Weather Risk Task Force

November 2021

Foreword

Our climate is changing, and keeping our railway running safely and reliably in the face of extreme weather is a challenge. To help us improve we commissioned expert reviews from renowned specialists Lord Robert Mair and Dame Julia Slingo, and earlier this year we published their reports. They gave us an independent assessment of our current practice and offered more than 50 recommendations on how to improve safety and performance. The recommendations are far-reaching and complex, involving every region of our business, capitalising on cutting-edge weather science, and transforming our drainage and asset management.

Over the past six months we've been turning those recommendations into realistic and achievable action plans. The update that follows over the next few pages shows how work is progressing across every region of Network Rail and what more we are going to do.

Our focus now is to keep up this momentum, to keep delivering at pace against these plans and continue to make real, tangible changes. We're working with partners in the wider rail industry, as well as with Lord Mair and Dame Julia, and together we will tackle the ever-increasing demands of a changing climate, and significantly improve the railway for passengers whatever the weather.

Mike Gallop
Chair,
Weather Risk Task Force

We have around 200,000 separate slopes alongside 20,000 miles of track – earthworks that allow the railway to connect communities across Britain, through difficult topography and complex ground conditions. A changing climate is presenting an enormous challenge to this infrastructure and we need robust plans to provide every one of those assets with the resilience and capability to perform during extreme weather.

Drainage and water management are fundamental, as is understanding fast-developing weather technology. Lord Robert Mair and Dame Julia Slingo gave us a world-leading team of specialists assessing our approach and provided expert guidance on how we can be better.

Crucially, both reports recommended looking at our culture and organisational change, upskilling our workforce to better access, interpret and use weather data and technology, to carry out inspections and examinations of earthworks and drainage assets, and to improve knowledge and competencies across the organisation.

Their recommendations are already being put into action and will continue to make a real difference to the way we're able to run the railway safely and reliably during adverse weather.

Martin Frobisher
Network Rail safety and engineering director

Oliver Bratton
Network Rail strategy and operations director

The tragedy at Carmont was a sad reminder of how vulnerable we are to weather and climate. My report sets out a number of transformational and far-reaching recommendations that will make Network Rail more resilient and better prepared in the future. I am delighted to see the progress made so far and to be actively engaged in guiding the action plans.

Dame Julia Slingo

Climate change presents a real challenge for Britain's rail infrastructure, particularly in terms of managing drainage and earthworks assets. The recommendations in my report will help to improve the resilience of these assets and it is pleasing to see Network Rail committed to delivering these through the action plans they have created.

Lord Robert Mair

Introduction

In March 2021 Network Rail published two independent reviews into how the railway can better cope with adverse weather. The reviews were commissioned immediately following the tragic accident near Stonehaven, Aberdeenshire, the previous summer. Three people lost their lives when a train derailed having struck a landslip following intense rainfall.

The reviews from Lord Robert Mair and Dame Julia Slingo showed that the challenge of climate change on the railway is substantial. Most earthworks alongside the tracks were built around 150 years ago and poorly engineered by modern standards – overly steep and unstable, with drainage of a similar age and installed to a pre-set design, regardless of location.

Their reports commended the work that had been done to upgrade the Victorian infrastructure where possible and manage risk across the network but were also clear there is more that could be done. Together, their reports made more than 50 recommendations.

A weather risk task force was established, with the objective to produce an integrated plan to deliver the recommendations from the Mair and Slingo reports.

The integrated plan brings together national initiatives, such as developing a weather academy with the Met Office and Newcastle University, with each region's action plans and local priorities. It brings together 19 action plans agreed with Dame Julia Slingo and Lord Robert Mair, to achieve a more effective approach to managing weather risk across the network. Both report authors have been retained in different capacities to help as we deliver the plan.

Work Package	Action Plan	Synopsis
Water Catchment & Concentration Features	1	Improved modelling of surface water threats
Intelligent Infrastructure Programme	2	II to deliver workstream requirements of Geotechnics
	3	II to deliver workstream requirements of Drainage
People (culture, competency, & organisation model)	4	Asset management culture
	5	Competency & resources
	6	Integrated approach between Geotech, drainage, and vegetation management
	7	Sufficient Drainage inspectors under control of Route Asset Managers
	8	Dedicated drainage maintenance teams across all routes
Policy & controls	9	Update earthworks policy
	10	Review / update earthworks bowties - COMPLETE
	11	Technical strategy for drainage system

