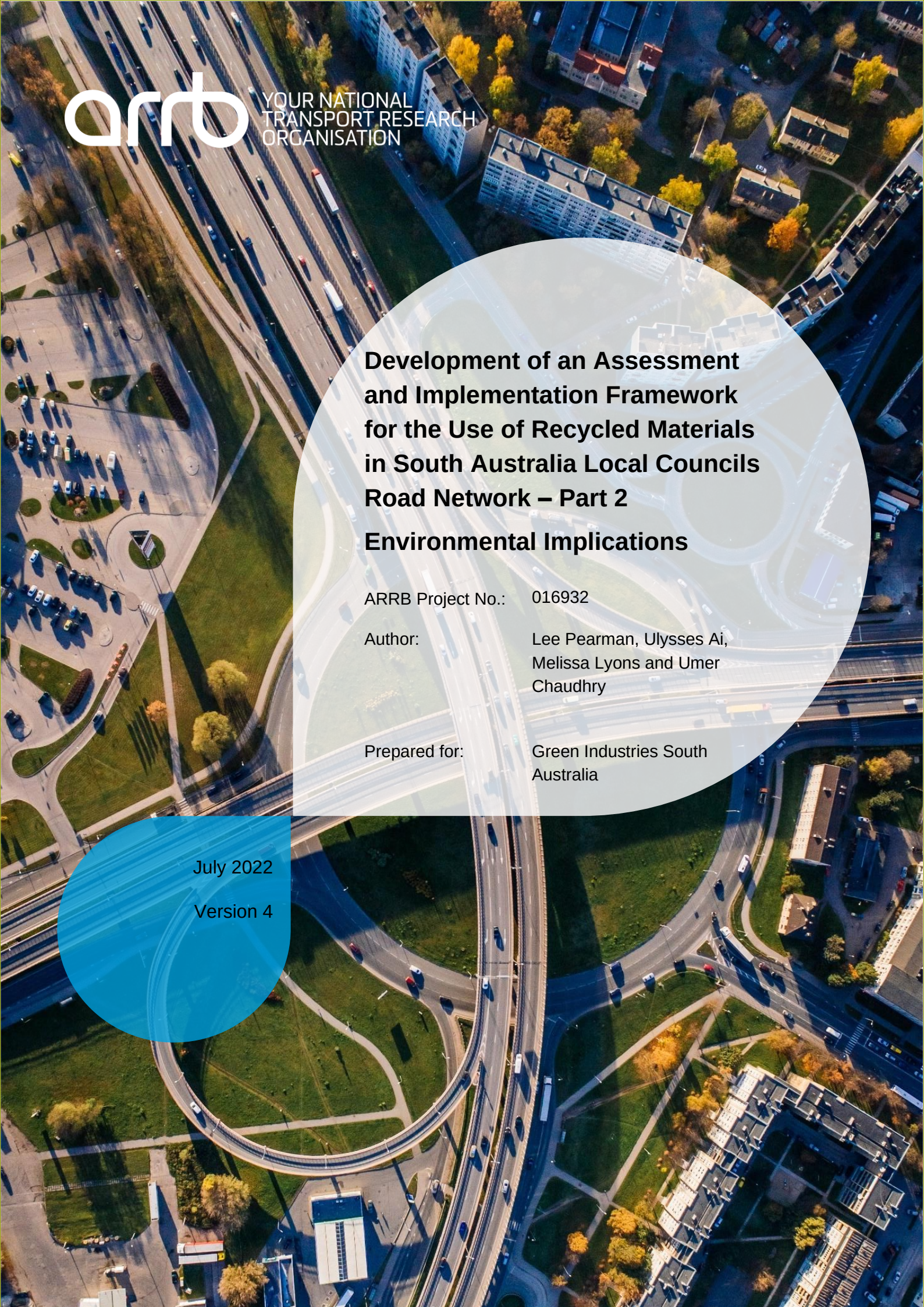

YOUR NATIONAL TRANSPORT RESEARCH ORGANISATION

Development of an Assessment and Implementation Framework for the Use of Recycled Materials in South Australia Local Councils Road Network – Part 2

Environmental Implications

ARRB Project No.: 016932

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Version 4

Summary

This project has been undertaken with support and funding from Green Industries South Australia (GISA) as well as in collaboration with the Institute of Public Works Engineering Australasia, City of Mitcham, City of Burnside, Port Pirie Regional Council, and the Adelaide Hills Council. The project is supervised by a project steering committee comprised of representatives from GISA, Department of Infrastructure and Transport South Australia (DIT SA), Local Government Association SA (LGA SA), and the Australian Road Research Board (ARRB).

The project has three main components: knowledge capture, a review of environmental implications and a life cycle assessment of South Australia (SA) roads containing recycled materials. This report is the second deliverable of the project, covering a review of the 'environmental implications' component. This part of the project highlights the environmental regulatory pathways, assessment approach, potential barriers to use, compliance and mitigation measures for the use of recycled materials. These aspects are further reviewed through direct consultation with key stakeholders, in which stakeholders have provided key insights into what could be changed to promote recycled materials in road pavements. Consultation with industry stakeholders included the Environmental Protection Authority South Australia (EPA SA), Downer, ResourceCo, Tyrecycle and other key industry consults.

EPA SA indicated that *Environment Protection Act 1993* has recently been amended to provide a way forward for industry to change their waste to recycled material. EPA SA are also undertaking a review of the Environmental Protection (Waste to Resources) Policy 2010 from June 2022. Included in this is a review of the end-of-waste framework included in clause 4 of the policy. This review will involve public consultation.

