LG TRRIP
Local Government Transport & Roads Research & Innovation Program

Final Project Presentation

Sustainable road construction practices for Local Government roads in Western Australia

Welcome

About LG TRRIP and WARRIP

LG TRRIP

The Local Government Transport and Roads Research and Innovation Program is a joint initiative between WALGA and Main Roads Western Australia.

LG TRRIP seeks to provide collaborative research that positively contributes to the design, construction and maintenance of safe, sustainable transport infrastructure for local government in Western Australia.

Housekeeping

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- **This session will be recorded.**
- **Please remain muted when not speaking.**
- **If you have a question during the presentation, please put them into the chat.**
  - Q & A time allocated at the end of the session.
- **Session length: aim 1.5 hours.**

Presenters

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NTRO/ARRB

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NTRO/ARRB

Agenda

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1. Welcome / Introduction to the Project
2. Development of the guideline
3. About the guideline
4. Example Scenarios
5. Way forward
6. Question time

Purpose of the presentation

- **Provide information**
  - Project overview: *Sustainable road construction practices for Local Government roads in Western Australia*
  - Presentation of finalised Practitioners Guideline
- **Recommendations of implementation strategies**
- **Guidance on how to use the document**
- **Support the WA Waste Avoidance and Resource Recovery Strategy 2030.**

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Local Government Transport & Roads
Research & Innovation Program

About the Project

Local Government Guideline for Sustainable Road Construction Practices in Western Australia

Background

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- LG TRRIP is funded through the State Roads Fund to Local Government Agreement 2023/24 – 2027/28.
- The SRFLGA will include a commitment to increase usage of recycled materials in road construction.
- WA’s Waste Avoidance and Resource Recovery Strategy 2030 sets targets of increasing material recovery to 70% by 2025 and 75% by 2030.
- The viability and range of recycled materials and sustainable practices in WA is not well understood…
- This Practitioners Guideline aims to bridge that gap!

Objective and Outputs

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- **The project will deliver a <u>practical guideline</u> that will assist Local Governments to make informed decisions for the use of recycled materials and sustainable practices in road preservation and upgrade activities.**
- **The Practitioners Guideline will:**
  - be in a user-friendly format.
  - be written in plain English.
  - Provide <u>practical solutions</u> for implementing sustainable road construction practices.

Anticipated Benefits

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- Provide a comprehensive catalogue of options to support and empower Local Governments to adopt sustainable practices.
- Provide guidance for adoption of practices based on sound judgement.
- Increase the uptake of recycled materials in the Local Government sector.
- Limit failures and inappropriate applications.

Project timeline

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Jan 2023 — **August 2023**

- **Economic Benefit Preliminary Analysis**
- **Development of** Guideline **Structure**
- **Undertake a Literature Review**
- **Complete a Desktop Study of suppliers**
- **Stakeholder Engagement Workshop**
- **Complete the economic benefit analysis**
- **Finalise the** guideline
- **Project summary, training & communications**
- **Deliver the final presentation**

We are here!

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Development of the Practitioners Guideline

Structure, Scope and Methodology

Documents Structure

- **A series of two documents have been prepared:**
  - Practitioners Guideline.
    - A user-friendly format, including tables and decision matrices to provide practical solutions interpretable by non-technical practitioners.
  - Technical Report.
    - A technical report containing all the background research and supporting technical information.

Scope and Methodology

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- **The document development scope encompassed a catalogue of recycled materials and sustainable practices.**
- **The documents were developed in 5 key stages:**

(1) Literature Review

(2) Desktop Study

(3) Stakeholder Engagement

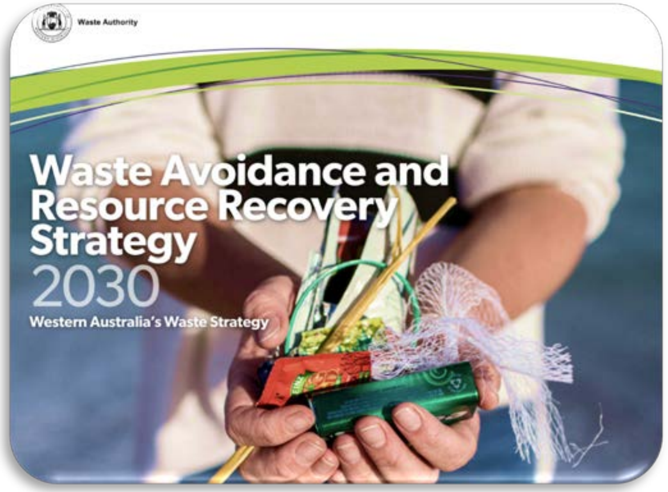
(4) Finalise Documents

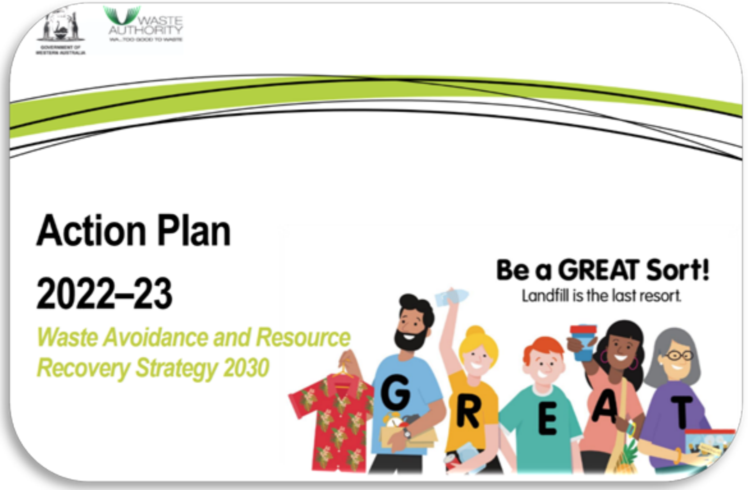
(5) Final Presentation

Waste Management Policies

“Western Australia will become a sustainable, low-waste, circular economy in which human health and the environment are protected from the impacts of waste.”

2019 Western Australia’s Waste Strategy





OBJECTIVES	**Avoid** *Western Australians generate less waste.*	**Recover** *Western Australians recover more value and resources from waste.*	**Protect** *Western Australians protect the environment by managing waste responsibly.*
TARGETS	**2025** – 10% reduction in waste generation per capita **2030** – 20% reduction in waste generation per capita	**2025** – Increase material recovery to 70% **2030** – Increase material recovery to 75% **From 2020** – Recover energy only from residual waste	**2030** – No more than 15% of waste generated in Perth and Peel regions is landfilled. **2030** – All waste is managed and/or disposed to better practice facilities

Foundations

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- **Drivers for Sustainable Road Construction**
  - Alignment with local, national, and international policy and commitments.
  - Beneficial reuse of existing recyclable materials waste streams.
  - Cost savings, typically via the insitu reuse/recycling of existing roads.
  - Reduced traffic disruption resulting from the import of virgin materials and use of some sustainable road construction techniques.
  - Reduction in landfill of waste materials.
  - Reduction in atmospheric emissions such as dust and fumes.
  - Reduced environmental degradation from extractive industry activities.
  - Reduced noise and dust from extractive industry activities.

Foundations

- **Principles of responsible use of recycled materials:**
  - Engineering performance
    - Must be equivalent of conventional materials if not better
  - Short-term HSE requirements
    - Not be harmful or be a WHS risk to workers or the public
  - Long-term environmental impact
    - Not generate harmful leachates or unwanted microplastics
  - Be fully recyclable
    - Have to be recyclable at end-of-life to support the circular economy

Stage 1

Literature Review

Literature Review

- A literature review was undertaken to produce a comprehensive guideline containing current established road building recycled materials options and products, suitable for use on local roads within WA.
- The review incorporated information from specifications and guidelines within WA and other jurisdictions.

Literature Review

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Recycled Materials

- Reclaimed Asphalt Pavement (RAP)
- Crushed concrete and brick
- Crushed glass
- Crumb rubber
- Fly ash
- Bottom ash
- Blast furnace slag
- Food and garden organics (FOGO)
- Recycled plastics
- Recycled materials in road furniture

Sustainable Practices

- Foamed bitumen stabilisation
- Bitumen emulsion stabilisation
- Cement stabilisation
- Soil/subgrade stabilisation
- Warm mix asphalt
- Hot in place asphalt recycling
- Insitu recycling of concrete pavements
- Marginal and non-standard materials

Literature Review

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- **Research was undertaken and detailed in the following key areas (where possible) during the review:**
  a) General applications and specifications (Note: WA specific specifications)
  b) Engineering Performance
  c) Environment
  d) Work Health and Safety
  e) Waste Recovery Process
  f) Case Studies
  g) Potential Future Applications.

Literature Review

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For example, Crumb Rubber

General applications	Crumb rubber is sourced from end-of-life tyres that are processed via shredding and crumbing (Department of Transport and Main Roads 2020, Rice et al. 2020).
Specifications	• Sprayed bituminous surfacing: road building model specification (WALGA) • MRWA specifications (503 Bituminous surfacing, 511 Materials for bituminous treatments, 516 crumb rubber open graded asphalt, 517 crumb rubber gap graded asphalt)
Engineering performance	Benefits • Asphalt: cracking resistance, rutting resistance, durability, etc. • Sprayed seals: productivity, aggregate retention, etc. Challenges: • Crumb rubber / binder segregation and degradation, emissions, etc.
Environment	Potential contaminants including heavy metals and hydrocarbons
Health and Safety	Increased fire risk, fuming and emissions of volatile organic compounds
Waste Recovery Process	Tyre Stewardship Australia (TSA) and MRWA accreditations
Future applications	Increasing the % of crumb rubber in roads.

