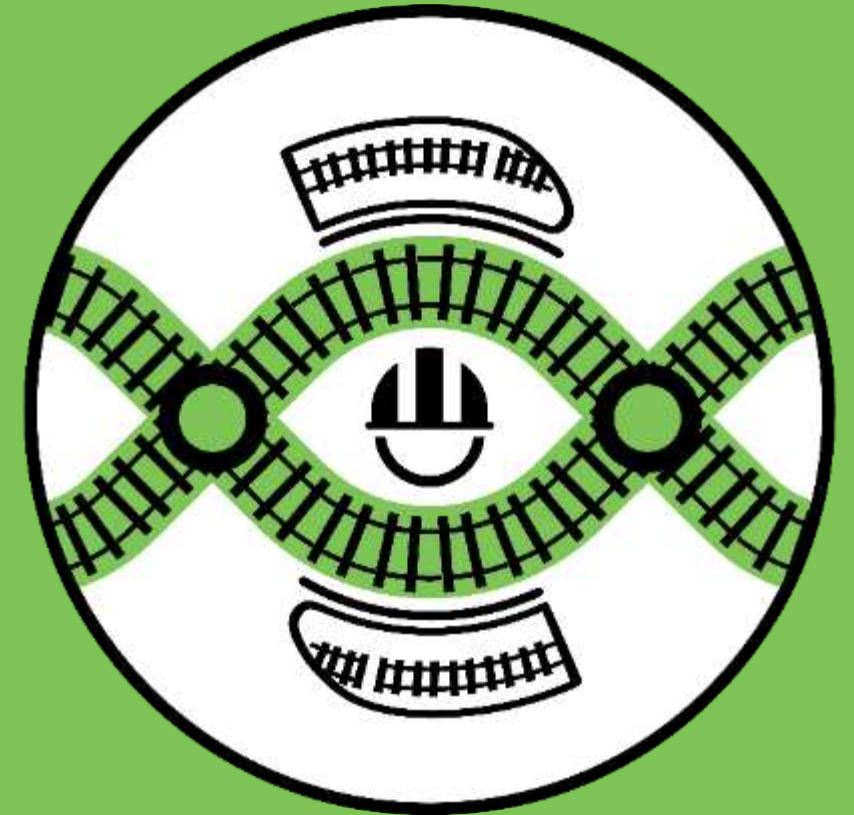


Remote Temperature & Buckle Monitors (RTBMs)



Richard Gibson – Senior Engineer (Track Frameworks & Assurance - TA)

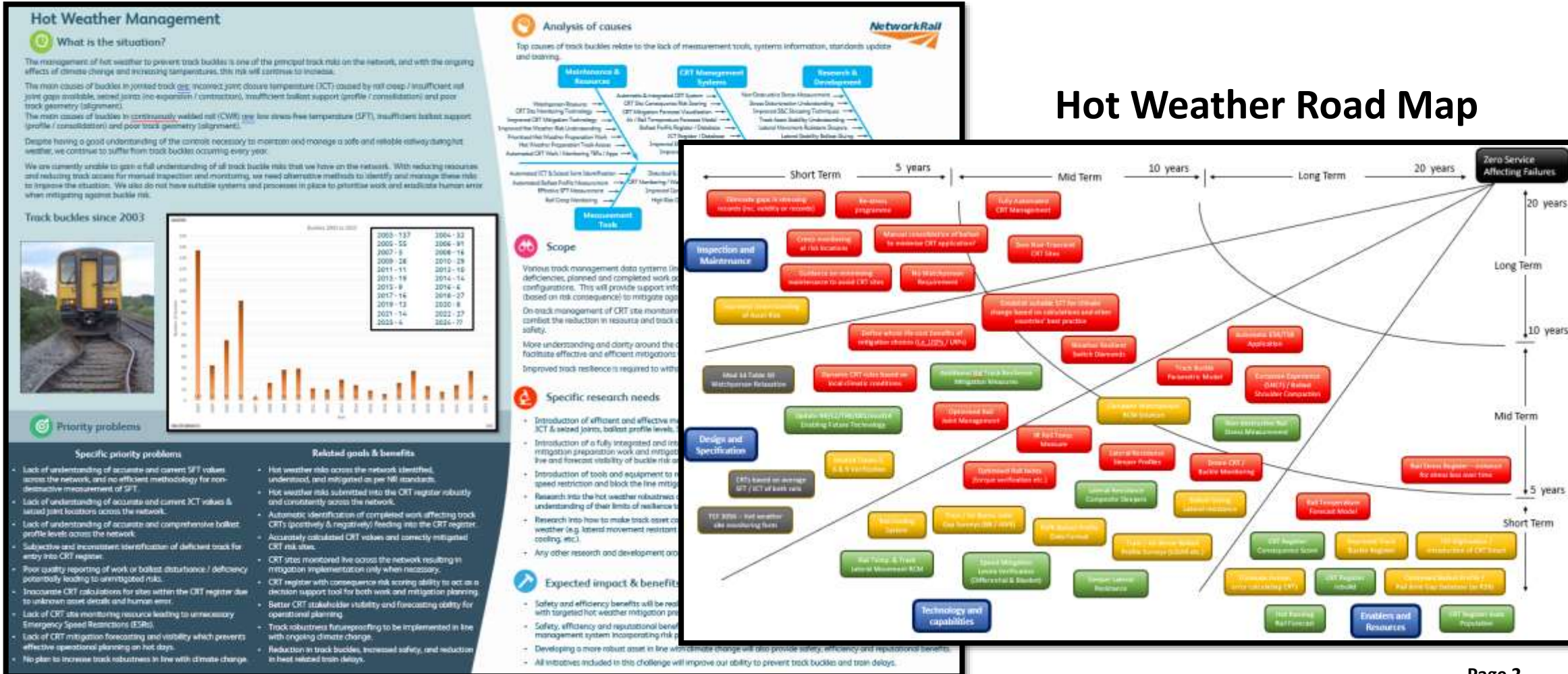
Jonathan Smith – Project Manager (Research, Innovation & Development - TA)

