Drop-off centre/site	A facility where households can drop-off selected materials and household items for recycling and reuse. Also called drop-off facilities.
E-waste	E-waste comprises of electronic equipment with a plug or battery that requires a current to operate and that has reached end of life. It includes televisions, computers, monitors and whitegoods such as fridges and washing machines.
Energy from waste	The terms 'energy recovery from waste', 'waste to energy' or 'energy from waste' can be used interchangeably to describe a number of treatment processes and technologies used to generate a usable form of energy from waste materials. Examples of usable forms of energy include electricity, heat and transport fuels.
Environment Protection Authority Victoria (EPA)	Established under the auspices of the *Environment Protection Act 1970*, EPA's role is to be an effective environmental regulator and an influential authority on environmental impacts.
Feedstock	Raw material used to manufacture products. Material varies depending on what is being produced.
Fill material	See clean fill.
Fines (glass)	Unsorted sub 5–10 mm glass material left over from the glass beneficiation process. It can contain contamination including plastics and small pieces of metals. These fines can be further processed to produce a glass sand product which has a number of potential uses.
Food organics	Food waste from households or industry, including food processing waste, out-of-date or off-specification food, meat, fruit and vegetable scraps. Excludes liquid wastes.
Garden organics	Organics derived from garden sources e.g. grass clippings, tree prunings. Also known as green organics.
Gasification	Thermal technology that converts material into combustible gases by partial oxidation under the application of heat, leaving an inert residue.
Green organics	See Garden organics.
Greenhouse gases	Gases, including carbon dioxide and methane that trap heat in the earth's atmosphere, affecting weather and climate patterns.
Hard waste	The term applied to household garbage that is not usually accepted into kerbside garbage bins by local councils e.g. old fridges and mattresses.
Incinerator	For the purpose of this document, a site that facilitates the disposal of waste streams through incineration without producing another useful end product or capturing value from the waste material.
Hazardous waste	See Prescribed waste and prescribed industrial waste (PIW).
Hubs	The concentration of reprocessing facilities where there is sufficient waste derived feedstock to support viable reprocessing options. The location of hubs will vary for individual material streams.
Illegal dumping	Illegal dumping is the deliberate and unauthorised dumping, tipping or burying of waste on land that is not licensed or fit to accept that waste.

Term	Explanation
In-vessel composting	Composting technology involving the use of a fully enclosed chamber or vessel in which the composting process is controlled by regulating the rate of mechanical aeration. Aeration assists in heat removal, temperature control and oxygenation of the mass. Aeration is provided to the chamber by a blower fan which can work in a positive (blowing) and/or negative (sucking) mode. Rate of aeration can be controlled with temperature, oxygen or carbon dioxide feedback signals.
Kerbside waste/collection	Waste collected by local councils from residential properties, including garbage, commingled recyclables and garden organics, but excluding hard waste.
Landfill	Discharge or deposit of solid wastes onto land that cannot be practically removed from the waste stream.
Landfill levy	A levy applied at differential rates to municipal, C&I and prescribed wastes disposed of at licensed landfills in Victoria. Landfill levies are used solely for the purposes of environment protection and fostering environmentally sustainable use of resources and best practice in waste management. They fund the activities of WRRGs, SV and EPA, helping to establish waste management infrastructure, industry waste reduction programs, education programs, regulatory controls and enforcement regimes. Levies also provide an incentive to minimise the generation of waste, sending a signal to industry that the government supports efforts to develop alternatives to disposal to landfill.
Leachate	Contaminated water that has percolated through or drained from a landfill.
Litter	Any small, medium or large item placed inappropriately.
Materials recovery facility (MRF)	A centre for the receipt, sorting and transfer of materials recovered from the waste stream. At a MRF, materials are also sorted by type and treatment, which may include cleaning and compression.
Mechanical biological treatment (MBT) plant	MBT plants combine mechanical sorting (such as in a MRF) with biological treatment of organic waste to process residual organic waste. This could include technology such as anaerobic digestion to stabilise the material and generate heat and power. Material remaining after further treatment (often referred to as 'digestate') can be added to compost or used as fuel in a thermal waste-to-energy facility.
Municipal solid waste (MSW)	Solid waste generated from municipal and residential activities, and including waste collected by, or on behalf of, a municipal council. In this document, MSW does not refer to waste delivered to municipal disposal sites by commercial operators or waste from municipal demolition projects.
Open windrow composting operation	A type of outdoor composting process where organic materials are piled in to windrows and are turned for aeration.
Optical sorting	Technologies used to sort glass by colour type, and plastics by polymer type.
Organic material	Plant or animal matter originating from domestic or industrial sources e.g. grass clippings, tree prunings and food waste.
Prescribed waste and prescribed industrial waste (PIW)	These wastes are defined in the *Environment Protection (Industrial Waste Resource) Regulations 2009*. EPA closely regulates these wastes because of their potential adverse impacts on human health and the environment. Prescribed wastes carry special handling, storage, transport and often licensing requirements, and attract substantially higher disposal levies than non-prescribed solid wastes. Also known as hazardous waste.
Process derived fuels	Also called process engineered fuel (PEF) or refuse derived fuel (RDF) is a fuel produced after basic processing in a MRF or MBT to increase the calorific value and remove recyclable materials and contaminants of municipal solid waste, commercial and industrial waste, and construction and demolition waste.
Processing facilities	Facilities which either receive materials directly from collection systems or from recovery facilities for further sorting and/or processing to provide material for use in the generation of new products.

