Category 4: Excellence in Pavement Recycling and Stabilising in Local Government

Paver Laid Insitu Recycling Process and Foamed Bitumen for State Road Rehabilitation

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Overview

- Isabella Drive is a major arterial road with heavy traffic loading of 3.38 x 107 Equivalent Standard Axles (ESA) for a 20-year design period.
- 1.7km section (11,771 m2)was rehabilitated in February 2024.
- Instead of asphalt pavements regularly carried out, The ACT Government nominated the Paver Laid Insitu Recycling and Foamed Asphalt treatment to rehabilitate Isabella Drive.

Objectives

- Actual Project:
  - Pavement Design & Rehabilitation Works
- Bigger Picture:
  - The success of this project adds another layer of confidence that **foamed bitumen** treatments and **innovative technologies** in the insitu recycling industry **can deliver excellent performance outcomes for state roads**.

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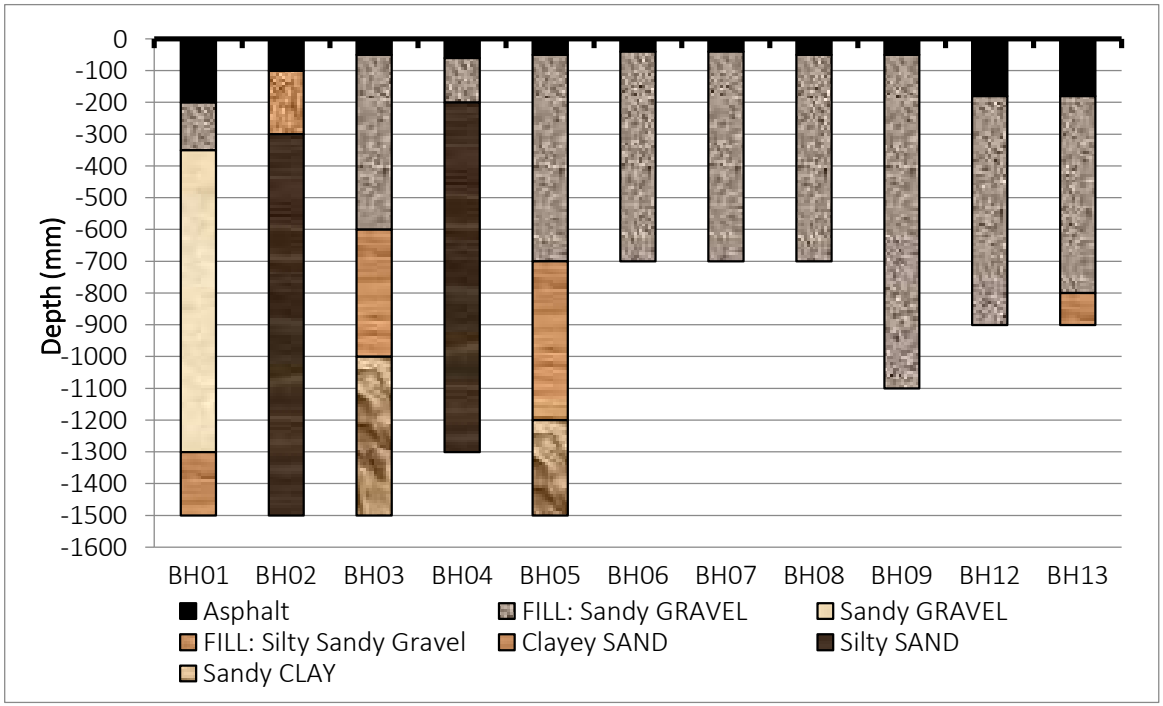
Description of the Project

- Isabella Drive is a major arterial road located in Tuggeranong in south ACT.

- The key parties comprising the project team were:
  - Client: ACT Government
  - Designer and Superintendent: Stantec
  - Principal Contractor: Dale & Hitchcock
  - Key Subcontractors:
    - *Paver Laid Insitu Recycling: Pavement Recyclers (Stabilised Pavements of Australia)*
    - *Asphalt and Spray Seal Wearing Courses: Capital Asphalt*

Design

- After the success of completed projects using Paver Laid Insitu Recycling for Northbourne Avenue Stage 1 and Stage 2 (completed in 2022) and David Walsh Avenue (completed in 2023), the ACT Government was keen to explore reusing the same process for Isabella Drive.
- Preconstruction testing and design was carried out for foamed bitumen treatment (PSD and Atterberg Limits).



