Department for Transport

Government Response to the Transport Resilience Review

November 2014

Government Response to the Transport Resilience Review

Presented to Parliament
by the Secretary of State for Transport
by Command of Her Majesty

November 2014

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Contents

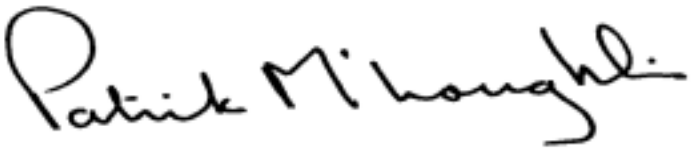
Foreword

I am grateful to Richard Brown for chairing the Transport Resilience Review which was published in July 2014. Having given the Review careful consideration, I am pleased to publish the enclosed response on behalf of Her Majesty's Government which reports on the progress made in the months since the Review's publication.

The review examined the problems encountered by all major transport modes, assessed lessons learned and put forward many practical recommendations to improve resilience both in the short and long term. The majority of recommendations quite rightly address the impacts of the wet and windy conditions experienced last winter which resulted in significant flooding and damage to vulnerable transport assets. Remaining recommendations take account of a broader range of weather and climate impacts, excluding snow and ice which were covered in the Quarmby review of 2010.

Whilst there will always be vulnerabilities to our transport networks from extreme weather, the Review serves to join up a lot of the existing work on resilience across transport modes and should put transport operators in an enhanced state of readiness to respond and recover from future severe weather events.

My Department will monitor the progress of the resilience activities endorsed in this response, and will provide a supplementary update next year to provide commentary on the delivery of actions that have been planned and highlighted in this document.



The Right Honourable Patrick McLoughlin MP

Secretary of State for Transport

Executive summary

1. The Transport Resilience Review[1] was commissioned in response to last winter's sustained wet and stormy weather that exposed the vulnerability of our transport networks. These networks are critical to our society and economy.

2. Richard Brown made 63 recommendations in his review. This Government response accepts the recommendations and sets out the actions being taken forward as a result.

Extreme weather and transport

3. The UK has highly variable weather and climate. The 2013-14 winter was exceptional in terms of the overall rainfall totals and the number of stormy days. These events led to a large number of impacts across all modes of transport.

4. During last winter, flooding caused delay to passenger and freight journeys on the strategic road network and strong winds resulted in incidents where high-sided vehicles overturned, causing further disruption. Similarly, local roads have been subjected to flooding, fallen trees, and general degradation of road surfaces. Coastal assets also suffered damage and disruption as a result of storms and tidal surges.

5. The nation’s railways have a long history, with parts of the network dating back over 150 years. Due to the size and age of the railway network, it is exposed to a large number of weather-related stresses. Last winter's storms damaged coastal railways, high winds brought down trees onto track and overhead lines, flooding affected signalling and sustained rainfall caused landslips. Network Rail, train operating companies and passengers were all affected by the impacts of the weather.

6. With our nation’s ports and airports, although the physical vulnerabilities to extreme weather may be different, they have shared some similar experiences of impacts from last winter’s extreme weather. Both have significant experience in dealing with disruption, however, events at Gatwick Airport and Immingham port caused unexpected levels of disruption due to issues which, it can be argued, could have been mitigated.

7. There are valuable lessons to be learned from the 2013-14 winter and this response welcomes all efforts made to improve transport resilience. The Review itself presented a useful reminder that not only are we

[1] https://www.gov.uk/government/speeches/transport-resilience-review

exposed to extreme weather events now, but with the likely impacts from projected long term change to our climate, the severity of events and the magnitude of their impact will likely increase. There is therefore the need to plan for resilience in terms of both the near and long term.

Common issues across transport modes

8. While there are specific challenges facing each mode of transport, there are common threads linking resilience across our transport networks.

9. The funding of resilience came across as a common issue in Richard Brown's Review. Resource funding, which is vital to the maintenance activities of our transport infrastructure will be considered carefully by the Department for Transport (DfT) in advance of the next spending review. The Department will also determine how best to collate maintenance and efficiency spending data to provide greater clarity on the capital/resource split. In addition, Infrastructure UK is soon to publish revised Green Book Guidance incorporating the valuation of systemic resilience. The DfT will investigate how best to incorporate this into spending review plans. The DfT has also been made aware of emerging research from recently established academic infrastructure research centres, for example work on infrastructure resilience and value[2]. The DfT's engagement with such centres will continue, to ensure emerging thinking is utilised effectively.

