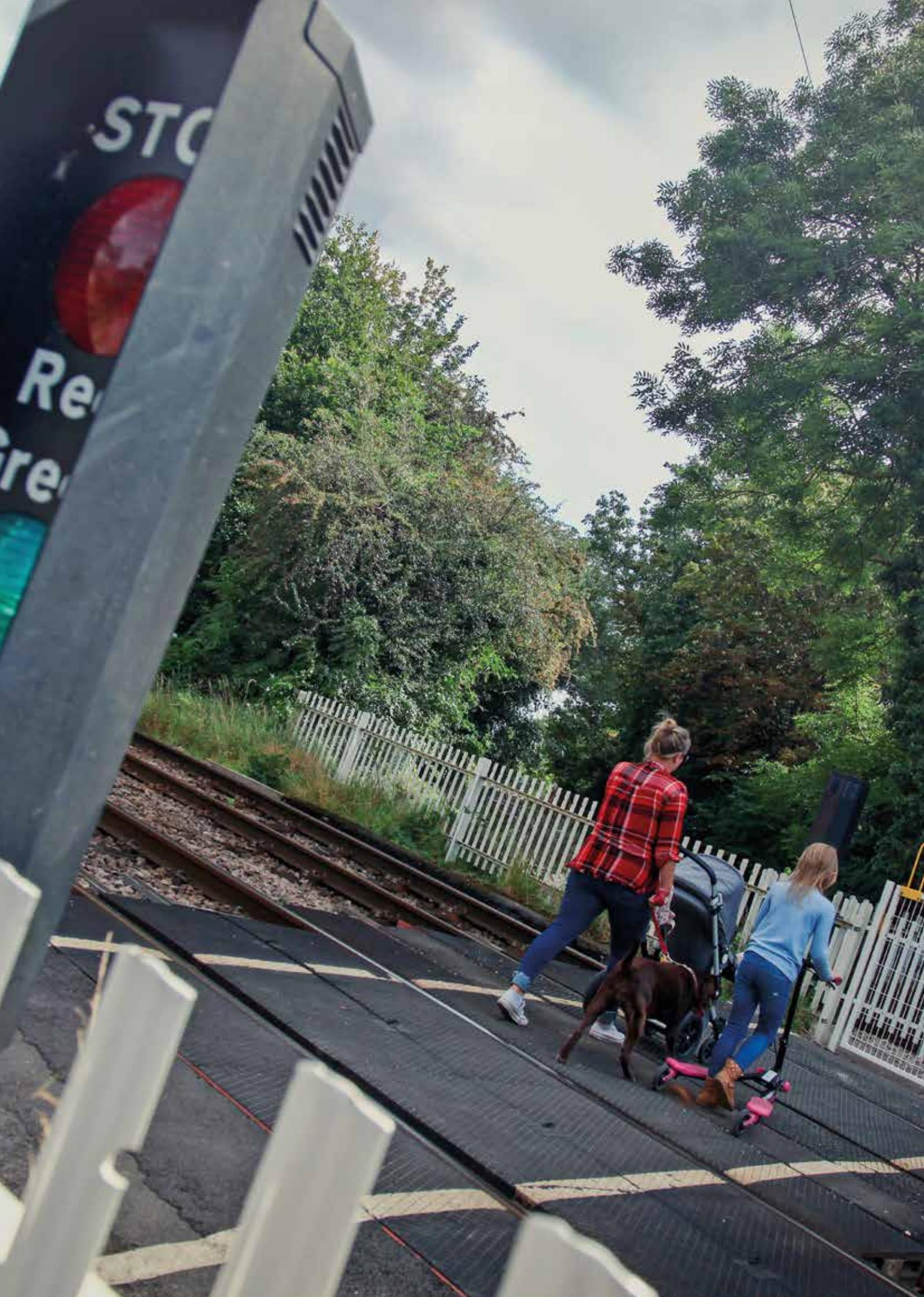




Enhancing Level Crossing Safety 2019 – 2029

A long-term strategy targeting improved safety on Great Britain's railway



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FOREWORD



Andrew Haines
chief executive

Level crossings were built when the railway was first constructed in the Victorian times. They are used to connect communities across the UK, from residential and industrial areas, to high streets and farmland.

If we were to build the railway from scratch today, we wouldn't include level crossings. They pose a risk to our passengers and members of the public, who can also be delayed if there is a fault or incident at a level crossing. Drivers, cyclists and pedestrians can also find themselves delayed in their journeys by waiting for trains to pass through crossings. However, we know what an important part of day-to-day life these crossings play for the communities around them.

That's why we have worked really hard to make sure the level crossings on our railway are as safe as they can be, and as a result we have one of the best safety records in Europe. This is a commendable achievement considering our railway is one of the most intensively used in the world. But for me, this is still not good enough. There are far too many near misses and there are still, sadly, fatalities on level crossings.

Simply put, the safest level crossing is a closed one. We know that closing our level crossings isn't always a realistic option for the communities they serve. That's why since 2009, we have invested over £200million in improving safety at thousands of crossings, which includes

closures, building bridges, identifying new safer rights of way, installing new barriers and warning systems, new signage and educating the people that use them how to be safe around them. Furthermore, we have introduced over 100 level crossing managers to gain a greater understanding of not only the level crossing itself, but the people who use them and the surrounding communities.

We've closed over 1,100 level crossings since 2009. With this, the hope would be that the number of incidents would have reduced, however, with more road journeys and an increasing population, coupled with growing public demand for train travel in and out of our economic hubs, more services are being introduced and sadly incidents continue. Overall, we see the same number of incidents despite having considerably less level crossings. That means there are more incidents per crossing now than there was five years ago.

Level crossing safety remains one of our key priorities. Further improvements to manage the safety of public and passengers are still required, this strategy sets out our objectives to make the railway a safer place for the people who use it and cross it. Our challenge, in collaboration with road and rail industry colleagues, remains the continued management of risk to be as low as reasonably practicable at level crossings while keeping the communities we work in safe and connected.

A handwritten signature in white ink that reads "Andrew Haines".

EXECUTIVE SUMMARY

Our approach to managing level crossing safety

Since 2009, we have made significant improvements in our management of level crossings, greatly improving safety and reducing opportunities for injuries and accidents across the network. We have a legal duty in health and safety legislation to, so far as reasonably practicable, not expose our passengers, the public or our workforce to risk at our level crossings.

