



Introducing Intelligent Infrastructure

PWI Seminar - Tomorrow's Rail Safety Today
Birmingham May 22

Introducing Intelligent Infrastructure

- Intelligent Infrastructure (II) is a data-driven programme helping the routes predict when and where to maintain our railway.
- We're using a range of web based technology to turn data into intelligent information so front line and supporting teams can work safely, efficiently and seamlessly.
- A range of online tools will be available for colleagues across all disciplines, making it easier to deliver improved services for passengers and freight customers.
- These tools are designed to support other initiatives in the business such as Track Worker Safety Task Force & Modernising Maintenance by removing the need to go track so often and by ensuring work done is the Right Thing at the Right place at the Right Time
- **insight** is just one tool the Intelligent Infrastructure programme is building.
- It is designed to turn data into intelligence and give engineers this intelligence all in one place rather than across disparate systems

Introducing Intelligent Infrastructure

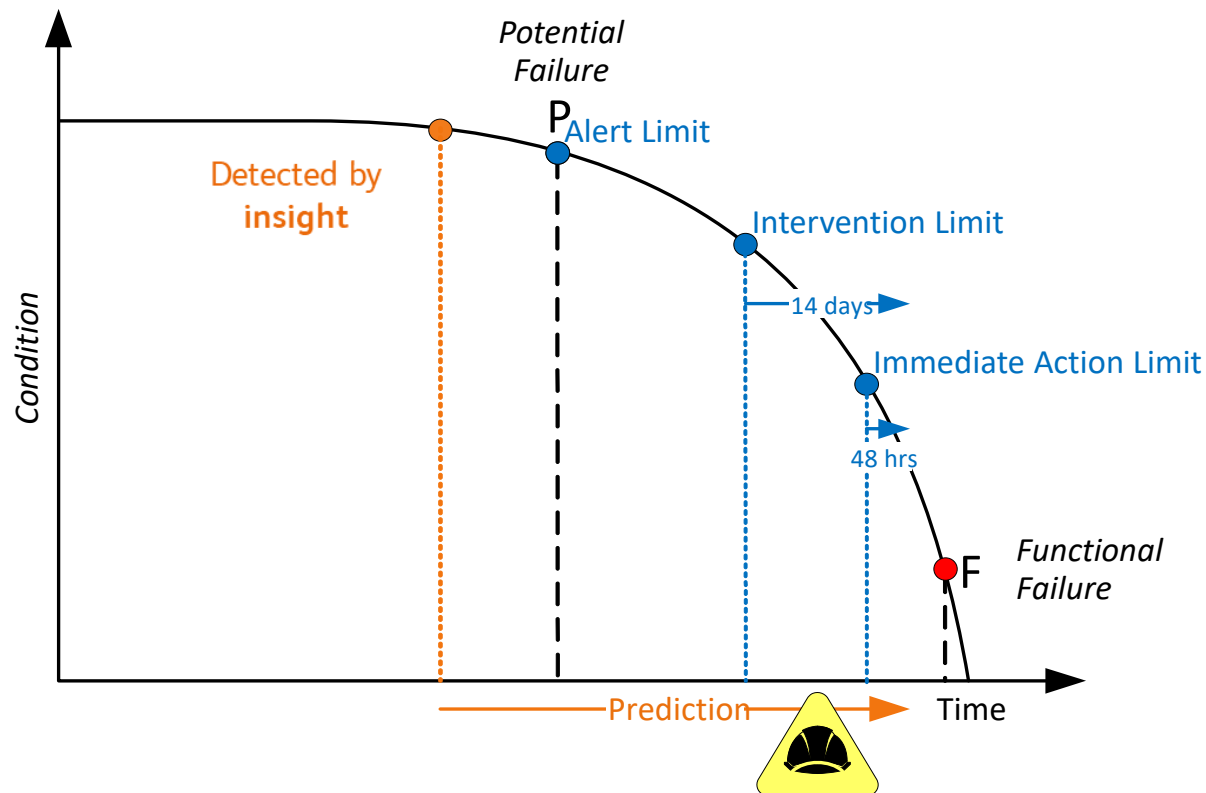


How does **insight** support earlier planning of maintenance?