Term	Explanation
Product stewardship	A concept of shared responsibility by all sectors involved in the manufacture, distribution, use and disposal of products, which seeks to ensure value is recovered from products at the end of life.
Public place recycling	Recycling facilities found in public areas, such as parks, reserves, transport hubs, shopping centres and sport and entertainment venues that allow the community to recycle when away from home.
Putrescible waste	Waste that readily decomposes, including food waste and organic waste from gardens.
Pyrolysis	Thermal breakdown of waste in the absence of air, to produce char, pyrolysis oil and syngas e.g. the conversion of wood into charcoal.
Recyclables	While this term strictly applies to all materials that may be recycled, in this document the term is generally used to refer to the recyclable containers and paper/cardboard component of kerbside waste e.g. it excludes garden organics.
Recycling	A term that may be used to cover a wide range of activities, including collection, sorting, reprocessing and manufacture into new products.
Refuse derived fuels	Refer to Process derived fuels.
Reprocessing	Changing the physical structure and properties of a waste material that would otherwise have been sent to landfill to add financial value to the processed material. Without reprocessing, the beneficial use of waste materials would be lost.
Reprocessing facilities	See Reprocessor.
Reprocessor	Facility that changes the physical structure and properties of a waste material that would otherwise be sent to landfill to add financial value to the processed material. Without reprocessing the beneficial use of the material would be lost.
Resale centre/shop	A centre/shop that enables the sale and subsequent re-use of good quality, saleable products and materials that were disposed of by their previous owner.
Residual waste	Residual material that remains after any source separation or reprocessing activities of recyclable materials or garden organics. Waste that is left over after suitable materials have been recovered for reuse and recycling. This generally means the environmental or economic costs of further separating and cleaning the waste are greater than any potential benefit of doing so.
Resource recovery	The process of obtaining matter or energy from discarded materials. Occurs at resource recovery centres.
Resource recovery centre	Facilities established to receive and/or recover re-usable and recyclable materials that would otherwise be destined for disposal. Can be combined with a transfer station and may include resale centres.
Re-use	Recovering value from a discarded resource without processing or remanufacture e.g. garments sold though opportunity shops are, strictly speaking, a form of re-use, rather than recycling.
Sectors, industry sectors	Groupings of industries used to generalise patterns in waste generation and disposal e.g. construction and demolition, food services including food retail and food manufacturing, small to medium enterprises.
Shredder floc	Residue directly arising from large scale shredding operations to recover metals. Shredded material includes, but is not limited to, end of life vehicles, white goods, machineries, drums and corrugated material.
Social licence to operate	The concept of a 'social licence to operate' has evolved from broader concepts of 'corporate social responsibility' and is based on the idea that a business not only needs appropriate government or regulatory approval but also a 'social licence'. The social licence is the acceptance that is continually granted to industry and facility operators by the local community or other stakeholders to operate.