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Stage 2

Desktop Study

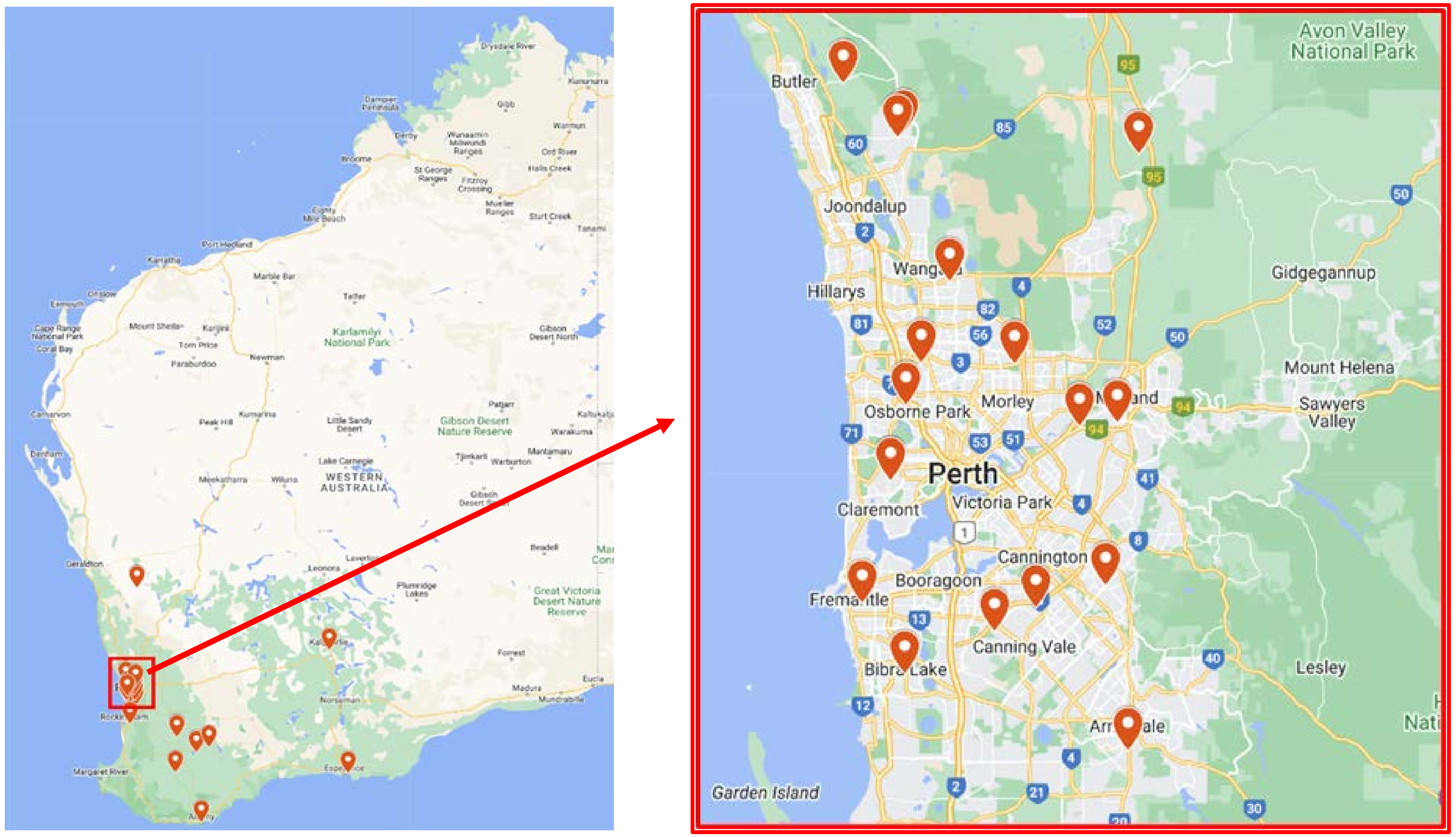
Desktop Study

- A review of availability identified that, as expected, many types of recycled materials for use in road construction are predominantly situated or accessible within metropolitan and surrounding regional areas.
- The availability of some recycled materials may present challenges for regional and remote LGs to integrate some materials in road construction or adopt certain practices.
- However, increasing the uptake of recycled materials and sustainable practices in road construction is anticipated to aid in improving availability.

So how available are these recycled materials and services in WA?

Desktop Study

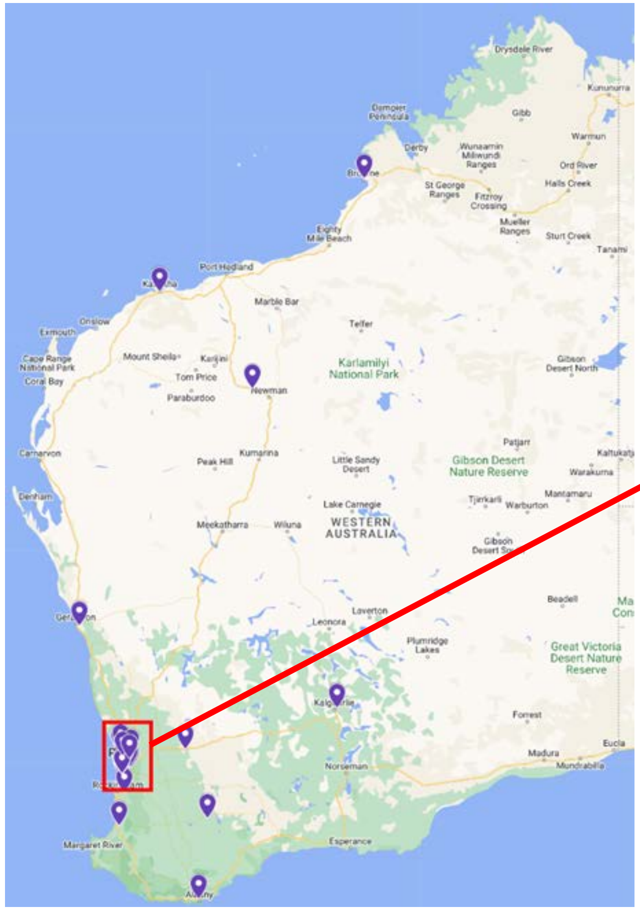
Material Recovery Facilities

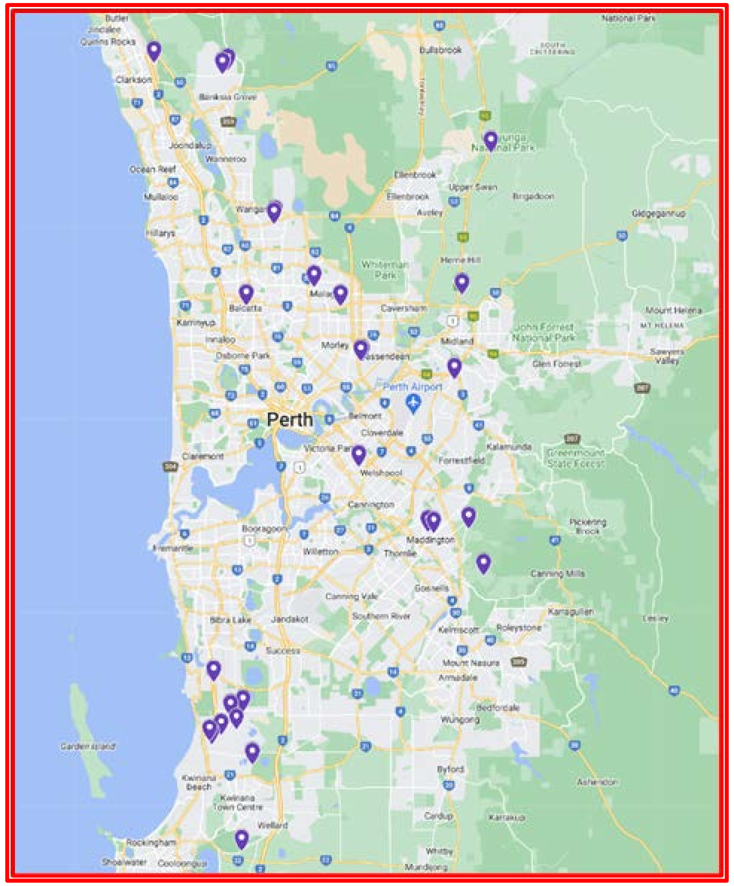


- ► **Primary recyclers**
  - ► Drop off locations for waste
  - ► Sorting and separation of waste materials
  - ► Reuse of recycled products
  - ► Located in Perth, south-west WA & Esperance

