SOUTH AUSTRALIA'S WASTE AND RESOURCE RECOVERY INFRASTRUCTURE PLAN

Government of South Australia
Green Industries SA

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 All images used in this report feature waste, recycling and resource recovery infrastructure in South Australia. Green Industries SA acknowledges the work of Rawtec for waste flow projection modelling and infrastructure need analysis and Econsearch for economic impact assessment in the development of this report.

Cover: Metallic alloy axle rods used for attaching the wheels to waste and recycling bins produced by South Australian company Mastec

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Construction and Demolition (C&D) waste sorting bays

Foreword

While the environmental benefits of recycling are widely recognised, recycling's economic importance to the South Australian economy has, until recently, not been as well understood.

We know now that the waste and resource recovery sector has an annual turnover of about $1 billion, contributing $500 million to Gross State Product (GSP) (directly and indirectly) and employs about 5,000 people across the State.

The employment opportunities in the recycling sector require a diverse range of skills from relatively low-skilled through to highly specialised skills associated with collection, materials handling, processing, and re-manufacturing products.

By turning waste into valuable raw materials and remanufactured products, recycling creates more jobs, builds more competitive manufacturing industries and adds significantly to South Australia's economy.

The transition to a more sustainable Circular Economy will require innovation along with investment and development of new infrastructure and technology to enhance resource efficiency and create business opportunities both locally and overseas.

New infrastructure required will include transport and processing equipment, bins, covered compost facilities and new monitoring technologies, as well as soft infrastructure such as training, market development, and integrated waste data systems.

Over the 30 year infrastructure planning timeframe, a greater variety of sophisticated technologies may be needed to sort, recycle and process the ever changing and often increasingly complex nature of wastes, some of which include rare earth metals, mixed polymers or hazardous materials and substances.

To help inform and guide these investment decisions, the South Australian Government has developed our State's first Waste and Resource Recovery Infrastructure Plan.

The Plan brings together the best available information and data at a particular point in time to map existing waste and resource recovery infrastructure by major types, and projects future waste flows.

The Plan models projections for future trends in waste generation, recovery and landfill, potential infrastructure needs and associated investment using two scenarios – one scenario is based on the next 10 years, and another is based on the next 30 years.

A scenario based on moderate diversion over the next 10 years estimates an additional $113.9 million in GSP and an additional 1,035 full time equivalent (FTE) jobs. A 30-year high diversion scenario estimates an additional $660.5 million in GSP and an additional 4,969 FTE jobs.

It is important to recognise that the waste and recycling industry is dynamic and future infrastructure needs will be influenced by several changing factors, such as international demand for recovered materials, local market dynamics and technological innovations.

Together, *South Australia's Waste Strategy 2015-2020* and this Plan provide a vision where waste is managed as a resource; waste generated per capita declines; re-use and recycling of waste are economically attractive options for public and private sectors; more materials are recycled according to their highest beneficial use and quality standards; energy recovery is limited to non-recyclable materials; and landfilling is virtually eliminated.

South Australia has attracted national and international interest with our pro-active approach to waste management. I encourage the public and private sectors to continue to lead the way to a more sustainable future for our State through continued investment in this important sector of our economy.

I thank all those who contributed their ideas during consultation on this important Plan.

IAN HUNTER MLC

Minister for Sustainability, Environment and Conservation

Executive summary

Introduction

Green Industries SA's vision is for South Australia to be internationally recognised as a leader in green industry development, the Circular Economy and recycling and resource recovery. Green Industries SA helps to develop the green economy and champions the efficient use of resources and the conservation and recovery of scarce materials. It promotes waste management practices that eliminate waste to landfill, and promotes innovation and business activity in the waste management, resource recovery and green industry sectors, recognising that these areas present a valuable opportunity to contribute to the State's economic growth.

The Review of *South Australia's Waste Strategy 2011-2015*[1] identified waste and resource recovery infrastructure planning and investment as a critical requirement to:

- Support industry development and economic growth in the State
- Maintain the State's world class recycling performance
- Transition to a more resource efficient, Circular Economy

Similar to utility services such as electricity, gas and water, waste and resource recovery services are essential for the protection of the health of both the community and the environment's ecosystems.

South Australia's Waste and Resource Recovery Infrastructure Plan (SAWRRIP) complements the *30-Year Plan for Greater Adelaide 2017 Update*[2] *(The 30-Year Plan)*, and has been developed to:

- Provide a clear guide for future waste and resource recovery infrastructure needs across the State
- In doing so, support a resource efficient economy in South Australia

This is the first time such a plan has been prepared for South Australia and its regions. SAWRRIP:

- Presents the best available information and data to project future waste flows
- Maps existing waste and resource recovery infrastructure by major types
- Identifies potential future infrastructure needs, investment opportunities, and the associated risks
- Provides intelligence for industry that will assist in informing investment decisions
- Identifies potential infrastructure needs for specialised and problematic waste streams
- Considers soft infrastructure supporting the waste and resource recovery industry development
- Includes a high level risk analysis

Reflecting the ever changing patterns of waste generation, increasing material complexity and technology advances, SAWRRIP is intended to be reviewed and updated every five years in parallel with the development of South Australia's Waste Strategy.

Vision and objectives

The vision is for South Australia to have an internationally-recognised and export-oriented integrated waste and resource recovery infrastructure system (incorporating infrastructure, skills and capabilities) that supports a resource efficient/Circular Economy.

Objectives of this plan are to:

- Provide an evidence base that enables common understanding by all stakeholders of waste and resource recovery infrastructure types and needs across the State and the associated economic benefits, job creation and investment opportunities
- Provide a clear policy framework and a platform conducive to attracting investment, which allows for a well-coordinated and balanced approach towards waste and resource recovery infrastructure and capability building that promotes innovation and economies of scale
- Inform the State's land-use planning system enabling land use planning to provide for appropriate and essential waste and resource recovery infrastructure investment, including adequate provision of suitable sites and buffers
- Support a viable resource recovery and re-manufacturing industry and foster industry capabilities in South Australia that can be exported

South Australia's future infrastructure and investment needs

In 2015, Green Industries SA commissioned a waste projection and economic assessment study to inform the development of this infrastructure plan[3]. The study used 2013-14 waste data as a baseline and modelled the waste flow projection, corresponding infrastructure needs and economic impact assessment for three landfill diversion scenarios for 10 and 30 year timespans:

- Business As Usual
- Moderate Additional Diversion
- High Additional Diversion

The 2015 modelling work was subsequently updated with the best available 2015-16 waste data as a baseline.

SAWRRIP has focused on the 10 year Moderate Additional Diversion scenario and the 30 year High Additional Diversion scenario.

The estimates of future investment needs presented in this Plan are based on a static model and were estimated based on the best available information at a particular point in time. Capital expenditure estimates do not include the cost of constructing new landfill cells at existing disposal facilities, replacement or maintenance of existing waste and resource recovery

infrastructure. The types of infrastructure considered are not exhaustive and hence may be considered a conservative estimation of the capital investment required.

The Plan does not estimate remanufacturing requirements or other downstream activities which will take advantage of the increased diversion and availability of recycled materials.

It is important to recognise that the waste and recycling industry is dynamic and future infrastructure needs will be influenced by a number of changing factors, such as international demand for recovered materials, local market dynamics and technological innovations.

10 year timespan, Moderate Additional Diversion scenario

Under the Moderate Additional Diversion scenario an estimated $166 million of investment in new/expanded waste and resource recovery infrastructure will be needed across South Australia by 2025-26 to manage additional volumes of waste, resource recovery and landfill. This includes:

- $49 million for Municipal Solid Waste (MSW) infrastructure
- $88 million for Commercial and Industrial (C&I) waste infrastructure
- $29 million for Construction and Demolition (C&D) waste infrastructure

Potential investment will be needed in skip bins, collection / transfer vehicles and facilities for Container Deposit Legislation (CDL) processing, compost, drop-off, energy-from-waste anaerobic digestion, waste soil storage and remediation and other medium technology reprocessing facilities[4].

30 year outlook, High Additional Diversion scenario

Under the High Additional Diversion scenario an estimated $990 million of investment in new/expanded waste and resource recovery infrastructure will be needed across South Australia over the next 30 years to manage additional volumes of waste, resource recovery and landfill. This includes:

- $385 million for MSW infrastructure
- $459 million for C&I waste infrastructure
- $146 million for C&D waste infrastructure

Investment will be needed in collection and resource recovery infrastructure, and facilities for composting, energy-from-waste (anaerobic digestion), C&D processing, and other medium technology reprocessing facilities such as waste soil and storage, remediation facilities and emerging waste stream facilities.

To achieve the High Additional Diversion scenario over a 30 year timeframe, it is expected that investment in alternative technologies will be needed to recover waste from the residual stream. This would potentially include Mechanical Biological Treatment (MBT) facilities, energy-from-waste thermal treatment facilities or other future technologies.

Recovered and bailed farm chemical containers

Future infrastructure and investment to manage specialised and problematic waste streams including tyres, photovoltaic panels, Copper Chrome Arsenate (CCA) treated timber, absorbent hygiene products, packaged food waste, batteries and shredder floc[5] will also be necessary.

Economic impacts

The total economic impact of infrastructure investment is estimated:

- At year 10, Moderate Additional Diversion scenario - contribution of an additional $113.9 million in GSP and an additional 1,035 full-time equivalent (FTE), direct and indirect jobs
- At year 30, High Additional Diversion scenario - contribution of an additional $660.5 million in GSP and an additional 4,969 FTE, direct and indirect jobs

Both the moderate and high additional diversion scenarios present an opportunity to increase significantly the contribution of the waste sectors to GSP and employment, which are currently at $504 million and employment at 4,800[6].

Land-use planning

SAWRRIP examines land-use planning considerations for waste and resource recovery infrastructure. The *30-Year Plan* has recognised the need to provide for adequate buffer zones around water and waste treatment plants[7]. The *30-Year Plan* has specified a number of actions to support waste infrastructure development, including:

- Develop Planning and Design Code policies that protect buffer distances, duplication requirements, and outlines operational requirements for strategic infrastructure such as major ports, mining operations, waste water treatment and waste management facilities
- Deliver long-term planning for waste and resource recovery infrastructure to identify locations that can meet future demand and support a resource efficient economy[8]

Key considerations for siting large scale waste, recycling and remanufacturing infrastructure include: suitable separation distances; logistical considerations relative to sources and destination of inputs/outputs; technology used (e.g. fully enclosed facilities with air filtration); and access to services such as electricity, gas and water.

It is likely that the larger scale, more intensive waste and resource recovery infrastructure would be positioned within the Greater Adelaide Area, rather than in regional South Australia. This acknowledges the large volumes of material available in metropolitan areas, access to transport networks and proximity to many of the final markets for recycled products or ports for export to overseas markets. Several large scale key strategic industrial and employment land areas are identified within the *30-Year Plan*, at Gillman/Wingfield, Greater Edinburgh Parks, Lonsdale, Monarto and Roseworthy.

Soft infrastructure

A range of soft infrastructure activities will be needed in South Australia to support new and expanded infrastructure investment and sector growth. This includes market analysis and development for recycling, community education and engagement, workforce planning, training, talent retention, and integrated waste data systems.

Risk management

SAWRRIP also provides a high level analysis on a range of risks that need to be considered and managed when investing in waste and resource recovery infrastructure across design, building/planning, operational stages and considering incidental risks. The ongoing viability of resource recovery and reprocessing operations in South Australia is vulnerable to a number of factors, including volatility of international commodity markets, local demand for recycled products, transport costs, and operating costs such as energy and water.

Metropolitan and regional infrastructure assessments

SAWRRIP is the first time that a plan has been developed that provides an infrastructure assessment for Metropolitan Adelaide and each Government region in South Australia. This includes:

- An overview of regional economic profiles
- An assessment of current waste and recycling streams and volumes
- Identification of existing waste and resource recovery facilities in the region
- Projections for future waste generation, resource recovery and landfill volumes
- Identification of potential future infrastructure and investment needs over the next 10 years and an outlook over a 30 year timeframe, including identification of region specific challenges and opportunities
- Considerations for land-use planning for future infrastructure

Recycled wood and plastic fibres recovered for reprocessing at Advanced Plastic Recyclers, Adelaide

Introduction

The waste management, resource recovery and resource efficiency sector is an economically significant part of the South Australian economy. It has an annual turnover of around $1 billion, contributes directly and indirectly more than $500 million to GSP, and employs directly and indirectly around 4,800 people across a wide spectrum of jobs[9].

South Australia is currently leading the nation in levels of resource recovery, achieving the highest recycling rates out of all jurisdictions in Australia[10]. The State has an integrated waste management system, which is supported by an extensive network of waste and resource recovery facilities.

Resource recovery infrastructure planning and investment is critical in order to support industry development and economic growth in the State, to maintain the State's world class recycling performance and to transition to a more resource efficient, Circular Economy.

The *Review of South Australia's Waste Strategy 2011-2015* identified that:

> *"attracting and coordinating investment into the sector represents a major future policy challenge. A well-coordinated strategic and tactical approach from and within state and local government is needed to deliver regionally distributed facilities with good economies of scale, protecting against over-capacity and securing the best value for money in procurement".*

Vision and objectives

The vision is for South Australia is to have an internationally-recognised and exportable integrated waste and resource recovery infrastructure system (incorporating infrastructure, skills and capabilities) that supports a resource efficient Circular Economy.

Future waste and resource recovery infrastructure needs in South Australia will be affected by a range of interrelated factors including future waste generation volumes, levels of resource recovery, government policy, technological advances, business expectations and community expectations and lifestyles.

SAWRRIP models projections for future trends in waste generation, recovery and landfilling, potential infrastructure needs and associated investment over the next 30 years with an immediate focus on the next 10 years.

Objectives of SAWRRIP include to:

- Provide an evidence base that enables a common understanding by all stakeholders of waste and resource recovery infrastructure types and needs across the state as well as the associated economic benefits, job creation and investment opportunities
- Provide a clear policy framework and a conducive platform to attract investment and allow for a well-coordinated and balanced approach towards waste and resource recovery infrastructure and capability building that promotes innovation and economies of scale
- Inform the State's land-use planning system, enabling land-use planning to provide for appropriate and essential waste and resource recovery infrastructure investment including adequate provision of suitable sites and buffers
- Support a viable resource recovery and re-manufacturing industry and foster industry capabilities in South Australia that can be exported

Future investment in Infrastructure

Estimates of future investment needs are based on high-level modelling undertaken in a previous study[11], which was updated to incorporate more recent data sets and feedback from the Consultation Draft version of SAWRRIP. This modelling was based on projected future waste generation volumes, resource recovery scenarios, assumed technology mixes, nominated infrastructure capacities and capital costs. The modelling is intended to identify the likely types of future major infrastructure needed and provide order of magnitude estimates for the number of new and/or expanded infrastructure units and associated capital expenditure.

The infrastructure units needed to manage waste from a given region may not always be located in that region due to economies of scale and other factors (e.g. planning or suitable locations). In these cases, waste from the region may be transported to another region where a facility is available.

Capital expenditure estimates are expressed in 2017 dollars. These estimates do not include the cost of constructing new landfill cells at existing disposal facilities, replacement or maintenance of existing waste and resource recovery infrastructure. The types of infrastructure considered are not exhaustive and hence may be considered a conservative estimation of the capital investment required.

The source of the investment in infrastructure has not been identified as this will be influenced by a range of factors. The investment may come from the private sector, the public sector and, most likely in some of the larger infrastructure investments, public-private partnerships.

A common challenge for increased resource recovery in regional areas is the long distance to central waste infrastructure locations. While logistic planning is out of the scope of SAWRRIP, increased on-site solutions, such as local composting, and increased compaction and baling will help to alleviate the need for long distance transport and/or increase its cost efficiency. Infrastructure needs for on-site solutions and compaction equipment in regional areas are considered.

The estimates of future investment needs presented in this Plan are based on a static model and were estimated based on the best available information at a particular point in time. It is important to recognise that the waste and recycling industry is dynamic and future infrastructure needs will be influenced by a number of changing factors, such as international demand for recovered materials, local market dynamics and technological innovations. These changes may result in future infrastructure needs different to those identified in this Plan.

Living plan

Implementing SAWRRIP will require collaboration between state and local governments, the private and non-profit sectors and communities.

Local government is a key waste industry partner, through kerbside collections, waste infrastructure investment and operation, contract management, education and engagement programs with residents and businesses, and through its role in development assessment. Councils are encouraged to include consideration of waste and resource recovery infrastructure as an integral part of their long term financial and asset management planning with regular reviews in this area.

The ever changing patterns of waste generation, increasing materials complexity and technology advances require SAWRRIP to be developed as a ‘living’ plan. It is important that the Plan is reviewed and updated regularly in conjunction with the process for the state-wide Waste Strategy every five years.

South Australian company East Waste use Botek, an on-board technology system in collection trucks which provides real time data for the kerbside-collected three bin system

Policy context and future directions

Under the guidance of State-based waste strategies, South Australia has achieved significant landfill diversion outcomes through waste prevention, reuse and recycling. It has also established functional integrated waste management infrastructure. However, there is still significant residual reliance on landfill. Against the backdrop of the mandatory resource recovery initiative, such as the *Environment Protection (Waste to Resources) Policy 2010*, national product stewardship schemes and other government policies and regulations, a new and extended network of resource recovery facilities will be needed over the coming years.

South Australia's Waste Strategy 2015-2020

South Australia's Waste Strategy 2015-2020 (The Waste Strategy) provides targets for landfill reduction, per capita waste generation and landfill diversion (refer **Figure 1**). South Australia will require new and expanded infrastructure for the collection, recovery and reprocessing of recyclable waste to meet these targets.

The Waste Strategy is based on the principles of the Waste Management Hierarchy. In accordance with relevant safety and environment protection requirements and aligned with the desired policy and regulatory outcomes, the Waste Strategy promotes and/or encourages the following waste management practices which have associated waste and resource recovery infrastructure needs:

- Collecting and treating food organics
- Diversifying materials captured and processed for recycling such as soft film plastics
- Better contracting and monitoring for household collection services, including application of technologies such as Radio Frequency Identification (RFID) tags for wheelie bins
- Improving source separation, collection systems and sorting infrastructure
- Weight-based charging and precinct-based collection routes for C&I waste
- Salvaging and reusing building materials
- Reusing waste fill and intermediate level contaminated soil
- Remediating low level and high level contaminated soils for reuse
- Providing convenient drop-off facilities for unwanted household and farm chemical waste
- Increasing landfill gas recovery for energy production where consistent with South Australia Environment Protection Authority (EPA) guidelines
- Improving recovery and treatment of oils, solvents and other valuable materials for reuse
- Banning materials from landfill that could be disposed of through strongly performing markets in metropolitan and non-metropolitan contexts
- No new landfills to service metropolitan Adelaide

The Waste Strategy also identifies the need to develop appropriate energy-from-waste facilities or other suitable technologies to extract the full value from the remaining residual waste stream and to grow the resource recovery sector.

Figure 1 **South Australia's Waste Strategy 2015-2020 targets**

***South Australia's Strategic Plan 2011* (Department of the Premier and Cabinet)**

- 35% reduction in landfill disposal from 2002-03 level by 2020
  milestone of 30% by 2017-18

Per capita waste generation target

- 5% reduction in waste generation per capita by 2020 (from 2015 baseline)

Landfill diversion targets

Year	Metropolitan (% diversion)	Non-metropolitan
Municipal solid waste (MSW) landfill diversion targets		
2009 (baseline)	55	Not applicable
2012	60	Maximise diversion to the extent practically and economically achievable
2015	70	Maximise diversion to the extent practically and economically achievable
2020	70*	Maximise diversion to the extent practically and economically achievable
Commercial and Industrial (C&I) landfill diversion targets		
2009 (baseline)	60	Not applicable
2012	65	Maximise diversion to the extent practically and economically achievable
2015	75	Maximise diversion to the extent practically and economically achievable
2020	80	Maximise diversion to the extent practically and economically achievable
Construction and demolition (C&D) landfill diversion targets		
2009 (baseline)	80	Not applicable
2012	85	Maximise diversion to the extent practically and economically achievable
2015	90	Maximise diversion to the extent practically and economically achievable
2020	90	Maximise diversion to the extent practically and economically achievable

**MSW target comprises 60% diversion from high performing bin systems contributing to an overall MSW target of 70%*

Environment Protection (Waste to Resources) Policy 2010 and waste reform

The *Waste to Resources Policy 2010*[12] provides regulatory underpinning for South Australia's Waste Strategy to promote implementation of the waste management hierarchy, improve resource recovery and reduce waste going to landfill.

Key elements of this policy that impact on South Australia's future waste and resource recovery infrastructure needs include:

- A requirement that suitable waste from metropolitan Adelaide be subject to resource recovery processes prior to disposal to landfill
- Landfill bans on hazardous wastes e.g. e-waste, whitegoods and aggregated recyclable materials

Since the policy's publication further potential growth in safe resource recovery has been identified for the next series of regulatory and policy settings.

The Environment Protection Authority (EPA) is pursuing an extensive waste reform program to achieve sound regulation that supports fair and equitable competition, stability, growth and innovation in the sector while protecting our environment.

As a first legislative step, the *Environment Protection (Waste Reform) Amendment Bill 2017* was introduced to Parliament on 9 August 2017. Subsequent legislative priorities are:

- Introduction of mass balance reporting
- Introduction of an amended manner of collection of levy at landfills
- Exploration of the introduction of an upfront levy liability
- Exploration of new legislative and policy measures that will keep South Australia as a resource recovery leader
- Exploration of expanded waste transporter licensing

The EPA is also seeking a series of administrative policy reforms in line with these changes such as increased stockpiling controls and a position on energy-from-waste policy.

Some of these reforms may require infrastructure (e.g. video cameras, electronic tracking or weighbridges) at waste and resource recovery facilities.

Solid waste levy

South Australia's solid waste levy is payable by the licence-holder of a waste depot for all waste received for disposal at that depot. The levy is an economic instrument designed to provide a price signal to the market, diverting waste from landfill and into recycling and productive use. The levy has increased over time and the 2016-17 State Government Budget announced a staged increase of the levy to $103 per tonne by 2019-20 in metropolitan Adelaide. The levy in regional areas is half that of metropolitan Adelaide.

As an economic instrument, the levy encourages the diversion of waste from landfill and is effective at driving resource recovery when the revenue is reinvested in infrastructure, technologies and resource recovery systems.

Overseas evidence appears to confirm that for any waste levy to be effective it needs to be sufficiently high to make alternatives to landfill disposal commercially viable[13]. Increasing the levies supports industry to reach the point where investment in alternative resource recovery treatments will be as financially competitive as landfill disposal.

The levy study commissioned by the Australian Council of Recyclers[14] found that, at the $100 levy rate in South Australia, C&I and sophisticated C&D resource recovery is very competitive with landfill and MBT technology becomes competitive to support MSW diversion. However, the study also found that the $100 levy rate will not be high enough to enable energy-from-waste to be competitive with landfill.

It is widely accepted that a targeted reinvestment of the levy revenue to the waste industry will strongly influence waste diversion and job creation[15].

Product stewardship and extended producer responsibility

Product stewardship is a key commitment under the Australian Government's long-term *National Waste Policy* to avoid and reduce the amount of waste generated and to increase the resources recovered from end-of-life products.

In addition to the Product Stewardship for Oil Program introduced in 2001, current stewardship schemes under the *Product Stewardship Act 2011* include the television and computer recycling scheme; the packaging covenant; and schemes for tyres, lamps containing mercury and waste architectural and decorative paint. The Australian Government is also considering introducing product stewardship schemes for other products such as handheld rechargeable and hazardous single-use batteries, plastic microbeads and products containing them, photovoltaic (PV) systems, electrical and electronic products and plastic oil containers[16].

These schemes have involved the establishment of infrastructure for the collection and recovery of end-of-life products. For example, approximately 50 permanent drop-off sites have been established in metropolitan and regional parts of South Australia for the television and computer recycling scheme. It is expected further waste and resource recovery infrastructure will be needed in South Australia to support existing and new product stewardship in the future.

Carbon Neutral Adelaide

The South Australian Government has announced its ambitious goal for the City of Adelaide to become the world's first carbon neutral city. The waste sector contributed five per cent of Adelaide City's net emissions in 2012-13, which was mostly from landfills[17]. A major contributor to these emissions is organic waste deposited in landfill. Promoting measures to reduce and avoid food waste and diverting food waste to composting or anaerobic digestion processes has both carbon and landfill savings and recovers nutrients through processing the material into soil improvement products. The *Carbon Neutral Adelaide Action Plan 2016-2021*[18] recognises the need for significant investment in energy, transport, waste and building infrastructure to bring about the changes.

Future investment in resource recovery infrastructure is needed to divert material from landfill, thereby driving further emissions reductions, building the State's green industries, increasing resource efficiency and improving waste management.

Future drivers

In addition to public policy and legislation, South Australia's future waste and resource recovery infrastructure and investment needs will be affected by a range of other drivers.

Population and economic growth

Population growth is a core driver for waste infrastructure. Population growth will increase MSW generation directly, as well as indirectly through associated increase in C&I and C&D waste streams. Historical experience shows that waste generation in Australia has significantly outpaced the rate of population growth. For example, from 1997 to 2012 the population in Australia rose by 22 per cent and waste generation has increased by 145 per cent[19].

According to the latest Australian Bureau of Statistics (ABS) population estimates[20], the population of South Australia was 1.71 million at 30 June 2016. This is slightly less than the population projected in the Department of Planning, Transport and Infrastructure (DPTI) medium series population projections, but on trend. The DPTI medium series projects a population of 2.06 million by 2041, an increase of 20 per cent on the ABS 2016 population estimate. It is projected that 96 per cent of South Australia's population growth will occur within the Greater Adelaide Planning Region[21] (i.e. Metropolitan Adelaide, Adelaide Hills, Barossa, Light and Lower North, and Fleurieu and Murray Bridge).