Term	Explanation
Solid industrial waste (SIW)	Solid waste generated from commercial, industrial or trade activities, including waste from factories, offices, schools, universities, state and federal government operations and commercial construction and demolition work. Excludes MSW, wastes that are prescribed under the *Environment Protection Act 1970* and quarantine wastes.
Solid waste	Non-hazardous, non-prescribed, solid waste materials, ranging from municipal garbage to industrial waste.
Source separation	The practice of segregating materials into discrete material streams prior to collection by, or delivery to, processing facilities.
Spokes	The sequence of activities that move materials from waste generators to (and from) hubs e.g. collection, transport and sorting. The length of the spoke and hence the location of the hub for a particular material stream is influenced by the impact of transport on the margin of return for that particular material stream.
Stockpiling	Storage of materials.
Sustainability Victoria (SV)	Statutory authority established in October 2005 under the *Sustainability Victoria Act 2005* with the key objective of 'facilitating and promoting environmental sustainability in the use of resources'. SV works across the areas of energy, waste and water with communities, industries and government applying the best ideas and encouraging action to enable change in environmental practices.
Transfer station	A facility allowing the drop-off and consolidation of garbage and a wide range of recyclable materials. Can be combined with a resource recovery centre and may include resale centres. Do not undertake processing activities.
Waste	Any discarded, rejected, unwanted, surplus or abandoned matter, including where intended for recycling, reprocessing, recovery, purification or sale. Anything that is no longer valued by its owner for use or sale and which is, or will be, discarded. In this document, the term 'solid waste' refers to non-hazardous, non-prescribed, solid waste materials ranging from municipal garbage to industrial waste.
Waste and resource recovery group (WRRG)	Statutory authorities established under the *Environment Protection Act 1970* responsible for preparing the Regional Waste and Resource Recovery Implementation Plan for their region.
Waste and Resource Recovery Planning Framework	The planning framework as defined in the amendments to the *Environment Protection Act 1970* and including: › The Statewide Waste and Resource Recovery Infrastructure Plan (SWRRIP) › The seven Regional Waste and Resource Recovery Implementation Plans (RWRRIPs) › Relevant Ministerial Guidelines made under section 50CA of the Act › The process for integration of the SWRRIP and RWRRIPs.
Waste management industry	Applies to those involved in managing waste e.g. collectors, sorters, processors and landfill operators.
Waste minimisation	The concept of, and strategies for, waste generation to be kept to a minimum level in order to reduce the requirement for waste collection, handling and disposal to landfill. Also referred to as waste avoidance.
Waste to energy	Refer to Energy from waste.

8.2 Data sources, data considerations and modelling

8.2.1 Data sources

Table 8.1 details the main data sources used for the Statewide Waste and Resource Recovery Infrastructure Plan (SWRRIP). Data sources are referenced throughout the SWRRIP where appropriate. There may be small disparities between the figures in the SWRRIP and other published data due to assumptions underpinning the data and changes in the methodologies for reporting the data. Where possible these have been noted and caution is advised when comparing data.

TABLE 8.1
MAIN DATA SOURCES FOR THE SWRRIP

Data source	Description
Victorian Local Government Annual Survey (VLGAS)	Annual data on materials collected through local government kerbside collection systems and published by Sustainability Victoria. All 79 local governments in Victoria participate. The survey provides trending data on recyclables, organics, residual waste, hard waste and litter. The SWRRIP uses survey data from the financial year 2011–12, which is available on the SV website at **www.sustainability.vic.gov.au**
Victorian Recycling Industries Annual Survey (VRIAS)	Annual data collection measuring tonnages of materials diverted from landfill by major reprocessors in Victoria. Used to measure progress against Victorian waste reduction targets, and trends in the recovery of waste materials. The survey is voluntary and although the return rate is relatively constant, contributors can vary from year to year. VRIAS is available on the SV website at **www.sustainability.vic.gov.au**
EPAs landfill levy returns	Unpublished (commercial-in-confidence) information provided by EPA.
Australian Bureau of Statistics (ABS) population data	ABS Catalogue Number 3101 — Australian Demographic Statistics, March 2012.
Victorian landfill audits	SVs disposal-based waste survey, 2009. A visual waste audit of eight metropolitan landfills, one regional landfill and one transfer station, covering 2003 separate inbound loads.
EPA Rural Landfill Risk Assessment 2013	Unpublished report provided by EPA.
The Victorian Waste and Resource Recovery Projection Model, v1.1, 2013.	SV's modelling of trends in population growth, economic activity, waste generation and growth of resource recovery markets to project future waste generation and resource recovery trends. Sources for the model are EPA landfill levy returns, VRIAS 2010–11, SV's disposal based waste surveys for 2005 and 2009 and ABS population data. More information about the design and assumptions underpinning the model can be found in Chapter 8.4.3.
Mapping data	SV internal data

8.2.2 Data considerations

Data accuracy

Accuracy of information and data depends on the source. SV has verified information and data where possible, but all data should be considered as indicative only and has been provided as a guide or estimate of true values, unless otherwise stated.