Desktop Study

C&D Recycling Facilities

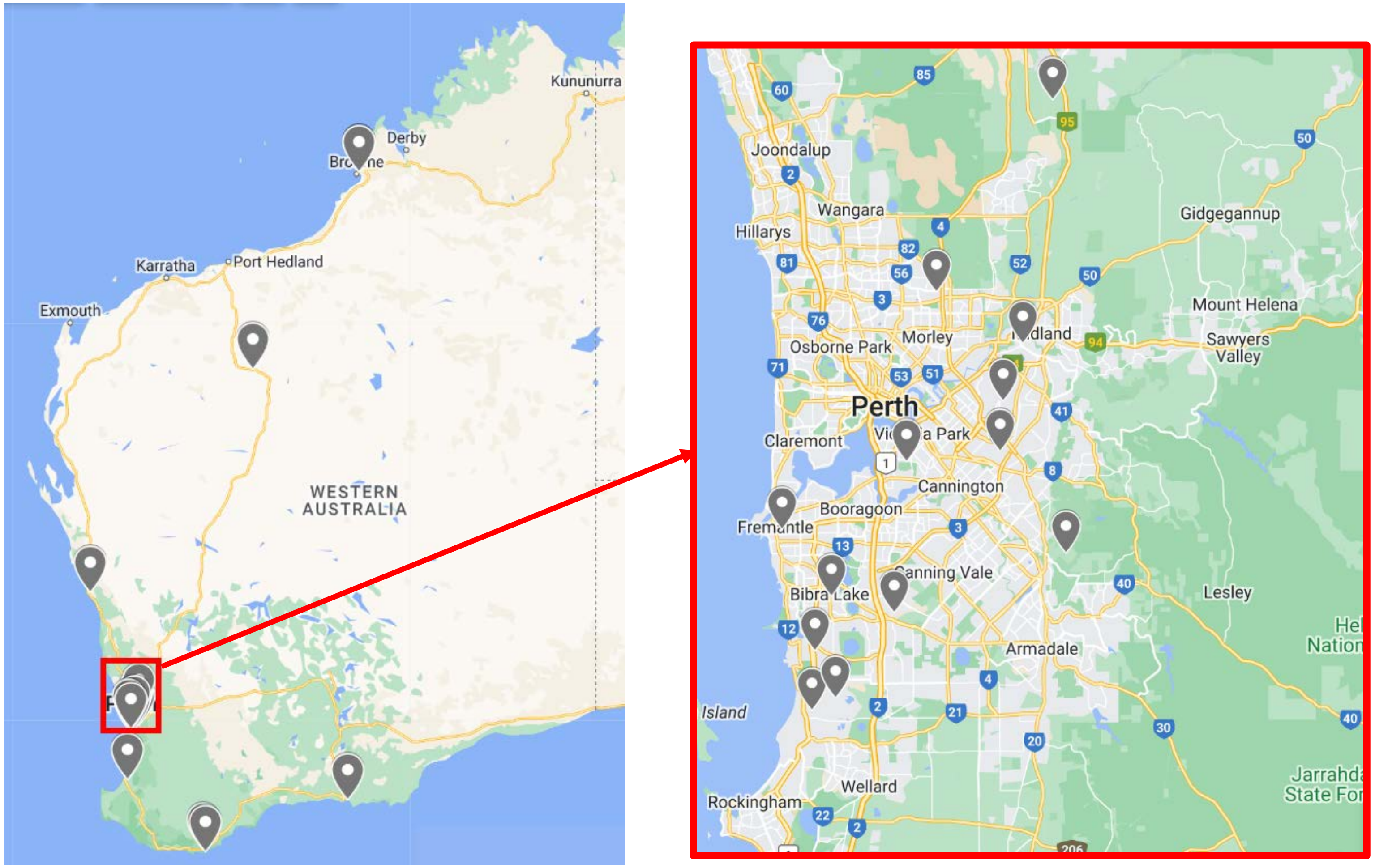




- **Primary recyclers**
  - Construction waste products
  - Can provide pick up or skip services
  - Sorting and separating waste
  - Reuse and reprocessing of materials

Desktop Study

Rubber Recyclers



- **Secondary recyclers**
  - Decreasing amount of recycled tyres
  - TSA approved facilities are limited in WA
  - Difficulties in stockpiling crumb rubber

More information is available in the guidelines and the DCCEEW waste and resource recovery data hub!

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Stage 3

Stakeholder Engagement

Stakeholder Engagement

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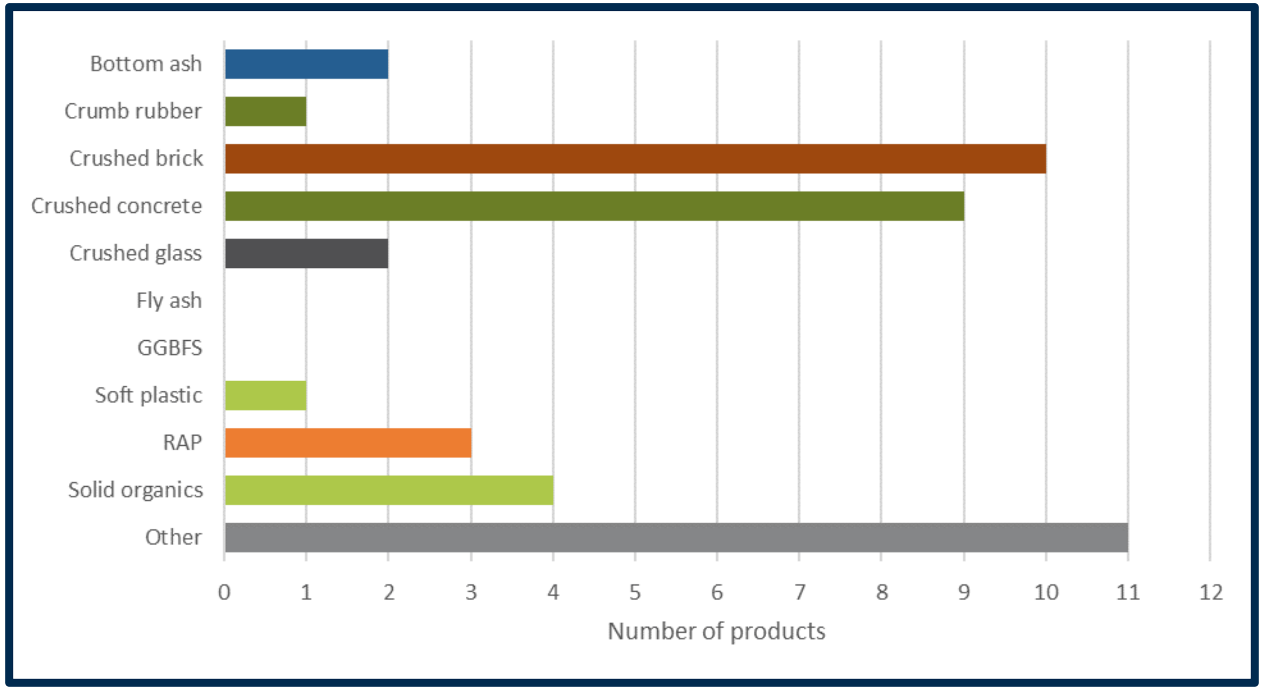
Suppliers

Engagement

- Supplier survey
- Direct engagement

Findings

- Distribution range
- Capacity
- Common challenges
- Recycled product and services list
- Challenges with obtaining detailed information during surveys and engagement.
  - Recommended that LGs prepare their own registers of local suppliers.



Supplier survey results: Recycled materials in supplier's products

Stakeholder Engagement

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Local Government Practitioners

Engagement

- Online, interactive stakeholder engagement workshop
  - Presentation
  - Mentimeter
  - Breakout rooms

Findings

- Feedback on sustainable materials and methods
- Perception of availability
- Most important aspects to consider when using sustainable materials and methods

LG Practitioner workshop Mentimeter output:
When thinking about “sustainable road construction”, what words come to mind?

Stage 4

Finalise Documents

Finalise Guidelines

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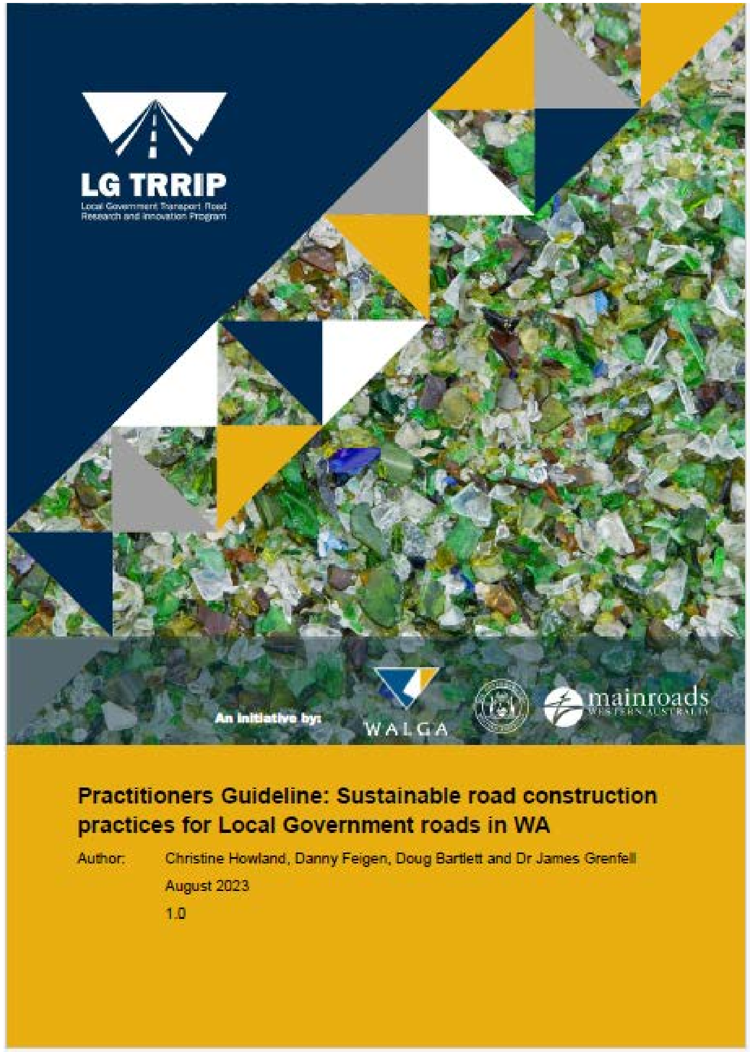
- Upon completion of the required research, studies and interactive engagement, the information obtained was used to prepare the Technical Report.
- The finalisation of the Technical Report enabled the development of the Practitioner’s Guideline.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Local Government Transport Road Research and Innovation Program