One key objective for **insight** is to **move maintenance planning earlier, moving it further up the P-F Curve**.

By providing predictions for when track assets will cross a particular threshold, track engineer's will have longer to plan their interventions, allowing them to:

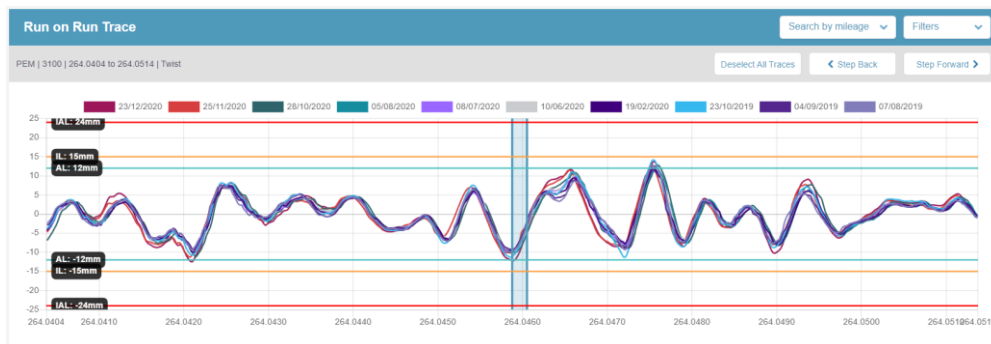
- Get the access and resources they need to carry out the optimal intervention in a safe and efficient manner
- Prevent a fault from occurring (where possible) leading to less disruption on the network
- Group interventions to make possessions more effective and efficient and avoiding unnecessary visits on to the track



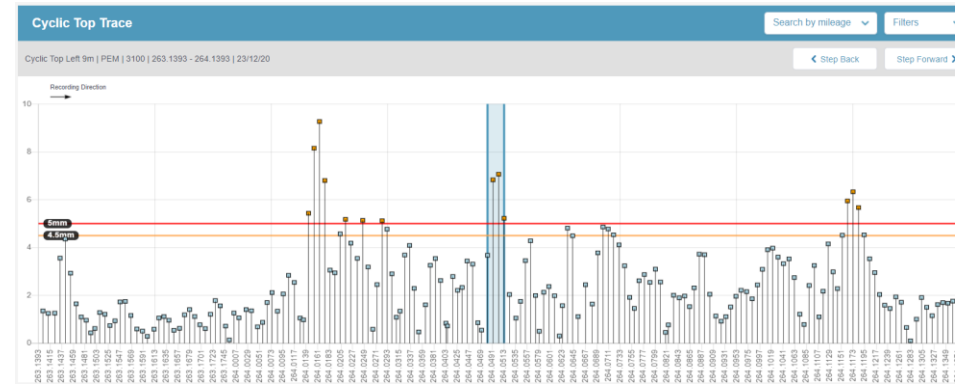
How does **insight** support earlier planning of maintenance?

insight is a first for Network Rail and the wider rail industry. By aligning trace data automatically, users can predict when a threshold exceedance will occur and when they need to intervene. **insight** gives users:

