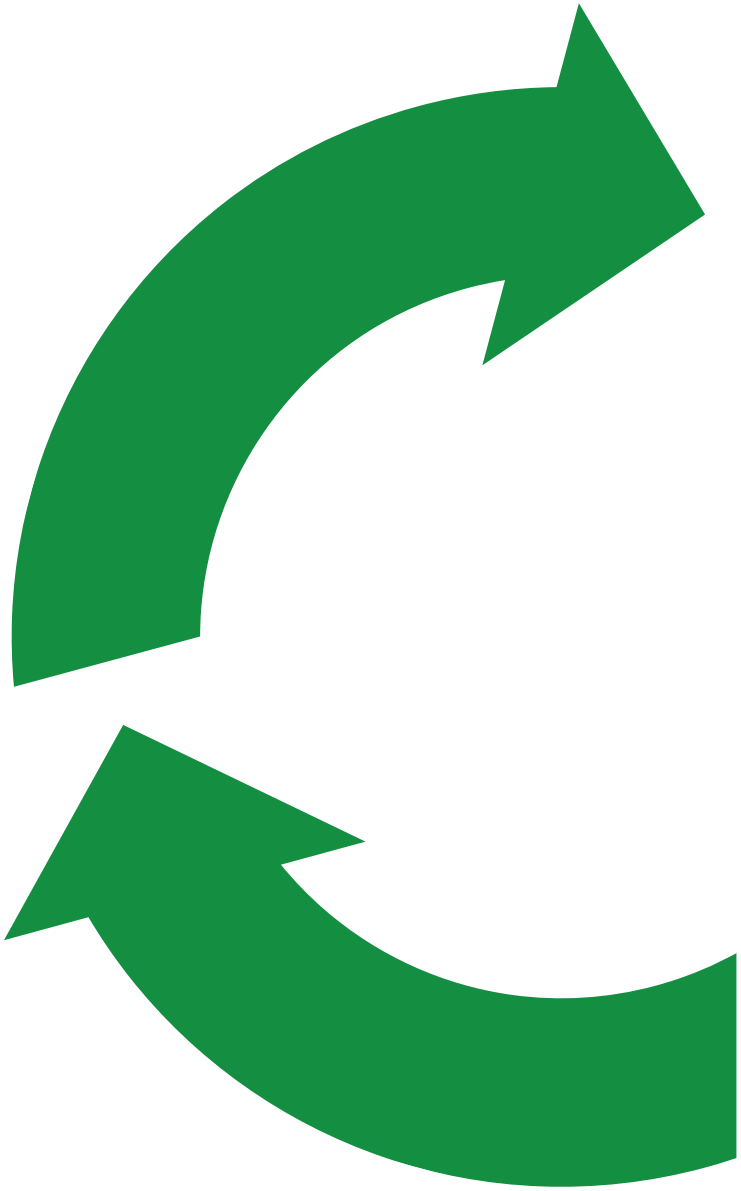
South Australia's

WASTE AND RESOURCE RECOVERY INFRASTRUCTURE PLAN



Consultation draft

September 2016

Government of South Australia
Green Industries SA

AVOID • REDUCE • REUSE • RECYCLE

CONTENTS

FOREWORD

I am pleased to release South Australia's Waste and Resource Recovery Infrastructure Plan for consultation. This plan aims to provide guidance for the future infrastructure planning and investment in the waste sector for South Australia.

We encourage your feedback to help develop the final plan.

This is the first time that such a plan has been developed for the State. It brings together the best available information and data to map existing waste and resource recovery infrastructure by major types, and projects future waste flows.

Importantly, this draft plan identifies potential future infrastructure needs and investment opportunities to inform investment decisions.

In line with *South Australia's Waste Strategy 2015-2020,* which is a clear policy framework aimed at attracting investment, capability building, innovation, economies of scale and re-manufacturing opportunities. Importantly, this plan highlights opportunities to increase the contribution of the waste sector to our State's Gross State Product (GSP) and employment through infrastructure investment and development.

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 $110.4 million in GSP and an additional 1,045 full time equivalent (FTE) jobs. A 30-year high diversion scenario estimates an additional $656.3 million in GSP and additional 4,719 FTE jobs.

Our vision is for South Australia to build upon our internationally-recognised waste and resource recovery achievements through continuous improvement and development of this important sector of our economy. Your contribution to this draft plan is an important step towards an important and growing sector of our state's economy.

Ian Hunter MLC

Minister for Sustainability, Environment and Conservation

INVITATION TO COMMENT

The Office of Green Industries SA invites you to comment on the consultation draft for *South Australia's Waste and Resource Recovery Infrastructure Plan*.

For the first time, a waste infrastructure plan has been prepared for South Australia and each of its regions. This consultation draft presents all available information and data to project future waste flows and maps existing waste and resource recovery infrastructure by major types. It also identifies potential future infrastructure needs and investment opportunities and provides intelligence for industry which will assist in informing investment decisions.

We invite input from stakeholders in the waste and resource recovery sector, local government and the community. Feedback received will be used to develop the final plan, ensuring that is has accurate information to assist industry and government with waste and resource recovery planning and decision making.

Your submission

All submissions received by the Office of Green Industries SA will be acknowledged. Submissions will be treated as public documents, unless received in confidence subject to the requirements of the *Freedom of Information Act 1991*, and may be quoted in full or part in subsequent reports.

When preparing your submission, please provide reasons for your comments, supported by relevant factual information/data you wish to provide and give details of the source. Please also include the following information with your submissions: your name; organisation and position; postal address; and contact details – telephone number and email address.

Written submissions must be lodged by 5pm, 25 November 2016 at the Office of Green Industries SA, GPO Box 1047, Adelaide SA 5001 or by email to: serena.yang@sa.gov.au

Queries should be directed to:

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EXECUTIVE SUMMARY

Introduction

The Review of *South Australia's Waste Strategy 2011-2015* (Resources and Waste Advisory Group, 2014) 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

South Australia's Waste and Resource Recovery Infrastructure Plan (SAWRRIP) is being developed to provide a clear guide for future waste and resource recovery infrastructure needs across the State, and, in doing so, support a resource efficient economy in South Australia.

For the first time, a draft plan has been prepared for South Australia and its regions. It presents all available information and data to project future waste flows and maps existing waste and resource recovery infrastructure by major types. It also identifies potential future infrastructure needs and investment opportunities and provides intelligence for industry which will assist in informing investment decisions. Potential infrastructure needs for specialised and problematic waste streams are also identified.

Vision and objectives

Our 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 the SAWRRIP are to:

- Provide an evidence base which enables a 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 which promotes innovation and economies of scale

- Inform the State's land-use planning system enabling it 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, the Office of Green Industries SA commissioned a waste projection and economic assessment study to inform the development of the SAWRRIP (Rawtec et al 2015). The study 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.

This consultation draft has focused on the 10 year Moderate Additional Diversion scenario and the 30 year High Additional Diversion scenario.

10 year timespan - Moderate Additional Diversion scenario

An estimated $129 million of investment in new/expanded waste and resource recovery infrastructure will be needed across South Australia by 2024-25 under the Moderate Additional Diversion scenario to manage additional volumes of waste, resource recovery and landfill. This includes:

- $41 million for Municipal Solid Waste (MSW) waste infrastructure
- $66 million for Commercial and Industrial (C&I) waste infrastructure
- $22 million for Construction and Demolition (C&D) waste infrastructure.

Potential investment will be needed in skip bins, collection and 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[1].

[1] Refer to Table 1 for definitions of classes and types of infrastructure.

30 year outlook - High Additional Diversion scenario

An estimated $919 million of investment in new/expanded waste and resource recovery infrastructure will be needed across South Australia over the next 30 years under the High Additional Diversion scenario to manage additional volumes of waste, resource recovery and landfill. This includes:

- $356 million for MSW waste infrastructure
- $431 million for C&I waste infrastructure
- $132 million for C&D waste infrastructure.

Potential 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 combustion facilities or other future technologies.

In addition to the above needs, future infrastructure and investment will be required 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[2].

Economic impacts

The total economic impact of infrastructure investment is estimated at:

- At year 10 – moderate additional diversion scenario: contribution of an additional $110.4 million in gross state product (GSP) and an additional 1,045 full-time equivalent (FTE, direct and indirect)
- At year 30 – high additional diversion scenario: contribution of an additional $656.3 million in GSP and an additional 4,719 FTE (direct and indirect).

[2] 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.

Both the moderate and high additional diversion scenarios present an opportunity to significantly increase the contribution of the waste sectors to GSP and employment, which are currently at $504 million and employment at 4,800 (Econsearch, 2014).

Land-use planning

The SAWRRIP examines land-use planning considerations for waste and resource recovery infrastructure. It is intended that the SAWRRIP be developed closely with the updated *30-Year Plan for Greater Adelaide* (currently under development) to ensure sufficient buffer zones and adequate provision of suitable sites protected from encroachment by incompatible uses.

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 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 or ports for export to overseas markets. Several large scale key strategic industrial and employment land areas are identified within the *30-Year Plan for the Greater Adelaide*, at Gillman/Wingfield, Greater Edinburgh Parks, Lonsdale, Monarto and Roseworthy.

Metropolitan and regional infrastructure assessments

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

- 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, and
- Land-use planning considerations for future infrastructure.

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 Gross State Product, and employs directly and indirectly around 4,800 people across a wide spectrum of jobs (Resources and Waste Advisory Group, 2013).

South Australia is currently leading the nation in levels of resource recovery, achieving the highest recycling rates out of all jurisdictions in Australia (Rawtec, 2015). 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* (RWA et al, 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

Our 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.

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 and community expectations and lifestyles.

The SAWRRIP consultation draft 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 the SAWRRIP include:

- Provide an evidence base to enable a common understanding by all stakeholder 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 which promotes innovation and economies of scale
- Inform the State's land-use planning system enabling it 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 which can be exported.

Future investment in Infrastructure

Estimates of future investment needs are based on high-level modelling undertaken in a previous study (Rawtec et al, 2015). 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 2015 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 is not exhaustive and hence may be a 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.

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 (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 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. It promotes and/or encourages the following waste management practices, which have associated waste and resource recovery infrastructure needs:

- Food organics collection and treatment
- Diversification of 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
- Improved source separation, collection systems and sorting infrastructure
- Weight-based charging and precinct-based collection routes for C&I waste
- Salvaging and reuse of building materials
- Reuse of waste fill and intermediate level contaminated soil
- Remediating low level and high level contaminated soils for reuse
- Convenient drop-off facilities for unwanted household and farm hazardous waste
- Landfill gas recovery for energy production where consistent with South Australia Environment Protection Authority (EPA) guidelines
- Recovery and treatment of oils, solvents and other valuable materials for reuse
- Ban from landfill for materials that could be disposed of through strongly performing markets with regard to metropolitan and non-metropolitan contexts

- No new landfills to service metropolitan Adelaide

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

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

> 35% reduction in landfill disposal from 2002-03 level by 2020[19]
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%.

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

Environment Protection (Waste to Resources) Policy 2010

The *Waste to Resources Policy 2010* (SA EPA, 2010) provides regulatory underpinning for South Australia's Waste Strategy and promotes the implementation of the waste management hierarchy, improves resource recovery and reduces waste going to landfill.

Key elements of this policy, which 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.

Solid Waste Levy and waste reform

The Solid Waste Levy is payable by the licence-holder of a waste depot for all waste received that is to be disposed of at that depot. The levy is an economic instrument designed to disincentivise landfilling in favour of waste reduction and resource recovery. The levy has increased over time and the 2016-17 State Government Budget has announced a staged increase of the levy to $103 per tonne by 2019-20.

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 levy to be effective it needs to be sufficiently high to make alternatives to landfill disposal commercially viable. Increasing the levy rate supports industry in reaching the point where investment in some new and innovative resource recovery treatments is financially competitive with landfill disposal.

The Australian Council of Recycling commissioned levy study (Deloitte Access Economics, 2015) 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 with landfill to support municipal solid waste 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.

The South Australian EPA is undertaking a significant waste reform process. This waste reform is considering mass balance reporting and upfront levy liabilities.

These reforms may require infrastructure (e.g. weighbridges, electronic tagging and tracking) to be installed at waste and resource recovery facilities.

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 increase the amount of resources recovered from end-of-life products (Australian Government Department of the Environment, Water, Heritage and the Arts, 2010).

In addition to the Product Stewardship for Oil Program introduced in 2001, current stewardship schemes under the *Product Stewardship Act 2011* (Australian Government, 2011) include the television and computer recycling scheme, packaging covenant, and schemes for tyres, mercury containing lamps and waste architectural and decorative paint. The Australian Government is also considering introducing product stewardship schemes for other products such as handheld rechargeable batteries, plastic microbeads and products containing these, photovoltaic (PV) systems, electrical and electronic products and plastic oil containers (Australian Government Department of the Environment, 2016).

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 ambition for the City of Adelaide to become the world's first carbon neutral city. The waste sector contributed 5% of Adelaide City's net emissions in 2012-13, which was mostly from landfills (South Australia Government, 2015). Future investment in resource recovery infrastructure is needed to divert material from landfill and thereby drive further emissions reductions, build the State's green industries, increase resource efficiency and improve 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% and waste generation has increased by 145% (ABS, 2013).

According to the Department of Planning, Transport and Infrastructure (DPTI), the 2016 population of South Australia is projected to be about 1.72 million (medium series), and by 2041, the State's population is projected to have grown to 2.06 million, representing a 20% growth between 2016 to 2041. The DPTI projection expects that over 96% of the population growth will be within the Greater Adelaide region (i.e. Metropolitan Adelaide, Adelaide Hills, Barossa, Light and Lower North, and Fleurieu and Kangaroo Island).

Waste is generated by activities in all economic sectors and at each point in the production chain. It is generally 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 for Greater Adelaide*, Greater Adelaide will 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.

The number of medium density, high density and multi-unit developments (MUDs) in specific locations may give rise to challenges in relation 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. Increased pressure on landfill and other systems interstate may be cause for more materials to be imported to South Australia for treatment, recycling, re-manufacturing or disposal.

Key drivers for this movement will come from economies of scale, South Australian innovation, interstate policy (e.g. waste levies and disposal requirements), changes to regulations and from national and international requirements, treaties and agreements.

Technological advances

Nowadays, change is increasing 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, radio frequency identification (RFID) and the associated ability to track and record dynamic information, as well as new technology such as new energy-from-waste, greenhouse gas capture, sorting and composting technology is also revolutionising waste management approaches.

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 and more) current recycling processes cannot extract all the components from purchased products. Industry innovation and investment are needed to address this and the changing forms of manufacturing, such as home manufacturing made possible by 3D printing technology.

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 (Access Economics, 2009).

INFRASTRUCTURE TYPES AND DEFINITIONS

Scope of infrastructure plan

The 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 consultation draft.

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, which are not included in this consultation draft but will be considered in the final plan. 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. Waste and resource recovery infrastructure definitions

Infrastructure class	Infrastructure type	Description
Collection infrastructure	Kerbside Source Separation bin systems	Kerbside bins for collection of MSW waste.
	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	Also referred to as resource recovery facilities, transfer stations are permanent sites set up to receive, minor sort, and temporarily store waste and recyclables prior to be taken to a reprocessing or disposal facility.
	Transfer vehicles	Large vehicles for bulk transport of waste (e.g. a walking floor truck).
	Material Recovery Facility	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 dismantling 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 a totally enclosed conditions where near-optimal composting conditions can be controlled and maintained.
	Energy-from-waste facilities – combustion	Facilities where waste is combusted 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 dissembled 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.