10. The impacts of extreme weather are felt at the local-level, regionally and nationally, and impacts can be felt as a result of cascading network problems. In response to understanding and managing resilience at the national-scale, a DfT-initiated study will set out to report on any identified single points of failure on our transport network. Alongside this, the DfT is consulting other Whitehall departments to ensure it has correctly identified and assessed the nation's critical transport network. At the local level, we commend efforts already underway by some regions to develop local resilient networks and we encourage dissemination of the approach across local highways authorities. In undertaking these tasks and achieving a sense of network prioritisation, we will be better placed to target resilience efforts, incorporating economic and social considerations.

11. Weather forecasting and climate modelling capabilities continue to advance year on year and we urge transport operators to make full use of the meteorological services available to better understand their exposure to weather-related risks. Further advances are being made in the flood forecasting capabilities of the Met Office and Environment Agency's (EA) Flood Forecasting Centre. We expect the owners of coastal and estuarine assets to fully capitalise on the improvements achieved in the production of longer period tidal surge forecasts.

12. To support effective contingency planning, which is vital to the management and operation of all transport networks, transport operators

[2] iBUILD's: Economic evaluation of systems of infrastructure provision: concepts, approaches report, University of Leeds, available at: https://research.ncl.ac.uk/ibuild/outputs/

must continually improve their intra-industry crisis management, cooperating fully with stakeholders in resilience fora and having in place plans to secure the provision of resources likely to be required in response to severe weather events. Commitments have been made to improve these areas, reflecting on the experiences of last winter.

13. We will be demanding that our transport operators deliver on their commitments to improve their communication of clear and consistent information through a range of channels and technologies. Government sees there being significant scope for improvement in this area which has the potential to greatly improve the customer experience.

Strategic Road Network

14. Flooding is a significant weather-related vulnerability for the Strategic Road Network (SRN). Effective maintenance of the drainage systems requires good knowledge of the asset and its condition. Government is pleased to hear work has begun to complete the drainage records and asset inventory for the strategic road network.

15. A review of communications for the SRN is also welcomed, including 'on-network' communications via variable message signs and 'off-network' through online channels.

16. The Agency is also working with the Freight Transport Association (FTA) to better communicate the risks to high-sided vehicles from high winds, and are developing a strategy to prohibit vulnerable vehicles accessing exposed parts of the network during windy periods while optimising availability to other road users.

17. Government also encourages the Highways Agency to contribute to the development of the Met Office's Vehicle Overturning Model to more accurately predict the impact of disruption from high winds.

Local roads

18. Richard Brown's Review points to the level of resource funding for local roads maintenance and the criteria for emergency funding allocation as barriers to effective maintenance of the local highway asset. The DfT's funding for local highways maintenance is increasing from 2015 onwards and each local highway authority will be able to retain a contingency for future extreme events.

19. Effective allocation of resource funding is essential to achieve efficiencies. The DfT is looking to encourage widespread use of asset management plans and has recently consulted on future highways maintenance block funding. As part of this, the Department sought views on whether a proportion of the funding should be set aside as an 'incentive' element, to encourage authorities to develop asset management strategies as a commitment to undertake efficiencies. The Department is now analysing responses received. Efficiencies have also been proven where local authorities collaborate in developing their approaches to asset management and we endorse this approach where feasible.

20. Drainage is a significant issue for local roads and poor management can cause significant localised flooding. Government encourages highways authorities to act on guidance on inspection, clearance, and maintenance of drainage assets.

Railways

21. The rail sector was the focus of many recommendations made in the Resilience Review and broadly aligns with initiatives already under way within the industry. To better understand the risks and communicate areas for investment in resilience, Network Rail has since published route-based weather resilience and climate change adaptation plans[3] to identify at-risk locations and potential mitigations.