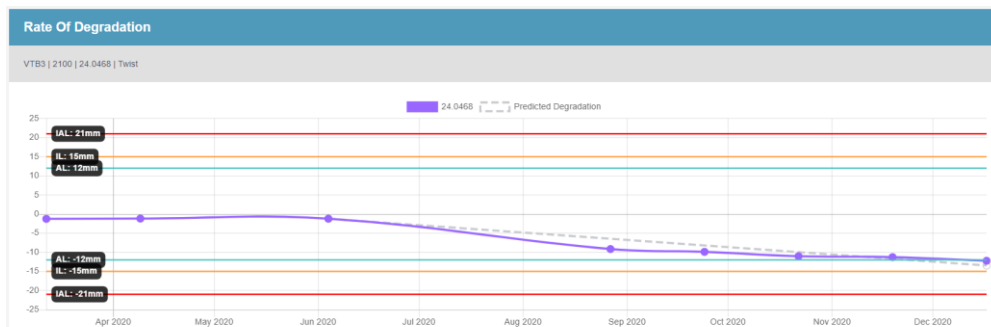
Automatically aligned track geometry traces



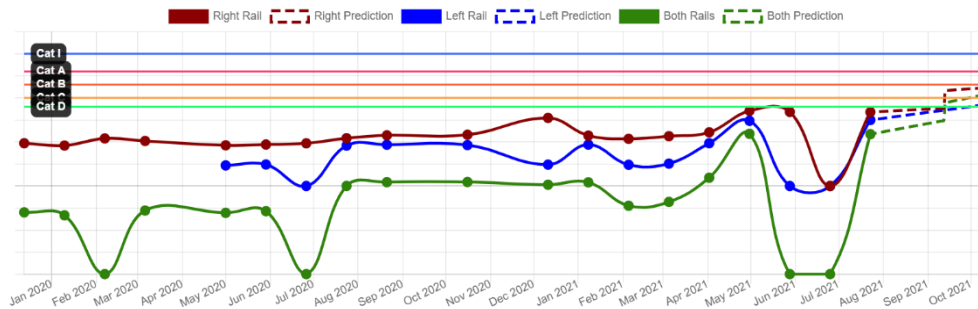
Visualising cyclic top faults



Predicting track geometry threshold exceedances



Predicting cyclic top threshold exceedances



Plain Line Pattern Recognition (PLPR)