In general, local governments are keen to implement a circular economy into their local areas, with the supply of recycled plastics and glass not being an issue. Tyrecycle, Downer and ResourceCo have all expressed concerns about the level of precautions local governments are wanting to take before committing fully to using recycled materials on roads. This is despite many case studies existing around the world, with a large majority showing positive results. Finally, the report includes a case study showing a SA council trial of recycled materials in road infrastructure and the environmental regulatory consultation process involved. Overall, SA is showing mostly positive progress in harnessing recycled materials and in adaptation of circular economy principles. Industries are more than ready to create change, as it leaves a positive legacy and benefits them economically through saved waste management costs.

Acknowledgements

ARRB would like to acknowledge the time and information given by SA EPA, City of Mitcham, Downer, Tyrecycle, ResourceCo and other key industry consults during the stakeholder consultations.

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1. Introduction

1.1 Background

Transport infrastructure has an environmental impact at every step of the construction process – extraction of raw materials, processing, manufacturing, transportation, construction, and disposal as part of maintenance and upgrade activities.

Governments nationwide and industry stakeholders are responding to the need to reduce waste with reformed regulation and legislation which aims to frame a market for pavement materials and products derived from suitable waste streams.

Now more than ever, there are clear opportunities for the road construction industry to invest in activities that will create profit and improve environmental outcomes by extracting valuable resources from recognised recycled materials. Transport infrastructure of the future is being constructed at the beginning of a new ecological era where governments are framing markets with regulation and legislation that respond to the challenges of environmental sustainability, and where industry must respond to the challenges of low-carbon economies and resource depletion. Businesses that are profiting and growing are adapting to these new challenges and responding with innovations that turn waste into valuable resources to supply the road construction industry.

The main challenge in adopting the use of recycled materials as business as usual in road infrastructure is the lack of confidence in recycled material products amongst council road and asset managers. The reason for this stems from the lack of structured and organised guidance on how to increase the uptake of recycled materials without compromising the quality of the asset.

The findings of this report will be used to develop a systematic and customised (to South Australian local materials) assessment framework that will facilitate asset managers and contractors to incorporate products containing optimised amounts of recycled materials into roads while complying with environmental legislation and regulatory pathways.

1.2 Objective and Scope

This part of the project explores the environmental legislative setting in South Australia (SA) and whether the existing waste framework supports the use of suitable recycled materials in road infrastructure. South Australian case studies and consultation with the Environmental Protection Authority (EPA), councils and contractors illustrate the environmental regulatory and risk assessment pathway.

The aim of this report is to review current SA environmental legislation relevant to the beneficial use of reclaimed waste in road infrastructure. From this, ARRB has illustrated the regulatory pathway currently in place, identified compliance, the assessment approach, risk mitigation measures and potential barriers. From these actions, SA stakeholders have been provided clarity and improved the legislative tools in place to support the use of recycled materials in road infrastructure. ARRB has consulted with stakeholders, such as Downer, Tyrecycle. ResourceCo and City of Mitcham to discuss how environmental regulations and processes affect the uptake of recycled materials in road infrastructure and how they are managed. The scope of this report encompasses private and both state and local levels of government and recycling activities that are occurring within South Australia.

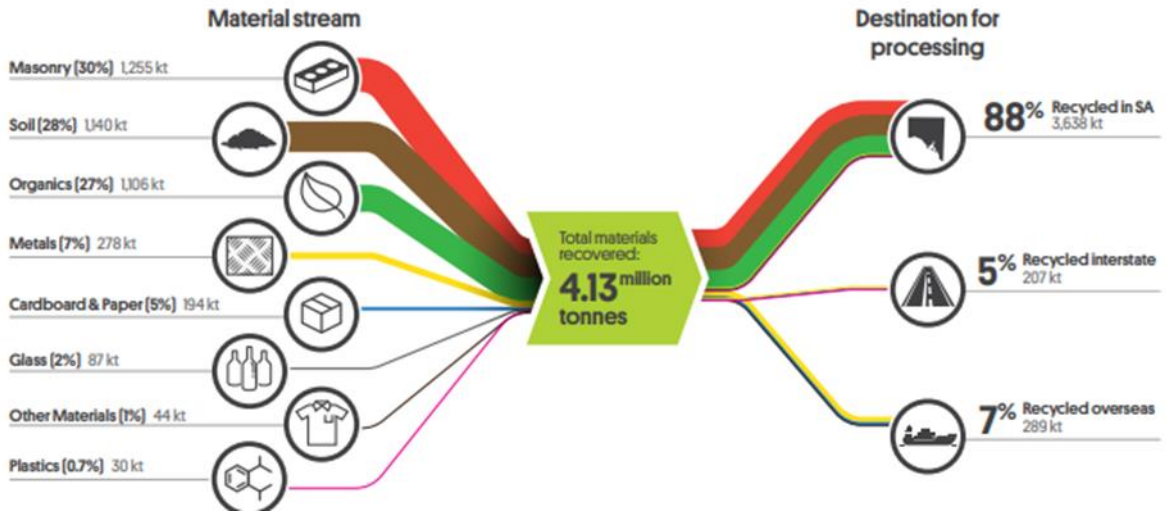
2. South Australian Waste and Recycling

2.1 Profile of SA

As of 2020, the estimated population of SA is 1.7 million (Australian Bureau of Statistics 2020). SA ranks as the 5th most populated state or territory in Australia, with a population density of 1.62 people per km^2 (Population Australia 2021). South Australia is leading the way in waste management practices and currently stands as one of the most innovative and progressive states within the realm of waste management and recycling in Australia.

In 2019–20, the state generated 4.96 million tonnes of waste, of that, 4.13 million tonnes were recovered (Figure 2.1). Overall, the resource recovery values were estimated at $342 million. Currently, the recycling and resource recovery sector employs approximately 4,800 South Australians, both indirectly and directly (Green Industries SA 2021). Despite the state's high performance, several issues still exist which impede progress being made.