Waste is generated by activities in all economic sectors and at each point in the production chain. Traditionally it has generally been regarded as an unavoidable by-product of economic activity, such as waste generated from inefficient production processes, low durability of goods and unsustainable consumption patterns.

How the State plans to locate growing populations will be critical to influence on how new waste management capacity can be added. According to the *30-Year Plan*, Greater Adelaide will continue to be in a more compact urban form and the majority of Greater Adelaide's urban growth will be located within existing built-up areas through increases in density at strategic locations and supported by continued improvements to public transport systems, ride-sharing and green infrastructure.

The number of medium density, high density and multi-unit developments in specific locations may give rise to challenges to waste management both on-site and in service methods, which require specialised waste collection infrastructure.

New and expanded infrastructure will be needed over time to manage increased volumes of waste generation due to population and economic growth in the State.

Technological advances and real time data

Technological change occurs at a rapid rate. Technological change will significantly impact existing and new infrastructure assets and their associated services. As well as enabling different and more efficient infrastructure, technological change facilitates new forms of real-time communication, which has the capacity to better respond to and shape the expectations and behaviours of consumers.

For instance, in the waste industry, RFID and the associated ability to track and record dynamic information, new technology such as energy-from-waste, greenhouse gas capture, sorting and composting technology is revolutionising waste management approaches.

Community expectations and engagement

Community expectations for a cleaner, better environment and a sustainable future have long been an important driving force for waste infrastructure investment. For example, South Australia's nation-leading container deposit scheme was originally introduced in response to strong community expectation and demand for a clean, better environment and effective litter management. This has now resulted in a comprehensive collection network with more than 130 depots across the State. The scheme has had a profound influence on increasing community awareness and behaviour change towards resource recovery and recycling.

As the community responds to the impacts of climate change, greater demand will be placed on related goods and services to reduce greenhouse gas emissions, including waste infrastructure investment, product development and new methods of waste collection, processing and disposal. In addition, community engagement has an important role in encouraging appropriate recycling behaviour and reducing contamination rates that may otherwise affect the viability of new technologies and investments aimed at maximising resource recovery.

Changing patterns of waste generation

Patterns of waste generation constantly change, and so do the types of chemicals and materials used to make the products we buy. With increasing material complexity (bio-composites, conductive polymers, nanotechnology, electronics) current recycling processes cannot extract all the components from purchased products. Industry innovation and investment must address this and the changing forms of manufacturing, such as home 3D printing manufacturing.

Opportunity for job creation

Waste management is increasingly being seen as not only an environmental protection issue but an economic growth opportunity. Diverting waste from landfill and increasing levels of local reprocessing and remanufacturing can create more jobs for South Australians. The estimated direct full time employment in Australia per 10,000 tonnes of waste is 9.2 for recycling and 2.8 for landfill[22].

Paper and cardboard sorted for recovery and recycling at the Clare Valley Waste recovery facility

Infrastructure types and definitions

The scope of *South Australia's Waste Resource Recovery Infrastructure Plan*

SAWRRIP identifies potential future infrastructure needs and investment for the main infrastructure classes and types. **Table 1** below outlines the main infrastructure classes and types included in this plan, recognising that future technologies and processes may also arise that are not currently identified.

Potential needs for specialised and problematic waste streams are also identified including PV panels, CCA-treated timber, batteries, absorbent hygiene products, packaged food waste and shredder floc.

A range of soft infrastructure and activities will be needed to support new/expanded infrastructure investment and sector growth. This includes regional waste strategy development, training and workforce development, data collection and management, online web platforms and marketing of the waste management and resource recovery infrastructure.

Table 1

Infrastructure class	Infrastructure type	Description
Collection infrastructure	Kerbside source separation bin systems	Kerbside bins for collection of MSW.
	Skip bins	Bins for collection of C&I and C&D waste (which range from 120 litres up to 20 cubic meters).
	Collection vehicles	Vehicles to collect waste, including side-lift, rear-lift, front-lift, Pantech, flatbed trucks, hook lift and other waste collection vehicles.
	Vacuum systems	An automated collection system which transports waste underground from a series of waste inlets to a collection station through a closed pipe network.
Resource recovery infrastructure	Transfer stations (including compaction equipment)	Transfer stations are permanent sites set up to receive, minor sorting, and temporarily store waste and recyclables prior to be taken to a reprocessing or disposal facility. This infrastructure also includes compaction equipment, such as balers, to reduce the volume and associated costs for transport.
	Transfer vehicles	Large vehicles for bulk transport of waste (e.g. a walking floor trailer).
	Material recovery facility (MRF)	A facility where mixed recyclable materials are received, stored and sorted to specifications, then baled, shredded, crushed, compacted or otherwise prepared for shipment to market.
	CDL facilities	Depots where container deposit legislation (CDL) bottles/ cans can be dropped off by businesses or the general public for refund (currently 10 cents per container), and are sorted to specifications for shipment to market.
	Drop-off facilities	Depots where waste under product stewardship schemes (e.g. computers and TVs, waste paints) may be dropped off and are aggregated for transfer to suitable recyclers.
	Other	A facility that does not fit the above definitions which receives and undertakes minor processing of a single waste stream, such as used motor vehicles, foundry sands, grease trap wastes, biowaste or bulky wastes.
Reprocessing infrastructure	Composting facilities (open windrow)	Facilities where source separated organics are composted using open windrow technology. The material is set out in long triangular cross section windrows in the open air with no enclosures or covers.
	Composting facilities (covered / tunnel)	Facilities where source separated organics are composted using covered windrow or fully enclosed tunnel technologies. These technologies minimise the potential for fugitive odour emissions from the piles and provide totally enclosed conditions where near-optimal composting conditions can be controlled and maintained.

Waste and resource recovery infrastructure definitions

Infrastructure class	Infrastructure type	Description
Reprocessing infrastructure (cont.)	Energy-from-waste facilities – thermal treatment	Facilities where waste is thermally treated and energy is recovered.
	Energy-from-waste facilities – anaerobic digestion	Facilities where microorganisms break down biodegradable waste in the absence of oxygen to produce methane, which is recovered for energy.
	Mechanical biological treatment	Facilities that combine a sorting facility with a form of biological treatment such as composting or anaerobic digestion.
	Construction and demolition processing facilities	Facilities that sort, crush, screen and recycle building materials.
	Other processing facilities (medium technology)	Other medium technology waste processing technologies that are grouped based on having capital and operating expenditures in the same order of magnitude. This includes reprocessing facilities for glass, plastics, paper/cardboard, metals, grape marc and meat rendering.
	Other processing facilities (high technology)	Other high technology waste processing technologies that are grouped based on having capital and operating expenditures in the same order of magnitude. Potential examples include low volume, high capital processing facilities such as nickel cadmium, lithium ion battery and CCA-treated post processing and mercury distillation.
	E-waste processing facilities	Facilities where e-waste is refurbished for reuse or disassembled manually, machine crushed or via automated equipment or high tech smelting processes with various valuable components extracted and reprocessed.
Hazardous Waste infrastructure	Hazardous waste facilities	Facilities which store and treat hazardous waste. Treatment types include recycling, chemical/physical treatment, thermal, energy recovery, immobilisation, biological and other.
	Soil storage and remediation facilities	Facilities that store and remediate contaminated soil so that it can be beneficially reused.
	Emerging waste streams facilities	Facilities that process emerging waste streams (e.g. e-waste).
Disposal infrastructure	Landfills	Facilities where waste is disposed into suitably constructed engineered cells.
	Medical waste disposal	Facilities that treat medical waste, including autoclave and incineration technologies.

Household kerbside-collected recycling in inner Adelaide, South Australia

Planning considerations

South Australia's land-use planning system is based on the strategic directions set out in *South Australia's Strategic Plan 2011* and is represented spatially through South Australian Planning Strategy. The volumes in the planning strategy guide the policy for development plans across South Australia's different regions, providing guidance for the future provision of developable land for industrial uses and waste facilities.

Key considerations for siting large scale waste, recycling and re-manufacturing infrastructure include suitable separation distances (refer to **Table 2**), logistical considerations relative to sources and destination of inputs/outputs, technology used (e.g. fully enclosed facilities with air filtration) and access to services infrastructure such as electricity, gas and water.

It is likely that larger scale, more intensive waste and resource recovery infrastructure would be located in the Greater Adelaide area (rather than in regional South Australia). This is due to the large volumes of material available in metropolitan areas, access to transport networks and proximity to many of the final markets for recycled products and ports for export to overseas markets. A number of large scale key strategic industrial and employment land areas are identified within the *30-Year Plan*, at Gillman/Wingfield, Greater Edinburgh Parks, Lonsdale, Monarto and Roseworthy.

Within these locations, there are a range of zones that provide differing levels of support for waste and resource recovery activities and associated infrastructure. The benefits and challenges of identified key locations within Greater Adelaide should be considered.

It is expected that the majority of waste and resource recovery infrastructure would be suitable within a form of Industry Zone. However, the following activities may have broader impacts on amenity (subject to how these are designed and managed) and may be deemed to be a form of Special Industry:

- Composting facilities (open windrow)
- Energy-from-waste facilities – thermal treatment
- Energy-from-waste facilities – anaerobic digestion
- Mechanical Biological Treatment facilities
- Household and farm chemical waste disposal facilities
- Disposal infrastructure

These activities have limited opportunities for locations. The majority of zones do not cater for these activities. There is a need to take advantage of locations where existing or previous intensive industries occurred, or to establish specific rezoning to accommodate specific desired locations. Therefore, the preferred locations should be identified early, with land being set aside, and zoning put in place so that sensitive land-uses do not encroach on the ability to establish such facilities in the future.

Table 2 **South Australia EPA air separation distance for waste and recycling activities[23]**

Activity	Description of activity	Air separation distance (metres)
Incineration	Destruction of chemical wastes	1,000
	Destruction of medical wastes	500
	Cremation	150
	Solid municipal waste	500
Waste or recycling depots	Landfill	500
	Other (e.g. transfer stations, resource recovery facilities)	300
	Not licensed in accordance with Schedule 1 of the EP Act (does not include residential/domestic premises)	100

A rotating trommel screen and conveyor belt system, used to sort recyclable and non-recyclable items and separate materials into different recovery streams

High pressure water hoses used in the production of recycled plastic building materials

Overview of South Australia's future infrastructure needs

Current status

- South Australia achieved an overall landfill diversion rate of 81.5 per cent in 2015-16. Landfill diversion rates vary by geographical origin and source sector with the highest rate (93%) achieved for waste generated by regional South Australia C&I sources due to large volumes of waste recovered from local industry, including timber, grape marc, meat and fly ash.
- An estimated 3.91 million tonnes of waste was resource recovered in 2015-16
- Significant waste streams recovered in South Australia include masonry materials (estimated at 31%), organics (28%), clean fill (19%), metals (7%), and cardboard/paper (6%)
- The majority of waste that was resource recovered (3.39 million tonnes or 87%) was reprocessed locally through South Australia's facilities, including reprocessing of masonry, organics, metals, glass, paper, cardboard and other materials. The balance of waste recovered (13%) was exported interstate or overseas for reprocessing, mainly paper and cardboard, metals and plastics.
- The State has an extensive network of waste and resource recovery infrastructure and facilities that collect, recover, reprocess, re-manufacture and dispose of these waste volumes (refer **Figure 2**)

Table 3 South Australia 2015-16 total waste by geographical region (metropolitan and regional South Australia) and landfill diversion performance by geographical region and source sector

	Geographical origin		
	SA	**Metro**	**Regional SA**
Waste generated	4,800,000	3,789,000	1,011,000
Resource recovered	3,910,000	3,110,000	800,000
Landfill	890,000	679,000	211,000
Diversion (overall)	81.5%	82.1%	79.1%
MSW diversion	54%	58%	39%
C&I diversion	87%	82%	93%
C&D diversion	88%	89%	65%

Future infrastructure needs

Scenarios

Landfill diversion rates under the scenarios studied in this plan are provided in **Table 4**. This includes:

- Moderate Additional Diversion scenario (10 years)

  The MSW diversion rate for Metropolitan Adelaide was modelled based on the 2020 target set under the current Waste Strategy. There are no diversion targets set for regional South Australia under the Waste Strategy. For modelling purposes, the diversion rate for regional South Australia's MSW was adopted from the metropolitan 2020 target to consider the maximum potential infrastructure and investment needs for the region. The diversion rates for C&I and C&D were set at moderate levels above current diversion performance.

- High Additional Diversion scenario (30 years)

  This scenario is based on an ambitious goal of zero waste to landfill in metropolitan Adelaide and high diversion rates for regional South Australia.

Figure 2

Existing waste and resource recovery facilities in South Australia (as at August 2017)

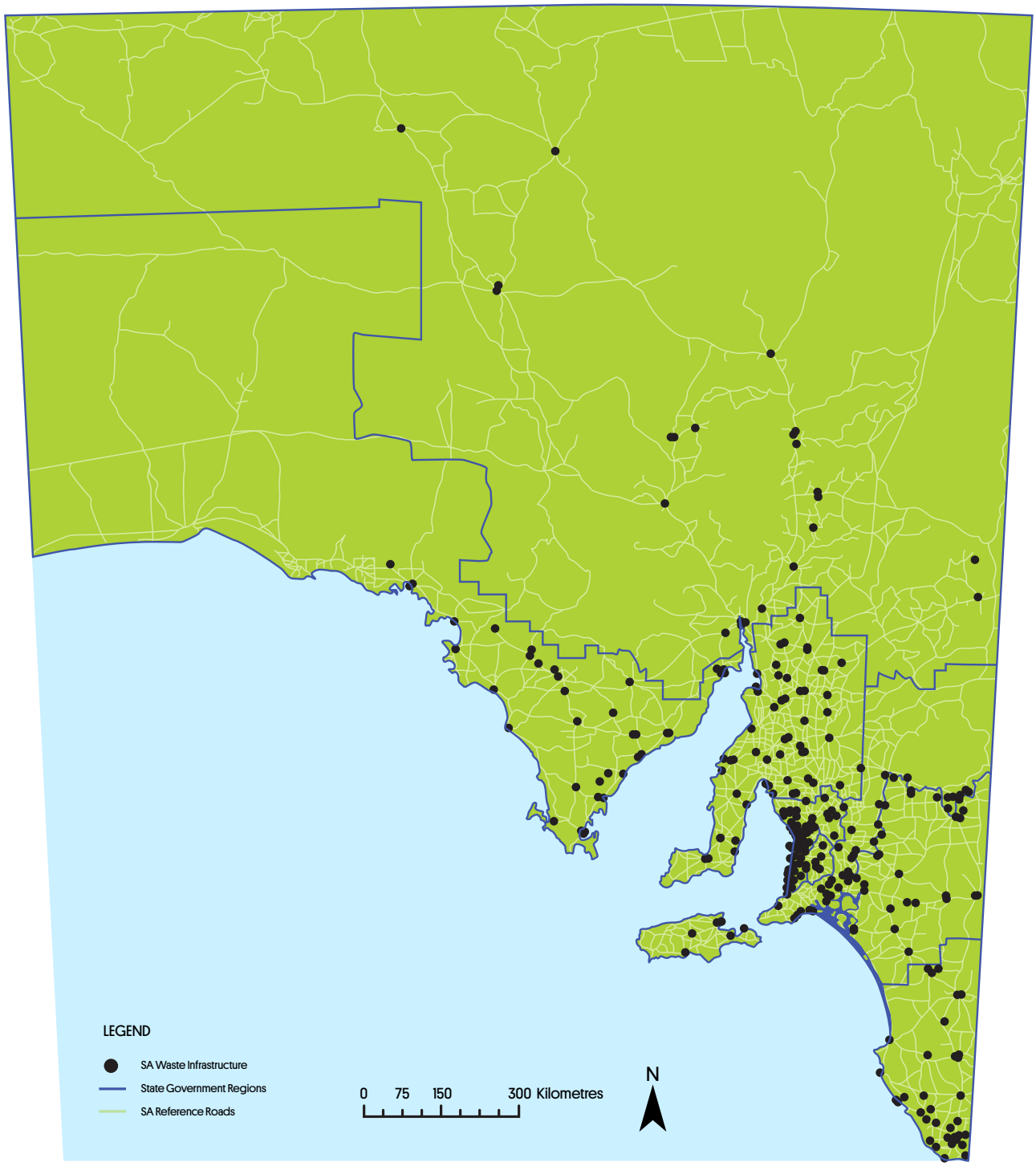


Table 4 **Landfill diversion rates under Moderate Additional Diversion and High Additional Diversion scenarios**

Diversion scenario	Source sector	SA	Metropolitan	Regional SA
Moderate additional (10 years)	MSW	70%	70%	70%
	C&I	89%	85%	94%
	C&D	94%	95%	70%
High additional (30 years)	MSW	98%	100%	90%
	C&I	98%	100%	95%
	C&D	99.7%	100%	95%

10 year timeframe - Moderate Additional Diversion scenario

Table 5 **Projected waste generation, resource recovery and landfill volumes for South Australia in 2025-26 under Moderate Additional Diversion scenario**

10 year - Moderate Additional Diversion scenario

	Waste generation	Resource recovery	Landfill
Projections (tonnes per year)	5,742,000	5,071,000	671,000
Change from baseline (2015-16)	938,000	1,158,000	-219,000

- An estimated $166 million investment in new/expanded waste and resource recovery infrastructure will be needed across South Australia by 2025-26 to manage additional volumes of waste, resource recovery and landfill (refer to **Table 6**). This includes:
  - $49 million for MSW infrastructure
  - $88 million for C&I waste infrastructure
  - $29 million for C&D waste infrastructure
- This expenditure is in addition to the cost of maintaining existing infrastructure. It does not include construction of new landfill cells at existing disposal facilities, replacement or upgrade of existing waste and resource recovery infrastructure.

Table 6 **Infrastructure assessment by sector for 2025-26, estimated number of new/ expanded infrastructure units and total capital expenditure based on Moderate Additional Diversion scenario***

	10 year forecast Moderate Additional Diversion scenario			
Number of new/ expanded infrastructure units	**MSW**	**C&I**	**C&D**	**Total SA**
Kerbside source separation bin systems	53,898	-	-	53,898
Skip bins	-	9,823	298	10,121
Collection vehicles	6	35	18	60
Vacuum systems	0.5	-	-	0.5
Transfer stations	1.2	3.3	-	4.5
Transfer vehicles	3	7	8	18.0
Material recovery facility	0.1	-	-	0.1
CDL facilities	4.6	8.6	-	13.2
Drop-off facilities	40.8	-	-	40.8
Composting facilities (open windrow)	3.8	1.7	-	5.5
Composting facilities (covered tunnel)	0.5	0.6	-	1.1
Energy-from-waste - anaerobic digestion	0.7	5.0	-	5.7
Construction & Demolition processing facilities	-	-	2.0	2.0
Other reprocessing facilities (medium technology)	2.9	13.0	-	15.9
Waste soil storage and remediation facilities	-	-	1.6	1.6
Emerging waste stream facilities	1.4	0.4	-	1.8
Total capital expenditure ($ million)	**49**	**88**	**29**	**166**

**Fractions of units may indicate expansion of an existing facility, or a smaller capacity facility. The number of units is based on average infrastructure capacities (refer to Appendix A) and is intended to be indicative of the types and number of new/expanded infrastructure units that will potentially be needed. The same methodology applies to all infrastructure assessment by sector tables for both Metropolitan Adelaide and regions.*

30 year outlook, High Additional Diversion scenario

Table 7 **Projected waste generation, resource recovery and landfill volumes for South Australia in 2045-46 under High Additional Diversion scenario**

30 year - High Additional Diversion scenario

	Waste generation	Resource recovery	Landfill
Projections (tonnes per year)	8,622,000	8,528,000	94,000
Change from baseline (2015-16)	3,819,000	4,614,000	-796,000

- An estimated $990 million investment in new/expanded waste and resource recovery infrastructure will be needed across South Australia over the next 30 years to manage additional volumes of waste, resource recovery and landfill. This includes:
  - $385 million for MSW infrastructure
  - $459 million for C&I waste infrastructure
  - $146 million for C&D waste infrastructure.
- Potential investment will be needed in waste collection infrastructure (bins, collection vehicles, vacuum systems), transfer stations, transfer vehicles, material recovery facilities, CDL facilities, drop-off facilities, composting facilities (closed tunnel), energy-from-waste (anaerobic digestion) facilities, C&D processing facilities, other reprocessing facilities (medium technology), waste soil storage and remediation facilities and emerging waste stream facilities. Investment in alternative technologies may be needed to process residual waste such as MBT facilities, energy-from-waste thermal treatment facilities or other future technologies. Appendix B provides the forecasted number of new/expanded infrastructure units for the scenario modelled.

Economic impacts

The total economic impact of infrastructure investment is estimated:

- At year 10, Moderate Additional Diversion scenario - contribution of an additional $113.9 million in GSP and an additional 1,035 FTE jobs (direct and indirect)
- At year 30, High Additional Diversion scenario - contribution of an additional $660.5 million in GSP and an additional 4,969 full-time equivalent jobs (direct and indirect)

Both the moderate and high additional diversion scenarios present an opportunity to significantly increase the contribution of the waste sectors to GSP and employment, currently at $504 million and employment at 4,800[24].

Table 8 **Total economic impacts of infrastructure investment scenarios**

	At Year 10 Moderate Additional Diversion	At Year 30 High Additional Diversion
GSP	**($m)**	**($m)**
Direct	52.6	289.7
Flow on	61.3	370.8
Total	**113.9**	**660.5**
Employment (fte)		
Direct	648	2,628
Flow on	387	2,341
Total	**1,035**	**4,969**

Metropolitan Adelaide and regional infrastructure assessments

The following sections provide regional infrastructure assessment for Metropolitan Adelaide and each Government region in South Australia. These include:

- Overview of regional economic profile
- Current status - waste and recycling streams and volumes and existing waste and resource recovery facilities in the region
- Future infrastructure needs - projections for future waste generation; resource recovery and landfill volumes; identification of potential future infrastructure and investment needs over the next 10 years and an outlook over 30 years; identification of regional specific challenges and opportunities; and land-use planning considerations

Recovered farm chemical containers, collected and bailed at Willaston, South Australia

Metropolitan Adelaide

Overview

Metropolitan Adelaide includes Eastern Adelaide, Northern Adelaide, Southern Adelaide and Western Adelaide and embraces seventeen local government areas: City of Adelaide, City of Prospect, City of Burnside, the Town of Walkerville, City of Campbelltown, City of Unley, City of Norwood Payneham & St Peters, City of Playford, City of Tea Tree Gully, City of Salisbury, City of Port Adelaide Enfield, City of Holdfast Bay, City of Mitcham, City of Marion, City of Onkaparinga, City of Charles Sturt and City of West Torrens.

The estimated resident population of Metropolitan Adelaide was 1,218,600 persons in June 2016 and accounted for over 71 per cent of the total state population of 1.71 million[25].

The economic contribution of Metropolitan Adelaide was $74.9 billion in 2015-16. This accounted for 74.7 per cent of the State's GSP, which was $100.3 billion.

Business services, household services and goods related services were the top three sector contributors. Together they accounted for more than 60 per cent of the Metropolitan Adelaide's Gross Regional Product (GRP).

Table 9 Metropolitan Adelaide Sector Contribution to GRP, 2015-16

Sector	Eastern Adelaide		Northern Adelaide		Southern Adelaide		Western Adelaide		Total Metropolitan Adelaide	
	$m	%	$m	%	$m	%	$m	%	$m	%
Agriculture, forestry and fishing	33	0.1	148	1.1	96	0.8	47	0.3	324	0.4
Mining	1,342	4.3	221	1.6	146	1.2	250	1.4	1,959	2.6
Manufacturing	482	1.5	1,517	11.3	797	6.3	2,290	12.9	5,086	6.8
Construction	1,617	5.2	931	6.9	951	7.5	1,792	10.1	5,292	7.1
Household services (a)	7,238	23.3	2,579	19.2	3,530	27.9	2,840	16.0	16,186	21.6
Business services (b)	11,079	35.6	1,069	8.0	1,953	15.5	2,389	13.5	16,490	22.0
Goods related services (c)	3,387	10.9	2,515	18.7	1,669	13.2	5,229	29.5	12,800	17.1
Public administration and safety	2,979	9.6	1,351	10.1	421	3.3	689	3.9	5,439	7.3
Net taxes in final demand and ownership of dwellings	2,955	9.5	3,097	23.1	3,071	24.3	2,203	12.4	11,326	15.1
Gross Regional Product (GRP)	**31,112**		**13,427**		**12,634**		**17,727**		**74,901**	

Source: EconSearch, Input Output Tables for South Australia and its Regions, 2015-16 final

(a) Household services includes accommodation and food services, education and training, health and community services, arts and recreation services, and other services.

(b) Business services includes information media and telecommunications, financial and insurance services, rental, hiring and real estate services, professional, scientific and technical services, and administrative and support services.

(c) Goods-related services includes electricity, gas, water and waste services, wholesale trade, retail trade, and transport, postal and warehousing.

Current status

Metropolitan Adelaide generated approximately 3.79 million tonnes of waste in the 2015-16 financial year, of which 3.12 million tonnes was resource recovered.

An estimated 60 per cent of waste was generated by the C&D sector, which included volumes of masonry materials (e.g. asphalt, bricks, concrete) and waste soils. Approximately 23 per cent of total waste was generated by the C&I sector, which originated in businesses and industry and included materials such as organics, cardboard/paper, metal and other materials. The MSW sector generated 17 per cent of the total waste but accounts for 40 per cent of total landfill.

