Proactive Management Review

Contract Year 16

April 2024 to March 2025

Connect Plus

Connect Plus Services

A Balfour Beatty, AtkinsRéalis & Egis joint venture

Contents

Executive summary

This brochure presents the case studies we are submitting to the PMR Panel for the current qualifying year (CY16: April 2024 – March 2025). The case studies showcase the breadth and impact of our work across the network, highlighting both our achievements and our ongoing commitment to innovation and collaboration.

We've also included a progress update on last year's customer strategy case study, highlighting how continued efforts have led to a reduction in customer complaints over the past year.

As in previous years, we've featured a selection of emerging projects - those in the early stages of implementation or where the innovation is promising but not yet mature enough for a full case study. Among these is the exciting robotic hydro-demolition trial, successfully deployed recently for urgent bridge deck repairs on Bow Arrow Bridge (A282 near J1A).

Some of these initiatives are expected to evolve significantly over the coming months and may be featured more prominently in future submissions.

Our teams have delivered exceptional work this year, and we should all take pride in what has been accomplished. Despite challenging timescales, we continued to innovate throughout our projects. The SmartRaft initiative stands out as a prime example of our forward-thinking approach, together with Vaisala, an innovation that featured as an emerging project last year.

We also collaborated with and successfully navigated the constraints of third-party schemes on the network such as the integrated site work with the NEAR scheme at the Thorpe Park outfall site.

These successes reflect the strength of our partnerships with National Highways, our framework contractors and our supply chain partners. The Better Together programme continues to drive collaboration and efficiency, which we truly believe is evident throughout this year's submissions.

PROJECT UPDATE

Putting our customers first

We have designed and implemented a proactive customer strategy across the entirety of the organisation with the objective of improving the experience for road users on the M25, thus driving down the number of complaints we receive from our communities.

A significant enabler to this strategy has been the Customer Relationship Management (CRM) system, which has automated the process of logging correspondence received from customers and allows access to a customer's records and previous interactions. It also allows for better reporting and analysis tools, meaning the customer services team can identify trends and patterns in customer complaints as well as accurately map them on the network. This has helped them flag issues to the relevant part of the business, for example litter complaint hotspots and issues with diversion routes around the network.

Furthermore, they have successfully integrated customer data from the CRM into ArcGIS online. The data from every case that's resolved is automatically visible to view from the dashboard so that a live view of the information is available. This means that works/operations/diversion routes can be both better informed and customer-centric, therefore improving the customer experience and reducing enquiries and complaints. In another innovative advancement, the team have successfully made this insight available via a mobile application; which means operatives who are not desk-based can just as easily access the information.

A key performance indicator to measure the success of this strategy is the number of customer complaints received. This number has reduced by 13% in 2024, when comparing to the same period in 2023. The positive impact of the strategy can also be seen when looking at the number of complaints received about diversion routes, which is now on a downwards trajectory of 14%.This is mainly owing to the feedback loops which are now in place to enable effective insight sharing with the diversion planning teams.

A significant enabler to this strategy has been our Customer Relationship Management (CRM) system

Case studies

The following case studies highlight some of the many innovations, industry best practices and new products that we are implementing and trialling across the network.

1

HEALTHIER HIGHWAYS

We recognise the need to improve worker health protection in line with our strategic themes of 'Promoting Health' and 'Leading in Safety.'

Through a collaborative partnership with Steve Perkins Associates (experts in risk-based health leadership and culture transformation) we drive ongoing improvement in health protection for all M25 workers. This is delivered through our '5 Lanes' Healthier Highways strategy.

The need

Safety is both an imperative and a value for National Highways. There is rightly a strong focus on work-related accident prevention across the strategic road network (SRN), but much more could be done on work-related ill-health prevention. The Health and Safety Executive estimates that each year 3,700 construction workers die from occupational cancer; there are 5,400 new cases of occupational cancer; and at any one time there are 78,000 construction workers with work related ill-health ranging from musculoskeletal disorders to lung disease, and noise-induced hearing loss to stress.

Highways construction and maintenance involves a wide range of health exposure hazards including respirable crystalline silica, other respirable dusts and particulates, noise, vibration, welding fumes, isocyanates, VOCs, manual handling, diesel exhaust emissions, solar radiation, fatigue and stress. Unfortunately, awareness of these hazards and their associated health risks is generally poor across the industry.

Deliverables and benefits

Through a combination of innovative strategies, targeted training programmes and collaborative research efforts, we aim to address occupational health concerns by enhancing awareness and fostering a culture of health protection among our workforce. The following details the deliverables and benefits over the past year.

Raising awareness
We have maintained a focus on health protection across the community through regular distribution of Healthier Highways messages via a range of communications channels, including e-newsletters, forums, presentations and digital platforms. We have held lunch and learn sessions and developed new Healthier Highways resource pages as part of the Compass intranet, which will allow easy access across the M25 Community.

Health 'Don't Walk Bys'

Our quarterly best health 'Don't Walk By' awards continued to highlight exemplary practices in health protection and provide published case studies for the community. These not only increase health risk awareness, but also provide examples of good health protection practice, which are used as health and safety moments in meetings and other settings. We have seen a gradual improvement in the quality of health DWBs so that now they don't just highlight poor practice, we also see examples of good practice, particularly in dust control. And this is spreading beyond the framework contractors to their subcontractors.

Health protection leading metric and KPI

Health and safety performance metrics across the industry are completely focussed on accident prevention. Even RIDDOR, which should cover health, doesn't cover the most serious diseases and only counts cases once they're diagnosed, which is too late for prevention. So this year we introduced the first ever health prevention metric and targets building on our work with Don't Walk By observations. This was incorporated into the COSIP targets for Framework contractors.

Wider roll-out of musculo-skeletal risk training

Following the development and trial of online awareness training on musculoskeletal (MSk) risk awareness last year, we conducted a wider roll-out with first line managers and engineers from Jackson, Octavius, CPS and Telent. As before 100% of delegates reported they would recommend the course to colleagues. Using the HSE's MAC tool to quantitatively break down the risk for the different factors of manual handling highlighted areas where improvements should be targeted. Examples covered a range of high-risk MSD tasks including, VRS barrier repair, manhole lifting, overhead gantry cabling work and bridge deck bearing replacement. This will feed into the forthcoming national MSk risk profiling research.

Dust investigation during hydrodemolition

Trial bearing renewals in the Dartford tunnel invert were completed by Jackson in September 2024. We undertook personal dust monitoring of workers in the invert during these works. Initial attempts at hand breaking concrete to remove the old bearings were unsuccessful and work had to be completed with hydrodemolition. Hydrodemolition contractors understandably are highly focussed on safety precautions and assume that, due to the large quantities of water spray, dust will not be a hazard. So they do not use respiratory protection. However, it is possible for dust to be entrained in the water mist and still present a hazard.

In this very challenging measurement scenario, we attempted static monitoring using sacrificial cowling to protect the sampling heads and mimic the face guards warn by the workers. Various constraints restricted the amount and quality of data we could gather. However, the data clearly showed that it was likely that personal exposures to inhalable dust will exceed the recommended exposure limit of 5 mg.m-3 and respirable dust levels may exceed the recommended exposure limit of 1 mg.m-3. Further investigation was recommended for such hydrodemolition tasks plus the use of suitable RPE.

Manager workshops – fatigue management

Following the fatigue management study conducted in 2023-24, we developed a targeted workshop for managers to address gaps identified in awareness and understanding. In March, two workshops were delivered to managers from CPS Service Delivery, Connect Plus, Tarmac, M Group Highways (previously known as Milestone) Octavius and Jackson. The sessions were very well received with 100% of attendees saying they would recommend them to colleagues. The workshops also uncovered a number of issues, for example:

- Most companies are not measuring actual hours worked.
- Workers are regularly contacted during rest periods, including when sleeping – in fact this is embedded into current processes.
- Poorly designed shift patterns, particularly with quick changes between day and night shifts.

Next year we will develop a fatigue management maturity matrix to help benchmark current approaches and support continuous improvement across the Community.

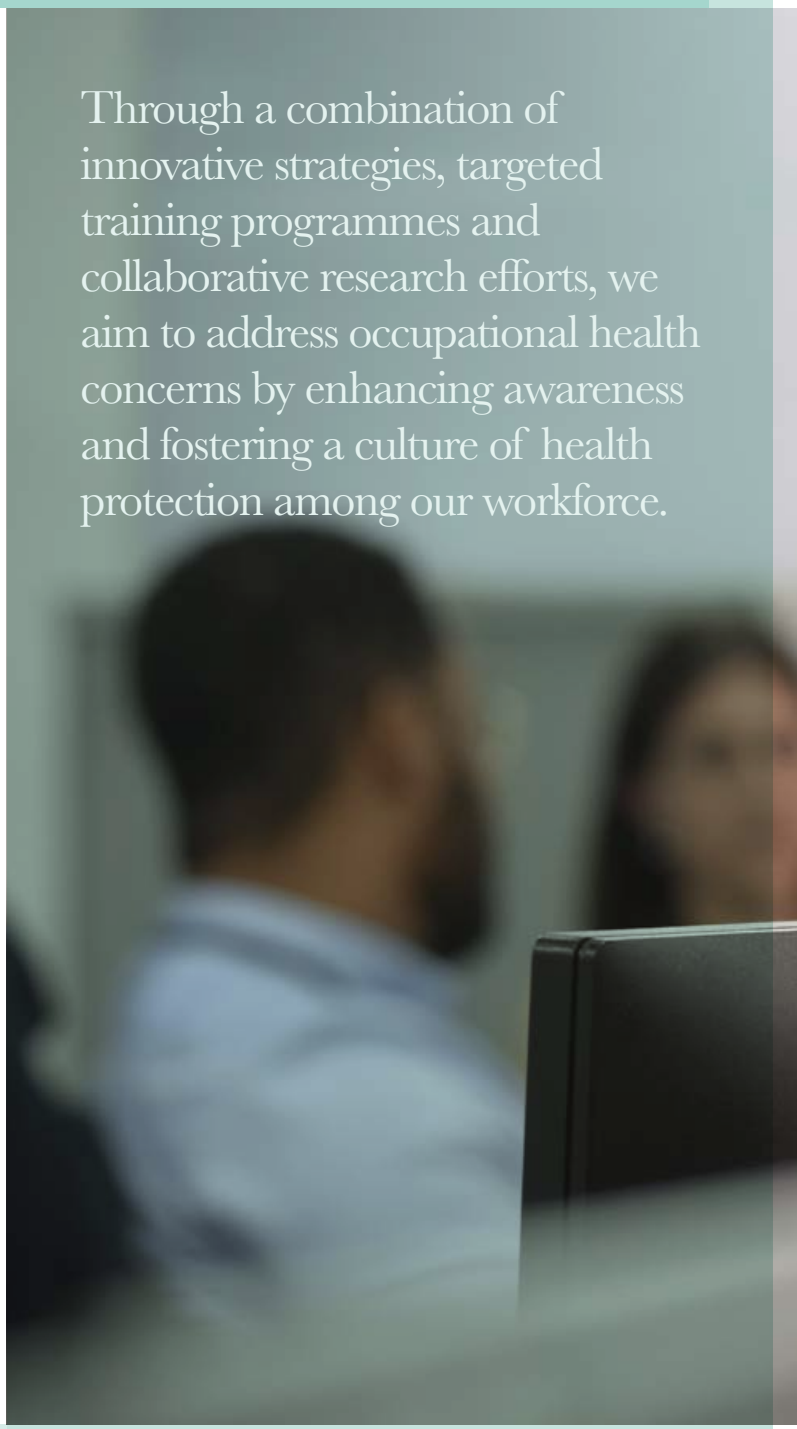
Mental health & wellbeing focus groups
To validate and supplement the M25 Community stress risk register (SRR) developed in 2023-24, a series of face-to-face mental health and wellbeing focus groups were conducted with front line and office staff. We ran 11 groups with over 70 attendees from CPS and all the Framework contractors. As far as possible, groups with frontline workers were conducted without supervisors or managers present. Overall, the results confirmed the contents of the SRR, adding only one, albeit significant, additional risk – lack of manager support. To begin to address this we will be developing managers' work-related stress prevention training in 2025-26. This programme will equip managers to address work-related stress issues in their own teams through four online sessions with practical application of tools and techniques in-between each session.