An initiative by: WALGA mainroads WESTERN AUSTRALIA

Practitioners Guideline: Sustainable road construction practices for Local Government roads in WA

Author: Christine Howland, Danny Feigen, Doug Bartlett and Dr James Grenfell

August 2023

1.0

The Guideline

Selecting appropriate recycled materials and sustainable road construction practices

The Guideline

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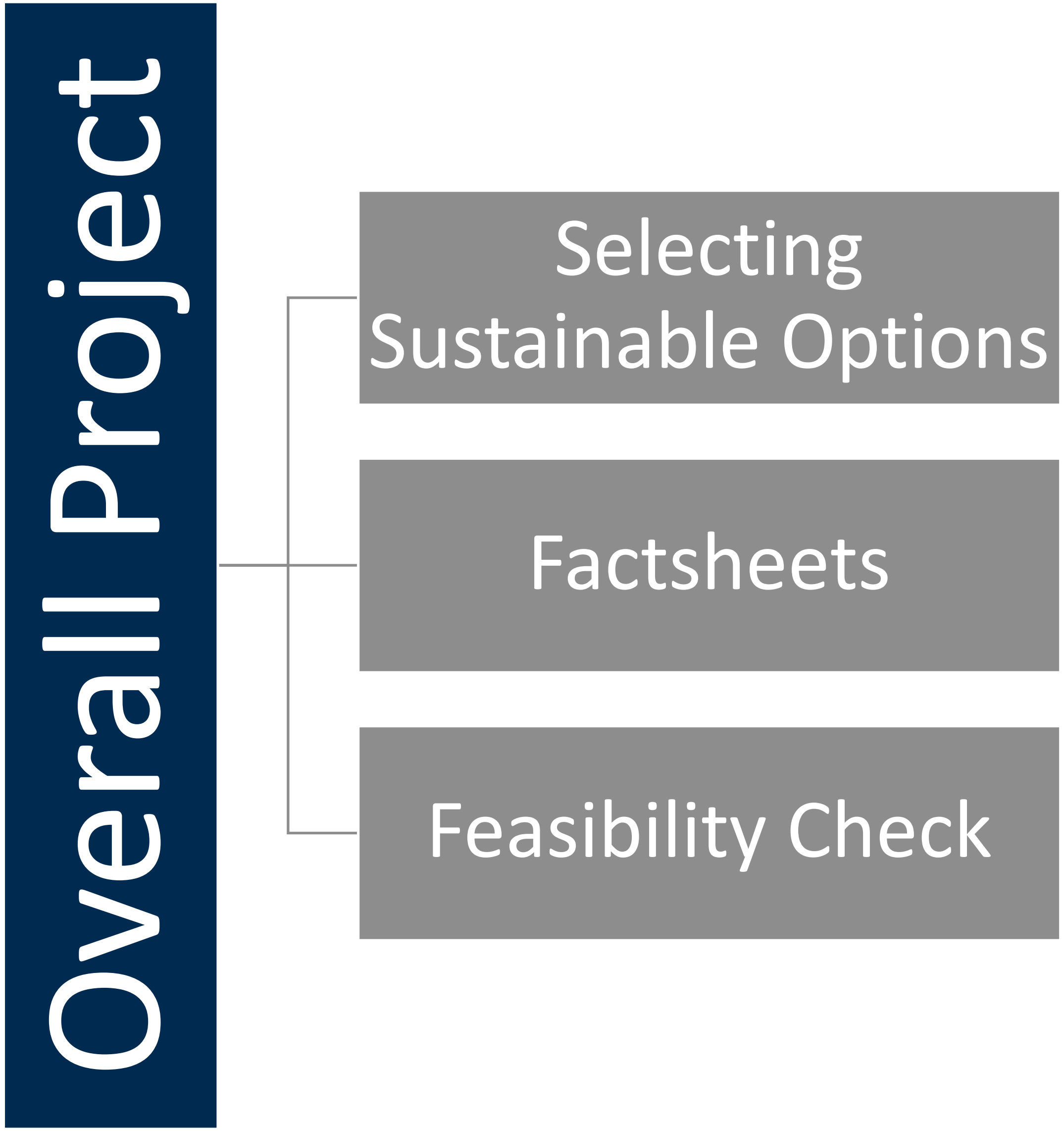
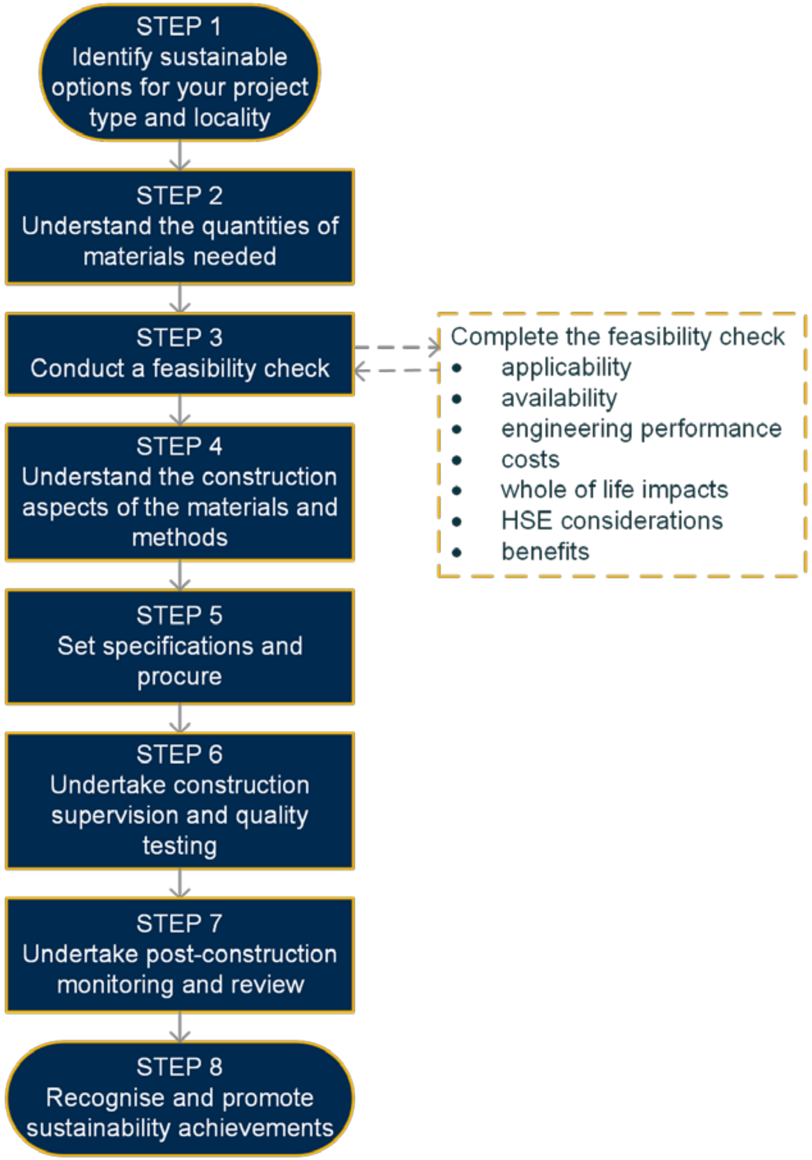
- The content identified during the project is transformed into a series of user-friendly flow charts, tables and matrices to enable effective decision making.



The Overall Project

- ►The selection of recycled materials and sustainable road construction practices for integration in road construction is one element of a greater road construction project.
- ►Steps 1 and 3 are critical points in identifying sustainable options and assessing their feasibility.