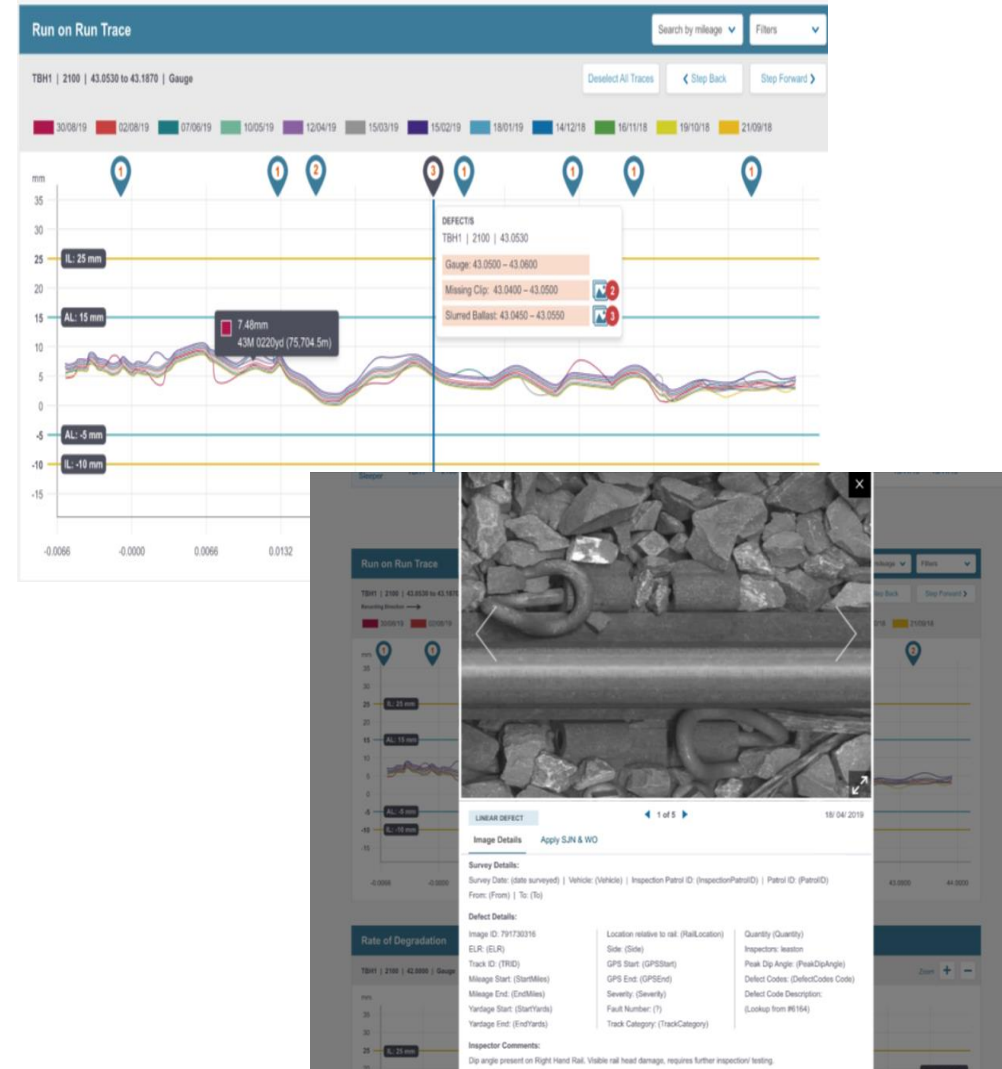
PLPR Dashboard

Through the **insight** PLPR Dashboard your maintenance teams will have an online repository of PLPR defects and data.

They will be able to track PLPR defects between measurement runs, reducing the number of “new” PLPR defects that are raised, reducing the need for boots on ballast to verify these defects which have in fact been raised on previous runs.

It will also provide the ability to better prioritise lower priority PLPR defects more effectively, compare them to track geometry faults and give greater ability to view imagery

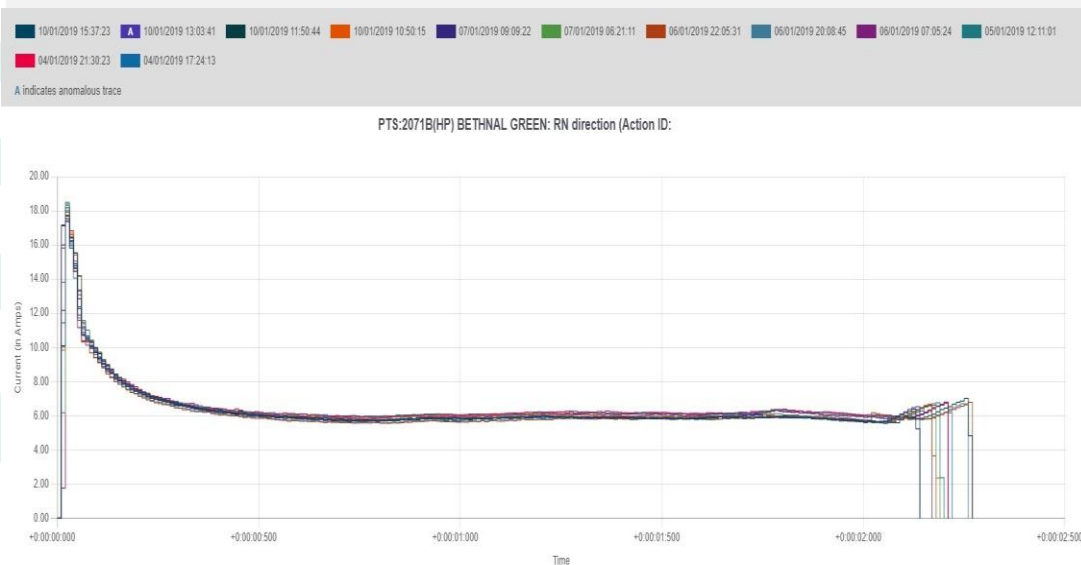
Much of this cannot be done currently.