Figure 2.1 Contribution of different material categories to SA's resource recovery during 2019–20 and location sent for recycling



Source: Green Industries SA (2021).

2.2 Impediments to Further Progress

Through research and consultations with industry stakeholders, four key issues have been identified that pose as barriers for advancements in the implementation of recycled materials in road pavements. These are elaborated on below.

2.2.1 Lack of SA-based Recycling Facilities

It was highlighted though the stakeholder consultations that there is a lack of local recycling facilities in South Australia. One reason for this, as expressed by Tyrecycle, is the lack of demand for crumb rubber within the state. Tyres currently are being collected and sent interstate for processing. This can be seen as an opportunity for the SA government to expand their industry and production of local materials as well as generate more employment within the state.

2.2.2 Innovation Inhibited by the Lack of Regulations and Processes

Federal and state governments are constantly aiming to create and amend acts, policies and initiatives to keep up with current trends and practices. Many of the stakeholders who had been consulted, expressed concerns about innovation being inhibited by outdated laws and processes. These outdated laws have hindered a stakeholder from generating meaningful change, cost the company more money due to sourcing overseas labour and denied SA's employment opportunities. Due to China's National Sword Policy, mounting internal pressures on Australia's waste management and recycling industry can be observed. Several actions have been undertaken on multiple fronts by all levels of government and industry to address the profound impacts of the China National Sword Policy, notably the National Waste Policy and National Waste Policy Action Plan and its implementation, Council of Australian Governments waste export bans, state level support packages and initiatives such as the Ecologiq program in Victoria etc. However, Australia's federal, state and territorial governments must continue to adapt and create change to ensure waste is continually managed.

2.2.3 Persistence of Myths around the Efficacy of Recycling

Despite recycled materials showing largely positive outcomes for its uses, such as the increase in employment (Green Industries SA 2021), reduction in emissions and reducing landfill sizes (City of Adelaide 2022; City of Burnside 2020; City of Port Adelaide Enfield n.d.), there still exists myths about recycled materials (Benjamin & Meiners 2010). One myth is that recycling materials is a waste of energy and its impacts on the environment are minuscule (Big Think 2010); however, recycling can save up to 95% of the energy required to produce a brand new product (Department of Energy and Environmental Protection 2020). For instance, Ng and Chau (2015) showed the energy savings of up to 80% can be made across various parts of the construction phase if recycled materials were harnessed, such as building suspended ceilings, upper floor construction and internal walls. Within the forestry industry, 50% less water is used and 17 trees are spared for every ton of paper made from recycled paper (EIA 2021). While uncommon in certain circumstances, using recycled materials may also prove to be less efficient than virgin materials. For instance, soft-drink bottles made from polyethylene terephthalate can be broken down into making polyester fibres. Once this is done, the fibres can no longer be recycled which then generates more waste into landfills (Hutchinson 2008).

Other common myths are that recycling is a meticulous process, requiring careful separation of materials and thorough cleaning or that products made from recycled content are of lower quality. This is true to an extent, as it depends on the type of material and what is it being repurposed for. A large part of the separation process is performed by machines, with operators removing contaminants along the process (Seadon 2019). Most types of glass for example are recyclable, with certain colours being easier than others and some broken glass not being accepted due to safety reasons. For the most part, however, the glass typically can be cleaned for any contaminants and be repurposed afterwards.

2.3 When Waste Ceases to be a Waste

The management of waste can be viewed as a critical issue, especially regarding how it is defined. Australia is in the process of transitioning from a linear to a circular economy, with part of this process involving redefining how waste is defined and viewed.

Currently, industries are being challenged to recycle and reuse their waste but have reported being inhibited by the definition of 'waste' in the *Environment Protection (Waste to Resources) Policy 2010 (WtR EPP 2010).*Under this policy, waste-derived material ceases to be a waste when:

- it constitutes a product that meets an EPA published standard (including the waste-derived fill, waste-derived soil enhancer and refuse-derived fuel Standards) or
- if there is no specification or standard, it constitutes a product that is ready and intended for imminent use without the need for further treatment to prevent any environmental harm.

If an industry or business holds material defined as waste by the *WtR EPP 2010* and wishes to amend this, they can do so by demonstrating to the EPA, among other things, that:

- there is an immediate market for the recovered material
- the recovered material and its use comply with all relevant state and federal legislation including regulations and policies made under relevant laws, Australian standards, market or engineering specifications
- where relevant, testing by a suitably qualified person demonstrates that:
  - environmental harm, including harm to human health, will not result from the storage, transport and use of the recovered material, and
  - the recovered material is suitable for its intended use.

It is worth highlighting that a positive outcome of the proposal is highly dependent on the amount of evidence supplied by the applicant. The EPA will review the application and either approve or reject the claim made by the business or industry, based on the evidence provided. It is at this stage that the waste ceases to be waste and is now deemed a resource or material.

2.4 General Environmental Duty

The requirement to demonstrate a recycled material in application poses no risk of harm to the environment and human health before its approved use, is also necessary when demonstrating compliance to the general environmental duty.

At the centre of the *Environment Protection Act*, is a general environmental duty, which applies to all of those in South Australia. Part 4-25 states that:

> A person must not undertake an activity that pollutes or might pollute, the environment unless the person takes all reasonable and practicable measures to prevent or minimise any resulting environmental harm.

2.5 Environmental Assessment of Recycled Materials

To ensure compliance to general environmental and waste duties, those approving the use of recycled material in road infrastructure, including EPA, road agencies, transport authorities and councils, must ensure an environmental risk assessment process is in place.

EPA SA realises that the processes that generate recycled material can introduce constituents not typically found in nature. When the use of material introduces chemical constituents or other stressors into the road infrastructure that are absent from traditional natural materials, a risk evaluation is warranted. The assessment approach would be tailored to recognise potential risks.