Following on from the M25 work on Musculo-skeletal risk training, our strategic health protection partners, Steve Perkins Associates, have developed a joint programme with National Highways SES to conduct MSk risk profiling research across the whole national supply chain. Joint matched funding from National Highways and the supply chain has been secured to deliver what will be a first of its kind national health protection project. Connect Plus will be part of the core team for this and is proud to build on the work pioneered here on the M25. This again demonstrates the scalability of our initiatives and sets a benchmark for best practice nationwide.

Both the Southeast and Southwest regions of National Highways have rolled-out the Healthier Highways planing dust study work and guidance, which requires planing contractors to properly maintain their vacuum extraction and water spray systems and use 100% water spray on the planer conveyor belts. This work demonstrated that these measures are required to protect workers from dangerous levels of respirable dust.

- National Highways teams in the Southeast region under Regional Director Christine Allen are aware of our work through their own Healthier Highways programme.
- National Highways SES under Mel Clarke (HSW Director) are also aware of this work.
- The wider National Highways supply chain also have some awareness of Healthier Highways through presentations made by Steve Perkins Associates at the National Engagement Council, Highways UK, Home Safe and Well webinars, the Supply Chain Safety Leadership Group and the Principal Designers Working Group.

Through a combination of innovative strategies, targeted training programmes and collaborative research efforts, we aim to address occupational health concerns by enhancing awareness and fostering a culture of health protection among our workforce.



2

HEALTH, SAFETY AND WELLBEING

We are committed to enhancing health, safety and wellbeing across our operations.

Our recent initiatives, including the implementation of Human Form Recognition (HFR) and the development of a GIS app to eliminate surface cable strikes, demonstrate our dedication to leveraging technology for continuous improvement. These projects not only address critical safety concerns but also reflect our proactive approach to innovation and collaboration. In addition to these technological advancements, we are proud to highlight our efforts in promoting diversity and supporting our workforce through dedicated programmes for women in service delivery and carers.

Human form recognition

We have made HFR mandatory for all telehandlers and excavators over 13 tonnes. This modular, multi-camera system can detect human forms and alert plant operators when pedestrians enter the exclusion zone. As part of our digital transformation efforts, this innovation strengthens on-site safety by reducing the risks associated with the people-plant interface – one of the most significant hazards in the construction sector.

The interface between people and plant remains the most significant cause of fatalities in construction. According to the HSE, being struck by moving vehicles accounted for 10% of worker fatalities in 2021/22. In response, and in line with National Highways' imperatives of Safety, Customer and Delivery, we have embraced technology to protect site operatives.

HFR was introduced as part of a digital transformation strategy, in partnership with Safety Shield and Lynch Construction. Building on the familiar industry procedure of the 'thumbs up' signal, this system digitalises the practice and provides real-time pedestrian detection and alerting, helping prevent serious incidents.

Deliverables and benefits

All telehandlers have been fitted with HFR and practical demonstrations delivered throughout all CPS depots. Incident notifications are detecting where HFR is alerting, and reviews of situations being undertaken.

HFR systems have been installed on all CPS direct-hire telehandlers. The system includes multiple modular cameras that detect human forms and issue real-time alerts to plant operators when a pedestrian is within the detection zone. Data from all detections is captured and accessible via a secure web portal for review.

Practical demonstrations and familiarisation sessions were delivered across all CPS depots to ensure operatives understood how the system works. Additionally, a demonstration vehicle was fitted with an electronic 'thumbs up' feature, clearly indicating when it is safe to approach a machine.

The system's scope includes the following plant:

- Excavators (13t and above)
- FT Dumpers (6t and above)
- Rollers (13t and above)
- Telehandlers (all sizes)
- Dozers
- Wheeled Loaders

HFR incident alerts have helped safety teams proactively identify high-risk interactions and review footage to support behavioural learning and corrective actions. Footage access is securely restricted to the HS&E Advisor.

Key benefits realised

- Enhanced pedestrian detection, especially in low-visibility or night-time conditions
- Increased awareness and understanding of safe approach procedures
- Improved data-driven safety insights
- Reduced risk of slips, trips and potential collisions

The technology complements existing safety measures and has strengthened our proactive safety culture. A mandate requiring all CPS subcontractors to adopt HFR came into effect from January 2025. HFR is already mandatory across all Balfour Beatty projects, including those operating on the Strategic Road Network (SRN).

Using GIS to eliminate surface cable strikes

Redundant surface cables have long posed a safety risk and have been the cause of multiple service strikes across the industry. Although these cables are no longer live, they are still classified as service strikes when hit. This has been a known issue on the SRN for years, involving cables such as temporary CCTV, NERTS and power lines. Our Utilities Co-ordinator identified the need to map all redundant surface cables so they could be easily identified when working in affected areas – helping to reduce avoidable incidents.

Following multiple Don't Walk By (DWB) reports from soft estate contractors, it became evident that unknown redundant surface cables – often leftover from improvement schemes – posed a recurring challenge and presented a major safety and reputational risk.

We decided we needed to push the reporting through DWBs to understand the extent of our network affected by unknown surface utilities and recording the data. The initial approach was to keep a track of the reports using an excel spreadsheet: logging locations, descriptions and photos. It was quickly realised this was not a suitable solution and the reducing risk of surface utilities strikes issue was bigger than previously thought, with 60+ surface utilities being reported in the first 9 months. The location information reported in the DWB's was sometimes not accurate enough, for example marker posts may not be present or could mean a tolerance of 100m, which made remedial works difficult if the utilities were not easily found on site.

Deliverables and benefits

In response to the growing number of redundant surface cable strikes, we developed a dedicated GIS app to simplify how these risks are reported, tracked and managed. The app allows field teams to capture accurate geospatial data, tag photos and input contextual notes in real time from site. Once testing was completed, the app was rolled out across CPS and its wider framework partners. Comprehensive training sessions were delivered to ensure everyone understood how to use the tool effectively.

The GIS team took the innovation a step further by embedding the surface utilities layer into all ArcGIS apps currently used on our network. This integration ensures:

- Universal visibility – no matter which GIS app a team member is using, surface cable alerts are visible.
- Cross-functionality – users can report findings directly within their existing app environment without needing to switch tools.

Key benefits realised

- Improved accuracy of utility locations reducing the guesswork and rework.
- Faster, more effective remediation of hazards.
- Reduction in potential for future service strikes.
- Stronger collaboration across teams through consistent data access.

This project demonstrates how digital innovation and a focus on user-friendly tools can deliver tangible safety improvements across the SRN. It also shows how listening to frontline feedback (via DWB reporting) can lead to scalable, proactive solutions.

The app has been shared through the National Highways Service Avoidance Working Group. While it has not yet been formally adopted elsewhere, its accessibility, success and integration potential make it a strong candidate for wider SRN rollout.

Establishing a carers group

At CPS, our goal is to provide a safe and inclusive platform where individuals – particularly those with caring responsibilities – can access compassionate support. We recognise the unique pressures faced by carers and are committed to creating a workplace culture that promotes wellbeing, empathy and connection through dedicated support initiatives.

Carers – whether they are supporting children, loved ones with disabilities or individuals with long-term health conditions – are often over-looked and undervalued. Even those supporting carers, such as partners or family members, face emotional and practical challenges that can impact wellbeing and work-life balance.

This initiative addresses a clear need to support carers, aligning with National Highways' imperatives of Safety, Customer and Delivery by promoting a healthier, more resilient workforce. Our carers group provides a confidential, non-judgemental space where participants can share experiences, express emotions and access peer support. It also serves as a platform to collaboratively organise wellbeing events and initiatives, boosting morale and engagement while fostering a more compassionate and inclusive workplace culture.

This year, we have continued to grow and strengthen our support for carers across the business, with a key focus on creating safe, inclusive spaces and raising awareness of the unique challenges carers face.

One of the core deliverables has been the introduction of fortnightly Carers' Calls, which provide a confidential and supportive forum for carers to share experiences, raise concerns, and feel heard. These regular touchpoints have not only fostered a sense of community among carers but have also enabled us to better understand their needs and respond accordingly. Feedback from participants has been overwhelmingly positive, with many reporting improved morale, reduced feelings of isolation and a greater sense of belonging within the organisation.

The first meeting on 8 January 2025 marked a powerful beginning, with participants expressing gratitude for a space where they felt seen and supported. One participant shared: "Lacey, who chaired and runs the group, was amazing... I felt so well listened to and supported." Feedback from this and subsequent sessions confirms that participants feel less isolated, more emotionally supported, and more engaged at work.

Notable highlights this year include:

- Guest speaker participation, including a Senior Leadership Team member who shared personal experiences and mental health resources, helping break down perceived hierarchies.
- Dedicated leadership support, with consistent attendance from the H&S Manager, demonstrating ongoing compassion and continuity.
- Cross-functional collaboration, with the Service Delivery Manager sharing valuable insights on carer self-care and group crossover opportunities.