Providing technical leadership

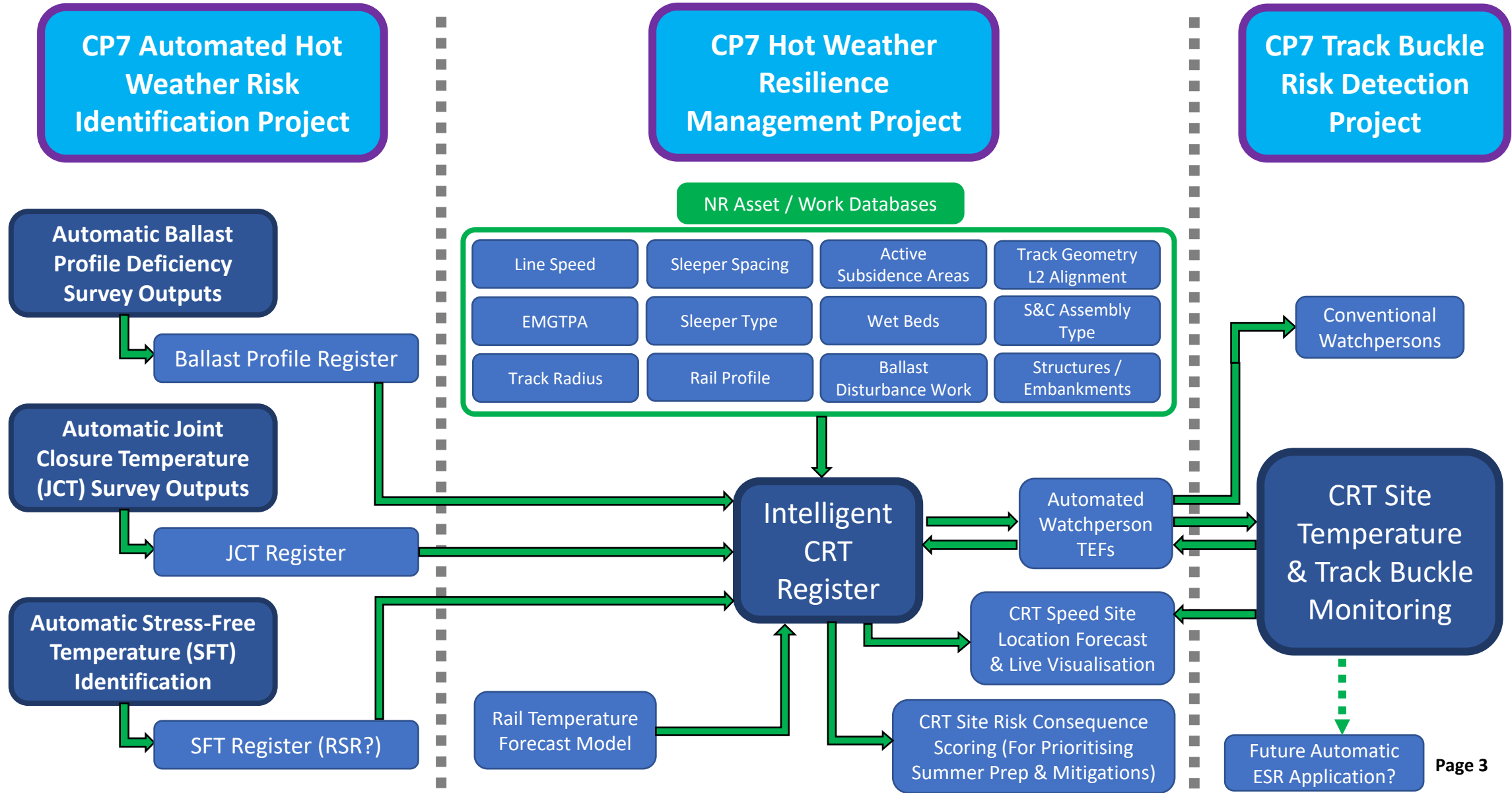
Hot Weather Management

Hot Weather Challenge Statement

Hot Weather Road Map



Bigger Picture



Project Background

Background

- During the calendar year 2020, over **1600** standards jobs were raised across the country for the deployment of a track watchperson for undertaking hot weather inspections, totalling **23,800** hours of planned inspection time.
- NR had approximately **14,700** CRT sites that would have required a watchperson $\leq 54^{\circ}\text{C}$ rail temperature over Summer 2022

Problem Statement

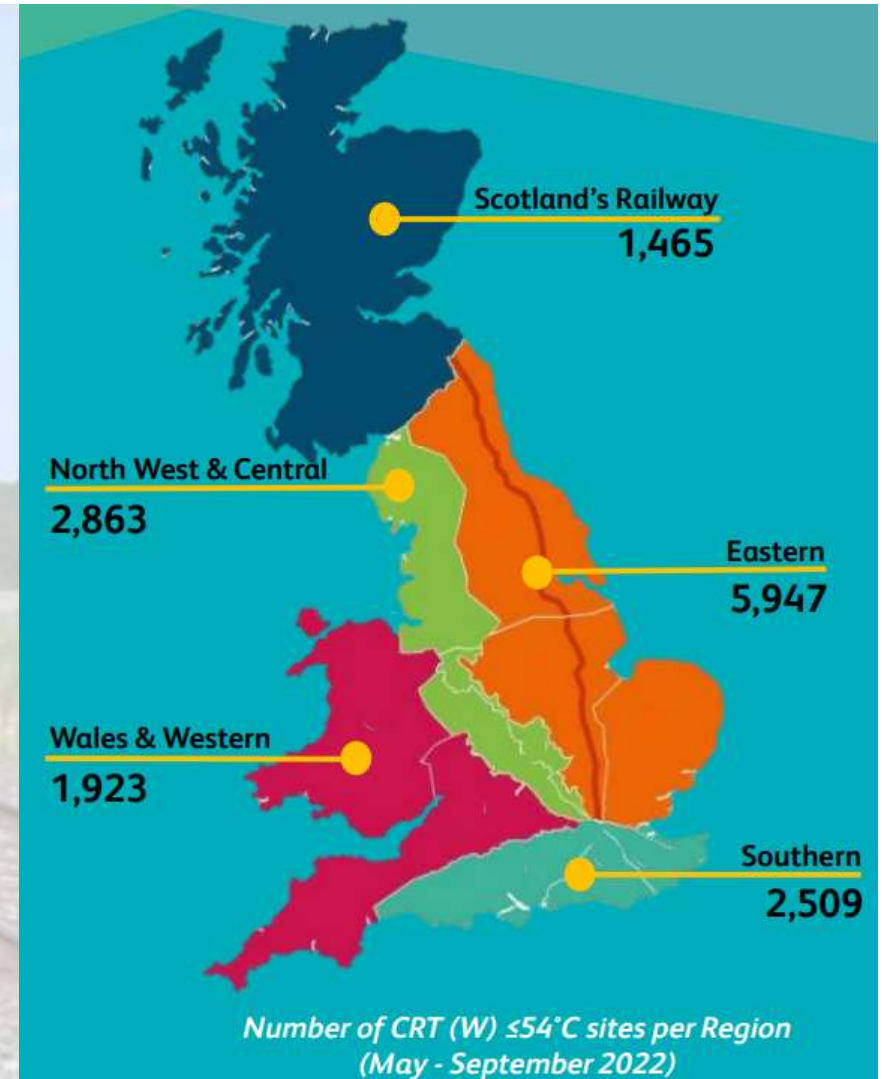
- NR now have reduced access and resources to carry out CRT watchperson duties
- Current process of how we manage these sites with watchpersons is not viable
- Current process is open to human error and it's difficult to monitor long CRT sites
- Watchpersons on site imports safety risk to staff, and staff welfare challenges
- Future track buckle risk is likely to become more prominent due to climate change