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 Australia's planning strategy. The volumes in the planning strategy guide the policy for development plans across South Australia's different regions. Therefore, it provides guidance for the future provision of developable land, including for uses such as industrial 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 (or 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 for the Greater Adelaide*, at Gillman/Wingfield, Greater Edinburgh Parks, Lonsdale, Monarto and Roseworthy.

Within these locations, there is a range of zones which provide differing levels of support for waste and resource recovery activities and associated infrastructure. The benefits and challenges of the 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 – combustion
- Energy-from-waste facilities – anaerobic digestion
- MBT facilities
- Hazardous waste facilities
- Disposal infrastructure

These activities have limited opportunities for locations as the majority of zones do not cater for these. Instead, these need to take advantage of locations where existing or previous intensive industries occurred, or otherwise, will require specific rezoning to accommodate specific desired locations. Therefore, the preferred locations should be identified early, and appropriately planned for by land being set aside, and zoning put in place so that sensitive land-uses do not encroach on their ability to establish into the future.

Table 2. South Australia EPA air separation distance for waste and recycling activities (SA EPA, 2007) (SA Government Department Environment Natural Resources, 2007)

Activity	Description of activity	Air separation distance (metres)
Incineration	Destruction of chemical wastes	1,000
	Destruction of medical wastes	500
	Solid municipal waste	500
Waste or recycling depots	Landfill	500
	Biosolids depot	400
	Other licensed facilities	300
	Not licensed	100

OVERVIEW OF SOUTH AUSTRALIA'S FUTURE INFRASTRUCTURE NEEDS

Current status

- South Australia achieved an overall landfill diversion rate of 79.7% in 2013-14. Landfill diversion rates vary by geographical origin and source sector with the highest rate (at 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 3.59 million tonnes of waste was resource recovered in 2013-14.
- Significant waste streams recovered in South Australia include organics (estimated at 28%), masonry materials (27%), clean fill (16%), metals (10%), and cardboard/paper (7%).
- The majority of waste that was resource recovered (2.98 million tonnes or 83%) was reprocessed locally through South Australia's facilities, including reprocessing of masonry, organics, metals, glass, paper and cardboard and other materials. The balance of waste recovered (17%) was exported interstate or overseas for reprocessing, which mainly included paper and cardboard, metals and plastics.
- The State has an extensive network of waste and resource recovery infrastructure and facilities which collect, recover, reprocess, re-manufacture and dispose of these waste volumes (refer Figure 2).

Table 3. South Australia 2013-14 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	4,504,000	3,558,000	946,000
Resource recovered	3,590,000	2,850,000	740,000
Landfill	914,000	708,000	206,000
Diversion (overall)	79.7%	80.1%	78.2%
MSW diversion	55%	60%	39%
C&I diversion	83%	77%	93%
C&D diversion	87%	88%	60%

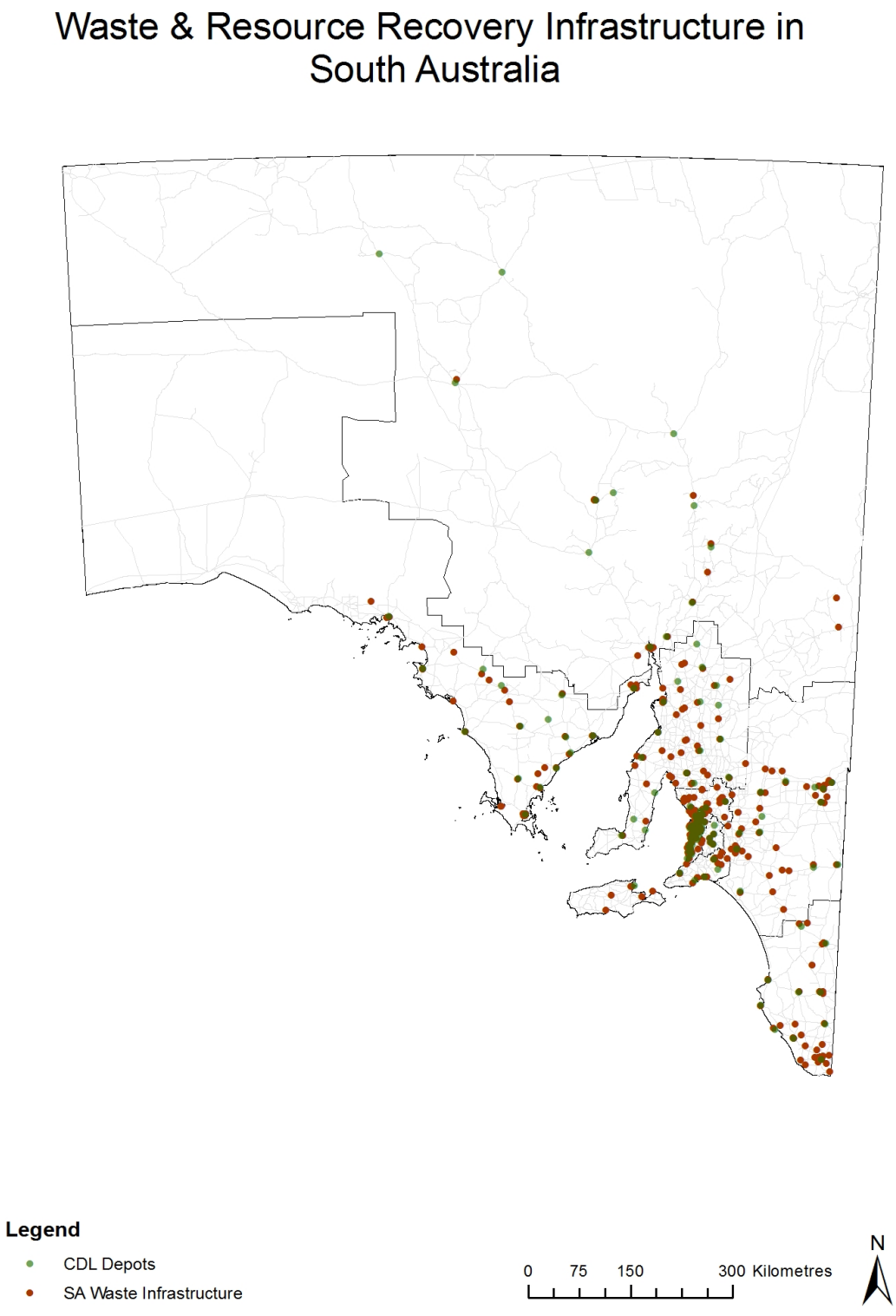

Figure 2. Existing waste and resource recovery facilities in South Australia

Future infrastructure needs

Scenarios

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

- Moderate additional diversion scenario (10 years): Diversion rates for Metropolitan Adelaide were modelled based on 2020 targets 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 MSW was adopted from the metropolitan 2020 target to consider the maximum potential infrastructure and investment needs for the region.
- 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.

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

Diversion scenario	Source sector	SA	Metro	Regional SA
Moderate additional (10 years)	MSW	70%	70%	70%
	C&I	85%	80%	94%
	C&D	89%	90%	70%
High additional (30 years)	MSW	98%	100%	90%
	C&I	98%	100%	95%
	C&D	99.8%	100%	95%

10 year timeframe - Moderate Additional Diversion scenario

Table 5. Projected waste generation, resource recovery and landfill volumes for South Australia in 2024-25 under Moderate Additional Diversion scenario

10 year- Moderate Additional Diversion scenario			
	Waste generation	**Resource recovery**	**Landfill**
Projections (tonnes per year)	5,447,000	4,602,000	844,000
Change from baseline (2013-14)	**943,000**	**1,012,000**	**-70,000**

Note that values in the table may not sum to totals due to rounding.

- An estimated $129 million of investment in new/expanded waste and resource recovery infrastructure will be needed across South Australia by 2024-25 to manage additional volumes of waste, resource recovery and landfill (refer to Table 6). This includes:
    - $41 million for MSW waste infrastructure
    - $66 million for C&I waste infrastructure
    - $22 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 2024-25, 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	51,499	-	-	51,499
Skip bins	-	10,891	288	11,179
Collection vehicles	6	39	18	63
Vacuum systems	0.5	-	-	0.5
Transfer stations	-	1.4	-	1.4
Transfer vehicles	2.9	8.1	7.4	18.4
CDL facilities	4.7	10.0	-	14.7
Drop-off facilities	43.5	-	-	43.5
Composting facilities (open windrow)	3.9	1.9	-	5.8
Composting facilities (covered tunnel)	0.5	0.6	-	1.1
Energy-from-waste - anaerobic digestion	0.3	1.3	-	1.6
Construction & Demolition processing facilities	-	-	1.2	1.2
Other reprocessing facilities (medium technology)	2.1	10.0	-	12.2
Waste soil storage and remediation facilities	-	-	1.2	1.2
Emerging waste stream facilities	1.3	0.3	-	1.6
Total capital expenditure ($ million)	41	66	22	129

Note that values in the table may not sum to totals due to rounding.

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

30 year outlook - High Additional Diversion scenario

Table 7. Projected waste generation, resource recovery and landfill volumes for South Australia in 2044-45 under High Additional Diversion scenario

30 year - High Additional Diversion scenario			
	Waste generation	**Resource recovery**	**Landfill**
Projections (tonnes per year)	**8,134,000**	**8,045,000**	**89,000**
Change from baseline (2013-14)	3,630,000	4,455,000	-825,000

Note that values in the table may not sum to totals due to rounding.

- An estimated $919 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:
    - $356 million for MSW waste infrastructure
    - $431 million for C&I waste infrastructure
    - $132 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 combustion 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:

- At year 10 – Moderate Additional Diversion scenario: contribution of an additional $110.4 million in Gross State Product (GSP) and an additional 1,045 full-time equivalent (direct and indirect)
- At year 30 – High Additional Diversion scenario: contribution of an additional $656.3 million in GSP and an additional 4,719 full-time equivalent (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 (Econsearch, 2014).

Table 8. Total economic impacts of infrastructure investment scenarios

	At Year 10 Moderate Additional Diversion	At Year 30 High Additional Diversion
GSP ($m)		
Direct	51.5	311.7
Flow on	59.0	344.6
Total	**110.4**	**656.3**
Employment (fte)		
Direct	646	2,404
Flow on	399	2,315
Total	**1,045**	**4,719**

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:

- Current status: current waste and recycling streams and volumes and identification of 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.

PROFILE: METROPOLITAN ADELAIDE

Current status

Metropolitan Adelaide generated approximately 3.55 million tonnes of waste in the 2013-14 financial year, of which 2.84 million tonnes was resource recovered.

Most of the waste (56%) was generated by the C&D sector, which mainly included volumes of masonry materials (e.g. asphalt, bricks, concrete) and waste soils. Approximately 26% 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 18% of the total waste but accounts for 37% of total landfill.

Baseline waste and recycling volumes

Table 9. Metropolitan Adelaide 2013-14 waste profile

Tonnes per annum	Waste generation	Resource recovery	Landfill
MSW	648,000	386,000	262,000
C&I	928,000	711,000	216,000
C&D	1,976,000	1,747,000	229,000
Total	**3,552,000**	**2,844,000**	**708,000**

Note that values in the table may not sum to totals due to rounding.

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[3], and some of the larger or more specialised facilities receive waste from other regions in South Australia or interstate. 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

[3] 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.