Selection Process

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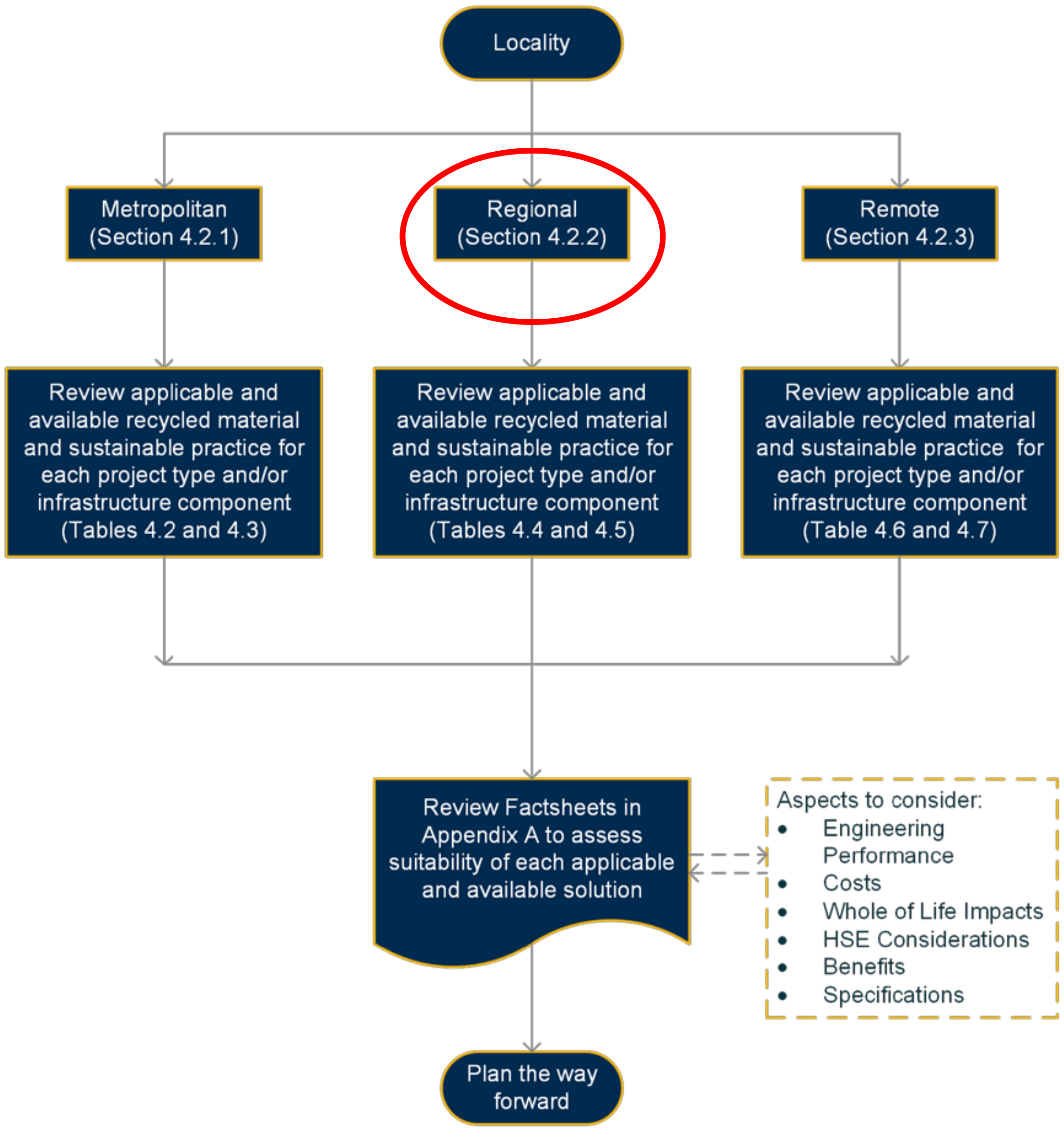
These guidelines have been structured to align with identified WA-specific locality constraints and project types:

- **Locality**
  - Remote / Very Remote
  - Regional
  - Metropolitan
- **Project Type**
  - Granular resheets / stabilisation
  - Seal / reseal
  - Rehabilitation base and seal
  - Upgrade widening
  - Asphalt overlay
  - Metro rehabilitation (mill and re-mill)

Selection Process

- A summarised version of the selection process is available in Volume 1.
- For additional detail, refer Volume 2.



Selection Process

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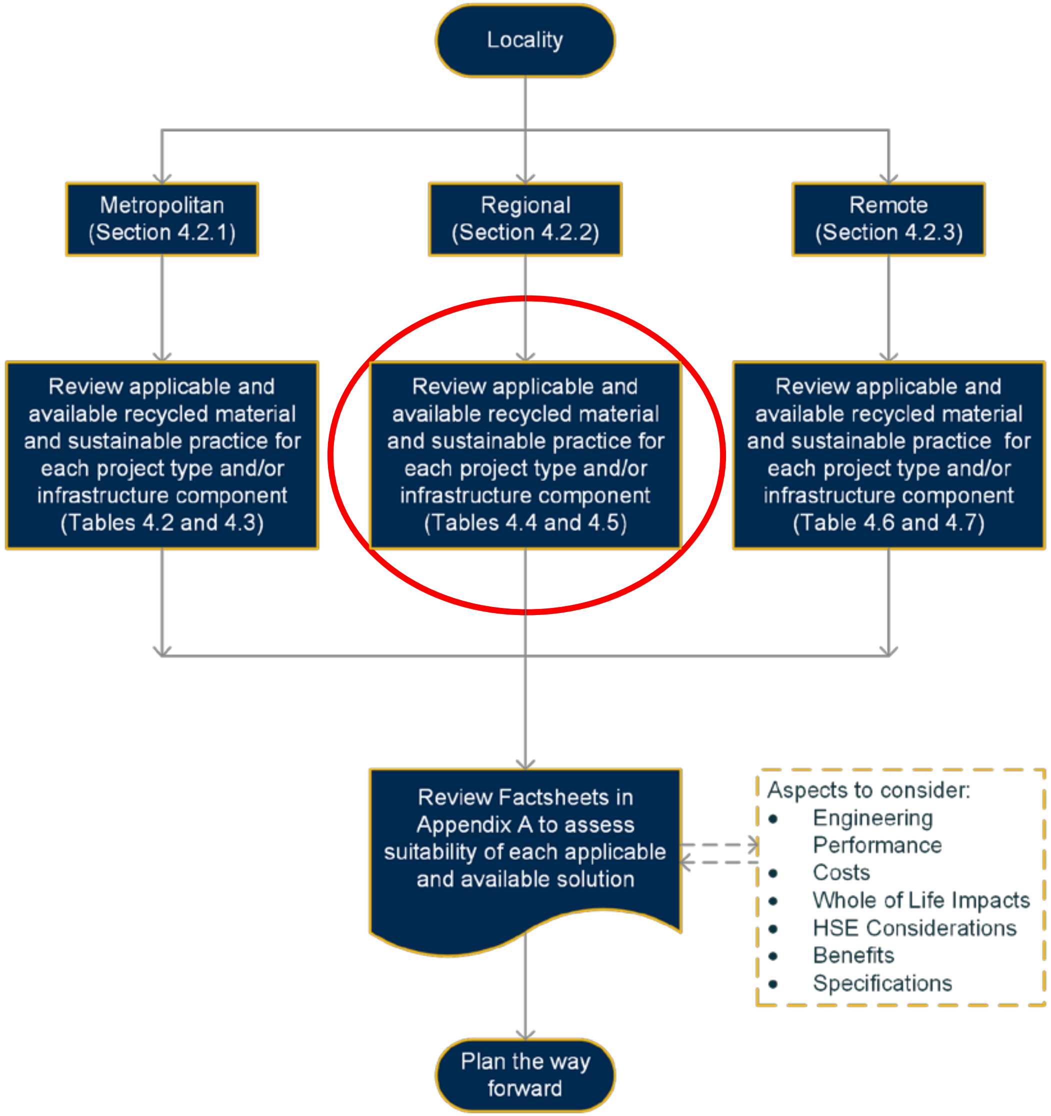

Table 4.4: Recycled Materials in Regional Areas

Project Type	Infrastructure Component	Recycled Materials[1]: RAP	Crushed Recycled Concrete and Crushed Brick	Recycled Crushed Glass	Crumb Rubber	Fly Ash	Bottom Ash	Blast Furnace Slag	Food and Garden Organics (FOGO)	Recycled Plastics
Granular resheets/ stabilisation	Unbound pavements	✓	✓	✓		✓	IS	✓		R
	Concrete		✓	✓		✓	R	✓		R
	Earthworks/Embankments	✓	✓	✓		✓	R	✓		
Seal/reseal	Seals				✓					R
	Asphalt	✓		✓	✓	✓		✓		R
Rehabilitation base and seal	Seals				✓					R
	Asphalt	✓		✓	✓	✓		✓		R
	Unbound pavements	✓	✓	✓		✓	IS	✓		R
	Concrete		✓	✓		✓	R	✓		R
Upgrade widening	Seals				✓					R
	Asphalt	✓		✓	✓	✓		✓		R
	Unbound pavements	✓	✓	✓		✓	IS	✓		R
	Concrete		✓	✓		✓	R	✓		R
	Earthworks/Embankments	✓	✓	✓		✓	R	✓		
	Ancillaries	✓	✓	✓	✓	✓	R	✓	✓	✓
Improvement projects – e.g. new carriageway, turning lanes, traffic circles etc.	Seals				✓					R
	Asphalt	✓		✓	✓	✓		✓		R
	Unbound pavements	✓	✓	✓		✓	IS	✓		R
	Concrete		✓	✓		✓	R	✓		R
	Earthworks/Embankments	✓	✓	✓		✓	R	✓		
	Ancillaries	✓	✓	✓	✓	✓	R	✓	✓	✓

1. Recycled materials are linked to the product factsheets in Appendix A.

Applicability Key:

✓ = Application in specifications in WA.
IS = Specifications available in other states.
R = Research underway.