Baseline waste and recycling volumes

Table 10 **Metropolitan Adelaide 2015-16 waste profile**

Tonnes per annum	Waste generation	Resource recovery	Landfill
MSW	643,800	374,100	269,700
C&I	881,500	722,600	158,900
C&D	2,269,100	2,018,700	250,400
Total	**3,794,400**	**3,115,400**	**679,000**

Existing waste and resource recovery facilities

Metropolitan Adelaide has an extensive network of waste and resource recovery facilities (refer **Figure 3**). These facilities manage waste volumes generated in metropolitan Adelaide[26], and some of the larger or more specialised facilities receive waste from other regions in South Australia or interstate[27]. There are two main precincts in metropolitan Adelaide with a high concentration of waste and resource recovery infrastructure. These include:

- Wingfield/Dry Creek precinct (refer **Figure 4**)
- Lonsdale precinct

Figure 3

Waste and resource recovery infrastructure in metropolitan Adelaide (as at August 2017)

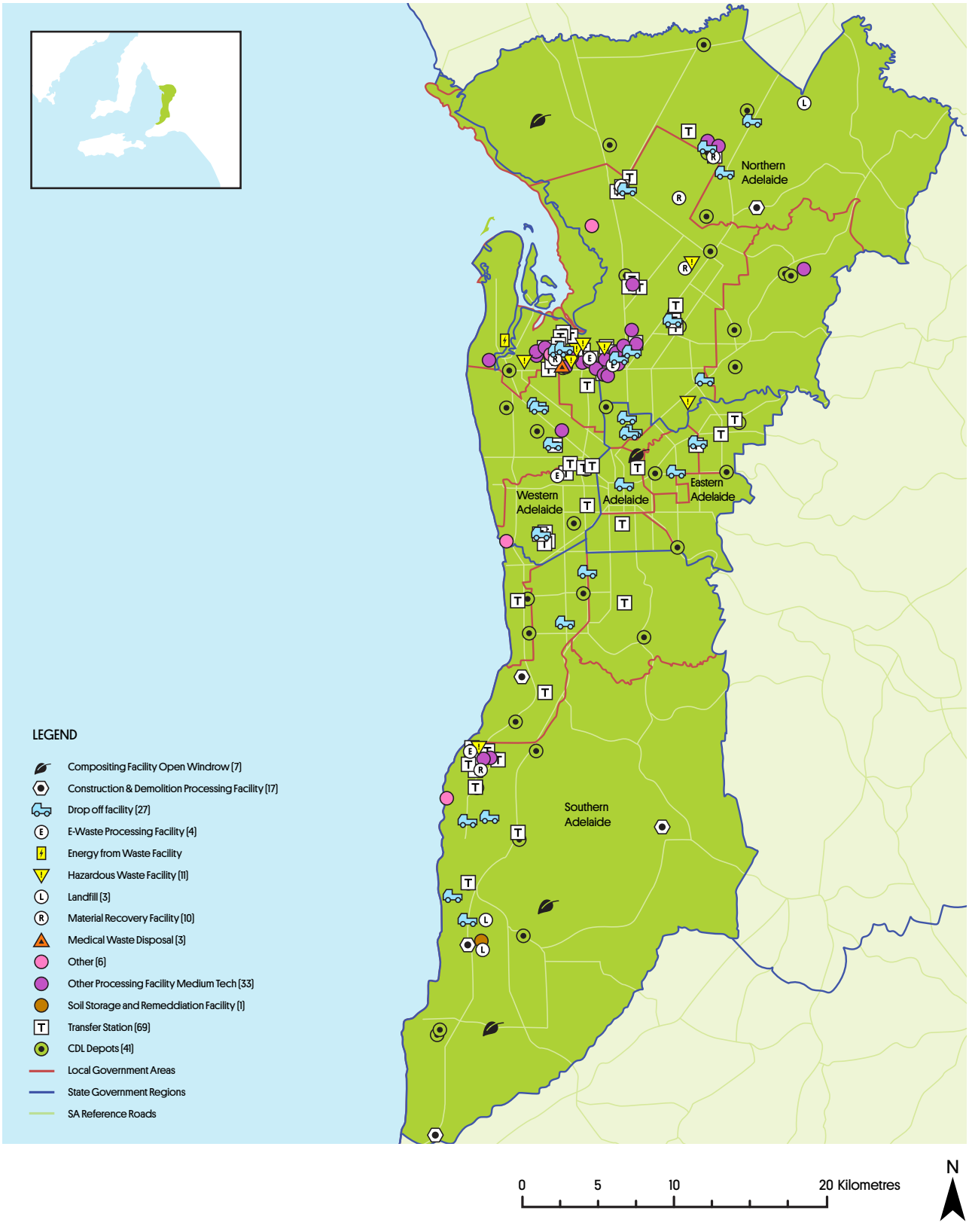
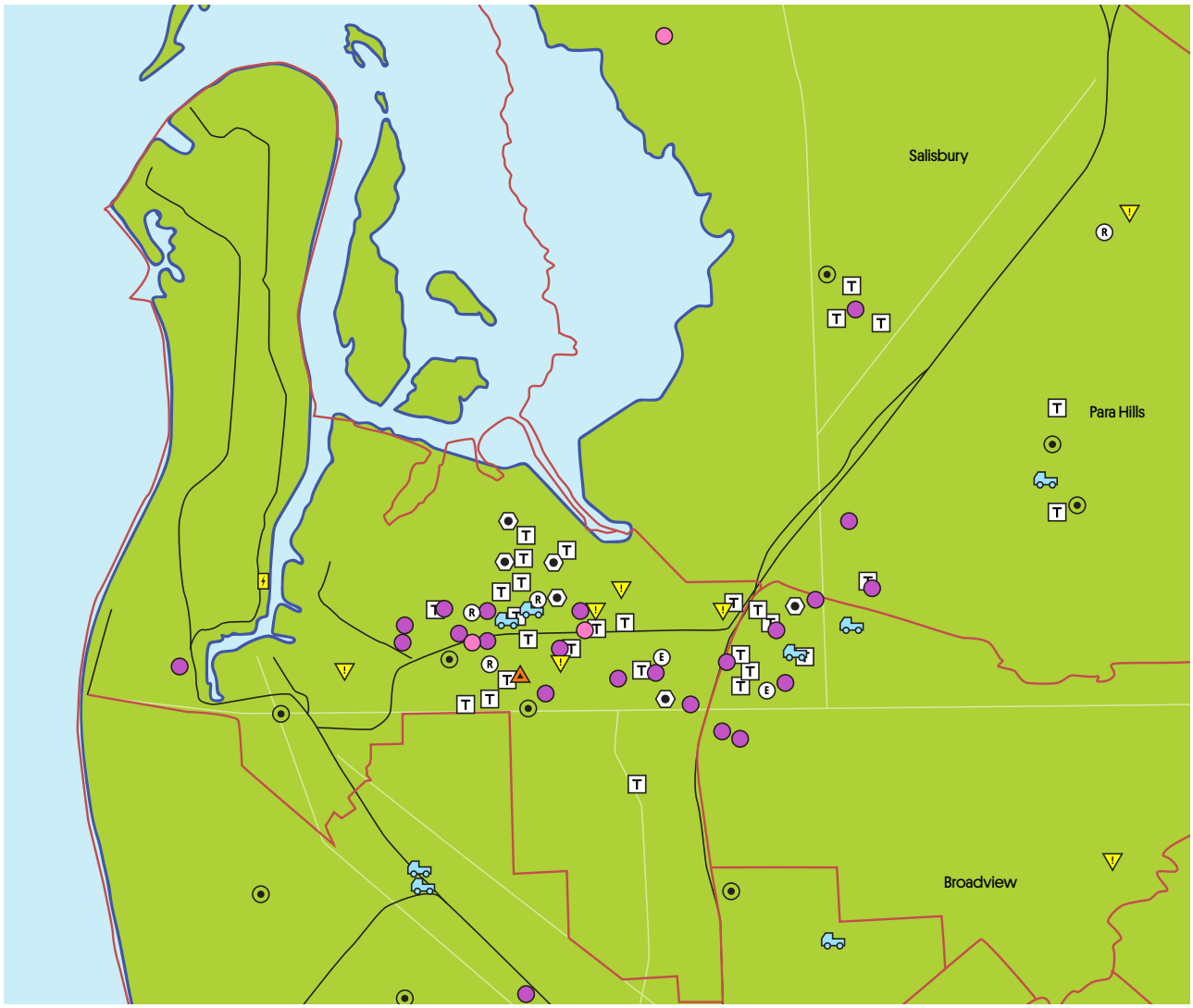


Figure 4

Waste and resource recovery infrastructure in the Wingfield / Dry Creek area (as at August 2017)



Future infrastructure needs

Waste volumes projections: 10 years (2025-26), Moderate Additional Diversion

Table 11 **Metropolitan Adelaide 2025-26 projections for tonnes per annum of waste generation, resource recovery and landfill for Moderate Additional Diversion scenario**

	Projected volumes (tonnes) – 10 years			Change (tonnes) from 2015-16		
Tonnes per annum	Waste Generation	Resource Recovery	Landfill	Waste Generation	Resource Recovery	Landfill
MSW	703,700	492,600	211,100	59,900	118,500	-58,600
C&I	1,101,200	936,000	165,200	219,700	213,400	6,300 [a]
C&D	2,834,600	2,692,800	141,700	565,500	674,100	-108,700
Total	**4,639,400**	**4,121,400**	**518,000**	**845,100**	**1,006,000**	**-161,000**

[a] This projected increase in landfill volumes is the result of projected waste generation volume growth greater than projected additional resource recovery.

Forecast of potential infrastructure needs: 10 years (2025-26), Moderate Additional Diversion scenario

Under the Moderate Additional Diversion scenario an estimated $94 million of investment in new/expanded infrastructure will be needed across Metropolitan Adelaide by 2025-26 to manage projected additional volumes of waste and resource recovery. This capital expenditure estimate is in addition to the cost of maintaining existing infrastructure. It does not include construction of new landfill cells at existing disposal facilities, replacement or upgrade of existing waste and resource recovery infrastructure.

This includes:

- **$30 million for MSW infrastructure**
  This includes kerbside bins, collection vehicles, vacuum system, transfer vehicles, CDL facilities, drop-off facilities, compost facilities (covered tunnel), energy-from-waste anaerobic digestion facilities, and other reprocessing facilities (medium technology).

  Note that the MRF infrastructure to process volumes of kerbside comingled recycling has changed since the time that the infrastructure modelling was undertaken. It is estimated that a new/expanded 50,000 tonne MRF may be needed to service Southern Metro Adelaide and peri-urban areas, which requires capital investment in the order of $10 million.

- **$35 million for C&I waste infrastructure**
  This includes skip bins, collection vehicles, transfer vehicles, CDL facilities, compost facilities (covered tunnel), energy-from-waste anaerobic digestion facilities and other reprocessing facilities (medium technology).
- **$28 million for C&D waste infrastructure**
  This includes skip bins, collection vehicles, transfer vehicles, C&D processing facilities, and a waste soil storage and remediation facility.

Table 12 **Forecast number of new/expanded infrastructure units required for the Metropolitan Adelaide region by 2025-26 for Moderate Additional Diversion scenario modelled***

	10 year forecast Moderate Additional Diversion			
Number of new/expanded infrastructure units	**MSW**	**C&I**	**C&D**	**Total Region**
Kerbside source separation bin systems	41,942	-	-	41,942
Skip bins	-	5,867	283	6,151
Collection vehicles	4.6	21.1	17.4	43.1
Vacuum system	0.5	-	-	0.5
Transfer vehicles	2.5	5.6	7.2	15.3
CDL facilities	3.4	6.2	-	9.6
Drop-off facilities	29.1	-	-	29.1
Composting facilities (covered tunnel)	0.5	0.6	-	1.1
Energy-from-waste - anaerobic digestion	0.7	1.5	-	2.2
C&D processing facilities	-	-	1.6	1.6
Other reprocessing facilities (medium tech)	1.5	4.9	-	6.5
Waste soil storage and remediation facilities	-	-	1.6	1.6
Emerging waste stream facility	1.4	0.4	-	1.8
Total capital expenditure ($ million)	**30**	**35**	**28**	**94**

** Fractions of units may indicate expansion of an existing facility, or a smaller capacity facility.*

Key challenges and opportunities for waste infrastructure

Municipal Solid Waste

- Food waste is the single largest component in the residual waste stream. Since 2011, 30 per cent of councils have adopted a food waste system of some sort. The best participation and diversion rates are achieved where barriers are removed. Providing a lined and ventilated food waste system with a free fortnightly kerbside green organics service has encouraged the best result.
- There is an opportunity to drive higher levels of source separation through improved methods for kerbside data collection, using RFID vehicle cameras and bin weighing systems. These systems would identify contamination and monitor and report on individual bins, which may be used to target household education campaigns or set-up mechanisms to reward recycling behaviours.
- The capacity of MRF infrastructure to process volumes of kerbside comingled recycling has changed since the time that the infrastructure modelling was undertaken, due to consolidation of existing SA infrastructure and changing market dynamics. It is estimated that a new/expanded MRF with a capacity of 50,000 tonnes per annum may be needed to process comingled recyclables from Southern Metropolitan Adelaide and peri-urban areas. The capital expenditure required for this infrastructure is estimated to be in the order of $10 million.
- There is an opportunity to invest in modern MRF technology to reduce processing residuals and increase the range of materials recovered. For example, modern MRFs may be able to recover soft plastics (e.g. films, wrapping), hard plastics (e.g. buckets, plastic toys, cups, pots) and expanded polystyrene packaging.
- Future growth in medium density, high density and multi-unit developments in specific locations may give rise to challenges to waste management both on-site and in service methods. It is expected that infrastructure such as bulk bins, waste chutes and vacuum collection systems will be used to manage waste from high-density developments.

Commercial and Industrial waste

- To achieve Moderate Additional Diversion, infrastructure will be needed to recover some waste streams that are currently going to landfill (including organics and dry recyclable materials). This may be achieved through improved source separation of recyclables and/or further processing of residual C&I waste streams.
- Under current market conditions, the cost of processing source-separated recyclables is generally less (on a per tonne basis) than landfill disposal. It is expected that the cost of processing recyclables relative to landfill disposal will decrease over time in line with increases in South Australia's solid waste levy.
- There is an opportunity to introduce 'save-as-you-throw' systems, which may assist businesses to measure and realise financial savings associated with increasing levels of recycling. This system would require investment in RFID bins, on-vehicle bin weighing and reporting systems.

Construction and Demolition waste

- New and expanded infrastructure will be needed to recover and process increased volumes of C&D waste. This would include expanding existing recycling facilities to process growing volumes of C&D waste (e.g. concrete crushing), as well as recovering more waste currently going to landfill such as waste soil.
- The issue of sustainable waste soil management has become increasingly critical with the continued introduction of more compact urban forms, smart growth and brownfield development along transit corridors as identified in the *30-Year Plan*. The cost of treatment and long term management of high risk contaminated soils is relatively high compared with the 'dig and dump' approach.
- Consideration should be given to establishing a 'soil bank' and to develop consistent and better coordinated systems and practices to enable cost effective reuse of low risk waste soils (e.g. clean fill and intermediate level waste soil) for development, redevelopment and infrastructure projects in South Australia.
- Renewal SA obtained government approval to establish a pilot soil recycling facility, or soil bank, on its land at West Grand Trunkway to test the feasibility of receiving and managing contaminated soils from development sites for reuse as fill material. The soil bank trial has been successful with all soil received being reused as fill on site. Renewal SA has applied for development approval to continue its soil bank operation.

Chemical waste infrastructure

- Currently household hazardous waste is collected at a depot in Dry Creek operated by a contractor on behalf of the State Government. Existing infrastructure provision for permanent household chemical waste collection facilities is considered inadequate. There is an opportunity to establish several permanent household chemical waste collection facilities in metropolitan Adelaide at existing transfer station sites or other suitable locations. This will improve the accessibility of the service for households and it will encourage the responsible disposal of chemical wastes. In July 2017, the State Government sought Expressions of Interest from local government and industry to host new, permanent facilities for the collection of household waste chemicals. The new facilities are expected to be established in 2018-19.
- South Australia has sufficient capacity within existing infrastructure to process a range of hazardous streams (including medical waste) for the next 10 to 30 years. The type of technology applied to hazardous waste streams will advance enabling more effective treatments with potential recovery of energy and/or materials (e.g. medical waste, intractable waste). Additionally, investment in new infrastructure will be needed to process emerging waste streams, such as CCA-treated timber and solar PV panels. These needs are identified in the section on Specialised and Problematic Wastes.

E-waste infrastructure

- E-waste is an emerging waste stream with volumes expected to grow over time from both MSW and C&I sources. With existing landfill bans, e-waste needs to be collected for recycling through alternative infrastructure, which at present are all drop-off facilities. Metropolitan Adelaide may require numerous drop-off facilities in the next 10 years to meet demand.

  There is an opportunity to expand current levels of e-waste reprocessing in Metropolitan Adelaide through introducing automated equipment to disassemble e-waste items into their constitute parts (plastic, metal, glass, etc.). This reprocessed material may then be sent to South Australian reprocessors and re-manufacturers to be made into new products, ready for market, and highly refined metals.

Container deposit legislation infrastructure

- Metropolitan Adelaide has an extensive network of CDL facilities. There is an opportunity to increase the efficiency of existing operations through the introduction of technology (e.g. reverse vending machines, automated sorting) that can receive, provide a deposit (cash/voucher), compact, store and deliver reports on collected containers. This may include installation of high-speed counting machines to process returned containers. Such machines could conceivably also recover these containers from the residual waste streams.

Organic waste processing and re-manufacturing

- There is the potential for encroachment of incompatible land-uses close to existing commercial composting facilities servicing Metropolitan Adelaide. Should this occur, composters may need to manage issues such as odour, dust and truck movements. This could be addressed through changes in existing operating procedures, the introduction of new technologies or enclosed composting. Enclosed composting includes techniques such as covered windrow composting, composting tunnels, covered composting bays and composting halls (with composting bays or open-plan without bays).
- There is also an opportunity to expand the sector to encompass the manufacture of 'higher value' compost and fertiliser products. This may include investment in:
  - Grinding, classification, blending and pelletising equipment
  - Equipment to remove contamination through automated systems (e.g. plastics, metals and other inert materials)
  - Equipment to generate energy (e.g. anaerobic digestion) and produce organics based fertiliser products
  - Equipment to produce fuels from sludges and grease trap wastes

Householder garden organics collected through the green organics kerbside bin collection are recovered and reprocessed into premium mulches and composts

Other reprocessing and re-manufacturing opportunities

- There are a number of facilities in Metropolitan Adelaide (classified under other reprocessing facilities - medium technology) that reprocess and/or remanufacture volumes of recovered recyclables. This includes facilities undertaking glass beneficiation, metal reprocessing, tyre reprocessing, and production of refuse derived fuel.
- There are significant benefits arising from local reprocessing/re-manufacturing, including buffering against the impacts of world commodity pricing on the recycling streams, and generating employment, economic activity, innovation and investment.
- Current challenges for local reprocessing and re-manufacturing include:
    - Australian markets for reprocessed metals are diminishing due to a decline in manufacturing, resulting in greater reliance on export markets for the sale of reprocessed metals
    - Insufficient volumes of cardboard waste in Metropolitan Adelaide means that the necessary economies of scale do not exist to establish a cardboard re-manufacturing facility in the area
    - Uncertainty surrounds the increased re-manufacturing of plastics in South Australia due to a range of business cost pressures, reliability of feedstock supply and other market factors
    - There is a need for further investment in design, development, product testing and marketing of high-value re-manufactured products
- Potential opportunities for reprocessing and re-manufacturing in Metropolitan Adelaide include:
    - Investment in advanced separation technologies in material recovery facilities to reduce contamination and improve the value of recovered materials
    - Vertical integration of plastic reprocessing operations as a solution to remaining competitive (e.g. taking control of collection to secure feedstock supplies and adding re-manufacturing capacity, such as extrusion equipment, where products have secure markets
    - Reduction of residuals from resource recovery operations, expensive to dispose of, through investment in facilities such as a vehicle shredder floc reprocessing plant and expanded residual fine glass reprocessing
    - Tyre processing for application in asphalt manufacture
    - Tyre shredding and sizing for refuse derived fuel manufacture
    - Upgrades in facilities to enable expanded use of refuse derived fuel in local cement manufacture
    - A reprocessing facility in Southern Adelaide Metropolitan area for co-mingled dry recyclables that could also accommodate the needs of surrounding regional areas, such as the Fleurieu and Kangaroo Island region
    - New product development

30 Year Outlook, High Additional Diversion scenario

Table 13 **Metropolitan Adelaide projected tonnes per annum of waste generation, resource recovery and landfill in 2045-46 for High Additional Diversion scenario**

	Projected volumes (tonnes) – 30 years			Change (tonnes) from 2015-16		
Tonnes per annum	Waste Generation	Resource Recovery	Landfill	Waste Generation	Resource Recovery	Landfill
MSW	841,200	841,200	-	197,400	467,100	-269,700
C&I	1,718,400	1,718,400	-	836,900	995,800	-158,900
C&D	4,423,400	4,423,400	-	2,154,300	2,404,700	-250,400
Total	**6,983,000**	**6,983,000**	**-**	**3,188,600**	**3,867,600**	**-679,000**

An estimated $699 million investment in infrastructure will be needed across the state over the next 30 years to manage projected additional volumes of waste generation and resource recovery. This includes:

- $290 million for MSW infrastructure
- $270 million for C&I waste infrastructure
- $139 million for C&D waste infrastructure.

Investment will be needed in collection infrastructure, vacuum systems, resource recovery infrastructure, covered tunnel composting facilities, energy-from-waste (anaerobic digestion) facilities, C&D processing facilities, other reprocessing facilities (medium technology), waste soil and storage remediation facilities and emerging waste stream facilities.

Investment in alternative technologies is necessary, to recover waste from the residual stream and achieve zero waste to landfill. This would potentially include MBT facilities, energy-from-waste thermal treatment facilities or other future technologies. Appendix B provides forecasted number of new/expanded infrastructure units for the scenario modelled.

Land-use planning considerations

Northern Adelaide

The Wingfield/Gillman precinct is likely to provide a suitable location for future waste and resource recovery infrastructure in Metropolitan Adelaide.

- The precinct has excellent access to freight transport routes (road, rail and ports)
- A full range of land sizes is available to cater for differing infrastructure needs
- An existing cluster of waste management facilities in this location supports the synergies provided by a cluster
- The area has proximity to a power station and associated land-uses
- Infrastructure in the area is unlikely to be compromised by the encroachment of sensitive land-uses (future housing over 500 metres away) and office and retail development, which is limited by proposed planning policies

Potential challenges of this location include:

- Some sites are near to the coast and sensitive coastal environment (including the Dolphin Sanctuary)
- The presence of acid sulphate soils needs to be managed
- There is potential for inundation of some land areas that will require mitigation works, and forms of special industry remain an undesirable use, limiting some forms of infrastructure

Opportunities for this precinct include:

- Establishment of a modern MRF, MBT facilities, energy-from-waste that links into existing power networks (if amenity impacts are suitably designed and managed)
- Filling of land with soil to make it suitable for industrial use
- Establishment of a soil storage and remediation facility

Other precincts in Northern Adelaide that may provide suitable locations for future waste and resource recovery infrastructure include Torrens Island and Greater Edinburgh Parks.

Southern Adelaide

The Lonsdale precinct is likely to provide a suitable location for future waste and resource recovery infrastructure in Metropolitan Adelaide.

- The Industry Zone will facilitate most forms of waste and resource recovery infrastructure
- The former Port Stanvac refinery site can accommodate more intensive forms of infrastructure than other areas in this location due to specific policy support
- The precinct has excellent access to freight transport routes

- Infrastructure in the region is unlikely to be compromised by the encroachment of sensitive land-uses due to the presence of existing industry, although this is subject to location within Lonsdale due to surrounding residential interface

Potential challenges of this location include:

- The proximity of desalination plants and impact on this facility (real or perceived)
- Vacant and larger scale sites may be difficult to find and would require consolidation of existing development

All forms of infrastructure are broadly appropriate within this precinct except open windrow composting facilities and disposal facilities. An MBT biological treatment facility and energy-from-waste facility may be appropriate if amenity impacts are suitably designed and managed. The former Port Stanvac refinery site would be suitable for both facilities.

Jeffries Compost Mulch and Soils using locally developed technology - ROSS, the Recycled Organic Screening System to separate inorganic materials from compostable material

Adelaide Hills

Overview

The Adelaide Hills region includes Adelaide Hills Council and Mount Barker District Council.

The estimated resident population of the Adelaide Hills region was 72,800 in June 2016[28].

The economic contribution of the Adelaide Hills region was $2.55 billion in 2015-16. This accounted for 2.5 per cent of the State's GSP.

Net taxes in final demand and ownership of dwellings was the largest sector contributor to the Adelaide Hills regional economy. It contributed $509 million and accounted for 20 per cent of GRP in 2015-16. Household services and goods related services were the second and third largest sector contributors to the Adelaide Hills economy respectively. Health and community services and retail trade were major sub-sectors contributing $161 million and $157 million respectively and accounting for approximately 6.3 per cent of GRP each.

Table 14 **Adelaide Hills Sector Contribution to GRP, 2015-16**

Sector	GRP	
	$m	%
Agriculture, forestry and fishing	223	8.8
Mining	163	6.4
Manufacturing	198	7.8
Construction	177	6.9
Household services (a)	433	17.0
Business services (b)	242	9.5
Goods related services (c)	441	17.3
Public administration and safety	165	6.5
Net taxes in final demand and ownership of dwellings	509	20.0
Gross Regional Product (GRP)	**2,552**	

Source: EconSearch, Input Output Tables for South Australia and its Regions, 2015-16 final

(a) Household services includes accommodation and food services, education and training, health and community services, arts and recreation services, and other services.

(b) Business services includes information media and telecommunications, financial and insurance services, rental, hiring and real estate services, professional, scientific and technical services, and administrative and support services.

(c) Goods-related services includes electricity, gas, water and waste services, wholesale trade, retail trade, and transport, postal and warehousing.