Short term Solution

- Automate watchperson duties by providing a system that allows a single watchperson to manage multiple CRT sites at once

Longer term Solution

- Replace watchperson role with remote condition monitoring technology, removing boots on ballast (incorporating automated speed boards / ETCS)



As is Process – Watchperson

Challenges of the watchperson role:

- ▲ Not enough watchperson resource for the quantity of CRT sites we have each summer, in particular long sites that require multiple watchpersons.
- ▲ Limited access to CRT sites following the removal of red zone working and the increasing number of trains running on the network.
- ▲ Difficult to provide suitable welfare for watchpersons – significant risk of heat exhaustion, sun stroke, and other dangers associated with lone working on the railway.
- ▲ Identification of track buckles is subjective and relies on the watchperson being in the right place at the right time to identify when a buckle appears.

OFFICIAL	
Ref:	NR/L2/TRK/001/mod14
Issue:	8
Date:	03 June 2023
Compliance date:	03 June 2023

NR/L2/TRK/001/mod14

Module 14

Managing track in hot weather



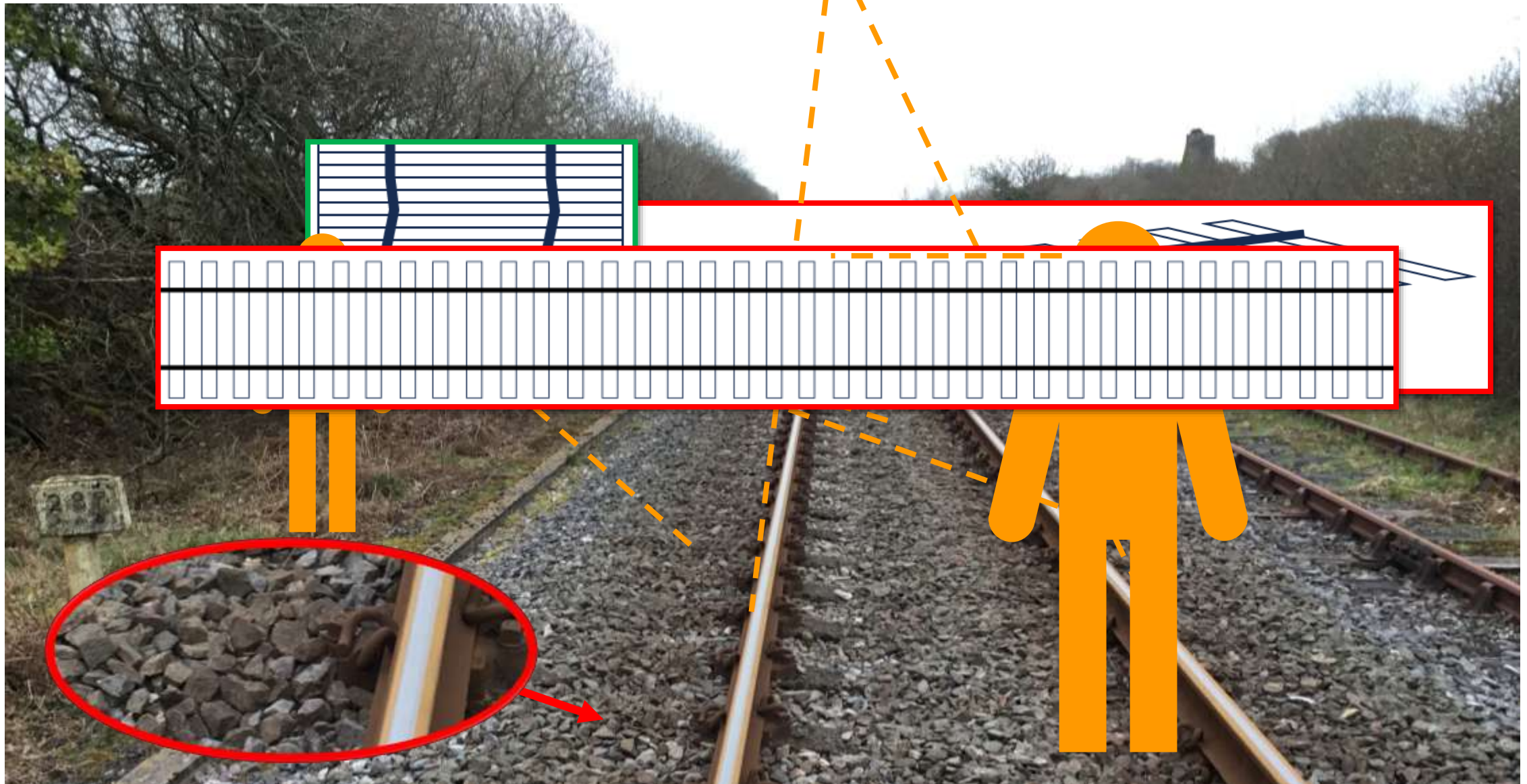
NR/L2/TRK/001/mod14 (Issue 8) – Managing track in hot weather

“An effective watchperson can:

- continuously observe sites under traffic for the potential or presence of a buckle taking place (e.g. from a vantage point from a platform, safe cess or similar, and observing track and train interaction) or site can have a line blockage after each train for assessment;
- report rail temperature reflective of specific site conditions; and
- implement the ESR when thresholds are reached”



As Is Process - Watchperson



Outcomes and Expected Benefits



- Boots off ballast – replacing watchpersons and removing safety and welfare risks.



