

Demonstrating the performance and cost effectiveness of recovered crushed glass (RCG) in WA Roads: Margaret River

Background

The Shire of Augusta Margaret River (the Shire) is a world renowned wine producing region and popular holiday destination. An estimated 500,000 people visit the region annually, increasing the volume and complexity of the region's waste stream. Five years ago the Shire identified the opportunity to avoid the mining of virgin sand by utilising glass collected from kerbside recycling collections in road construction.

The Shire first undertook an analysis of its waste which identified a potential local glass resource of 1000 tonnes per annum and a regional potential of 2600 tonnes. Financial analysis showed that local processing of glass and the potential reuse of recovered crushed glass (RCG) in civil construction applications locally would dramatically reduce recovery costs (some glass was previously transported to Perth for recycling, the rest landfilled) and significantly increase recycling.

As a result the Shire received \$73,100¹ in funding from the Australian Packaging Covenant to establish a GM-2 System glass reprocessor to crush glass containers collected from local kerbside and drop-off collections and use the RCG in civil construction. The reprocessor has been operational since October 2009 at the Davis Road Disposal Site as part of an integrated Materials Recovery Facility (MRF) for processing co-mingled recyclables.

In 2011 with funding from The Packaging Stewardship Forum (PSF) of The Australian Food and Grocery Council, the Shire commissioned the construction of two sections of asphalt pavement to demonstrate the use of RCG from the Margaret River MRF as a viable medium for use in road pavement construction as a replacement for fine aggregate. The results of the finished pavements using RCG indicate no noticeable difference in the performance of the pavement from standard asphalt.

Summary of the project

The two demonstration sites constructed in April 2011 involve two 1200m sections of roadway, one with average suburban traffic volumes located in Railway Terrace within the main township of Margaret River, and the second site located at Davis Road and Rosa Glen

Road, Cowaramup which was selected because of its high traffic volumes including large trucks.

The asphalt pavement design using 5% RCG conforms to the relevant AustRoad specifications and Australian Asphalt Pavement Association (AAPA)

The Margaret River site comprises two lanes in both directions 214 m in length and 6.5m wide with an overlay area of approximately 1400 square meters. Usage is predominantly light motor vehicles.

The Cowaramup site is at a road intersection with an overlay area of approximately 1200 square metres where usage includes heavy vehicles up to 14 B-Double transport vehicles per day.



Technical Summary: Performance and Testing

The Shire contracted asphalt suppliers, Malatesta Pty Ltd, to undertake sampling and testing prior to commissioning the RCG asphalt mix to ensure that quality standards could be maintained throughout the process.

The RCG asphalt mix comprises approximately 5% RCG (supplied by the Margaret River Glass Reprocessing Plant) and replaces the fine aggregate fraction of the mix which would normally be virgin sand. The asphalt specification conforms to Australian Standard AS2150 for both sections and the design was for an equivalent 10mm size dense graded asphalt mix designed for heavy traffic conditions.

Feedback from contractors, Malatesta, during the laying of the RCG asphalt mix was that it compared favourably with a “normal” mix in terms of workability and performance. The site manager also commented on how well the matrix of the mix bound and compacted under the roller with less movement during compaction.

Based on performance and results of the RCG asphalt mixes on both sites to date, it has proven to be suitable for residential streets with medium to heavy traffic or subdivision situations.

Monthly inspections were undertaken for three months after construction was completed. No degradation of the finishes of the asphalt pavement surfaces have been observed in this time. Both surfaces are performing well with no discernable difference between the RCG product and standard asphalt.

Costs and benefits

Production costs for the demonstration mix were higher than would normally be expected due to transport logistics and the “one off” nature of the production run. Extra bitumen was also required to reduce air voids and there was some extra mixing of the glass into the sand prior to the final batching. No additional costs would be incurred if RCG was part of the normal mixing process.

A financial analysis of the cost of dealing with glass containers before the glass crusher at 2007 prices and volumes was updated in 2010 to reflect the revised situation. The modeling assumes that the cost of landfill at \$47 per tonne has remained constant.

The cost saving from using RCG in asphalt mix compared to standard asphalt is \$3896.

	Natural Washed Sand	RCG
Tonnes	100 tonnes	100 tonnes
Cost per tonne- (assume mid point)	\$15	\$23.04
Transport distance from source to manufacture	Local Supply (10km)	Local supply
Saving to Council from Landfill costs for glass per tonne		\$47 per tonne
Cost of buying aggregate mix	\$1500	\$2304 per tonne
Landfill Cost	\$4,700	
Cost Saving to Council		\$3896

The benefits of using RCG as part of the normal production process for large scale projects could be significant, reducing the cost of the production of asphalt because the cost of RCG is less than mining natural resources and paying landfill costs.

By offsetting the costs of processing an average 1500 tonnes of glass per annum against the cost of disposing container glass in landfill there is an **annual net saving to the Shire of \$40,010.**

As the cost of naturally washed sand in Western Australia and the cost of landfill increases, the financial benefits of using RCG will increase significantly.

Markets for Recovered Crushed Glass

RCG product available commercially in Australia can be blended with natural and recycled aggregates.

RCG can be used in concrete and asphalt as a fine aggregate material that can be blended with other natural aggregates prior to mixing with the other components in concrete and asphalt. The maximum recommended blend for sealed and unsealed roads is 5%-10%; for heavy duty granular base 15%; and 30% for pavement sub base and light duty road base.

The product can also be used as engineering fill or blended with natural or crushed sands for use as pipe or block paving bedding as defined in the relevant specifications.

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