Plans are in place for two in-person events during Carers' Week (June 2025), featuring guest speakers from Carers UK, wellbeing workshops and engagement from Connect Plus and CPS leadership. These events will provide measurable engagement data to support future planning.

The group has also begun shaping future wellbeing and charity initiatives and is creating a model of best practice that can be replicated across other contractor groups.

While we are aware that other businesses may have similar internal support groups for carers, this specific initiative has not yet been formally adopted across the SRN. However, it represents a clear example of best practice that could be easily replicated across other National Highways projects or contractor organisations.

The structure and success of this group offer a scalable model for supporting carers and promoting wellbeing more broadly across the sector. We welcome opportunities to share our approach with other teams and are open to collaboration to help drive wider adoption. Positive feedback received internally indicates the potential for broader implementation.

National Highways has been made aware of the initiative. It was communicated during the Road Safety Performance Team meeting, where the programme was well received as an example of proactive wellbeing support on the network.

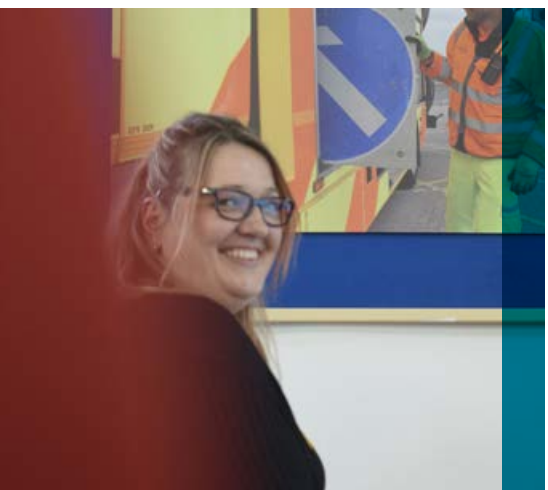
Supporting women in service delivery

The highways and construction industry continues to see low representation of women in operational roles. In response, CPS launched the Women in Service Delivery Group to create a supportive environment for women across the business.

The group aims to foster inclusion, provide mentorship and build confidence – while exploring ways to attract and retain female talent in the sector. This initiative is helping to shape a more diverse, equitable and forward-thinking workforce.

The Women in Service Delivery Group was established to ensure that women across the business feel empowered, supported and confident in their roles. From the outset, the group identified the value of mentorship and peer networks as essential tools for building confidence and supporting career progression.

The group also aimed to cultivate a culture of inclusive behaviour across all teams, underlining the importance of allyship and equal access to opportunities. Feedback from female colleagues highlighted a strong desire to be heard, to feel valued and to contribute meaningfully to a more inclusive working environment. Additionally, the initiative seeks to attract more women into the highways and construction sector by challenging outdated perceptions and addressing barriers to entry.



Deliverables and benefits

Throughout 2024, we hosted four in-person Women in Service Delivery events at Leatherhead, bringing together female colleagues from both frontline and framework teams. These sessions focused on key themes including mentoring, allyship, personal development and inclusive leadership.

Each event was thoughtfully designed to create an open, welcoming space for women to share experiences, build connections and engage in meaningful dialogue about their careers. Attendees participated in discussions around overcoming challenges, accessing development opportunities and supporting one another within male-dominated environments.

The impact has been clear: participants reported increased confidence and stronger peer relationships following the events. Several attendees have since pursued mentoring relationships, taken on new responsibilities, or actively engaged with leadership on future initiatives. Managers have also noted increased engagement and enthusiasm from those involved.

Beyond individual benefits, the sessions helped raise awareness around gender inclusivity across the business. They opened the door to wider conversations about allyship and representation, and paved the way for further initiatives to support diversity in operational roles.

The events also demonstrated our commitment to building a more inclusive workplace and highlighted the value of creating dedicated spaces for underrepresented groups to connect, grow and thrive.

The positive feedback and growing interest could present an opportunity for wider adoption across other SRN frameworks in future. The initiative has been shared through Operational Performance Meetings (OPM) and Regional Safety Performance Team (RSPT) discussions, ensuring visibility to National Highways stakeholders.

The Women in Service Delivery Group was established to ensure that women across the business feel empowered, supported and confident in their roles.

3

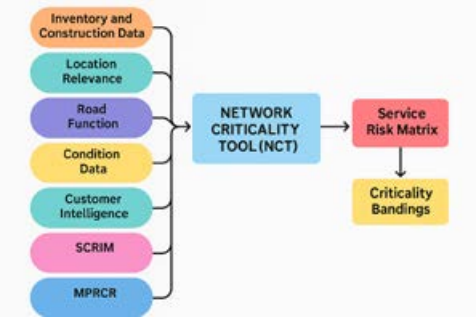
NETWORK CRITICALITY TOOLS – DEVELOPED FOR ASSET CATEGORIES

Asset Managers leading the Investment Planning Process are responsible for defining the short-, medium- and long-term plans through each iteration of the Asset Management Forward Plan (AMFP) development.

These investment plans reflect a holistic approach to renewals, illustrating how the business translates asset strategies and asset management objectives into actionable renewal activities. In essence, the asset management plans serve as the execution of our overall strategy, and the realisation of six key objectives:

1	**Whole life approach**
2	**Minimising the impact of maintenance and renewals**
3	**Ensuring the maintenance of project facilities**
4	**Enhancing knowledge of the asset portfolio**
5	**Incorporation environmental considerations**
6	**Reducing risk**

These objectives guide the planning process and provide a framework for prioritising and justifying investment decisions across the network.



The need

We faced a challenge in normalising and addressing, in standardised terms, the short- to medium-term investment needs across our asset categories. Asset Managers needed to analyse multiple data points - such as condition, inventory, inspection, performance and customer data - but these datasets were often fragmented and unstructured. Without a standardised framework, it was difficult to justify decisions and align them with the company's strategic objectives. Historically, asset managers relied on manual processes and standalone reports, which made it hard to validate decisions and ensure consistency.

To address this, we required a centralised decision support tool that could standardise and integrate these diverse data sources. The result was the development of the Network Criticality Tools (NCTs). The NCTs take inputs such as:

- Inventory data
- Inspection data
- Contract performance data
- Design and service or operational requirements
- Condition data
- Performance and customer data
- Location importance data

Through standardised data processing, the NCTs generate risk scores and attributes for each P-AMS section in the network. These scores help highlight the urgency or size of the investment opportunity. By integrating all asset intelligence into a single platform, the NCTs enable more transparent, data-driven decision-making, ensuring that investment priorities align with our Asset Management Objectives: whole life approach, minimising maintenance impact, facility maintenance, asset knowledge enhancement, environmental considerations and risk reduction. The NCTs bridge gaps between annual engineering priorities, decision support tools and long-term renewal forecasts, ensuring better strategic asset management.

Deliverables and benefits

Between April and August 2024, we made significant strides in enhancing our investment planning capability by developing and implementing a centralised decision support tool. This tool enables engineers to identify and define short- to medium-term priorities against renewal strategies.

Key activities included extensive stakeholder engagement to establish the functionality and processes necessary for generating risk scores for asset categories such as paved areas, road signs, road restraint systems, road markings and road studs. The tools integrate multiple data sources – inventory, condition, service, performance and customer data – enabling a comprehensive assessment of each asset's criticality.

The NCTs assess risk at the P-AMS section level, offering a detailed, standardised framework for asset evaluation. The system doesn't merely present data but allows asset managers to interact with it, providing justification for investment decisions. This analytical approach enhances the ability to prioritise investments based on quantifiable risk, directly aligning with our asset management objectives.

The benefits of implementing NCTs have been considerable. By centralising data and standardising risk assessment, asset managers can now make more informed, data-driven decisions. The new tools have significantly improved the ability to articulate and justify investment priorities, enhancing transparency and accountability. The ability to track and validate decisions through an auditable trail of asset information is transforming the way investment decisions are made, improving efficiency across the board.

Looking ahead, the full integration of the NCT into our investment planning process will drive operational efficiencies, streamline whole-life costing decisions and enable quicker, more transparent decision-making. The process also fosters the deployment of a common language and standardised criteria, improving consistency in renewal justification across the AMFP development cycle.

As far as we are aware, National Highways and other organisations do not currently use a similar short- to medium- term risk-based tool. While there have been prior attempts to develop similar technologies, it remains unclear how effectively they have been implemented, if at all. The NCT however, stands out as both an engineering and a strategic tool, with asset managers being the primary users. Unlike other tools, it does not merely present data or outputs but allows users to interact with the system, providing justification for their decisions. This interactive capability highlights the tool's inherent ability to drive informed decision making.

We believe the NCTs could be shared and used more widely across the SRN, offering significant benefits for broader network-wide planning and decision-making.

The use of the technology and various use cases have been presented to National Highways in the past. Development and improvements have also been presented as part of the AMFP development cycle.

4

RCS AUTOMATION

The M25 Community handles significant volumes of data through each iteration of the AMFP development and submission.

This data includes inspections, mechanical surveys, inventories, value management, engineering outputs and, ultimately, renewal recommendations and quantities.

Historically, we have struggled to fully digitalise centralised repositories and tools that depict a universal understanding of asset need and renewal recommendations. These elements are crucial for executing the asset management plan and enhancing the asset management line of sight, allowing practitioners to demonstrate how proposed and planned works deliver the asset category strategies.

In the past two contract years, we have designed and implemented a fully digitalised scoping tool for the pavement portfolio. This tool enables the definition of scope priorities, quantification of renewal volumes and generation of standardised reporting. Following its successful implementation, additional asset categories are now adopting the same principles.

The need

Scoping activities, whilst well engineered and rationalised, historically relied on standalone tools and technology that lacked any capacity for enhanced interoperability. Using pavement scoping tools, we expect asset engineers, commercial managers, designers, technical reviewers and project managers to interact with proposed strategies and scope definitions, tracking relevant intelligence, recommendations and residual service risks throughout the project lifecycle.

Historically, downstream analytics were completed manually, requiring engineers to interact with non-standardised spreadsheets. This led to a lack of controls over commerciality and deliverability considerations and no clear analytical framework to centralise key outputs for value management principles. Manual analytics posed risk of inconsistencies and difficulties in collating key outputs for value management. The absence of an integrated digital tool increased manual work, delays and inefficiencies in investment decision-making.

This would generate unnecessary clutter and manual rework, potentially delaying planning, programming and design activities, thereby hampering our ability to deliver and validate the best investment strategies for this asset category.

Deliverables and benefits

From April to August 2024, we enhanced our value management and need prioritisation capabilities by refining the technology that supports engineers in defining asset need and renewal strategies.

We conducted extensive community consultations to gather functional and non-functional requirements and review how our in-house tool could further expand our asset management capabilities. This process aimed to translate asset management objectives into functionality accessible to all road engineers and stakeholders involved in the AMFP development process.