- Reduction in requirement for line blockages for watchpersons to inspect track after passage of trains.



- Accurate and consistent buckle detection with full site coverage – removing human behaviour and subjectivity aspects.



- Improvement in DU personnel resourcing – reducing the requirement to supply watchpersons on CRT sites.



- Reduction in implementing ratcheted mitigation measures due to having no watchperson in place.



- Reduction of work cancellations with the replacement of on-call / reactive watchperson requirements.



- Reduction of blanket speed restrictions where implementation is due to insufficient watchperson resource.



- Future objective – to fully replace watchperson role with automated monitoring and mitigation measures incorporating automated speed boards / ETCS.



Specification

Technical Specification Development Track Buckle Monitoring

5. Monitoring Requirements

5.1.1 The proposed solution shall be capable of detecting lateral track movement at any point over a CRT risk site, which could range from a few metres to a few kilometres in length;

5.1.2 The proposed solution shall have the capability of monitoring rail temperature **or** linking to existing Network Rail approved remote rail temperature monitoring units;

5.1.3 The proposed solution shall immediately transmit safety critical alerts to relevant track staff:

- a) if the track shows signs of irregular lateral movement;
- b) when the rail temperature approaches and reaches relevant CRT levels;
- c) if there is any reduction in system performance (i.e., low battery or battery charging issues / temperature or track movement monitoring issues);

5.1.4 The proposed solution shall present rail temperature and track movement data in a user-friendly platform which can be used for immediate and future analysis and trending;



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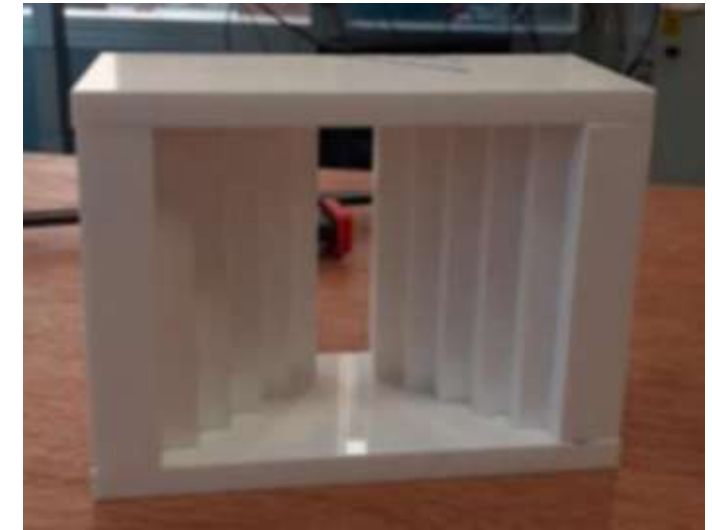
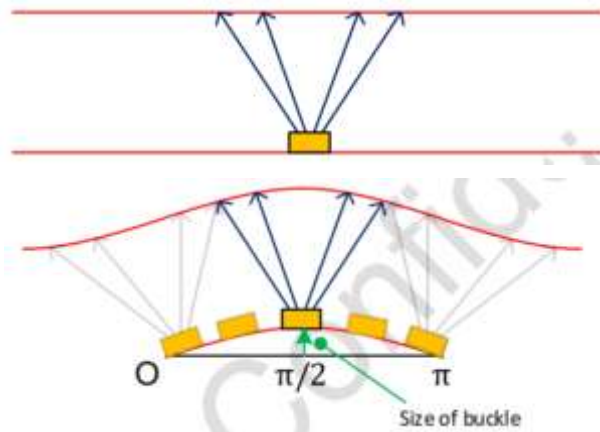
[Home](#)

Tender

Design Contest-Track Buckle Risk and Detection



Collaborative Bench Testing



RIDC Tuxford Testing

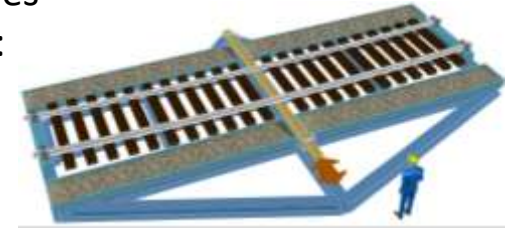
Purpose

- Carry out testing in a controlled environment to meet our summer 23 milestone commitment
- Maintain control of assessment criteria being met by suppliers, while ensuring consistent and repeatable testing
- Deliver accelerated testing of all supplier technology attributes, including power supplies, communications and processing of data
- Assess supplier's solutions and 'fail' them 'fast' if they are not feasible for future live testing or if re-design was required
- Familiarise suppliers with Permanent Way assets for different use cases

Stage 1 – Buckle Test Rig

To accelerate testing of supplier technologies we developed our own test rig to facilitate:

- Proof of concept testing
- Repeatability & Reproducibility



Stage 2 – Asset familiarisation



Stage 3 – Realistic Environment Buckle Testing

To facilitate testing of supplier technologies in a realistic railway environment layout