Availability Key:

= Readily available from most suppliers.
= Some availability from some suppliers.
= Limited availability in quantity or by number of suppliers.

Factsheets

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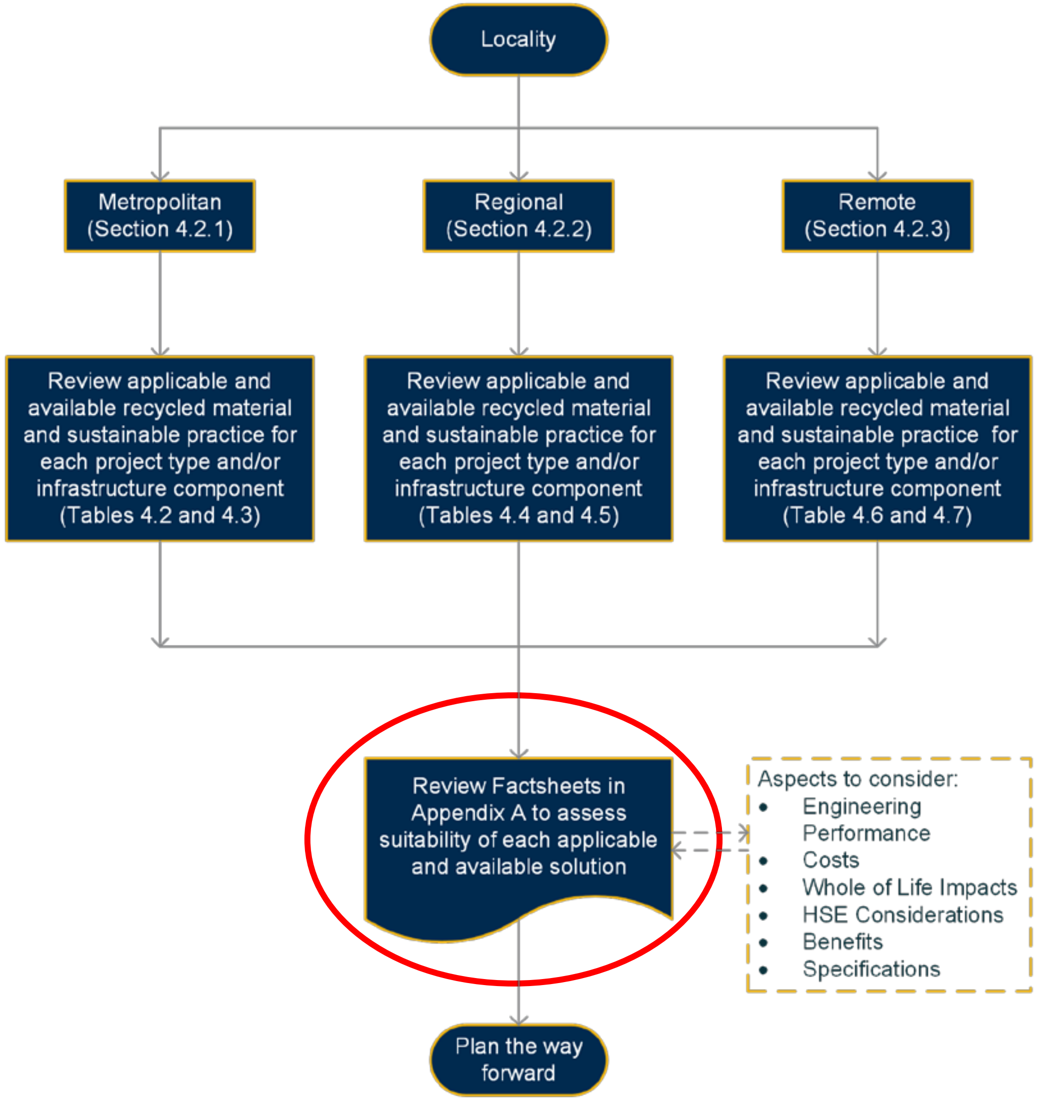

CRUSHED RECYCLED CONCRETE AND CRUSHED BRICK

Crushed recycled concrete and crushed brick for use in road construction are typically generated from construction and demolition waste. The materials primarily comprise aggregates and cementitious adhesion medium.

POTENTIAL APPLICATIONS

- Unbound Pavements
- Concrete
- Earthworks / Embankments
- Ancillaries (refer Recycled Materials in Road Furniture)

AVAILABILITY

Supplier	Distribution Range	Capacity
Product Recovery Industries	Postans, Bayswater & Neerabup	Confirm with supplier
Broome Waste Management Facility	Broome area	Low – small projects only
Corps Environmental Pty Ltd	Pilbara, Kimberley and Gascoyne	10,000 tonnes
WA Recycling	300km of Hazelmere	High – confirm with supplier
Red Sand Supplies	100Km of Perth	15,000 - 20,000 tonnes/annum
Stoneridge Quarries WA	WA	Confirm with supplier
Encore Recycling & Resource Recovery	Within 50KM Perth GPO	100 tonnes per day
Wylie Bay MRF	Esperance	Low – small projects only
Everything Earth	Port Hedland area	Confirm with supplier
Peel Resource Recovery	Pinjarra Bunbury Vasse	100,000 tonnes /annum

ENGINEERING PERFORMANCE

Crushed recycled concrete is known to increase in strength and stiffness over time. Some key risks include cracking, popping, hazardous contaminants and pH. There is also a risk of recementing if used in pavement base or subbase, which may lead to cracking. Management options are available to reduce this risk. Research indicates that crushed recycled concrete performs satisfactorily when compared to virgin aggregates, and they typically have higher moisture absorption, lower impact resistance, lower density and lower abrasion resistance.

WHOLE OF LIFE FACTORS

The potential future application with respect to crushed recycled concrete and brick primarily relate to improved capture and recycling of construction and demolition waste and also increased uptake in road infrastructure projects. Some of the key barriers to this uptake relate to a perceived high contamination rate, a lack of awareness over the benefits of recycling over landfilling and haulage distances.

HSE CONSIDERATIONS

Potential contaminants will likely depend on the previous use of the product. As such, hazards may vary (e.g. asbestos, fuels and oils, etc.). This material can have high pH, so consideration should be given to the end use location. The crushing required during waste processing may introduce WHS hazards relating to asbestos and respirable crystalline silica.

BENEFITS

Utilising recycled crushed concrete and brick presents the opportunity to recover valuable resources and reduce the volume of material being sent to landfill. As an aggregate replacement for use in road construction, it also has the potential to minimise or reduce the demand for virgin materials, in turn reducing the potential environmental impacts associated with extractive industry.

WA SPECIFICATIONS

Specification	Application
IPWEA/WALGA Specification for the Supply of Recycled Road Base	Crushed recycled concrete (base and subbase): Class 1: Maximum 95% by weight, Class 2: Maximum 95% by weight as base, 100% by weight as subbase. Crushed bricks: Class 1: Maximum 10% by weight, Class 2: Maximum 15% by weight
Roads to Reuse Recycled Road Base and Recycled Drainage Rock	Base (predominantly concrete) and drainage (mixture of coarse grained aggregate, including bricks) (waste processing specification)
MRWA Specification 501 Pavements	Crushed recycled concrete: Crushed recycled concrete may be used as subbase material under full depth asphalt pavements, subject to limitations. Crushed bricks: Up to a maximum limit of 15% by mass retained on a 4.75 mm sieve.