Signalling – predict & prevent

What is it and why does NR need it?

- Predict and Prevent harnesses the power of machine learning to identify anomalous behaviour with enough headroom for maintenance teams to intervene prior to potential failure
- The tool will notify users when anomalous behaviour is identified, via a widget card (home dashboard) along with the Inbox page, generating an alert based on severity and risk
- The tool contains relevant information, including potential factors for the anomalous behaviour. Cross-discipline data points surrounding the assets can be utilised - such as wet beds and drainage issues, as well as track geometry and condition
- All this is designed to help users in determining the optimal intervention in advance to reduce service affecting failures



What will this mean for users?

Prioritise your track geometry faults



Confidence to plan work earlier



Transparency to analyse faults



Fewer repeat faults



Better access planning

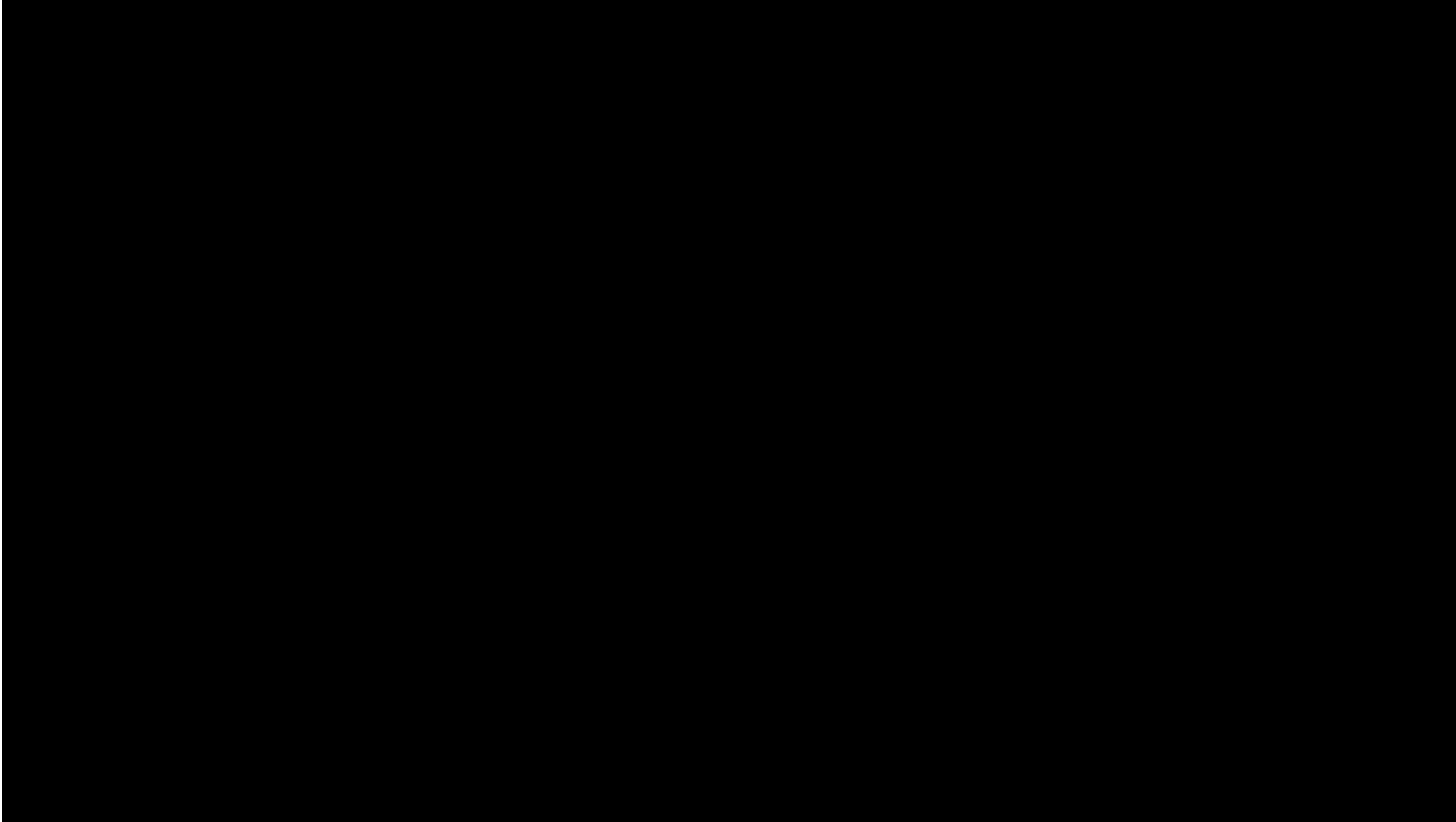


Grouping interventions



All of these benefits will lead to more efficient time being spent on track when needed, reduced visits on track and improved passenger experience with less disruption

What are colleagues saying about **insight**?



What are we doing?

What we are delivering:

Role based **insight** tool

More intelligent Track Geometry and Cyclic Top Defect review ability

Manual Digital Data Capture being ingested into **insight** instead of being stored on paper records

PLPR Defect Review

POE and Track Circuit Predict and Prevent

Risk Based Maintenance