Our goal was to capture and define a lean process, identify key stakeholders and develop a minimum viable product that supplements our asset management regime. This product translates strategies, policies, investment priorities and risk controls into easily accessible and understood asset intelligence.

The investment planning team developed and configured this tool and its peripheral ecosystem, enabling a transition to a fully digitalised state. This allows end-to-end asset management and value engineering principles to be traceable and auditable.

A team of data scientists and investment planners created a 'workbench' using extract, transform and load (ETL) techniques to draw data from various datasets, including condition inspections, age, construction, material types, historical works and scrim data. This generates an interactive strip-map for users to ascertain renewal activities and propose appropriate actions. The technology integrates recent commercial assumptions and treatment options, allowing real time assessment of investment and operational efficiency.

The scoping tool, takes as input:

- Inventory data
- Condition data
- Inspection data
- Construction and scrim data
- Age information
- Commercial intelligence
- Value engineering intelligence

This enables asset engineers, designers and technical reviewers to interact with multiple data-sources in a centralised 'sandbox' to generate their ultimate recommendations and annual plans.

To further enhance our BAU protocols, relevant procedures have been developed and implemented, and downstream ETL routines have been developed, to enable the business to collate intelligence from all scoping and AMFP activities in a way that enriches risk validation and optimisation of programmes and activities.

As a result, we are now equipped with a decision support tool that generates strip-maps for each P-AMS section in the network, collating relevant intelligence to align with our asset management objectives. Additional downstream ETL routines standardise presentation of all relevant data points from individual 10m sections, supporting investment reviews, value management workshops and the development of necessary intelligence for the asset management forward plan.

There are additional benefits we are realising in our investment planning process annual cycles. We have reduced the time needed to generate any network-wide intelligence from days to minutes and we have standardised the metrics and scores presented to rationalise the investment. We are now better equipped to summarise the anticipated benefit of treatment strategies, residual risks, necessary controls and future renewal opportunities. Every meter of need prioritised and scope assigned, can now be justified and assessed to break down and better understand the risks we are addressing and the nature of the works we are proposing.

Through this exercise, significant efficiencies are being identified in the works planning process, meaning we're in a better position to refine and optimise how our supply chain is being utilised, ultimately reducing our renewals operational footprint and carbon emissions.

Lastly, the capacity to draw down from this vast source of data points that depict the M25 paved areas network in its totality has enabled us to validate how the asset management strategy is performing and identify sooner whether any changes are required at the highest strategic level.

The digitalised scoping tool fundamentally changes our approaches in scoping and prioritising, allowing the whole community to visualise and utilise superimposed layers of asset information to rationalise and justify strategies. As we move forward with implementation of AI technologies, we anticipate a greater reach into new sources of information that may further expand the intelligence collated and used to drive higher efficiencies and improved outcomes in all aspects of investment planning.

Each road authority generally owns and utilises some form of scoping tools. The RCS in its current format and specifically with the whole ecosystem and ETL protocols generated and implemented to enable its full integration in our asset management system, is something unique to the M25 DBFO.

The use of the technology and various use cases have been presented to National Highways in the past. Development and improvements have also been presented as part of the AMFP development cycle.

5

VAISALA – RoadAI

Ensuring the safety, resilience and efficiency of the network's pavement assets is essential to delivering high service standards for road users.

Traditional pavement surveying methods, however, have limitations in frequency, accuracy and responsiveness, which can lead to gaps in data and reactive maintenance strategies. To address these challenges, we deployed RoadAI, an innovative mobile-based AI system that provides continuous, real-time monitoring of pavement conditions. Mounted on operational vehicles, RoadAI captures high-resolution video data, analyses road surface health, defects, road markings and other key assets through advanced AI-driven processing.

Following a successful trial, RoadAI was fully integrated into the M25 network, transforming data collection and utilisation. By connecting with Power BI, RoadAI enables real-time trend analysis, predictive maintenance planning and enhanced reporting, leading to:

- Improved safety by identifying and addressing pavement defects before they become hazards.
- Greater operational efficiency through automation, reducing costs and time spent on inspections.
- Enhanced asset longevity by shifting from reactive to proactive maintenance strategies.
- Minimised disruption for road users, ensuring a smoother and safer driving experience.

The need

The need for this project stems from a critical gap in pavement asset understanding between longstop inspections and machine-based inspections. While these inspections provide valuable periodic assessments of the road network, they leave significant intervals where pavement deterioration can progress unnoticed. This gap presents risks to safety, customer experience and the timely, efficient delivery of maintenance interventions.

Environmental factors - such as increasing temperatures, higher instances of extreme rainfall and more frequent freeze-thaw cycles – are making the rate of pavement degradation less predictable. Without a continuous and data-driven approach, the risk of asset failure increases, potentially leading to costly emergency repairs, increased safety hazards and a poor driving experience for our road users.

This innovative approach aligns with National Highways' key imperatives - Safety, Customer and Delivery - setting a new benchmark for intelligent infrastructure management. By leveraging AI-driven data, we are driving forward a more resilient, efficient and data-led future for the M25 network, ensuring it remains one of the UK's most well-maintained strategic road assets.

By integrating RoadAI technology into the existing network safety inspections process, we can establish a consistent, reliable and high-resolution dataset that provides real-time insights into pavement conditions. This will allow us to proactively manage road surfaces, enhance safety outcomes and improve service delivery, ensuring that the network remains resilient and fit for purpose.

Deliverables and benefits

From April 2024 to January 2025, a significant milestone was achieved in network data collection, with 74,994 km of road network surveyed. This effort resulted in 1,210 hours of high-quality video footage, offering an unprecedented level of coverage and insight into the condition of our asset.

This extensive video capture has introduced an innovative approach to validating pavement defects as part of the AMFP. By leveraging this real-time, visual data, the process of assessing road surface conditions has become more accurate, timely and data-driven, significantly reducing reliance on traditional inspection methods which are often time-consuming and less precise.

Key benefits realised

1. **Improved decision-making and risk mitigation**
   - The high-resolution data has enabled more informed decision-making regarding asset renewal priorities.
   - This approach helped avoid Paymech charges on two separate incidents, as we were able to demonstrate that appropriate maintenance and risk mitigation measures were in place while awaiting renewal activities.
2. **Enhanced asset validation and maintenance planning**
   - The availability of near real-time data has greatly improved how pavement defects are identified and validated.
3. **Opportunities for expanded asset insights**
   - The introduction of beta testing modules within the RoadAI system has opened up opportunities to assess additional asset categories beyond pavements.
   - Early trials suggest that the system can provide valuable insights into signs, road markings, studs and road restraint systems, further enhancing our ability to proactively manage and maintain these assets.
4. **Stronger data-driven evidence for investment planning**
   - With 74,994 km of network coverage and 1,210 hours of video data, we now have a significantly stronger evidence base to support future investment decisions.

Measurable improvements

- Inspection efficiency: Traditional methods required significant time investment, however the shift to video-based validation has streamlined the process, making it faster and more efficient.
- Operational scalability: The use of AI-driven data analysis has set the foundation for expanding similar methodologies to other asset classes, thereby increasing the overall effectiveness of asset management strategies.

Conclusion

The implementation of extensive video data collection and AI-driven analysis has fundamentally transformed our approach to asset validation and maintenance planning. The ability to rapidly assess, validate and act on real-time road condition data has led to cost savings, enhanced risk mitigation and improved decision-making. Additionally, the expansion into other asset categories presents an exciting opportunity to further enhance the resilience and efficiency of our network in the months ahead.

Based on our understanding from RoadAI, we are the only supplier utilising RoadAI on the SRN and the only organisation actively collecting and leveraging data in this format. This positions us at the forefront of innovation in asset management, setting a new industry benchmark for AI-driven pavement monitoring and data-led decision-making.

The RoadAI project was successfully presented at the Innovation Forum with National Highways in attendance, following the completion of a successful trial and the full integration of the system into the network. The project generated significant interest, highlighting it for wider application across the SRN.

As we continue to refine our approach and enhance our data analysis and reporting capabilities, providing an updated progress report would be highly beneficial in demonstrating the system's evolving capabilities and impact. Looking ahead to 2025, a key focus will be evaluating how RoadAI's data can contribute to predictive deterioration modelling for pavement assets. If successful, this would mark a significant advancement in long-term asset planning, enabling more accurate forecasting of pavement wear and reinforcing a proactive, data-driven maintenance strategy.

6

PARTNERING WITH ALCHERA TO EXTEND WORKING WINDOWS

We have partnered with Alchera to develop an innovative tool that identifies opportunities to extend working windows on the M25 network. This tool leverages cutting-edge machine learning and artificial intelligence algorithms to enhance road maintenance efficiency, safety and customer experience.

Successful trials have shown a 20% increase in productivity per shift and predicted annual savings of £2.2 million, aligning with National Highways' key imperatives.

The need

The M25 is one of the busiest and most strategically important road networks in the UK, and maintaining it comes with its own set of challenges. As part of our 30-year contract with National Highways, we're responsible for ensuring its safe and efficient operation. A key part of this is managing road closures, which, while necessary for maintenance, can disrupt both traffic and the daily routines of the 300,000 drivers who rely on us.

Currently, most of our work is completed within a defined working window from 22:00 to 05:00, but this limited timeframe can make it difficult to complete tasks efficiently, often leading to more closures over time. Finding a way to extend working windows safely, without adding undue disruption to road users, is vital to improving the efficiency of our operations.

This approach aligns with National Highways' key imperatives – Safety, Customer and Delivery. By extending working windows and reducing the number of closures, we're able to deliver more maintenance in each closure, meaning less disruption for users, fewer delays and a better overall experience for commuters. Fewer disruptions also help businesses and local communities that depend on the M25 for their daily operations.

At the same time, we're improving safety for both workers and road users. With fewer road closures, we're reducing road workers' exposure to live traffic, which helps lower the risk of incidents for everyone involved. By delivering more work per shift, we can streamline maintenance and reduce the overall impact on both the road network and those who use it. This ensures that the M25 remains a reliable, safer and more efficient route for all.

Deliverables

1. **Predictive analytics tool:** We have developed a tool that uses historic traffic flow patterns and external factors like weather and event data to predict future traffic flows. This allows us to determine the optimal times for extending working windows.
2. **User-friendly interface:** The tool includes a simple interface that integrates the PayMech model, enabling project teams to assess the financial impact of extending working windows and make informed decisions.
3. **Integration with road space booking system (noms):** The tool has been fully integrated within NOMS, ensuring visibility of additional working window opportunities for all teams booking roadspace.