Most data in the SWRRIP is rounded, for ease of reading. This may result in minor discrepancies between totals and line items. Non-rounded data has been used to generate graphs and charts, and for modelling. Any exceptions are referenced.

Data availability

The availability of data is not evenly spread across the state, or available for all material streams. There is fairly robust data around material streams collected via municipal kerbside collection systems but limited data around C&I and C&D streams For example, there is more data for municipal organics — as it is collected, measured and reported by local governments — than for C&I organics (for which there is no formal data collection and reporting system). There is also some disparity between data available from metropolitan Melbourne and for regional Victoria.

Generation data

Modelling has been used to estimate generation tonnes using the sum of the state landfill tonnes obtained from landfill levy receipts and state tonnes reprocessed using VRIAS data. These are referenced as modelled and should only be used as indicative.

Generation tonnes at the regional level are the sum of a proportion of the total state recovered tonnes (from VRIAS) based on Australian Bureau of Statistics population data for the region and the tonnes landfilled in that region based on EPA landfill data and therefore quoted as modelled.

Landfill data

Calculating landfill airspace is based on information from WRR region landfill owners, local governments and EPA. It reflects the estimated amount of airspace void and the amount of works approved airspace. This approach to estimating closure dates will be refined through the SWRRIP and the Regional Waste and Resource Recovery Implementation Plans (RWRRIPs) integration process and should only be considered estimates. Actual closure dates are determined by the owners and operators of each landfill. In estimating available landfill airspace, we also factored in prescribed industrial waste (PIW) received by landfills as this reduces the available airspace on those landfills that accept PIW, as well as municipal solid waste (MSW) or solid industrial waste (SIW).

Landfill tonnes are based on landfill levy data and are not adjusted for daily cover. In previous versions of the SWRRIP and some other historical reports, landfill tonnages assumed that 15% of the tonnes received at a landfill were used by the landfill for daily cover and maintenance such as roads. This was based on historical assumptions and does not reflect current activities.

Tonnes landfilled attributed to an individual region are based on the tonnes landfilled in that region and do not allow for residual waste flows either entering or leaving the region.

Landfill numbers only include operational landfills at the time of publication and not those awaiting approval. For this reason, numbers may vary from those in RWRRIPs, as they also include planned and some closed landfills.

Material streams

Data collected to support the former Towards Zero Waste Strategy included tyres as 'other organic' in data collections. The SWRRIP also considers these separately as the way tyres are managed and reprocessed is different to how other organic materials are managed and reprocessed. This should be noted when comparing data with that published previously.

In previous publications textiles data was considered a subsection of the organics data. As most of the recovered textiles are synthetic it is now considered a category of its own but granular data is limited.

Data relating to the reprocessing of material streams

Reprocessing data is sourced from VRIAS and represents the tonnes of materials entering reprocessing facilities. This is not a direct correlation to how much was reprocessed as there is no data on amounts stockpiled by reprocessors or the amounts landfilled by reprocessors. For this reason, quantities are referred to as 'recovered', rather than 'reprocessed'.

Most businesses willingly provide information about the types and quantities of materials they handle. However some choose not to participate and therefore, while the data is comprehensive and a good representation of the Victorian reprocessing industry it is not 100% complete.

Additional data identifying the reprocessing facilities has been sourced from the previous waste management groups, old recycling databases, phone conversations and site visits to businesses that collect and reprocess solid industrial waste (SIW).

8.2.3 The Victorian Waste and Resource Recovery Projection Model

Overview

SV developed the Victorian Waste and Resource Recovery Projection Model to support the development of the SWRRIP. It uses past trends in waste generation and resource recovery to track and project future solid waste flows until 2043–44.