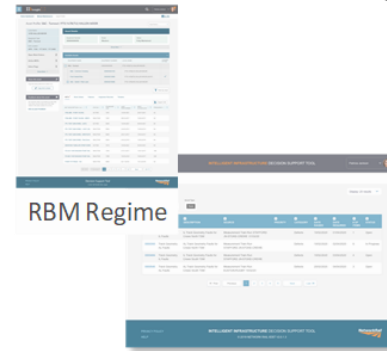
Track Quality review capability



Query Builder



Intervention decision support and planning



RBM Regime

Inbox



Manual digital data capture

What we want to deliver in CP6:

Missed Inspections Risk Assessments

Intervention Decision Support giving more intelligence into the effects of previous work activity

Ellipse Integration making **insight** the one stop shop

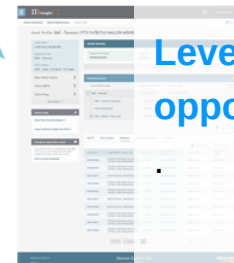
Maintain & manage the railway as a System

Capex and Whole Life Asset Management

Leverage **insight** for other business opportunities



Asset Information and Operating Context (e.g. Q&E designs)



S&C Defect Page



Remote condition monitoring

What does Network Rail get?

Underpins Modernising Maintenance

Provides management and auditability of Risk Based Maintenance Regimes.

Enables more complex local regimes to be easily managed within the tool including cross discipline FMECAs and P to Fs

Supports Safety Task Force

Provides more time to plan interventions in a safe and efficient manner and optimise access across disciplines.

Reduces boots on ballast by reducing the need to carry out site inspections (desk top scoping) and addressing repeat faults.

Reduces safety risk from service affecting failures and immediate action faults whilst improving performance for our customers.

Reduces Operational Expenditure

Reduction in data handling effort (e.g. preparing trace reviews and managing IoT alerts via Predict and prevent)

Reduces 'over maintenance' of the asset prolonging the asset life and reducing maintenance activities

