# Recycled Asphalt Pavement Pilot

Kevin West, Senior Engineer, Monaghan County Council
Declan Toner, Senior Executive Engineer, Monaghan County Council

# Contents

- Introduction
- Schemes to date
- Restoration Improvement Programme – 2026
- Process Material management – EPA National Criteria Site-won Asphalt
- Lough Egish Trial 2022
  - Performance Monitoring – FWD, RSP, Visual
  - Environmental Benefits Observed

# Introduction

- Reclaimed Asphalt Pavement (RAP) uses recycled aggregates, promoting environmental benefits and supporting circular economy goals.
- Cold-Mix Asphalt uses unheated aggregates, resulting in lower energy consumption and a smaller carbon footprint compared to HMA.
- This Pilot combines cold-mix technology with high recycled aggregate content to create a sustainable road-making material that meets performance standards and circular economy targets.

| Year | Scheme Location | Cumulative Scheme Length (km) | Material Produced (T) | Estimated CO2 Saved (T) | Estimated CO2 Saved (%) |
|---|---|---|---|---|---|
| 2020 | 3 Monaghan Local Roads | 4.2 | 2,511 | 70.3 | 50.10% |
| 2022 | R180 Lough Egish | 2.0 | 3,511 | 61.7 | 40.90% |
| 2023 | LP1210/LT12102 Emyvale | 4.3 | 4,084 | 69.8 | 39.90% |
| 2024 | Annakisha Greenway, Co. Cork | 3.1 | 800 | 132.1 | 87.20% |
| 2024 | R197 Belturbet, Co. Cavan | 2.3 | 2,145 | 74.2 | 80.80% |
| 2024 | Monaghan Regional and Local Roads | 5.4 | 4,334 | 150.3 | 81.00% |
| 2024 | Louth Local Roads | 5.0 | 2,866 | 85.8 | 69.90% |
| **Total/Average** | | **26.3** | **20,251** | **644.3** | **64.26%** |

# Scheme Progression

| Year | Focus |
|---|---|
| 2020 | 100% Rap, no virgin aggregates, familiarisation with the material characteristics |
| 2022 | R180 Lough Egish (Case Study) 80% RAP, 20% Virgin Aggregate |
| 2023 | Regional & Local (60mm overlay), stockpile control, compaction (NDG) |
| 2024 | Regionalisation to Monaghan, Cavan, Louth and Cork |
| 2025 | Development of Cold-mix Recycling Centre in county<br>Varying the ratios of recycled aggregate to virgin aggregate<br>Incorporating binder rejuvenator to assess the impact on reducing the use of virgin binder. (HVO, Warm-mix, Low-cost interventions – 5year Road Maintenance Strategy) |
| 2026 | Utilise 5,000T of cold-mix RAP as a regulating layer in Monaghan County Council's 2026 Restoration Improvement Programme.<br>Achieve a 10% reduction in overall CO2 emissions compared to the exclusive use of HMA and WMA. |

# Article 27 By-product & National Criteria for Site-won Asphalt

***National Criteria for Site-won Asphalt or Single Case Notification – EPA (Registers on Eden Portal)***

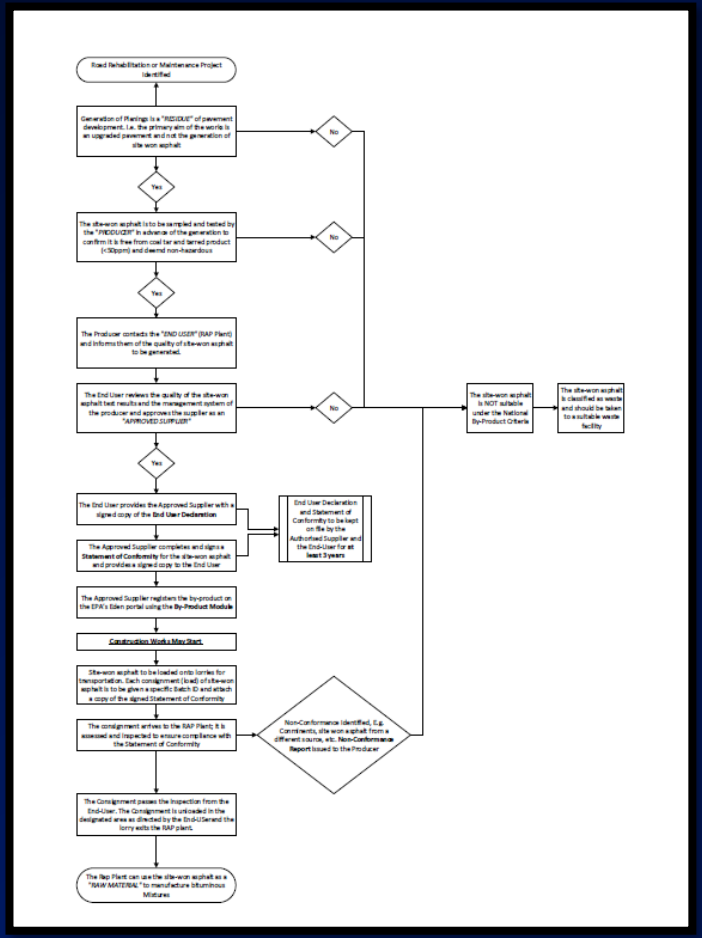
- The local authority can identify a use for the plannings and complete a single case article 27 notification on the EPA Eden Portal.