Current status

Baseline waste and recycling volumes

An estimated 44 per cent of waste generated in the region is from the MSW sector and key streams include organics (including food and garden waste), cardboard, paper, plastics and metals. An estimated 28 per cent of total waste was generated by the C&I sector and C&D sector each. C&I sector waste is generated by businesses and industry and includes streams such as organics, cardboard/paper, metal and other materials.

Table 15 **The Adelaide Hills region 2015-16 waste profile**

Tonnes per annum	Waste generation	Resource recovery	Landfill
MSW	29,300	11,500	17,800
C&I	18,400	10,800	7,600
C&D	18,200	11,800	6,400
Total	**65,900**	**34,100**	**31,800**

Future infrastructure needs

Waste volumes projections: 10 years (2025-26), Moderate Additional Diversion

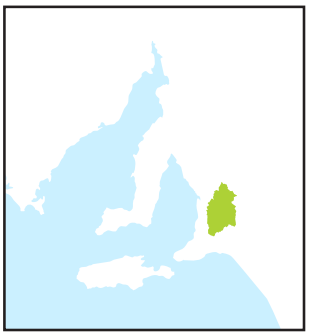
Table 16 **The Adelaide Hills region 2025-26 projections for tonnes per annum of waste generation, resource recovery and landfill for Moderate Additional Diversion scenario**

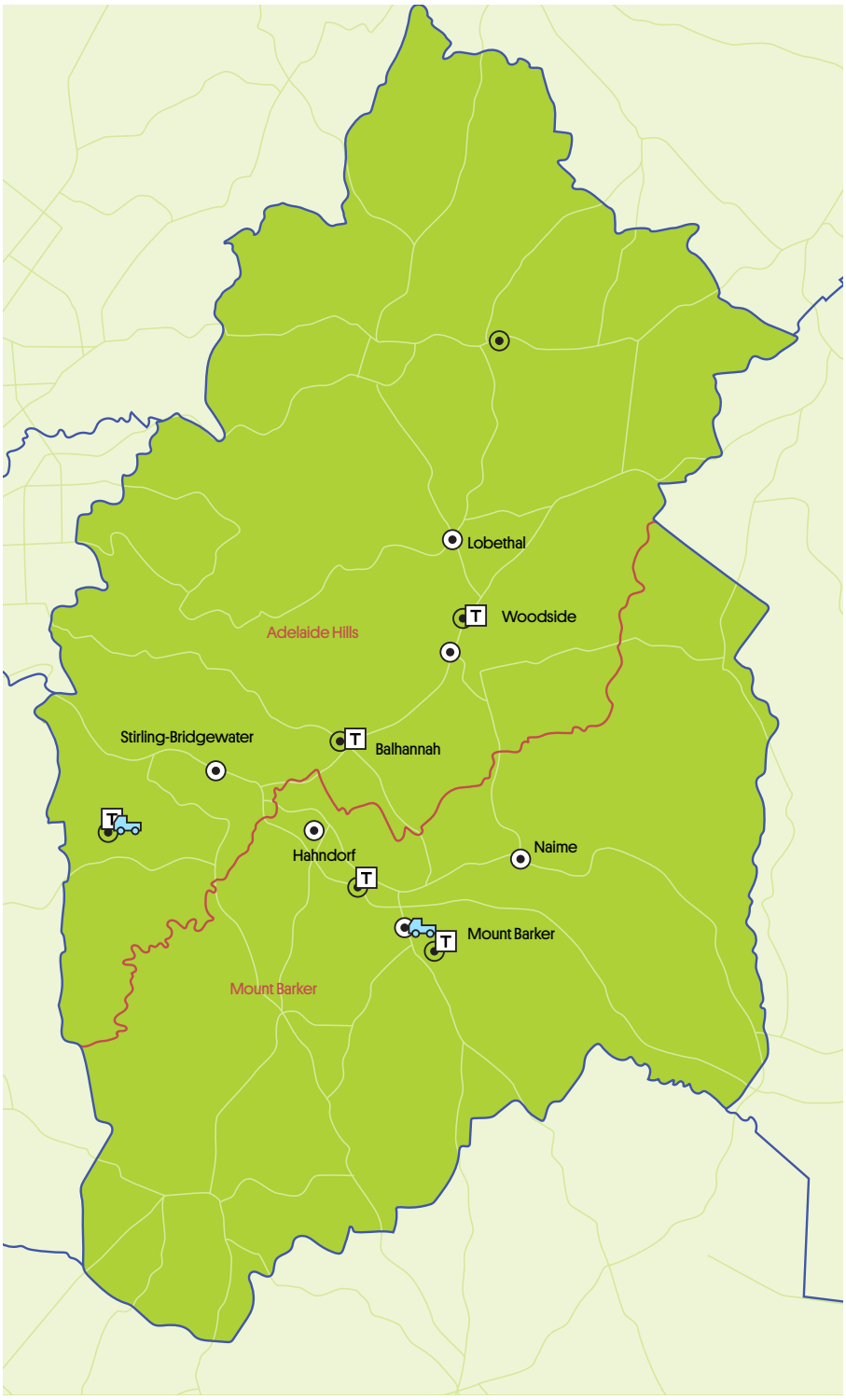
	Projected volumes (tonnes) – 10 years			Change (tonnes) from 2015-16		
Tonnes per annum	Waste generation	Resource recovery	Landfill	Waste generation	Resource recovery	Landfill
MSW	32,500	22,700	9,700	3,200	11,200	-8,100
C&I	23,000	21,600	1,400	4,600	10,800	-6,200
C&D	22,700	15,900	6,800	4,500	4,100	400[a]
Total	78,200	60,200	17,900	12,300	26,100	-13,900

[a] This projected increase in C&D landfill volumes is the result of projected waste generation volumes growing greater than additional resource recovery.

Figure 5

Existing waste and resource recovery infrastructure in the Adelaide Hills region (as at August 2017)





LEGEND

- Drop off facility (3)
- Transfer Station (5)
- CDL Depots (5)
- Local Government Areas
- State Government Regions
- SA Towns
- SA Reference Roads

0 5 10 20 Kilometres

N

Forecast of potential infrastructure needs: 10 years (2025-26), Moderate Additional Diversion scenario

Under the Moderate Additional Diversion scenario an estimated $10.0 million investment in infrastructure will be needed across the Adelaide Hills region by 2025-26 to manage projected additional volumes of waste generation, resource recovery and landfill. This capital expenditure estimate is in addition to the cost of maintain existing infrastructure. It does not include construction of new landfill cells at existing disposal facilities, replacement or upgrade of existing waste and resource recovery infrastructure.

- **$3.2 million for MSW infrastructure**
  This includes kerbside bins, collection vehicles, transfer stations, transfer vehicles, CDL facilities, drop-off facilities and compost facilities (open windrow).
- **$6.6 million for C&I waste infrastructure**
  This includes skip bins, collection vehicles, transfer stations, transfer vehicles, CDL facilities, compost facilities (open windrow) and energy-from-waste (anaerobic digestion).
- **$200,000 for C&D waste infrastructure**
  This includes skip bins, collection vehicles and transfer vehicles.

Table 17 **Forecast number of new/expanded infrastructure units required for the Adelaide Hills region by 2025-26 for Moderate Additional Diversion scenario***

	10 year forecast Moderate Additional Diversion scenario			
Number of new/ expanded infrastructure units	**MSW**	**C&I**	**C&D**	**Total region**
Kerbside source separation bin systems	2,536	-	-	2,536
Skip bins	-	122	2	125
Collection vehicles	0.3	0.4	0.1	0.9
Transfer stations (inc. compaction equipment)	0.3	0.1	-	0.3
Transfer vehicles	0.1	0.05	0.1	0.2
CDL facilities	0.2	0.4	-	0.6
Drop off facilities	1.9	-	-	1.9
Composting facilities (Open WR)	0.7	0.4	-	1.1
Energy-from-waste - anaerobic digestion	-	1.0	-	1.0
C&D processing facilities	-	-	0.1	0.1
Total capital expenditure ($ million)	**3.2**	**6.6**	**0.2**	**10.0**

**Fractions of units may indicate expansion of an existing facility, or smaller capacity facility. Infrastructure units needed to manage waste from a given region may not always be located in that region due to economies of scale and other factors (e.g. planning or suitable locations).*

Region specific waste infrastructure challenges and opportunities

The region faces challenges for waste management and related infrastructure.

- There is potential for encroachment of incompatible land-uses near existing waste and resource recovery infrastructure
- There is currently no viable recycling option available for the management of CCA-treated posts and other winery related solid wastes generated across the McLaren Vale wine region. Disposal of CCA-treated posts in particular is problematic given their chemical treatment and high cost of disposal to landfill. Hence more research and development investment on this problematic waste stream is required.

Potential opportunities for infrastructure development in the region include reprocessing of biomass available in the area (e.g. via composting, anaerobic digestion or biofuel processing).

30 Year Outlook, High Additional Diversion scenario

Table 18 **Adelaide Hills projected tonnes per annum of waste generation, resource recovery and landfill in 2045-46 for High Additional Diversion scenario**

	Projected volumes (tonnes) – 30 years			Change (tonnes) from 2015-16		
Tonnes per annum	Waste generation	Resource recovery	Landfill	Waste generation	Resource recovery	Landfill
MSW	39,900	35,900	4,000	10,600	24,400	-13,800
C&I	35,800	34,100	1,800	17,400	23,300	-5,800
C&D	35,500	33,700	1,800	17,300	21,900	-4,600
Total	111,200	103,600	7,600	45,300	69,500	-24,200

Under the High Additional Diversion scenario an estimated $32.4 million investment in infrastructure will be needed across the region over the next 30 years to manage projected additional volumes of waste generation, resource recovery and landfill. This includes:

- $16.9 million for MSW infrastructure
- $14.3 million for C&I waste infrastructure
- $1.2 million for C&D waste infrastructure

Investment will be needed in collection infrastructure, transfer stations, transfer vehicles, CDL facilities, drop-off facilities, open windrow composting facilities, energy-from-waste (anaerobic digestion) and construction and demolition waste processing facilities. To achieve higher landfill diversion, investment in alternative technologies such MBT facilities may be needed. Appendix B provides the forecasted number of new/expanded infrastructure units for the scenario modelled.

Over the 30 year timeframe it is expected that:

- Technological advances will enable commercially viable recycling of legacy CCA-treated posts. There will be a transition away from the use of CCA-posts by wineries and other local industry in the Adelaide Hills, which will reduce the prevalence of this problematic waste stream.
- The availability of biomass from local industry in the region will provide ongoing opportunities for local reprocessing such as composting, anaerobic digestion or biofuel processing

Land-use planning considerations

Identified, well-sited and serviced industrial land suitable for waste infrastructure is limited in Adelaide Hills' development plans[29]. Therefore, it is anticipated that any waste infrastructure would be clustered near other waste infrastructure where possible. The Brinkley Landfill site has been identified as a potentially suitable site should a soil bank be considered for the region.

A truck lifting arm fitted with Botek technology weighs and measures materials collected from householder kerbside recycling bins

ROSS, the Recycled Organics Screening System processing organics collected from South Australian householders and businesses diverts valuable resources from being sent to landfill

Barossa, Light and Lower North

Overview

The Barossa, Light and Lower North State Government region includes the Barossa Valley, the town of Gawler, the Northern Adelaide Plains and the Samphire Coast. The region is covered by four local government areas: Light Regional Council, the Barossa Council, District Council of Mallala and the Town of Gawler.

The estimated resident population of the Barossa, Light and Lower North region was 70,400 in June 2016[30].

The economic contribution of the region was $2.73 billion in 2015-16, which accounted for 2.7 per cent of the State's GSP.

The region's economy is driven by primary production but more so by the manufacturing associated with primary production. Manufacturing was the largest sector contributor. It contributed $522 million and accounted for around 20 per cent of GRP in 2015-16. Within the manufacturing sector, key sub-sectors included wine and spirit manufacturing ($282 million) and non-metallic mineral products ($80.8 million).

Wine grapes, poultry, pigs and grains were key sub-sectors for primary production in the region.

Table 19

Barossa, Light and Lower North region sector contributors to GRP, 2015-16

Sector	GRP	
	$m	%
Agriculture, forestry and fishing	420	15.4
Mining	15	0.6
Manufacturing	522	19.1
Construction	146	5.4
Household services (a)	476	17.4
Business services (b)	264	9.7
Goods related services (c)	344	12.6
Public administration and safety	61	2.3
Net taxes in final demand and ownership of dwellings	481	17.6
Gross Regional Product (GRP)	**2,729**	

Source: EconSearch, Input Output Tables for South Australia and its Regions, 2015-16 final
(a) Household services includes accommodation and food services, education and training, health and community services, arts and recreation services, and other services
(b) Business services includes information media and telecommunications, financial and insurance services, rental, hiring and real estate services, professional, scientific and technical services, and administrative and support services.
(c) Goods-related services includes electricity, gas, water and waste services, wholesale trade, retail trade, and transport, postal and warehousing.

Current status

Baseline waste and recycling volumes

An estimated 77 per cent of waste generated in the region is from the C&I sector. Significant waste streams include volumes of organics generated by local industry including grape marc and agricultural organics.

Table 20

Barossa, Light and Lower North region 2015-16 waste profile

Tonnes per annum	Waste generation	Resource recovery	Landfill
MSW	28,000	10,900	17,000
C&I	151,600	144,300	7,200
C&D	17,400	11,200	6,100
Total	**196,900**	**166,500**	**30,400**

Future infrastructure needs

Waste volumes projections: 10 years (2025-26), Moderate Additional Diversion

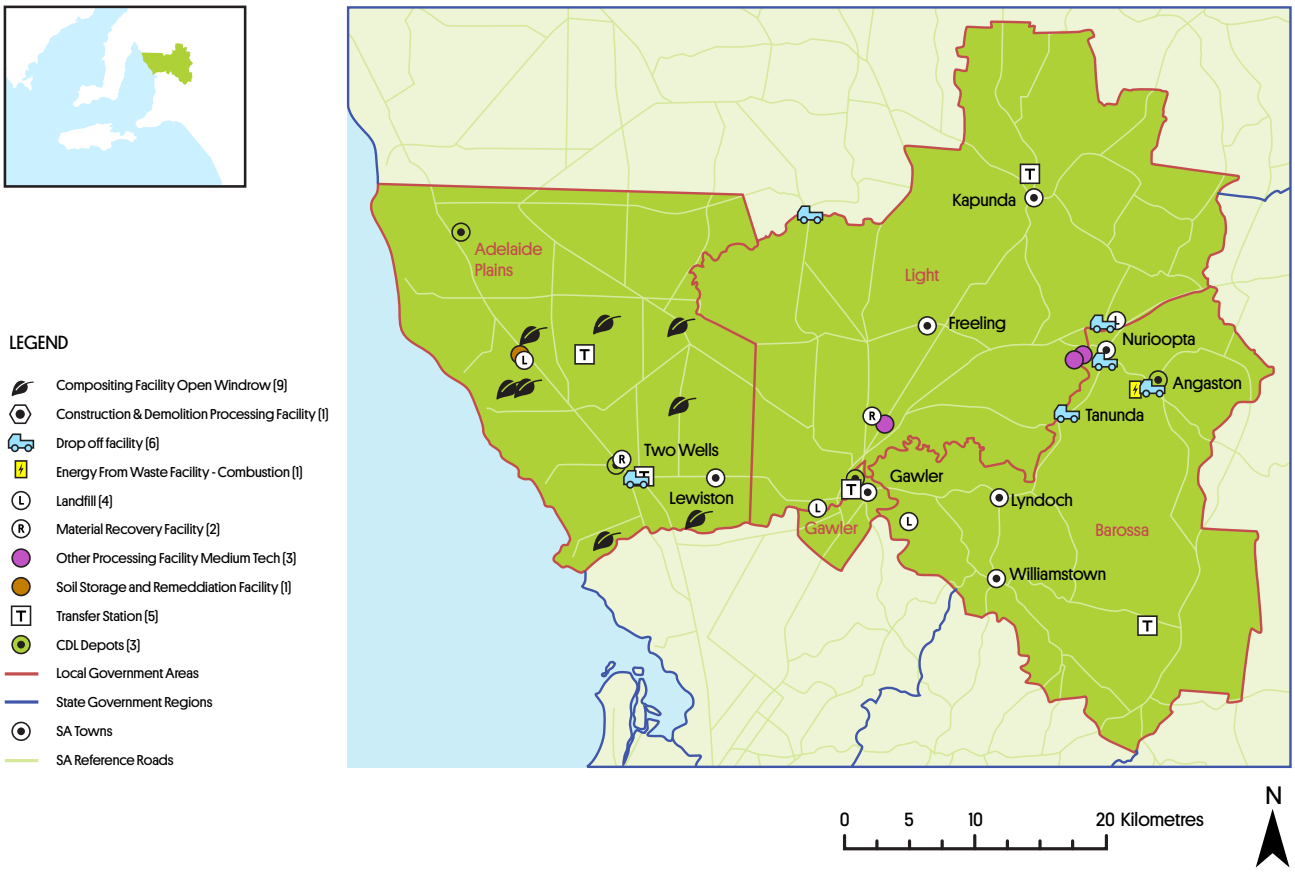
Table 21 **The Barossa, Light and Lower North region 2025-26 projections for tonnes per annum of waste generation, resource recovery and landfill for Moderate Additional Diversion scenario**

	Projected volumes (tonnes) – 10 years			Change (tonnes) from 2015-16		
Tonnes per annum	**Waste generation**	**Resource recovery**	**Landfill**	**Waste generation**	**Resource recovery**	**Landfill**
MSW	33,100	23,100	9,900	5,100	12,200	-7,100
C&I	189,300	178,000	11,400	37,700	33,700	4,200[a]
C&D	21,700	15,200	6,500	4,300	4,000	400[b]
Total	244,100	216,300	27,800	47,200	49,800	-2,600

[a] Conditions specific to the region, including large C&I volumes together with current high diversion levels [that are close to or exceed the diversion scenario for regional South Australia], result in projected C&I landfill volumes that are above baseline levels, which are not expected to eventuate in reality.

[b] This projected increase in C&D landfill volumes is the result of projected waste generation volumes growing greater than additional resource recovery.

Figure 6 **Existing waste and resource recovery infrastructure in the Barossa, Light and Lower North region (as at August 2017)**



Forecast of potential infrastructure needs: 10 years (2025-26), Moderate Additional Diversion scenario

Under the Moderate Additional Diversion scenario an estimated $18.9 million investment in new/expanded waste and resource recovery infrastructure will be needed across the region by 2025-26 to manage projected additional volumes of waste generation, resource recovery and landfill. This capital expenditure estimate is in addition to the cost of maintain existing infrastructure. It does not include construction of new landfill cells at existing disposal facilities, replacement or upgrade of existing waste and resource recovery infrastructure.

- **$4.8 million for MSW infrastructure**
  This includes kerbside bins, collection vehicles, transfer vehicles, CDL facilities, drop-off facilities, compost facilities (open windrow) and other reprocessing facilities (medium technology).
- **$14.0 million for C&I waste infrastructure**
  This includes skip bins, collection vehicles, transfer stations, transfer vehicles, CDL facilities, compost facilities (open windrow) and other reprocessing facilities (medium technology).
- **$200,000 for C&D waste infrastructure**
  This includes skip bins, collection vehicles, transfer vehicles and C&D processing facilities.

Table 22 **Forecast number of new/expanded infrastructure units required for the Barossa, Light and Lower North region by 2025-26 for Moderate Additional Diversion scenario***

	10 year forecast Moderate Additional Diversion			
Number of new/ expanded infrastructure units	**MSW**	**C&I**	**C&D**	**Total region**
Kerbside source separation bin systems	4,083	-	-	4,083
Skip bins	-	1,009	2	1,011
Collection vehicles	0.4	3.6	0.1	4.2
Transfer stations (inc. compaction equipment)	0.4	0.8	-	1.2
Transfer vehicles	0.2	0.4	0.1	0.7
Material recovery facility	0.1	-	-	0.1
CDL facilities	0.2	0.4	-	0.6
Drop off facilities	2.0	-	-	2.0
Composting facilities (Open WR)	0.75	0.02	-	0.8
Energy from waste - anaerobic digestion	-	1.0	-	1.0
C&D processing facilities	-	-	0.05	0.05
Other reprocessing facilities (Medium Tech)	0.3	3.3	-	3.6
Total capital expenditure ($ million)	**4.8**	**14.0**	**0.2**	**18.9**

** Fractions of units may indicate expansion of an existing facility, or a smaller capacity facility. Infrastructure units needed to manage waste from a given region may not always be located in that region due to economies and scale and other factors (e.g. planning or suitable locations).*

Region specific waste infrastructure challenges and opportunities

The region faces challenges for waste management and related infrastructure including:

- There is potential for encroachment of incompatible land-uses near existing waste and resource recovery infrastructure, such as at Two Wells
- There is currently no viable recycling option available for management of CCA-treated posts and other winery related solid wastes generated across the Barossa wine region. The disposal of CCA-treated posts in particular is problematic due to the chemical treatment and high cost of disposal to landfill. Hence more research and development investment on this problematic waste stream is required.

Potential opportunities for infrastructure development in the region include:

- Opportunities for reprocessing of biomass available in the area (e.g. via composting, anaerobic digestion or biofuel processing)
- Further processing of organic residues into value added products (e.g. extraction of alcohol from grape marc)
- Good access to landfills and suitable transfer routes to waste and resource recovery facilities and ports to export markets located in Wingfield/Dry Creek precinct

30 Year Outlook, High Additional Diversion scenario

Table 23 **Barossa Light and Lower North region projected tonnes per annum of waste generation, resource recovery and landfill in 2045-46 for High Additional Diversion scenario**

	Projected volumes (tonnes) – 30 years			Change (tonnes) from 2015-16		
Tonnes per annum	Waste generation	Resource recovery	Landfill	Waste generation	Resource recovery	Landfill
MSW	46,200	41,600	4,600	18,200	30,700	-12,400
C&I	295,400	280,700	14,800	143,800	136,400	7,600[a]
C&D	33,900	32,200	1,700	16,500	21,000	-4,400
Total	375,500	354,500	21,100	178,600	188,000	-9,300

[a] Specific conditions to the region, including large C&I volumes together with current high diversion levels (that are close to or exceed the diversion scenario for regional SA), result in projected C&I landfill volumes that are above baseline levels, which are not expected to eventuate in reality.

Under the High Additional Diversion scenario an estimated $70.1 million investment in infrastructure will be needed across the region over the next 30 years to manage projected additional volumes of waste generation, resource recovery and landfill. This includes:

- $24.0 million for MSW infrastructure
- $45.0 million for C&I waste infrastructure
- $1.1 million for C&D waste infrastructure

Investment in collection infrastructure, transfer stations, transfer vehicles, CDL facilities, drop-off facilities, open windrow composting facilities, C&D waste processing facilities, energy-from-waste (anaerobic digestion) and other reprocessing facilities (medium technology) will be needed. To achieve higher landfill diversion, it may be necessary to invest in alternative technologies such as MBT facilities. Appendix B provides the forecasted number of new/expanded infrastructure units for the scenario modelled.

Over the 30 year timeframe it is expected that:

- The availability of biomass from local industry in the region will provide ongoing opportunities for local reprocessing of this waste stream such as composting, anaerobic digestion or biofuel processing
- The region may offer suitable locations for new waste and resource recovery infrastructure servicing Metropolitan Adelaide
- Technological advances will enable commercially viable recycling of legacy CCA-treated posts. There will be a transition away from the use of CCA-treated posts by wineries and other local industry in the Barossa, Light and Lower North region, which will reduce the prevalence of this problematic waste stream.

Land-use planning considerations

The Roseworthy/Kingsford precinct is likely to provide a suitable location for future waste and resource recovery infrastructure.

- The Industry Zone supports intensive 24 hour activities that require large sites or generate air emissions within the northern part of the Kingston Regional Estate. This aligns with a full range of waste and resource recovery infrastructure.
- Infrastructure is unlikely to be subject to encroachment from sensitive land-uses given the zoning in this location
- The precinct has good access to freight transport infrastructure
- The precinct is near to future urban growth areas

Potential challenges of this location include:

- Future expansion to employment land[31] identified, associated with growth of nearby Roseworthy township, may take the shape of an Urban Employment Zone, introducing potential for sensitive land-uses
- The adequacy of broader infrastructure capacities needs to be determined

In terms of opportunities, all forms of infrastructure are broadly appropriate within this precinct except open windrow composting facilities and disposal infrastructure. If amenity impacts are suitably designed and managed opportunities exist to establish MBT and energy-from-waste facilities.

Chemical waste from households and farms in collection barrels

Fleurieu and Kangaroo Island

Overview

The Fleurieu and Kangaroo Island State Government region covers four local government areas: Alexandrina Council, Kangaroo Island Council, City of Victor Harbor and District Council of Yankalilla.

The estimated resident population of the Fleurieu and Kangaroo Island region was 50,300 in June 2016[32].

The economic contribution of the Fleurieu and Kangaroo Island region was $1.75 billion in 2015-16. This accounted for 1.7 per cent of the State's GSP.

Agriculture, Forestry and Fishing was the largest sector contributor to the Fleurieu and Kangaroo Island regional economy. It contributed $398 million and accounted for 23 per cent of GRP in 2015-16. Beef and dairy cattle, sheep and wine grapes were the major sub-sectors.

Net taxes in final demand and ownership of dwellings and household services the second and third largest sector contributors respectively to the Fleurieu and Kangaroo Island economy. Ownership of dwellings ($176 million) and health and community services ($135 million) were the major sub-sector contributors.