Asset failure & weather diagnostics	12	Improved earthworks failure reporting
Lope Safety Review Group	13	Platform to focus in on regional challenges. Develop failure resilience plans. Strengthen decision making.
Innovation	14	Identifying and responding appropriately to changes outside the railway boundary
Examination & evaluation	15	Improvements to earthwork examination system
	16	Increased resources for site-based earthworks evaluations
Slope assessment & observational monitoring	17	More specific requirements for slope assessments
	18	Increasing site investigations and slope assessments
Weather services & operations management	19	Better weather forecasting and operational responses

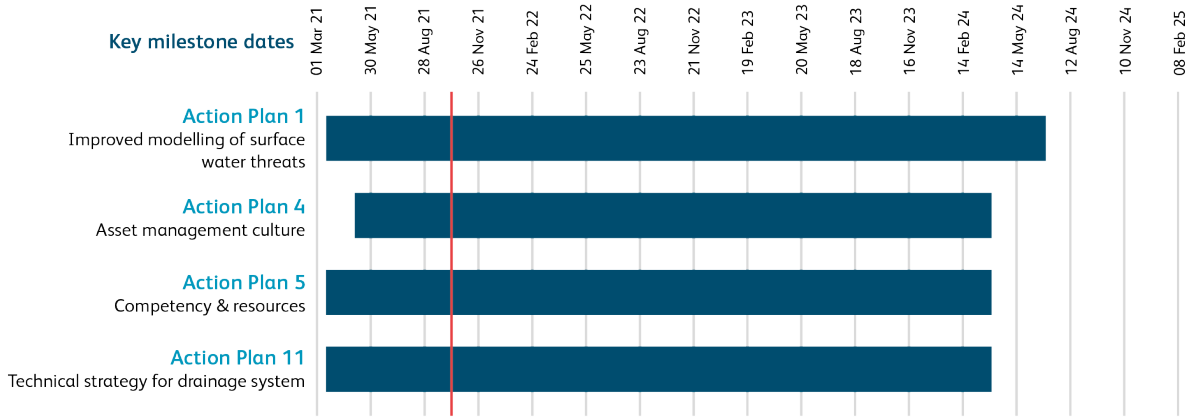
A master schedule has been created and we have made good progress against the plan, completing several early projects including:

- The convective rainfall alert tool (CAT) has been deployed nationally. Route controls staff now have much better, quicker notice of extreme rainfall and can communicate this directly to the train cab.
- We've published our drainage technical strategy and drainage resource calculator, which is helping our regions build their dedicated drainage teams.
- We've signed a contract with the Met Office giving us access to their expertise, which will be essential for delivering many of our national initiatives.
- We've set up working groups with regional representatives to manage and plan the transition of national capability to each route, including placing operations and engineering staff into weather academy cohorts, and planning the deployment of new weather services tools.