The model is based on data for annual tonnes of waste landfilled and recovered, waste stream composition and landfill capacity data, and government population projections. The model projects the amount of materials recovered and the amount of waste going to landfill in future years, assuming that current trends continue. It then splits these amounts into municipal and industrial sector streams.

While the model uses the best available data, it has a number of limitations that users of the data need to consider including that it:

- Overestimates the proportion of the total tonnes of waste recovered from the construction and demolition (C&D) and commercial and industrial (C&I) sectors because it uses past trends to project future trends, and recovery trends in these sectors were very high for several years before 2010–11; C&D waste generation grew from about 1.4 million tonnes in 2003–04 to 2.3 million in 2010–11, and in the C&I sector from about 2.3 million tonnes to 3.7 million tonnes over the same period.
- Models solid industrial waste (SIW), which it then splits into C&D and C&I sector streams, based on landfill waste audits in 2005.
- Generation projections are the sum of the projections for landfill and for recovery, and are therefore only indicative of generation.

As a result, users should consider the model as giving a good estimate of total amounts going to landfill and total amounts recovered, but providing only an indication of the sector breakdown.

The model assumes Victoria's population will increase to 8.1 million by 2041 and per capita waste generation will increase to 3.1 tonnes a year. SV will update the model regularly to incorporate real data as it becomes available, and to reflect changes in population growth and waste generation trends. This will improve the accuracy of the model. It is, however, only intended to be indicative and not to represent real quantities of materials.

How the model works

The Victorian Waste and Resource Recovery Projection Model is a custom built Excel spreadsheet model prepared for SV by Blue Environment in early 2013. It is designed to track and project future solid waste flows until 2043–44. The outputs are of:

- estimates of past, present and future waste flows by quantity, composition, source sector and management route, with accompanying charts
- estimates of the drawdown of putrescible and inert landfill airspace by waste and resource recovery group (WRRG) region.

The primary data sets that the model uses are annual tonnes of waste landfilled and recycled, data on the composition of these streams, landfill capacity data, and government population data and projections.

Generation tonnage figures are compiled using actual data and near-term projections from EPA's landfill tonnes projection model for municipal solid waste (MSW), C&I waste, C&D waste and prescribed industrial waste (PIW) to landfill. The near-term projections run to 2016–17. The model finds the best fit between the input waste figures and population data and projections. It then applies this best fit to population projections to estimate future waste quantities to 2043–44.

Three scenarios are modelled for the split of MSW and SIW into landfill and recycling:

- Business as usual (BAU): The recovery rate remains at the level, in the last year, projected by EPA landfill tonnes projection model (currently 2016–17).
- Moderate additional diversion: By 2043–44, the recovered tonnes exceed BAU by some quantity that can be set by the user (currently set at 0.75 million tonnes).
- High additional diversion: By 2043–44, the recovered tonnes exceed BAU by some quantity that can be set by the user (currently set at 1.5 million tonnes).

The model then splits these waste quantities by WRR area and, for metropolitan Melbourne, into sub-regions (east and west). It applies the projected quantities of waste to landfill to regional estimates of landfill capacity, taking into account knowledge of cross regional transfers of residual waste. It projects the drawdown of existing landfill capacity, showing when it is likely to be depleted. Regional estimates are derived for all landfill capacity and, separately, for inert landfill capacity.

The model generates updated estimates when new annual data is inserted. As the size of the data sets increase, the accuracy of the projections should improve. The model will be reviewed annually and updated data made available.

Readers should consider outputs as best estimates based on available data and should only consider the values as indicative. Error margins are not known. Inputs with low levels of certainty include landfill composition, the split of industrial landfill quantities into C&I and C&D, and potentially the landfill capacity data. The error margin of the projections increases with time, from the present.

Modelling method and assumptions

SV's Victorian Waste and Resource Recovery Projection Model compiles the quantity of MSW and SIW sent to landfill and recycled since 2002–03, the first year when this split was possible. The quantity of PIW to landfill was compiled since 2006–07, the year when the PIW levy was significantly increased.

Near-term projections are imported from EPA's landfill tonnes projection model. EPA uses this model to project landfill levy income (at the time of writing, running to 2016–17). The EPA model is more sophisticated than SV's projection model because it uses a broader range of short term data, including projections of gross state product, weather and market conditions. For inter-agency consistency, the outputs of that model are imported directly into SV's model.