Table 24 **Fleurieu and Kangaroo Island Sector Contribution to GRP, 2015-16**

Sector	GRP	
	$m	%
Agriculture, forestry and fishing	398	22.8
Mining	95	5.5
Manufacturing	80	4.6
Construction	90	5.2
Household services (a)	306	17.5
Business services (b)	171	9.8
Goods related services (c)	238	13.6
Public administration and safety	55	3.1
Net taxes in final demand and ownership of dwellings	313	17.9
Gross Regional Product (GRP)	1,745	

Source: EconSearch, Input Output Tables for South Australia and its Regions, 2015-16 final
(a) Household services includes accommodation and food services, education and training, health and community services, arts and recreation services, and other services
(b) Business services includes information media and telecommunications, financial and insurance services, rental, hiring and real estate services, professional, scientific and technical services, and administrative and support services.
(c) Goods related services includes electricity, gas, water and waste services, wholesale trade, retail trade, and transport, postal and warehousing.

Current status

Baseline waste and recycling volumes

An estimated 44 per cent of waste in the region is generated by the MSW sector, which includes organics (including food and garden waste), cardboard, paper, plastics and metals. The C&I and C&D sectors contribute an estimated 28 per cent of total waste each. The C&I sector waste is generated by businesses and industry and includes materials such as organics, cardboard, paper, metal and other materials.

Table 25 **The Fleurieu Kangaroo Island region 2015-16 waste profile**

Tonnes per annum	Waste generation	Resource recovery	Landfill
MSW	20,100	7,900	12,300
C&I	12,600	7,500	5,200
C&D	12,500	8,100	4,400
Total	**45,300**	**23,400**	**21,900**

Future infrastructure needs

Waste volumes projections: 10 years (2025-26), Moderate Additional Diversion

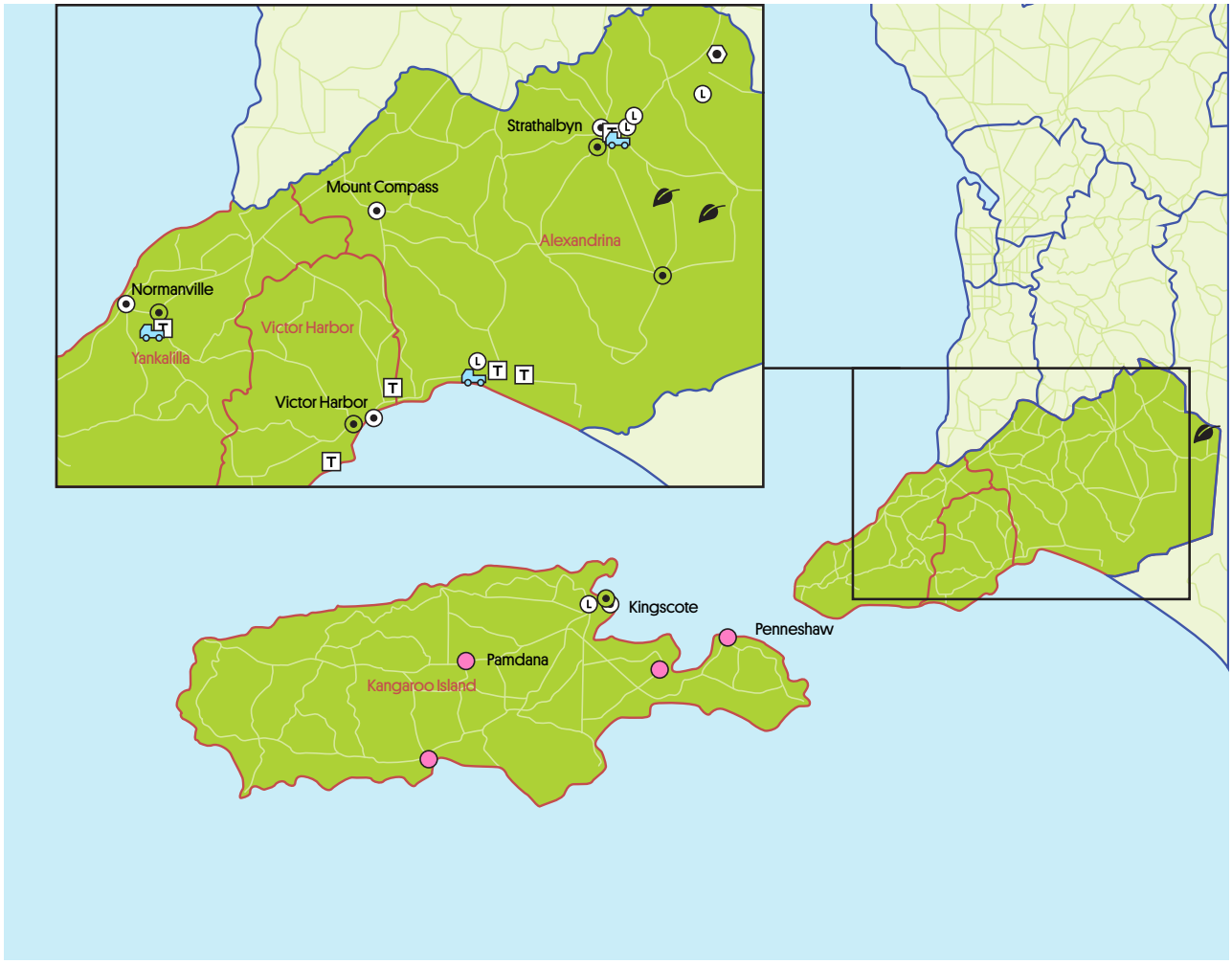
Table 26 **The Fleurieu and Kangaroo Island region 2025-26 projections for tonnes per annum of waste generation, resource recovery and landfill for Moderate Additional Diversion scenario**

	Projected volumes (tonnes) – 10 years			Change (tonnes) from 2015-16		
Tonnes per annum	Waste generation	Resource recovery	Landfill	Waste generation	Resource recovery	Landfill
MSW	23,800	16,700	7,100	3,700	8,800	-5,200
C&I	15,800	14,900	900	3,200	7,400	-4,300
C&D	15,600	10,900	4,700	3,100	2,800	300[a]
Total	55,200	42,500	12,800	9,900	19,100	-9,100

[a] This projected increase in C&D landfill volumes is the result of projected waste generation volumes growing greater than additional resource recovery.

Figure 7

Waste and resource recovery infrastructure in the Fleurieu Kangaroo Island region (as at August 2017)



Forecast of potential infrastructure needs: 10 years (2025-26), Moderate Additional Diversion scenario

Under the Moderate Additional Diversion scenario an estimated $7.3 million investment in infrastructure will be needed across the Fleurieu Kangaroo Island region by 2025-26 to manage projected additional volumes of waste generation, resource recovery and landfill. This capital expenditure estimate is in addition to the cost of maintaining existing infrastructure. It does not include construction of new landfill cells at existing disposal facilities, replacement or upgrade of existing waste and resource recovery infrastructure.

- **$3.3 million for MSW infrastructure**
  This includes kerbside bins, collection vehicles, transfer stations, transfer vehicles, CDL facilities, drop-off facilities, compost facilities (open windrow) and other reprocessing facilities (medium technology).
- **$3.8 million for C&I waste infrastructure**
  This includes skip bins, collection vehicles, transfer stations, transfer vehicles, CDL facilities, compost facilities (open windrow), energy-from-waste (anaerobic digestion) and other reprocessing facilities (medium technology).
- **$100,000 for C&D waste infrastructure**
  This includes skip bins, collection vehicles, transfer vehicles and C&D processing facilities.

Table 27 **Forecast number of new/expanded infrastructure units required for the Fleurieu and Kangaroo Island region by 2025-26 for Moderate Additional Diversion scenario modelled***

	10 year forecast Moderate Additional Diversion			
Number of new/ expanded infrastructure units	**MSW**	**C&I**	**C&D**	**Total region**
Kerbside source separation bin systems	2,928	-	-	2,928
Skip bins	-	84	2	86
Collection vehicles	0.3	0.3	0.1	0.7
Transfer stations (inc. compaction equipment)	0.3	0.1	-	0.4
Transfer vehicles	0.15	0.03	0.04	0.2
CDL facilities	0.1	0.3	-	0.4
Drop off facilities	1.5	-	-	1.5
Composting facilities (Open WR)	0.5	0.3	-	0.8
Energy-from-waste - anaerobic digestion	-	0.5	-	0.5
C&D processing facilities	-	-	0.03	0.03
Other reprocessing facilities (Medium Tech)	0.2	0.2	-	0.4
Total capital expenditure ($ million)	**3.3**	**3.8**	**0.1**	**7.3**

** Fractions of units may indicate expansion of an existing facility, or a smaller capacity facility. Infrastructure units needed to manage waste from a given region may not always be located in that region due to economies and scale and other factors (e.g. planning or suitable locations).*

Region specific key waste infrastructure challenges and opportunities

The region faces challenges for waste management and related infrastructure.

- Kangaroo Island has limited reprocessing facilities or suitable landfills to manage future volumes of waste. There are high costs to transport waste to the mainland facilities by ferry.
- There is potential encroachment of incompatible land-uses near existing waste and resource recovery infrastructure
- There is currently no viable recycling option available for the management of CCA-treated posts and other winery related solid wastes generated across the Fleurieu and Kangaroo Island Region. Disposing of CCA-treated posts in particular is problematic given their chemical treatment and high cost of disposal to landfill. Hence more research and development investment on this problematic waste stream is required.

Potential opportunities for infrastructure development in the region include:

- Opportunities for reprocessing of biomass available in the area via composting, anaerobic digestion or biofuel processing that may be suitable for small-scale on site reprocessing
- An opportunity to create a closed-loop, Circular Economy on Kangaroo Island. For example:
  - An energy-from-waste facility, with energy used locally
  - A local composting facility, with compost used on local vineyards and farms

30 Year Outlook, High Additional Diversion scenario

Table 28 **Fleurieu Kangaroo Island region projected tonnes per annum of waste generation, resource recovery and landfill in 2045-46 for High Additional Diversion scenario**

	Projected volumes (tonnes) – 30 years			Change (tonnes) from 2015-16		
Tonnes per annum	**Waste generation**	**Resource recovery**	**Landfill**	**Waste generation**	**Resource recovery**	**Landfill**
MSW	33,200	29,900	3,300	13,100	22,000	-9,000
C&I	24,700	23,400	1,200	12,100	15,900	-4,000
C&D	24,400	23,200	1,200	11,900	15,100	-3,200
Total	82,300	76,500	5,800	37,000	53,100	-16,100

Under the High Additional Diversion scenario an estimated $26.6 million investment in infrastructure will be needed across the region over the next 30 years to manage projected additional volumes of waste generation, resource recovery and landfill. This includes:

- $17.2 million for MSW infrastructure
- $8.6 million for C&I waste infrastructure
- $800,000 for C&D waste infrastructure

Investment in collection infrastructure, transfer vehicles, CDL facilities, drop-off facilities, open windrow composting facilities, C&D waste processing facilities, energy-from-waste (anaerobic digestion) and other reprocessing facilities (medium technology) will be needed. To achieve higher landfill diversion, it may be necessary to invest in alternative technologies that enable waste to be separated into commercially viable material streams or in any suitable technology that could be effectively deployed in regional areas such as modular MBT. Appendix B provides the forecasted number of new/expanded infrastructure units for the scenario modelled.

Over the 30 year timeframe it is expected that:

- Opportunities for Kangaroo Island will include further development of Circular Economy solutions as a way to reduce waste management costs associated with transporting waste to the mainland, establish a sustainable source of energy to the Island through energy-from-waste, and build on activities that support environmental sustainability and ecotourism. This may include greater local reuse, reprocessing and re-manufacturing of waste generated on Kangaroo Island.
- Technology advances will enable commercially viable recycling of legacy CCA-treated posts. There will be a transition away from use of CCA-posts by wineries and other local industry in the Fleurieu and Kangaroo Island, which will reduce the prevalence of this problematic waste stream.
- The availability of biomass in the region will provide an ongoing opportunity for local reprocessing (e.g. via composting, anaerobic digestion or biofuel)

Land-use planning considerations

The Kangaroo Island Plan[33] identifies the need for well-sited and serviced industrial land in Kingscote, Penneshaw and Parndana. It is anticipated that as much as possible any waste infrastructure would be clustered within these identified locations.

Mastec, a South Australian-owned family business, uses state- of-the-art robotics to manufacture waste and recycling bins for sale in Australia and overseas

Eyre and Western

Overview

The Eyre and Western region is a rural and coastal environment. Approximately one third of South Australia's coastline stretches over 2,000 km from the Upper Spencer Gulf to the Western Australian border. The region covers eleven local government areas: District Council of Ceduna, District Council of Streaky Bay, Wudinna District Council, District Council of Elliston, District Council of Kimba, District Council of Cleve, District Council of Franklin Harbour, City of Whyalla, District Council of Lower Eyre Peninsula, District Council of Tumby Bay and Maralinga Tjarutja lands. This includes remote unincorporated areas serviced by the Outback Communities Authority.

The estimated resident population of the Eyre and Western region was 58,500 in June 2016[34].

The economic contribution of the Eyre and Western region was $3.78 billion in 2015-16. This accounted for 3.8 per cent of the State's GSP.

The Eyre and Western regional economy is driven by primary production (largely broadacre farming, but also aquaculture and fishing) and mining. The agriculture, forestry and fishing sector was the largest contributor to the region's economy, contributing $665 million in 2015-16 or 17.6 per cent of GRP. Major sub-sectors included grains ($347 million), aquaculture ($120 million) and sheep ($114 million). The region is highly export orientated, with the majority of grain and seafood produced in the region destined for export markets.

Mining was the second largest contributor to the region's economy, contributing $656 million in 2015-16 or 17.4 per cent of GRP. Major sub-sectors included iron, non-ferrous ore mining ($316 million) and exploration and mining services ($288 million).

Whyalla is the principal centre in the region for manufacturing, steel production and resource processing.

Table 29 **Eyre and Western Sector Contribution to GRP, 2015-16**

Sector	GRP	
	$m	%
Agriculture, forestry and fishing	665	17.6
Mining	656	17.4
Manufacturing	225	6.0
Construction	234	6.2
Household services (a)	609	16.1
Business services (b)	339	9.0
Goods related services (c)	584	15.5
Public administration and safety	116	3.1
Net taxes in final demand and ownership of dwellings	347	9.2
Gross Regional Product (GRP)	**3,775**	

Source: EconSearch, Input Output Tables for South Australia and its Regions, 2015-16 final
(a) Household services includes accommodation and food services, education and training, health and community services, arts and recreation services, and other services
(b) Business services includes information media and telecommunications, financial and insurance services, rental, hiring and real estate services, professional, scientific and technical services, and administrative and support services.
(c) Goods related services includes electricity, gas, water and waste services, wholesale trade, retail trade, and transport, postal and warehousing.

Current status

Baseline waste and recycling volumes

An estimated 44 per cent of waste generated in the region is from the MSW sector, which includes organics such as food and garden waste, cardboard, paper, plastics and metals. The C&I and C&D sectors each contribute 28 per cent of total waste. C&I is generated by local businesses and industry and includes materials such as organics, cardboard, paper, metal and other materials. A priority waste stream in the region is oyster baskets generated by local growers. This waste stream makes up about 150 tonnes per annum, with current stockpiles estimated at 1,300-1,500 tonnes across the South Australian industry.

Table 30 **The Eyre and Western region 2015-16 waste profile**

Tonnes per annum	Waste generation	Resource recovery	Landfill
MSW	23,400	9,100	14,200
C&I	14,700	8,700	6,000
C&D	14,500	9,400	5,100
Total	**52,600**	**27,200**	**25,400**

Future infrastructure needs

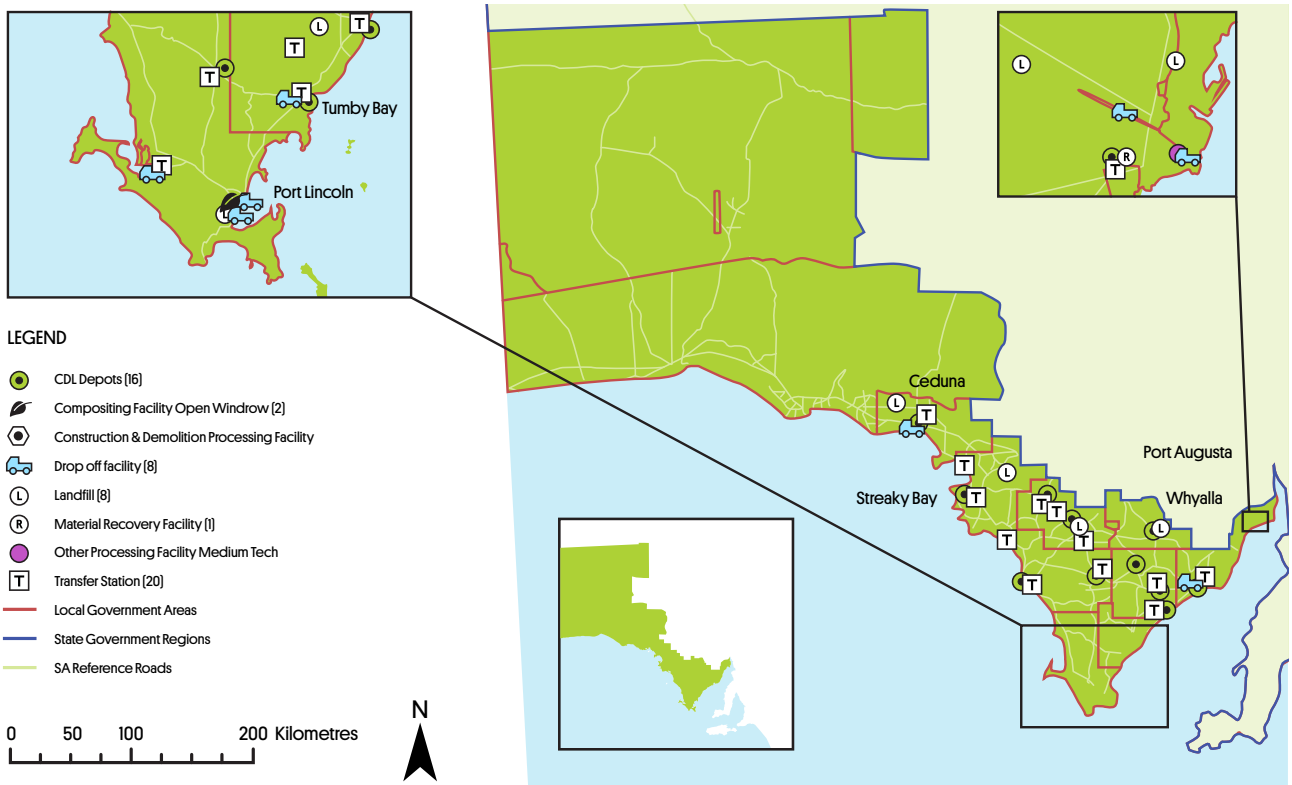
Waste volumes projections: 10 years (2025-26), Moderate Additional Diversion

Table 31 Eyre and Western region future waste scenario – 2025-26 projections for tonnes per annum of waste generation, resource recovery and landfill for Moderate Additional Diversion scenario

	Projected volumes (tonnes) – 10 years			Change (tonnes) from 2015-16		
Tonnes per annum	Waste generation	Resource recovery	Landfill	Waste generation	Resource recovery	Landfill
MSW	24,000	16,800	7,200	600	7,700	-7,000
C&I	18,300	17,200	1,100	3,600	8,500	-4,900
C&D	18,100	12,700	5,400	3,600	3,300	300[a]
Total	**60,500**	**46,800**	**13,800**	**7,900**	**19,600**	**-11,600**

[a] This projected increase in C&D landfill volumes is the result of projected waste generation volumes growing greater than additional resource recovery.

Figure 8 Existing waste and resource recovery infrastructure in the Eyre and Western region (as at August 2017)



Forecast of potential infrastructure needs: 10 years (2025-26), Moderate Additional Diversion scenario

Under the Moderate Additional Diversion scenario an estimated $4.2 million investment in new/ expanded waste and resource recovery infrastructure will be needed across the Eyre and Western region by 2025-26 to manage projected additional volumes of waste generation, resource recovery and landfill. This capital expenditure estimate is in addition to the cost of maintaining existing infrastructure. It does not include construction of new landfill cells at existing disposal facilities, replacement or upgrade of existing waste and resource recovery infrastructure.

- **$1.6 million for MSW infrastructure**
  This includes kerbside bins, collection vehicles, transfer stations, transfer vehicles, CDL facilities, drop-off facilities, compost facilities (open windrow) and other reprocessing facilities (medium technology).
- **$2.5 million for C&I waste infrastructure**
  This includes skip bins, collection vehicles, transfer stations, transfer vehicles, CDL facilities, compost facilities (open windrow) and other reprocessing facilities (medium technology).
- **$100,000 for C&D waste infrastructure**
  This includes skip bins, collection vehicles, transfer vehicles and C&D processing facilities.

Table 32 **Forecast number of new/expanded infrastructure units required for the Eyre and Western region by 2025-26 for Moderate Additional Diversion scenario modelled***

	10-year forecast Moderate Additional Diversion			
Number of new/ expanded infrastructure units	**MSW**	**C&I**	**C&D**	**Total region**
Kerbside source separation bin systems	526	-	-	526
Skip bins	-	98	2	100
Collection vehicles	0.1	0.4	0.1	0.5
Transfer stations (inc. compaction equipment)	0.05	0.29	-	0.3
Transfer vehicles	0.03	0.15	0.05	0.2
CDL facilities	0.1	0.3	-	0.4
Drop off facilities	1.3	-	-	1.3
Composting facilities (Open WR)	0.5	0.4	-	0.8
C&D processing facilities	-	-	0.04	0.04
Other reprocessing facilities (Medium Tech)	0.2	0.3	-	0.4
Total capital expenditure ($ million)	**1.6**	**2.5**	**0.1**	**4.2**

** Fractions of units may indicate expansion of an existing facility, or a smaller capacity facility. Infrastructure units needed to manage waste from a given region may not always be located in that region due to economies and scale and other factors (e.g. planning or suitable locations).*

Region specific key waste infrastructure, challenges and opportunities

The region faces challenges for waste management and related infrastructure.

- Management of oyster baskets, fishing rods and nets generated by local industry are a challenge. The costs involved with recovering composite recyclable materials and the cost of transport to recycling markets creates challenges for recycling these items. Currently oyster baskets, fishing rods and nets are stockpiled or landfilled.
- Long travel distances and high costs involved in sending recovered materials to recycling markets and ports in Adelaide make recycling operations not commercially viable
- There is a lack of local market demand for mulch products processed from local green waste
- There are a limited number of landfills in the region relative to the size of the geographical area. Transporting waste from some locations to regional landfills involves long travel distances with associated costs.

Potential opportunities for infrastructure development in the region include:

- Investment in equipment and facilities for compaction and bulk hauling could reduce costs of transporting waste to processing facilities and/or end markets. This may include equipment to shred and reduce the volume of oyster baskets, which would reduce the cost of transporting this stream to recycling facilities and markets.
- An expansion/development of commercial composting, on site or at locally centralised locations, could process organics from MSW sources and organics industries such as aquaculture and fisheries with more value added end products

30 Year Outlook, High Additional Diversion scenario

Table 33 **Eyre Western region projected tonnes per annum of waste generation, resource recovery and landfill in 2045-46 for High Additional Diversion scenario**

	Projected volumes (tonnes) – 30 years			Change (tonnes) from 2015-16		
Tonnes per annum	Waste generation	Resource recovery	Landfill	Waste generation	Resource recovery	Landfill
MSW	25,400	22,900	2,500	2,000	13,800	-11,700
C&I	28,600	27,200	1,400	13,900	18,500	-4,600
C&D	28,300	26,900	1,400	13,800	17,500	-3,700
Total	**82,300**	**76,900**	**5,400**	**29,700**	**49,700**	**-20,000**

Under the High Additional Diversion scenario an estimated $16.1 million investment in infrastructure will be needed across the region over the next 30 years to manage projected additional volumes of waste generation, resource recovery and landfill. This includes:

- $7.5 million for MSW infrastructure
- $7.7 million for C&I waste infrastructure
- $900,000 for C&D waste infrastructure.

Investment will be needed in collection infrastructure, transfer stations, transfer vehicles, CDL facilities, drop-off facilities, open windrow composting facilities, C&D waste processing facilities and other reprocessing facilities (medium technology). To achieve higher landfill diversion, it may be necessary to invest in alternative technologies that enable waste to be separated into commercially viable material streams or in any suitable technology, such as modular MBT facilities, that could be effectively deployed in regional areas. Appendix B provides the forecasted number of new/expanded infrastructure units for the scenario modelled.

Over the 30 year timeframe it is expected that:

- The region will continue to face challenges associated with lengthy travel distances to waste and recycling processing facilities and end markets. As a result, further future investment will be needed in equipment and facilities for compaction and bulk hauling to reduce costs of transporting waste.
- There will be an ongoing opportunity to locally process organics from MSW sources and industries such as aquaculture, fisheries and agriculture in the region
- New generation designs for oyster baskets will become available which reduce the nature of different material components and improve their suitability for recycling

Land-use planning considerations

The Eyre Peninsula Plan[35] identifies the need for land for processing facilities and waste-disposal facilities in Port Lincoln, Whyalla, Ceduna, Coffin Bay, Cowell, Arno Bay, Haslam, Port Neill, Smoky Bay, Tumby Bay and Streaky Bay.

Metal containers collected from householders are sorted, bailed and ready for resale

Advanced Plastics Recyclers manufactures and exports heavy duty decking planks from recycled plastic and wood 'flour' recovered from the manufacturing industry

Far North

Overview

The Far North region accounts for 80 per cent of the State's land mass and covers four local government areas: City of Port Augusta, the Flinders Ranges Council, Municipal Council of Roxby Down, District Council of Coober Pedy and the Anangu Pitjantjatjara Yankunytjatjara (APY) Lands. Port Augusta is the largest city in the region and the major service centre for the mid and far north of South Australia.