22. We welcome Network Rail acting on recommendations to improve the detection of earthworks failures and monitoring of slope stability though more can be done in this area. In addition, a vegetation management strategy will look to reduce the risk of trees falling onto railway lines, improving both safety and performance. We recognise this initiative has been designed sensitively with due consideration given to the environment and neighbours.

23. In February 2014, the damage to the coastal railway line at Dawlish was much publicised. We look forward to seeing the outcome of Network Rail's investigations to assess the resilience of all its coastal and estuarine defences. This will be complemented by an extensive asset mapping exercise, using updated flood maps. Using lessons learned from last winter, the consideration of track circuit adaptations in flood prone areas is also welcomed.

24. In an effort to maintain the running of train services, the Department is pleased that the majority of train operating companies will have available updated contingency timetables this coming winter. The Rail Delivery Group is proceeding with its proposed task to investigate an amended approach to the compensation regimes during severe weather disruption.

25. The rail sector is also committed to investigating the long-term impacts of weather and climate with a planned portfolio of work commissioned by the DfT funded Rail Safety and Standards Board's TRaCCA project (Tomorrow's Railways and Climate Change Adaptation).

Ports and airports

26. As a direct consequence of last winter's disruptions, several airports and ports have revisited their essential power, communications and IT infrastructure, mapping assets against the EA's updated flood maps. Raising the elevation of assets and relocation of components has been demonstrated.

[3] http://www.networkrail.co.uk/publications/weather-and-climate-change-resilience/

27. We are grateful to Gatwick Airport Limited's McMillan Report (Feb 2014)[4], which has provided an 'industry standard' that has been widely approved within the aviation sector, and offers a good example of resilience planning and preparation.

28. The importance of communications with key stakeholders and weather forecasters has been recognised across the two sectors, and Government commend the recent updates in contingency plans, weather forecasts and flood models.

29. For ports, a series of DfT-led resilience and tidal surge workshops continue to prove highly effective in understanding the risks to ports from extreme weather and tidal surges. They include sharing best practice, planning resilience and devising recovery actions.

Post response

30. Focus must be maintained on resilience at all times. While it might be easy to lose sight of the risks in seasons of quieter weather, there is a need for sustained effort to ensure risks are properly understood and optimal resilience is achieved for the benefit of all transport users.

31. Whilst total resilience is not attainable, the recommendations have been embraced by transport operators and asset owners. Clear and specific deliverables have been committed, many of which are well under way. These are helping us to better manage the risks and develop proportionate responses to improve resilience.

32. The DfT will monitor progress of the actions set out in this response and will produce a progress report next year. The Department will also maintain its links with established centres of excellence in the field of transport resilience to keep abreast of developments in industry and academia, including - for example - science-based technology applications and social resilience analysis of behavioural response.

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4 http://www.gatwickairport.com/PublicationFiles/business_and_community/all_public_publications/2014/McMillan_report_Feb14.pdf

1. Introduction

1.1 Richard Brown's review of the resilience of the transport network to extreme weather events[5] was published 22 July 2014 in response to the sustained period of adverse weather conditions experienced over the winter of 2013-14. Last winter saw the highest winter rainfall across southern England since records began in 1766, resulting in widespread flooding, and extensive wind and coastal damage.

1.2 In the main, our various transport networks managed well in the face of the challenges. But the Review identified more than 60 recommendations aimed at better anticipating the impacts of extreme weather events, reducing the overall vulnerability of our transport networks to them, cross-modal collaboration, and speeding up the restoration of normal services.

1.3 The recommendations are both cross cutting and mode-specific, covering road, rail, ports and airports. Some are short term, designed for action prior to this coming winter, whilst others are longer term. They tackle a number of areas including asset management; communications; economics and funding; flooding; geotechnics; maintenance; supporting infrastructure; user behaviour; vegetation management and weather forecasting.

1.4 The Government has given careful consideration to the Review's 63 recommendations proposed to make our transport systems more resilient to future extreme weather events. It accepts the recommendations made - the majority of which are for transport operators to deliver. It also comments on the progress made in the intervening months since the Review's publication, and commitment to future work on transport resilience.

1.5 The structure of this document reflects the structure of the Review itself, responding firstly to recommendations regarding cross cutting issues before looking at each mode of transport in turn - the strategic road network, local highways, rail, ports and airports. Each chapter starts with a summary of the responses and actions.