Britain's level crossing safety record, which is one of the best across the world, reflects our efforts. But despite our investment and focus, level crossings continue to present a risk to the public. With accidents still occurring each year, we recognise the need to improve further and target continuous improvement in key areas.

Enhancing Level Crossing Safety is our strategy to manage the safety and reliability of level crossings in Great Britain for the next 10 years. It is aligned to the rail industry strategy *Leading Health and Safety on Britain's Railway* which targets improved safety at level crossings as one of its 12 key priorities.

Our long-term level crossing safety vision is:

- No accidents at level crossings on Britain's main line rail network

Our strategic long-term goals for level crossings are clear:

- Reduce safety risk to the public, passengers and our workforce
- Increase rail capacity and performance across the network
- Reduce operational and financial risk

We will reach these goals by meeting the following level crossing strategic objectives:

- Maximise risk reduction
- Fewer fatalities, injuries and near misses
- Reduce the likelihood of human error
- Change user behaviour
- Improve reliability at our level crossings

To meet these objectives *Enhancing Level Crossing Safety* clearly identifies four areas of targeted focus:

- Risk Management
- Technology and Innovation
- Competence Management
- Education and Enforcement

All of which are underpinned by the need for effective collaboration.

Enhancing Level Crossing Safety is designed around ALARP (as far as reasonably practicable) principles. It is an iterative strategy that will evolve over time to take account of emerging risks and trends which take precedence or require equal focus.





01

INTRODUCTION

Enhancing level crossing safety

Closing crossings is the only way to fully eradicate the risk and sometimes we need to do that even if that means adversely affecting the community they serve. However, it is not possible or practicable to immediately close all level crossings. Aside from the financial and practical constraints, user convenience still needs to be a key consideration. A broad range of targeted interventions and initiatives are therefore needed to manage safety at crossings which remain open.

As part of our licence to operate and manage Britain's railway infrastructure, we have the legal duty to protect our passengers, the public and our workforce, and to reduce risk at our level crossings so far as is reasonably practicable.

Enhancing Level Crossing Safety provides the necessary overarching strategy to manage risk at level crossings. Its objective is to improve the safety of passive¹ and protected² crossings through effective collaboration and the delivery of targeted improvements.

The strategy provides:

A clearly defined vision that maximises risk reduction from investment

- The strategy underpins the company's policy on level crossing safety
- A common set of risk management objectives, priorities and processes that are shared across the business are consistently applied
- Efficiencies and opportunities that are shared through the procurement and delivery of solutions

A reference point for all Network Rail employees as to how level crossing safety is managed

- The strategy is visible and recognised across the business
- Corporate goals are understood by everyone, with safety at the forefront of all activities which interface directly or indirectly with level crossings
- The strategy sets direction and focus and helps to prioritise areas of greatest risk
- A holistic approach to risk management is applied, negating duplicated effort, waste and sub-optimal decision making

A reference point for rail industry colleagues, local authority stakeholders, the Office of Rail and Road (ORR) and the public as to how level crossing safety is managed

- The strategy is transparent with clearly articulated goals which target improved safety and enhanced reputation
- The strategy identifies how we will continue to meet our health and safety obligations in this area of risk management
- Collaboration and cross-industry working is understood and endorsed across all disciplines
- Good practice is adopted by all parties in Great Britain and is shared internationally with rail industry colleagues



¹ Footpath, bridleway, open, public and private vehicle crossings which require users to make safe decisions to traverse based on sighting alone or interface with Signallers using telephones (where provided).

² Crossings equipped with stop lights, alarms and/or barriers which warn users of approaching trains.



02 OUR SAFETY RECORD

There are around 6,000 level crossings across the network. They range from the most basic passive crossings, which rely on users making informed decisions to cross safely, through to public road crossings equipped with active risk controls.

Great Britain can demonstrate a very good safety record at level crossings in comparison to any major rail network in the world. Our good record is assisted by factors such as:

- i. relatively few level crossings compared to other major rail networks;
- ii. public awareness of rail/level crossing safety is generally good; and
- iii. a sustained investment and focus in successive years since 2009.



Figure 1: Level crossing incident rate across Europe per thousand track kilometres 2013 – 2017³

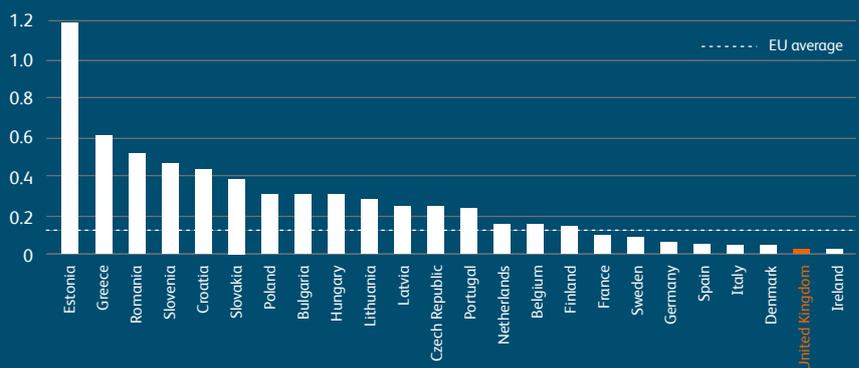


Figure 2: Level crossing incident rate across Europe per million train kilometres 2013 – 2017³

Despite our very good record, there is more we can do to prevent accidents at level crossings as there remains opportunity for human error to occur, for users to be distracted and for deliberate misuse to take place. Level crossings therefore not only present a risk to individual users, but where they facilitate vehicular access over the railway, they also increase the likelihood of potentially high risk train accidents.

Due to the nature of the road and rail networks in Great Britain, both types of infrastructure are extremely congested in parts of the country. These pockets of activity further increase the challenge of managing level crossing safety and intensify the opportunity for accidents to happen.

It is therefore to be expected that **level crossings represent one of the principal public safety risks on the railway**. Even though risk has been significantly reduced over successive years they still account for 6%⁴ of the total railway system risk.