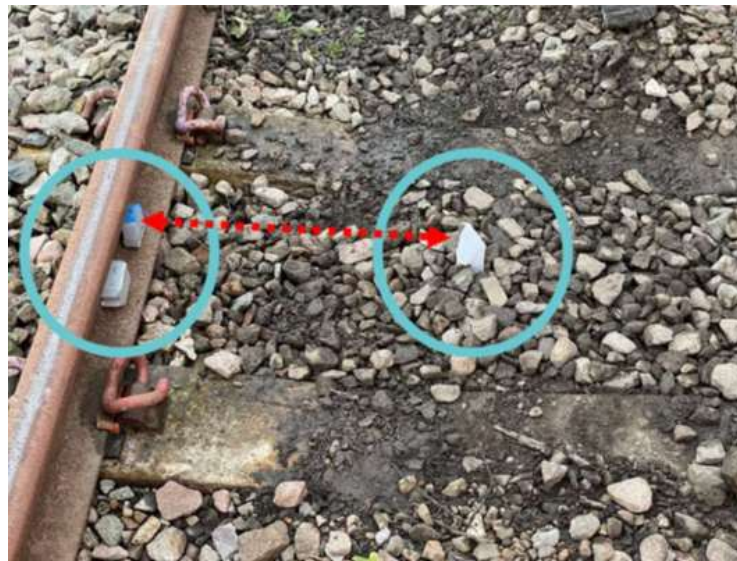
Buckle Test Rig



Buckle Test Rig



Tuxford Testing



Environmental Trials (from October 2024)



Sandwell & Dudley DU – Yeltech



Edge Hill DU – DS RailTech

Chester DU – Wisen Innovation



Bletchley DU – RailSense



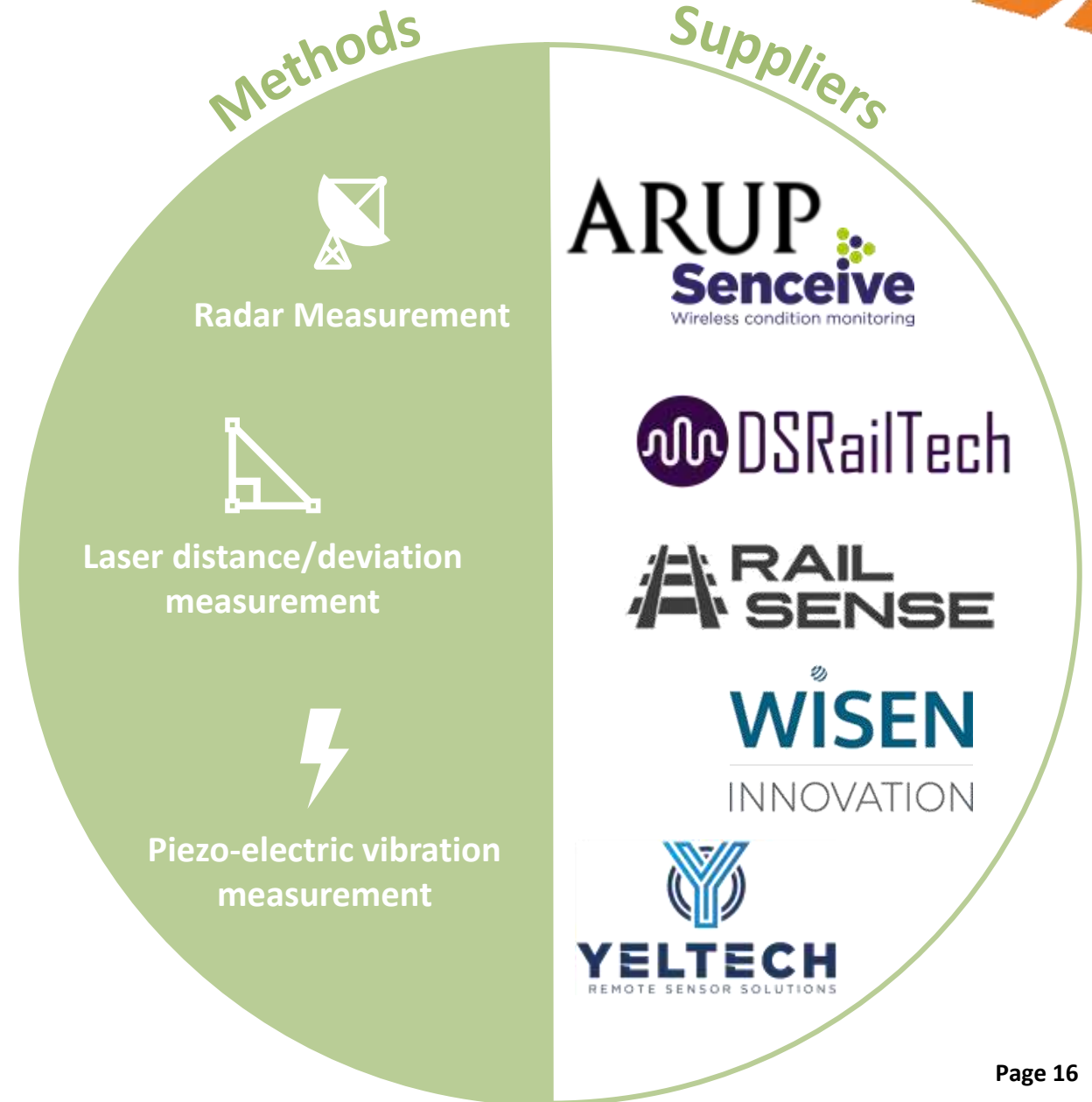
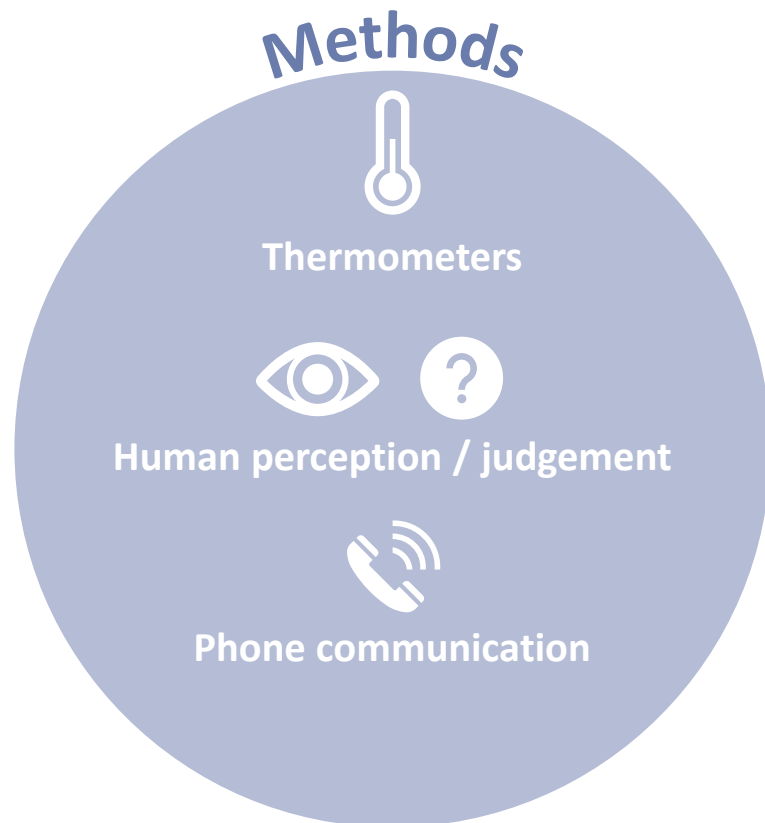
Sandwell & Dudley DU – Senceive