The estimated resident population of the Far North region was 29,100 in June 2016[36].

The economic contribution of the Far North region was $5.16 billion in 2015-16. This accounted for 5.1 per cent of the State's GSP.

Mining is the most dominant industry in the region, contributing $2.7 billion or 53 per cent of GRP in 2015-16. Key sub-sectors included iron and non-ferrous ore mining ($1.5 billion), exploration and mining services ($952 million) and oil and gas extraction ($236 million).

Table 34 **Far North Sector Contributor to GRP, 2015-16**

Sector	GRP	
	$m	%
Agriculture, forestry and fishing	97	1.9
Mining	2,734	53.0
Manufacturing	73	1.4
Construction	348	6.7
Household services (a)	476	9.2
Business services (b)	255	4.9
Goods related services (c)	801	15.5
Public administration and safety	147	2.8
Net taxes in final demand and ownership of dwellings	231	4.5
Gross Regional Product (GRP)	**5,162**	

Source: EconSearch, Input Output Tables for South Australia and its Regions, 2015-16 final

(a) Household services includes accommodation and food services, education and training, health and community services, arts and recreation services, and other services

(b) Business services includes information media and telecommunications, financial and insurance services, rental, hiring and real estate services, professional, scientific and technical services, and administrative and support services.

(c) Goods related services includes electricity, gas, water and waste services, wholesale trade, retail trade, and transport, postal and warehousing

Current status

Baseline waste and recycling volumes

The Far North region generated an estimated 21,000 tonnes of waste in the 2015-16, excluding fly ash volumes (100,000 tonnes generated by the Port Augusta power station). An estimated 44 per cent of waste in the region was generated by the MSW sector, including organics such as food and garden waste, cardboard, paper, plastics and metals.

Table 35 **The Far North region 2015-16 waste profile excluding fly ash volumes**

Tonnes per annum	Waste generation	Resource recovery	Landfill
MSW	9,300	3,600	5,700
C&I (ex. Fly ash)	5,800	3,400	2,400
C&D	5,800	3,700	2,000
Total (ex. Fly ash)	**20,900**	**10,800**	**10,100**

Future infrastructure needs

Waste volumes projections: 10 years (2025-26), Moderate Additional Diversion

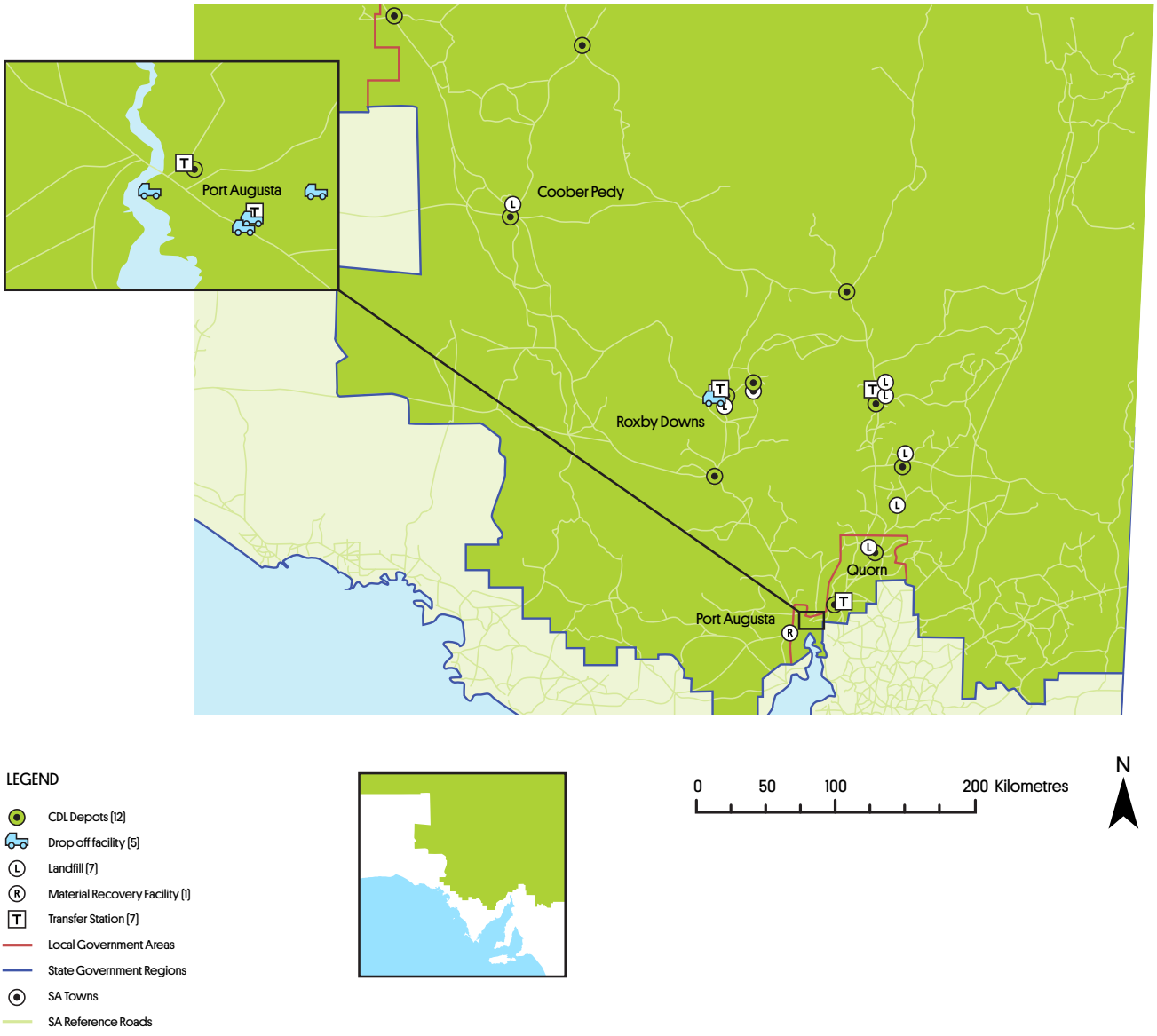
Table 36 **The Far North region 2025-26 projections for tonnes per annum of waste generation, resource recovery and landfill for Moderate Additional Diversion scenario**

	Projected volumes (tonnes) – 10 years			Change (tonnes) from 2015-16		
Tonnes per annum	Waste generation	Resource recovery	Landfill	Waste generation	Resource recovery	Landfill
MSW	9,600	6,700	2,900	300	3,100	-2,800
C&I	7,300	6,800	400	1,500	3,400	-2,000
C&D	7,200	5,000	2,200	1,400	1,300	200[a]
Total	**24,100**	**18,600**	**5,500**	**3,200**	**7,800**	**-4,600**

[a] This projected increase in C&D landfill volumes is the result of projected waste generation volumes growing greater than additional resource recovery.

Figure 9

Waste and resource recovery infrastructure in the Far North region (as at August 2017)



Forecast of potential infrastructure needs: 10 years (2025-26), Moderate Additional Diversion scenario

Under the Moderate Additional Diversion scenario an estimated $1.7 million investment in new/ expanded waste and resource recovery infrastructure will be needed across the Far North region by 2025-26 to manage projected additional volumes of waste generation, resource recovery and landfill. This capital expenditure estimate is in addition to the cost of maintaining existing infrastructure. It does not include construction of new landfill cells at existing disposal facilities, replacement or upgrade of existing waste and resource recovery infrastructure.

- **$680,000 for MSW infrastructure**
  This includes kerbside bins, collection vehicles, transfer stations, transfer vehicles, CDL facilities, drop-off facilities, compost facilities (open windrow) and other reprocessing facilitis (medium technology).
- **$980,000 for C&I waste infrastructure**
  This includes skip bins, collection vehicles, transfer stations, transfer vehicles, CDL facilities, compost facilities (open windrow) and other reprocessing facilities (medium technology).
- **$20,000 for C&D waste infrastructure**
  This includes skip bins, collection vehicles and transfer vehicles.

These estimates do not include infrastructure and investment needed in the APY lands.

Table 37 **Forecast number of new/expanded infrastructure units required for the Far North region by 2025-26 for Moderate Additional Diversion scenario modelled***

	10-year forecast Moderate Additional Diversion			
Number of new/ expanded infrastructure units	**MSW**	**C&I**	**C&D**	**Total region**
Kerbside source separation bin systems	269	-	-	269
Skip bins	-	39	1	40
Collection vehicles	0.03	0.14	0.04	0.2
Vacuum system	-	-	-	-
Transfer stations (inc. compaction equipment)	0.03	0.12	-	0.14
Transfer vehicles	0.01	0.06	0.02	0.09
CDL facilities	0.1	0.1	-	0.2
Drop off facilities	0.5	-	-	0.5
Composting facilities (Open WR)	0.2	0.1	-	0.3
Other reprocessing facilities (Medium Tech)	0.1	0.1	-	0.2
Total capital expenditure ($ million)	**0.68**	**0.98**	**0.02**	**1.7**

** Fractions of units may indicate expansion of an existing facility, or a smaller capacity facility. Infrastructure units needed to manage waste from a given region may not always be located in that region due to economies and scale and other factors (e.g. planning or suitable locations).*

Region specific key waste infrastructure, challenges and opportunities

The region faces challenges for waste management and related infrastructure.

- Low population spread over large distances leads to small economies of scale, higher waste collection costs, reduced commercial viability for local reprocessing of waste and a limited local market
- Collecting waste in remote areas with poor road conditions poses a range of challenges
- Existing equipment for waste management activities is in poor condition and there is limited access to suitable maintenance and spare parts
- Sending recovered materials to recycling markets in Adelaide and export transport networks incurs long travel distances and high costs
- There are a limited number of landfills in the region relative to the size of the geographical area. Transporting waste from locations to regional landfills can involve long travel distances and high costs.

Green Industries SA has prepared two key reports that describe the waste management issues in the APY Lands and South Australia's outback and remote communities: *Waste Management in the APY Lands, Past, Present and Future* – known as 'The Rubbish Report" prepared in 2011 and the *Outback Waste Management Report* prepared in 2012.

At that time, the reports found additional challenges for waste infrastructure in APY lands, such as:

- Bins were knocked over by animals
- Unfenced landfills were full to overflowing
- Some landfills were near watercourses or above groundwater bores used as a water supply for communities
- Valuable landfill capacity was taken up with metals and building materials leading to regular burning to reduce volume
- Windblown debris could be scattered for kilometres
- Litter was a significant problem and there was no program to redeem and recover used beverage containers deposits from APY communities due to remoteness
- There was both a lack of suitable collection vehicles/equipment and a severe shortage of mechanical skills for service and maintenance
- Environmental factors contributed to the poor condition of existing infrastructure and lack of maintenance

Special trials and projects have been undertaken on the APY Lands to improve its waste management infrastructure and systems.

- Two 240 litre mobile garbage bins with lids, wheels and handles were supplied to each house, accompanied by training in bin use and proper waste management
- Bins and bin stands were placed in public places to provide basic infrastructure that would not be knocked over by animals
- A collection system for 10 cent deposit containers was implemented through schools to reduce litter, increase recycling and provide an income stream
- Cardboard balers have been installed in the APY Land community stores to enable transport of cardboard to Adelaide for recycling
- Technical guidelines that explain how to establish and maintain appropriate infrastructure for use in outback areas and remote Aboriginal lands were drafted by Green Industries SA and forwarded to the Outback Communities Authority, the State Government's Aboriginal Affairs and Reconciliation Division and the EPA for consideration

Potential opportunities for infrastructure development in the region include investment in:

- Equipment and facilities for compaction and bulk hauling of waste
- Specialised equipment and facilities can be designed to meet the needs of remote communities such as Mobile Garbage Bins (MGBs) with bin holders, purpose built tractors with designed trailers, mobile de-sludging and de-watering units for biosolids management, cardboard balers for community stores, transport cages, landfill compaction equipment, such as roller types with steel wheels
- New or upgraded existing landfill sites in accordance with requirements of the EPA

30 Year Outlook, High Additional Diversion scenario

Table 38 **The Far North region projected tonnes per annum of waste generation, resource recovery and landfill in 2045-46 for High Additional Diversion scenario**

	Projected volumes (tonnes) – 30 years			Change (tonnes) from 2015-16		
Tonnes per annum	Waste generation	Resource recovery	Landfill	Waste generation	Resource recovery	Landfill
MSW	10,300	9,300	1,000	1,000	5,700	-4,700
C&I	11,400	10,800	600	5,600	7,400	-1,800
C&D	11,200	10,700	600	5,400	7,000	-1,400
Total	**32,900**	**30,800**	**2,200**	**12,000**	**20,000**	**-7,900**

Under the High Additional Diversion scenario an estimated $6.6 million investment in infrastructure will be needed across the region over the next 30 years to manage projected additional volumes of waste generation, resource recovery and landfill. This includes:

- $3.2 million for MSW infrastructure
- $3.0 million for C&I waste infrastructure
- $300,000 for C&D waste infrastructure

Investment will be needed in collection infrastructure, transfer vehicles, CDL facilities, drop-off facilities, open windrow composting facilities, construction and demolition waste processing facilities and other reprocessing facilities (medium technology). To achieve higher landfill diversion, it may be necessary to invest in alternative technologies that enable waste to be separated into commercially viable material streams or in any suitable technology, such as modular MBT facilities, that could be effectively deployed in regional areas. Appendix B provides the forecasted number of new/expanded infrastructure units for the scenario modelled.

Over the 30 year timeframe it is expected that:

- The region will continue to face challenges associated with its remoteness and large travel distances to waste and recycling processing facilities and end markets. As a result, continued future investment will be needed in equipment and facilities for compaction and bulk hauling to reduce costs of transporting waste.
- There will be an ongoing need to invest in waste and resource recovery infrastructure which is suited to the local conditions in the APY lands

Land-use planning considerations

The Andamooka Structure Plan[37] identifies the need to close the existing waste landfill site and plan for a new landfill facility and a waste transfer station outside the existing township boundary. White Dam Road has been identified as a possible site.

Green organics bins manufactured by Mastec ready for delivery to householders with kerbside collection systems

Limestone Coast

Overview

The Limestone Coast is located in the south eastern corner of South Australia. The region covers seven local government areas: District Council of Tatiara, Kingston District Council, Naracoorte Lucindale Council, District Council of Robe, Wattle Range Council, District Council of Grant and City of Mount Gambier.

The estimated resident population of the Limestone Coast region was 64,600 persons in June 2016[38].

The economic contribution of the region was 2.9 billion in 2015-16. This accounted for 2.9 per cent of the State's GSP.

The Limestone Coast regional economy is driven by agricultural and forestry production and manufacturing associated with these industries.

Agriculture, forestry and fishing was the largest contributor to the region's economy. It contributed over $1 billion and accounted for 36 per cent of GRP in 2015-16. Key sub-sectors included beef cattle ($239 million), forestry and logging ($234 million) and sheep ($157 million). Within the manufacturing sector, key sub-sectors included sawmilling, paper and wine production.

Table 39 **Limestone Coast Sector Contribution to GRP, 2015-16**

Sector	GRP	
	$m	%
Agriculture, forestry and fishing	1,044	36.0
Mining	10	0.3
Manufacturing	287	9.9
Construction	125	4.3
Household services (a)	436	15.0
Business services (b)	180	6.2
Goods related services (c)	331	11.4
Public administration and safety	96	3.3
Net taxes in final demand and ownership of dwellings	391	13.5
Gross Regional Product (GRP)	**2,899**	

Source: EconSearch, Input Output Tables for South Australia and its Regions, 2015-16 final.

(a) Household services includes accommodation and food services, education and training, health and community services, arts and recreation services, and other services

(b) Business services includes information media and telecommunications, financial and insurance services, rental, hiring and real estate services, professional, scientific and technical services, and administrative and support services.

(c) Goods related services includes electricity, gas, water and waste services, wholesale trade, retail trade, and transport, postal and warehousing.

Current status

Baseline waste and recycling volumes

An estimated 81 per cent of waste in the region was generated by the C&I sector. Significant waste streams include organics generated by local timber, food processing and meat rendering industries, and paper generated by the local paper processing industry.

Table 40 **The Limestone Coast region 2015-16 waste profile**

Tonnes per annum	Waste generation	Resource recovery	Landfill
MSW	26,200	10,200	15,900
C&I	180,200	173,400	6,700
C&D	16,300	10,500	5,700
Total	**222,600**	**194,200**	**28,400**

Future infrastructure needsWaste volumes projections: 10 years (2025-26), Moderate Additional Diversion

Table 41 **The Limestone Coast region future waste Scenario – 2025-26 projections for tonnes per annum of waste generation, resource recovery and landfill, Moderate Additional Diversion scenario**

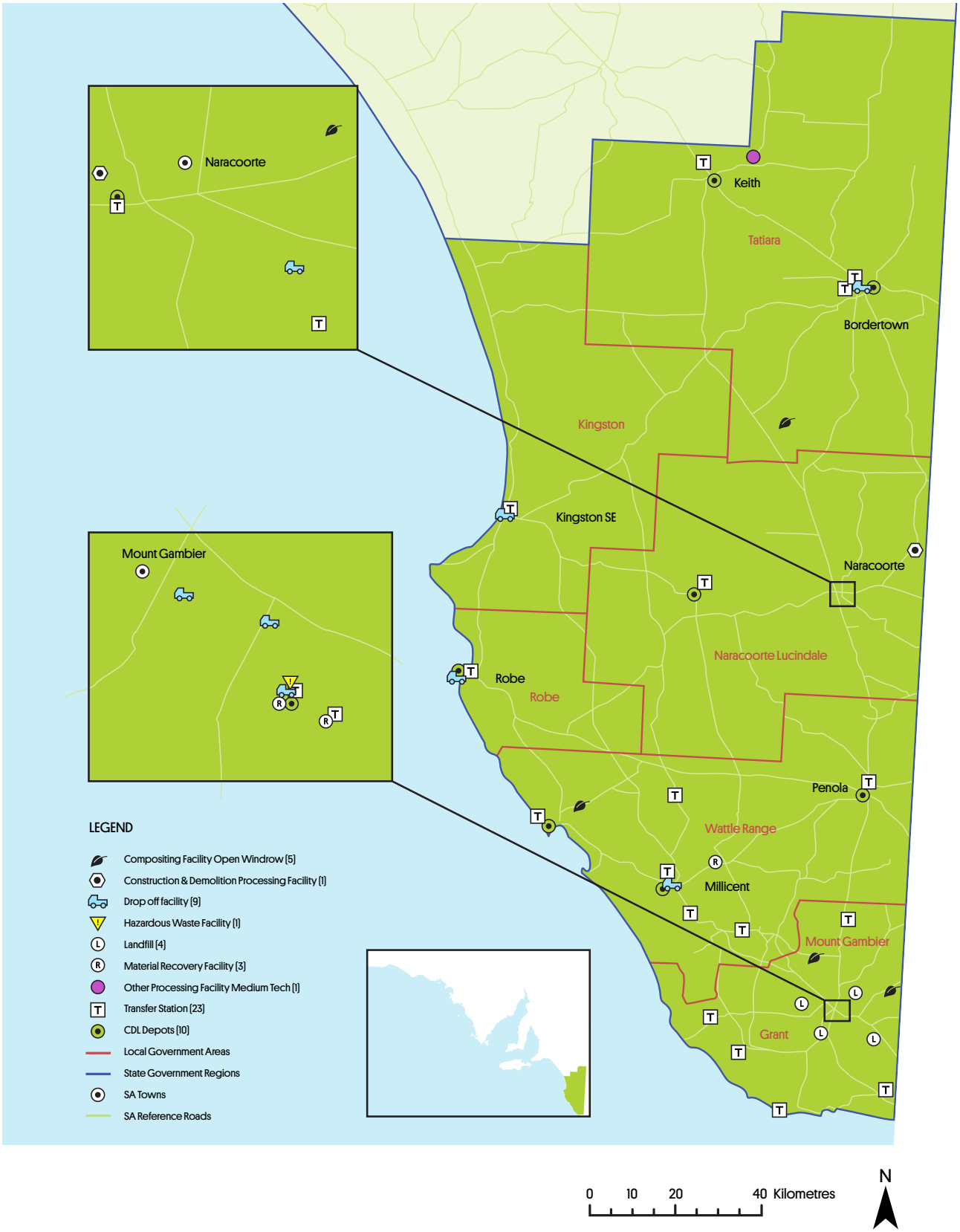
	Projected volumes (tonnes) – 10 years			Change (tonnes) from 2015-16		
Tonnes per annum	Waste generation	Resource recovery	Landfill	Waste generation	Resource recovery	Landfill
MSW	26,600	18,600	8,000	400	8,400	-7,900
C&I	225,100	211,600	13,500	44,900	38,200	6,800[a]
C&D	20,300	14,200	6,100	4,000	3,700	400[b]
Total	**272,000**	**244,400**	**27,600**	**49,400**	**50,200**	**-800**

[a] Specific conditions to the region, including large C&I volumes together with current high diversion levels [that are close to or exceed the diversion scenario for regional SA], result in projected C&I landfill volumes that are above baseline levels, which are not expected to eventuate in reality.

[b] This projected increase in C&D landfill volumes is the result of projected waste generation volumes growing greater than additional resource recovery.

Figure 10

Existing waste and resource recovery infrastructure in the Limestone Coast region (as at August 2017)



Forecast of potential infrastructure needs: 10 years (2025-26), Moderate Additional Diversion scenario

Under the Moderate Additional Diversion scenario an estimated $13.7 million investment in new/expanded waste and resource recovery infrastructure will be needed across the Limestone Coast region by 2025-26 to manage projected additional volumes of waste generation, resource recovery and landfill. This capital expenditure estimate is in addition to the cost of maintaining existing infrastructure. It does not include construction of new landfill cells at existing disposal facilities, replacement or upgrade of existing waste and resource recovery infrastructure.

- **$600,000 for MSW infrastructure**
  This includes kerbside bins, collection vehicles, transfer vehicles, CDL facilities, drop-off facilities and other reprocessing facilities (medium technology).
- **$12.9 million for C&I waste infrastructure**
  This includes skip bins, collection vehicles, transfer stations, transfer vehicles, CDL facilities, anaerobic digestion and other reprocessing facilities (medium technology).
- **$200,000 for C&D waste infrastructure**
  This includes skip bins, collection vehicles, transfer vehicles and C&D processing facilities.

Table 42 **Forecast number of new/expanded infrastructure units required for the Limestone Coast region by 2025-26 for Moderate Additional Diversion scenario modelled***

	10-year forecast Moderate Additional Diversion			
Number of new/ expanded infrastructure units	**MSW**	**C&I**	**C&D**	**Total region**
Kerbside source separation bin systems	337	-	-	337
Skip bins	-	1,199	2	1,201
Collection vehicles	0.04	4.3	0.1	4.5
Transfer stations (inc. compaction equipment)	0.03	0.9	-	0.9
Transfer vehicles	0.02	0.5	0.1	0.5
CDL facilities	0.1	0.3	-	0.5
Drop off facilities	1.4	-	-	1.4
Energy-from-waste - anaerobic digestion	-	1.0	-	1.0
C&D processing facilities	-	-	0.05	0.05
Other reprocessing facilities (Medium Tech)	0.2	1.2	-	1.4
Total capital expenditure ($ million)	**0.6**	**12.9**	**0.2**	**13.7**

** Fractions of units may indicate expansion of an existing facility, or a smaller capacity facility. Infrastructure units needed to manage waste from a given region may not always be located in that region due to economies and scale and other factors (e.g. planning or suitable locations).*

Region specific key waste infrastructure, challenges and opportunities

The region faces challenges for waste management and related infrastructure.

- There is both a limited number and limited access to landfills servicing the region. Transporting waste from some locations to landfills in the region or to other regions incurs long travel distances and associated costs.
- Sending recovered materials to recycling markets and export ports in Adelaide incurs long travel distances and high costs
- There is currently no viable recycling option available for management of CCA-treated posts and other winery related solid wastes generated in the Coonawarra wine region. Disposing of CCA-treated posts in particular is problematic given their chemical treatment and high cost of disposal to landfill. Hence more research and development investment on this problematic waste stream is required.
- Access to regional waste and resource recovery facilities is limited in the northern part of the region

Potential opportunities for infrastructure development in the region include:

- Large volumes of biomass in the region from timber and other industries, which may be suitable for energy-from-waste applications (e.g. anaerobic digestion, pyrolysis, combustion)
- Investment in equipment and facilities for waste compaction and bulk hauling to reduce the cost of transporting waste to end markets
- Expansion/development of commercial composting to process organics from MSW sources and organic industry residues
- Development of higher value products through organics reprocessing
- Local re-manufacturing of recovered paper collected from South Australia and Victoria

30 Year Outlook, High Additional Diversion scenario

Table 43 **Limestone Coast region projected tonnes per annum of waste generation, resource recovery and landfill in 2045-46 for High Additional Diversion scenario**

	Projected volumes (tonnes) – 30 years			Change (tonnes) from 2015-16		
Tonnes per annum	Waste generation	Resource recovery	Landfill	Waste generation	Resource recovery	Landfill
MSW	27,400	24,700	2,700	1,200	14,500	-13,200
C&I	351,200	333,700	17,600	171,000	160,300	10,900[a]
C&D	31,700	30,100	1,600	15,400	19,600	-4,100
Total	**410,400**	**388,500**	**21,900**	**187,800**	**194,300**	**-6,500**

[a] Specific conditions to the region, including large C&I volumes together with current high diversion levels [that are close to or exceed the diversion scenario for regional South Australia], result in projected C&I landfill volumes that are above baseline levels, which are not expected to eventuate in reality.