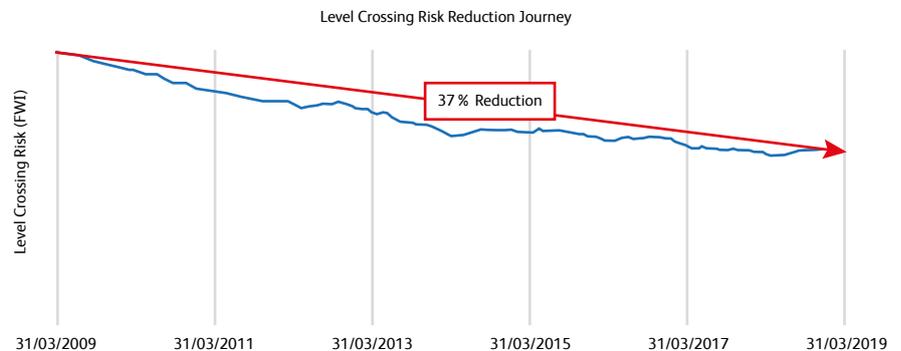


Figure 3: LCRIM calculated risk, March 2019

The All Level Crossing Risk Model (ALCRM) identifies, as shown in figure 4 below, that while Automatic Half Barrier Crossings (AHBs) account for just 6% of the total estate they hold 32% of total modelled risk and 75% of our level crossings require the user to make the decision on whether it is safe to cross.

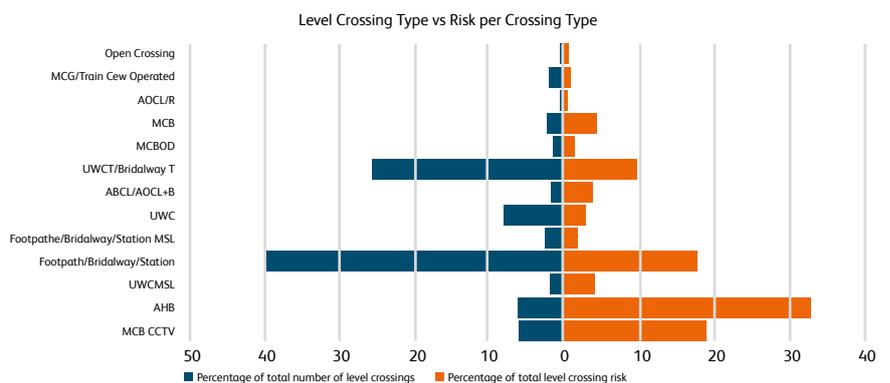


Figure 4: Level Crossing Type vs Risk per Crossing Type

Level crossing risk is driven by a number of external factors. If we were to do nothing more than maintain and renew level crossings like-for-like, it would be expected that **risk increases** would outpace efforts to manage safety as low as reasonably practicable. This is due to factors such as:

- Increased road/rail traffic
- Changing population (e.g. increased diversity, access by more vulnerable people)
- Congested pockets of road/rail/footpath networks
- Changes in public attitudes and expectations that risks are designed out, increasing the likelihood of errors

Our focus, through delivery of this level crossing safety strategy, is to prevent injuries and loss of life, so far as is reasonably practicable, by working to address legacy issues and to design out foreseeable risks of the future.

³ Source: Eurostat Data – extracted 2019.

⁴ As measured by Rail Safety & Standards Board (RSSB); source Safety Risk Model (SRM) v8.5, March 2018.



03

OUR PURPOSE, VISION AND APPROACH

We exist to get people and goods where they need to be and to support economic growth and productivity in an environmentally sustainable way. The railway connects homes with schools and workplaces, businesses with markets and can help unlock new land for house building. It is also part of the social fabric of our nation, connecting people with friends, family and loved ones. We are...

“A company that is **on the side of passengers and freight users**; that is **easy to engage with and a dependable partner**; **a company people are proud to work for**; instinctively recognised as an industry leader.”

Our role is to run a safe, reliable and efficient railway, servicing passengers and freight users and the communities we work in.

Ideally, we would not have any level crossings. However, we recognise roads and walking routes are public rights of way and therefore running a safe and reliable railway must be delicately balanced with the number of level crossings in operation, and the people who use them.

We estimate that over 3.5 million vehicles and over 600,000 pedestrians or cyclists use our level crossings every day and given that trains can travel over those same crossings approximately 400,000 times per day, it is unfortunately inevitable that incidents will happen.

For members of public that experience near misses, or even direct contact with a train, whether that is in a car, on a bike, by foot or any other means, it can be very scary. With two accidental fatalities in

2018/19 and six the year before, we must never forget how dangerous level crossings can be. Not only do these incidents alter lives, they also result in delays for passengers who are trying to get home, to their hospital appointments or to pick their children up from school. In the past few decades, passenger numbers have soared, the number of train services has increased, and our network is now congested. Our Victorian rail network was never designed to accommodate so many trains. The sheer amount of traffic on the network means that even the smallest incident can have a significant knock-on impact.

To help reduce this impact we look at every level crossing in detail. Deciding how to manage each single level crossing is done through risk assessment and expert judgement. We work closely with the level crossing's authorised users and liaise with communities around them. Often, the solution to improve safety at one crossing is different to the next.

04

OUR SAFETY VISION, GOALS AND OBJECTIVES



Network Rail’s core safety vision is ‘*Everyone home safe every day*’. Of the 12 key commitments within our safety vision, two are particularly relevant to how we manage level crossing safety. These are:

- We will relentlessly strive to find new ways to keep ourselves, colleagues, passengers and the public safe.
- We will design, construct, inspect, operate and maintain the railway to keep everyone safe.

Underpinning our company safety vision is our Home Safe Plan which comprises of a series of projects that target risk reduction in key safety areas. Building on our home safe commitments, our long-term safety vision for level crossings targets ‘**no accidents at level crossings**’.

Our vision for no accidents is shared with our vision for collaboration, a critical factor in successful risk management. We must work together as rail infrastructure owners, train operators, transport police, local authorities and highways agencies to effectively tackle safety at our rail, road and footpath intersections. This applies at all levels, from a strategic tier to frontline operations.

This vision successfully encompasses the overarching principles of the rail industry safety strategy Leading Health and Safety on Britain’s Railway and its challenge to improve level crossing safety.

We are committed to improving level crossing safety and will do all that is reasonably practicable to close crossings and improve safety at those which remain open.