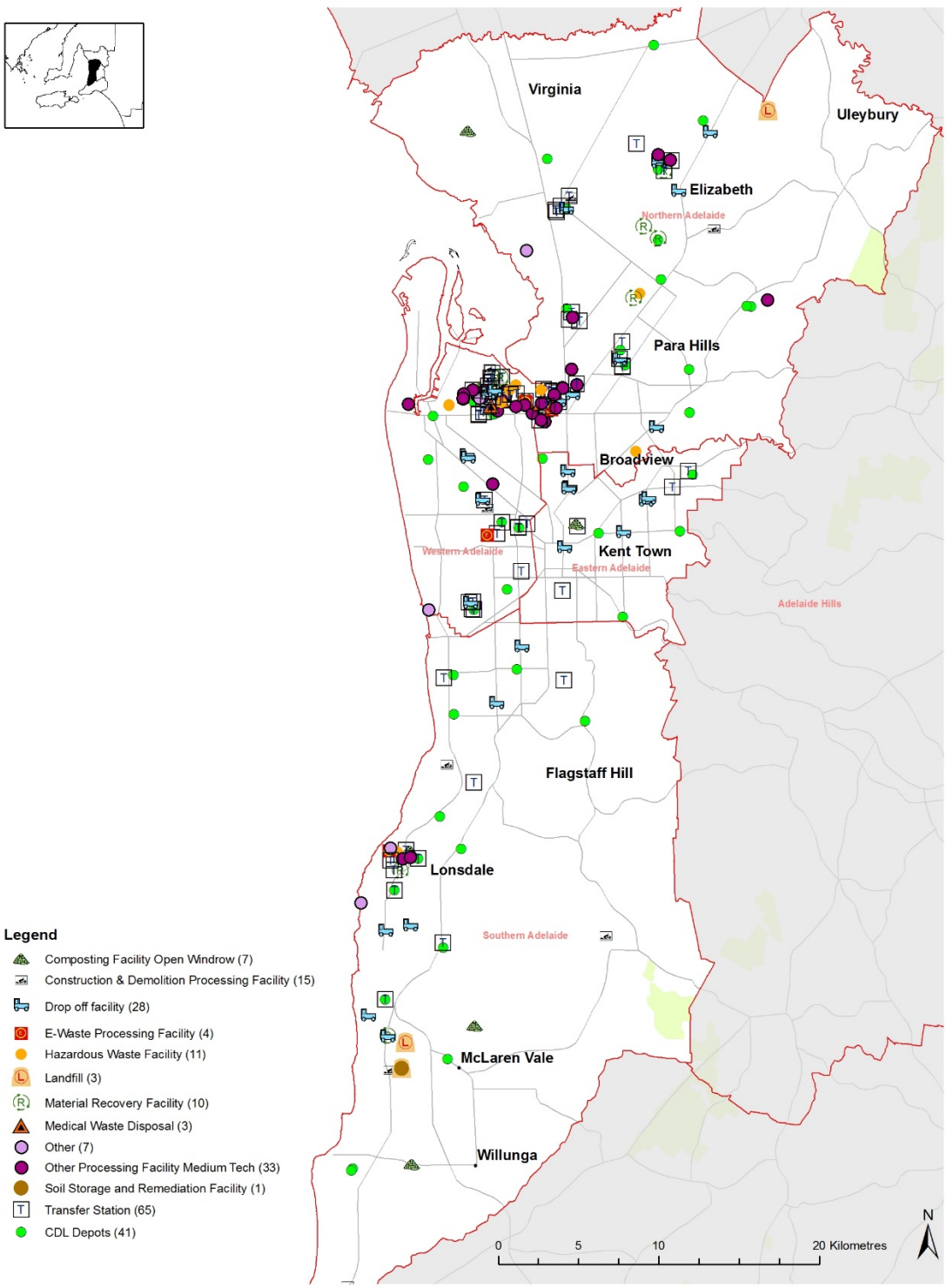

Figure 3. Waste and resource recovery infrastructure in metropolitan Adelaide

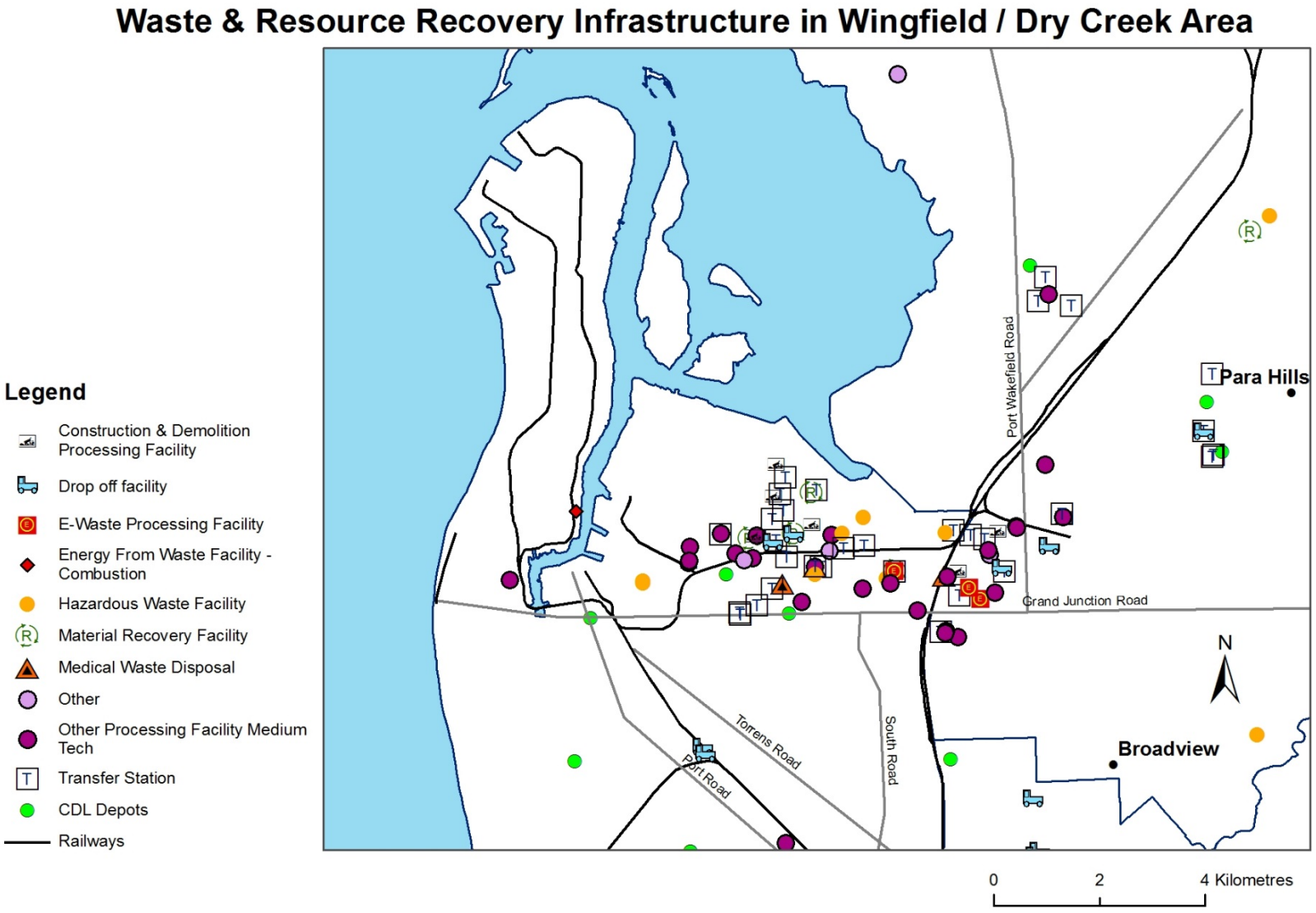

Figure 4. Waste and resource recovery infrastructure in the Wingfield / Dry Creek area

Future infrastructure needs

Waste volumes projections: 10 years (2024-25), Moderate Additional Diversion

Table 10. Metropolitan Adelaide 2024-25 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 2013-14		
Tonnes per annum	Waste Generation	Resource Recovery	Landfill	Waste Generation	Resource Recovery	Landfill
MSW	704,000	493,000	211,000	56,000	107,000	-51,000
C&I	1,185,000	948,000	237,000	257,000	237,000	21,000[4]
C&D	2,524,000	2,272,000	252,000	548,000	525,000	23,000[4]
Total	**4,414,000**	**3,713,000**	**701,000**	**862,000**	**869,000**	**-7,000**

Note that values in the table may not sum to totals due to rounding.

Forecast of potential infrastructure needs: 10 years (2024-25), Moderate Additional Diversion scenario

An estimated $94 million of investment in new/expanded infrastructure will be needed across Metropolitan Adelaide by 2024-25 under the Moderate Additional Diversion scenario to manage projected additional volumes of waste and resource recovery[5]. This includes:

- **$33 million for MSW waste infrastructure**, including for 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).
- **$41 million for C&I waste infrastructure**, including for skip bins, collection vehicles, transfer vehicles, CDL facilities, compost facilities (covered tunnel), energy-from-waste anaerobic digestion facilities and other reprocessing facilities (medium technology).
- **$20 million for C&D waste infrastructure,** including for skip bins, collection vehicles, transfer vehicles, C&D processing facilities, and a waste soil storage and remediation facility.

[4] Under the 10-year Moderate Additional diversion scenario, there is projected to be an increase in C&I and C&D landfill volumes above the baseline period. This projected increase in landfill volumes is the result of projected waste generation volumes growing greater than additional resource recovery.

[5] This capital expenditure estimates 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 11. Forecast number of new/expanded infrastructure units required for the Metropolitan Adelaide region by 2024-25 for Moderate Additional Diversion scenario modelled[6]

	10 year forecast Moderate Additional Diversion			
Number of new/ expanded infrastructure units	**MSW**	**C&I**	**C&D**	**Total Region**
Kerbside Source Separation bin systems	39,387	-	-	39,387
Skip bins	-	6,871	274	7,146
Collection vehicles	4	25	17	46
Vacuum system	0.5	-	-	0.5
Transfer vehicles	2.3	6.6	7.0	15.9
CDL facilities	3.3	7.1	-	10.5
Drop-off facilities	31.1	-	-	31.1
Composting facilities (covered tunnel)	0.5	0.6	-	1.1
Energy-from-waste - anaerobic digestion	0.3	0.8	-	1.1
C&D processing facilities	-	-	0.9	0.9
Other reprocessing facilities (medium tech)	1.4	5.6	-	7.0
Waste soil storage and remediation facilities	-	-	1.2	1.2
Emerging waste stream facility	1.3	0.3	-	1.6
Total capital expenditure ($ million)	**33**	**41**	**20**	**94**

Note that values in the table may not sum to totals due to rounding.

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% 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 radio frequency identification technologies (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 behaviors.

[6] 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.

- 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, wraps), hard plastics (e.g. buckets, plastic toys, cups, pots) and expanded polystyrene (e.g. EPS packaging).
- Future growth in medium density, high density and multi-unit developments (MUDs) in specific locations may give rise to challenges in relation 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 within the context of smart growth and brownfield development along transit corridors as identified in the *30-Year Plan for Greater Adelaide*. 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 has obtained Government approvals to establish a pilot soil recycling facility, or soil bank, on its land at West Grand Trunkway. It will test the feasibility of receiving and managing contaminated soils from development sites for reuse as fill material. The trial facility will receive, test and reclassify waste fill and intermediate and low level contaminated soils.

Hazardous waste infrastructure

- Currently household hazardous waste is collected at a depot in Dry Creek. There is an opportunity to establish several permanent low toxicity household hazardous waste collection facilities in metropolitan Adelaide at existing transfer station sites, to improve the accessibility for households to responsible hazardous material disposal facilities.
- South Australia has sufficient capacity within existing infrastructure to process a range of hazardous streams (including medical waste) over the next 10 to 30 years. The type of technology applied to treatment of 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 drop-off facilities. The region 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 equipment into its 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.

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 recovered volumes of recyclables. This includes facilities undertaking glass beneficiation, metals reprocessing, tyres reprocessing, plastic granulation and production of refuse derived fuel (RDF).
- 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 region.
    - Uncertainty surrounding the increased re-manufacturing of plastics in South Australia due to business cost factors (higher energy and labour costs) which once worked in favour of local reprocessing.
    - Need for further investment in the design, development 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 (e.g. extrusion equipment) where products have secure markets.
    - Reducing residuals from resource recovery operations which are expensive to dispose of through investment in facilities such as a vehicle shredder floc reprocessing plant and expanded residual fines glass reprocessing.
    - Tyre processing for application in asphalt manufacture.
    - Tyre shredding and sizing for RDF manufacture.
    - Upgrades in facilities to enable expanded use of RDF in local cement manufacture
    - New product development.

30 Year Outlook, High Additional Diversion scenario

Table 12. Metropolitan Adelaide projected tonnes per annum of waste generation, resource recovery and landfill in 2044-45 for High Additional Diversion scenario

	Projected volumes (tonnes) – 30 years			Change (tonnes) from 2013-14		
Tonnes per annum	Waste Generation	Resource Recovery	Landfill	Waste Generation	Resource Recovery	Landfill
MSW	819,000	819,000	-	171,000	433,000	-262,000
C&I	1,849,000	1,849,000	-	921,000	1,138,000	-216,000
C&D	3,939,000	3,939,000	-	1,963,000	2,192,000	-229,000
Total	**6,608,000**	**6,608,000**	**-**	3,056,000	3,764,000	-708,000

Note that values in the table may not sum to totals due to rounding.

An estimated $725 million of investment in infrastructure will be needed across the region over the next 30 years to manage projected additional volumes of waste generation and resource recovery. This includes:

- $277 million for MSW waste infrastructure
- $323 million for C&I waste infrastructure
- $126 million for C&D waste infrastructure

Potential investment will be needed in collection infrastructure, 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.

To achieve zero waste to landfill, investment in alternative technologies will be needed to recover waste from the residual stream. This would potentially include MBT facilities, energy-from-waste combustion facilities or other future technologies[7].

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 given:

- The precinct has excellent access to freight transport routes (road, rail and ports)
- There is an availability of a full range of land sizes to cater for differing scales and needs for infrastructure

[7] Appendix B provides forecasted number of new/expanded infrastructure units for the scenario modelled.

- It builds on an existing cluster of waste management facilities in this location and supports the synergies provided by a cluster
- Its proximity to a power station and associated land-uses
- Infrastructure in the region is unlikely to be compromised by the encroachment of sensitive land-uses (future housing over 500 meters away) and office and retail development limited by proposed planning policies

Potential challenges of this location include some sites may have proximity to the coast and sensitive coastal environment (including the Dolphin Sanctuary), the presence of acid sulphate soils that needs to be managed, the potential for inundation of some land areas that will require mitigation works to occur, 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, and 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 given:

- 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 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) and that vacant and larger scale sites may be difficult to find and would require consolidation of existing development.

All forms of infrastructure are appropriate broadly within this precinct except open windrow composting facilities and MBT biological treatment facility and energy-from-waste facility on the former Port Stanvac refinery site (if amenity impacts are suitably designed and managed).

PROFILE: ADELAIDE HILLS

Current status

Baseline waste and recycling volumes

Most waste (estimated at 46%) in the region is generated by the MSW sector and key streams include organics (including food and garden waste), cardboard, paper, plastics and metals. An estimated 32% of total waste was generated by the C&I sector, which was generated by businesses and industry and includes streams such as organics, cardboard/paper, metal and other materials.

Table 13. The Adelaide Hills region 2013-14 waste profile

Tonnes per annum	Waste generation	Resource recovery	Landfill
MSW	29,600	11,700	17,900
C&I	20,800	13,900	6,900
C&D	14,400	8,600	5,800
Total	64,800	34,200	30,600

Note that values in the table may not sum to totals due to rounding.

Future infrastructure needs

Waste volumes projections: 10 years (2024-25), Moderate Additional Diversion

Table 14. The Adelaide Hills region 2024-25 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 2013-14**		
Tonnes per annum	Waste generation	Resource recovery	Landfill	Waste Generation	Resource Recovery	Landfill
MSW	32,200	22,500	9,600	2,600	10,800	-8,300
C&I	26,600	25,000	1,600	5,800	11,100	-5,300
C&D	18,300	12,800	5,500	3,900	4,200	-300
Total	**77,100**	**60,300**	**16,700**	**12,300**	**26,100**	**-13,900**

Note that values in the table may not sum to totals due to rounding.

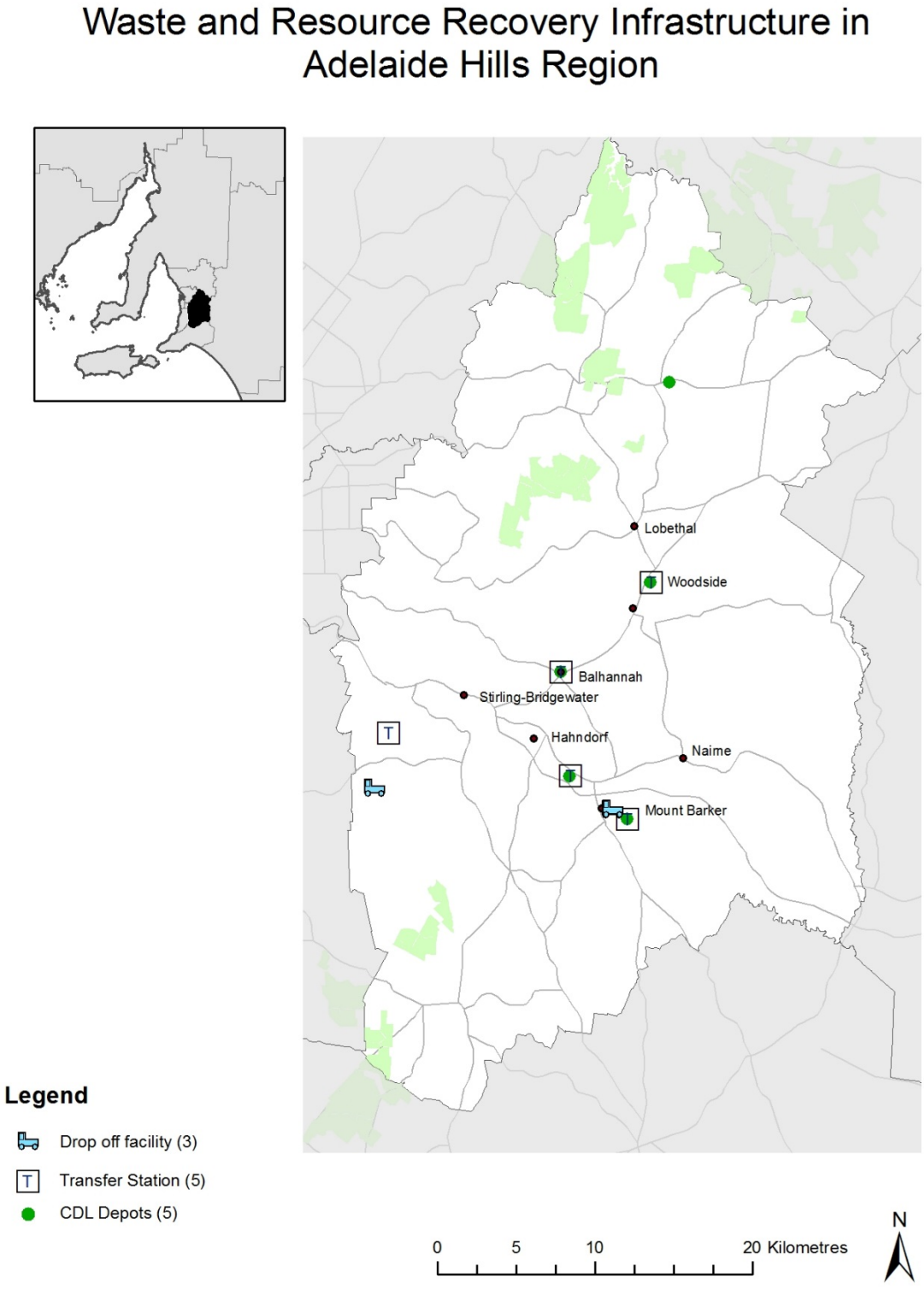

Figure 5. Existing waste and resource recovery infrastructure in the Adelaide Hills region