Pre-rehabilitation pavement profile

Foamed Bitumen Mix Designs Trialled During Resilient Modulus Testing

1. 3.0% C170 Bitumen, 2.0% Hydrated Lime – ***Selected Mix Design***
2. 3.0% C170 Bitumen, 1.0% 70:30 GP Cement:Flyash
3. 2.5% C170 Bitumen, 1.0% 70:30 GP Cement:Flyash
4. 2.5% C170 Bitumen 2.0% Hydrated Lime

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Design

Layer Name	Thickness (mm)	Type
Asphalt Wearing Course	45	AC14 (A15E) DGA (modulus 3,400 MPa)
Asphalt Base	55	AC20 (C450) DGA (modulus 4,000 MPa)
Foamed Asphalt (recycled pavement)	250	Foamed Bitumen 3% C170 Bitumen, 2% Hydrated Lime (modulus 2,000 MPa)
Total Thickness of Rehabilitated Pavement	350	
Design Subgrade CBR		6% *Lab test results returned values 16-70% on sandy gravel material => approx. 300mm deep*

Fresh Foamed Asphalt

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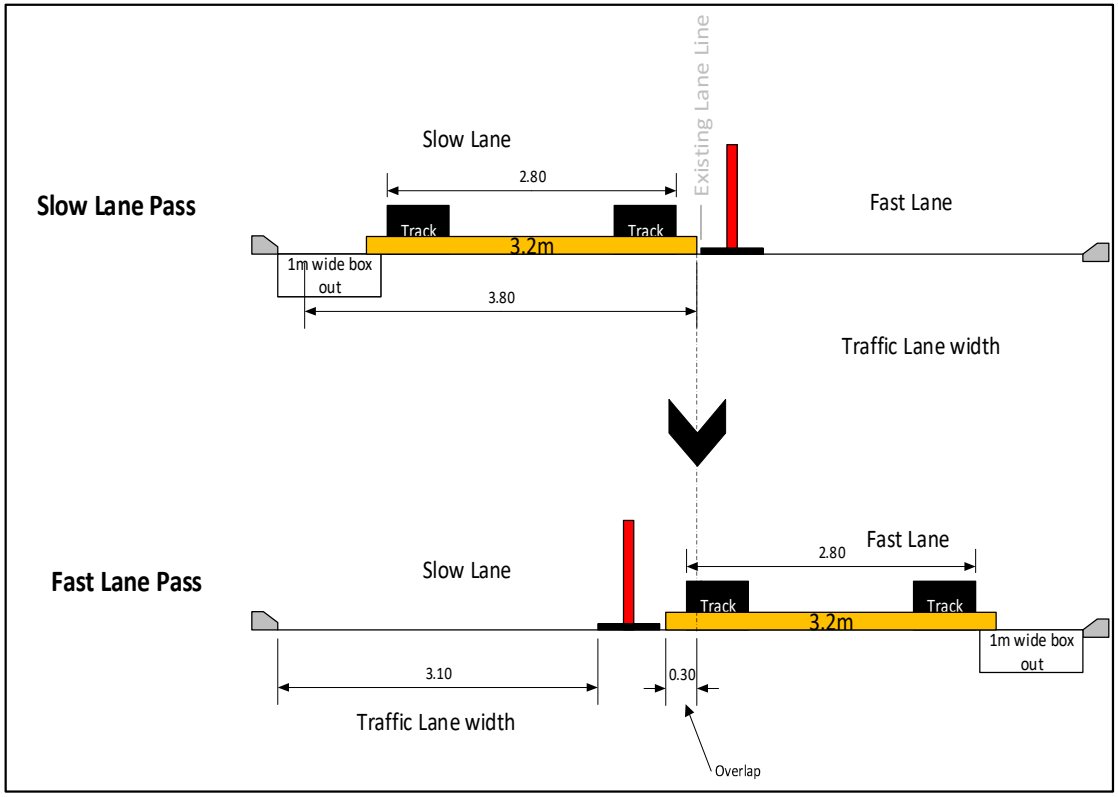
Innovative Construction

- Close the working lane to traffic.
- Mobilise equipment in sequence of work.
- Box-out (removal) of excess material from the pavement using a road profiling mill.
- Start the Paver Laid Insitu Recycling process.
- Complete final compaction with rollers.
- Complete trimming operation.
- Cure placed material with water applied by watercart.
- Open the freshly recycled and treated pavement to traffic loads, which was possible within 2 hours of the process starting.