Our long term strategic goals for level crossings are:

- Reduce safety risk to the public, passengers and the workforce
 - Increase rail capacity and performance across the network
 - Reduce operational and financial risk
-

To reach these goals we will work towards the below objectives:



To meet these objectives we have identified four key areas of focus which are underpinned by the need for effective collaboration:



05

ROLES AND INTERFACES



This document provides a clear strategic framework for enhancing level crossing safety, endorsed and to be delivered by a devolved business. To effectively tackle level crossing safety requires effective collaboration. Through the industry's Level Crossing Strategy Group and System Safety Risk Group meeting structures, Network Rail will lead the industry in promoting collaborative practice. We will also champion collaboration across all other sectors, from engagement within parliamentary channels through to discussions with land owners, authorised users of private level crossings and the general public.

With shared objectives and co-operation across all sectors, there will be greater opportunities to improve public safety at level crossings. Crucial to this is funding, which is an essential enabler in delivering high volume risk reduction activity. We will work closely with ORR and Department for Transport (DfT) colleagues to demonstrate that plans for risk reduction activities are effectively targeted and offer appropriate levels of safety benefits and value for

money. The case for dedicated investment will always be made with demonstrable returns evidenced within strategic plans.

Collaboration and shared goals within our own organisation are as critical as the relationships with external partners. *Enhancing Level Crossing Safety* will be used within Network Rail to promote the message of closing level crossings where possible and making those that remain open safer. We will also make use of safety education campaigns and channels such as the Network Rail intranet to broaden communication and awareness.

The general public must also contribute toward improved level crossing safety, eradicating risk taking behaviours and safely using level crossings. Our continued use of safety awareness campaigns, promotion of safety through social media networks, in addition to local activity and engagement will be used to educate and reinforce the safety messages.



Figure 5: Everyone: external stakeholders to Network Rail

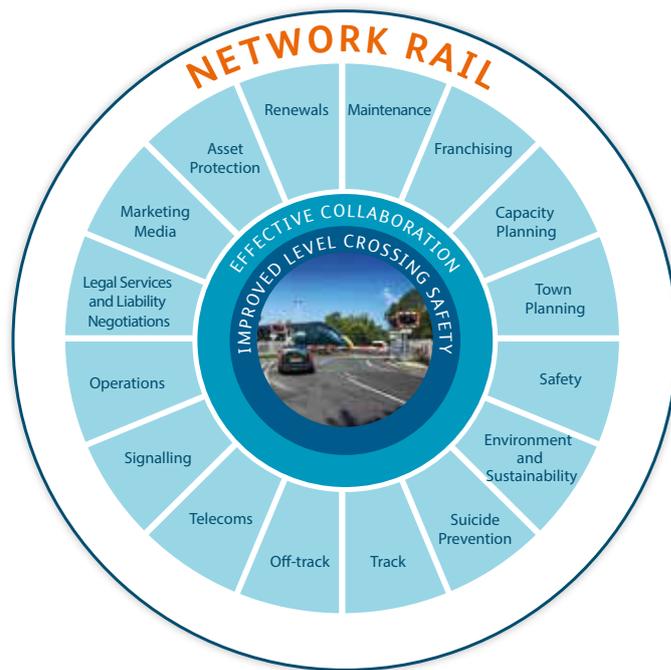


Figure 6: Network Rail's internal stakeholders

Legislative change that will allow us to work more closely with local authorities, highways agencies and private landowners in our efforts to reduce level crossing risk is welcomed. We will continue to press for change as parliamentary time allows and work closely, forging good working relations, with public authorities and local communities.

Our train operator colleagues continue to provide vital reporting, helping us better understand risk hotspots and real-time activities. We welcome this continued support and our future opportunities to work jointly, for example in the promotion of safety awareness messages, to improve level crossing safety and increase performance on the network.

Our partnerships mean that we have the necessary support network to continue our journey as world leaders in level crossing safety. Using platforms such as the industry's safety groups to progress our strategy and provide the necessary collaborative leadership to improve, we aspire to push the boundaries further still and to be united in our long-term vision of no accidents at level crossings.

Figures 5 and 6 illustrate the types of effective collaboration needed, both internally and externally, to enhance level crossing safety.

Managing safety within our own organisation

Within our own organisation, the principles of this safety strategy will be applied when work interfaces directly or indirectly with level crossings.

Enhancing Level Crossing Safety extends across our business, to many roles and functional areas and applies not only to those who manage safety on a daily basis, but to those whose actions may introduce risks and hazards at level crossings. For example; train planning, possession management, maintenance, renewals and enhancements, they all play a role in level crossing safety.

A joined-up way of working must be applied if we are to manage the safety of level crossings holistically, negate duplication and waste, and optimise risk management solutions and investment.

Doing more to continue to reduce procurement and installation costs is essential if we are to bring about efficiencies and opportunities to do more for less.

Transparent asset management plans visible across all sectors of the business will also help to drive such collaborative efficiencies.

'A joined-up way of working must be applied if we are to manage the safety of level crossings holistically, negate duplication and waste, and optimise risk management solutions and investment.'

06

TAKING SAFE DECISIONS

Network Rail has provisions in place that govern safety-based decision making. The company's Health and Safety Management System details this more fully in section 3.8 Safety Decision Criteria.

The industry's Taking Safe Decisions framework, which sets out a structure for taking decisions and helps meet the

reasonably practicable legal standard, has been adopted by Network Rail. Risk assessment appraisal methods and professional judgement are applied to safety investments in determining reasonable practicability.

The industry's Taking Safe Decisions risk management framework is illustrated below.