[5] https://www.gov.uk/government/publications/transport-resilience-review-recommendations

2. Common issues across transport modes

Chapter summary

Government response and actions to cross-modal recommendations

- Resource funding allocation will be considered carefully by the DfT in advance of the next spending review, with the DfT determining how best to collate maintenance and efficiency spending to provide greater clarity on the capital / resource split.
- IUK are soon to publish revised Green Book Guidance incorporating the valuation of systemic resilience. The DfT will investigate how best to incorporate this in to spending review plans.
- A DfT-initiated study will report on any identified single points of failure in our transport network.
- The DfT is consulting other Whitehall departments to ensure it has correctly identified its critical transport network, with work concluding by 2016.
- Through cross-modal collaboration, options on access rights to third party land for maintenance purposes will be reviewed by January 2015.
- Further resilience workshops have been planned and will take place in the ports sector over the coming months.
- All modes will review their risks to climate change but to different timescales, with the biggest network operators - the Highways Agency and Network Rail reporting in advance of this winter.
- Weather forecasting continues to develop at pace and all transport operators must ensure they receive and make best use of the real-time information available.
- We understand that further advances are being made in the flood forecasting capabilities of the Met Office and Environment Agency, with improvements on last year being made in longer period tidal surge forecasts. Transport operators must fully capitalise on this.
- We agree with the recommendations relating to communications - in a data rich environment, information channels must meet the ever increasing demands of 'connected' passengers and transport users.
- We agree it is important for transport operators to maintain commitment to intra-industry crisis management and have in place plans securing provision of resources likely to be required in response to severe weather events.

Government response to recommendations

1) The Department for Transport (DfT), Department for Communities and Local Government, the Office of Rail Regulation and Treasury should ensure that funding decisions for road and rail are informed by asset management plans and do not unduly restrict maintenance and resource expenditure that is necessary to maintain transport network resilience.

2.1 Richard Brown argues that to bring about effective resilience of the nation's transport infrastructure, investment in transport - particularly maintenance, should be informed with a clear understanding of the needs of the asset.

2.2 Government recognises the importance of providing for appropriate, targeted and ongoing risk-based maintenance and renewals regimes for transport assets. This will contribute to maximising the asset value of its investments and ensuring continued value for taxpayers. With capital investment in our road and rail networks set to increase significantly over the coming years, ensuring an appropriate resource funding allocation to support maintenance activities on both existing assets and new investments will be an important consideration in any Spending Review following the general election in 2015.

2.3 Strategic Road Network - From 2015, the Highways Agency will be transformed into a government-owned Strategic Highway Company (SHC) with responsibility for managing and maintaining the strategic road network in England. The change of status to a Government-owned Company will be completed following the passage of the Infrastructure Bill, with asset management inputs informing the Government's Road Investment Strategy (RIS). The RIS will form the basis of future investment decisions and make clear how funding will be allocated to all operations, maintenance and renewals on the highway network. By providing longer-term funding certainty, the RIS will allow the SHC to plan more effectively and confidently for the future and drive down the cost of maintenance, and support increased resilience.

2.4 Local Authority Road Network - Over the last few years the highways sector has been working hard to demonstrate that highways and its associated infrastructure is a valuable asset and vital to the economic and social well-being of communities. The implementation of Whole of Government Accounts has proved that the road network is the most valuable asset that many local authorities manage. Increasing resilience to extreme weather and climate change should be a vital part of a local highway authority capital and maintenance programme, where this is cost effective. In May 2013 the Department for Transport's sponsored Highways Maintenance Efficiency Programme (HMEP) produced guidance aimed at local highway authorities on how asset management principles may be used to support a more efficient approach to maintaining highway infrastructure assets. The Government, working with the sector, encourages local highway authorities to have an up to date asset management strategy and adopt the principles as set out in

the guidance. We set out in detail in chapter four the means by which we will achieve this.

2.5 Rail - For Control Period 5 (CP5) 1 April 2014-31 March 19, the Office of Rail Regulation (ORR) have significantly strengthened the requirements on Network Rail to improve the management of its assets. This includes specific quality standards for asset knowledge and requirements to improve asset management capability. These changes will help move Network Rail to a position where it has better asset data so it can make well informed decisions, including planning maintenance and renewals work more efficiently.