EPA SA is yet to offer a framework or guidelines to improve the consistency and efficiency when assessing the potential environmental implications of using recycled material in road infrastructure. Currently, the EPA predominantly relies on licensing and use of general environmental duty (Schedule 1 of the EP Act sets out activities that require a licence). Waste and resource recovery activities that require a licence to undertake are generally captured by waste receipt, collection, transport, processing, recovery and disposal. The following case studies and summaries of discussions with stakeholders, including industry and EPA, illustrate the current approach in gaining approval and trialling recycled materials within South Australian cities. Barriers that inhibit recycled material use and opportunities to improve uptake are also discussed.

At a high level, the head power of the EPA regulates waste and resource recovery activities, including the use of specifications or standards to be met to determine that material is no longer a waste. The process starts with the objectives of the *Environment Protection Act 1993* and includes the *WtR EPP 2010*. Specifically, clause 4 of the *WtR EPP 2010* gives the EPA the ability/power to publish standards or specifications to determine when waste is no longer a waste. SA's waste strategy is also a critical consideration as it forms government policy formally under the *Green Industries SA Act*.

The EPA SA is an independent statutory authority that regulates environmental protection in South Australia. The EPA works closely with industry, government and the community to protect unique and diverse natural environments while also simultaneously improving social wellbeing and economic growth (Environmental Protection Authority SA 2022). EPA works primarily with the *Environment Protection Act 1993* and the necessary referrals under the *Planning Development and Infrastructure Act 2016* (previously Development Act 1993). Other legislation which the EPA work with includes:

- *Radiation Protection and Control Act 1982*
- *Plastic Shopping Bags (Waste Avoidance) Act 2008*
- *Single-use and Other Plastic Products (Waste Avoidance) Act 2020.*
- National Environment Protection Measures
- *Aquaculture Act 2001*
- *Local Nuisance and Litter Control Act 2016*
- *Mining Act 1971*
- *Wingfield Waste Depot Closure Act 1999*

From this, the EPA possesses the authority to develop regulations, environmental protection policy and guidelines that must be complied with by industry, the community and government. Since 2015, the EPA has embarked on a substantial waste reform program aimed at establishing a robust regulatory environment to support the sustainable operation of the waste and resource recovery industry by seeking to minimise the risk of environmental harm, support the highest, best and safe use of secondary materials, support business innovation and growth and stamp out illegal operators. A development assessment process exists under the *Planning, Development and Infrastructure Act 2016*, which ensures that development is design and developed to prevent and minimise impacts on the environment, human health and amenity. This process is outlined in Figure 2.2.

Figure 2.2 EPA SA Development Application Assessment Process

Source: EPA SA (https://www.epa.sa.gov.au/environmental_info/environmental_planning/advice-and-assistance)

2.5.1 Recycling Guidelines from other Government Departments

Other government departments have established guidelines to adapt to rapid technological change in using recycled materials for road construction. EPA is commencing a review of WtR EPP 2010 from June 2022 which will include stakeholder consultation.

For example, the Department of Infrastructure and Transport (2021) has produced guidelines related to the beneficial reuse of solid waste. This Guidelines provide advice related to:

- the reuse of material that is generated on-site during project works (e.g. road, roadside, and subgrade material)
- imported recycled materials for use in the project (e.g. crushed building bricks, crushed non-structural concrete, etc.)
- reclaimed asphaltic planings.

In particular, the Guidelines have detail related to risk-based assessments that must be undertaken for options to use Reclaimed Asphalt Pavement (RAP), as well as reporting requirements in general. The Guidelines are complimentary to the EPA Standard for the Production and Use of Waste Derived Fill (2010).

However, a consistent assessment approach is yet to be developed. An Austroads national protocol for the assessment of waste materials in road surfacing and an update to the Austroads *Guide to Pavement Technology Part 4E: Recycled Materials* (Austroads 2009) aims to fill this gap. However, it will be the responsibility of individual jurisdictions to interpret and rollout requirements.