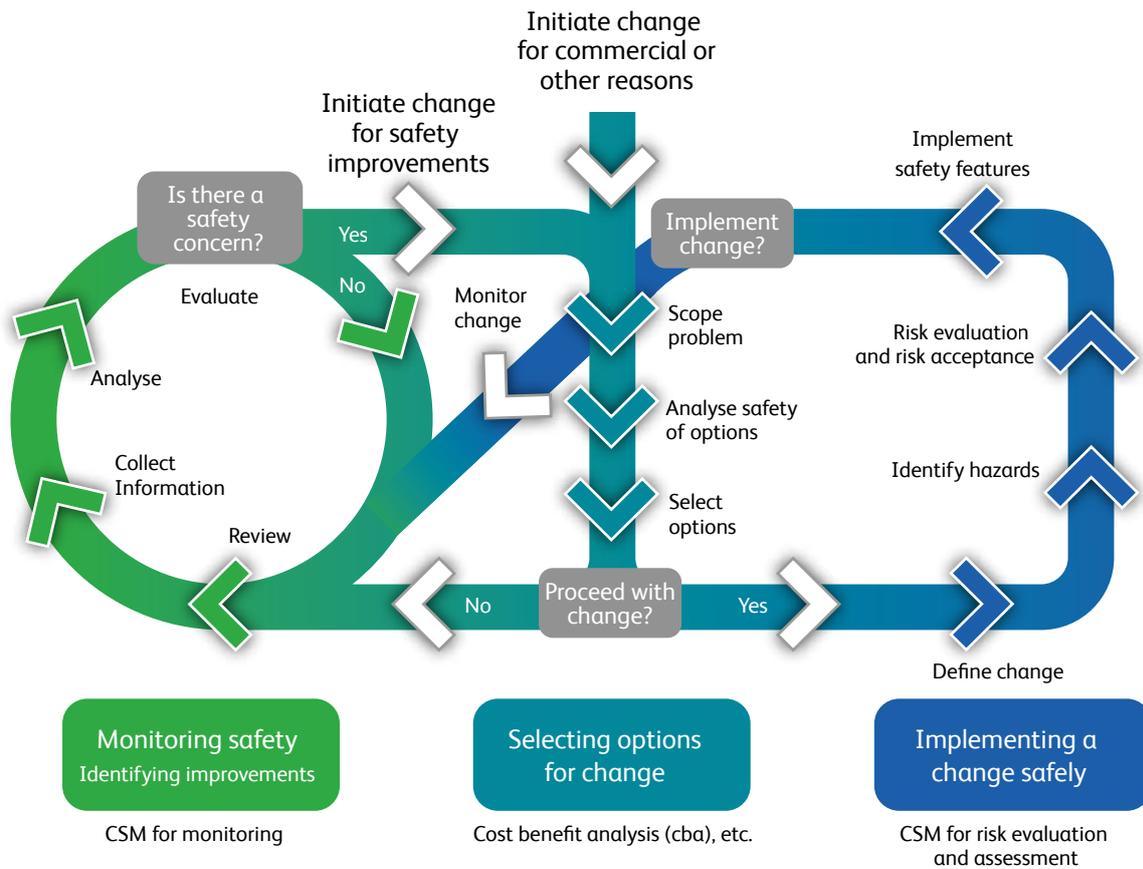


Figure 7: Taking safe decisions

ALARP

A recognised challenge that extends beyond the rail sector is economic constraint. We must adopt a responsible position in how we spend public money.

While we have a vision to eliminate accidents at level crossings, the question of what is reasonably practicable to do, must to be considered. This applies at every individual location.

We always seek to comply with the law and cost benefit analysis is used to determine how best to achieve this. Where increased investment is required to manage safety, risk-based decisions are made using the test of 'as low as reasonably practicable'. (ALARP)

In making decisions about safety expenditure, reasonable practicability needs to be evaluated. In so doing, we will consider the collective risk (aggregated over all exposed groups, which will include members of the public, passengers and staff) that is present, against the sacrifice (money, time and effort) involved in the measures necessary to avert the risk. If it is shown that there is a gross disproportion between them and the risk is inconsequential in relation to the sacrifice, then a case may be made that the investment, or measure, is not considered to be reasonably practicable to progress.

In reaching such a judgement, a quantifiable risk-based cost benefit analysis (CBA), which also accounts for whole-life cost, will be undertaken to aid decision making.







In making ALARP decisions, we will not accept a decrease in risk at one location as offsetting risk increases in other locations, unless risk is also managed to ALARP.

Investment in level crossing safety must also be balanced against other safety risks. Competing priorities may, for example, occur with embankments, structures, track, signalling, through trespass and at stations. Thus, it may not be possible and within funding to immediately implement long-term safety improvements at all level crossings. Where such prioritisation is needed, interim controls will be applied to mitigate risk.

Through a safety management framework of re-assessment and monitoring, we can continuously evaluate safety risks and prioritise expenditure appropriately, making sure risks are managed ALARP and public money is invested wisely.

As well as always complying with the legal duties placed upon us, there may be occasions when, for good business reasons, we decide to make changes to level crossings that provide further improvements for both passengers and public which go above and beyond what would otherwise be deemed 'reasonably practicable'.

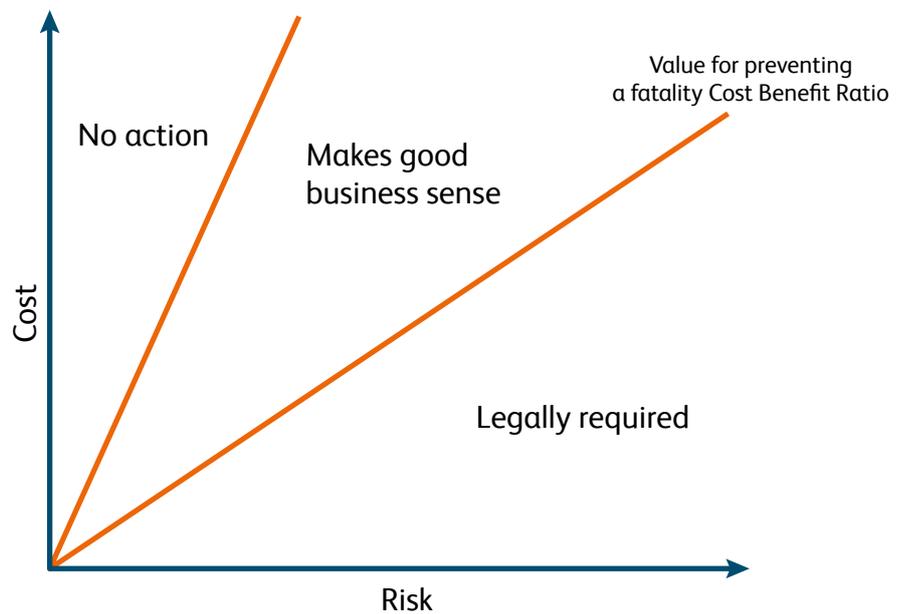


Figure 8: Our appetite for investment in level crossings

OUR FOCUS

‘We will continue to work with communities, private landowners and local authorities to find safer ways to cross the railway.’