2) For railways, strategic roads and local roads, the DfT should develop benchmarks for expected volumes and efficient costs of maintenance activity related to given transport asset populations and associated condition assessments. These benchmarks should inform the financial settlements with the respective infrastructure bodies.

2.6 The Department agrees that the use of benchmarks has the potential to enable a better approach to funding allocation decisions across modes and help to understand the scale of resource expenditure likely to be required to maintain existing and future capital investments. The optimum level of maintenance spending will be determined by a wide range of factors, including geography, climate, age of asset, level of usage and the vehicle mix. There are also differences in the way network operators are funded and the level of devolution, which further challenge the mechanisms for providing a comprehensive funding settlement across all modes.

2.7 The DfT will test such funding allocations during the Spending Review process, which is likely to take place in the second half of 2015. In advance of that process, the Department will undertake work to determine how best to collate the information on the costs and efficiency of maintenance spending that network operators and local authorities hold. This information will provide greater clarity to the Central Department as to the appropriate balance between resource and capital spending and will help to secure the right settlement at the Spending Review.

3) The DfT should work with Network Rail, the Highways Agency and Local Highway Authority representatives to understand how the full costs of disruption can be better accounted for in network investment decisions.

2.8 The Department agrees that the full costs of disruption should form part of network investment decisions. Typically, for new transport investments appraised over a 60 year time horizon, it is likely that the costs of disruption will form a marginal part of the overall economic case. Where current guidance does not provide a comprehensive guide, analysts refer to the Green Book and guidance from other departments and agencies such as the Environment Agency.

2.9 Infrastructure UK will shortly publish supplementary Green Book [6] guidance on valuing systemic resilience. The Department will investigate how best to incorporate the approach into guidance. The Central Department will also work with their counterparts in the network operators such as Network Rail and the Highways Agency to ensure that the costs of disruption are accounted for on a consistent basis and in line with the DfT's general principles on proportionality in appraisal.

4) The DfT should work with researchers, the devolved administrations and the transport industry to further consider whether there are potential 'single points of failure' in the strategic transport networks, which leave parts of the country at risk of having vital economic and social links severed.

2.10 Last winter illustrated the fragility of some of the transport links in the UK. Whilst all modes may be vulnerable, there may be some points on our transport network where the level of resilience needs to be ensured to protect vital economic and social links. Richard Brown commissioned a brief project to look at the issue of single points of failure. The Government supports taking this further and has drawn up a specification for a more detailed project to identify such vulnerabilities.

2.11 The study, scheduled to report by next year will identify the key locations at risk from single and multiple weather/climate threats including flooding (pluvial, fluvial, coastal and groundwater), storms, high winds, landslides, and extreme heat on the rail and strategic road networks. Although research led, the Department will ensure consultation and input from Network Rail, Highways Agency, and Local Highways Authorities to enable cross-examination of the vulnerabilities and consequences on identified routes. Assessment of the key activities that the routes support will also be considered to indicate the potential impact of network failures on transport services.

2.12 The study will ultimately inform decisions on future resilience improvements to be made based on the probability of failure and the strategic importance of the route, and also provide a baseline level of knowledge for future investigations.

5) The DfT should work with other Whitehall infrastructure interests and industry to identify a 'critical network', comprising those routes which are of national economic significance. Once identified, the DfT should work with the relevant industry partners to ensure that this network is maintained and enhanced where appropriate to a standard which provides for a higher level of resilience to the effects of extreme weather.

2.13 Government agrees that maintaining our critical network, including our strategic road and rail networks is crucial to our severe weather resilience and will reduce the economic impact of such events. The DfT is consulting with other interested departments to update its understanding of this critical network, in the full context of other critical infrastructure, and bearing in mind the experience of winter 2013-14. We

[6] https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-governent

will ensure not only that we look at resilience to extreme weather events but also the other potential threats, hazards and challenges faced by the transport network. The DfT is considering the network in the widest sense, so as to include the systems, assets, facilities, processes and the essential workers that operate and facilitate them. As such this complex task, which has already started, is anticipated to take 18-24 months to complete.