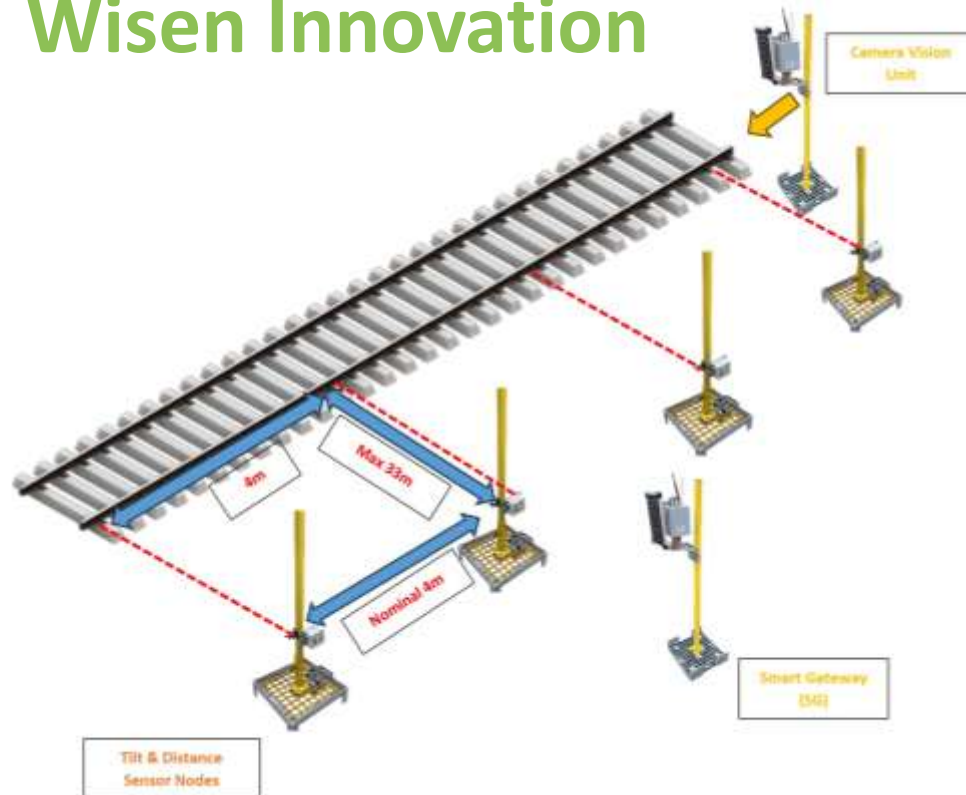
To-Be (Watch System)

Supplier Technologies

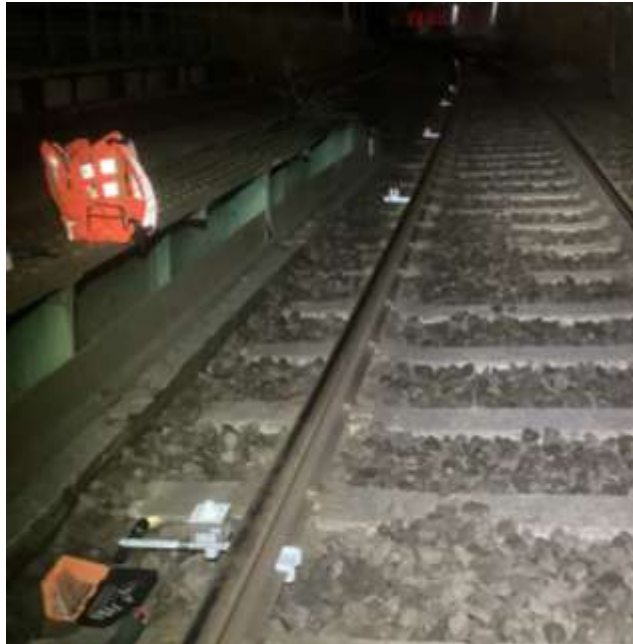
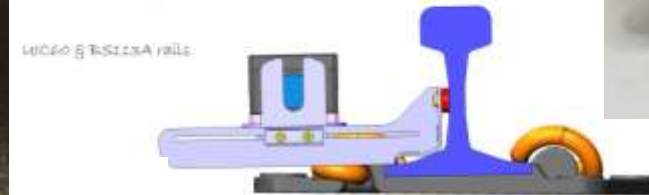
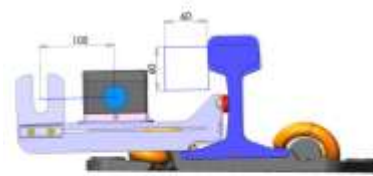
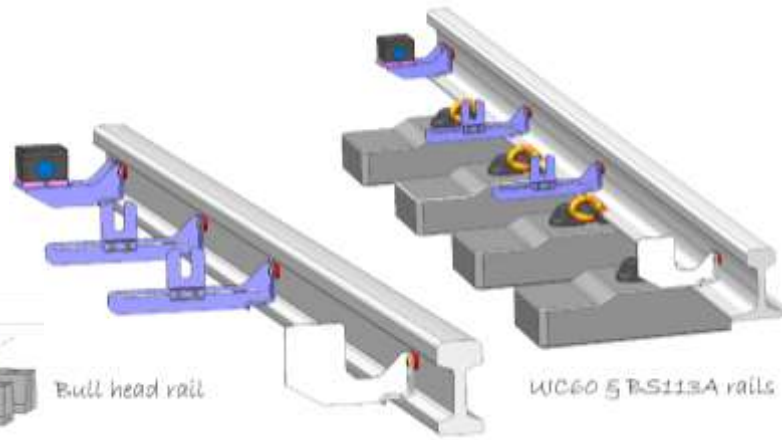
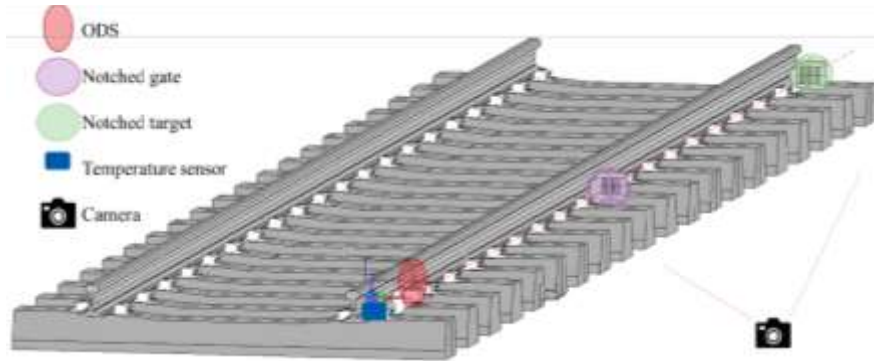
As-Is (Watchperson)