Enhancing level crossing safety sets out our strategic direction, providing the vehicle for effective collaboration across the industry to reduce level crossing risk to as low as reasonably practicable. It is delivered through activities which are both internal and external to Network Rail and centres on four focal areas which affect both our passive and automatic level crossings targeting user mistakes or errors (including slips and lapses), deliberate misuse, asset failures and defects, and operator errors. This section looks at each of the four areas and considers how we will work over the next 10 years to improve the safety of level crossings.

Risk to the users of a level crossing is greatest where we ask the user to take more decisions for themselves. Therefore, risk reduction at passive level crossings is the first priority. Second, the automatic level crossing estate where opportunity for error and misuse continues.

Managing level crossing safety in a time of growth

A growth in rail traffic is required to accommodate a forecasted 40% increase in passenger numbers by 2050 and to support the government’s Rail Freight Transport Strategy. Our level crossings are an important part of the operational

Technology and Innovation

Risk Management

Competence Management

Education and Enforcement



railway system and we need to ensure that level crossing safety is included in the discussions when we look for opportunities to increase rail traffic on our network.

To support those discussions, we will work to better understand the impact rail traffic increases will have on the safe operation of our level crossings and how it may affect the communities we serve.

As such, we will collaborate with the DfT and our train and freight operator colleagues to identify and manage the risk from proposed franchise requirements, freight and open access requirements and any subsequent timetable changes.

We will develop and embed processes that allow for full and proper understanding of risk changes to our level crossings at the earliest opportunity. By affording us enough time we will be able to determine, implement and/or install solutions to

mitigate the risk increases, created by higher numbers of traffic moments at our level crossings, where required, thus allowing us to maintain a well performing railway.

Closures

The closure of a level crossing is the only true way to guarantee that risk has been eradicated and accidents cannot occur. Closures of passive footpath, bridleway and user worked crossings have been a focus of strategic investment since 2009.

However, we must recognise the importance of community, and how our level crossings do, in some circumstances, allow communities to remain connected. We will continue to work with communities, private landowners and local authorities to find safer ways to cross the railway. Opportunities will be taken, in accordance with ALARP principles, to close level crossings by using legislation including,

where appropriate, the Transport and Works Act 1992. The risks of traversing the railway will be balanced against the risks of diversionary proposals. We will take account of demographic needs and user convenience within option selection. Public safety will always be at the forefront of decision making.

Wherever practicable and safe to do so, any diversions will seek to utilise conveniently located over-bridges or underpasses to assure public money is efficiently managed.

The support and partnerships of train operating company colleagues is welcomed in closing station crossings used by rail staff, where alternative/lift access is provided.

07

TECHNOLOGY AND INNOVATION

Technology will be used to make level crossings which remain open safer and generate improved performance and capacity on the network. We will seek out innovative technology, working with suppliers and other partners to reduce costs and generate financial efficiencies. Whole-life costs will be taken into consideration in tandem with the safety benefits of solutions.

To reduce the likelihood of human error and improve safety, we will continue to use available technology and look to future innovation opportunities to develop new solutions.

The use of technology at our level crossings is a central element of the level crossing safety strategy. It is a crucial measure in improving the safety of sighting-only crossings and protecting users of our highest risk footpath, bridleway and user worked level crossings.

Through appropriate deployment of technology, we are able to reduce risk and generate safety benefits, and maintain convenience to the users which reflect the importance of these solutions and support the investment made.

In targeting technology at passive crossings, we will prioritise in equal measure:

- Locations of high risk, high line speeds and high traffic volumes
- Footpath and bridleway crossings with sighting deficiencies protected by whistle boards; targeting those with known usage during the night-time quiet period⁵ and working to eradicate whistle boards from the network

- Footpath and bridleway crossings providing access to schools and local amenities which are used by cross-sections of the community, notably by those who may be considered most at risk
- User worked crossings equipped with telephones in long signal sections
- User worked crossings equipped with telephones where Signaller workload and call volumes are assessed to be demanding
- User worked crossings which rely on sighting alone and which are assessed to present greatest risk of train accidents

In targeting technology at automatic crossings, we will prioritise:

- Unprotected automatic crossings - the automatic half barrier crossing
- Automatic crossings that rely on people, whether the signaller or train driver to confirm whether it is clear before allowing a train to pass over the level crossing
- Improvement and installation of both visual and audible warnings

Train detection warning systems

Audible warning devices (AWDs), overlay miniature stop lights (OMSLs) and integrated miniature stop lights (MSLs) will continue to be used to improve user awareness of approaching trains, reduce the likelihood of errors and lapses and safeguard vulnerable members of society from greater harm. At crossings which provide vehicular access over the railway, technology can significantly reduce the chance of high-risk train accidents. We will continue to innovate and develop new solutions that will allow us to place train detection warning systems at a greater number of level crossings and those solutions will be targeted at the user worked crossings which present greatest risk.

⁵ Night-time quiet period or NTQP: The hours between 23:59 to 06:00 when train drivers do not sound train horns at whistle board protected level crossings except in emergencies.



Automatic half barrier level crossings

Whilst generating a proportionally high level of risk, automatic half barrier crossings do offer user convenience through minimised barrier down times. This has the potential to reduce road delays and congestion. In contrast, however, the opportunity for user error or deliberate red light violations and barrier weaving is always present and offsets much of this benefit. Consequently, the location of half barrier crossings is critically selected.

To improve levels of protection, but maintain convenience levels, we will continue to develop a variant to half barriers by using obstacle detection technology to design an AHB+ crossing type. This solution will retain the convenience of limited road closure times, but users will be protected by full barriers.

AHB+ technology, when available, will be deployed as part of risk-based improvements, upgrades and enhancements. Prioritised locations will be driven through risk assessment and will include those at stations, where there is high pedestrian use e.g. on the route to schools, stations or holiday parks and on high-speed lines. Specifically, AHB crossing types will not be renewed as equivalent like-for-like assets where they are adjacent to stations or regularly used by school children.