SV's model adds the landfill and recycling components of waste to landfill and waste recycled to get the total generated. It then seeks the best linear statistical fit (using a 'least squares' approach) between population and MSW generated, SIW generated and PIW to landfill. The best fit covers the period from 2002 to 2003 (the first year data became available) up until the last year of EPA model projections. SV's model projects waste quantities after that date by applying this best fit to government population projections. The underlying assumption is that waste generation is driven by population growth and the past; measured statistical relationships between these variables represent the relationships through to 2043–44.

The projected quantity of MSW and SIW is split into recycling and landfill components for the three scenarios (BAU, moderate additional diversion and high additional diversion).

It is assumed that the additional diversion occurs by an equal annual increment between the year following EPA model projections and 2043–44.

The composition of the recycling and landfill streams is calculated by the user nominating the proportion of SIW to landfill attributable to C&I, and the percentage composition of MSW, C&I waste and C&D waste to landfill.

For past years, the model applies proportions recorded in landfill composition audits.

For future years, unless the user specifies otherwise, the proportion of SIW to landfill attributable to C&I and the proportional composition of MSW, C&I waste and C&D waste to landfill are assumed to be those recorded in the most recent audit. For past years, the model applies proportions recorded in SV surveys of the recycling industry.

For future years:

- unless the user specifies otherwise, the proportion of industrial recycling attributable to C&I, and the proportional composition of MSW, C&I waste and C&D waste in the recycling stream, in the BAU scenario, are assumed to be those recorded in the most recent recycling survey
- for the moderate and high additional diversion scenarios, the additional diverted material is assumed to have the same composition as waste to landfill (this assumption ensures that scenario selection does not affect the quantities of each waste type that are projected to be generated).

This data is used to calculate annual displays of data or projections, which can be seen in the spreadsheet *Annual summary*.

The quantity of waste to landfill transferred between regions (or in or out of Victoria) is projected to 2043–44. This is undertaken in the worksheet *Reg lfill transf calcs*. It is assumed that the transfers grow (or shrink) over time at the same rate as the average for waste to landfill produced in the source region. This applies only for the period nominated for that transfer in the data inputs. Transfers of MSW, SIW, PIW and waste to inert landfills are modelled separately.

The quantities of waste to landfill produced in each region are derived by adding or subtracting waste transfers to reported quantities of waste landfilled. The quantities of MSW, SIW, PIW and inert waste to landfill are separately projected to 2043–44, with automatic readjustment when new landfill data is entered in the model. These calculations are given in the worksheet *Reg lfill proj calcs*. The projections are based on the assumption that the proportionate change in per capita production of each waste type sent to landfill is the same in each region, while the total must add to the projected quantity for the state in each year. This is complex because different regions produce varying quantities of waste to landfill per capita, and have different projected population growth rates.

Expressed mathematically, the assumption implies that $(L_{x,k}/P_{x,k})/(L_{x,k-1}/P_{x,k-1})$ is a constant (C_k), where:

$L_{x,k}$ = waste to landfill in region X in year K

$P_{x,k}$ = population of X in year K.

Hence, $L_{x,k} = C_k * L_{x,k-1} * P_{x,k}/P_{x,k-1}$.

Putting $L_{x,k-1} * P_{x,k}/P_{x,k-1} = S_{x,k,}$ we can say: $L_{x,k} = S_{x,k} * C_k$

Also, we have $\sum Lk$ for all regions = total garbage for the year k = TLk.

Substituting, we get: $TLk = Ck * \sum Sk$, and therefore: $Ck = TLk / \sum Sk$.

Inserting this value for Ck into (1), we have for any region X in year K: $Lx,k = Sx,k * TLk / \sum Sk$.

The inter-regional transfers of waste projected for each year are added and subtracted to the projected quantities of waste produced in the region, yielding an estimate of the waste sent to landfill in each region and year. The total waste to landfill by region is derived by adding the sub-components. Waste to inert landfills is presented separately. These calculations are given in the worksheet *Calcs - reg lfill projections*.

