Sustainable Material Recovery at M5 Junction 8

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Sustainability & Carbon Reduction

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Key Facts

Project Scope: Installation of Cement Bound Granular Material (CBGM) as part of the M5 Junction 8 Earthworks Scheme.

Key Challenge: Reducing carbon emissions and material waste while ensuring durability and efficiency in highway reconstruction.

Solution: Implemented material recovery and circular supply chain principles to achieve a 30% carbon reduction.

Framework: This scheme was delivered as part of the Pavement Delivery Framework for National Highways.

Situation

The M5 Junction 8 scheme involved earthworks and reconstruction of Lane 1 and the hard shoulder. Traditional approaches to road construction require large quantities of virgin materials, resulting in high carbon emissions and waste. This project aimed to integrate sustainable practices by maximising material reuse and reducing carbon impact.

Task

The primary objective was to explore innovative ways to reduce carbon emissions and enhance sustainability within the highways sector. Key goals included:

- **Reducing waste generation** by recovering and reusing materials.
- **Minimising carbon footprint** through local sourcing and efficient logistics.
- **Enhancing circular economy principles** by closing the loop on material use.

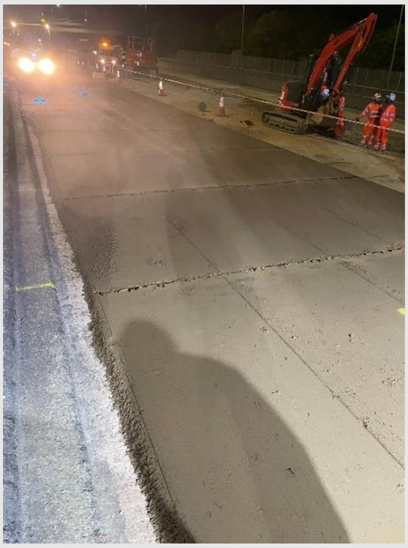
Action

To achieve these objectives, a structured approach was adopted, focusing on material recovery, carbon reduction, and innovative technology.

Efficient Material Recovery & Reuse - A key component of the project was the proactive approach taken to achieve the lowest carbon outcome. This was accomplished by securing a temporary access agreement to adjacent land, which enabled the retention, recovery, and reuse of materials on-site. By avoiding conventional disposal and import methods, transport emissions were dramatically reduced.

A total of 2,600 tonnes of aggregate were recovered and stockpiled within 5km of the site, significantly reducing transportation emissions. Additionally, 7,560 tonnes of asphalt were reclaimed and sent for recycling, reinforcing material circularity. Any unsuitable material was retained for the landowner, reducing unnecessary waste disposal. Rigorous testing ensured 2,200 tonnes of recovered aggregate could be successfully reused, while 400 tonnes of new material were required to meet quality specifications.

Sustainable Carbon Reduction Measures - To minimise carbon emissions, the project implemented several key measures. Warm-mix asphalt was utilised, reducing production temperatures and overall energy consumption. A circular supply chain approach ensured that the new asphalt was sourced from the same supplier responsible for recycling the reclaimed material, maximising efficiency. Additionally, the use of CEM I was limited to 130 tonnes for rebinding aggregate, thereby reducing cement-related emissions.

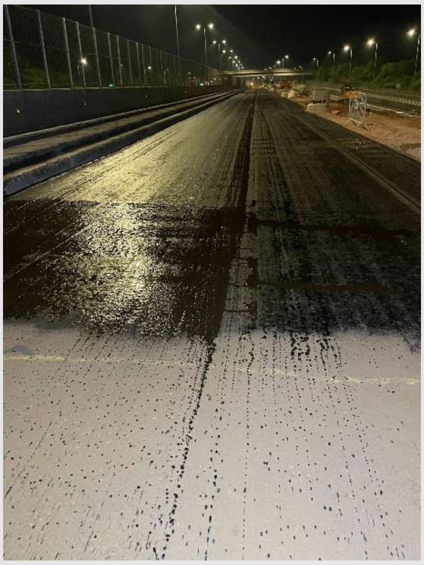


<u>Integration of Innovative Technology -</u> The project leveraged cutting-edge technology to enhance sustainability and efficiency. The Wirtgen KMA 220i mobile cold recycling mixing plant was deployed, enabling high-quality on-site production of cold mixes with a mixing capacity of up to 220 tonnes per hour. Its compact and mobile design allowed for quick relocation and setup without requiring special transport permits. A twin-shaft compulsory mixer ensured uniform material blending, while the operator's cabin provided real-time monitoring, improving precision and quality control. By producing materials on-site, the project significantly reduced transportation requirements, leading to lower fuel consumption and CO_2 emissions.

<u>Construction Details -</u> The construction adhered to strict specifications to ensure durability and long-term performance. The pavement design consisted of:

- 300mm CBGM
- 350mm base
- 50mm binder
- 50mm surface,
- Removal and reinstatement of existing detail

The CBGM was successfully laid in May 2024, marking a major milestone in the project's sustainability efforts.



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Result

30% reduction in carbon emissions (from 755t CO2e baseline to 530t CO2e).

225t CO2e savings achieved through material recovery and local sourcing.

Significant waste reduction, diverting thousands of tonnes from landfill.

Improved sustainability practices, setting a precedent for future highway projects.

Transfer

This case study highlights best practices that can be replicated across other highway schemes, including:

- Adopting material recovery strategies to **reduce dependency on virgin materials.**
- **Prioritising local sourcing** and stockpiling to minimise transport emissions.
- **Utilising warm-mix asphalt and RAP** content to drive sustainability.
- Implementing a **circular supply chain approach** to enhance resource efficiency.
- **Leveraging mobile cold recycling technology** to improve efficiency and lower carbon impact.
- **Exploring temporary land access agreements** to enable material retention and reuse, reducing overall emissions.

By embedding these principles into future projects, we can work towards a more sustainable and carbon-efficient approach to road construction.

Photo caption

Key Benefits

Environmental Impact: Lower CO2 emissions through reduced transport and material reuse.

Economic Efficiency: Cost savings by minimising imported aggregate and asphalt requirements.

Supply Chain Innovation: Strengthened relationships with local suppliers for material circularity.

Industry Leadership: Demonstrated commitment to sustainable infrastructure practices aligned with national carbon reduction goals.