Under the High Additional Diversion scenario an estimated $75.4 million investment in infrastructure will be needed across the region over the next 30 years to manage projected additional volumes of waste generation, resource recovery and landfill. This includes:

- $7.3 million for MSW infrastructure
- $67.1 million for C&I waste infrastructure
- $1.0 million for C&D waste infrastructure

Investment in collection infrastructure, transfer stations, transfer vehicles, CDL facilities, drop-off facilities, open windrow composting facilities, energy-from-waste, anaerobic digestion, construction and demolition waste processing facilities and other reprocessing facilities [medium technology] will be needed. To achieve higher landfill diversion, it may be necessary to invest in alternative technologies, such as MBT facilities, that enable waste to be separated into commercially viable material streams. Appendix B provides the forecasted number of new/expanded infrastructure units for the scenario modelled.

Over the 30 year timeframe it is expected that:

- Increased pressure on landfill and other systems in Victoria may cause more materials to be imported to South Australia for treatment, recycling, re-manufacturing or disposal, which may form an opportunity for the Limestone Coast to develop and/or expand local re-manufacturing facilities to process volumes of recovered paper and organics from Victoria.
- Technological advances will enable commercially viable recycling of legacy CCA-treated posts. There will be a transition away from the use of CCA-treated posts by wineries and other local industry in the Limestone Coast region, which will reduce the prevalence of this problematic waste stream.

Land-use planning considerations

The Limestone Coast Plan[39] identifies a need to provide for land-based processing and disposal facilities at key sites, in particular at Robe, Cape Jaffa and Beachport. Industrial growth is envisaged in Mount Gambier, Naracoorte, the Katnook industrial area near Penola, Snuggery, Bordertown, Keith, Kingston and Millicent, where facilities may also be established.

Manually sorting recoverable materials from waste remains an important part of the recycling process

Murray Mallee

Overview

The Murray Mallee region, commonly referred to as Murraylands and Riverland, is located in the central eastern part of South Australia. It covers eight local government areas: the Berri and Barmera Council, Renmark Paringa Council, Mid Murray Council, Rural City of Murray Bridge, District Council of Karoonda East Murray, District Council of Loxton Waikerie, the Coorong District Council and Southern Mallee District Council.

The estimated resident population of the Murray Mallee region was 68,900 in June 2016[40].

The economic contribution of the region was $3.36 billion in 2015-16. This accounted for 3.4 per cent of the State's GSP. The region's economy is dominated by primary production with broadacre grain and livestock production in Murraylands and intensive horticulture, fruit, nut and wine grape production in Riverland.

The agriculture, forestry and fishing sector was the largest contributor to the region's economy, contributing $1.17 billion and accounting for 35 per cent of GRP in 2015-16. Key sub-sectors included vegetables ($255 million), fruit and nuts ($230 million), wine grapes ($143 million), grains ($129 million) and beef cattle ($109 million).

Household services and net taxes in final demand and ownership of dwellings were other key contributing sectors.

Table 44 **Murray Mallee Sector Contribution to GRP, 2015-16**

Sector	GRP	
	$m	%
Agriculture, forestry and fishing	1,167	34.7
Mining	18	0.5
Manufacturing	216	6.4
Construction	140	4.2
Household services (a)	481	14.3
Business services (b)	231	6.9
Goods related services (c)	553	16.4
Public administration and safety	120	3.6
Net taxes in final demand and ownership of dwellings	438	13.0
Gross Regional Product (GRP)	**3,363**	

Source: EconSearch, Input Output Tables for South Australia and its Regions, 2015-16 final

(a) Household services includes accommodation and food services, education and training, health and community services, arts and recreation services, and other services

(b) Business services includes information media and telecommunications, financial and insurance services, rental, hiring and real estate services, professional, scientific and technical services, and administrative and support services.

(c) Goods related services includes electricity, gas, water and waste services, wholesale trade, retail trade, and transport, postal and warehousing.

Current status

Baseline waste and recycling volumes

An estimated 79 per cent of waste in the region is generated by the C&I sector, which includes large volumes of organics generated by local industry including meat rendering and other organics.

Table 45 **The Murray Mallee region 2015-16 waste profile**

Tonnes per annum	Waste generation	Resource recovery	Landfill
MSW	27,800	10,900	16,900
C&I	171,900	164,700	7,200
C&D	17,300	11,200	6,100
Total	**217,000**	**186,800**	**30,200**

Future infrastructure needs

Waste volumes projections: 10 years (2025-26), Moderate Additional Diversion

Table 46 **The Murray Mallee region 2025-26 projections for tonnes per annum of waste generation, resource recovery and landfill for Moderate Additional Diversion scenario**

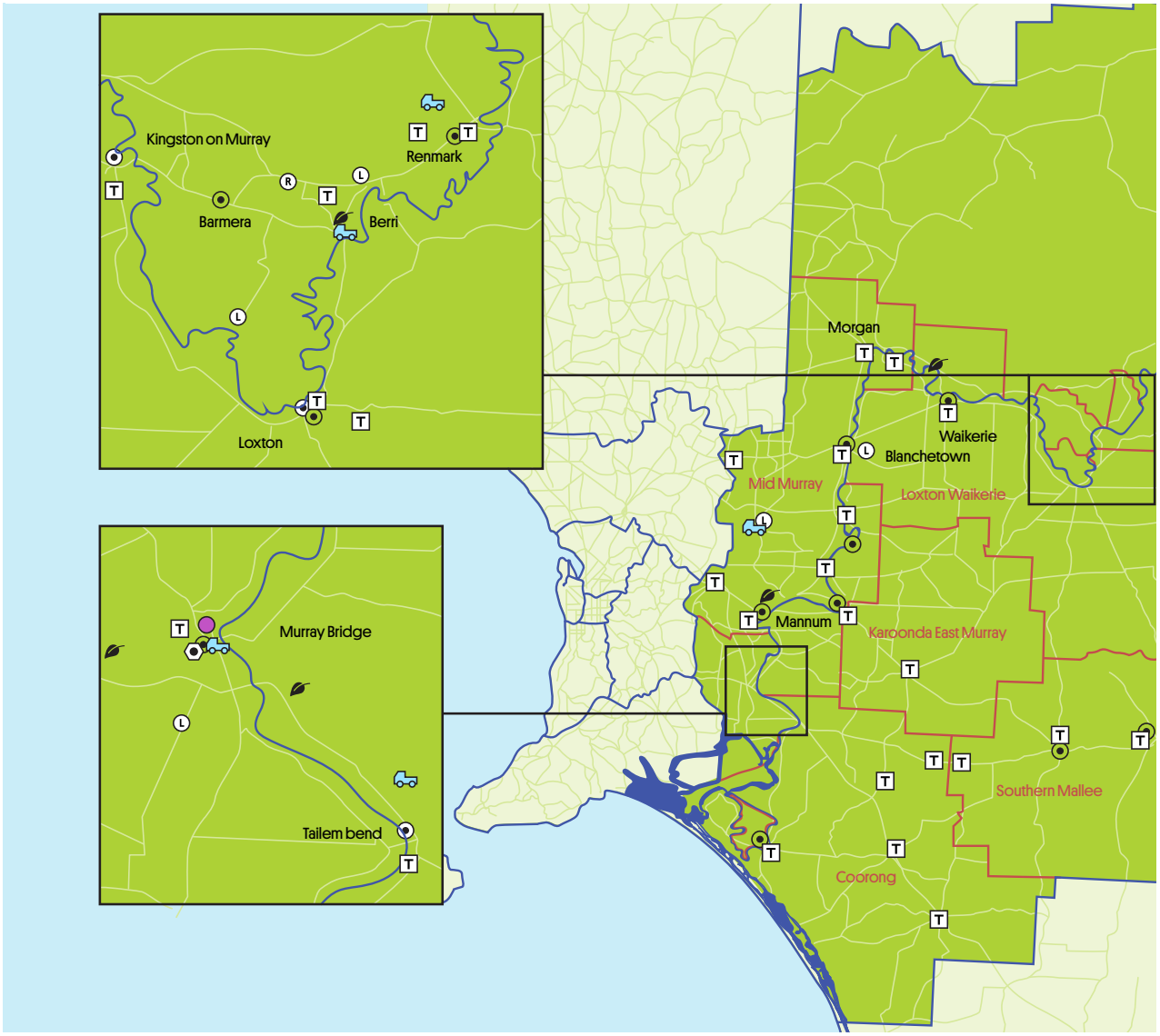
	Projected volumes (tonnes) – 10 years			Change (tonnes) from 2015-16		
Tonnes per annum	Waste generation	Resource recovery	Landfill	Waste generation	Resource recovery	Landfill
MSW	28,400	19,900	8,500	600	9,000	-8,400
C&I	214,700	201,800	12,900	42,800	37,100	5,700[a]
C&D	21,600	15,100	6,500	4,300	3,900	400[b]
Total	**264,700**	**236,800**	**27,900**	**47,700**	**50,000**	**-2,300**

[a] Specific conditions to the region, including large C&I volumes together with current high diversion levels (that are close to or exceed the diversion scenario for regional SA), result in projected C&I landfill volumes that are above baseline levels, which are not expected to eventuate in reality.

[b] This projected increase in C&D landfill volumes is the result of projected waste generation volumes growing greater than additional resource recovery.

Figure 11

Waste and resource recovery infrastructure in the Murray Mallee region (as at August 2017)



Forecast of potential infrastructure needs: 10 years (2025-26), Moderate Additional Diversion scenario

Under the Moderate Additional Diversion scenario an estimated $11.0 million investment in new/ expanded infrastructure will be needed across the Murray Mallee region by 2025-26 to manage projected additional volumes of waste generation, resource recovery and landfill. This capital expenditure estimate is in addition to the cost of maintaining existing infrastructure. It does not include construction of new landfill cells at existing disposal facilities, replacement or upgrade of existing waste and resource recovery infrastructure.

- **$1.8 million for MSW infrastructure**
  This includes kerbside bins, collection vehicles, transfer vehicles, CDL facilities, drop-off facilities, compost facilities (open windrow) and other reprocessing facilities (medium technology).
- **$9.1 million for C&I waste infrastructure**
  This includes skip bins, collection vehicles, transfer stations, transfer vehicles, CDL facilities, compost facilities (open windrow) and other reprocessing facilities (medium technology).
- **$200,000 for C&D waste infrastructure**
  This includes skip bins, collection vehicles, transfer vehicles and C&D processing facilities.

Table 47 **Forecast number of new/expanded infrastructure units required for the Murray Mallee region by 2025-26 for Moderate Additional Diversion scenario modelled***

	10-year forecast Moderate Additional Diversion			
Number of new/ expanded infrastructure units	**MSW**	**C&I**	**C&D**	**Total region**
Kerbside source separation bin systems	468	-	-	468
Skip bins	-	1,144	2	1,146
Collection vehicles	0.05	4.1	0.1	4.3
Transfer stations (inc. compaction equipment)	0.05	0.9	-	0.9
Transfer vehicles	0.02	0.4	0.1	0.5
CDL facilities	0.1	0.4	-	0.5
Drop off facilities	1.5	-	-	1.5
Composting facilities (Open WR)	0.55	0.02	-	0.6
C&D processing facilities	-	-	0.05	0.05
Other reprocessing facilities (Medium Tech)	0.2	2.6	-	2.8
Total capital expenditure ($ million)	**1.8**	**9.1**	**0.2**	**11.0**

** Fractions of units may indicate expansion of an existing facility, or a smaller capacity facility. Infrastructure units needed to manage waste from a given region may not always be located in that region due to economies and scale and other factors (e.g. planning or suitable locations).*

South Australian company Reclaim PV is developing ways to recover and reprocess solar panels into new products

Region specific key waste infrastructure, challenges and opportunities

The region faces challenges for waste management and related infrastructure.

- There is both a limited number and limited access to landfills servicing the region. Transporting waste from some locations to landfills in the region (or to other regions) incurs long travel distances and associated costs.
- Sending recovered materials to recycling markets and export ports in Adelaide incurs long travel distances and high costs
- There is currently no viable recycling option available for the management of CCA-treated posts and other winery related solid waste generated across the local wine region. The disposal of CCA-treated posts is problematic due to the chemical treatment and high cost of disposal to landfill. More research and development investment on this problematic waste stream is required.

Potential opportunities for infrastructure development in the region include:

- Investment in equipment and facilities for waste compaction and bulk hauling to reduce costs of transporting waste to end markets
- Expansion/development of commercial composting to process organics from MSW sources and organic industry such as vineyards, orchards and other agriculture
- Development of higher value products through organics reprocessing

30 Year Outlook, High Additional Diversion scenario

Table 48 **The Murray Mallee region projected tonnes per annum of waste generation, resource recovery and landfill in 2045-46 for High Additional Diversion scenario**

	Projected volumes (tonnes) – 30 years			Change (tonnes) from 2015-16		
Tonnes per annum	**Waste generation**	**Resource recovery**	**Landfill**	**Waste generation**	**Resource recovery**	**Landfill**
MSW	29,600	26,600	3,000	1,800	15,700	-13,900
C&I	335,100	318,300	16,800	163,200	153,600	9,600[a]
C&D	33,700	32,000	1,700	16,400	20,800	-4,400
Total	**398,400**	**377,000**	**21,400**	**181,400**	**190,200**	**-8,800**

[a] Specific conditions to the region, including large C&I volumes together with current high diversion levels (that are close to or exceed the diversion scenario for regional South Australia), result in projected C&I landfill volumes that are above baseline levels, which are not expected to eventuate in reality.

Under the High Additional Diversion scenario an estimated $44.9 million investment in infrastructure will be needed across the region over the next 30 years to manage projected additional volumes of waste generation, resource recovery and landfill. This includes:

- $8.4 million for MSW infrastructure
- $35.4 million for C&I waste infrastructure
- $1.1 million for C&D waste infrastructure

Investment in collection infrastructure, transfer stations, transfer vehicles, CDL facilities, drop-off facilities, open windrow composting facilities, construction and demolition waste processing facilities and other reprocessing facilities (medium technology) will be needed. To achieve higher landfill diversion, it may be necessary to invest in alternative technologies, such as MBT facilities, that enable waste to be separated into commercially viable material streams. Appendix B provides the forecasted number of new/expanded infrastructure units for the scenario modelled.

Over the 30 year timeframe it is expected that:

- There will be an ongoing opportunity to process organics from MSW sources, agricultural residues and organic processing industry residues locally
- The region will continue to face challenges associated with long travel distances to waste and recycling processing facilities and to end markets. Investment in equipment and facilities for compaction and bulk hauling will be needed.
- Technological advances will enable commercially viable recycling of legacy CCA-treated posts. There will be a transition away from use of CCA-treated posts by wineries and other local industry in the Murray Mallee region, which will reduce the prevalence of this problematic waste stream.

Land-use planning considerations

The Murray and Mallee Region Plan[41] identifies a need to promote industrial growth in Murray Bridge, Tailem Bend, Monarto, Berri and Renmark. There is the potential for waste and resource recovery activities to be integrated within these locations. The Monarto South precinct is likely to provide a suitable location for future waste and resource recovery infrastructure.

- The proposed Urban Employment zoning would support the establishment of some forms of waste and resource recovery infrastructure
- The precinct has good access to freight transport infrastructure
- The precinct has access to future intermodal facilities in this region
- There is a full range of land sizes to cater for differing scales and needs for infrastructure

A potential challenge for this location is that more intensive infrastructure (i.e. special industry) is not supported in this location. There may also be potential conflicts with nearby Monarto Zoo which is classified as a sensitive land use. Other challenges include the need to manage impacts on the surrounding environment (potential conservation park and native flora and fauna). A possible future airport may create conflict with activities like composting which attract birds.

All forms of infrastructure are broadly appropriate within this precinct except open windrow composting facilities and disposal infrastructure. If amenity impacts are suitably designed and managed, opportunities exist for the establishment of MBT facilities and energy-from-waste facilities.

Mulch and compost ready for the marketplace

Yorke and Mid North

Overview

The Yorke and Mid North region is located in the north of Adelaide and covers 11 local government areas: District Council of Mount Remarkable, District Council of Orroroo/Carrieton, District Council of Peterborough, District Council of Copper Coast, District Council of Yorke Peninsular, Clare and Gilbert Valleys Council, Regional Council of Goyder, Northern Areas Council, Port Pirie Regional Council, District Council of Barunga West and Wakefield Regional Council.

The estimated resident population of the Yorke and Mid North region was 75,000 in June 2016[42].

The economic contribution of the Yorke and Mid North region was $3.2 billion in 2015-16. This accounted for 3.2 per cent of the State's GSP.

Agriculture, forestry and fishing was the largest sector contributor to the Yorke and Mid North regional economy. It contributed $766 million and accounted for 24 per cent of GRP in 2015-16. The region is renowned for producing high quality wheat and barley varieties. Grain ($448 million) and sheep ($120 million) production were key sub-sectors.

Household services and goods related services were the second and third sector contributors, accounting for 17 per cent of GRP each.

Table 49 **Yorke and Mid North Sector Contribution to GRP, 2015-16**

Sector	GRP	
	$m	%
Agriculture, forestry and fishing	766	23.9
Mining	54	1.7
Manufacturing	198	6.2
Construction	185	5.8
Household services (a)	557	17.4
Business services (b)	289	9.0
Goods related services (c)	567	17.7
Public administration and safety	125	3.9
Net taxes in final demand and ownership of dwellings	461	14.4
Gross Regional Product (GRP)	**3,202**	

Source: EconSearch, Input Output Tables for South Australia and its Regions, 2015-16 final
(a) Household services includes accommodation and food services, education and training, health and community services, arts and recreation services, and other services
(b) Business services includes information media and telecommunications, financial and insurance services, rental, hiring and real estate services, professional, scientific and technical services, and administrative and support services.
(c) Goods related services includes electricity, gas, water and waste services, wholesale trade, retail trade, and transport, postal and warehousing.

Current status

Baseline waste and recycling volumes

An estimated 44 per cent of waste was generated by the C&I sector, mainly volumes of foundry waste generated by local industry.

Table 50 **The Yorke Mid North 2015-16 waste profile**

Tonnes per annum	Waste generation	Resource recovery	Landfill
MSW	30,300	11,800	18,400
C&I	39,100	31,300	7,800
C&D	18,800	12,200	6,600
Total	**88,200**	**55,300**	**32,900**

Future infrastructure needs

Waste volumes projections: 10 years (2025-26), Moderate Additional Diversion

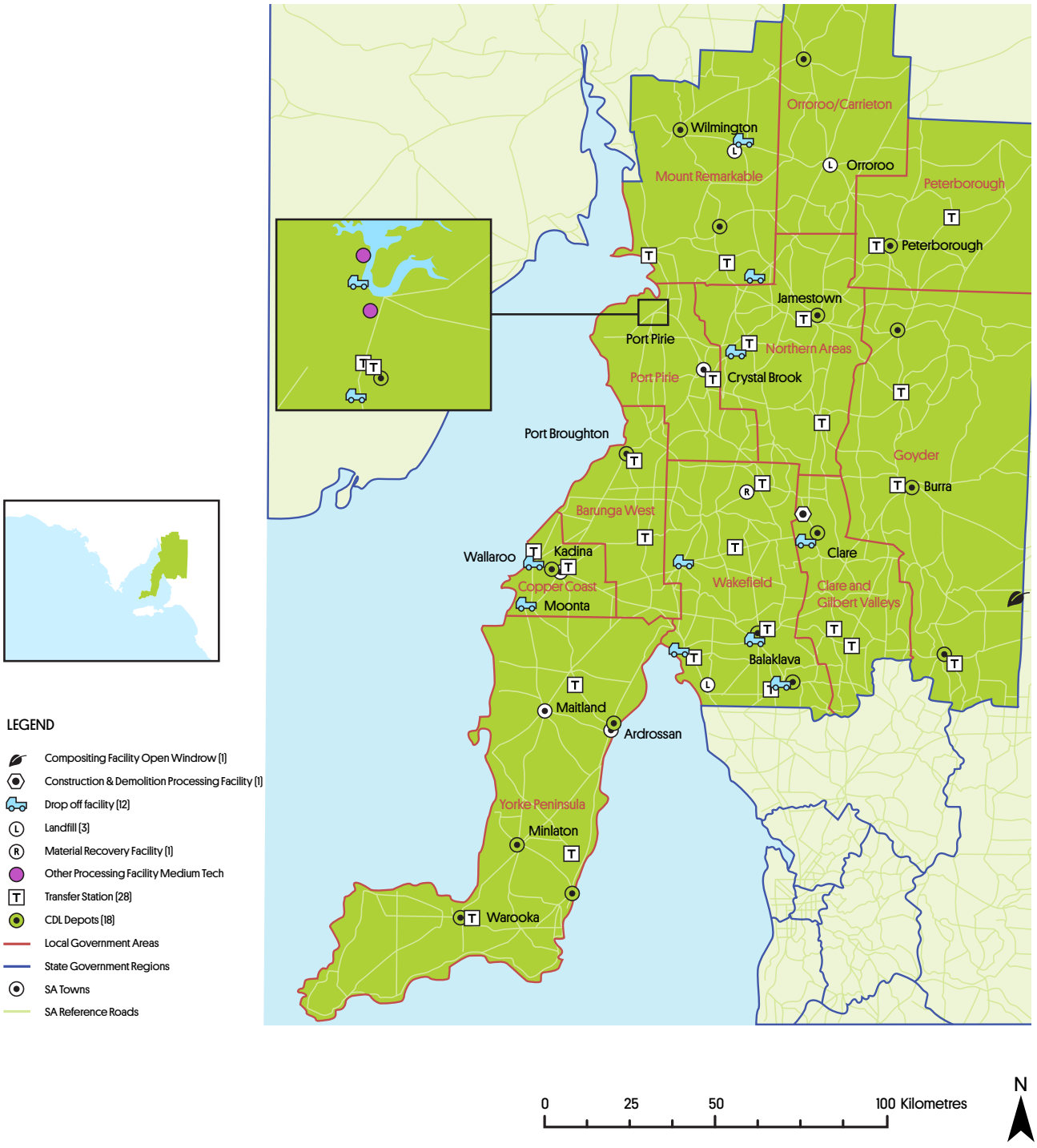
Table 51 The Yorke Mid North region 2025-26 projections for tonnes per annum of waste generation, resource recovery and landfill for Moderate Additional Diversion scenario

	Projected volumes (tonnes) – 10 years			Change (tonnes) from 2015-16		
Tonnes per annum	Waste generation	Resource recovery	Landfill	Waste generation	Resource recovery	Landfill
MSW	31,300	21,900	9,400	1,000	10,100	-9,000
C&I	48,900	45,900	2,900	9,800	14,600	-4,900
C&D	23,500	16,500	7,100	4,700	4,300	500[a]
Total	**103,700**	**84,300**	**19,400**	**15,500**	**29,000**	**-13,500**

[a] This projected increase in C&D landfill volumes is the result of projected waste generation volumes growing greater than additional resource recovery.

Figure 12

Existing waste and resource recovery infrastructure in the Yorke Mid North region (as at August 2017)



Forecast of potential infrastructure needs: 10 years (2025-26), Moderate Additional Diversion scenario

An estimated $4.9 million of investment in new/expanded waste and resource recovery infrastructure will be needed across the Yorke Mid North region by 2025-26 under the Moderate Additional Diversion scenario to manage projected additional volumes of waste generation, resource recovery and landfill. This capital expenditure estimate is in addition to the cost of maintain existing infrastructure. It does not include construction of new landfill cells at existing disposal facilities, replacement or upgrade of existing waste and resource recovery infrastructure.

- **$2.2 million for MSW infrastructure**
  This includes kerbside bins, collection vehicles, transfer stations, transfer vehicles, CDL facilities, drop-off facilities, compost facilities (open windrow) and other reprocessing facilities (medium technology).
- **$2.6 million for C&I waste infrastructure**
  This includes skip bins, collection vehicles, transfer stations, transfer vehicles, CDL facilities, compost facilities (open windrow) and other reprocessing facilities (medium technology).
- **$200,000 for C&D waste infrastructure**
  This includes skip bins, collection vehicles, transfer vehicles and C&D processing facilities.

Table 52 **Forecast number of new/expanded infrastructure units required for the Yorke Mid North region by 2025-26 for Moderate Additional Diversion scenario modelled***

	10-year forecast Moderate Additional Diversion			
Number of new/ expanded infrastructure units	**MSW**	**C&I**	**C&D**	**Total region**
Kerbside source separation bin systems	810	-	-	810
Skip bins	-	260	2	263
Collection vehicles	0.09	0.9	0.1	1.2
Transfer stations (inc. compaction equipment)	0.08	0.2	-	0.3
Transfer vehicles	0.04	0.1	0.1	0.2
CDL facilities	0.2	0.4	-	0.5
Drop off facilities	1.7	-	-	1.7
Composting facilities (Open WR)	0.6	0.4	-	1.0
C&D processing facilities	-	-	0.1	0.1
Other reprocessing facilities (Medium Tech)	0.2	0.3	-	0.5
Total capital expenditure ($ million)	**2.2**	**2.6**	**0.2**	**4.9**

** Fractions of units may indicate expansion of an existing facility, or a smaller capacity facility. Infrastructure units needed to manage waste from a given region may not always be located in that region due to economies and scale and other factors (e.g. planning or suitable locations).*

Region specific challenges and opportunities for infrastructure

The region faces challenges for waste management and related infrastructure, including:

- There is potential for encroachment of incompatible land-uses near existing waste and recycling infrastructure
- There is both a limited number and limited access to landfills located in the region. Transporting waste from some locations to landfills in the region (or to other regions) incurs long travel distances and associated costs.
- Sending recovered materials to recycling markets and export ports in Adelaide incurs long travel distances and high costs
- There is currently no viable recycling option available for management of CCA-treated posts and other winery related solid wastes generated in parts of this region (e.g. Clare Valley). Disposing of CCA-treated posts in particular is problematic given their chemical treatment and high cost of disposal to landfill. Hence more research and development investment on this problematic waste stream is required.