Other types of automatic half barrier or open crossings will be enhanced with automatic full barrier technology as identified through risk assessment.

Improved visual and audible warnings

There are a number of miniature stop light (MSL) equipped level crossings on the network which only provide users with a visual warning of approaching trains. We will identify these crossings and, based on risk, develop plans to install audible warning devices or make provisions, as part of renewals, to replace

equipment with more modern solutions. Decisions to prioritise these locations will be balanced against other passive crossings where there are currently no train detection warning systems installed and where risk may be greater.

Some AHB level crossings conform to a previous design standard meaning that the audible warnings cease to sound when the half barriers reach the lowered position. These locations will be brought up to current design standards whereby the audible warnings continue until the end of the completed sequence, i.e. after the train has passed clear and the barriers have raised.

In accordance with risk assessment output, we will further introduce 'another train coming' spoken alarms at locations throughout the country, targeting automatic crossings where there is regular pedestrian footfall and a high likelihood of more than one train passing another within a single crossing sequence.

As enhancements with audible warnings are progressed, environmental noise impact on lineside neighbours will be taken into account and volumes adjusted within available tolerances so far as is practicable. We will continue to upgrade our 50W halogen bulb road traffic light signals (RTLS) to light emitting diode (LED) lamps to improve the visibility of stop lights at level crossings. Locations identified as not currently being fitted with LEDs will be upgraded as part of renewal and enhancement schemes.

Work with suppliers to utilise new technologies that may provide even better visual warnings than the current LED RTLS will continue, and such technology will be used at locations where sun glare is a known concern.

Signage

Signs which convey safety messages must be clearly articulated such that they can be easily and expediently understood. The signs found at passive level crossings, which are mandated by legislation, have not evolved in many years and are not necessarily optimised for modern society or ergonomically designed around human factors studies.

Network Rail is therefore working in partnership with the ORR to review and update all mandatory signage at footpath, bridleway and user worked crossings. This work is building on the human factors studies and recommendations within RSSB commissioned research projects T983 Signs at private level crossings, and T984 Research into the causes of pedestrian accidents at level crossings and possible solutions. Improvements to signage at public road level crossings will follow once the prioritised work at passive crossings is concluded.

New signage will be deployed in a targeted and controlled way. We will work with the DfT and ORR to progress changes in legislation to formalise new signs in law.

Improved layout

In parallel with improving signs, we will work to enhance the ergonomics of passive crossings as a long-term objective, using our good practice guidance to remove signage clutter.

The findings of RSSB research paper T984 will form the basis of demarcating the danger zone, or area within the confines of the level crossing.

Guide-fencing and chicanes will be used to help direct users along safe paths to improve awareness and behaviours. We will use these measures at skewed crossings which are upgraded to right-angled surfaces and where original access points are retained.

Locations will be prioritised based on risk and qualitative judgement, making use of opportunities to make incremental improvements during risk assessment and asset inspection site visits.

The next generation of obstacle detection

First generation obstacle detection uses both RADAR (radio detection and ranging) and LIDAR (light imaging detection and ranging) to detect the entire crossing surface for obstructions. Whilst the combined system has been successfully deployed at almost 100 locations nationally, the lower LIDAR necessitates expensive profiling work and introduces potential failure modes which cause disruption and secondary risk.

A second generation of obstacle detection technology that will exceed current capability and avoid the need for a supplementary LIDAR (or equivalent) system is being explored. Such technology may prove suitable for use at different crossing types as part of a range of risk reduction solutions and safety enhancements.

Innovation

In addition to managing our known legacy issues, we will pool our expertise, taking opportunities to innovate such as those within a Digital Railway, to design level crossing improvements which target user mistakes or errors (including slips and lapses), deliberate misuse, asset failures and defects and operator errors.

We will tailor technology specifications according to risk, enabling wider deployment of safer but affordable designs. In designing for safety, areas of focused activity will include:

- Predictor technology to enable consistent and optimised train detection warnings, leading to minimised waiting times, enhanced user convenience, improved safety and increased rail performance
- Development of remote condition monitoring to:
 - Prevent failures (so far as is reasonably practicable)
 - Improve notification of faults and failures to enhance safety and reduce maintenance costs
 - Facilitate better data collection leading to improved analytics and improved safety
 - Provide robust intelligence post incident or as a result of allegations of faults and failures
- Use of video analytics to assist monitoring of CCTV controlled crossings



Locations will be prioritised based on risk and qualitative judgement, making use of opportunities to make incremental improvements during risk assessment and asset inspection site visits.



08

RISK MANAGEMENT

Effective risk management of our level crossings requires us to not only look at level crossings as a physical asset, but as a system of systems, and we must remember that our level crossings connect the railway to other public rights of way.

As part of condition-led renewals, we will take opportunities to look holistically at current and future road, rail and environmental proposals to efficiently manage risk.

We also need to continue improving our risk management capabilities.

Risk assessment process improvements

We will continue to build on the good work undertaken by level crossing managers, seeking ways to continually improve our risk assessment processes so that emerging human factors risks, and other hazards are fully incorporated within core risk management activity.

Further improvements in the number of extended censuses undertaken within risk assessments will be made to provide the best intelligence possible to determine when level crossings are used, at what frequency and by whom (user demographics, vulnerable and encumbered usage etc.).

Other transport systems, such as the roads network, will be explored to determine if alternative good practice measures exist to best represent vulnerable users within traverse time calculations. If it is established that well-founded procedures exist, we will explore how we might adjust our processes to align with these.

We will work with local authorities to understand the impact that our level crossings have on the wider local road network. Determining how our level crossings interact with the road network will give better information for our system risk understanding.

Improvements to the process of undertaking a narrative risk assessment (NRA) will be made in conjunction to

enhancing the content and appearance of the document. It will evolve to support steady-state, renewals and enhancement project risk assessments. This will take account of lessons we have learnt and improve consistent risk assessment across the business.

The next generation of the All Level Crossing Risk Model (ALCRM)

Network Rail has used ALCRM since 2007 to quantitatively support its qualitative risk assessment of level crossing safety. In 2017, RSSB led the completion of research project T936 to update the algorithms such that they are further enhanced and aligned with the industry's Safety Risk Model (SRM).