  **OR**

- The National By-Product Criteria in Relation to Site Won Asphalt, 2023 can be followed to use the planings as a raw material in a RAP plant (Fixed or Mobile) registered with the EPA. Under this process:

  - The RAP Plant is the "END USER". The End User must:
    - Complete an "END USERS DECLARATION"
    - Retain the End User Declaration for 3 years

- The Local Authority are the "PRODUCER" of the by-product. The Producer must:
  - Complete a "STATEMENT OF CONFORMITY" (attached)




Environmental Protection Agency
*An Ghníomhaireacht um Chaomhnú Comhshaoil*

An Roinn Iompair
Department of Transport

Cumann Lucht Bainistiochta Contae agus Cathrach
County and City Management Association

# National Criteria - LA Process

1. ***Management of Asphalt Millings arising from site: (Registers on Eden Portal)***

   a) Identify the need for a pavement intervention – PSCI, Establish residual is By-product.

   b) LA (Producer) Tests material prior to milling operations – Cores 1no every 500t.

      I. Assessment bases on several factors including; Location, Contaminants, Quality of millings, Economic, Environmental & Social factors (Cost, Excessive Haulage) & Jurisdiction.

      II. Used to inform the tender process and potential end use. (Cold Tar – Waste facility).

   c) LA (Producers) informs the "End User" RAP Plant (Contractor) of the quantity and quality of the plannings that are to be generated from site. (Test records).

      I. The End User accepts the LA (Producer) as an "Approved Supplier" and issues the LA (Producer) an "End User Declaration"

      II. Statement of Conformity – LA (Producer) completes and signs, given to "Ender User" (Contractor)

   d) Construction works may start

   Note; End User Declaration & Statement of Conformity templates are provided in the National Criteria document.

# Case Study – Lough Egish 2022

- The R-180 regional road in Monaghan was selected for the 2022 trial.
  - PSCI Rating 1-4
  - AADT 1,941
  - 12.2 % HGV's

- Non Destructive -
  - GPR - Ground Penetrating Radar testing
  - Falling Weight Deflectometer (FWD) testing

- Destructive testing was carried out to develop an appropriate pavement design:
  - Core samples of the existing pavement
  - Trial holes (c. 1m depth) at various locations identified from non-destructive test analysis
  - Trial Pits - Samples were taken of the granular layers in each trial pit and tested:
    - Gradation
    - Atterberg limits
    - Moisture Content
    - Optimum Moisture Content


Table 1: Trial Pit 1 Pavement Profile

| Trial Hole | Dir. | Ch. (m) | Material | D(mm) | Photo |
|---|---|---|---|---|---|
| 1 | SB | 501 | Bituminous | 120 |  |
| | | | Granular | 240 | |
| | | | Soil | - | |

# Case Study – Lough Egish 2022

- IAPDM = Irish Analytic Pavement Design Method:
  - Cold-Mix RAP – Design Layer Stiffness E = 1750 MPa.
  - A.C. 20 70/100 – Design Layer Stiffness E = 3100 MPa.
- For overlay or inlay pavement designs, the input factors include:
  - The loading of the pavement (AADT/%HGV)
  - Design life of 20 years = 2.3 msa Design Traffic
  - Existing pavement structure (trial holes/trenches)
  - Stiffness modulus of the existing layers and foundation (FWD)
  - ISTM Stiffness Modulus of the proposed new pavement layers
- Output Proposed Pavement Options:
  - 50 - 150 mm of LEBM cold-mix
  - 50 -125 mm of AC 20 dense bin hot-mix

| Southbound | | Overlay Thickness (mm) | |
|---|---|---|---|
| From km | To km | LEBM L2 | AC20 70/100 |
| 0 | 500 | 50 | 50 |
| 500 | 800 | 80 | 70 |
| 800 | 1475 | 145 | 125 |
| 1475 | 1900 | 145 | 125 |

