Case Study: CarbonBind S9R in Darling Downs

Client

Darling Downs District

Project Partners

- **Puma Bitumen** – Innovation Lead & Binder Supply
- **RPQ** – Spray Sealing Contractors
- **Darling Downs District** – Asset Owner

Background

Spray Sealing is the most commonly used road maintenance activity in Australia. It acts by applying thin layer/s of bitumen commonly followed by various aggregate sizes, the variation of aggregate sizes, bitumen types and amount account for various treatment designs that are engineered for each situation. Bitumen has the highest Global Warming Potential (GWP) when maintaining the roads. When analysing the GWP for a typical spray seal, using 2.3 l/m^2 of C170 binder, it estimates that over half the emissions are produced from the binder alone.

End of life tyres or crumb rubber binders is one of the most common spray sealing treatments in Australia, where bitumen is blended with granulated tyre compounds. This has been effective to provide performance benefits and promote adhesion between the aggregate and the binder. Using this technology slightly reduces the GWP, but does provide some performance benefits which may extend the whole of life for the road.

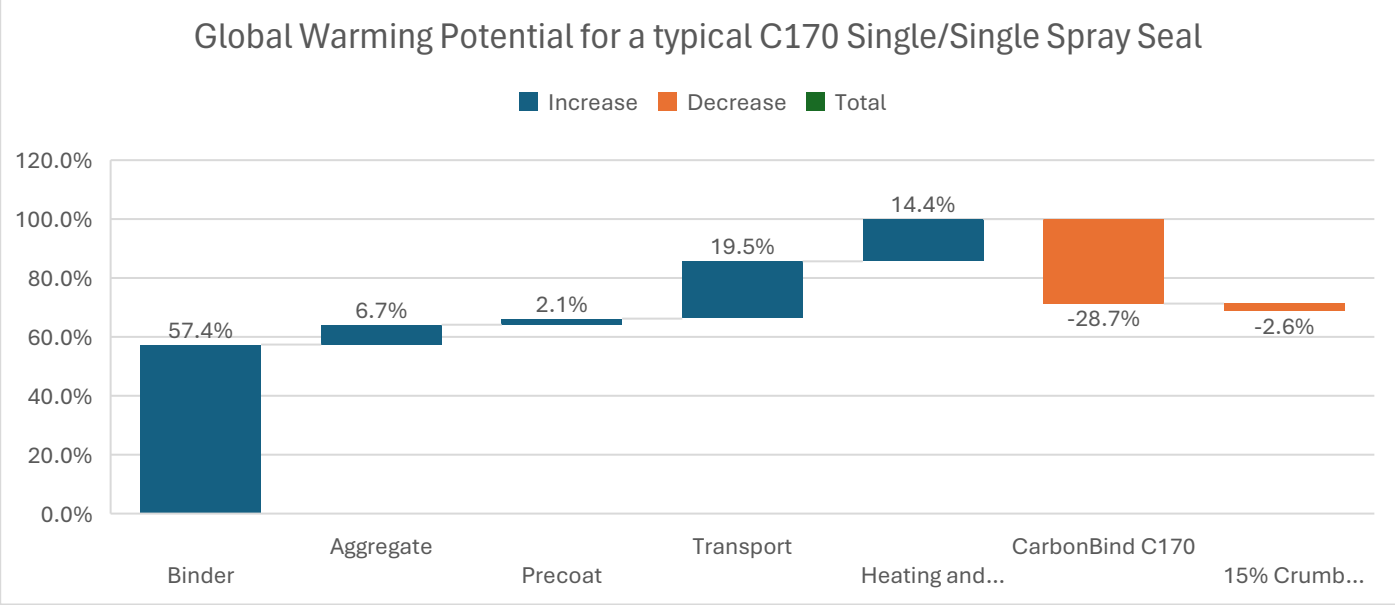

Figure 1, Global Warming Potential of typical AC14 Asphalt

Puma Energy have developed a bitumen with this biogenic component, that reduces the GWP of Paving Grade C170 bitumen by 50%. This reduction expressed across a spray sealing example, shown in Figure 1.

Application

S9R is a ATS3110 specified product that incorporates 9% crumb rubber with standard C170 binder. By using a portion of recycled content alongside binder, it provides slight performance enhancements and is visible in the application. Using this alongside CarbonBind C170, meant that the binder contained end of life tyres, and recycled biogenic material.

The crumb rubber is visible on the applied binder, as small particles can be seen when stretching the bitumen.

Figure 2, CarbonBind S9R Bitumen

22 tonnes of CarbonBind S9R was applied across the site at 2.4l/m^2 covering 7602m^2 across the site.

The product was sprayed successfully and adhered to the aggregate well.

Figure 3, CarbonBind S9R application

This project marks the first case of a CarbonBind S9R being sprayed in the industry.

Sustainability Benefits

	STANDARD S9R	CARBONBIND S9R
ESTIMATED GLOBAL WARMING POTENTIAL ($KGCO_2$/TONNE)	461	240
GWP SAVINGS	0	-224

These emission savings delivered 4,928 kg of CO_2 saved over this project site.

Results

Environmental Impact

- 4,928 kg CO_2 saved through binder substitution alone
- Stored biogenic carbon directly within the pavement
- Supported transparent LCAs and EPDs reporting

Operational Impact

- No additional testing, delays, or equipment changes required
- Demonstrated seamless substitution

Industry Impact

- Demonstrated that sustainable binders can be commercially viable at scale

Key Learnings

- Sustainability goals can be achieved without sacrificing technical performance or cost efficiency.
- Co-production of standard and sustainable binders allows for direct performance benchmarking, aiding future adoption.