3. Stakeholder Consultations and Case Study

3.1 Consultation with the EPA SA

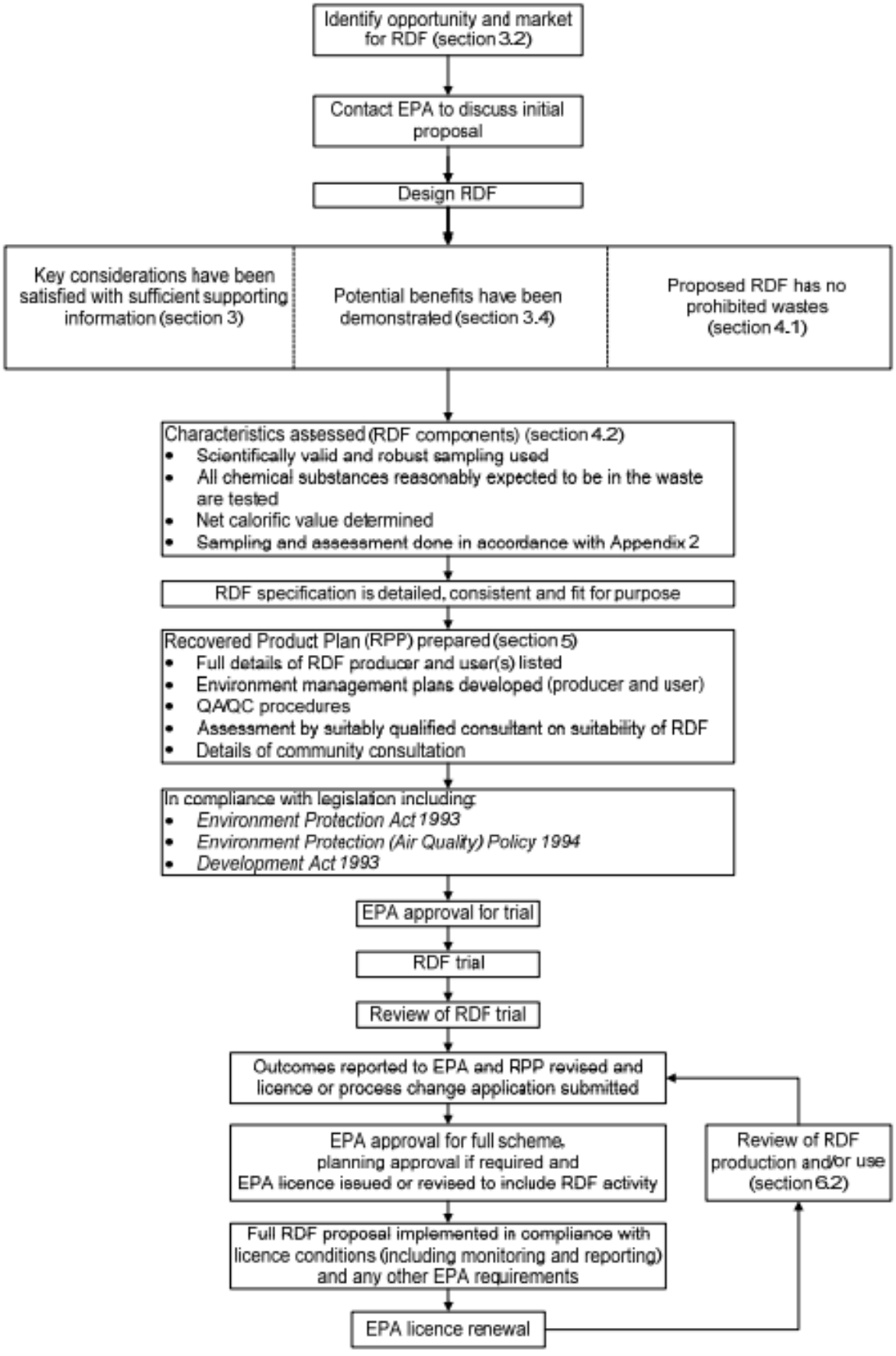
As part of the research for this project, ARRB consulted with the EPA SA, who had identified key regulatory underpinning on recycled materials relevant to Green Industries South Australia (GISA). Those are the *Environment Protection* (EP) *Act 1993* and the WtR EPP 2010. The intended work set out by GISA has been identified to have a complex roadmap, as SA's current experience with implementing recycled materials into road pavement materials such as asphalt, is limited. The SA EPA seeks to harmonise regulatory assessment criteria with other jurisdictions where possible. It isn't always reasonable or appropriate to adopt another state's regulatory assessment criteria in a South Australian context, however specifications or standards published by other jurisdictions relating to recovered product assessment methodologies can provide an ideal starting point for reference, particularly where they have been developed in a mature regulatory environment and are based upon sound science. The SA EPA is currently observing activity within the NSW EPA surrounding the reuse of recovered resources for road pavements, , particularly the use of recovered glass sand in road pavement.

Previously in SA, the EPA published the WtR EPP 2010 for the purpose of allowing industry to incorporate recovered waste into products. The approval criteria require a risk-based approach, including quality control measures, identification of beneficial properties, how the industry will minimise harm to the environment or human health and quality assurance. A full outline of the endorsement process is outlined in Figure 3.1 using refuse-derived fuel (RDF) as an example.

To aid industries in qualifying their waste as a usable material, clause 4 of the EP Act was updated in 2019, which defines waste for approved recovery resources. This is so regulation could be made in relation to waste being an approved resource. Once or if the resource has been approved by the EPA, the business is required to license the activity as waste reprocessing under schedule 1 of the EP Act. The responsibility of specifying how the waste is reprocessed falls onto the applicant.

The EPA is required to regulate waste and resource recovery while ensuring the reuse of recovered products will not cause harm to the environment or human health. The risk of using recovered waste materials in a road pavement is dependent on what is being proposed and what the measurement criteria is. It would be based upon an understanding of the source and potential chemical and physical contaminants and therefore the likely chemical and physical characteristics of the waste proposed to be reused. In general terms, a specification for a recovered waste material needs to be submitted to the EPA for assessment and approval, or the EPA could publish a Specification or Standard where there is a need for a transparent and consistent regulatory assessment process to ensure a fair playing field for all industry operators. DIT would regulate how the material is used in road pavements from a performance perspective.

Figure 3.1 SA EPA waste to material endorsement process



Source: EPA South Australia (2010).

An overview of all relevant legislation and sections can be found in Table 3.1.