Table 15: Overlay design thickness per homogeneous section - Northbound

| Northbound | | Overlay Thickness (mm) | |
|---|---|---|---|
| From km | To km | LEBM L2 | AC20 70/100 |
| 0 | 500 | 50 | 50 |
| 500 | 800 | 80 | 70 |
| 800 | 1475 | 150 | 125 |
| 1475 | 1900 | 110 | 90 |

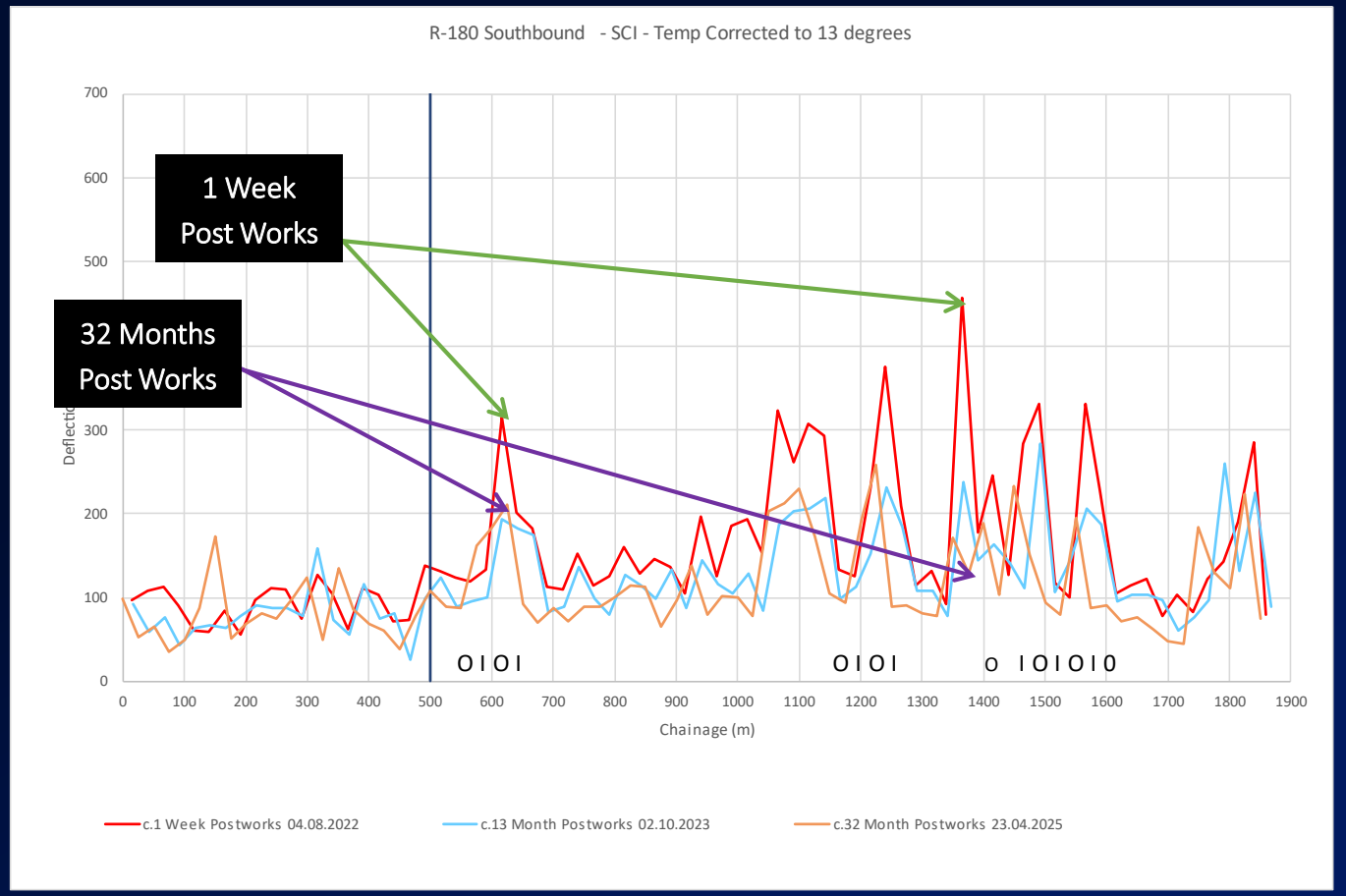
| Chainage | Pavement Material |
|---|---|
| CH0 – CH500 | AC20 dense bin **Hot - Mix** |
| CH500 – C1900 | LEBM **Cold-Mix RAP** |