Forecast of potential infrastructure needs: 10 years (2024-25), Moderate Additional Diversion scenario

An estimated $2.3 million of investment in infrastructure will be needed across the Adelaide Hills region by 2024-25 under the Moderate Additional Diversion scenario to manage projected additional volumes of waste generation, resource recovery and landfill.[8]

Table 15. Forecast number of new/expanded infrastructure units required for the Adelaide Hills region by 2024-25 for Moderate Additional Diversion scenario [9]

	10 year forecast Moderate Additional Diversion			
Number of new/ expanded infrastructure units	**MSW**	**C&I**	**C&D**	**Total region**
Kerbside Source Separation bin systems	1,799	-	-	1,799
Skip bins	-	154	2	156
Collection vehicles	0.2	0.6	0.1	0.9
Transfer vehicles	0.09	0.06	0.05	0.2
CDL facilities	0.2	0.4	-	0.6
Drop-off facilities	1.8	-	-	1.8
Composting facilities (open windrow)	0.7	0.5		1.2
C&D processing facilities	-	-	0.06	0.06
Total capital expenditure ($ million)	**1.2**	**0.9**	**0.2**	**2.3**

Note that values in the table may not sum to totals due to rounding.

[8] 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.

[9] 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 Appendix A) and is intended to be indicative of the types and number of new/expanded infrastructure units that will potentially be needed. Note that 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).

Region specific waste infrastructure challenges and opportunities

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

- Potential encroachment of incompatible land-uses near existing waste and resource recovery infrastructure.
- Management of CCA-treated posts generated across the McLaren Vale wine region. The disposal of CCA-treated posts is problematic given their chemical treatment and high cost of disposal to landfill. There is currently no viable recycling option available for this stream.

Potential opportunities for infrastructure development in the region include:

- Availability of biomass for reprocessing (e.g. via composting, anaerobic digestion or biofuel).

30 Year Outlook, High Additional Diversion scenario

Table 16. Adelaide Hills projected tonnes per annum of waste generation, resource recovery and landfill in 2044-45 for High Additional Diversion scenario

	Projected volumes (tonnes) – 30 years			Change (tonnes) from 2013-14		
Tonnes per annum	Waste generation	Resource recovery	Landfill	Waste generation	Resource recovery	Landfill
MSW	37,400	33,700	3,700	7,800	22,000	-14,200
C&I	41,500	39,400	2,100	20,700	25,500	-4,800
C&D	28,600	27,200	1,400	14,200	18,600	-4,400
Total	**107,500**	**100,300**	**7,200**	**42,700**	**66,100**	**-23,400**

Note that values in the table may not sum to totals due to rounding.

An estimated $15.5 million of investment in infrastructure will be needed across the region over the next 30 years under the High Additional Diversion scenario to manage projected additional volumes of waste generation, resource recovery and landfill. This includes:

- $11.9 million for MSW waste infrastructure
- $2.7 million for C&I waste infrastructure
- $1.0 million for C&D waste infrastructure

Potential investment will be needed in collection infrastructure, transfer stations, transfer vehicles, CDL facilities, drop-off facilities, open windrow composting facilities and construction and demolition waste processing facilities. To achieve higher landfill diversion, investment in alternative technologies may be needed such MBT facilities[10].

[10] 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 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 in the region (from local industry) will provide an ongoing opportunity for local reprocessing (e.g. via composting, anaerobic digestion or biofuel).

Land-use planning considerations

There is limited identified well-sited and serviced industrial land in the Adelaide Hills' development plans suitable for waste infrastructure. It is anticipated therefore that any waste infrastructure would be clustered near other waste infrastructure where possible.

PROFILE: BAROSSA, LIGHT AND LOWER NORTH

Current status

Baseline waste and recycling volumes

Most waste in the region (estimated at 79%) is generated by the C&I sector. Significant waste streams include volumes of organics generated by local industry including grape marc and agricultural organics.

Table 17. Barossa, Light and Lower North region 2013-14 waste profile

Tonnes per annum	Waste generation	Resource recovery	Landfill
MSW	28,100	11,000	17,000
C&I	153,700	147,200	6,600
C&D	13,600	8,100	5,500
Total	**195,400**	**166,300**	**29,100**

Note that values in the table may not sum to totals due to rounding.

Future infrastructure needs

Waste volume projections: 10 years (2024-25), Moderate Additional Diversion

Table 18. The Barossa, Light and Lower North 2024-25 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 2013-14**		
Tonnes per annum	Waste generation	Resource recovery	Landfill	Waste generation	Resource recovery	Landfill
MSW	30,500	21,300	9,100	2,400	10,300	-7,900
C&I	196,400	184,600	11,800	42,700	37,400	5,200[11]
C&D	17,400	12,200	5,200	3,800	4,100	-300
Total	**244,300**	**218,100**	**26,100**	**48,900**	**51,800**	**-3,000**

Note that values in the table may not sum to totals due to rounding.

[11] 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.

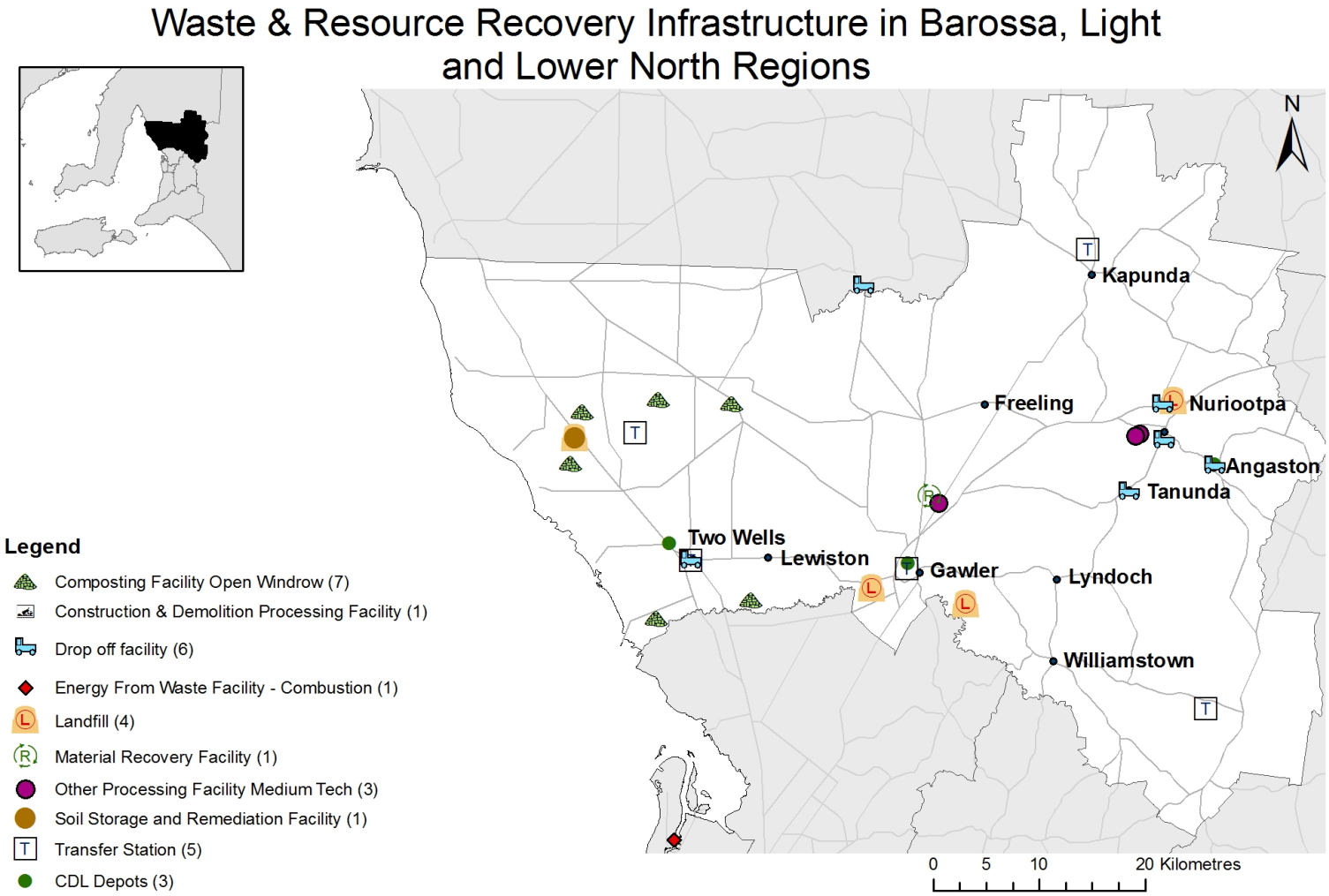

Figure 6. Existing waste and resource recovery infrastructure in the Barossa, Light and Lower North region

Forecast of potential infrastructure needs: 10 years (2024-25), Moderate Additional Diversion scenario

An estimated $7.9 million of investment in new/expanded waste and resource recovery infrastructure will be needed across the region by 2024-25 under the Moderate Additional Diversion scenario to manage projected additional volumes of waste generation, resource recovery and landfill.[12] This includes:

- **$1.3 million for MSW waste infrastructure**, including kerbside bins, collection vehicles, transfer vehicles, CDL facilities, drop-off facilities, compost facilities (covered tunnel) and other reprocessing facilities (medium technology).
- **$6.4 million for C&I waste infrastructure**, including 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**, including skip bins, collection vehicles, transfer vehicles and C&D processing facilities.

Table 19. Forecast number of new/expanded infrastructure units required for the Barossa, Light and Lower North region by 2024-25 for Moderate Additional Diversion scenario [13]

	10 year forecast Moderate Additional Diversion			
Number of new/ expanded infrastructure units	**MSW**	**C&I**	**C&D**	**Total region**
Kerbside Source Separation bin systems	1,706	-	-	1,706
Skip bins	-	1,139	2	1,141
Collection vehicles	0.2	4.1	0.1	4.4
Transfer station	-	0.5	-	0.5
Transfer vehicles	0.09	0.44	0.05	0.6
CDL facilities	0.2	0.4	-	0.6
Drop-off facilities	1.7	-	-	1.7
Composting facilities (open windrow)	0.6	0.1	-	0.7
C&D processing facilities	-	-	0.05	0.05
Other reprocessing facilities (medium technology)	0.1	1.8	-	1.9
Total capital expenditure ($ million)	**1.3**	**6.4**	**0.2**	**7.9**

[12] 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.
[13] 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 average 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. Note that 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).

Region specific waste infrastructure challenges and opportunities

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

- Potential encroachment of incompatible land-uses near existing waste and resource recovery infrastructure, such as at Two Wells.
- Management of CCA-treated posts generated in the Barossa wine region. Disposing of CCA-treated posts is problematic due to the chemical treatment and high cost of disposal to landfill. There is currently no viable recycling option available for this stream.

Potential opportunities for infrastructure development in the region include:

- Availability of biomass in region that maybe suitable for reprocessing (e.g. via composting, anaerobic digestion or biofuel).
- 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 that are located in Wingfield/Dry Creek precinct.

30 Year Outlook, High Additional Diversion scenario

Table 20. Barossa Light and Lower North region projected tonnes per annum of waste generation, resource recovery and landfill in 2044-45 for High Additional Diversion scenario

	Projected volumes (tonnes) – 30 years			Change (tonnes) from 2013-14		
Tonnes per annum	Waste Generation	Resource Recovery	Landfill	Waste generation	Resource recovery	Landfill
MSW	35,500	31,900	3,500	7,400	20,900	-13,500
C&I	306,400	291,100	15,300	152,700	143,900	8,700[14]
C&D	27,100	25,800	1,400	13,500	17,700	-4,100
Total	**369,000**	**348,800**	**20,200**	**173,600**	**182,500**	**-8,900**

Note that values in the table may not sum to totals due to rounding.

An estimated $38.3 million of investment in infrastructure will be needed across the region over the next 30 years under the High Additional Diversion scenario to manage projected additional volumes of waste generation, resource recovery and landfill. This includes:

- $11.3 million for MSW waste infrastructure
- $26.2 million for C&I waste infrastructure

[14] 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.

- $0.9 million for C&D waste infrastructure

Potential investment will be needed 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). To achieve higher landfill diversion, investment in alternative technologies may be needed such as MBT facilities.[15]

Over the 30 year timeframe it is expected that:

- The availability of biomass in the region (from local industry) will provide an ongoing opportunity for local reprocessing of this waste stream (e.g. via composting, anaerobic digestion or biofuel).
- The region may provide suitable locations for new waste and resource recovery infrastructure servicing Metropolitan Adelaide.
- There will be a transition away from 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 given:

- 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's proximity to future urban growth areas.

Potential challenges of this location include that expansion to employment lands identified in the location (associated with growth of Roseworthy township) into the future may take the shape of an Urban Employment Zone, which may introduce abilities for sensitive land-uses to be established. Broader infrastructure capacities need to be determined for adequacy.

[15] Appendix B provides the forecasted number of new/expanded infrastructure units for the scenario modelled.

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

PROFILE: FLEURIEU AND KANGAROO ISLAND

Current status

Baseline waste and recycling volumes

Most waste in the region (estimated at 46%) is generated by the MSW sector, which includes organics (including food and garden waste), cardboard, paper, plastics and metals. The C&I sector contributes an estimated 32% of total waste, which was generated by businesses and industry and included materials such as organics, cardboard/paper, metal and other materials.

Table 21. The Fleurieu Kangaroo Island region 2013-14 waste profile

Tonnes per annum	Waste generation	Resource recovery	Landfill
MSW	20,000	8,000	12,000
C&I	14,000	9,000	5,000
C&D	10,000	6,000	4,000
Total	**44,000**	**23,000**	**21,000**

Note that values in the table may not sum to totals due to rounding.