Table 3.1: Relevant SA legislation

Act	Section	Part	Subsection & description
EP Act 1993	10	2	The objectives of the Act are: a. to promote the following principles (principles of ecologically sustainable development): i. that the use, development and protection of the environment should be managed in a way, and at a rate, that will enable people and communities to provide for their economic, social and physical well-being and their health and safety while – sustaining the potential of natural and physical resources to meet the reasonably foreseeable needs of future generations; and – safeguarding the life-supporting capacity of air, water, land and ecosystems; and – avoiding, remedying or mitigating any adverse effects of activities on the environment. ii. that proper weight should be given to both long and short-term economic, environmental, social and equity considerations in deciding all matters relating to environmental protection, restoration and enhancement; and b. ensure that all reasonable and practicable measures are taken to protect, restore and enhance the quality of the environment having regard to the principles of ecologically sustainable development; and c. to ensure that, as far as is reasonably practicable, the following measures are taken: i. to prevent, reduce, minimise and, where practicable, eliminate harm to the environment ii. to promote the circulation of materials through the waste management process and to support a strong market for *recovered resources:* – by programs to encourage and assist the industry, public authorities and the community to engage in resource recovery; and – by regulating resource recovery; and – by regulating the handling, storage, treatment, transfer, transportation, receipt or disposal of waste or other matter – by preventing the unauthorised stockpiling of waste or other matter.
	4	4B	**Section 4 of the EP Act refers to the waste management hierarchy** In this Act, a reference to the waste management hierarchy is a reference to an order of priority for the management of waste in which: a. avoidance of the production of waste b. minimisation of the production of waste c. reuse of waste d. recycling of waste e. recovery of energy and other resources from waste f. treatment of waste to reduce potentially degrading impacts g. disposal of waste in an environmentally sound manner, are pursued in order with, first, avoidance of the production of waste, and second, to the extent that avoidance is not reasonably practicable, minimisation of the production of waste, and third, to the extent that minimisation is not reasonably practicable, reuse of waste, and so on.
	25		General environmental duty – Outlines the responsibilities of a person, whether licensed or not, when undertaking an activity that may pollute the environment, to take all reasonable and practicable measures to prevent or minimise environmental harm.
	36		Requirement for licence – Outlines the requirement for a person undertaking a prescribed activity of environmental significance to have an environmental authorisation.
	40 & 48		Grant of licence and annual fee – These sections outline the requirement for the holder of an environmental authorisation to pay an authorisation fee.
	47	1	**Relates to criteria for grant and conditions of environmental authorisations** a. In determining: i. whether to grant or refuse an environmental authorisation; or ii. what should be the terms or conditions of an environmental authorisation, the authority must – Have regard to, and seek to further, the objects of this Act; and iii. have regard to the waste strategy for the State adopted under the *Green Industries SA Act 2004* (if relevant).

Act	Section	Part	Subsection & description
	113		Waste depot levy – Defines who needs to pay the waste depot levy and is linked to the Environment Protection Regulations 2009 which contains additional information on who must pay the levy and how much to pay.
WtR EPP 2010	4		**For the purposes of section 4(2)(b) of the Act, waste or other matter is declared not to be waste if:** a. it constitutes a material that meets specifications or standards published from the time on a website by the Minister or approved in writing by the *Authority; or* b. in the absence of such a specification or standard – it constitutes a material that is ready and intended for imminent use without the need for further treatment to prevent any environmental harm that might result from such use.
	7	1	The objective of this policy (the waste management objective) is to achieve sustainable waste management by applying the waste management hierarchy consistently with the principles of ecologically sustainable development set out in section 10 of the Act.
	Clause 4		**Standard for the Production and Use of Waste Derived Fill** http://www.epa.sa.gov.au/files/4771359_standard_wdf.pdf **Standard for the Production and Use of Waste Derived Soil Enhancer** Waste derived soil enhancer | EPA **Standard for the Production and Use of Refuse Derived Fuel** http://www.epa.sa.gov.au/files/4771351_standard_rdf.pdf
	Schedule 1		Lists the activities of environmental significance for which a licence from the EPA to operate is required. Most waste-related activities are listed under Activity 3, Waste Treatment and Disposal. Note: Schedule 1 is currently under review with a particular focus on the waste activities
South Australia's Waste Strategy 2020–2025	47		South Australia's Waste Strategy includes priority actions for the growth of circular economy activities with SA, including the waste strategy objective on page 9 South Australia's Waste Strategy 2020–2025 outlines actions that can contribute to the development of a circular economy – that is, an economy that realises the best or full value from products and materials produced, consumed and recovered in South Australia through: • a clearly articulated policy and legislative framework that gives a solid platform for investment decisions and a stable and efficient market • applying the waste management hierarchy consistently with the principles of ecology and sustainable development.

Source: EP Act 1993, EP (Waste to Resources) Policy 2010, South Australia's Waste Strategy 2020–2025 and private correspondence.

3.2 Consultation with Industry Stakeholders

Consultation was undertaken with industry stakeholders – Downer, Tyrecycle, ResourceCo and other key industry consults. Discussions topics with these stakeholders included supply and demand of recycled materials, suppliers' perception of local government practices, barriers to uptake of recycled materials, potential drivers to using more recycled materials, social impacts experienced by suppliers and the EPA/environmental processes that they follow. The key findings and overall recommendations to improve the uptake of recycled materials is summarised in Table 3.2.

Table 3.2: Stakeholder consultation key findings and recommendations

Discussion point	Key findings	Recommendations
Supply and demand	• Room for growth of demand, this will also drive the establishment of local processing facilities. • Supply of materials in general not an issue, glass supply decreasing as going to higher value uses. • Higher value uses for recycled materials should always be priority.	• Councils should set waste targets to drive demand. • Local government recycled material procurement activities (at planning and design stages) and methods to be reviewed.

Discussion point	Key findings	Recommendations
Local government perception	• Overall, SA local governments are receptive to recycling practices and use of recycled materials in infrastructure. • Councils are risk averse when it comes to using recycled materials widely on their road network. • Councils want to make informed decisions but do not know what information they should be seeking from suppliers. • Suppliers are already doing the quality assurance testing and performance testing to DIT specifications to inform decision making. • Lack of collaboration and knowledge sharing between councils on use of recycled materials.	• A united effort between councils to trial materials so there are less trials and a faster pathway to the product being used as business as usual. • Local Government Association SA, together with state government agencies such as GISA, make efforts to educate LGs on the case studies performed in other local areas. • Potentially explore the adoption of a uniform process for adoption of new products
Barriers	• Pace of technology is moving faster than specifications, guidelines and regulations are being developed or updated. • Testing of materials to meet regulations is a timely and costly activity. • EPA classification of waste needs to be updated. • Local government predominantly follow state government practices, this includes state and national technical specifications. • Lack of local material recycling and processing facilities.	• EPA to reconsider how they classify waste. • Testing requirements to be reviewed so testing can be carried out within Australia. • Tender process to consider penalising the use of virgin materials rather than praising those that use recycled materials.
Drivers	• State government as the largest users of infrastructure materials were identified as one of the main drivers for increasing the use of recycled materials.	• State government need to lead Local government and drive the change to make recycled materials mainstream.
Social reception	• Suppliers did not identify any negative social impacts regarding the use of their materials. • Overall, the consultation showed that using local waste streams was favourable and gives a sense of civic pride.	• Promoting the use of recycled products, especially from local waste streams, may drive interest and demand.
EPA/Environmental processes	• Suppliers follow DIT specifications for environmental management. • Local governments rely on the suppliers to be following the regulations, i.e. they do not take much, if not any responsibility for the environmental practices used in the production of the recycled materials they source.	• Local governments could develop their own environmental assurance processes for procurement of recycled materials from suppliers.