Potential opportunities for infrastructure development in the region include:

- Investment in equipment and facilities for waste compaction and bulk hauling to reduce cost of transporting waste to end markets
- Reprocessing of cathode ray tube (CRT) lead glass, gold printed computer boards (PCB), mobile phones, photovoltaic panels, batteries and other metal based waste streams at the local smelter based in Port Pirie

30 Year Outlook, High Additional Diversion scenario

Table 53 **The Yorke Mid North region projected tonnes per annum of waste generation, resource recovery and landfill in 2045-46 for High Additional Diversion scenario**

	Projected volumes (tonnes) – 30 years			Change (tonnes) from 2015-16		
Tonnes per annum	Waste generation	Resource recovery	Landfill	Waste generation	Resource recovery	Landfill
MSW	33,400	30,100	3,300	3,100	18,300	-15,100
C&I	76,300	72,400	3,800	37,200	41,100	-4,000
C&D	36,700	34,800	1,800	17,900	22,600	-4,800
Total	**146,400**	**137,400**	**9,000**	**58,200**	**82,100**	**-23,900**

Under the High Additional Diversion scenario an estimated $19.4 million investment in infrastructure will be needed across the region over the next 30 years to manage projected additional volumes of waste generation, resource recovery and landfill. This includes:

- $10.2 million for MSW infrastructure
- $8.0 million for C&I waste infrastructure
- $1.2 million for C&D waste infrastructure

Investment in collection infrastructure, transfer stations, transfer vehicles, CDL facilities, drop-off facilities, open windrow composting facilities, construction and demolition waste processing facilities and other reprocessing facilities (medium technology) will be needed. To achieve higher landfill diversion, it may be necessary to invest in alternative technologies, such as MBT facilities. Appendix B provides the forecasted number of new/expanded infrastructure units for the scenario modelled.

Over the 30 year timeframe it is expected that:

- The region will continue to face challenges associated with lengthy travel distances to waste and recycling processing facilities and end markets. As a result, further future investment in equipment and facilities for compaction and bulk hauling to reduce costs of transporting waste will be needed.
- The upgraded smelter in the region will provide opportunities for reprocessing of e-waste and other emerging waste streams where metal recovery is required
- Technological advances will enable commercially viable recycling of legacy CCA-treated posts. There will be a transition away from use of CCA-treated posts by wineries and other local industry which will reduce the prevalence of this problematic waste stream.

Land-use planning considerations

The Yorke Peninsula Regional Land Use Framework[43] identifies a need for land-based processing clusters at Wallaroo, Port Broughton, Port Giles, Ardrossan and Stansbury. Major industrial hubs are identified at Kadina, Balaklava, Blyth and Ardrossan

Householder recycling is collected, sorted and reprocessed using a mix of both manual and automated methods

Specialised and problematic waste streams

In addition to the infrastructure needs identified in the previous regional assessments, further significant infrastructure is required for specialised or problematic waste streams.

Tyres

An estimated 18,400 tonnes of tyres from South Australia were resource recovered in 2015-16. The majority of these were shredded and sent for energy recovery overseas. This represents about 60 per cent of end-of-life tyres generated in South Australia, and is estimated to be 30,500 tonnes or about 2.2 Equivalent Passenger Units (EPUs)[44] per person per year.

The industry-led voluntary Tyre Product Stewardship Scheme (TSS) became operational from 1 July 2014. Since its inception, the TSS has focused on measures to develop the domestic recycling industry and markets for tyre derived products. Measures include research and development expenditure on tyre derived products, such as asphalt additive, matting surfaces, rubber modified structural concrete etc. TSS has been working on establishing an associated market development strategy to increase use of the product in road, rail and civil engineering applications.

There is potential to re-manufacture end-of-life tyres in South Australia into higher value products or to produce fuel suitable for energy recovery.

Photovoltaic panels

The rapid growth in the installation of residential and commercial Photovoltaic (PV or solar panels) for the production of electricity will lead to the generation of a new waste stream when these panels reach the end of their useful life.

Based on current economic lifetime estimates of 20 to 25 years, this waste stream will need a suitable recycling or re-manufacturing option within the 30 year time frame of this study.

The volume of PV system equipment reaching end-of-life is expected to sharply increase in coming years to become Australia's largest electronic waste growth stream. This waste stream, already on the 2016-17 Minister's Product List, is being considered for possible accreditation or regulation under the under the *Product Stewardship Act 2011*.

In the future PV panels may be processed through e-waste infrastructure and/or more specialised processing infrastructure designed to capture component parts (e.g. silicon).

In March 2017, the Australian Government announced a review of the *Product Stewardship Act 2011* which offers an opportunity to consider expanding the National Television and Computer Recycling Scheme to include other categories of electrical and electronic products not currently covered under the Scheme[45].

The transformation of the Port Pirie smelter to a multi-metals processing and recovery facility will provide technology to process e-waste, such as printed circuit boards, television screens, mobile phones, PV panels and alkaline batteries[46].

CCA-treated timber

CCA is a preservative used to treat timber to prevent attack by fungi and insects and to protect wood products against decay from the elements. CCA-treated timber is mainly used in agriculture, viticulture and also in building and aquaculture. The treatment can extend the life of a pine post from a few years to 30 years or more. CCA-treated timber has significant challenges for disposal and recycling when it reaches its end-of-life. Burning CCA-treated timber is banned in South Australia due to the chemicals and heavy metals present in the ash, which bring environmental and health concerns. Currently only suitably licenced landfills can accept CCA-treated posts for disposal.

There is currently no viable recycling option available for the management of CCA-treated posts. Research and development for recycling solutions is needed. Future infrastructure could be developed to treat CCA-treated posts to enable recycling/recovery of the components or more favourable disposal options.

Absorbent Hygiene Product

An estimated 29,000 to 36,000 tonnes of Absorbent Hygiene Product waste is currently disposed to landfill per year. There are technologies for recycling its components being used overseas that may be suitable for South Australia in the medium term.

Packaged food waste

An estimated 2,800 tonnes of packaged food waste is generated in South Australia every year and is disposed of to landfill. This material could be recovered for recycling using de-packaging equipment to separate the organic content from the packaging waste (e.g. plastics, cardboard, metal). The organic fraction could be sent for composting or anaerobic digestion to produce fuel and fertiliser, and packaging waste could be sent to a recycler.

Batteries

It is estimated that only 5 per cent of the end-of-life batteries produced every year are recycled. Used batteries, less than 5kg in weight are listed under the Australian Government Minister of Environment's 2014-2015 Product Priority list to develop a national scheme under the *Product Stewardship Act 2011*.

While there was broad support for an industry-led voluntary scheme for used batteries, the major brand owners of primary (non-rechargeable) batteries opposed an all-inclusive voluntary scheme.

At the meeting of Environment Ministers on 15 July 2015, it was agreed that work to explore an industry-led used battery stewardship approach be refined to focus on secondary batteries, that is, rechargeable and hazardous single-use battery types, such as button cell, power tool, sealed lead acid and emergency lighting batteries.

Large storage batteries such as those used in electric vehicles and for stationary energy storage are becoming increasingly common. The number of these batteries entering the waste stream are likely to increase significantly in coming years.

Should a National Product Stewardship Scheme for used secondary batteries be introduced, coupled with other measures for effective collection of primary batteries, then larger volumes of batteries may be recovered for recycling in South Australia. This initiative may create the economies of scale required to consider investment in new battery recycling infrastructure.

Shredder floc

Shredder floc arises in the scrap metal sector as a low-magnetic residual fraction that is separated from shredded scrap steel. It is a complex waste stream comprised of non-magnetic metals and alloys, various plastic polymers, minor amounts of steel, minor amounts of other non-metallic materials and a high soil fraction contaminated with oils and lubricants.

An estimated 40,000 to 45,000 tonnes per annum of this material is produced by the two major generators of shredder floc in South Australia. This material is currently sent to landfill, but in the future there may be an opportunity to establish a vehicular shredder floc reprocessing plant in South Australia.

Real time video is used in kerbside collection trucks to help monitor householder recycling practices

Supporting soft infrastructure

A range of soft infrastructure and activities will be needed in South Australia to support new and expanded infrastructure investment and sector growth. This includes:

- Recycling market analysis and development
- Community education and engagement
- Workforce planning, training and talent retention
- Integrated waste data systems

Recycling market analysis and development

Markets for recycled products are central to the long-term viability of resource recovery in South Australia. It is important that strategies are employed to ensure continued demand for existing volumes of recovered recyclables. Furthermore, markets will need to be developed for new and expanded volumes of recovered recyclables. There is an opportunity to create local demand for these materials through government procurement policies and Circular Economy processes.

Creation of local markets could lead to several other positive outcomes for South Australia. It could reduce reliance on volatile overseas markets for recovered recyclables, reduce resource use, create jobs and drive innovation. Establishing accredited testing for product standards and performance will provide purchasers with confidence in the quality of the remanufactured products.

Community education and engagement

The South Australian community is a key driver for:

- Waste generation volumes based on consumption behaviours
- Demand for and use of recycling services across homes, workplaces and other locations and
- Demand for recycled products through preferential purchase of recycled-content products

It is important that community education and engagement strategies are focused, targeted and consistent to build on the success of existing initiatives and drive positive outcomes.

Workforce planning, training and talent retention

Workforce planning, training and talent retention supports and adds value to investment in physical infrastructure. A range of initiatives can improve outcomes, such as:

- Delivering information on career pathways in the industry to career advisors and counsellors across schools, universities and other institutions
- Developing tertiary education courses in South Australia on waste and resource management and the Circular Economy
- Developing a chartered professional program for the waste and resource management industry to build knowledge and upskill industry professionals

The State recognizes emerging opportunities for South Australia to become a waste management training destination for Australian and overseas professionals. This could include behavior change, systems design and deployment and alternative technology policy.

Green Industries SA is currently working with tertiary institutions and other training providers to develop pilot short training courses for international and Australian participants to study waste management and policy in South Australia.

Integrated waste data systems

Integrated waste data systems measure and help drive improvements in resource recovery. Timely and verifiable waste and recycling data, through systems such as RFID equipped bins and on-truck bin weighing technology, will bring a number of benefits. The technology can measure and provide feedback to households and businesses on their waste generation and landfill diversion performance, or help target and measure the effectiveness of waste education campaigns aimed at increasing resource recovery.

This information can also help with transparency and fair outcomes in waste contracting negotiations and assist increased uptake of the National Australian Built Environment Rating System waste management rating tool and other waste-related carbon emission disclosure tools.

Wood fibre and plastic being processed into durable, long lasting building materials

Identifying and developing markets for plastics reprocessing is increasingly challenging

Risk management

Risks related to investment in infrastructure

There are a range of risks to be considered and managed in relation to investment in waste and resource recovery infrastructure. Examples of these risks and mitigation strategies are outlined below.

Table 54 Risks related to investment in infrastructure and risk mitigation strategies

Investment Stage	Risks	Mitigation Strategies
Design	There are risks that the technology selected in the design stage does not perform as expected in the operational phase. For example, the technology may not meet desired performance for processing capacity, level of resource recovery and/or delivery of suitable outputs. This risk is higher for emerging technologies, such as Alternative Waste Technologies, which have not been tried and tested, or for plants that have not been suitably engineered. There is also the risk of unintended consequences from new infrastructure that may compete for waste and resources as feedstocks. This may result in excess capacity, leading to no net increase in resource recovery, or potentially diversion of waste volumes to a lower order on the Waste Management Hierarchy. For example, waste that was previously destined for recycling may be sent to an energy-from-waste facility.	Invest in technologies that have a strong track record. Engage suitably qualified and experienced professionals to design and engineer the plant to appropriate standards. Undertake feasibility study prior to investment in infrastructure to identify volumes and sources of feedstock. Prioritise investment in infrastructure in line with principles from the Waste Management Hierarchy.
Building/Planning	There are risks that timeframes for approval and construction for waste and resource recovery infrastructure may be delayed or extended. This may affect an organisation's ability to process waste volumes and achieve environmental outcomes such as landfill diversion. It may also have a financial impact on the affected organisation, such as lost income or penalties for not being able to meet contracts for processing waste.	Proactively engage with planning and regulatory authorities to ensure that the application process is understood, including information requirements and timelines for submission of application, review and approval. Ensure adequate consultation has been undertaken with the community during the early planning phase. Allow extra time for approval processes and construction to be completed.
Operational	There are a range of operation risks that can affect the viability of operations, such as the volatility of international commodity markets for recovered materials, rising energy costs for operations and the inability to secure markets for the recovered material. Operations that recover paper/cardboard, metals and plastics are particularly vulnerable to the volatility of international commodity markets, given that these materials are traded on these markets and the companies are price-takers. Increased stockpiling of these materials on site at recycling facilities due to falling global commodity prices can be a major fire risk factor.	Enter into long-term supply arrangements for sale of recycled products to reduce vulnerability to the volatility of international commodity markets, or preferably, enter contracts to supply to local and Australian markets. Create increased local demand for recycled products through government procurement policies and Circular Economy processes.
Incidental	Lack of infrastructure redundancy or contingency planning is a potential risk for key waste and resource recovery infrastructure. For example, risk of fire to a single facility that processes a major stream.	Develop business continuity plans to minimise disruption to services caused by an incident. This would include making provisions for waste to be received and processed at alternative sites/organisations in the event that it cannot be received by business-as-usual infrastructure.

Waste-stream specific operational risks

The ongoing viability of resource recovery and reprocessing operations in South Australia is vulnerable to several factors such as operating costs, price and demand volatility of international commodity markets, energy prices, and local demand for recycled products. The level of susceptibility to these factors varies by material stream and different reprocessing activities undertaken. For example, baling for export activity requires minimal energy compared with more complex reprocessing activities. A high-level analysis of these vulnerability levels is provided in the table below.

Table 55 **Waste stream specific vulnerability level analysis**

Material Stream	Vulnerability to costs of energy	Vulnerability to price volatility of international commodity markets	Vulnerability to local demand for recycled products
Masonry	Medium	Low	High
Metals	High	High	Medium-High
Organics	Medium	Low	High
Cardboard	Medium	High	Medium
Paper	Medium	High	Medium
Plastics	High	High	Medium
Glass	High	Low	High

Costs of energy

Due to the energy-intensive nature of some recycling processes, local plastics, operations with more complex reprocessing than baling for export, metals and glass reprocessors are particularly vulnerable to rises in local energy costs.

Price volatility of international commodity markets

Local operators that recover materials, such as plastics, cardboard, paper and metals to sell on international commodity markets are susceptible to price volatility in commodity markets. Demand for commodities can be influenced by the policies and requirements of the export destination.

Local demand for recycled products

Operators that reprocess and sell recycled products locally, such as recyclers of masonry materials, organics and glass, are particularly vulnerable to levels of local demand for their products.

Building materials are recovered and recycled from demolition sites and offered for sale in Adelaide's Southern suburbs, contributing to a Circular Economy in South Australia

Appendix A

Nominated infrastructure capacities and capital costs

	Nominated average processing capacity (tonnes/year)		
Infrastructure Unit	**MSW**	**C&I**	**C&D**
Kerbside source separation bin systems	1		
Skip bins		37	499
Collection vehicles	10,400	10,400	32,500
Vacuum systems	10,000	10,000	
Transfer stations (including compaction equipment)	100,000(M) 10,000(R)	100,000(M) 10,000(R)	100,000(M) 10,000(R)
Transfer vehicles	19,500	19,500	19,500
Material recovery facility	50,000(M) 5,000(R)	50,000(M) 5,000(R)	
CDL facilities	250	250	
Drop-off facilities	250	250	
Composting facilities (open windrow)	50,000(M) 10,000(R)	50,000(M) 10,000(R)	
Composting facilities (covered tunnel)	50,000(M) 10,000(R)	50,000(M) 10,000(R)	
Energy-from-waste facilities - thermal treatment	100,000	100,000	100,000
Energy-from-waste - anaerobic digestion	10,000	10,000	
Mechanical biological treatment	100,000	100,000	
Construction & demolition processing facilities			200,000(M) 50,000(R)
Other reprocessing facilities (medium technology)	20,000(M) 10,000(R)	20,000(M) 10,000(R)	
Other reprocessing facilities (high tech)	5,000	5,000	
Hazardous waste facilities	5,000	5,000	
Waste soil storage and remediation facilities			100,000
Emerging waste streams facilities	2,000	2,000	2,000
Medical waste disposal		4,000	

Table A.1 Nominated average processing capacities (tonnes) and capital costs for infrastructure units

Key: M – metropolitan R – regional. **Reading this table:** e.g., the nominated average processing capacity of one unit of Kerbside source separation bin systems is 1 tonne per year and the estimated capital cost for one unit of Kerbside source separation bin systems is $150 in metropolitan area and $195 in regional area.

Estimated capital cost for nominated capital size		
MSW	**C&I**	**C&D**
$150 (M) $195 (R)		
	$1,000 (M) $1,300 (R)	$2,000 (M) $2,600 (R)
$350,000	$350,000	$300,000
$10,000,000	$10,000,000	
$6,000,000(M) $4,000,000(R)	$6,000,000(M) $4,000,000(R)	$6,000,000(M) $4,000,000(R)
$400,000	$400,000	$400,000
$10,000,000(M) $2,000,000(R)	$10,000,000(M) $2,000,000(R)	
$100,000	$100,000	
$100,000	$100,000	
$3,000,000(M) $2,000,000(R)	$3,000,000(M) $2,000,000(R)	
$10,000,000(M) $5,000,000(R)	$10,000,000(M) $5,000,000(R)	
$100,000,000	$100,000,000	$100,000,000
$5,000,000	$5,000,000	
$30,000,000	$30,000,000	
		$8,000,000(M) $2,000,000(R)
$1,200,000(M) $1,000,000(R)	$1,200,000(M) $1,000,000(R)	
$5,000,000	$5,000,000	
$5,000,000	$5,000,000	
		$4,000,000
$2,000,000	$2,000,000	$2,000,000
	$10,000,000	

Appendix B

Potential infrastructure needs: 30 year outlook, High Additional Diversion scenario

Number of new/ expanded infrastructure units	Metropolitan	Adelaide Hills	Barossa Light and Lower North	Fleurieu Kangaroo Island
Kerbside source separation bin systems	138,210	8,461	14,622	10,475
Skip bins	23,432	475	3,851	327
Collection vehicles	161.9	3.1	15.9	2.7
Vacuum systems	5.0	-	-	-
Transfer stations (including compaction equipment)	3.4	1.2	4.3	1.3
Transfer vehicles	57.2	1.0	2.7	1.0
Material recovery facility	0.4	-	-	-
CDL facilities	44.8	2.1	2.3	1.6
Drop-off facilities	45.1	3.3	4.2	3.0
Composting facilities (open windrow)	-	1.0	0.3	0.7
Composting facilities (Covered Tunnel)	5.4	-	-	-
Energy-from-waste facilities - thermal treatment	1.3	0.05	0.1	0.04
Energy-from-waste - anaerobic digestion	5.4	2.0	2.0	1.0
Mechanical biological treatment	5.1	0.2	0.2	0.2
Construction & Demolition processing facilities	10.3	0.4	0.4	0.3
Other reprocessing facilities (medium technology)	19.4	-	13.4	0.7
Waste soil storage and remediation facilities	5.5	-	-	-
Emerging waste streams facilities	3.6	-	-	-
Total capital expenditure ($ million)	**698.9**	**32.4**	**70.1**	**26.6**

Table B.2 **30-year outlook, High Additional Diversion scenario**

Note that values in the table may not sum to totals due to rounding. Fractions of units may indicate expansion of an existing facility or a smaller capacity facility. The number of units is based on nominated infrastructure capacities (refer Appendix A) and is intended to be indicative of the types and number of new/expanded infrastructure units that will potentially be needed for waste volumes from each region. The infrastructure units needed to manage waste from a given region may not always be located in that region due to economies and scale and other factors (e.g. planning or suitable locations). In these cases, waste from the region may be transported to another region where a facility is available.

Eyre and Western	Far North	Limestone Coast	Murray Mallee	Yorke Mid North	Total SA
1,624	837	1,026	1,432	2,511	179,199
379	151	4,577	4,367	1,001	38,559
1.9	0.8	17.0	16.4	4.4	224
-	-	-	-	-	5.0
1.3	0.5	3.5	3.4	1.0	20.0
0.9	0.4	2.1	2.1	0.9	68
-	-	-	-	-	0.4
1.5	0.6	1.7	1.8	2.0	58.4
1.9	0.8	2.0	2.1	2.5	64.8
0.7	0.3	5.7	0.2	0.9	9.9
-	-	-	-	-	5.4
0.03	0.01	0.03	0.03	0.04	1.6
-	-	5.0	-	-	15.4
0.1	0.04	0.1	0.1	0.1	6.2
0.3	0.1	0.4	0.4	0.4	13.0
0.8	0.3	5.2	10.9	1.0	51.6
-	-	-	-	-	5.5
-	-	-	-	-	3.6
16.1	**6.6**	**75.4**	**44.9**	**19.4**	**990.2**

Endnotes

1 *Review of South Australia's Waste Strategy 2011-2015*, Resources and Waste Advisory Group, 2014
2 *The 30-Year Plan for Greater Adelaide 2017 Update*, South Australian Department of Planning, Transport and Infrastructure, 2017
3 *South Australian Waste and Resource Recovery Infrastructure Plan: waste projection and economic assessment*, Rawtec, EconSearch, and Jensen Planning + Design, 2016
4 Refer to Table 1 for definitions of classes and types of infrastructure.
5 Shredder floc is a by-product of metal reprocessing, primarily form the recovery of end-of-life vehicles and white goods, including refrigeration and air conditioning equipment.
6 *Review of South Australia's Waste Strategy 2011-2015,* Resources and Waste Advisory Group, 2014
7 *The 30-Year Plan for Greater Adelaide 2017 Update*, Policy 85, page 94
8 *The 30-Year Plan for Greater Adelaide 2017 Update* , Actions 49 and 52, page 98
9 *Review of South Australia's Waste Strategy 2011-2015*, Resources and Waste Advisory Group, 2014
10 *South Australia's Recycling Activity Survey 2015-16*, Rawtec, 2017
11 *South Australian Waste and Resource Recovery Infrastructure Plan: waste projection and economic assessment*, Rawtec, EconSearch, and Jensen Planning + Design, 2016
12 *Environment Protection (Waste to Resources) Policy 2010*, South Australian Environment Protection Authority, 2010
13 *Review of South Australian Solid Waste Levy*, Hyder Consulting, 2007
14 *Economic effects of the South Australian solid waste levy*, Deloitte Access Economics, 2015
15 *Review of the South Australian Solid Waste Levy*, the Allen Consulting Group, 2012.
16 Australian Government Department of the Environment and Energy Product Stewarship 2016-17 Product List, retrived from http://www.environment.gov.au/protection/national-waste-policy/product-stewardship/legislation/product-list-2016-17,
17 *Developing a new climate change strategy for South Australian: Carbon neutral Adelaide consultation paper*, South Australian Government 2015
18 The Carbon Neutral Adelaide Action Plan 2016-2021, Adelaide City Council and South Australian Department of Environment, Water and Natural Resources, 2016
19 *Waste Account, Australia, Experimental Estimates*, Australian Bureau of Statistics, Catelogue no. 4602.0.55.005, 19 February 2013
20 Australian Bureau of Statistics, Catalogue no. 3101.0, Dec 2016
21 *The Planning Development and Infrastructure Act 2016.*
22 *Employment in waste management and recycling*, Access Economics, 2009.
23 *Evaluation Distances for Effective Air Quality and Noise Management*, South Australian Environment Protection Authority, 2016
24 *Economic Aspects of the Zero Waste SA Strategy Review*, Econsearch, 2014
25 ABS, Regional Population Growth, Australia 2016, Catalogue no 3218.0
26 Not all waste generated in metropolitan South Australia is managed at these facilities. Some waste is sent to facilities in other regions in the State (e.g. landfill located within Yorke and Mid North) or is aggregated locally before being sent interstate/overseas for resource recovery.
27 This includes examples such as MRFs processing comingled reccylabes from the regions, glass beneficiation, glass processing and metals processors.
28 ABS, Regional Population Growth, Australia 2016, Catalogue no 3218.0
29 Adelaide Hills Council Development Plan, Consolidated 9 January 2014, Department of Planning Transport and Infrastructure
30 ABS, Regional Population Growth, Australia 2016, Catalogue no 3218.0
31 'Employment land' is a term used to describe land used for industrial, retail and commercial purposes.
32 ABS, Regional Population Growth, Australia 2016, Catalogue no 3218.0
33 The Kangaroo Island Plan, Department of Planning and Local Government, January 2011
34 ABS, Regional Population Growth, Australia 2016, Catalogue no 3218.0
35 The Eyre and Western Region Plan, Department of Planning and Local Government, April 2012
36 ABS, Regional Population Growth, Australia 2016, Catalogue no 3218.0
37 The Andamooka Structure Plan, Department of Planning Transport and Infrastructure, July 2013
38 ABS, Regional Population Growth, Australia 2016, Catalogue no 3218.0
39 The Limestone Coast Region Plan, Department of Planning and Local Government, August 2011
40 ABS, Regional Population Growth, Australia 2016, Catalogue no 3218.0
41 The Murray & Mallee Region Plan, Department of Planning and Local Government, January 2011
42 ABS, Regional Population Growth, Australia 2016, Catalogue no 3218.0
43 The Yorke Peninsular Regional Land Use Framework, Planning SA, December 2007
44 An equivalent passenger unit (EPU) is a standard passenger car tyre. The weight of an EPU for a new standard passenger car tyre is standardised as 9.5kg; and the weight of an EPU for an end-of-life standard passenger car tyre is standardised as 8 kg.
45 http://www.environment.gov.au/protection/national-waste-policy/product-stewardship/legislation/product-list-2016-17, accessed on 14/08/2017.
46 *Waste Management Review*, June /July 2017, "South Australian recycler plans to take on e-waste", page 12

Bailing wire on spools ready to bundle recovered recyclable materials for resale