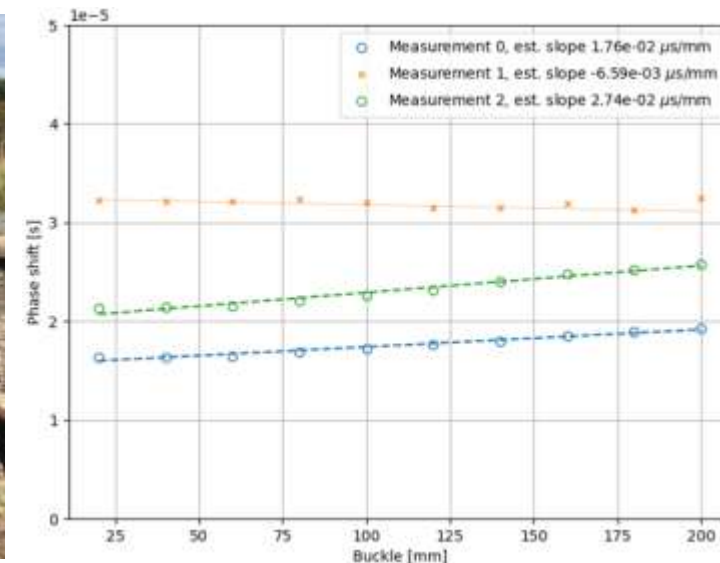
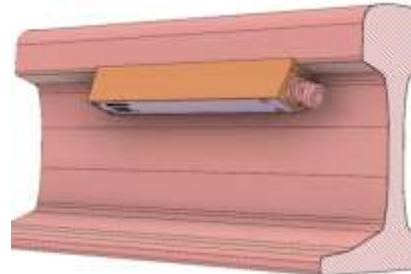
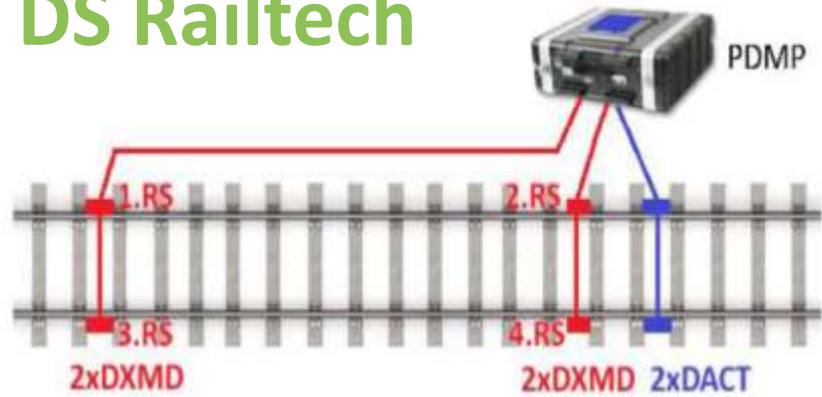
Wisen Innovation



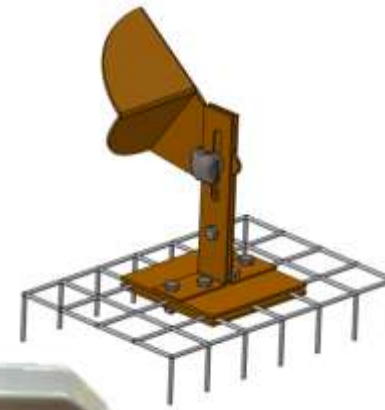
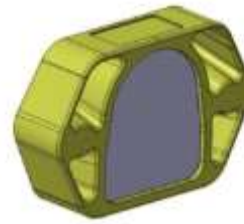
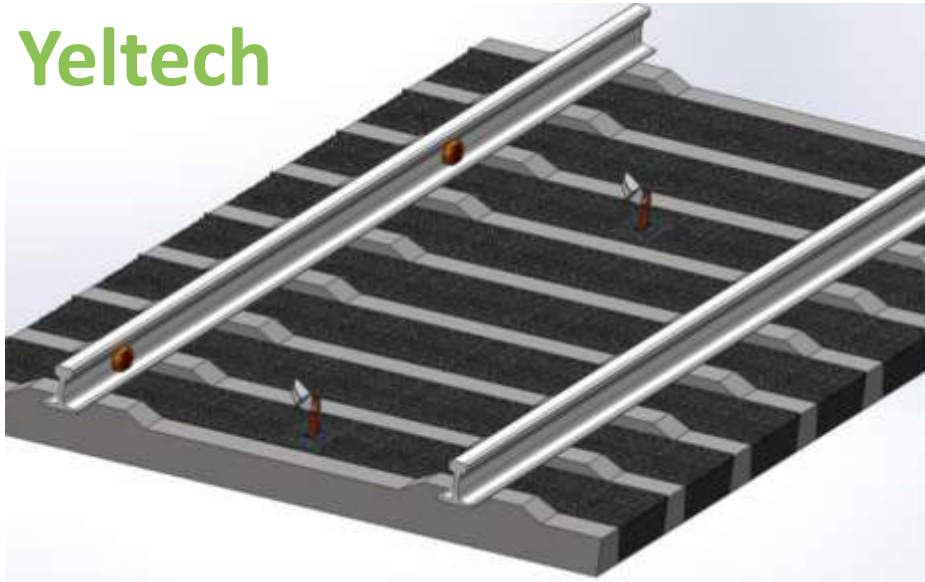
ARUP / Senceive