3.3 Local Government Case Study

This section reports what other LGs are doing in the space of recycled materials in road pavements. The City of Mitcham has been used as a primary case study looking into how environmental regulations and processes have affected the implementation of recycled materials.

3.3.1 City of Mitcham

The City of Mitcham is one of SA's oldest councils and, has a blend of semi-rural and urban environments, with an abundant supply of tree cover, parks, gardens and reserves. City of Mitcham is located approximately 5.5 km south of Adelaide, with a population of 64,805. The city spans 75.7 km^2 with the area providing 30,500 local jobs and generating $3.5 billion in gross regional product (City of Mitcham 2020). Some of the city's largest industries of employment include health care, higher education and state government administration (Australian Bureau of Statistics 2016). This city has been chosen as a case study due to the efforts being made to transition into a circular economy.

The City of Mitcham has announced that recycled aggregates are to be trialled in two road pavements in honour of Earth Day 2021. Carlisle Street will use over 450,000 plastic bottles and will be supported by

Boral, a multinational company that manufactures and supplies construction materials. Simla Parade will be constructed using asphalt incorporating HDPE plastic from local yellow waste bins, crumb rubber and recycled glass by contractor Fulton Hogan (City of Mitcham n.d.b).

Mitcham council is also fairly established in the use of crumb rubber asphalt. In 2019 crumb rubber asphalt was applied to a 335 m stretch along Stanlake Avenue, St Marys. This project diverted approximately 850 tyres from landfill and is currently showing positive results, according to City of Mitcham Mayor, Dr Heather Holmes-Ross (City of Mitcham n.d.a).

ARRB consulted with the City of Mitcham project engineers to explore how environmental regulatory processes in the St Marys project and in general across their contracts are managed.

Overall, it was found that there is no environmental regulatory consultation for councils with EPA or other agencies involved in the procurement or construction processes when using recycled materials. However, the EPA does require licenced producers of waste derived products to comply with specific licence conditions and typically an approved EPA recovered product plan. For the St Mary's trial and other asphalt contracts, City of Mitcham did not stipulate their own environmental requirements or regulations directly related to the use of the recycled material. The contracts, like many local councils, are based on DIT standards, including the environmental aspects. These aspects include protection of the site, protection of wildlife and environment, but nothing specific to the recycled asphalt materials.

It was noted that the responsibility for adhering to any environmental regulations for the recycled material lies on the asphalt/materials suppliers and not the council. The council rely on the supplier's procedures and that they are doing the right thing. It is not part of their tender documents to check where materials are sourced, nor do they ask suppliers for environmental information or compliance with any regulations. Once the material is on-site, there are environmental aspects for storage and protection of site that may need to be considered.

From with the recycled materials suppliers, it was noted that councils have incomplete knowledge on the environmental regulations pertaining to recycled materials. As an example, in the OHS space, councils have learnt over the years how to manage contractors and what is of concern. Now councils are entering the new space of recyclables, they must learn over time what the concerns are that they need to address.

Internally, the councils environmental and sustainability representatives are focused on EPDs and GHG emissions and are pushing for environmentally friendly practices to be enforced, however there is no structure or systems in place for the engineering teams to follow and no measurables or benchmarks for them to achieve. If benchmarks and reporting tools were bought in to the council, this could change the way they tender. This would enhance procurement and performance from an environmental perspective. This suggestion also relates to Tyrecycle's concern around local council procurement procedures hindering the expansion of use of recycled materials.

The council saw few challenges from an environmental perspective in continuing to expand the use of products containing recycled materials. Internally, there are concerns about the end-of-life recyclability of the recycled material products they are using, as well as concerns around microparticles in stormwater. These issues are considered to be well understood for crumb rubber, but in the case of plastics are still being investigated. Another challenge in the expansion of use of recycled materials is that the council felt that the market was driven by suppliers who are pushing their own products and IP, and councils have no standards or third party to consult to make informed decisions about what materials and products they should be using. The council would like to see more direction from the state road agency when it comes to product standards and specifications.

3.3.2 SA Council Recycling Activities

Table 3.3 gives an overview of recycling activities in other SA councils.