These changes will be incorporated into the risk model to optimise calculated risk and enhance decision making, elevating the accuracy of risk assessments further still. A new Level Crossing Decision Support Tool will bring risk, asset and safety incident data into one place to help prioritise action.



09

COMPETENCE MANAGEMENT



Employee competence is a critical area of importance for Network Rail. Effective training and high levels of competence are conducive to effective risk management and tangible safety improvements at level crossings.

Accordingly, we will continue to invest in the training and competence of our level crossing managers, making sure that it is continuously adapted to account for change. Training and competence will be a particular area of focus in the development and deployment of the next generation of ALCRM, enhanced NRAs and/or as human factors intelligence or incident analysis modernises current thinking.

Training, competence, and assurance frameworks will continue to evolve to improve levels of consistency, quality and capability within the organisation. Where practicable this will be extended to others who interface with level crossings, such as those who undertake level crossing designs, produce ground plans or level crossing orders.



10

EDUCATION AND ENFORCEMENT

Influencing user behaviour

Getting people to behave safely around level crossings relies on them knowing how to behave safely and choosing to do so. This needs to be done before, during and in some cases after someone has used the crossing.

The 'before' requires education of safety risks and good habits around level crossings, the 'during' reinforces expected behaviour and 'after' re-educates on safety risks, good habits and expected behaviour where required.

Promoting safety awareness has been a critical part of improving level crossing safety, and indeed, rail safety for many years. We will continue to teach communities how to behave safely at level crossings giving them all the information they need. We will, in collaboration with the British Transport Police and other partners such as the National Farmers Union (NFU), trade groups and our train operator colleagues, deliver key safety messages to coincide with trending risks, seasonal trends and partner led campaigns – keeping information fresh and engaging.

We will target known 'at risk' groups such as those most vulnerable or prone to errors, lapses or deliberate acts and the communities where our level crossings are situated or nearby. We will do this by engaging in local community outreach activities such as visits to schools, clubs, societies as well as with level crossing users directly.

Those people who choose to behave unsafely will be addressed both through education and enforcement. We will undertake national campaigns aimed at changing the factors that drive unsafe behaviour e.g. mental health issues, anti-authority attitudes, inattention and intoxication. This activity will tackle, at a mass scale, the factors that lead to unsafe behaviours around level crossings. Increased awareness will also be promoted within our own organisation, helping our employees to become ambassadors for level crossing safety inside and outside of work.

Red light safety equipment (RLSE)

Over the past five years, Network Rail has worked with suppliers to develop Home Office Type Approved (HOTA) digital red light enforcement cameras, known as RLSE. This safety initiative has been successfully installed at 33 automatic level crossings around the country.

RLSE has been quantitatively established to significantly improve situational awareness and user behaviour, with safety related incidents reduced by as much as 90% at certain locations.

We will continue to rollout RLSE as a means of improving safety at automatic level crossings, targeting our high-risk locations. RLSE will also be used to bolster safety at full barrier signal protected crossings which are subject to significant road vehicle violations in an aid to improve performance, train running and reduce the likelihood of perturbed working and imported secondary risks.

Mobile Safety Enforcement

A fleet of 15 British Transport Police (BTP) staffed mobile safety vehicles, equipped with automatic number plate recognition cameras, have operated throughout the country for the past five years. They have been deployed proactively and reactively at public road level crossings which are high risk or prone to regular bouts of deliberate misuse.

The BTP led driver education course has been successful in raising awareness and reducing the likelihood of repeat offences for drivers caught behaving in an unsafe manner. Prosecution is also used for more serious offences and repeat offenders.

The current fleet of MSVs continue to provide a valuable service as they draw toward life-expiry. In exploring a new mobile solution, evaluation of the safety benefits and cost of new mobile enforcement equipment will be undertaken. We will take account of lessons learnt and seek cost-effective technology to optimise investment and improve efficiency.

Any future investment in mobile enforcement equipment will be supported by a safety, performance, financial and reputational cost benefit analysis and underpinned by ALARP principles.



11

DELIVERY

Embedding and delivering our Enhancing Level Crossing Safety Strategy

Delivering the objectives laid out within the strategy will require us to treat level crossings as a system of systems requiring an increased level of collaboration.

Effective collaboration starts with a common understanding of the goals and objectives. Industry experts were consulted in the development of this strategy and there is agreement what needs to be done. We will continue to, through the Industry Level Crossing Strategy Group, to

develop a wider industry understanding of level crossing risk and establish the best collaborative delivery models across all our external stakeholders.

Our Level Crossing Integrated Review Group will drive through the delivery of this strategy within our organisation.

Supported and guided by this strategy, our Strategic Business Plans show how we intend to deliver safe and reliable level crossings for public and passengers, now and in the future.





KEEP
CROSSING
CLEAR

ANOTHER TRAIN
COMING
If lights
continue to show

KEEP
CROSSING
CLEAR

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KEY INFORMATION

Understanding our level crossings

Our Level crossing safety site provides a one-stop shop understanding of our level crossings, providing information on crossing locations and risk and information on how to use crossings safely.

<https://www.networkrail.co.uk/communities/safety-in-the-community/level-crossing-safety/>

Level crossing safety education

Having worked closely with teachers and students to develop resources that will help run fun, engaging and interactive activities that match different curriculum areas and deliver OFSTED requirements of PHSE teaching.

Our Safety education site provides teachers with resources aimed at Key Stages 1 to 4 (Scotland P1 to S4) providing safety awareness to young people in their early years and providing those at secondary school with the information and skills to stay safe as they enjoy greater independence.

Key Stages 1 and 2 (Scotland P1 to P6)

<https://www.networkrail.co.uk/communities/safety-in-the-community/safety-education/primary-school-resources/>

Key Stages 3 and 4 (Scotland P7 to S4)

<https://www.networkrail.co.uk/communities/safety-in-the-community/safety-education/secondary-school-resources/>

Welsh Baccalaureate

We have also worked to develop resources that support the Rail Safety Community Challenge which forms part of the WJEC Welsh Baccalaureate Framework

<https://www.networkrail.co.uk/communities/safety-in-the-community/safety-education/welsh-baccalaureate/>

Company Strategy

Enhancing level crossing safety 2019-2029

Endorsement and authorisation

Endorsed by:

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Authorised by:

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Accepted for issue by:

Robert Wainwright, head of level crossings