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Feasibility Check

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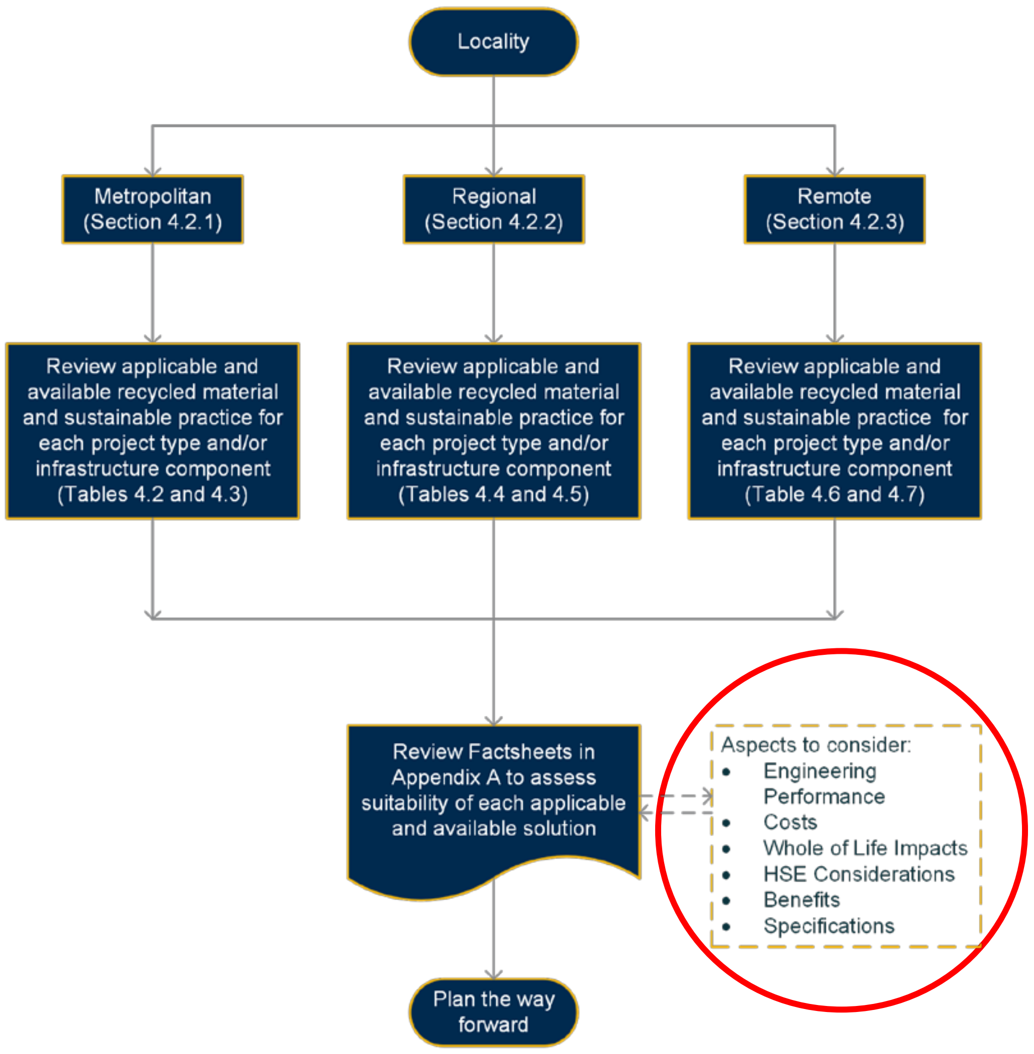

Table 4.8: Aspects to Consider

Item	Summary
Applicability	• Refer Step 1. • Identify any project constraints such as time and quality that may prevent a recycled materials product from being utilised.
Availability	• Refer Step 1. • Seek advice from the local government's waste operations, and contact product suppliers and recycled materials suppliers, to determine the availability of alternative materials for inclusion in the project(s).
Engineering Performance	• Consider the durability requirements for the project (e.g. is the road highly trafficked, an unsealed road, etc).
Cost Implications	• Undertake a cost analysis of the impact of using the different recycled materials in the projects and programs. • Elements to consider may include a comparison of virgin materials vs recycled materials, transportation costs, etc.
Whole-of-life factors	• At the end of the pavement life, can the road be recycled or used a clean fill?
Health, Safety and Environmental Considerations	• Is the road being constructed in a particularly sensitive location? • Are there any potential contamination, workplace exposure, cultural or community considerations that need to be taken into account? • Identify project risks that may be increased or reduced as a result of using the recycled materials products
Environmental Benefits	• Identify the local benefits of using each recycled material, which may include tangible savings from reductions of waste-to-landfill, and intangible benefits such as life of products, local employment, and sustainability objectives.

Example Scenarios

How to use the guidelines!

Example Scenario - Metropolitan

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- **A Metropolitan City Resurfacing Project**
  - In this example, the asset infrastructure team in a metropolitan City (known as the A team) have a resurfacing program consisting of asphalt overlay, of 20 to 30 roads a year. As part of their new Climate Change Action Plan and Waste Management Strategy, they have identified the need to introduce recycled materials into their road construction projects to reduce climate change effects and reduce waste to landfill. It is thought that crumb rubber in asphalt would be a good product to trial.
  - The A team accesses the Sustainable road construction practices for Local Government roads in WA (the documents) and proceed with the following implementation process:

Example Scenario - Metropolitan

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A Metropolitan City Resurfacing Project

Step 1
Step 2
Step 3
Step 4
Step 5
Step 6
Step 7
Step 8

Step 1

Identify sustainable options

- Asphalt overlay only.
- Reviewed tables in section 4.2.1 (Metropolitan).
- Reviewed Factsheets in Appendix A.
- Identified crumb rubber as a potential option.

Table 4.2: Recycled Materials in Metropolitan Areas

Project Type	Infrastructure Component	Recycled Materials[1]								
		RAP	Crushed Recycled Concrete and Crushed Brick	Recycled Crushed Glass	Crumb Rubber	Fly Ash	Bottom Ash	Blast Furnace Slag	Food and Garden Organics (FOGO)	Recycled Plastics
Asphalt overlay	Asphalt	✔		✔	✔	✔		✔		R

CRUMB RUBBER

Crumb rubber is sourced from end-of-life tyres that are processed via shredding and crumbing. Crumb rubber is currently approved for use in WA as a Crumb Rubber Modified (CMB) binder in asphalt and sprayed seal applications.

POTENTIAL APPLICATIONS

- Seals
- Asphalt
- Ancillaries (refer Recycled Materials in Road Furniture)

AVAILABILITY

Supplier	Distribution Range	Capacity
CTS tyre recycling	WA	11,000 tonnes /annum.
Wylie Bay MRF	Esperence	Low – minor projects only
Boral Asphalt	Confirm with supplier	Confirm with supplier
Downer Hope Valley Asphalt Plant	Confirm with supplier	Confirm with supplier
Malatesta Group	South West region	Confirm with supplier

Although TSA facilities are recommended for local governments to use, not all rubber recyclers are TSA accredited. If engaging with non-accredited TSA recycler, local governments should investigate the reason for their lack of accreditation and ensure their recycling and waste process aligns with TSA standards.

ENGINEERING PERFORMANCE

In asphalt, crumbed rubber can improve rutting resistance and fatigue due to its high viscosity and elasticity. Higher percentages of crumb rubber (> 18% by mass of total binder) has been demonstrated to effectively mitigate reflective cracking of failed pavements. In asphalt, crumbed rubber can improve rutting resistance and fatigue due to its high viscosity and elasticity. Higher percentages of crumb rubber (> 18% by mass of total binder) has been demonstrated to effectively mitigate reflective cracking of failed pavements. In sprayed seals applications, crumb rubber can improve crack resistance, productivity, oxidation resistance and aggregate retention on heavily trafficked roads.

WHOLE OF LIFE FACTORS

Recent research undertaken in WA has enabled the integration of crumb rubber into asphalt, in addition to the well-established sprayed seals application. Research is currently underway to investigate further increasing the percentage of crumb rubber in road construction.

HSE CONSIDERATIONS

The primary potential environmental impacts associated with waste tyres relate to the potential discharges and emissions related to tyre fires. Heavy metals, hydrocarbons, volatile organic compounds (VOCs) are also reported as key potential contaminants of concern associated with the rubber manufacturing and processing industry. Air emissions and fumes may present a WHS risk to workers during heating and application. Using crumb rubber with warm mix asphalt technology may mitigate fuming risks.

BENEFITS

In addition to the noted improved performance benefits, utilising waste tyres presents the opportunity to recover valuable resources and reduce the volume of material being sent to landfill. It also has the potential to minimise or reduce the demand for virgin materials, in turn reducing the potential environmental impacts associated with the production of polymers and petroleum derived bitumen products. It is also reported that crumb rubber modified roads can also aid in reducing traffic noise.

WA SPECIFICATIONS

Specification	Application
WALGA Sprayed Bituminous Surfacing: Road Building Model Specification	Crumb rubber modified binder (CMB) shall be manufactured using Class 170 bitumen and recycled rubber from end-of-life vehicle tyres or other suitable sources.
MRWA Specification 503 Bituminous Surfacing	5% by mass rubber can be utilised in Geotextile Reinforced Seals in Class 170 bitumen. Rubber binder to be supplied from a bulk mixing facility. The facility shall be capable of mixing the rubber blend to ensure the rubber is thoroughly mixed prior to transport.
MRWA Specification 511 Materials for Bituminous Treatments	A minimum quantity of 18% crumb rubber by mass of total binder shall be used in the crumb rubber modified asphalt binder. Crumb rubber in crumb rubber modified binders shall consist of rubber processed from end-of-life tyres or other suitable rubber products. Crumb rubber shall be sourced from a Tyre Stewardship Australia accredited tyre recycler or a Main Roads Approved supplier.
MRWA Specification 516 Crumb Rubber Open Graded Asphalt	A minimum quantity of 18% crumb rubber by mass of total binder shall be used in the crumb rubber modified asphalt binder. The crumb rubber shall be designed to meet the requirements of Table 516.1, without the inclusion of a warm mix additive.

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Example Scenario - Metropolitan

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A Metropolitan City Resurfacing Project

Step 1

Step 2

Step 3

Step 4

Step 5

Step 6

Step 7

Step 8

Step 2

Understand quantities

- 360 tonnes of asphalt required.
- Normal cost via standard methods = $90,000.

Step 3

Feasibility

- 2 suppliers/contractors available.
- 10% increase in cost.
- Approval to proceed obtained.