Table 3.3: SA councils harnessing recycled materials

Council	Previous/current work
City of Salisbury	• Recycled tyres and plastic waste collected from yellow roadside bins is being blended into bitumen and used in road surfacing in a two-year trial Northern Adelaide Waste Management Authority (2020). • Asphalt mix contains about 20% RAP. • This trial was conducted together with Northern Adelaide Waste Management Authority and Fulton Hogan (contractor). (Northern Adelaide Waste Management Authority 2019)
City of Onkaparinga	• Using Reconophalt™ which includes reclaimed asphalt, printer cartridges in road resealing, recycled glass in pavements. This is the first pavement in SA to be built with recycled plastics and glass. (IPWEA 2019)
City of Burnside	• City of Burnside's initiative 'Burnside Neutral' is looking to triple the amount of reclaimed asphalt and recycled glass that will be put into their road infrastructure. • They are also using recycled materials in playground equipment, such as recycled rubber for a soft and durable surface. The aim is for all of their materials in the playgrounds to be recyclable by the end of the playgrounds' lives (City of Burnside 2021). • Recycled plastics are also being used to create drainage crates that redirect underground water to trees and other flora.
City of Port Adelaide Enfield	• In 2019, the City of PAE collected 7.47 tonnes of soft plastic from supermarket chains Coles and Woolworths (approximately 439,000 plastic bags) and trialled it with Downer on Humphries Terrace, Short St and Beatty Ave. (City of Port Adelaide Enfield n.d.) • Results of the road's performance compared to virgin materials have yet to be released (City of Port Adelaide Enfield n.d.).
City of Adelaide	• The City of Adelaide is setting a hallmark for sustainability by creating new roads made entirely from reclaimed asphalt and recycled vegetable oil. • The road has been tested against virgin material asphalt and it has been concluded that the road is 25% stronger. The project was in collaboration with Downer (City of Adelaide 2022).
Adelaide Hills Council and Adelaide Hills Region Waste Management Authority (AHRWMA)	• One of the best rates of waste recovery in rural areas from the three-bin system. The average for rural areas was 32.5%, whereas Adelaide Hills was 48.8% (Adelaide Hills Council 2020) • 'Salvage and Save' business initiative of Finding Workable Solutions employs disadvantaged people to salvage materials for resale which would otherwise be disposed of. • AHRWHMA is part of a project which allows councils to crush their construction and demolition material to create a useable product.(AHRWMA 2019).
City of Marion	• City of Marion (n.d.) mentions 331 tonnes of carbon dioxide emissions saved by using sustainable asphalt.
City of West Torrens	• Uses RAP, plastics, glass and rubber in pavements (City of West Torrens n.d.).

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4. Findings on Environmental Implications

It is now recognised industry-wide that transport infrastructure contributes to environmental deterioration every step of the way, from extraction to disposal. Global efforts are being made to rectify this by reforming regulations and legislation, encouraging industry involvement and adopting a circular economy framework. As a result, sustainability opportunities for the road construction industry in Australia have emerged, which encourage investment in greener activities. This massive change in market activity requires collaboration to succeed. It is therefore imperative that a review of environmental implications and stakeholder consultation be conducted. This process will aid industry, local government and state government organisations such as GISA to identify the best path forward.

This report provides a holistic overview of the environmental challenges in the implementation of recycled materials in the council road infrastructure. This task has been undertaken by consulting with industry stakeholders, such as the EPA, private business and local government and conducting desktop research. After consulting with the SA EPA, two policies were identified to be relevant, those being the EP Act 1993 and the WtR EPP 2010. The current climate surrounding recycled materials in SA roads is relatively new, with NSW acting as a reference point for guidelines and specifications. Currently, EPA SA have no road specific standards other than the waste derived fill guidelines. However, the EP Act has recently been amended, making it easier for the industry to change their waste to recycled material. EPA SA are also undertaking a review of the WtR EPP 2010 from June 2022. Included in this is a review of the end-of-waste framework included in clause 4 of the policy. This review will involve public consultation inclusive of industry.

The second component of this report is consultations with key players in the waste and resource recovery sector such as Downer, ResourceCo, Tyrecycle, City of Mitcham and other key industry stakeholders. In general, LGs are keen to implement a circular economy into their local areas, with the supply of recycled materials not being an issue. However, it was identified the size of the local market hindered the ability to be able to produce and supply local materials.

Concerns were also expressed about the level of caution of LGs about committing fully to using recycled materials in roads. It was found that this is more due to risk aversion in terms of the performance of the material as opposed to environmental regulations. From an environmental perspective, there is a lack of direction on how to effectively procure recycled materials and what LGs need to consider to be environmentally responsible. There is no requirement for the councils to consult directly with EPA or other agencies such as DIT on environmental regulations. Councils currently rely on the suppliers and that they are consulting with the EPA and complying with the appropriate environmental legislation for the recovered waste products they are producing and selling Environmental benchmarks, tools for recording emissions, and overall unbiased guidance on the available and priority recycled materials to use, either internally from councils or from DIT will help councils in being environmentally accountable

From an industry perspective, Government is also finding it hard to keep up with the pace at which technology is evolving, resulting in outdated pieces of legislation and a lack of unbiased guidance on the use of recycled materials, from an environmental regulatory perspective and overall performance perspective. As a result, recycled material usage and innovation are not able to be maximised. DIT and LGs need to reassess their procedures and policies to provide guidance for the use of recycled materials in road pavements and the reassurance that the materials are environmentally sound. This can be done by highlighting what councils need to consider when procuring materials and making businesses environmentally accountable. It was also recommended that businesses that continue to use virgin materials should start being penalised, rather than rewarding businesses that use recycled materials, as it will generate change much faster.

While producers of recovered products feel there is a hurdle to overcome in how their materials are viewed as waste, it should be noted that all recovered product producers work within an environment that is regulated by the EPA and receive the same scrutiny as does the whole marketplace. In saying this, the EPA SA is committed to reviewing the WtR EPP 2010 and will seek comment from industry during formal public consultation.

Overall, SA is showing mostly positive progress in the harnessing of recycled materials. Councils such as the City of Mitcham are displaying genuine interest to endorse a circular economy, however as they mentioned the use of recyclables is still relatively new and they are learning what needs to be considered environmentally and how to manage the suppliers and contractors in this aspect. Industries are more than ready to create change and continue to be environmentally responsible, as it leaves a positive legacy and benefits them economically through saved waste management costs. If SA legislation and specifications can maintain pace with technology advancements and the environmental challenges they bring, great strides can be made and further demonstrate why SA is one of the most progressive states.

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