The projected quantities of waste to landfill are subtracted from the recorded regional airspace capacities, resulting in a region-by-region time series estimate of the drawdown of landfill airspace. It is assumed that no waste is transferred between regions, unless specified in the *Data inputs* worksheet. If a particular site fills during the modelling period, it is effectively assumed that the material goes to another landfill in the region.

Similarly, when the model determines that all regional airspace is depleted, a zero is displayed: waste is not reallocated to some other region. For Melbourne, however, a separate calculation is carried out which assumes that when landfill capacity in the sub-region Metropolitan east is depleted, the material is transferred to the sub-region Metropolitan west. Data and charts showing the estimated drawdown of landfill airspace are presented in the worksheet *Time series*.

8.3 Waste and resource recovery group member local governments

Table 8.2 lists all local government areas in Victoria by waste and resource recovery region (WRR region) and by previous waste management group (WMG) regions.

TABLE 8.2
LOCAL GOVERNMENT AREAS IN EACH WRR REGION

WRR region	Local government area	Previous WMG region
Metropolitan	Banyule City Council	Metropolitan Melbourne
	Bayside City Council	
	Boroondara City Council	
	Brimbank City Council	
	Cardinia Shire Council	
	Casey City Council	
	Darebin City Council	
	Frankston City Council	
	Glen Eira City Council	
	Greater Dandenong City Council	
	Hobsons Bay City Council	
	Hume City Council	
	Kingston City Council	
	Knox City Council	
	Manningham City Council	
	Maribyrnong City Council	
	Maroondah City Council	
	Melbourne City Council	
	Melton Shire Council	
	Monash City Council	
	Moonee Valley City Council	
	Moreland City Council	
	Nillumbik Shire Council	
	Port Phillip City Council	
	Stonnington City Council	
	Whitehorse City Council	
	Whittlesea City Council	
	Wyndham City Council	
	Yarra City Council	
	Yarra Ranges Shire Council	
	Mornington Peninsula Shire Council	Mornington Peninsula
Barwon South West	Colac Otway Shire Council	Barwon
	Greater Geelong City Council	
	Queenscliffe Borough Council	
	Surf Coast Shire Council	
	Corangamite Shire Council	South Western
	Glenelg Shire Council	
	Moyne Shire Council	
	Southern Grampians Shire Council	
	Warrnambool City Council	
Gippsland	Bass Coast Shire Council	Gippsland
	Baw Baw Shire Council	
	East Gippsland Shire Council	
	Latrobe City Council	
	South Gippsland Shire Council	
	Wellington Shire Council	
Goulburn Valley	Campaspe Shire Council	Goulburn Valley
	Greater Shepparton City Council	
	Mitchell Shire Council	
	Moira Shire Council	
	Murrindindi Shire Council	
	Strathbogie Shire Council	
Grampians Central West	Hindmarsh Shire Council	Desert Fringe
	West Wimmera Shire Council	
	Ararat Rural City Council	Grampians
	Horsham Rural City Council	
	Northern Grampians Shire Council	
	Yarriambiack Shire Council	
	Ballarat City Council	Highlands
	Central Goldfields Shire Council	
	Golden Plains Shire Council	
	Hepburn Shire Council	
	Moorabool Shire Council	
	Pyrenees Shire Council	

WRR region	Local government area	Previous WMG region
Loddon Mallee	Greater Bendigo City Council	Calder
	Macedon Ranges Shire Council	
	Mount Alexander Shire Council	
	Buloke Shire Council	Central Murray
	Gannawarra Shire Council	
	Loddon Shire Council	
	Swan Hill Rural City Council	
	Mildura Rural City Council	Mildura
North East	Alpine Shire Council	North Eastern
	Benalla Rural City Council	
	Indigo Shire Council	
	Mansfield Shire Council	
	Towong Shire Council	
	Wangaratta Rural City Council	
	City of Wodonga	
	Falls Creek Alpine Resort Management Board	
	Mount Buller and Mount Stirling Alpine Resort Management Board	
	Mount Hotham Alpine Resort Management Board	

Sustainability Victoria
Level 28, Urban Workshop,
50 Lonsdale Street, Melbourne VIC 3000
Phone (03) 8626 8700
sustainability.vic.gov.au

Published by Sustainability Victoria.
Statewide Waste and Resource
Recovery Infrastructure Plan
 IWM031

Sustainability Victoria

State Government Victoria