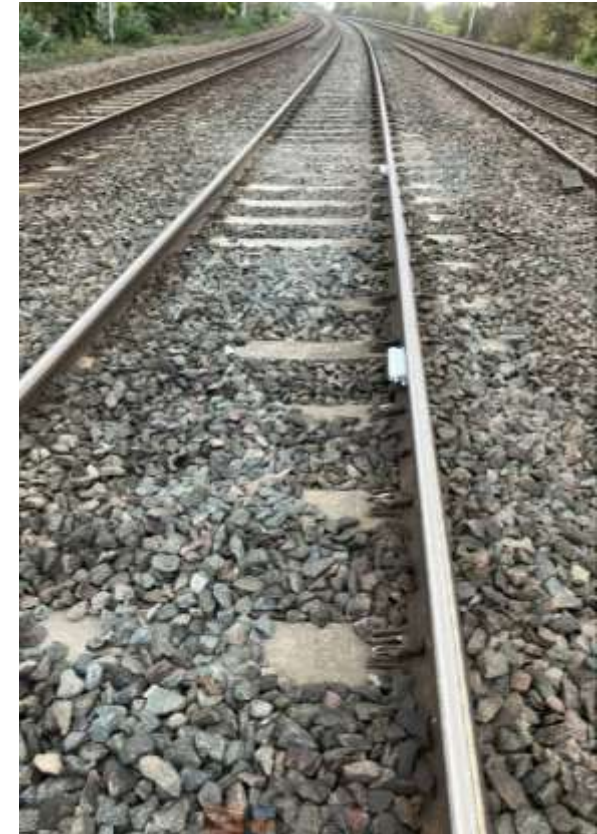
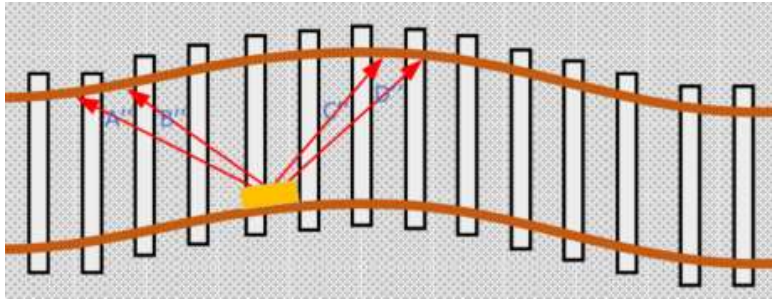
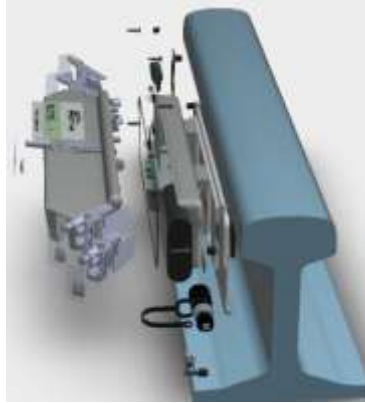
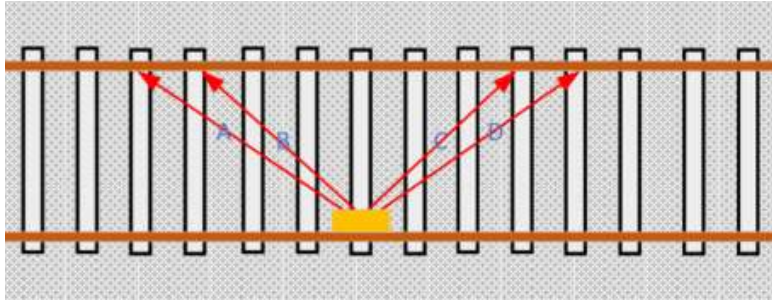
DS Railtech



Yeltech



Railsense



Mod 14 Update

- NR/L2/TRK/001 – Mod 14: Issue 9 is now published, incorporating use of 'RTBMs' within CRT site 'Watch Systems'.

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Ref:	NR/L2/TRK/001/mod14
Issue:	9
Date:	01 March 2025
Compliance date:	07 March 2026

NR/L2/TRK/001/mod14

Module 14

Managing track in hot weather

Content approved by:

D. Webb

David Webb,
Standard and Control Document Owner

9	March 2025	Update incorporating Emergency Change NR/BS/LI/504 and facilitating process and technology developments
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Term	Definition
Remote Temperature and Buckle Monitor (RTBM)	CRT Temperature and Buckle Monitor approved by Network Rail to remotely monitor rail temperatures and lateral track movement on CRT sites for buckle mitigation purposes
Watch system	System of Watchperson(s) and/or RTBM(s) deployed to monitor rail temperatures and lateral track movement on sites identified as CRT risk sites to identify and alert when track buckle management mitigations are required



Summer 2025 Operational Trials

- Trial extended to more Delivery Units.
- Watchsystem to run alongside watchpersons on live CRT sites.
- User feedback and data will be gathered from all trial sites kit deployed on.



Commercial Options for deployment

1. Individual Routes purchasing for Delivery Units



2. National framework service contract managed by Route Services



What's next