- **Feasibility Check**
  - Applicability
  - Availability
  - Engineering Performance
  - Cost Implications
  - Whole-of-life factors
  - Health, Safety and Environmental Considerations
  - Environmental Benefits

Example Scenario - Metropolitan

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A Metropolitan City Resurfacing Project

Step 4
Construction aspects

- Suppliers indicate no unusual requirements.

Step 5
Set specifications

- Product information sheets received.
- Works specifications prepared.
- Procurement process undertaken.

Step 6
Construction supervision

- Construction works completed.
- Test results received and attached to the asset register.

Example Scenario - Metropolitan

LG TRRIP

A Metropolitan City Resurfacing Project

Step 1
Step 2
Step 3
Step 4
Step 5
Step 6
Step 7
Step 8

Step 7
Post-construction

- Quality testing scheduled for 12 and 24 months.
- Project review indicates the sustainable resurfacing program was a success.
- Asphalt supply contract now updated to include crumb rubber.

Step 8
Recognition

- Project information communicated to industry peers and public.

Example Scenario - Remote

- **A Remote Gravel Resheeting Program**
  - In this example, a remote Shire (Local Government organisation) is planning its usual annual gravel resheeting and grading program. An increase in private building construction activity in the region has resulted in larger than usual volumes of construction and demolition waste arriving at the local landfill site, and the Shire officer that supervises the landfill has asked if the materials can be used in the resheeting program. The works manager (sitting next to him – it’s a small Shire) suggests they refer to the Sustainable road construction practices for Local Government roads in WA to work out what they would need to do to use the crushed concrete and brick waste materials,
  - Coincidentally, a local mine site has just asked if the Shire needs any of their clean fill material from a haul road expansion project. The works manager proceeds with the following implementation process:

Example Scenario - Remote

LG TRRIP

A Remote Gravel Resheeting Project

Step 1

Step 2

Step 3

Step 4

Step 5

Step 6

Step 7

Step 8

Step 1

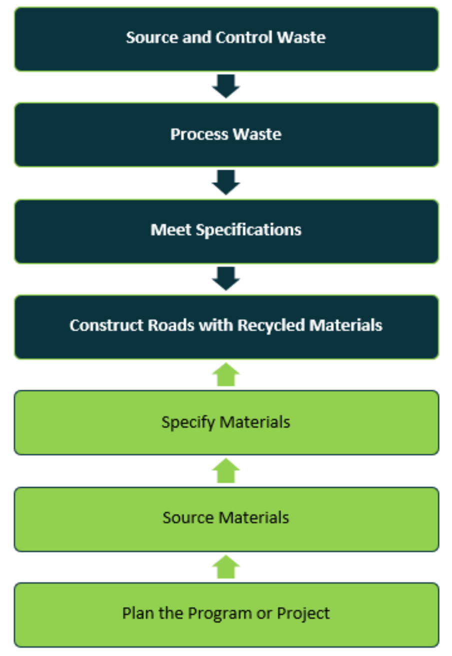
Identify sustainable options

- Reviewed tables in section 4.2.3 (Remote) and Factsheets in Appendix A.
- Identified C&D waste as a potential option.
- Further review of V2 (section 8) highlights C&D may be processed by Council inhouse.

Table 4.6: Recycled materials in remote areas

Project type	Infrastructure component	Recycled materials[1]								
		RAP	Crushed recycled concrete and crushed brick	Recycled crushed glass	Crumb rubber	Fly ash	Bottom ash	Blast furnace slag	Food and garden organics (FOGO)	Recycled plastics
Granular resheets/ stabilisation	Unbound pavements	✓	✓	✓		✓	IS	✓		R
	Concrete		✓	✓		✓	R	✓		R
	Earthworks/Embankments	✓	✓	✓		✓	R	✓		
	Ancillaries	✓	✓	✓	✓	✓	R	✓	✓	✓

Figure 8.1 Path from waste to recycled materials in road construction



Example Scenario - Remote

LG TRRIP

A Remote Gravel Resheeting Project

Step 1

Step 2

Step 3

Step 4

Step 5

Step 6

Step 7

Step 8

Step 2

Understand quantities

- Volumes calculated and C&D waste required exceeds that available.
- C&D waste to be mixed with locally available clean fill.

Step 3

Feasibility

- Clean fill material blend checked to ensure it meets spec.
- Costing for recycled material assessed.
- C&D material assessed, and no contaminants are present.

- **Feasibility Check**
  - Applicability
  - Availability
  - Engineering Performance
  - Cost Implications
  - Whole-of-life factors
  - Health, Safety and Environmental Considerations
  - Environmental Benefits

Example Scenario - Remote

LG TRRIP

A Remote Gravel Resheeting Project

Step 1

Step 2

Step 3

Step 4

Step 5

Step 6

Step 7

Step 8

Step 4

Construction aspects

- No concerns are raised for normal gravel resheeting after testing.
- No contaminants identified.

Step 5

Set specifications

- Specifications in the guidelines are referenced for procurement.
- Testing shows there is higher clay fine % present, however as its unreactive clay it can still be used.

Step 6

Construction supervision

- The recycled material is delivered and spreading proceeds without incident.

Example Scenario - Remote

A Remote Gravel Resheeting Project

Step 1
Step 2
Step 3
Step 4
Step 5
Step 6
Step 7
Step 8

Step 7
Post-construction

- C&D processing successful, however there is unlikely to be ongoing supply of high quantities.
- Landfill manager to consider smaller batches.

Step 8
Recognition

- The shire staff celebrate the success of the program at their monthly get-together.

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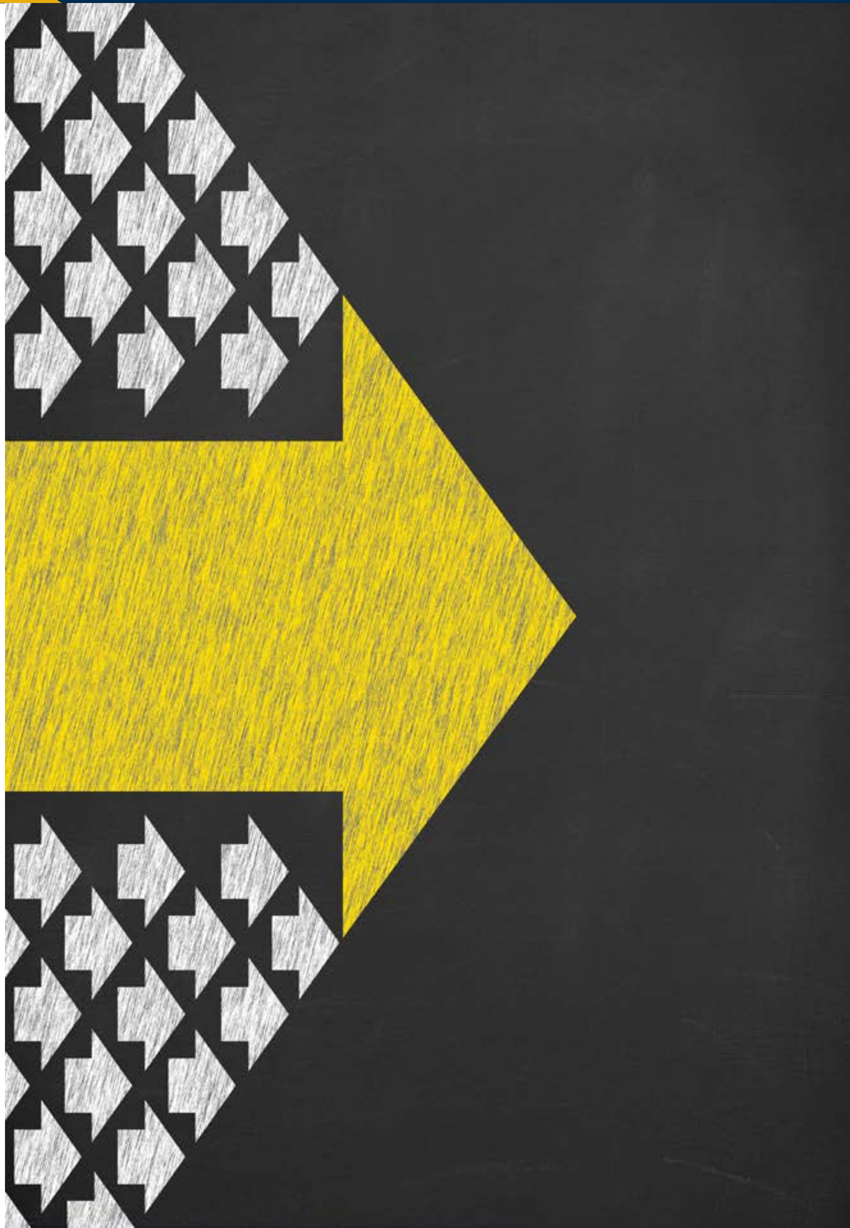
Local Government Transport & Roads Research & Innovation Program

Way Forward

Way Forward

- ►Sustainable road construction practices for Local Government roads in WA, Practitioners Guideline and Technical Report will be available via the WALGA or WARRIP websites.
- ►Updates in materials availability and research undertaken may instigate future updates.
- ►It is recommended that LGs maintain their own lists of materials and suppliers.
- ►Feedback on the documents is welcome.



Question Time

LG TRRIP

Thank you!

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