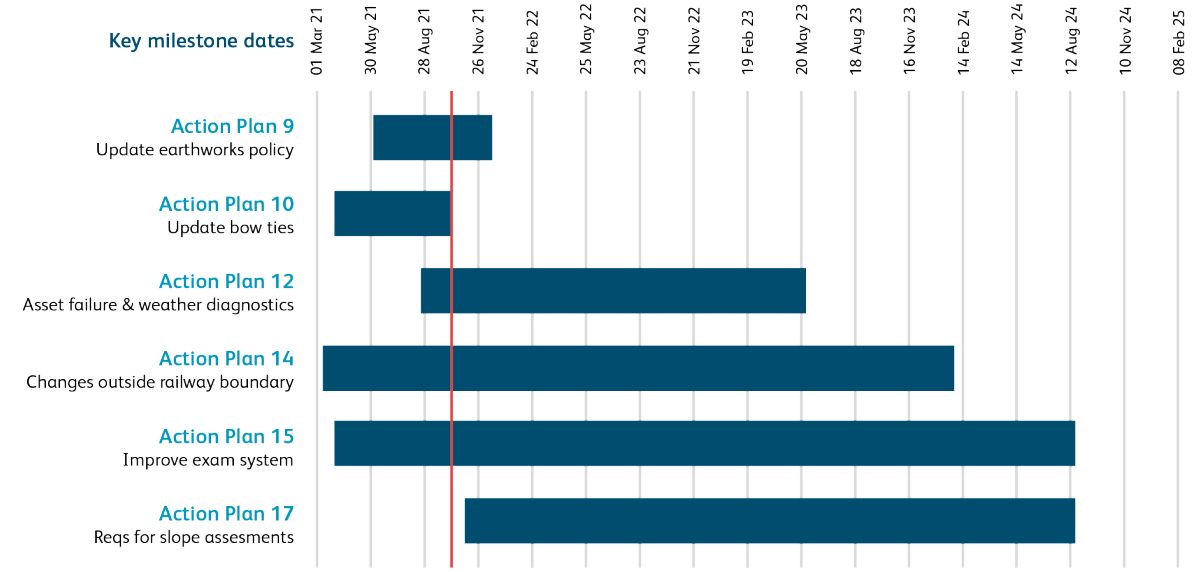
The national picture

One service function (Route Services) and two network functions (Technical Authority and System Operator) are leading on the national initiatives. The Technical Authority, via its Network Technical Heads for drainage and Geotech, developed the 19-action plan structure and led the stakeholder engagement to canvas support across the industry.

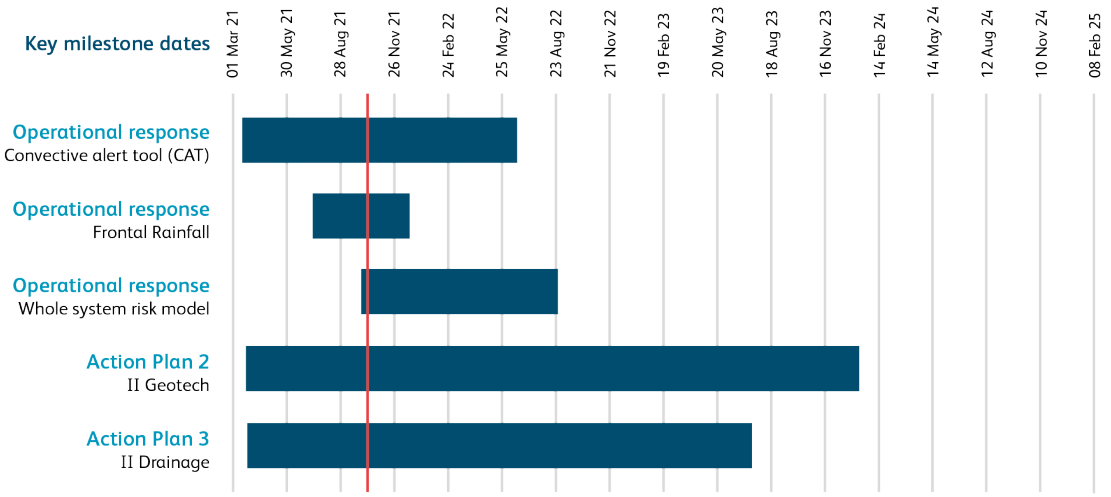
The drainage workstreams have been aligned to the Lord Mair Taskforce recommendations in the areas of people, technology and process, building a strong drainage asset management foundation through a drainage asset policy that encourages and supports partnership and collaboration; a drainage technical strategy that ensures we are continually evolving to new technologies and environmental demands; and a strong emphasis on qualified and competent drainage resources through an improved training programme to meet the challenges of extreme/adverse weather and climate change.



The Geotech workstreams are also aligned to people, technology and process, with review and updates of asset policy and risk bowties; collaboration with the other national and regional initiatives; enhancing the requirements of failure reporting and analytics of future failure events; and identifying and responding appropriately to changes outside of the railway boundary.



The Geotech and drainage workstreams are supported by Route Services' Intelligent Infrastructure programme, which is enabling improved engineering management capability through technology. They also work closely with the System Operator-led weather services and operations management team. Focusing on the recommendations made by Dame Julia, they are looking at how we can utilise any new forecasting technology at both a system and granular level; working collaboratively with partners outside of the industry such as the Met Office and the National Highways Agency, and becoming a member of the Natural Hazards Partnership Steering Group; and developing a weather academy, which will be crucial in helping our staff within the railway, and those across other transport modes, become 'informed clients' when it comes to weather management.



The regional picture

Each of Network Rail's five regions has made changes following the publication of the Mair and Slingo reports. Progress is being seen in key areas such as improving weather forecasting, how extreme weather events are managed, organisational and behaviour change, and the management of earthworks and drainage assets.

Each region has developed a plan to address the recommendations from the reports, specific to their regional context, priorities, and challenges. They are supported by national working groups to enable cross-region comparison and to share best practice, as well as regular peer review sessions and independent expert challenge.