Future infrastructure needs

Waste volumes projections: 10 years (2024-25), Moderate Additional Diversion

Table 22. The Fleurieu and Kangaroo Island region 2024-25 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 2013-14**		
Tonnes per annum	Waste generation	Resource recovery	Landfill	Waste generation	Resource recovery	Landfill
MSW	22,000	15,000	7,000	2,000	7,000	-5,000
C&I	18,000	17,000	1,000	4,000	8,000	-4,000
C&D	13,000	9,000	4,000	3,000	3,000	-
Total	**53,000**	**41,000**	**12,000**	**9,000**	**18,000**	**-9,000**

Note that values in the table may not sum to totals due to rounding.

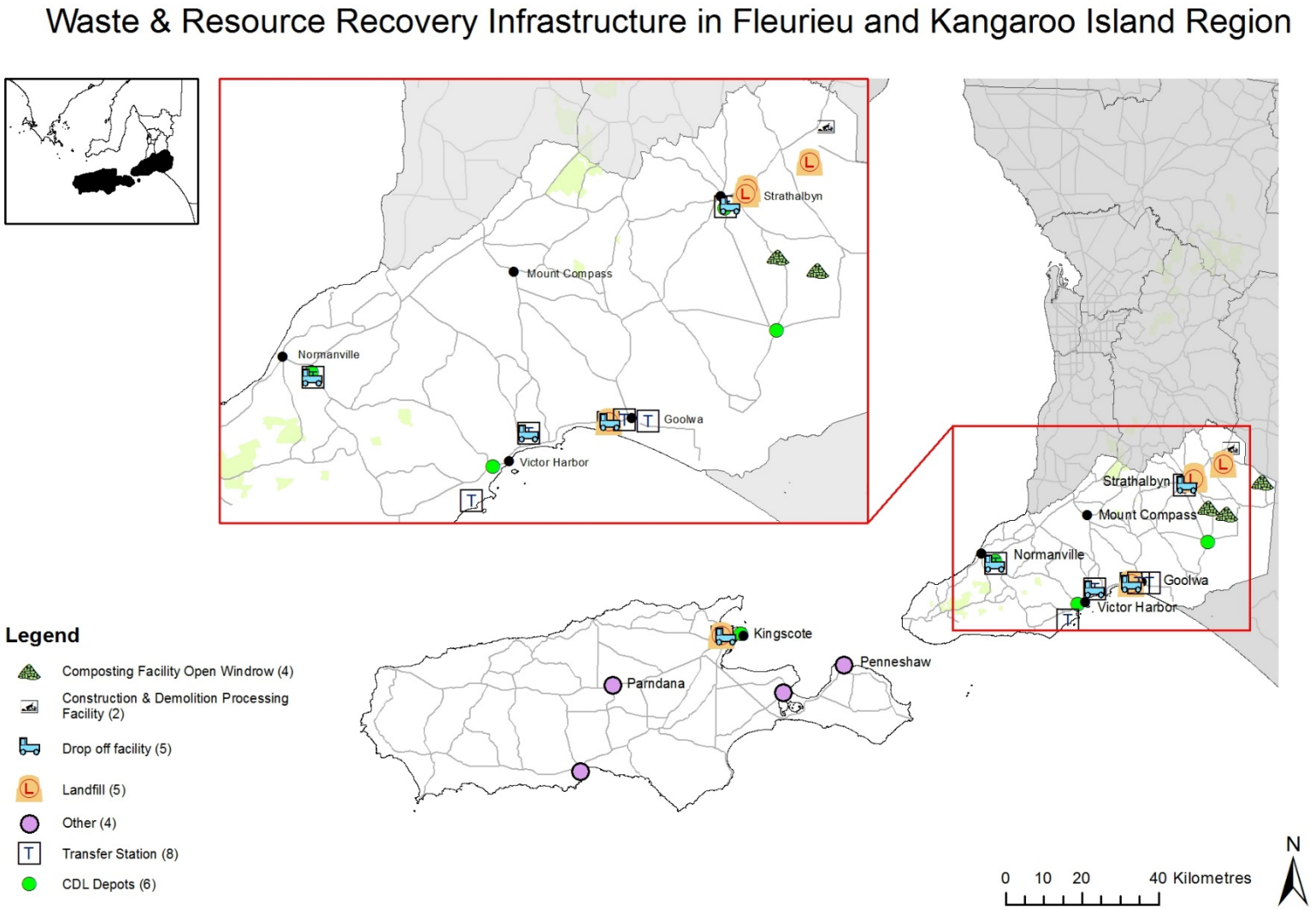

Figure 7. Waste and resource recovery infrastructure in the Fleurieu Kangaroo Island region

Forecast of potential infrastructure needs: 10 years (2024-25), Moderate Additional Diversion scenario

An estimated $1.8 million of investment in infrastructure will be needed across the Fleurieu Kangaroo Island region by 2024-25 under the Moderate Additional Diversion scenario to manage projected additional volumes of waste generation, resource recovery and landfill[16].

Table 23. Forecast number of new/expanded infrastructure units required for the Fleurieu and Kangaroo Island region by 2024-25 for Moderate Additional Diversion scenario modelled[17]

	10 year forecast Moderate Additional Diversion			
Number of new/ expanded infrastructure units	**MSW**	**C&I**	**C&D**	**Total region**
Kerbside Source Separation bin systems	1,229	-	-	1,229
Skip bins	-	105	2	107
Collection vehicles	0.1	0.4	0.08	0.6
Transfer vehicles	0.1	0.04	0.03	0.1
CDL facilities	0.1	0.3	-	0.4
Drop-off facilities	1.3	-	-	1.3
Composting facilities (open windrow)	0.5	0.3	-	0.8
C&D processing facilities	-	-	0.03	0.03
Other reprocessing facilities (medium technology)	0.1	0.1	-	0.2
Total capital expenditure ($ million)	**0.9**	**0.7**	**0.1**	**1.8**

Note that values in the table may not sum to totals due to rounding.

Region specific key waste infrastructure challenges and opportunities

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

- 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 (via ferry) where such facilities are located.
- Potential encroachment of incompatible land-uses near existing waste and resource recovery infrastructure.
- The disposal of CCA posts is problematic given their chemical treatment and high cost of disposal to landfill. There is currently no viable recycling option available for this stream.

[16] 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.
17 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 Appendix A) and is intended to be indicative of the types and number of new/expanded infrastructure units that will potentially be needed. Note that 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).

Potential opportunities for infrastructure development in the region include:

- Availability of biomass in the Fleurieu and Kangaroo Island region which may be suitable for reprocessing (e.g. via composting, anaerobic digestion or biofuel).
- Creating a closed-loop, circular economy on Kangaroo Island. For example:
  - Energy-from-waste facility, with energy used locally
  - Local composting facility, with compost used on local vineyards and farms.

30 Year Outlook, High Additional Diversion scenario

Table 24. Fleurieu Kangaroo Island region projected tonnes per annum of waste generation, resource recovery and landfill in 2044-45 for High Additional Diversion scenario

	Projected volumes (tonnes) – 30 years			Change (tonnes) from 2013-14		
Tonnes per annum	Waste Generation	Resource Recovery	Landfill	Waste generation	Resource recovery	Landfill
MSW	26,000	23,000	3,000	6,000	15,000	-9,000
C&I	28,000	27,000	1,000	14,000	18,000	-4,000
C&D	20,000	19,000	1,000	10,000	13,000	-3,000
Total	**73,000**	**68,000**	**5,000**	**29,000**	**45,000**	**-16,000**

Note that values in the table may not sum to totals due to rounding.

An estimated $10.5 million of investment in infrastructure will be needed across the region over the next 30 years under the High Additional Diversion scenario to manage projected additional volumes of waste generation, resource recovery and landfill. This includes:

- $7.8 million for MSW waste infrastructure
- $2.0 million for C&I waste infrastructure
- $0.6 million for C&D waste infrastructure

Potential 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, investment in alternative technologies may be needed MBT facilities[18].

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, provide a sustainable source of energy to the Island (through energy-from-waste) and build on activities that support environmental sustainability and ecotourism.

[18] Appendix B provides the forecasted number of new/expanded infrastructure units for the scenario modelled.

This may include greater local reuse, reprocessing and re-manufacturing of waste generated on Kangaroo Island.

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

PROFILE: EYRE AND WESTERN

Current status

Baseline waste and recycling volumes

Most waste in the region (estimated at 46%) is generated by the MSW sector, which includes organics (including food and garden waste), cardboard, paper, plastics and metals. The C&I sector contributes 32% of total waste, which 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 (Rawtec and Econsearch, 2013).

Table 25. The Eyre and Western region 2013-14 waste profile

Tonnes per annum	Waste generation	Resource recovery	Landfill
MSW	23,900	9,400	14,500
C&I	16,800	11,200	5,600
C&D	11,600	6,900	4,700
Total	**52,300**	**27,500**	**24,800**

Note that values in the table may not sum to totals due to rounding.

Future infrastructure needs

Waste volumes projections: 10 years (2024-25), Moderate Additional Diversion

Table 26. Eyre and Western region future waste Scenario – 2024-25 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 2013-14		
Tonnes per annum	Waste generation	Resource recovery	Landfill	Waste generation	Resource recovery	Landfill
MSW	26,000	18,200	7,800	2,100	8,800	-6,700
C&I	21,500	20,200	1,300	4,700	9,000	-4,300
C&D	14,800	10,400	4,500	3,200	3,500	-200
Total	**62,300**	**48,800**	**13,600**	**10,000**	**21,300**	**-11,200**

Note that values in the table may not sum to totals due to rounding.

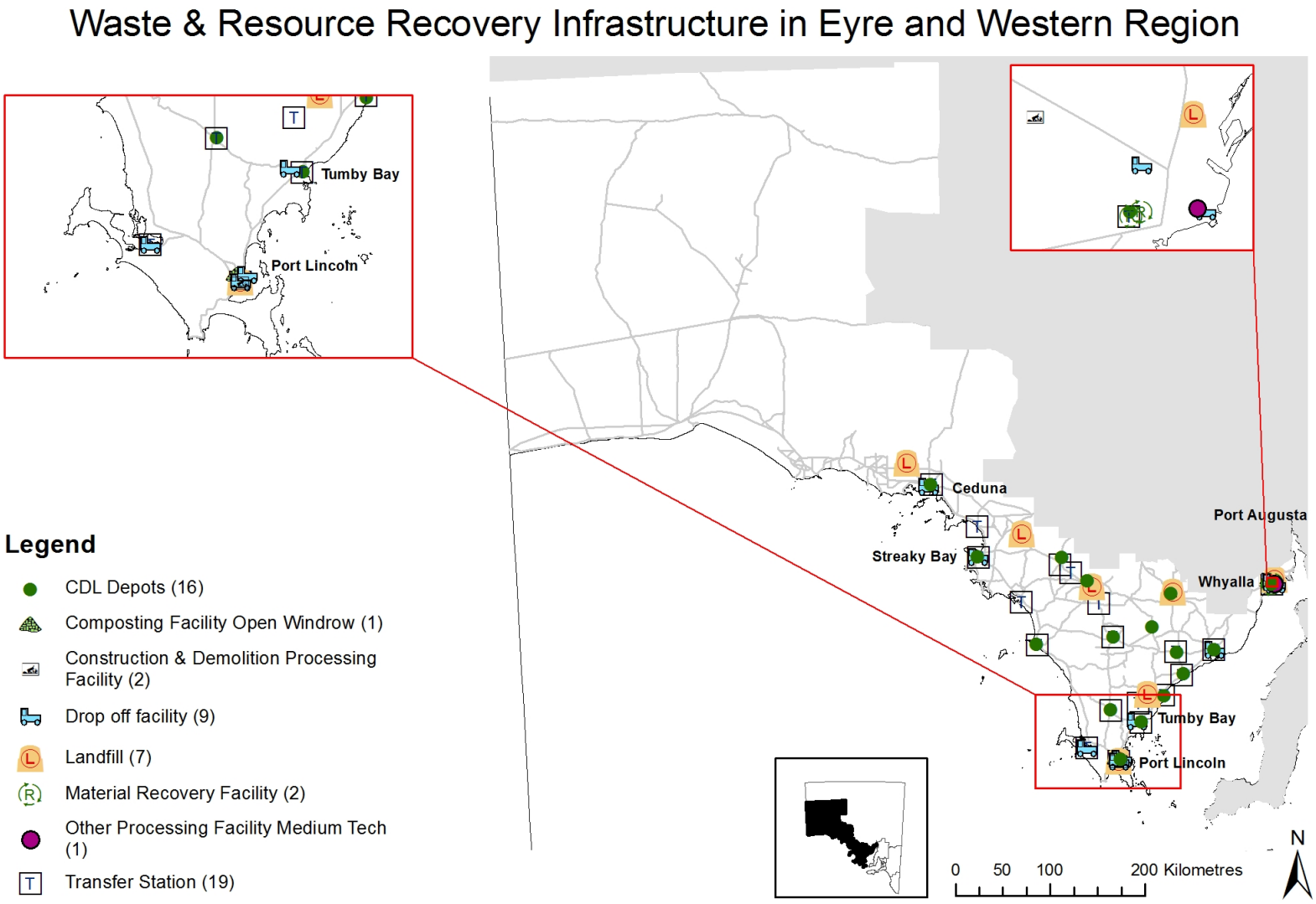

Figure 8. Existing waste and resource recovery infrastructure in the Eyre and Western region

Forecast of potential infrastructure needs: 10 years (2024-25), Moderate Additional Diversion scenario

An estimated $2.1 million of investment in new/expanded waste and resource recovery infrastructure will be needed across the Eyre and Western region by 2024-25 under the Moderate Additional Diversion scenario to manage projected additional volumes of waste generation, resource recovery and landfill.[19]

Table 27. Forecast number of new/expanded infrastructure units required for the Eyre and Western region by 2024-25 for Moderate Additional Diversion scenario modelled[20]

	10-year forecast Moderate Additional Diversion			
Number of new/ expanded infrastructure units	**MSW**	**C&I**	**C&D**	**Total region**
Kerbside SS bin systems	1,454	-	-	1,454
Skip bin	-	124	2	126
Collection vehicles	0.2	0.4	0.1	0.7
Transfer vehicles	0.07	0.05	0.04	0.2
CDL Facilities	0.2	0.3	-	0.5
Drop-off facilities	1.5	-	-	1.5
Composting facilities (open windrow)	0.5	0.4	-	0.9
C&D processing facilities	-	-	0.04	0.04
Other reprocessing facilities (medium technology)	0.1	0.1	-	0.2
Total capital expenditure ($ million)	**1.1**	**0.9**	**0.1**	**2.1**

Note that values in the table may not sum to totals due to rounding.

Region specific key waste infrastructure, challenges and opportunities

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

- Challenges involved with management of oyster baskets generated by local industry. The costs involved with recovering composite recyclable materials and the cost of transport to recycling markets creates challenges for recycling these items. Instead, oyster baskets are stockpiled or landfilled.
- Lengthy travel distances and high costs involved with sending recovered materials to recycling markets and ports in Adelaide.

[19] 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.
[20] The number of units is based on average 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. Fractions of units may indicate expansion of an existing facility, or a smaller capacity facility. Note that 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).

- Limited number of landfills in the region relative to size of the geographical area. Transporting waste from some locations to regional landfills involves lengthy travel distances and the associated costs.