6) HM Government needs to identify cases where transport infrastructure which supports nationally vital passenger flows and supply chains, is insufficiently protected and enhancement cannot be fully funded by the current flood protection funding formula. Where such cases are identified, it should closely consider the case for funding to supplement the resources, from both public and private sectors, which are currently available.

2.14 The DfT agrees that it is important to consider how to deal with the case where the funding provided by the current flood protection funding formula is insufficient to enhance or maintain necessary resilience levels for vital transport infrastructure. Much of the transport infrastructure at risk from flooding is privately owned and therefore the Department has limited powers to influence infrastructure owners to invest in suitable protective measures. Where infrastructure is publicly owned there are considerable funding constraints governing investment. The Department will work with the transport industry to highlight the benefits of forward planning and investment, and where appropriate, in additional or enhanced protective measures. Resilience and flood defences in particular remain a key priority for the Department and wider government, and work is ongoing to determine how resources can be best deployed, in terms of this winter and beyond, to optimise resilience.

7) The Highways Agency, Local Government Association and Network Rail should consider the value of a 'land owner code of responsibility'. Put simply, this would set out the responsibilities of the transport infrastructure owner and neighbour in terms of maintenance of their respective assets, including right of access. It would need to be tailored for application to roads and railways respectively, given the different legislative regimes that apply.

2.15 For quick response and recovery to severe weather events it makes sense for transport owners / operators and landowners to work together in discharging their responsibilities. Government therefore sees merit in this recommendation.

2.16 Network Rail will engage with the HA and Local Government Association (LGA) on exploring this recommendation and will review options by January 2015. We look forward to learning the outcome of this dialogue. We understand the Highways Agency currently provides guidance on these responsibilities on a case by case basis with affected parties, and in October 2014 commenced work on the preparation of a draft guidance document. This will be developed into a concise guide for issue by April 2015.

8) The DfT should consider how further resilience planning workshops can best be provided for port operators; extended to

other sectors; and cross-sector groups brought together to share experience and best practice.

2.17 The Government endorses this recommendation based on the positive impact of the DfT's tidal surge workshops in 2013. The DfT received considerable praise from those ports attending last autumn's tidal surge seminars, which put them in a stronger position when the East Coast tidal surge occurred in December. For ports, further workshops have already been scheduled for the coming months. Within each of the four areas that the seminars were held, a port has been identified to act as the lead for the ports sector in representing ports interests and concerns within the wider local resilience fora. Each area will host further Recovery Workshops at which the DfT will bring the port and local resilience stakeholders together to determine the best way of embedding the ports into the local resilience community. The ports identified are Immingham, Harwich, Dover and the Port of London. There is the possibility that Teesport will also take the lead for an additional group in the north-east.

2.18 These groups will focus efforts on planning in advance of a flood, planning for recovery, communications between key stakeholders and delivering a capable workforce in the event of significant damage caused by a surge or flood. In addition, the DfT Maritime Security and Resilience team are passing on the benefit of their experience of conducting dedicated resilience workshops to other transport modes within the Department. Finally, other countries are being approached for resilience and recovery planning where they are integral to the United Kingdom ports. For example, the port of Calais is actively being pursued to review and strengthen its links with Dover on resilience issues.

9) With the winter's experience fresh in the mind, operators of strategic transport infrastructure should revisit their Climate Change Risk Assessments and Adaptation Plans in advance of winter 2014.

2.19 Assessing the risks to transport assets and their operations requires taking account of their vulnerability to short term extreme weather events and longer term projected climate change impacts. The Government welcomes this forward thinking recommendation and notes some good examples of progress.

2.20 The Highways Agency are revisiting their Climate Change Risk Assessment and Adaptation Plan in advance of this coming winter and will prepare a pertinent piece of work for their Flood Management Strategy Guidance in preparation for reflecting the climate change threats. In addition, work is currently underway to establish the 'Economics of Winter Climate Change' - an HA-led report scheduled for completion later this year. Information from this work will be used to inform other strands of resilience and adaptation assessment and reporting. Examples are given in chapter three of some of the work underway to manage the risks.