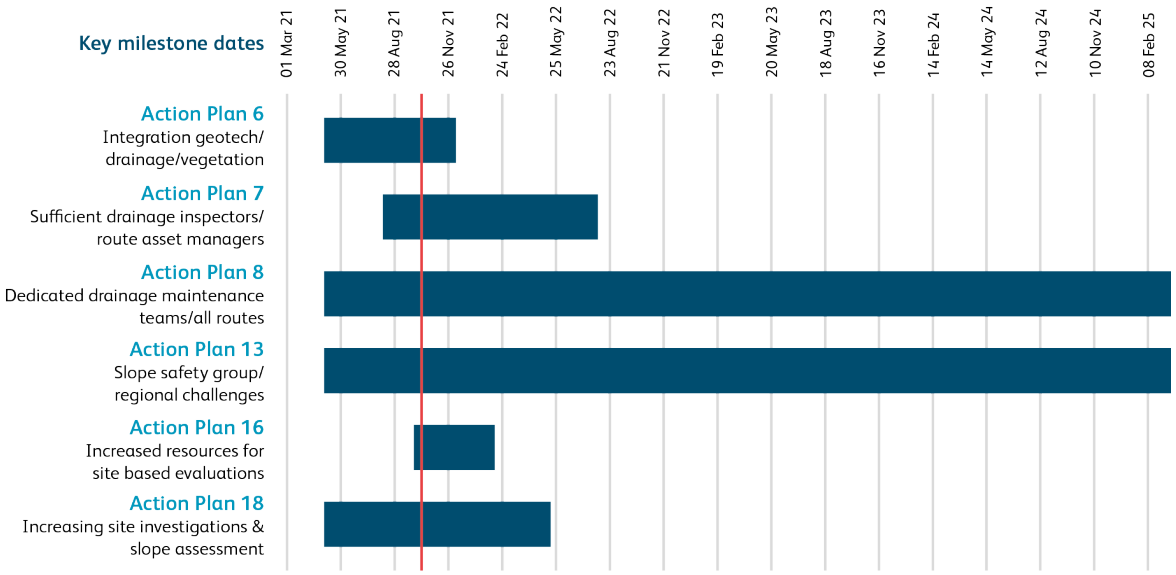
Eastern

Eastern is the largest of Network Rail's regions and covers a third of the network's railway lines. We have over 60,000 geotechnical assets and 2,900 miles of drainage systems across our region.

Since the publication of the Mair and Slingo reports we've made improvements in several key areas. We're using new technology and tools to better predict weather patterns and their potential effect on our operational railway, allowing us to improve the management of extreme weather events and to minimise the impact on the travelling public.

We're changing our asset management procedures to consider drainage, earthworks, and track drainage as one integrated system. We've invested in our capability and recruited additional engineers in both drainage and earthworks, including bringing our earthwork inspection teams under the direct control of our route engineers.

Next steps over the coming year include reviewing inspection and maintenance resources based on the enhanced asset knowledge we have from improved drainage inspections. We're also identifying further improvements through investing in new technologies.



Scotland

We are focused on creating a more resilient railway given the increasing impact of severe weather on Scotland's Railway.

Our integrated control is the first in Britain to establish a 24/7 specialist weather team, who are bringing a comprehensive oversight to the ever more severe weather caused by climate change. They are being supported through a combination of more geotechnical engineering experts and new dedicated teams for drainage inspection and maintenance.