# Performance Monitoring

| Monitoring to be Undertaken | | Timeline After Construction | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Before Works | 3 Days | 7 Days | 14 Days | 21 Days | 2 Months | 3 Months | 6 Months | 1 Year | 2 Years | 3 Years |
| Test | FWD Testing | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Core Samples | X | X | X | X | X | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Profilometer | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Visual Inspection | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Progress Photos | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

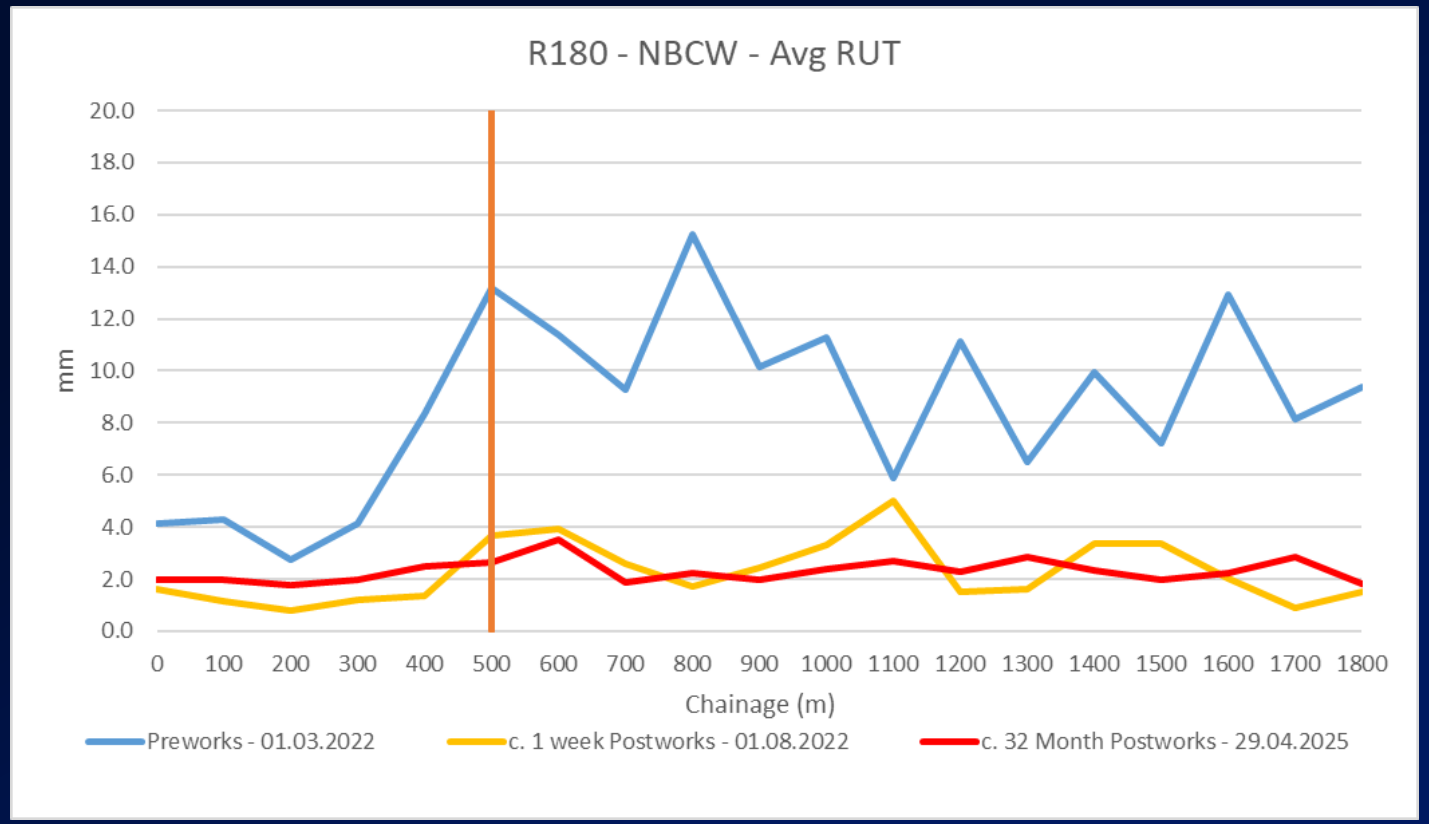
# Falling Weight Deflectometer Data

- SCI – Pavement Load Spreading ability
  - Hot mix Section at its strongest immediately after construction
  - Cold-mix section continuing to gain strength



# Road Surface Profilometer (RSP)

- Resistance to rutting
- Negligible post works rutting observed (around 2mm)
- The hot-mix control section is similar to the cold-mix section
- No rutting was  observed in the early life of the pavement



# Core Data

- Increased Bulk density over time
- Reduction in void content over time