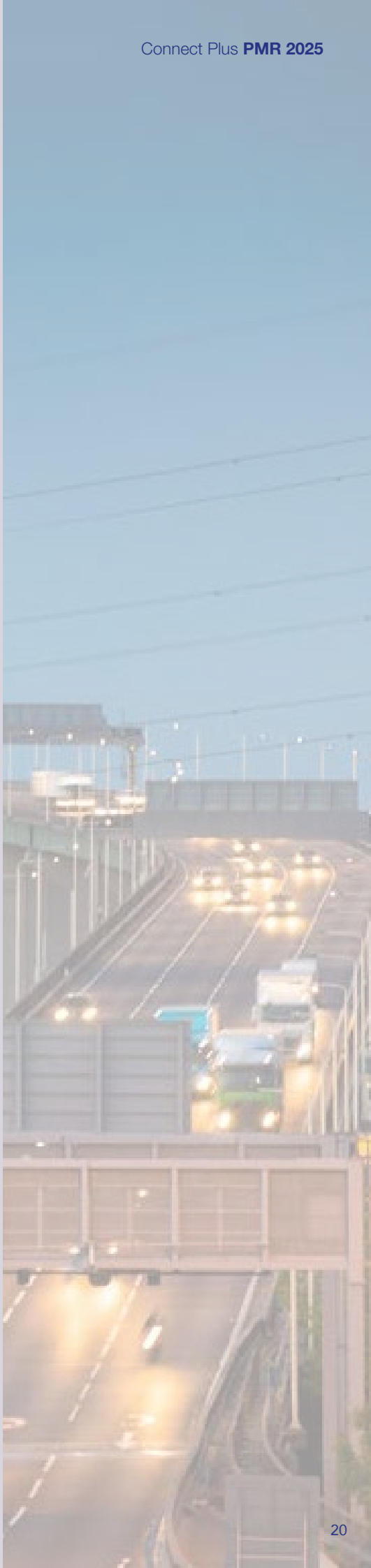
Benefits:

1. **Increased productivity:** Trials have shown that we can achieve 20% additional productivity time per shift. This means more work can be completed in a single shift, reducing the total number of closures required.
2. **Cost savings:** By extending working windows and completing more work per shift, we predict annual savings of £2.2 million until 2039, the end of the 30-year DBFO contract. This is demonstrated by a resurfacing project that we completed on the M11 in 2024, where 10 planned closures were reduced to five through increasing the volume of work delivered in longer closures.
3. **Environmental benefits:** Reduced frequency and duration of road closures lead to lower emissions from idling engines, decreased air pollutants and improved energy efficiency. Optimised equipment use and targeted artificial lighting further enhance environmental sustainability.
4. **Improved journey experiences:** By minimising disruptions and reducing the number of closures, we enhance the journey experiences for the daily 300,000 M25 users and surrounding communities.
5. **Enhanced safety:** With fewer closures and shorter work durations, we lower the exposure of our workforce to live traffic conditions, reducing the risk of accidents and aligning with National Highways' zero harm safety ambition.
6. **Economic impact:** Streamlined maintenance schedules reduce economic impacts on businesses and commuters, supporting both the local and national economy.
7. **Biodiversity and habitat protection:** Reduced road closures and disruptions help protect local ecosystems, aligning with our environmental team's focus on biodiversity and habitat conservation.
8. **Global sustainability targets:** The project's strategies significantly reduce the overall carbon footprint of road maintenance activities, contributing to global sustainability goals.

These deliverables and benefits collectively demonstrate our commitment to leveraging technology for infrastructural improvement and operational excellence, aligning with National Highways' key imperatives of safety, customer service and delivery.

Alchera is working on various innovation projects with National Highways. However, the specific economic benefits provided to us by Alchera through contract incentives (such as Paymech), are not applicable in other parts of the country.

National Highways are aware of our project, and the tool has been fully integrated within the road space booking system (NOMS) to ensure visibility of additional working window opportunities for all teams booking roadspace. This rollout demonstrates the project's potential as a model for future infrastructure projects across the highways industry and beyond.



7

TECHNOLOGY MODERNISATION AND REFRESH PROGRAMME

In 2023 National Highways launched the modernisation and refresh programme to upgrade outdated and underperforming operational technology assets across All Lane Running (ALR) sections of its network, nationwide.

The programme focuses on replacing key asset types including:

- CCTV systems
- Signals
- MIDAS Radar (motorway incident detection automatic signalling)

This initiative is a critical step in ensuring the continued reliability, safety and efficiency of the strategic road network.

The need

National Highways recognised that the operational technology within the ALR sections was underperforming, with availability levels continuing to decline. As the safety case for the ALR sections relies heavily on the effectiveness of this technology, a dedicated programme was created to replace the failing asset types and restore performance.

Upgrading these assets improves Traffic Officers' ability to monitor the network in real time and use signals to maintain safety and keep road users informed.

A key benefit of the new equipment is its support for remote diagnostics, software updates and fault resolution. This reduces the need for roadside engineer visits, minimising closures and reducing the risk to personnel by reducing their exposure to live traffic – ultimately delivering both safety and customer benefits.

Deliverables and benefits

National Highways entrusted Connect Plus and CPS with the delivery of critical upgrade works across the Southeast, not only in Area 5, but also in Areas 3 and 4, as part of the modernisation and refresh programme. This wider remit is a strong endorsement of our capability and track record in delivering high-quality, safety-critical infrastructure upgrades.

The works were delivered by COFA contractors following a detailed survey and design phase in 2023/24. Installations commenced in May 2024, marking a major step forward in upgrading key operation technology assets across the Southeast.

The first scheme was delivered on the M20 (Areas 4 and 5), replacing 25 MIDAS radar units, with one additional site relocated and installed through coordination with the NEAR programme. We initially planned to use Techmiracle equipment, as this had been used previously, however this solution was unavailable within the required timescales, therefore the scheme was adapted to install Wavetronix devices, following direction from National Highways.

Subsequent installations included:

M23 – 40 sites

M3 – 54 sites

M25 – 96 sites

M4 – 120 sites

This gave a total of 334 sites that were upgraded.

After installation, Wavetronix carried out checks to ensure the sites were correctly aligned and that they were picking up the traffic in the correct lanes. National Highways' MIDAS subject matter expert then reviewed the results, before re-enabling each site for live traffic monitoring and congestion detection.

Completion of the MIDAS sites installation was achieved in Mid–March, and the verification of the sites is ongoing.

CCTV site upgrades

A total of 20 CCTV sites were surveyed and upgraded:

M3 – 7 sites

M4 – 8 sites

M20 – 4 sites

M25 – 1 site

Surveys revealed widespread power cable defects, which were addressed during the design and installation phases. Two sites required the installation of new cabinets to support updated camera technology and cable routing.

In addition, we replaced one camera on the M3 due to a lack of maintenance spares, to allow the NEAR scheme to lift its traffic management and achieve the visibility levels required by the Southeast ROC. We are also due to replace a further CCTV site on the M3 at the end of April.

Signal replacement (planned)

The programme also includes the replacement of 10 Advanced Matrix Indicators (AMIs) and 2 MS1 signals, planned for May – June 2025. Delivery of this phase is pending final equipment availability and resource planning.

One of the major achievements in delivering the M&R programme in the Southeast was the collaboration between NEAR and the COFA teams. With the exception of one section, NEAR was involved in nearly all ALR areas, working alongside teams to deliver emergency refuge areas. This joint effort earned praise from COFA contractors for the seamless cooperation provided by the NEAR team, particularly when accessing the NEAR schemes traffic management.
The ability of the two projects to work together, allowed for shared road space and integrated traffic management, resulting in significant cost savings.

Key benefits and outcomes

- **Enhanced confidence and expanded scope**
  Being asked to lead delivery across three areas, despite only operating Area 5, reflects National Highways' confidence in our ability to deliver complex, high-value programmes across wider geographies.

- **Improved network monitoring and response**
  The upgraded MIDAS and CCTV systems restore reliable traffic detection and situational awareness, ensuring safer and more responsive traffic management in ALR sections.

- **Remote support capabilities**
  New equipment enables remote diagnostics and updates, reducing the need for on-site maintenance. This lowers costs, enhances safety for roadside workers and minimises disruption to the travelling public.

- **Collaborative working and cost-efficiencies**
  Effective coordination with the NEAR programme allowed both projects to share traffic management setups. This cooperative approach:
  – *Minimised disruption to our customers with fewer closures*
  – *Accelerated delivery timelines*
  – *Generated significant cost savings for National Highways*

- **Timely delivery**
  All MIDAS installations were completed by mid-March 2025, with site validation now underway — keeping the programme firmly on track.

Next steps

- Completion of MIDAS site validation
- Final CCTV upgrade scheduled for April 2025
- AMI and MS1 signal replacement to proceed from May 2025

The M&R programme was a Nationwide programme and covered all the ALR sections across the country. Regular monthly meetings were held with representation from the Northwest, the Northeast, the Midlands and the Southeast. The Southwest do not have any ALR sections.

This was a National Highways programme managed by a central team.

8

OUR CONCRETE ROAD STRATEGY

Our concrete road strategy is well aligned with National Highways' Project Road Objectives set out in Road Investment Strategy 2 (RIS2) and is future-proofed to support the ambitions of Roads Period 3 (RP3).

The need

Under Schedule 9 of our contract, all new and resurfaced carriageways forming part of the project road are required to have low noise surfacing installed. In response, a strategy has been developed specifically for exposed pavement quality concrete (PQC), based on national standards, best practice guidance and the principles set out in the concrete pavement maintenance manual (CPMM).

Over time, joint deterioration between concrete bays has led to widening gaps. As vehicle tyres strike the edges of these bays, it creates a phenomenon known as 'tyre slap' – a form of intermittent noise that contributes significantly to noise pollution. This issue has resulted in a growing number of complaints from both local residents and road users.

The primary aims of the project are to:

- Improve ride quality for vehicles, reducing vibrations and enhancing user comfort.
- Reduce noise levels, particularly within designated noise important areas (NIAs), in compliance with low noise surfacing obligations and to improve community satisfaction.
- Extend asset life by proactively addressing structural deterioration through appropriate joint maintenance techniques.

Deliverables and benefits

In contract year 16, we delivered a significant phase of our concrete road strategy between junctions 10 and 11. This aligned with National Highways' imperatives and the requirements of schedule 9 of the DBFO contract, which mandate the installation of low noise surfacing on new or resurfaced carriageways.

We utilised four full weekend closures at J10 and multiple overnight closures to carry out essential maintenance, including the repair and re-profiling of approximately 400 concrete joints, equivalent to around 7,500 linear metres.

These works were carefully coordinated with our framework contractor and the J10 major project improvement team, allowing us to make best use of planned closures and minimise disruption to road users.