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Challenges

Variable asphalt thicknesses up to and over 100mm thick were successfully rehabilitated with existing sandy gravel material.

One lane was required to be always open to traffic, so work was confined to one lane only. This logistic was a significant motive for electing the Paver Laid Insitu Recycling process, which enabled a streamlined, single-pass process that live traffic could pass alongside safely.

After each recycling shift, the pavement was opened to live traffic within two hours. This occurred without incident or quality issues regarding the pavement.

The traffic lane needed to always have a suitable surface for safe vehicle passage.

Works needed to be completed during the day to accommodate material deliveries (bitumen and hydrated line) and support resource allocation.

Points of Interest

High productivity rates were achieved. Per shift, the process was able to rehabilitate between 450-600 lineal metres of road pavement at either 3.3m or 4.5m width. The median and maximum areas rehabilitated per shifts were 3030m^2 and 5287m^2, respectively.

Paver-laid technology uniformly places insitu recycled material, ensuring precise and controlled levels with a clean surface. It was possible to view the “cut” or a “window” of the pavement underneath the rehabilitated pavement.

The screed of the paver has compacting mechanisms, which resulted in the material achieving 80% upon initial placement.

“CarbonBind” by Puma was trialled as the AC14 wearing course, and is a product specifically designed to reduce the overall carbon footprint of bitumen through the inclusion of biogenic materials in the material composition.

After each recycling shift, the pavement was opened to live traffic within two hours without incident or quality issues regarding the pavement.

Since the Paver Laid Insitu Recycling process is an innovation to Australia and specifications are currently under development, a project specific specification was developed and implemented on the project.