- Continuous strength gain over time

| Date | Average ITSM (MPa) | Wheel Tracking: Average PRD | Average Voids Content (%) | Average Bulk Density (kg/m³) |
|---|---|---|---|---|
| c. 2 months post-works | 551 | N/A | 18 | 1991 |
| c. 7 months post-works | 857 | N/A | 17 | 1987 |
| c. 12 months post-works | 1236 | 3.64 | 15 | 2054 |
| c. 13 months post-works | 1412 | N/A | 16 | 2023 |

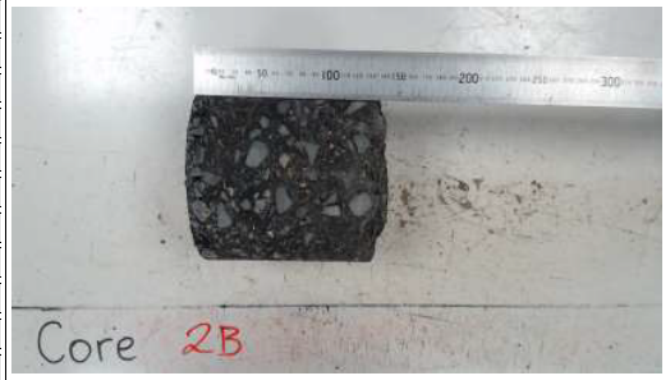
N/A – not applicable as 200mm cores for wheel tracking were only retrieved at +12 months post-construction

CORE LOG

| | | | |
|---|---|---|---|
| Client: | Monaghan County Council | Project No: | 22/133 |
| Road No: | R180 | Date Cored: | 14/08/2024 |
| Section: | 2022 RAP Trial Site | Direction: | WB |
| | | Procedure Used: | EN12697-36: 2022 - Clause 4.1 |

Pavement Management Services Ltd.

| Layer No. | Top (mm) | Bottom (mm) | Thickness (mm) | Material | Layer Condition | |
|---|---|---|---|---|---|---|
| 1 | 0 | 10 | 10 | SD | | |
| 2 | 10 | 75 | 65 | LEBM | | |
| 3 | 75 | 145 | 70 | LEBM | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |




Asphalt; SD= Surface Dressing; HBM= se Bitumen Macadam; LMC= Lean Mix Heavy Duty Macadam; HFS=High Friction