This phase focused on reinstating joint performance and implementing next generation concrete surfacing (NGCS) to address NIAs.

Measured outcomes and benefits

Skid resistance:

- SCRIM survey results for Lane 1 post-NGCS installation showed a 50% improvement, with values of 0.55–0.63, significantly above the investigatory level (IL) of 0.35.
- PFT testing indicated a 23% increase in high-speed friction across the treated area.

Surface texture:

- 3D laser profilometer and volumetric surface macrotexture testing recorded an increase in texture depth from 1.1 mm to 1.5 mm, improving both grip and drainage.

Noise reduction:

- Ambient measurements near NIA 1286 (West Byfleet) showed nighttime reductions of -1.8 dB (westbound) and -3.6 dB (eastbound).
- In-car noise testing (BS 6068:1981) reported reductions of 7 – 11 dB, with a noticeable elimination of joint-related clicking – bringing acoustic comfort close to that of asphalt overlays.

- **Enhanced customer experience**
  For road users, these benefits are immediate and tangible. The smoother, quieter surface significantly enhances the driving experience, especially during night-time travel or longer journeys. The reduction in cabin noise, elimination of tyre slap and improved ride quality reduce driver fatigue and stress, contributing to greater satisfaction and a stronger perception of safety.

  By integrating preventative maintenance with intelligent programming and customer-centric design, this work reflects our commitment to delivering better journeys – a core outcome in National Highways' Road Investment Strategy (RIS2) and an essential foundation for Roads Period 3 (RP3).

The innovative maintenance methods trialled and implemented – including NGCS and T17 resin-based joint replacement – have generated promising results with measurable benefits in noise reduction, skid resistance and durability. These outcomes contribute directly to National Highways' imperatives around Safety, Customer Experience and Delivery, making them highly relevant for potential wider adoption across the SRN.

To date, while full-scale adoption of these methods elsewhere on the SRN is still emerging, we have:

- Shared findings and technical results with National Highways and industry stakeholders.
- Engaged in positive conversations with National Highways regional asset management team and SES, who have expressed interest in applying elements of our strategy – particularly NGCS – for future resurfacing programmes where concrete preservation is preferred.
- Noted that T17 joint repair is being increasingly recognised as a viable alternative to more invasive joint reconstruction methods, with potential applications in other DBFO and maintenance areas.

There is strong potential for wider national benefit, especially as Roads Period 3 (RP3) focuses more on whole-life asset performance, carbon reduction and minimising customer disruption. Our strategy provides a scalable model that other contracts and delivery partners could follow to extend the life of concrete roads without full-depth reconstruction.

By continuing to engage with National Highways' SES teams and sharing our performance data, we are actively supporting knowledge transfer and contributing to the broader goal of embedding best practice across the SRN.

National Highways is fully aware of the project and deeply involved in the strategy setting. We have maintained regular communication and collaboration with National Highways throughout the development and delivery of the concrete road strategy.

National Highways has been informed through the following channels:

- Direct engagement with regional asset management teams: strategy setting, progress updates, performance data and planned interventions were shared throughout the year, particularly in relation to junctions 10 – 11 and associated closures.
- Alignment with the J10 major project: Integration with National Highways' major scheme planning ensured shared awareness, strategic coordination and optimisation of road space and closure schedules.
- Technical briefings and reporting: Performance results from NGCS trials and T17 joint treatments were reported back to National Highways' technical team to demonstrate innovation and effectiveness.
- Knowledge sharing forums: Discussions with National Highways representatives took place during pavement innovation working groups and through structured lessons-learned sessions.

9

FIRST USE OF SMARTRAFT IN A HIGH-CONTAINMENT ENVIRONMENT

This project delivered the successful replacement of 396 meters of high-containment vehicle restraint system (VRS) at the M25/M20 interchange using the innovative Smartraft modular foundation system. Installed over a single 56-hour weekend closure, the scheme achieved significant reductions in carbon emissions, workforce-hours and overall project costs.

As the first-ever use of Smartraft in a high-containment environment, the project sets a precedent for smarter, faster and more sustainable infrastructure delivery across the SRN.

The M25/M20 interchange is a vital part of the UK's highway network, carrying high volumes of traffic including a large percentage of HGVs.

The Need

The M25/M20 interchange is a vital part of the UK's highway network, carrying high volumes of traffic including a large percentage of HGVs. The existing VRS required replacement to maintain network safety and resilience. However, traditional VRS installation methods rely on deep concrete foundations and posts, which are time-consuming and disruptive, especially around underground services.

There was a clear need for a more efficient, cost-effective and environmentally friendly solution. A conventional approach would have taken three weeks of night shifts, leading to prolonged traffic management measures, narrow lanes and speed restrictions, negatively impacting both road users and workforce wellbeing. The project team needed a smarter, faster alternative that could meet National Highways' imperatives for Safety, Customer, and Delivery – without compromising quality or performance.

Deliverables and benefits

Earlier this year, the project team successfully replaced 396 meters of high-containment VRS barrier at the M25/M20 interchange using Smartraft – the first time the system had been deployed in a high-containment setting on the SRN. Smartraft is a modular, precast foundation system designed and manufactured off-site, enabling rapid, consistent installation with reduced risk and environmental impact.

Each unit was approximately six meters long and connected using a dado-style joint. VRS posts are slotted into pre-formed sockets and secured with pins or surface mounted as needed. The system requires only a 200mm excavation, far shallower than the 600-800mm typically needed for conventional barriers. Once installed, the interlocking units form a continuous ground-beam effect, enhancing performance and ease of maintenance.

Installation was completed during a single 56-hour weekend closure, avoiding the need fo a 3-week night-shift programme. This innovative approach led to substantial benefits across safety, cost, customer service and environmental performance.

Benefits realised

Safety

- 70% reduction in workforce hours, lowering exposure to site risks.
- Daytime working improved visibility and situational awareness, reducing fatigue -related hazards.
- Reduced plant movement and manual handling, minimising plant/person interface hazards.

Customer impact

- Drastically reduced disruption: The compressed programme avoided weeks of narrow lanes and 40mph speed limits, reducing queuing, emissions and driver frustration.
- Zero customer complaints: A result of effective communication and swift delivery – a rare outcome for closures of this scale.
- Reduced likelihood of rework due to controlled conditions and fewer shifts.

Environmental sustainability

- 49% carbon saving: Less concrete used, fewer vehicle movements and shorter programme duration.
- Smaller excavation footprint (200mm) reduced impact on existing infrastructure and underground services.
- Off-site manufacturing aligns with modern methods of construction and National Highways' net zero roadmap.

Delivery certainty and efficiency

- 41% cost saving over conventional approaches.
- Higher quality control from off-site production.
- Fewer delays and programme risks, including the ability to respond to unforeseen ground conditions during a continuous closure window.

Thorpe Park

Smartraft was key to the success of the Thorpe Park outfall scheme, which addressed a very high-risk pollution source. For this project it was the only viable option as a barrier solution, due to the space available at the top of the embankment. Unlike traditional VRS which would need driven posts or concrete foundations, we were able to install Smartraft directly over the new drainage system.

Looking ahead: Smartraft for future maintenance

The benefits of Smartraft go beyond initial installation. Its modular design allows damaged barrier posts to be removed and replaced without excavation, enabling maintenance to be completed in hours rather than over multiple shifts. This significantly reduces traffic management needs, workforce exposure and stakeholder disruption. For road users, this means shorter closures, fewer delays, and a more reliable network.

This installation marks more than just a successful delivery – it represents a scalable innovation aligned with National Highways' goals for smarter, sustainable and safer infrastructure.

10

WATER IMPROVEMENT SCHEMES

The **M3 Thorpe Park** outfall scheme and the **Brookhouse Brook** site were both identified as Category A (very high risk) pollution sources. Both projects were initiated to prevent harmful pollutants travelling from the SRN to nearby water bodies and to improve the overall health of surface water.

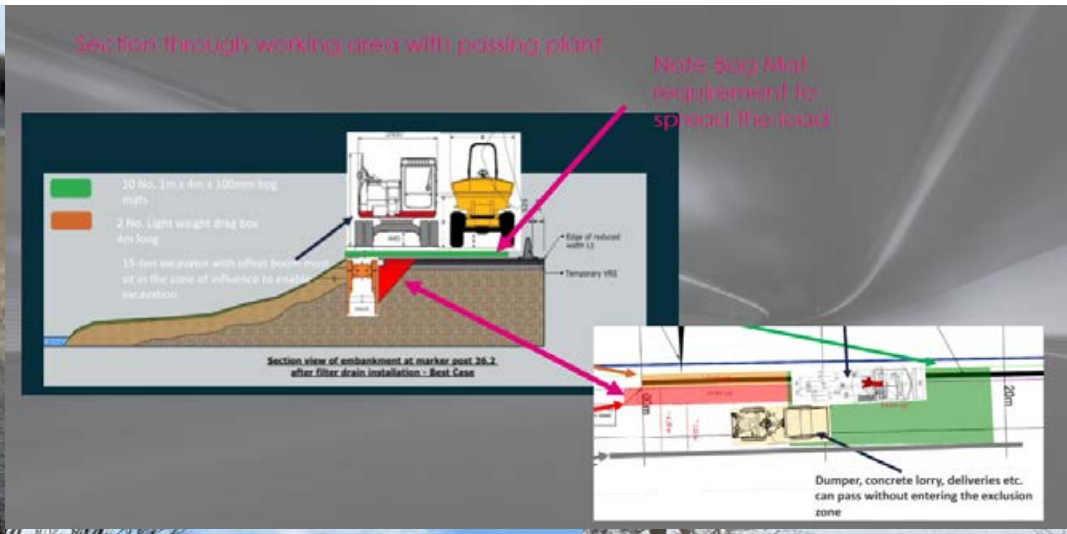
M3 THORPE PARK

The need

The M3 Thorpe Park outfall site is located on the M3 Eastbound carriageway nearside, between junctions two and one, with a scheme extent of approximately 500m.

Following assessments using HEWRAT, M-BAT and site specific risk assessment (SSRA), and subsequent discussions with National Highways safety engineering and standards (SES), the M3 Thorpe Park outfall was classified as a category A (very high risk) pollution source to water quality. The scheme was initiated in direct response to National Highways environmental vision and commitment to stopping harmful pollutants from entering nearby waterbodies via the SRN, and to improve the chemical and ecological health of surface water.

The scheme aimed to address the risk posed by 31 outfalls/outlets currently discharging polluted runoff water into St Ann's Lake without mitigation measures. It was funded by National Highways through the environment and wellbeing designated funding and designed, procured and delivered within the 2024/2025 financial year.