Potential opportunities for infrastructure development in the region include:

- Investment in equipment and facilities for compaction and bulk hauling to 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.
- Expansion/development of commercial composting to process organics from MSW sources and organics industries (e.g. aquaculture and fisheries).

30 Year Outlook, High Additional Diversion scenario

Table 28. Eyre Western region projected tonnes per annum of waste generation, resource recovery and landfill in 2044-45 for High Additional Diversion scenario

	Projected volumes (tonnes) – 30 years			Change (tonnes) from 2013-14		
Tonnes per annum	Waste generation	Resource recovery	Landfill	Waste generation	Resource recovery	Landfill
MSW	30,200	27,200	3,000	6,300	17,800	-11,500
C&I	33,600	31,900	1,700	16,800	20,700	-3,900
C&D	23,100	22,000	1,200	11,500	15,100	-3,500
Total	**86,900**	**81,100**	**5,900**	**34,600**	**53,600**	**-18,900**

Note that values in the table may not sum to totals due to rounding.

An estimated $12.6 million of investment in infrastructure will be needed across the region over the next 30 years under the High Additional Diversion scenario to manage projected additional volumes of waste generation, resource recovery and landfill. This includes:

- $9.4 million for MSW waste infrastructure
- $2.4 million for C&I waste infrastructure
- $0.8 million for C&D waste infrastructure

Potential investment will be needed 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). To achieve higher landfill diversion, investment in alternative technologies may be needed such MBT facilities.[21]

[21] 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 type of different material components and improve their suitability for recycling.

Land-use planning considerations

The Eyre Peninsula Plan 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.

PROFILE: FAR NORTH

Current status

Baseline waste and recycling volumes

The Far North region generated an estimated 23,500 tonnes of waste in the 2013-14, excluding fly ash volumes (110,000 tonnes generated by the Port Augusta power station). Most waste (46%) was generated by the MSW sector, which includes organics (including food and garden waste), cardboard, paper, plastics and metals.

Table 29. The Far North region 2013-14 waste profile excluding fly ash volumes

Tonnes per annum	Waste generation	Resource recovery	Landfill
MSW	10,700	4,200	6,500
C&I (ex. Fly ash)	7,600	5,000	2,500
C&D	5,200	3,100	2,100
Total (ex. Fly ash)	**23,500**	**12,300**	**11,100**

Note that values in the table may not sum to totals due to rounding.

Future infrastructure needs

Waste volumes projections: 10 years (2024-25), Moderate Additional Diversion

Table 30. The Far North region 2024-25 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 2013-14**		
Tonnes per annum	Waste Generation	Resource Recovery	Landfill	Waste generation	Resource recovery	Landfill
MSW	11,700	8,200	3,500	1,000	4,000	-3,000
C&I	9,700	9,100	600	2,100	4,100	-1,900
C&D	6,700	4,700	2,000	1,500	1,600	-100
Total	**28,100**	**22,000**	**6,100**	**4,600**	**9,700**	**-5,000**

Note that values in the table may not sum to totals due to rounding.

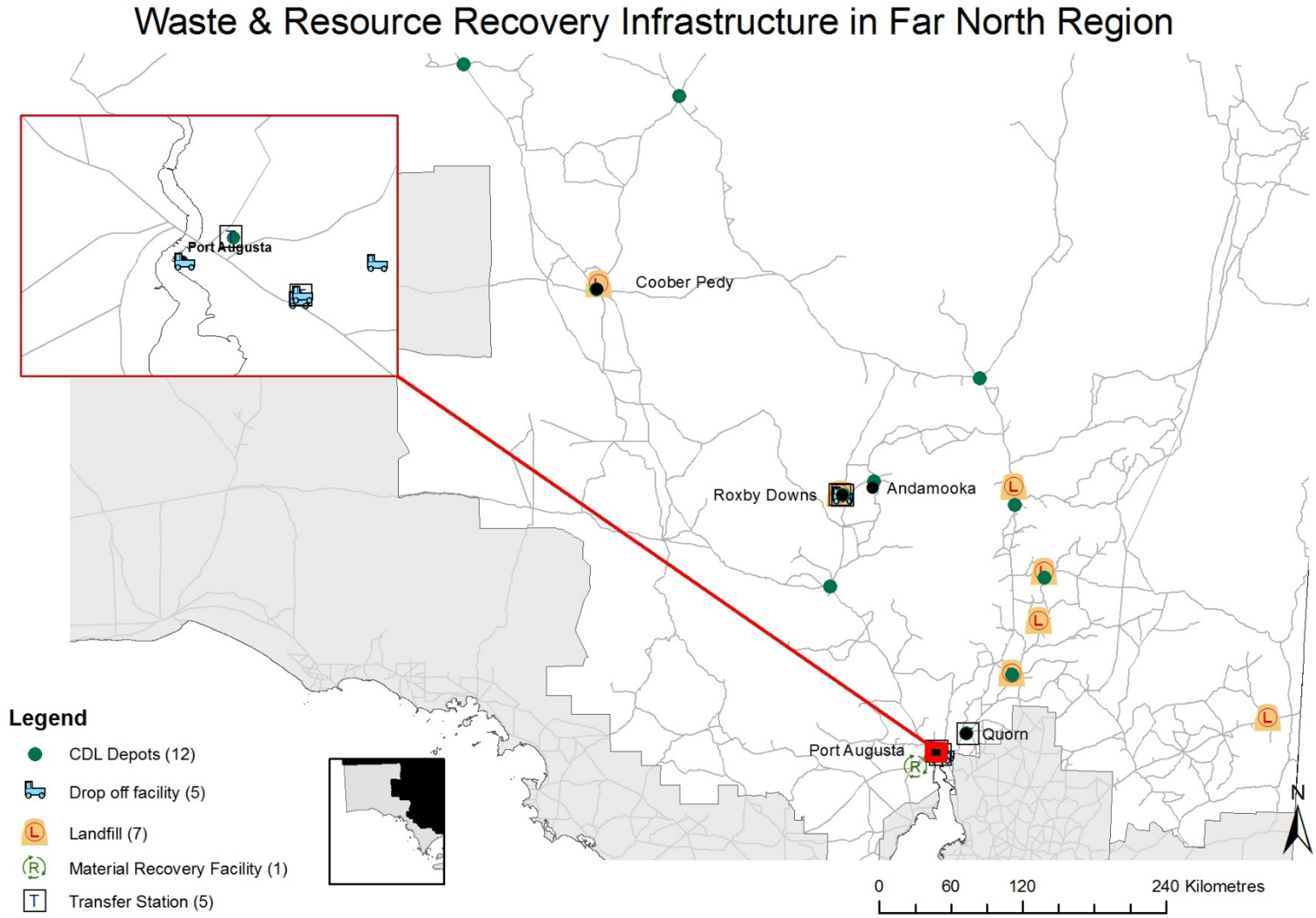

Figure 9. Waste and resource recovery infrastructure in the Far North region

Forecast of potential infrastructure needs: 10 years (2024-25), Moderate Additional Diversion scenario

An estimated $920,000 of investment in new/expanded waste and resource recovery infrastructure will be needed across the Far North region by 2024-25 under the Moderate Additional Diversion scenario to manage projected additional volumes of waste generation, resource recovery and landfill.[22]

These estimates do not include infrastructure and investment needed in the Anangu Pitjantjatjara Yankunytjatjara (APY) lands.

Table 31. Forecast number of new/expanded infrastructure units required for the Far North region by 2024-25 for Moderate Additional Diversion scenario modelled[23]

	10-year forecast Moderate Additional Diversion			
Number of new/ expanded infrastructure units	**MSW**	**C&I**	**C&D**	**Total region**
Kerbside SS bin systems	653	-	-	653
Skip bins	-	56	1	57
Collection vehicles	0.07	0.2	0.04	0.3
Transfer vehicles	0.03	0.02	0.02	0.1
CDL facilities	0.07	0.15	-	0.2
Drop-off facilities	0.7	-	-	0.7
Composting facilities (open windrow)	0.2	0.2	-	0.4
C&D processing facilities	-	-	0.003	0.003
Other reprocessing facilities (medium technology)	0.05	0.06	-	0.1
Total capital expenditure ($ million)	**0.50**	**0.39**	**0.03**	**0.92**

Note that values in the table may not sum to totals due to rounding.

Region specific key waste infrastructure, challenges and opportunities

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

- Small economies of scale due to low population spread over large distances leading to higher waste collection costs and reduced commercial viability for local reprocessing of waste.
- Challenges with collecting waste in remote areas that have poor road conditions.
- Poor equipment for waste management activities and limited access to suitable maintenance and spare parts.

22 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.

23 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 Appendix A) and is intended to be indicative of the types and number of new/expanded infrastructure units that will potentially be needed. Note that 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).

- Large travel distances and high costs involved with sending recovered materials to recycling markets in Adelaide and export transport networks.
- Limited number of landfills in the region relative to size of the geographical area. Transporting waste from locations to regional landfills can involve large travel distances and associated high costs.

The Office of Green Industries SA has prepared two key reports which outline 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.

The reports found additional challenges for infrastructure in APY lands, such as:

- Bins being knocked over by animals
- Unfenced landfills that are full to overflowing with some located adjacent watercourses or above groundwater bores that are used as water supply for communities, with metals and building materials consume valuable landfill capacity and burning occurs regularly to assist in volume reduction
- Windblown debris scattered for kilometres
- Significant litter problem while there was no program in place to redeem and recover the used beverage containers deposits from APY communities due to the remoteness
- Lack of suitable collection vehicles and equipment and a severe shortage of mechanical skills for their service and maintenance
- Poor condition of existing infrastructure due to environmental factors and lack of maintenance.

Special trials and projects undertaken on the APY Lands to improve its waste management infrastructure and system included:

- Provision of two 240 litre mobile garbage bins with lids, wheels and handles per house, accompanied with educational training called 'Germ Theory' which explores the 'shy' issues surrounding bin use and proper waste management
- Bins and bin stands in public places to provide basic infrastructure that will not be knocked over by animals
- A collection system for 10 cent deposit containers throughout schools to reduce litter, increase recycling and provide an income stream; now interest gained from the APY community stores with beverage containers refund program
- Cardboard balers were installed into the APY Land community stores with 40 tonnes of cardboard returned to Adelaide for recycling.

- Technical guidelines which explain how to establish and maintain appropriate infrastructure for use in outback areas and remote Aboriginal lands were drafted by the Office of 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.
- Investment in specialised equipment and facilities that are 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 unit for biosolids management, cardboard balers for community stores, transport cages, landfill compaction equipment including roller types with steel wheels, and develop new or upgrade existing landfill sites in accordance with requirements of the EPA.

30 Year Outlook, High Additional Diversion scenario

Table 32. The Far North region projected tonnes per annum of waste generation, resource recovery and landfill in 2044-45 for High Additional Diversion scenario

	Projected volumes (tonnes) – 30 years			Change (tonnes) from 2013-14		
Tonnes per annum	Waste Generation	Resource Recovery	Landfill	Waste generation	Resource recovery	Landfill
MSW	13,600	12,200	1,400	2,900	8,000	-5,100
C&I	15,100	14,300	800	7,500	9,300	-1,700
C&D	10,400	9,900	500	5,200	6,800	-1,600
Total	**39,000**	**36,400**	**2,600**	**15,500**	**24,100**	**-8,500**

Note that values in the table may not sum to totals due to rounding.

An estimated $5.5 million of investment in infrastructure will be needed across the region over the next 30 years under the High Additional Diversion scenario to manage projected additional volumes of waste generation, resource recovery and landfill. This includes:

- $4.1 million for MSW waste infrastructure
- $1.1 million for C&I waste infrastructure
- $300,000 for C&D waste infrastructure

Potential 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, investment in alternative technologies may be needed such as MBT facilities.[24]

[24] 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 in the APY lands which is suited to the local conditions.

Land-use planning considerations

The Andamooka Structure Plan identifies the need to close the existing waste site and plan for a new landfill facility and waste transfer station outside of the existing township boundary (White Dam Road is identified as a potential site).

PROFILE: LIMESTONE COAST

Current status

Baseline waste and recycling volumes

Most waste in the region (76%) 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 33. The Limestone Coast region 2013-14 waste profile

Tonnes per annum	Waste generation	Resource recovery	Landfill
MSW	26,900	10,600	16,300
C&I	128,600	122,300	6,300
C&D	13,100	7,800	5,300
Total	**168,600**	**140,700**	**27,900**

Note that values in the table may not sum to totals due to rounding.

Future infrastructure needs

Waste volumes projections: 10 years (2024-25), Moderate Additional Diversion

Table 34. The Limestone Coast region future waste Scenario – 2024-25 projections for tonnes per annum of waste generation, resource recovery and landfill, Moderate Additional Diversion scenario

	Projected volumes (tonnes) – 10 years			**Change (tonnes) from 2013-14**		
Tonnes per annum	Waste generation	Resource recovery	Landfill	Waste generation	Resource recovery	Landfill
MSW	29,200	20,500	8,800	2,300	9,900	-7,500
C&I	164,300	154,400	9,900	35,700	32,100	3,600[25]
C&D	16,700	11,700	5,000	3,600	3,900	-300
Total	**210,200**	**186,600**	**23,700**	**41,600**	**45,900**	**-4,200**

Note that values in the table may not sum to totals due to rounding.

[25] 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.