2.21 Network Rail has adopted a route based approach to revisiting risk assessments and adaptation plans. A series of eight weather resilience and climate change adaptation plans were recently published in September 2014. These explain how weather affects the railway and the

potential impact of changes in our climate. The plans outline the work being done to mitigate the impacts of weather and climate change on Network Rail's infrastructure.

2.22 There is less firm commitment from the ports sector to revisiting risk assessments. Some ports declined to participate in the reporting of their risks following an invitation from Defra's Parliamentary Under Secretary of State in December 2013. Whilst this reporting was voluntary, we understand some ports viewed the exercise as adding no additional value to their risk management reporting. Whilst there is evidence of good work taking place on the resilience of ports and their operations, given the severity of the East Coast Tidal Surge of 05 December 2013, it is essential for operators of ports - especially those on the east coast to follow this recommendation.

2.23 In the aviation sector, the Airport Operators Association (AOA) report that the majority of its members have made positive steps towards assessing the risks of extreme weather and producing adaptation plans to potential impacts. Many airports are providing updated plans, but not in advance of this winter. Although this delay is not welcome, we are pleased that Gatwick Airport Limited's (GAL) recent McMillan report (2014)[7] has been widely accepted across the sector and several airports have used this to cross-map their own adaptation plans.

10) All transport operators should have contingency plans to cope with extreme weather events. For infrastructure operators these should extend to include their major customers, and at a minimum be developed in consultation with them. Contingency plans should be regularly rehearsed and progressively extended to take account of a wider range of extreme weather scenarios as experience develops.

2.24 Contingency plans are at the heart of effective response and recovery of transport operations, playing a crucial role in the management of incidents. These are generally mature practices amongst transport operators, given their criticality. Involvement of customers, rehearsals and extending their scope to incorporate more weather risks is a common sense approach which Government sees as the minimum standard required. The demands of contingency planning varies across modes and the following paragraphs describe a range of activities currently in place.

2.25 The Highways Agency Severe Weather Plans have been reviewed and revised in the light of the Transport Resilience Review. The Agency is building on its long-established regional severe weather plans, which incorporate a mature lessons learned process. The plans are reviewed, updated and exercised every year prior to the winter season when most adverse weather is experienced. Additional guidance will now incorporate high temperature impacts. In addition to these plans, the Highways Agency has a robust crisis management process, used extensively through the winter of 2013-14. This process ensures suitable

7 http://www.gatwickairport.com/PublicationFiles/business_and_community/all_public_publications/2014/McMillan_report_Feb14.pdf

preparation and management of any significant disruption on the network, including severe weather.

2.26 Contingency plans exist under Network Rail's Business Continuity Management (BCM) strategy. However they typically apply to single Routes and do not necessarily conform to adjacent Routes' contingency plans. The adequacy of these contingency plans is being assessed during the review of the Extreme Weather Action Team (EWAT) process which is currently underway, and will be complete by end November 2014. This is involving input from the Routes, Train Operating Companies (TOCs), Freight Operating Companies (FOCs) and the National Operations Centre. The work will also identify the requirement to train staff and exercise the plans. In addition, each route will now have to provide assurance of the adequacy of their cross industry off-the-shelf contingency plans.

2.27 Ports have Emergency Plans which provide response to serious incidents whether on board ships or within the land and buildings under their jurisdiction. Copies are shared with emergency services and designated agencies, stakeholders and other organisations. In order to deal effectively with a major incident, there must be close co-operation and mutual aid where experience and resources are shared. For this multi-agency response to be effective, there is a need for all stakeholders to understand their own and others roles and responsibilities. Stakeholders will continue to regularly review and exercise their plans and will build on experiences gained through exercises or real events. The DfT issued winter weather and tidal surge business continuity templates to all major and medium sized ports in mid-October. These represent a check list of the key considerations for any internal plans made by the ports and are designed to ensure full and consistent planning for such events across the sector, including encouraging ports to share contingency and continuity planning with their tenants and customers.