Deliverables and benefits

The scheme progressed through detailed design, supported by extensive early contractor involvement (ECI), and successfully completed procurement, achieving contract award. The main works completed in early March 2025.

Key project challenges and solutions
One of the most complex aspects of the scheme was the Thorpe Park site itself, which presented multiple engineering and logistical challenges.

- Strict adherence was required to National Highways' narrow land boundaries and site constraints.
- The site lies within environmentally sensitive designations; a Site of Special Scientific Interest (SSSI), a Special Protection Area (SPA) and a Ramsar wetland.
- It is situated on a partially submerged embankment, adjacent to St Ann's Lake, requiring a flood risk activity permit (FRAP).
- The design incorporated an innovative bioengineered filter media material (Aqua-Xchange) to enhance environmental resilience and water treatment performance.

Design and construction considerations
Given the sensitivity of the location, both the design solution and methodology were carefully developed to:

- Address geotechnical risks and ensure stability, protecting the M3 embankment and carriageway.
- Implement temporary works strategies to maintain safety and minimise disruption to the surrounding infrastructure.
- Deploy 24/7 traffic management, including hard shoulder/lane 1 closures, a temporary vehicle restraint system (TVRS) and narrow lanes to safely carry out the works and achieve a fast-track programme to meet with National Highways expectations.

Innovation and compliance
The use of a bioengineered filter media posed a unique challenge, as it is not currently listed as a recognised pollution control measure. To proceed, the project team secured a departure from standard, supported by a comprehensive water quality sampling and monitoring protocol, developed during the design phase and agreed in principle with National Highways SES.

Given its innovative nature, the scheme was treated as a trial project, with post-construction performance monitoring set to begin immediately upon completion of the main works. This will provide valuable data on the effectiveness of the engineered filter media in full-scale operation.

Key benefits of the solution include:
- Extended design life compared to conventional drainage systems
- High treatment effectiveness, improving pollution control
- Low maintenance requirements, reducing long-term costs
- Smaller construction footprint, reducing land use and disruption

Given these advantages, Aqua-Xchange offers a promising alternative to standard DMRB-compliant solutions – particularly for Category A outfalls. Engagement with stakeholders is ongoing, and there is strong potential for future replication on similar high-risk sites.

To our knowledge, Aqua -Xchange has previously been used on the M56 Lymm. However, we understand that the site conditions and design implementation in that instance differed significantly from those on the Thorpe Park scheme.

This scheme marks the first use of Aqua-Xchange on the M3 and represents a major step in demonstrating its potential for broader application across the SRN.

National Highways have been actively engaged in the project from its early stages.

During stage 1, assessments using HEWRAT, M-BAT and SSRA identified the outfall as a Category A risk. A comprehensive business case was developed and submitted to National Highways, leading to further engagement during optioneering and preliminary design. The proposed solution was presented during a value management workshop with SES and accepted for further development.

Ongoing collaboration throughout design development ensured a shared understanding of the scheme and confidence in its long-term benefits. National Highways decision to proceed with construction reflects that trust in the scheme's innovation, deliverability and environmental value.

11

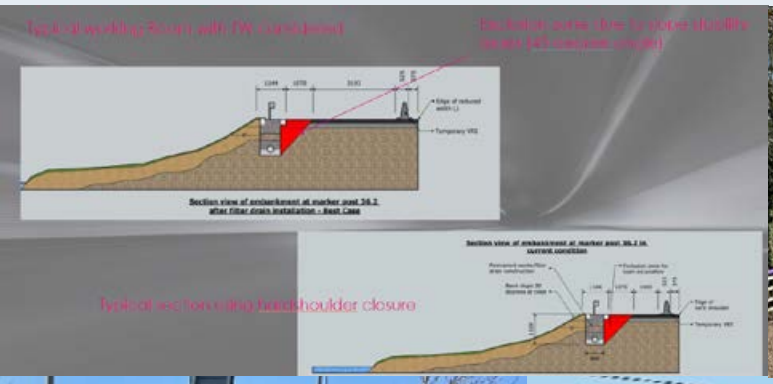
BROOKHOUSE BROOK

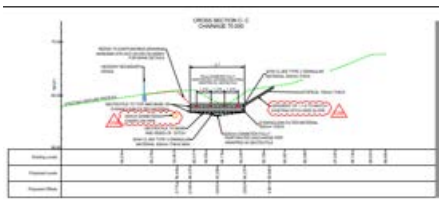
The need

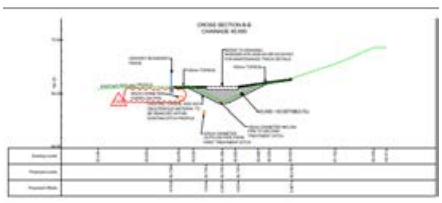
The Brookhouse Brook site, located near the M25, approximately 1km south of Epping Town has been identified as a Category A (very high risk) pollution outfall, posing a significant threat to nearby water quality. The site, located between Bell Common and Junction 27 of the M25, has direct implications on local ecosystems and waterbodies.

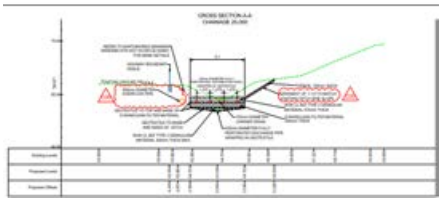
The project was initiated to support National Highways' environmental vision and commitment of reducing harmful pollutants travelling from the SRN to nearby water bodies and improving the overall health of surface water. By addressing this pollution risk, the project directly aligns with National Highways' imperatives of Safety, Customer and Delivery, while contributing to environmental sustainability and community wellbeing.

The scheme is funded under National Highways' environment and wellbeing designated funding, aiming to design, procure and implement the solution within the 2024/2025 financial year.









Deliverables and benefits

The scheme has been developed through detailed design with extensive ECI. It went through the procurement process and achieved contract award, with the main works completing towards the end of March 2025.

Key project challenges and solutions

One of the most complex aspects of the scheme was the Brookhouse Brook site itself, which presented multiple engineering and logistical challenges.

- The site required strict adherence to National Highways' narrow land boundaries to avoid the need to acquire private land, ensuring regulatory constraints.
- A strategic engineering approach was adopted to mitigate conflicts with critical national utilities, including:
  - BPA main oil pipe,
  - CADENT gas main
  - UKPN electrical infrastructure
- To deliver a practical and sustainable solution, the project incorporated an innovative bioengineered filter media material (D-Rainclean) – enhancing environmental resilience and water management.

Design and construction considerations

Given the sensitivity of the location, the design solution and construction methodology were carefully developed to:

- Address geotechnical risks and ensure stability, preventing potential impacts on the M25 motorway embankment, and subsequently to the M25 carriageway.
- Implement temporary works strategies to maintain safety and minimise disruption to the surrounding infrastructure.

Innovation and compliance

The adoption of bioengineered filter media posed a unique challenge, as it is not currently listed as a recognised pollution control measure within DMRB CG 501. To proceed, the project team secured a departure from standard, supported by:

- Pre-implementation water quality sampling and monitoring to establish baseline conditions.
- A comprehensive water quality sampling and monitoring protocol, developed during the design phase and agreed in principle with National Highways SES.

Given its innovative nature, the scheme is considered a trial project, with post-construction performance monitoring set to begin immediately upon completion of the main works. This will provide valuable data on the effectiveness of the engineered filter media in full-scale operation.

To our current knowledge, the D-Rainclean material (formerly known as Re-Medi8) was previously trialled on the A38 Dean Burn several years ago. However, based on information available to us, the site conditions and design implementation in that instance were notably different from those on this project.

This scheme marks the first time that D-Rainclean has been designed and implemented on the M25, representing a significant milestone in its application on a major strategic route.

The key advantages of this innovative solution include:

- Extended design life compared to conventional drainage solutions.
- High treatment effectiveness, improving pollution control.
- Low maintenance requirements, reducing long-term costs.
- Smaller construction footprint, minimising land use and disruption.

Given these advantages, D-Rainclean offers a promising alternative to standard DMRB-compliant solutions– particularly for Category A outfalls. Engagement with stakeholders is ongoing, and there is strong potential for future replication on similar high-risk sites.

National Highways have been actively engaged in the project from its early stages.

During stage 1, as part of our efforts to identify improvements to the SRN, we conducted an assessment using National Highways Water Risk Assessment Tool (HEWRAT). This identified the Brookhouse Brook outfall as a Category A (very high risk) pollution source, posing a significant threat to water quality.

To address this, we developed a comprehensive business case, which was formally submitted to National Highways for approval. At the optioneering and preliminary design stage, the proposed solution was presented to National Highways SES during a value management workshop. Following which, the recommended solution was accepted for further development into detailed design.

The maturity of the final design, combined with consistent and effective engagement with National Highways SES, ensured a robust understanding of the scheme. This collaborative approach enabled National Highways to make an informed decision to proceed with construction, demonstrating confidence in the solution's effectiveness and long-term benefits.

12

A NETWORK FIRST IN BRIDGE STRENGTHENING

The Swanley Interchange East and West bridges are an integral part of the M25 Junction 3 interchange roundabout. Initially designed and constructed with insufficient reinforcement, these bridges were unable to support the required design loads.

In 1977, this issue was addressed through strengthening efforts, which involved the application of bonded steel plates. While additional repairs were undertaken in 1995, further evidence of surface deterioration has continued. To manage the structural integrity of the bridges, interim monitoring and regular surfacing repairs have been implemented to mitigate further breakdowns and ensure continued functionality.

The need

The Swanley Interchange bridges required an innovative, long-term solution to address the ongoing structural deficiencies and surface deterioration. Traditional repairs and interim measures, such as weight restrictions, were no longer sufficient. The introduction of surface mounted carbon fibre reinforced polymer (CFRP) rods provided a UK-first innovation in bridge strengthening, restoring the structure's load capacity and enhancing durability. This solution addresses National Highways' imperatives for Safety, Customer, and Delivery, by eliminating traffic restrictions, reducing the need for future repairs and avoiding full closures, all while minimising disruption to road users. This project not only improves the structural integrity of a critical M25 asset but also delivers a more sustainable and cost-effective approach

Deliverables and benefits

This year marked the successful completion of the final phase of works on the Swanley Interchange West bridge, delivering several significant benefits both to the structure and to the wider community. The completion of this phase has provided a sustainable, cost-effective solution that enhances both the safety and performance of this critical asset.

Key benefits delivered

Structure remained open throughout works:
One of the most significant benefits was the ability to keep the bridge open to traffic throughout the duration of the works. This minimised disruption for road users and avoided the need for a full closure, which is particularly important for such a critical asset.