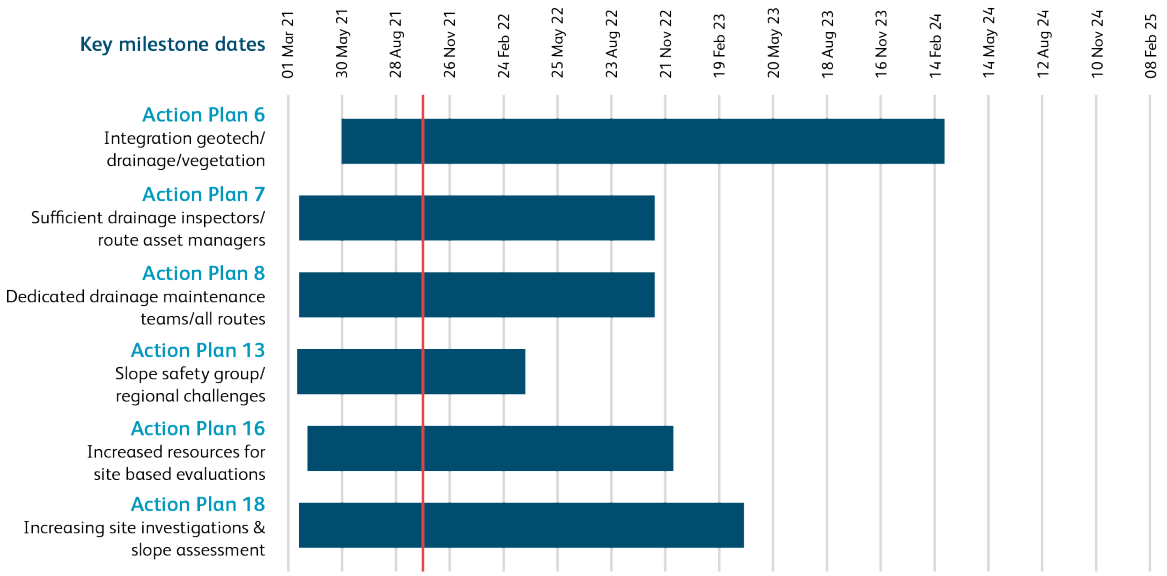
We're aligning our asset activity to make sure we have an integrated approach to earthworks, vegetation and drainage management. Future asset renewals will consider all these contributing elements as we target where we most need to invest.

Scotland's Railway is also at the forefront of deploying remote monitoring equipment, which give us early alerts to problems on the network.

We have installed wireless tilt meters at 20 locations throughout our network from the Highland Main Line and the line to Kyle of Lochalsh in the North to the Glasgow & South Western line through Dumfries and Galloway in the South. We have river level monitors and scour telemetry on more than 25 bridges across our network. Over the next two years we will continue to increase the number of locations fitted with these technologies.

We are supporting research and development into a wider range of remote monitoring equipment including smart drainage solutions – currently on trial on the Glasgow & South Western line – and a potential LIDAR scanning application for our helicopter to survey the environment, which helps our teams on the ground.

We are also increasing the use of our dedicated helicopter to carry out lineside inspections and are now better able to engage quickly with landowners by using aerial surveys to highlight potential third-party risks to Scotland's Railway.



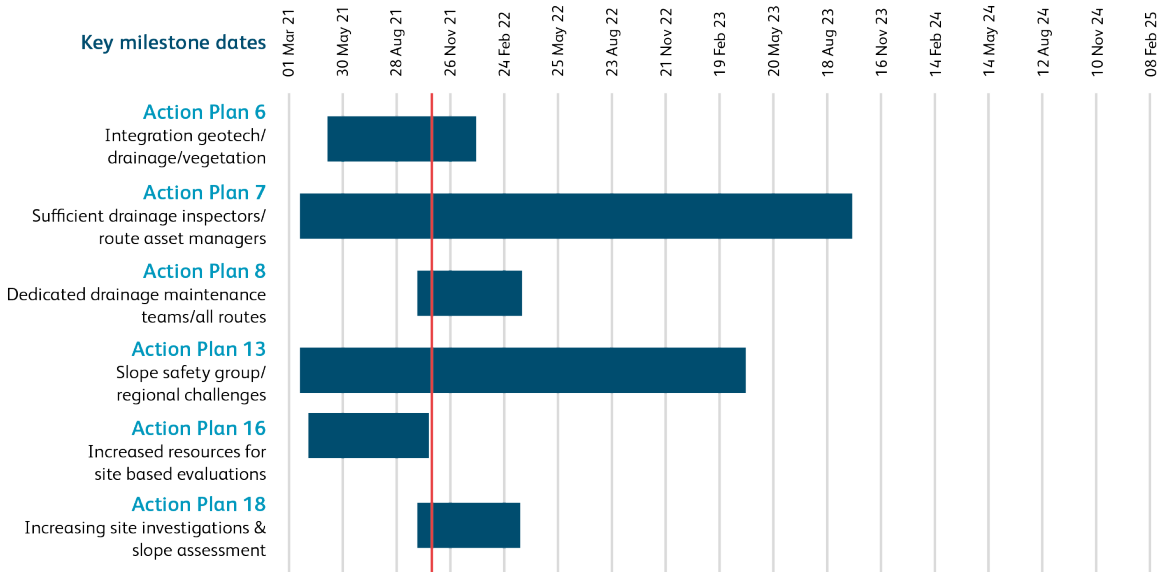
North West and Central

The North West and Central region is managing the Mair and Slingo recommendations with action-led projects, strategic behaviour and organisational change. Progress on the projects is shared regularly with the region's leadership.