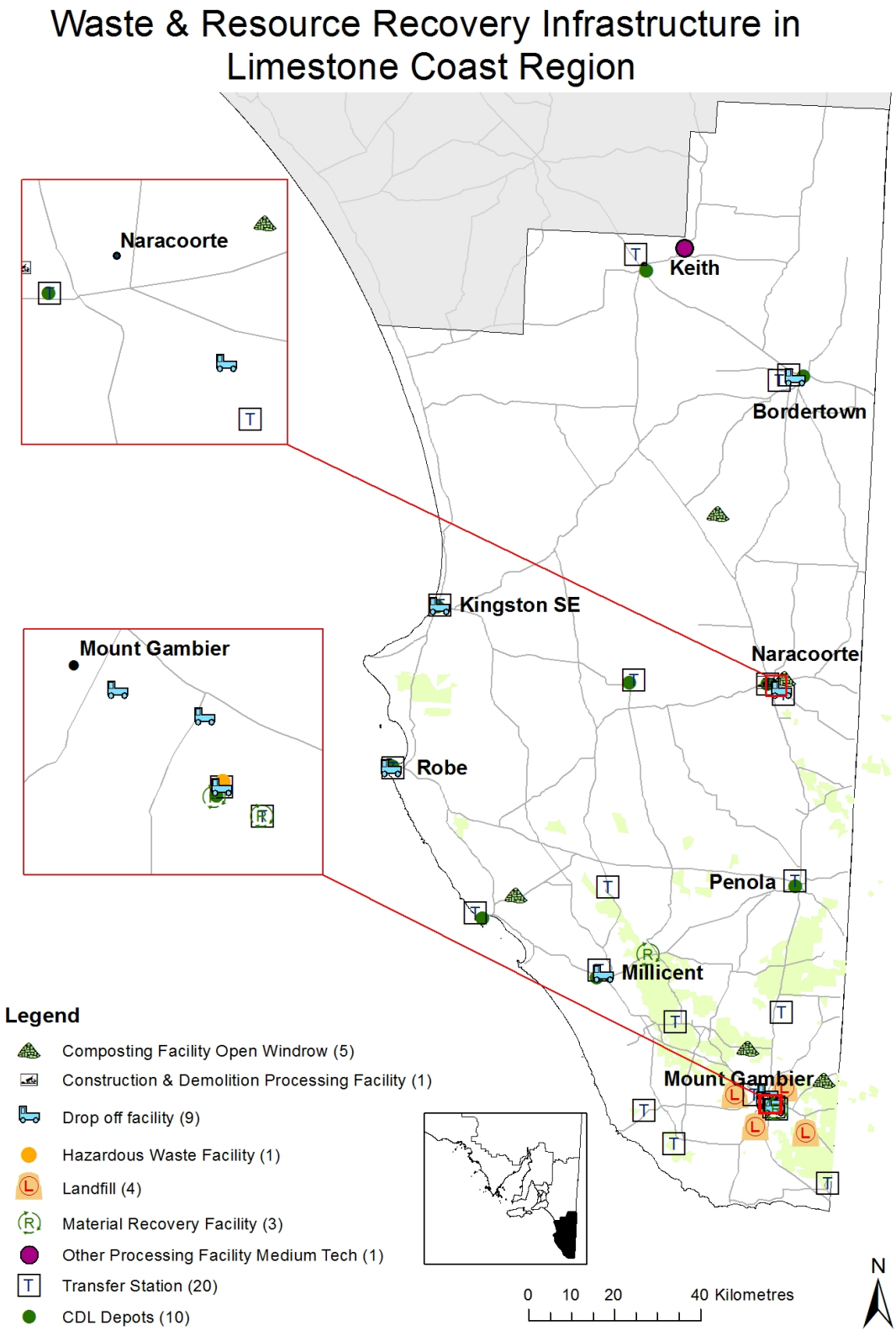

Figure 10. Existing waste and resource recovery infrastructure in the Limestone Coast region

Forecast of potential infrastructure needs: 10 years (2024-25), Moderate Additional Diversion scenario

An estimated $10.2 million of investment in new/expanded waste and resource recovery infrastructure will be needed across the Limestone Coast region by 2024-25 under the Moderate Additional Diversion scenario to manage projected additional volumes of waste generation, resource recovery and landfill.[26] This includes:

- **$700,000 for MSW waste infrastructure**, including kerbside bins, collection vehicles, transfer vehicles, CDL facilities, drop-off facilities and other reprocessing facilities (medium technology).
- **$9.4 million for C&I waste infrastructure**, including 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**, including skip bins, collection vehicles, transfer vehicles and C&D processing facilities.

Table 35. Forecast number of new/expanded infrastructure units required for the Limestone Coast region by 2024-25 for Moderate Additional Diversion scenario modelled[27]

	10-year forecast Moderate Additional Diversion			
Number of new/ expanded infrastructure units	**MSW**	**C&I**	**C&D**	**Total region**
Kerbside Source Separation bin systems	1,636	-	-	1,636
Skip bins	-	953	2	955
Collection vehicles	0.2	3.4	0.1	3.7
Transfer stations	-	0.4	-	0.4
Transfer vehicles	0.1	0.4	0.05	0.5
CDL facilities	0.2	0.4	-	0.6
Drop-off facilities	1.7	-	-	1.7
Energy-from-waste - anaerobic digestion	-	0.5	-	0.5
C&D processing facilities	-	-	0.05	0.05
Other reprocessing facilities (medium technology)	0.1	0.9	-	1.0
Total capital expenditure ($ million)	**0.7**	**9.4**	**0.2**	**10.2**

Note that values in the table may not sum to totals due to rounding.

26 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.

27 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 Appendix A) and is intended to be indicative of the types and number of new/expanded infrastructure units that will potentially be needed. Note that 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).

Region specific key waste infrastructure, challenges and opportunities

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

- Limited number and access to landfills servicing the region. Transporting waste from some locations to landfills in the region (or to other regions) involves long travel distances and associated costs.
- Long travel distances and high costs involved with sending recovered materials to recycling markets and export ports in Adelaide.
- Challenges with management of CCA-treated posts generated in the Coonawarra wine region. Disposing CCA-treated posts is problematic due to the chemical treatment and high cost of disposal to landfill. There is currently no viable recycling option available for this stream.
- 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)
- 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 36. Limestone Coast region projected tonnes per annum of waste generation, resource recovery and landfill in 2044-45 for High Additional Diversion scenario

	Projected volumes (tonnes) – 30 years			**Change (tonnes) from 2013-14**		
Tonnes per annum	Waste feneration	Resource recovery	Landfill	Waste generation	Resource recovery	Landfill
MSW	34,000	30,600	3,400	7,100	20,000	-12,900
C&I	256,400	243,600	12,800	127,800	121,300	6,500[28]
C&D	26,000	24,700	1,300	12,900	16,900	-4,000
Total	**316,400**	**298,900**	**17,500**	**147,800**	**158,200**	**-10,400**

Note that values in the table may not sum to totals due to rounding.

[28] 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.

An estimated $55.3 million of investment in infrastructure will be needed across the region over the next 30 years under the High Additional Diversion scenario to manage projected additional volumes of waste generation, resource recovery and landfill. This includes:

- $10.6 million for MSW waste infrastructure
- $43.8 million for C&I waste infrastructure
- $0.9 million for C&D waste infrastructure

Potential 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, construction and demolition waste processing facilities and other reprocessing facilities (medium technology). To achieve higher landfill diversion, investment in alternative technologies may be needed such as MBT facilities.[29]

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. There may be 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.
- There will be a transition away from 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 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 potential facilities may also be established.

[29] Appendix B provides the forecasted number of new/expanded infrastructure units for the scenario modelled.

PROFILE: MURRAY MALLEE

Current status

Baseline waste and recycling volumes

Most waste (78%) 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 37. The Murray Mallee region 2013-14 waste profile

Tonnes per annum	Waste Generation	Resource Recovery	Landfill
MSW	28,700	11,300	17,400
C&I	147,800	141,000	6,700
C&D	13,900	8,300	5,600
Total	**190,400**	**160,600**	**29,700**

Note that values in the table may not sum to totals due to rounding.

Future infrastructure needs

Waste volumes projections: 10 years (2024-25), Moderate Additional Diversion

Table 38. The Murray Mallee region 2024-25 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 2013-14**		
Tonnes per annum	Waste generation	Resource recovery	Landfill	Waste generation	Resource recovery	Landfill
MSW	31,100	21,800	9,300	2,400	10,500	-8,100
C&I	188,700	177,400	11,300	40,900	36,400	4,600[30]
C&D	17,800	12,400	5,300	3,900	4,100	-300
Total	237,600	211,600	25,900	47,200	51,000	-3,800

Note that values in the table may not sum to totals due to rounding.

[30] 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.

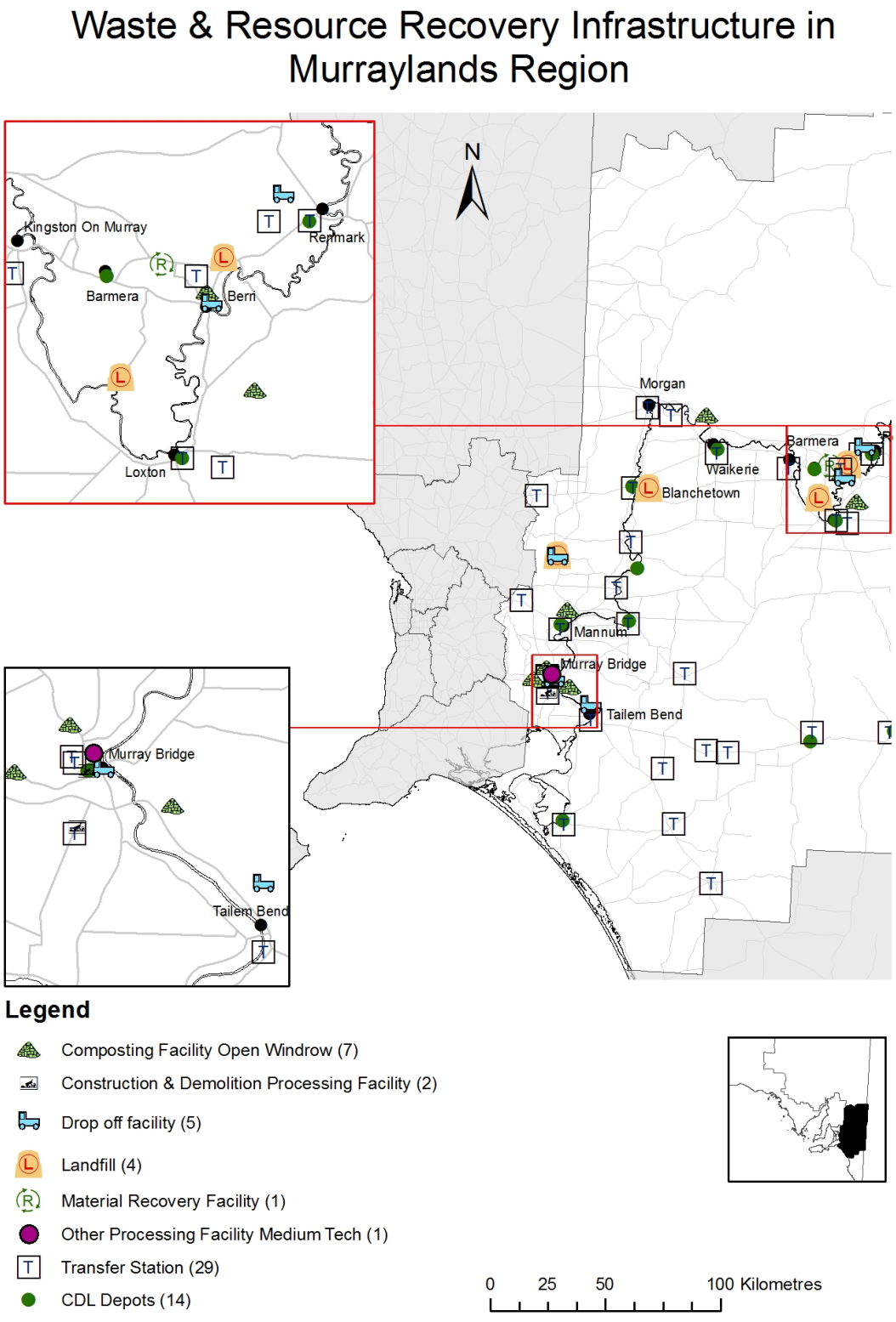

Figure 11. Waste and resource recovery infrastructure in the Murray Mallee region

Forecast of potential infrastructure needs: 10 years (2024-25), Moderate Additional Diversion scenario

An estimated $7.1 million of investment in new/expanded infrastructure will be needed across the Murray Mallee region by 2024-25 under the Moderate Additional Diversion scenario to manage projected additional volumes of waste generation, resource recovery and landfill.[31] This includes:

- **$1.3 million for MSW waste infrastructure**, including kerbside bins, collection vehicles, transfer vehicles, CDL facilities, drop-off facilities, compost facilities (open windrow) and other reprocessing facilities (medium technology).
- **$5.6 million for C&I waste infrastructure**, including 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**, including skip bins, collection vehicles, transfer vehicles and C&D processing facilities.

Table 39. Forecast number of new/expanded infrastructure units required for the Murray Mallee region by 2024-25 for Moderate Additional Diversion scenario modelled[32]

	10-year forecast Moderate Additional Diversion			
Number of new/ expanded infrastructure units	**MSW**	**C&I**	**C&D**	**Total region**
Kerbside Source Separation bin systems	1,742	-	-	1,742
Skip bins	-	1,094	2	1,096
Collection vehicles	0.2	3.9	0.1	4.2
Transfer stations	-	0.5	-	0.5
Transfer vehicles	0.1	0.4	0.05	0.6
CDL facilities	0.2	0.4	-	0.6
Drop-off facilities	1.8	-	-	1.8
Composting facilities (open windrow)	0.6	0.1	-	0.7
C&D processing facilities	-	-	0.05	0.05
Other reprocessing facilities (medium technology)	0.1	1.3	-	1.4
Total capital expenditure ($ million)	**1.3**	**5.6**	**0.2**	**7.1**

Note that values in the table may not sum to totals due to rounding.

[31] 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.

[32] 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 Appendix A) and is intended to be indicative of the types and number of new/expanded infrastructure units that will potentially be needed. Note that 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).

Region specific key waste infrastructure, challenges and opportunities

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

- Limited number and access to landfills servicing the region. Transporting waste from some locations to landfills in the region (or to other regions) involves lengthy travel distances and associated costs.
- Lengthy travel distances and high costs involved with sending recovered materials to recycling markets and export ports in Adelaide.
- Challenges with management of CCA-treated posts 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. There is currently no viable recycling option available for this stream.

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 residues (e.g. vineyards, orchards and other agriculture).
- Development of higher value products through organics reprocessing.

30 Year Outlook, High Additional Diversion scenario

Table 40. The Murray Mallee region projected tonnes per annum of waste generation, resource recovery and landfill in 2044-45 for High Additional Diversion scenario

	Projected volumes (tonnes) – 30 years			Change (tonnes) from 2013-14		
Tonnes per annum	Waste generation	Resource recovery	Landfill	Waste generation	Resource recovery	Landfill
MSW	36,200	32,600	3,600	7,500	21,300	-13,800
C&I	294,500	279,800	14,700	146,700	138,800	8,000[33]
C&D	27,700	26,300	1,400	13,800	18,000	-4,200
Total	**358,400**	**338,700**	**19,700**	**168,000**	**178,100**	**-10,000**

Note that values in the table may not sum to totals due to rounding.

An estimated $35.5 million of investment in infrastructure will be needed across the region over the next 30 years under the High Additional Diversion scenario to manage projected additional volumes of waste generation, resource recovery and landfill. This includes:

- $11.5 million for MSW waste infrastructure
- $23.0 million for C&I waste infrastructure
- $0.9 million for C&D waste infrastructure

[33] 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.

Potential investment will be needed 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). To achieve higher landfill diversion, investment in alternative technologies may be needed such as MBT facilities.[34]

Over the 30 year timeframe it is expected that:

- There will be an ongoing opportunity to locally process organics from MSW sources, agricultural residues and organic processing industry residues.
- The region will continue to face challenges associated with lengthy travel distances to waste and recycling processing facilities and end markets. As a result, future investment will be needed in equipment and facilities for compaction and bulk hauling.
- There will be a transition away from use of CCA-treated posts by wineries 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 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 given:

- 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
- It has access to future intermodal facilities in this region
- The availability of 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) and a potential future airport may create conflict with activities which attract birds (e.g. composting activities).

All forms of infrastructure are appropriate broadly within this precinct except open windrow composting facilities and disposal infrastructure. Opportunities exist for the establishment of

[34] Appendix B provides the forecasted number of new/expanded infrastructure units for the scenario modelled.

MBT facilities and energy-from-waste facilities if amenity impacts are suitably designed and managed.

PROFILE: YORKE AND MID NORTH

Current status

Baseline waste and recycling volumes

Most waste (54%) was generated by the C&I sector which mainly included volumes of foundry waste generated by local industry.