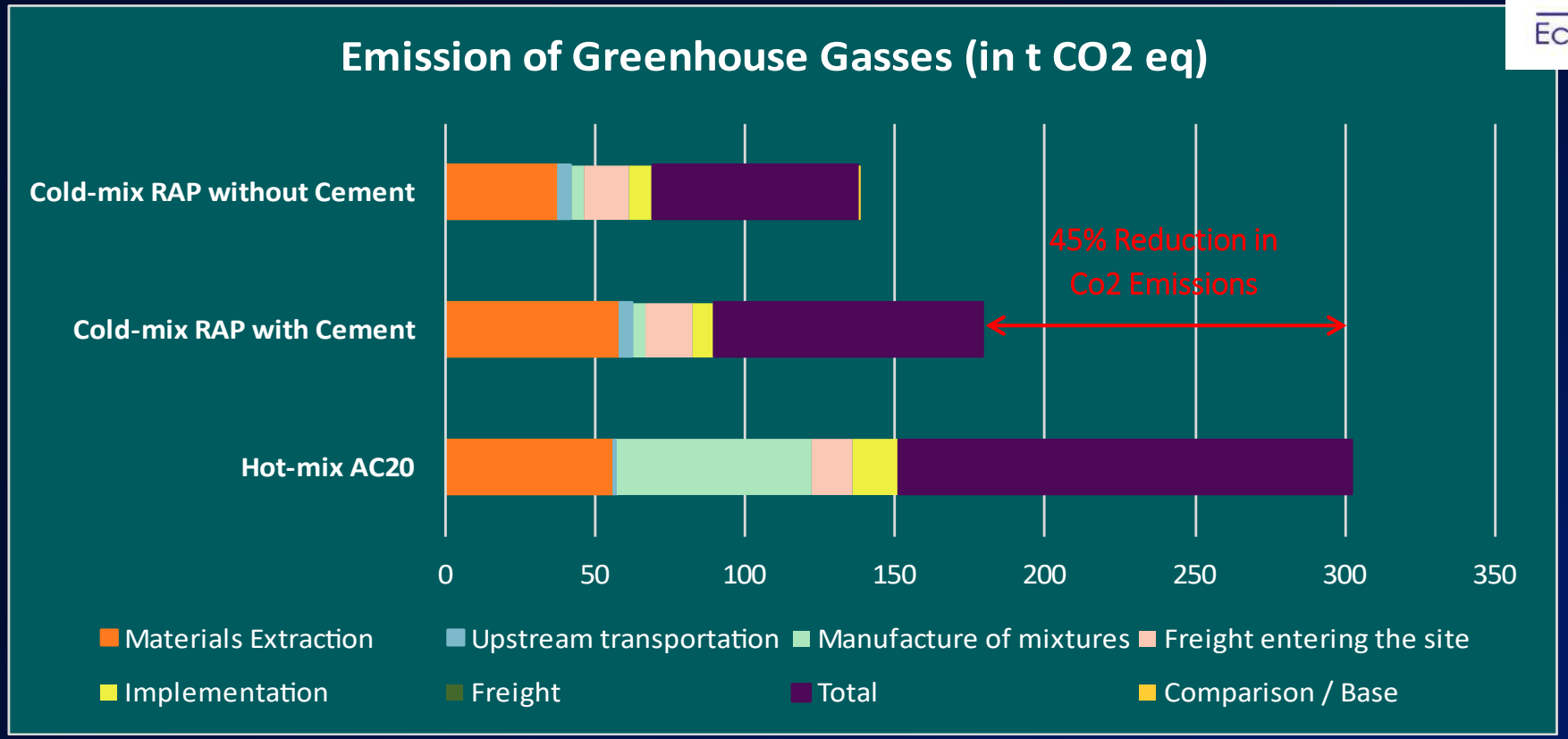
Key: LWP= Left Wheel Path; Centre = Centre of the Lane; RWP= Right Wheel Path; HS= Hard Shoulder

HTSF504, Rev5, 19022024

| | | | |
|---|---|---|---|
| Core No: | 2B | Chainage (m): | 1325 |
| Core Diameter (mm): | 150 | Core Depth (mm): | 145 |
| Easting: | 678788 | Wheelpath: | LWP |
| Northing: | 812709 | | |
| Operator: | AH | Date Measured: | 31/08/2024 |

# Carbon Savings

***2022 Trial – R180 Lough Egish, Co. Monaghan***



# Summary

***2022 Trial – R180 Lough Egish, Co. Monaghan***

- Cold-mix RAP material cured slower than the AC20 control section.
- Significant environmental benefits using the cold-mix RAP
- Cores are showing the cold mix RAP pavement is still developing strength
- The visual inspections and RSP data indicate not deterioration between the control section and the cold-mix RAP section:
  - Consistent IRI
  - Consistent MPD
  - Consistent RUT
  - No obvious visual differences

# Recycled Asphalt Pavement Pilot

Kevin West – kwest@monaghancoco.ie
Declan Toner – dtoner@monaghancoco.ie

# THANK YOU

**Join the Q&A session at Slido.com and enter 3873601 or via the QR Code.**
**Questions must include name and associated Local Authority to be considered by the panel.**

LASNTG Local Authority Services National Training Group

An Roinn Iompair
Department of Transport

CCMA
Cumann Lucht Bainistiochta Contae agus Cathrach
County and City Management Association

RSTG ANNUAL CONFERENCE 2025
20TH-21ST MAY | MULLINGAR PARK HOTEL, CO. WESTMEATH