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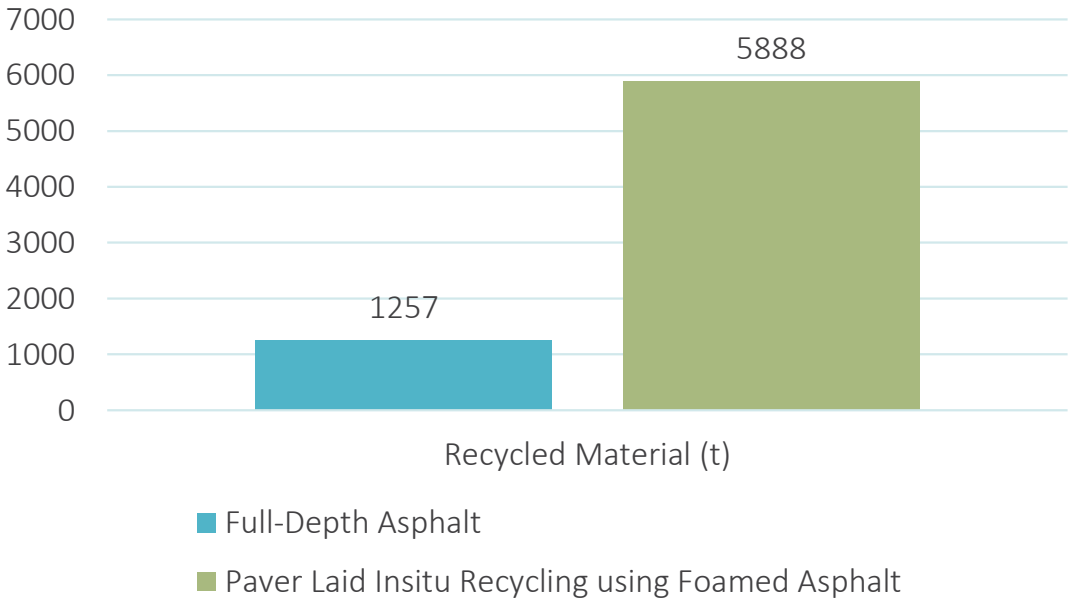
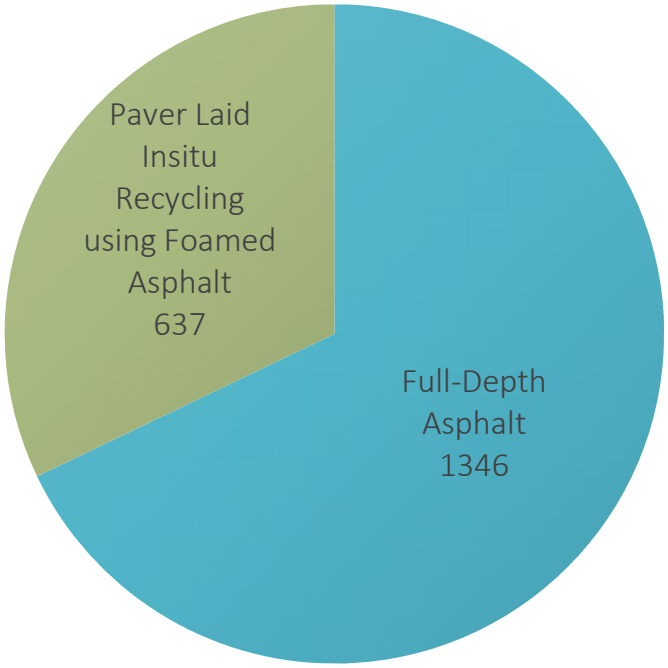
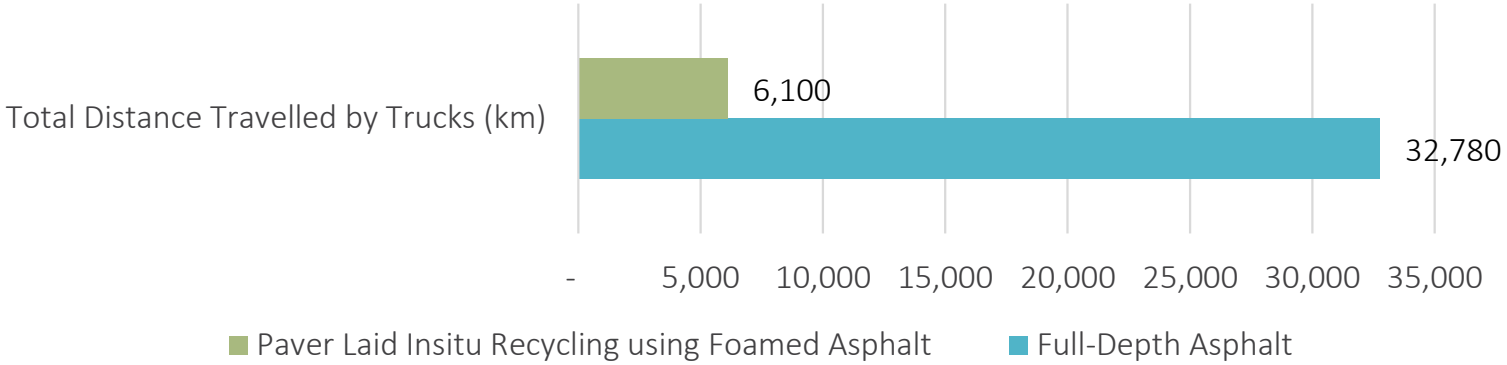
Sustainability



Total Greenhouse Gas Emissions
(Measured in Carbon Dioxide Equivalent Tonnes)





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Evidence of Success

- No WHS incidents.
- From suitability testing to onsite completion of the works, the total duration was less than 6 weeks.
- Significant reduction in construction duration, as traditional methods would have a production duration of greater than 10 weeks and significant traffic impacts compared to this method.
- Onsite operations and sequencing greatly reduced the impact on traffic flows compared to traditional construction methods.
- The environmental exposure/risk was greatly reduced due to streamlined, single-pass Paver Laid Insitu Recycling process. Therefore, greatly removing environmental risks such as erosion and sediment along with dust generation.
- The utilisation of the lime binder in the mix added in the removal of silica content of the process, compared to using cement/fly ash mix as the lime does not contain silica contents above the new high-risk level in the ACT determined as materials with levels greater than 1%.
- A far more sustainable option than full depth asphalt: lower emissions by 53%, increased quantity of recycled material by 4631 tonnes, prevented 26,680 km worth of truck movements traversing the surrounding road network.
- No environmental impact was recorded as part of the project, confirmed by real time site monitoring of noise, vibration and dust, which proves the insitu approach can be safely implemented around sensitive receivers and environments.
- All quality aspects were accepted by the Client. Such as, the standard set-out in the project specification was characteristic values ≥100% standard compaction. All results exceeded 100%, and the median value of results was 102.6%.