Table 41. The Yorke Mid North 2013-14 waste profile

Tonnes per annum	Waste generation	Resource recovery	Landfill
MSW	31,000	12,000	19,000
C&I	53,000	46,000	7,000
C&D	15,000	9,000	6,000
Total	**99,000**	**67,000**	**32,000**

Note that values in the table may not sum to totals due to rounding.

Future infrastructure needs

Waste volumes projections: 10 years (2024-25), Moderate Additional Diversion

Table 42. The Yorke Mid North region 2024-25 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 2013-14**		
Tonnes per annum	Waste generation	Resource recovery	Landfill	Waste generation	Resource recovery	Landfill
MSW	34,000	24,000	10,000	3,000	12,000	-9,000
C&I	68,000	64,000	4,000	15,000	18,000	-3,000
C&D	19,000	13,000	6,000	4,000	4,000	-
Total	**121,000**	**101,000**	**20,000**	**22,000**	**34,000**	**-12,000**

Note that values in the table may not sum to totals due to rounding.

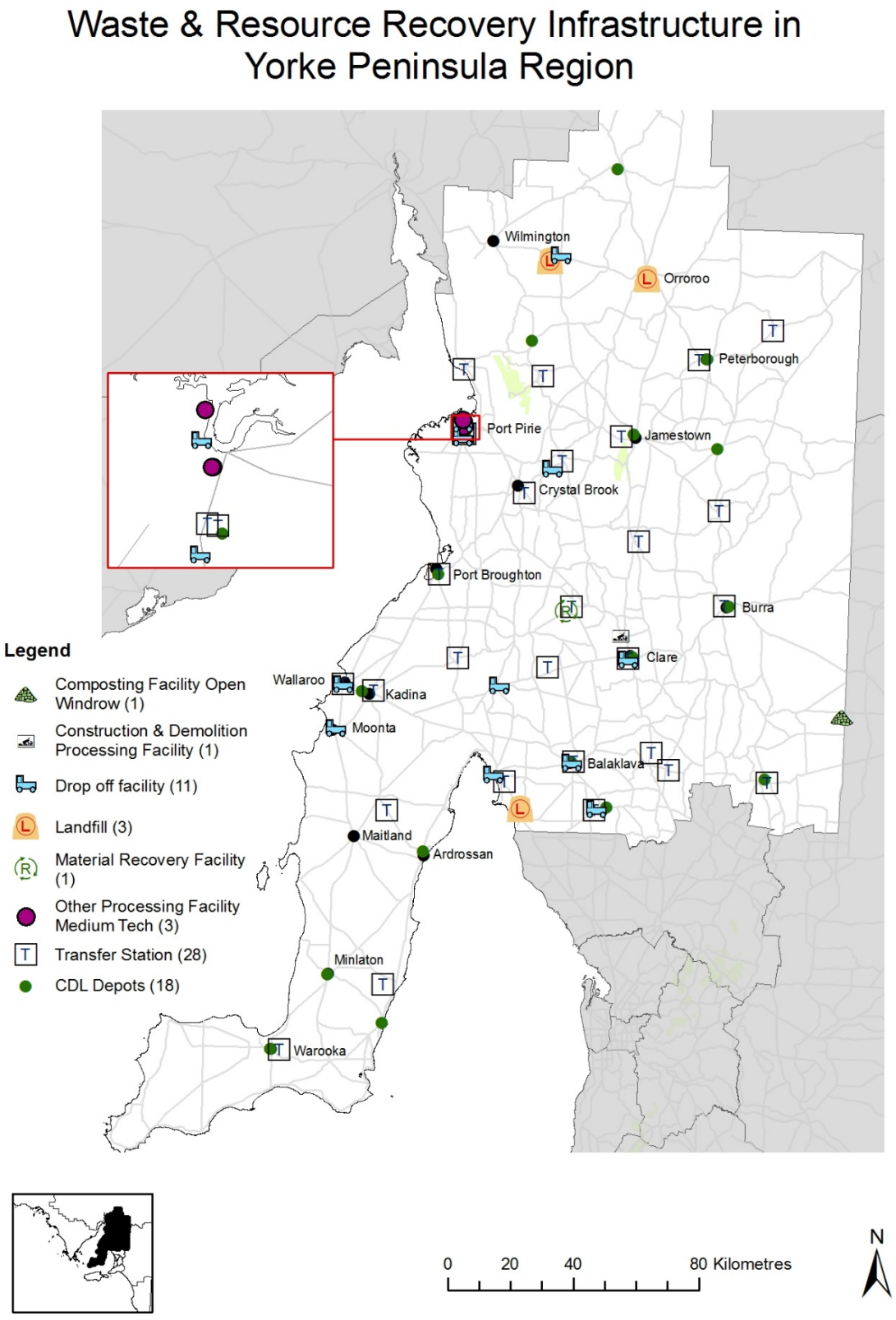

Figure 12. Existing waste and resource recovery infrastructure in the Yorke Mid North region

Forecast of potential infrastructure needs: 10 years (2024-25), Moderate Additional Diversion scenario

An estimated $3.2 million of investment in new/expanded waste and resource recovery infrastructure will be needed across the Yorke Mid North region by 2024-25 under the Moderate Additional Diversion scenario to manage projected additional volumes of waste generation, resource recovery and landfill.[35]

Table 43. Forecast number of new/expanded infrastructure units required for the Yorke Mid North region by 2024-25 for Moderate Additional Diversion scenario modelled[36]

	10-year forecast Moderate Additional Diversion			
Number of new/ expanded infrastructure units	**MSW**	**C&I**	**C&D**	**Total region**
Kerbside Source Separation bin systems	1,893	-	-	1,893
Skip bins	-	394	2	396
Collection vehicles	0.2	1.4	0.1	1.8
Transfer vehicles	0.1	0.2	0.1	0.3
CDL facilities	0.2	0.4	-	0.7
Drop-off facilities	1.9	-	-	1.9
Composting facilities (open windrow)	0.7	0.4	-	1.1
C&D processing facilities	-	-	0.06	0.06
Other reprocessing facilities (medium technology)	0.1	0.1	-	0.3
Total capital expenditure ($ million)	1.5	1.5	0.2	3.2

Note that values in the table may not sum to totals due to rounding.

[35] 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.

[36] 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 Appendix A) and is intended to be indicative of the types and number of new/expanded infrastructure units that will potentially be needed. Note that 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).

Region specific challenges and opportunities for infrastructure

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

- Encroachment of incompatible land-uses near existing waste and recycling infrastructure.
- Limited number and access to landfills located in the region. Transporting waste from some locations to landfills in the region (or to other regions) involves lengthy travel distances and associated costs.
- Lengthy travel distances and high costs involved with sending recovered materials to recycling markets and export ports in Adelaide.

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) and other metal based waste streams at the local smelter.

30 Year Outlook, High Additional Diversion scenario

Table 44. The Yorke Mid North region projected tonnes per annum of waste generation, resource recovery and landfill in 2044-45 for High Additional Diversion scenario

	Projected volumes (tonnes) – 30 years			**Change (tonnes) from 2013-14**		
Tonnes per annum	Waste generation	Resource recovery	Landfill	Waste generation	Resource recovery	Landfill
MSW	39,000	35,000	4,000	8,000	23,000	-15,000
C&I	106,000	101,000	5,000	53,000	55,000	-2,000
C&D	30,000	29,000	1,000	15,000	20,000	-5,000
Total	**175,000**	**165,000**	**10,000**	**76,000**	**98,000**	**-22,000**

Note that values in the table may not sum to totals due to rounding.

An estimated $20.6 million of investment in infrastructure will be needed across the region over the next 30 years under the High Additional Diversion scenario to manage projected additional volumes of waste generation, resource recovery and landfill. This includes:

- $12.6 million for MSW waste infrastructure
- $7.0 million for C&I waste infrastructure
- $1.0 million for C&D waste infrastructure

Potential investment will be needed 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). To achieve higher landfill diversion, investment in alternative technologies may be needed such as MBT facilities.[37]

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.
- The upgraded smelter in the region will provide opportunities for reprocessing of e-waste and other emerging waste streams where metal recovery is required.

Land-use planning considerations

The Yorke Peninsula Regional Land Use Framework 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

[37] Appendix B provides the forecasted number of new/expanded infrastructure units for the scenario modelled.

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

Significant volumes of tyres - 21,300 tonnes in 2013-14 (Rawtec, 2015) - are currently shredded and sent for energy recovery overseas. This represents about 70% of end-of-life tyres generated in South Australia, which is estimated at 30,500 tonnes or about 2.2 Equivalent Passenger Units (EPUs) per person per year (National Environment Protection Council, 2015).

There is potential for infrastructure for further processing of end-of-life tyres to produce fuel suitable for energy recovery in South Australia or re-manufacturing into higher value products (such as asphalt additive, matting surfaces).

Photovoltaic panels

The rapid growth in the installation of residential and commercial PV panels (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.

Potentially, PV panels may get processed through e-waste infrastructure in the future and/or more specialised processing infrastructure developed to capture component parts, such as the silicon material used in the solar cells.

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 which 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 restricted in South Australia due to environmental and health concerns of the chemicals and heavy metals present in the ash from burnt CCA-treated timber. Currently only suitably licenced landfills can accept CCA-treated posts for disposal.

This presents an opportunity for future infrastructure to 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 (AHP) waste is currently disposed to landfill per year (Zero Waste SA, 2013). There are currently technologies being used overseas for recycling the components of this waste stream which 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 (Rawtec and EconSearch, 2014). Instead, this material could be recovered for recycling using de-packaging equipment to separate the organic fraction from the packaging waste (e.g. plastics, cardboard, metal). The organic fraction could be sent to a 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% of the end-of-life batteries produced every year are recycled. The Australian Government Minister of Environment has approved the listing of used batteries (less than 5kg in weight) under the 2014-2015 Product Priority list for development of a national scheme under the Product Stewardship Act (Australian Government Department of Environment, 2015).

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, i.e. hazardous and rechargeable battery types, such as button cell, power tool, sealed lead acid and emergency lighting batteries.

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 (Rawtec and EconSearch, 2014). This material is currently sent to landfill at significant cost to these businesses. There may be an opportunity to establish a vehicular shredder floc reprocessing plant in South Australia.

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APPENDIX A: NOMINATED INFRASTRUCTURE CAPACITIES AND CAPITAL COSTS

Table A.1. Nominated average processing capacities (tonnes) and capital costs for infrastructure units (Rawtec, 2015).

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.

	Nominated average processing capacity (tonnes/year)			Estimated capital cost for nominated capital size		
Infrastructure Unit	**MSW**	**C&I**	**C&D**	**MSW**	**C&I**	**C&D**
Kerbside Source Separation bin systems	1			$150		
Skip bins		37	499		$1,000	$2,000
Collection vehicles	10,400	10,400	32,500	$350,000	$350,000	$300,000
Vacuum systems	10,000	10,000		$10,000,000	$10,000,000	
Transfer stations	100,000(M) 10,000(R)	100,000(M) 10,000(R)	100,000(M) 10,000(R)	$6,000,000(M) $3,000,000(R)	$6,000,000(M) $3,000,000(R)	$6,000,000(M) $3,000,000(R)
Transfer vehicles	19,500	19,500	19,500	$400,000	$400,000	$400,000
Material Recovery Facility	50,000(M) 5,000(R)	50,000(M) 5,000(R)		$10,000,000(M) $2,000,000(R)	$10,000,000(M) $2,000,000(R)	
CDL facilities	250	250		$100,000	$100,000	
Drop-off facilities	250	250		$100,000	$100,000	
Composting facilities (open windrow)	50,000(M) 10,000(R)	50,000(M) 10,000(R)		$3,000,000(M) $1,000,000(R)	$3,000,000(M) $1,000,000(R)	
Composting facilities (covered tunnel)	50,000(M) 10,000(R)	50,000(M) 10,000(R)		$10,000,000(M) $5,000,000(R)	$10,000,000(M) $5,000,000(R)	
Energy-from-waste Facilities - combustion	100,000	100,000	100,000	$100,000,000	$100,000,000	$100,000,000
Energy-from-waste - anaerobic digestion	20,000	20,000		$10,000,000	$10,000,000	
Mechanical Biological Treatment	100,000	100,000		$30,000,000	$30,000,000	
Construction & Demolition processing facilities			200,000(M) 50,000(R)			$8,000,000(M) $2,000,000(R)
Other reprocessing facilities (medium technology)	20,000	20,000		$1,200,000	$1,200,000	
Other Reprocessing Facilities (high tech)	5,000	5,000		$5,000,000	$5,000,000	
Hazardous waste facilities	5,000	5,000		$5,000,000	$5,000,000	
Waste soil storage and remediation facilities			100,000			$4,000,000
Emerging waste streams facilities	5,000	5,000	5,000	$5,000,000	$5,000,000	$5,000,000
Medical waste disposal		4,000			$10,000,000	

APPENDIX B: POTENTIAL INFRASTRUCTURE NEEDS: 30 YEAR OUTLOOK, HIGH ADDITIONAL DIVERSION SCENARIO

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.

Number of new/ expanded infrastructure units	Metropolitan	Adelaide Hills	Barossa Light and Lower North	Fleurieu Kangaroo Island	Eyre and Western	Far North	Limestone Coast	Murray Mallee	Yorke Mid North	Total SA
Kerbside Source Separation bin systems	119,970	5,480	5,196	3,743	4,429	1,990	4,982	5,307	5,767	156,863
Skip bins	25,594	559	4,085	382	452	203	3,419	3,927	1,418	40,039
Collection vehicles	162.2	3.0	15.7	2.1	2.4	1.1	13.2	15.1	6.2	221
Vacuum systems	5.0	-	-	-	-	-	-	-	-	5.0
Transfer stations	3.8	0.3	2.9	0.04	0.1	-	2.4	2.8	1.0	13.3
Transfer vehicles	55.8	0.9	2.2	0.6	0.7	0.3	1.9	2.1	1.2	66
Material Recovery Facility	0.5	-	-	-	-	-	-	-	-	0.5
CDL Facilities	42.5	2.4	2.3	1.6	1.9	0.9	2.2	2.3	2.5	58.6
Drop-off facilities	47.1	3.0	2.9	2.1	2.5	1.1	2.8	2.9	3.2	67.5
Composting facilities (open windrow)	-	1.2	0.5	0.8	1.0	0.4	0.3	0.5	1.1	5.8
Composting facilities (Covered Tunnel)	5.2	-	-	-	-	-	-	-	-	5.2
Energy-from-waste facilities - combustion	1.41	0.04	0.04	0.03	0.04	0.02	0.04	0.04	0.05	1.7
Energy-from-waste - anaerobic digestion	2.6	-	-	-	-	-	2.5	-	-	5.1
Mechanical Biological Treatment	5.6	0.2	0.2	0.1	0.1	0.1	0.2	0.2	0.2	6.8
Construction & Demolition processing facilities	9.2	0.3	0.33	0.23	0.27	0.11	0.31	0.33	0.63	11.50
Other reprocessing facilities (medium technology)	20.3	-	6.9	0.3	0.4	0.2	3.3	4.9	0.5	36.8
Waste soil storage and remediation facilities	5.1	-	-	-	-	-	-	-	-	5.1
Emerging waste streams facilities	2.5	-	-	-	-	-	-	-	-	2.5
Total capital expenditure ($ million)	725.2	15.5	38.3	10.5	12.6	5.5	55.3	35.5	20.6	918.9