We're capturing data for all our drainage assets and we're on target to complete this by 2023, allowing us to manage the assets more consistently. We're also looking at ways to integrate drainage and earthworks management.

We're currently trialling tilt switches on selected earthworks on our West Coast South route, an exercise that has real potential for changing how slope failures are managed. We also have a regional slope safety review group that meets quarterly, along with more regular meetings with key stakeholders, all of which are action-driven and leading to demonstrable change.

The scope of the project is to look at the potential costs and benefits to the operational railway. We are examining the possibility of making a chosen operational route section of railway weather agnostic, which would allow the safe running of trains in all but the most extreme of conditions without imposing operational restrictions or increasing the risk levels above that which is already considered to be the background risk. This will look where improvements to the infrastructure are needed to allow the train service to run unrestricted during a one in 100-year weather event.



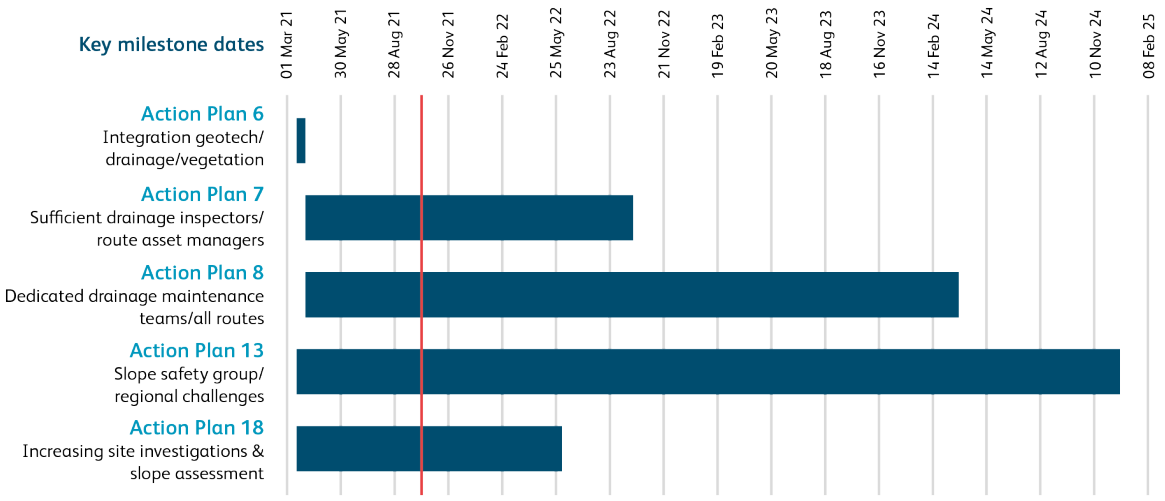
Wales and Western

The Wales and Western region has a range of geotechnical assets, including exceptionally large features such as the cutting faces along the sea between Dawlish and Teignmouth, and along the River Severn between Chepstow and Gloucester.

We have led on several key national development initiatives to deliver the Mair and Slingo recommendations, including the successful trial of Precautionary Extreme Rainfall Speed Restrictions (PERSRs) delivered directly to train cabs. Regionally, work began immediately to create a clear and concise action plan, and good progress is already being made.

A slope safety review group has been established to promote best practice, engineering excellence and new knowledge in the design, construction and maintenance of both existing and new build earthworks and drainage projects. We are increasing the number of drainage maintenance teams to further improve the volume we can carry out each year and the capacity of interventions.

We've deployed failure detection equipment to high-risk earthworks assets. We're also making sure that existing, new, and emerging technology is being used to best advantage for the region and providing design input into our planned renewals and refurbishments.



Southern

Southern region has established a Geotech and drainage improvement programme to address the Mair and Slingo recommendations, as well as to embed an organisational change across the region.

We have created a slope review group to improve working between the disciplines and provide engineering assurance. This group will also work through additional earthworks and weather recommendations from the Mair and Slingo reviews and agree how they can be integrated into future business activity.

We're improving the way we manage our drainage assets. We've put in place new inspection frequencies for assets with a different risk profile, increasing focus on systems that protect earthworks from washout failure, and we're also increasing the size of drainage maintenance teams throughout the region and proactively scheduling maintenance for all safety critical drainage systems.

We're adopting more technology and we're currently progressing the rollout of a significant network of monitoring equipment to detect landslips. We're also making changes to the way weather is managed, including a more formal decision-making framework and the use of precautionary speed restrictions during periods of severe weather.