Collaboration and innovation:
Successful collaboration with National Highways led to a 'departure from standards' agreement and the development of a tailored 'specification of highways works' for this unique solution. This enabled the use of surface mounted carbon fibre reinforced polymer (CFRP) rods, a UK first, providing a more sustainable and efficient alternative to traditional bridge reinforcement methods. As a result, the overall weight of the bridge was reduced by 14.5 tonnes. Additionally, the development of a bespoke bracket for rod chasing saved four hours per shift.

Structural capacity restored:
Upon completion, the bridge was returned to its full operational capacity, eliminating the need for previous vehicle weight restrictions. This restoration ensures the bridge can safely accommodate current and future traffic volumes, enhancing overall traffic flow and network reliability on the M25.

Improved durability and reduced maintenance needs:
The use of CFRP rods in the deck slab has significantly improved the durability of the bridge. This advancement reduces the likelihood of surface breakups, thus minimising the frequency of maintenance interventions required by service delivery and framework teams. The project is expected to lead to long-term savings on repairs and maintenance.

Cost-effective and sustainable:
The CFRP solution provided a cost-effective alternative to a full bridge replacement. By restoring the structure without the need for extensive reconstruction, the project delivered substantial cost savings while meeting National Highways' safety, operational and sustainability goals.

Alternative solutions would have required either multiple closures over a year or more, or more than one hundred individual closures, whereas our approach only needed 21 closures.

Enhanced stakeholder engagement:
The project also strengthened relationships with key local stakeholders, including Swanley Town Council, Brands Hatch Race Circuit and Area 4 colleagues such as KCCG and the M20 Moveable Barrier teams. Improved communication and collaboration led to smoother project delivery, minimising disruption to local businesses and traffic.

Thanks to this collective approach, the project was completed three weeks ahead of schedule, achieving a 10% reduction in the programme.

A gap between the first and second phases provided an opportunity to review customer feedback. As a result, additional signage was introduced in phase two to better inform drivers about the overnight works and enhance safety.

These results demonstrate the project's success in improving safety, reducing long-term costs, and minimising disruption for the public. By delivering a solution that addresses both immediate and future needs, the project supports National Highways' priorities of efficiency, safety and customer satisfaction.

Because of the success of this project, National Highways aim to adopt this solution for nationwide use.

As a part of key client and stakeholder engagement, the National Highways SES team visited the site to observe the works, praising the project teams for their efforts.

The development of this scheme, using an innovative technique trialled for the first time, has the potential for widespread application across the network, offering significant cost savings in the future.

The scheme was nominated for two awards: Construction News Award Supply Chain Collaboration Excellence and the Highways Magazine Award Highways Authority Innovation, where it received a Highly Commended recognition.

13

ENHANCING CYBERSECURITY ON THE NETWORK

We will continue to enhance our cybersecurity initiatives across the business in collaboration with National Highways and third-party providers. Cybersecurity is essential for safeguarding business data and ensuring robust protection against potential threats.

The need

As our digital world continues to expand, and now with the increasing use of AI, it is even more critical than ever to protect our data. Cybersecurity safeguards sensitive information, systems and networks from malicious attacks, theft and damage. Protecting personal data is essential to ensure it remains private and secure. Strong cybersecurity measures are vital for defending against cyber threats and protecting sensitive data.

Deliverables and benefits

Over the past year we have significantly improved our cybersecurity engagement with National Highways through regular meetings with the Digital Services team. Information is exchanged between both parties, and any campaigns that are worked on are discussed and utilised by both businesses.

We hold monthly internal meetings to discuss all information security and cybersecurity topics. These meetings are attended by the information security team including the head of business transformation. Additionally, quarterly information security management system (ISMS) meetings are held, attended by the ISMS team and the portfolio management director. Recently the operational technology team has also started attending these meetings to ensure a joined-up approach to cybersecurity within the business.

Our IT Services are managed by Balfour Beatty, which includes the information security team responsible for managing any alerts related to social engineering attempts on our networks. This team promptly raises these alerts with CPS, who can then take appropriate action based on the severity of the alert. Monthly service reviews are conducted to ensure all service level agreements are met and to discuss any arising issues. Bi-weekly meetings with the information security team at Balfour Beatty and CPS are held to discuss ways to improve our security within the business and to address any cybersecurity incidents.

Twice a year we carry out mock phishing exercises across the business. We monitor the results, and any employee who enters their credentials is automatically offered training. Any incomplete training must be successfully completed, and this is monitored by the information security team. We have seen an improvement in the number of staff who entered their credentials over the past year. In the first exercise in May, 30 staff members failed, while in October this number dropped to 20. Increased communication and engagement have shown positive results in these exercises.

During cybersecurity awareness month in October 2024, we planned several events and activities for everyone to participate in. Top management made pledges for the year, which were communicated to all employees and displayed on posters. We collaborated with Essex Police to hold in-person cybersecurity escape room exercises over several days. These escape rooms highlighted the importance of cybersecurity in a unique and engaging way. Everyone had the opportunity to attend one of the sessions, which were split into groups tasked with saving a police officer from jail using cybersecurity hints and techniques. Prizes were awarded to the fastest teams, and the feedback received from these sessions was extremely positive.

Due to the positive engagement we have with the digital services team at National Highways, all the activities are communicated effectively. As a result, the digital services team obtained the contact details for Essex Police to organise cyber escape rooms within their own business.

National Highways is aware of our initiatives, and have been involved with the NIS plans since 2024. In addition, key National Highways team members regularly attend the project review meetings.

Looking ahead

This section of the brochure highlights additional projects and innovations our teams are currently engaged in, some of which may be smaller in scale.

We anticipate that some of these projects will evolve and progress throughout the year and be featured more prominently in future submissions.

1. Robotic hydrodemolition trial sets new standard on the M25
2. Reducing disruption while maintaining our assets
3. Unimog vehicles
4. VacEx on site
5. Pier access vehicle

ROBOTIC HYDRODEMOLITION TRIAL SETS NEW STANDARD ON THE M25

Our team successfully trialled robotic hydrodemolition for urgent bridge deck repairs on Bow Arrow Bridge (A282 near J1A). The bridge's dense rebar and low concrete cover made mechanical breaking unviable, while its location near Dartford Crossing meant road closure hours had to be minimised to prevent major traffic disruptions.

Working with Octavius and their supply chain contractor, Gunite Solutions, we deployed a robotic hydrodemolition machine – our first use of this technology – under a full traffic management closure to maximise productivity within restricted working hours.

The team successfully completed this trial within one nighttime shift. The traditional method of using a hand-held hydrodemolition can remove 0.75-1.0m³ of concrete in a single shift. In contrast, the robotic hydrodemolition removed around 6.5-10.0m³, making the work possible within restricted hours and avoiding extended closures.

Key benefits

- Safety: Operatives remained at a safe distance from this typically high-risk operation.
- Debris containment: The robot captured most of the concrete debris, making future works of this type viable under lane closures where time and space may be limited.
- Quieter than traditional methods: The technology minimises noise impact to local stakeholders, and the risk of hearing impairment to operatives.

This successful trial marks a new standard in safe, efficient concrete repair on the SRN.

REDUCING DISRUPTION WHILE MAINTAINING OUR ASSETS

Essential work is underway to protect key areas of the QEII Bridge from corrosion as part of a five-year programme. A four-coat painting system is being applied to the underside, cable stays and pylons.

Access has been challenging, with crews working from enclosed maintenance gantries wrapped in polythene to contain debris and shield workers from the weather.

A temporary walkway with a steel safety barrier alongside live lanes of traffic ensures safe, 24-hour access to the areas of the bridge that require maintenance. This was achieved by narrowing lanes three and four by approximately 600mm without affecting speed limits or introducing additional stopping areas.

Work is limited to between April and September to avoid weather disruption and protect the nearby Site of Special Scientific Interest, home to migrating birds in late autumn.

Looking ahead, trials are underway for a mobile deck to access the main span from underneath and investments are being made in long-term maintenance trials for the bridge's pylons, cable stays and associated parts.

UNIMOG VEHICLES

This year, CPS acquired two Unimog vehicles equipped with soft estate and winter maintenance attachments to provide exceptional versatility and efficiency for the M25 network.

The Unimog's multi-functional capability allows a single vehicle to perform a wide range of tasks year-round, increasing our ability to self-deliver in these areas.

In soft estate management, the Unimog has been active in mowing, flailing and verge maintenance, and has the capability to mow underneath VRS barriers and carry out 3 and 5 metre cuts. This ensures roadsides remain clear, improving visibility and safety for our road users.

In winter, the same vehicle can be quickly adapted with snow blower attachments, enabling rapid response to adverse weather conditions. Its superior mobility ensures effective operation even in challenging snow or ice-covered environments.

By consolidating seasonal operations into one platform, the Unimogs improve operational flexibility, reduce downtime between tasks and increase value for money. We are currently reviewing what other activities the Unimog could be used for, as they offer a wide range of attachments such as washing heads for tunnel washing and road breakers for pavement repairs. Overall, the vehicles have brought positive improvements to our delivery.

PIER ACCESS VEHICLE

The pier access vehicle (PAV), known colloquially as the 'M4 Access Truck' is a bespoke piece of equipment that we've designed and built to facilitate access to piers carrying the M4 elevated section through West London.

The concrete repair works we intend to carry out involve hydrodemolition and spraying new concrete onto the piers.

The equipment began life as a standard scissor lift used at airports. With the help of our supply chain partners, we have modified the main platform so that it encapsulates piers of varying sizes allowing the intended works to be undertaken in an enclosed, controlled environment with adequate lighting and ventilation.

Most importantly, using this equipment will negate the need for scaffolding to be erected around piers for months at a time, thus significantly reducing the impact on the travelling public as well as the programme of works in general.

The PAV is currently in its final build stages with an initial snagging visit held earlier this year. Delivery is expected by mid-2025 to commence offsite trials and confirm readiness for use on the M4 and elsewhere.

VACEX ON SITE

Having a vacuum excavator on site fulltime has offered significant advantages in terms of safety, efficiency and cost-effectiveness. Traditional excavation methods can risk damaging underground utilities, posing safety hazards and causing costly delays. Vacuum excavation is a non-invasive, precise method that significantly reduces the likelihood of such incidents. Its ability to expose services safely makes it ideal for working in the often-congested roadside environments where VRS systems are installed. It also minimises the need for manual digging, reducing workforce exposure to traffic and excavation-related injuries.

We've found that using a vacuum excavator for our maintenance activities has led to faster repair times, fewer service strikes and improved compliance with health and safety regulations. Overall, it's enhanced productivity while mitigating key risks, making it a valuable asset on the M25 network.

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national highways