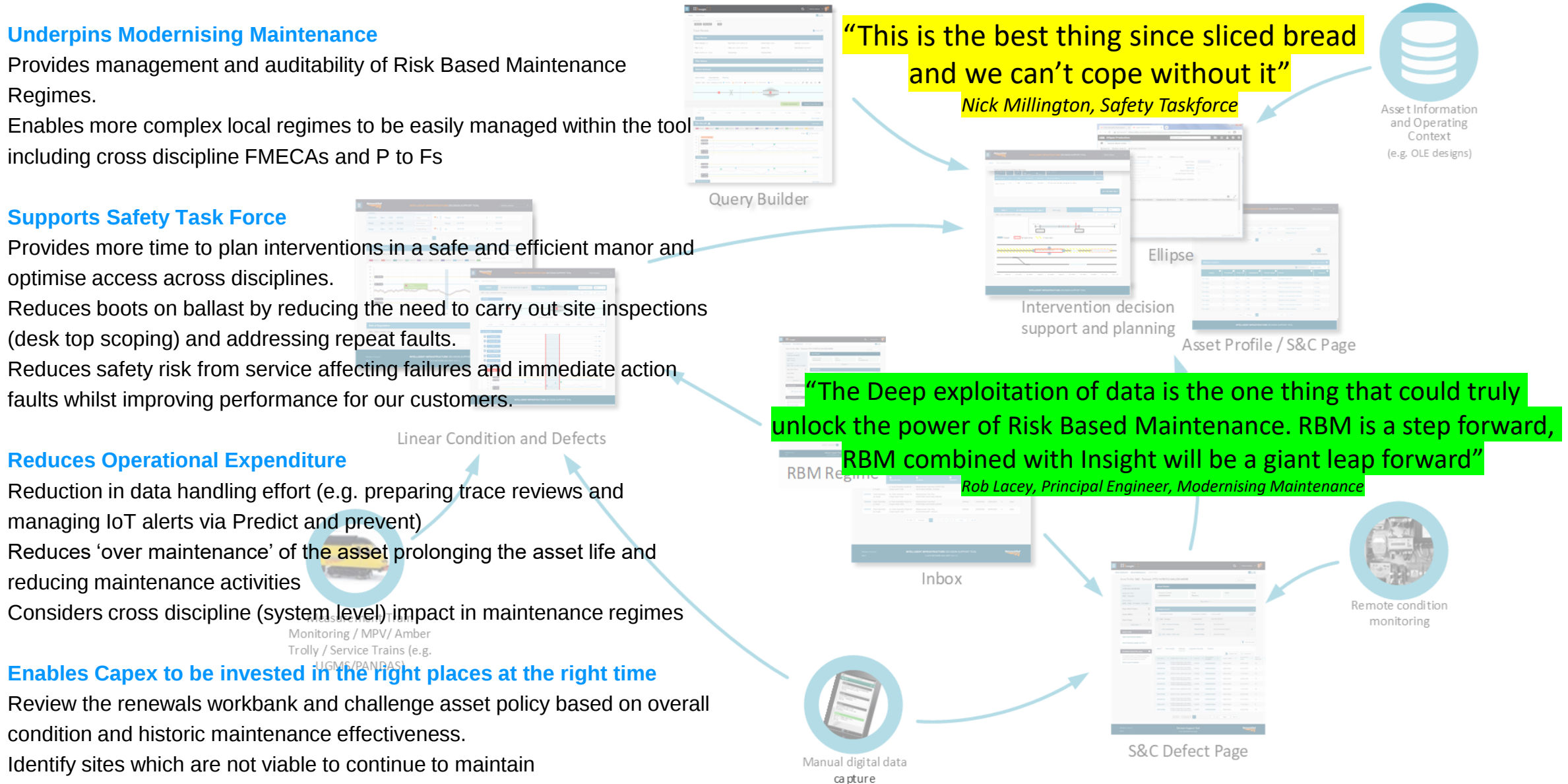
Considers cross discipline (system level) impact in maintenance regimes

Enables Capex to be invested in the right places at the right time

Review the renewals workbank and challenge asset policy based on overall condition and historic maintenance effectiveness.

Identify sites which are not viable to continue to maintain

Extend asset life by considering the overall asset system in renewal decisions.



Thank you