2.28 The 'Well Maintained Highways' Code of Practice provides guidance to highway authorities to plan for weather emergencies. The guidance advises highway authorities to take steps to prepare for an increasing risk of emergencies. This includes establishing with others, including emergency services and relevant agencies, such as the Environment Agency, operational plans and procedures to enable timely and effective action by the highway maintenance service to mitigate the effects of such weather emergencies, as they affect the highway network. The Code also suggests the content of operational plans and procedures based on those developed in respect of winter, but adapted to suit the particular risks and requirements for the weather situation in question. Many authorities already have local flood risk management strategies in place.

2.29 Airports have a long-established culture of contingency planning due to the nature of their business and many operators are using this experience to tailor plans for resilience to extreme weather. There has been increased industry effort to integrate weather planning throughout all business practice from the strategic to operational level. For example, there is widespread use of the Gold/Silver/Bronze model used by Government and Emergency services coupled with an increase in local

crisis management teams for more extreme and prolonged events. Several airports have reported the creation of designated winter preparedness teams (i.e. for snow and extreme weather), and emergency management committees that include additional team leaders and staff on call for the winter period. As the recommendation suggests, plans have been developed in consultation with the wider airport community that has in many cases included passenger representative groups. Several airports are active in the annual updating of weather preparedness plans and both indoor desktop and outdoor training rehearsals and scenario planning for extreme weather incidents. The report by David McMillan to the board of Gatwick airport has provided further contingency planning recommendations which other airports are applying to their operations as needed.

11) All transport operators should ensure they have clearly agreed channels for receiving weather and flood forecasts. These should be monitored in real time during periods when extreme weather is expected.

2.30 The UK experiences a varied pattern of weather and our transport networks are exposed to many weather-related stresses. Knowing when, where and how assets will be exposed to the risks is fundamental to effective planning of transport services. Having clear channels in place for monitoring weather conditions is just as important. Government therefore commends this recommendation.

2.31 The Highways Agency has clear processes for receiving weather and flood forecasts all year round, across all parts of the organisation including with emergency planners and service providers. Met Office staff are embedded in the Highways Agency's National Traffic Operations Centre throughout each winter period, providing forecasts, weather alerts, updates and briefing. The HA Weather Information Service (HAWIS) provides the HA, its service providers and key stakeholders with information from more than 200 Highways Agency weather stations together with rainfall radar images, forecasts and severe weather warnings from the Met Office and flood alerts from the Environment Agency (EA). A review of the 2013-14 winter has shown that these systems worked well in providing the HA, its supply chain and partners with up-to-date forecasts and real-time weather information. The HA will continue to work closely with the Met Office and the EA to continually review and improve the service.

2.32 For Network Rail this process is embedded within its National Control Instructions. As a Category 2 responder[8] it receives flood forecasts and warnings through the joint Met Office / Environment Agency Flood Forecasting Centre[9] and weather forecasts from a range of service suppliers. The Weather Resilience and Climate Change Programme

[8] The Civil Contingencies Act (2004) establishes a legislative framework for emergency planning arrangements at the local level. The Act requires Category 2 responders, many of whom are private sector bodies (e.g. utilities, transport companies), to co-operate and share information with Category 1 responders (e.g. emergency services and local authorities) to inform multi-agency planning frameworks

[9] The Flood Forecasting Centre (FFC) is a partnership between the Environment Agency and the Met Office, combining meteorology and hydrology expertise into a specialised hydrometeorology service. The centre forecasts for all natural forms of flooding - river, surface water, tidal/coastal and groundwater.

within Network Rail has initiated a project to consolidate, enhance and integrate these services with access to them being provided via a web portal. The process to select a partner to deliver the capability is at an early stage; the contract is scheduled to be let by December 2014 with the new services scheduled to come on line in March 2015.

2.33 Following the recent winter events, the aviation sector has made a number of improvements to practice and protocols regarding weather and flood forecasting. The Airport Operators Association (AOA) report that the majority of its member airports now subscribe to the Met Office 'OpenRunway' service, and have also received positive feedback on the use of the Met Office's 'Talk to the Forecaster' tool for the winter period. Airports also utilise the Met Office 'Hazard Manager System' for gathering information for responders and resilience planners. In addition to this Glasgow Airport highlighted its intended use of 'Resilience Direct', a multi-agency mapping tool which can provide nationwide information during disruptive events. The AOA noted that numerous airports have also fostered stronger relationships with multiple weather forecasters and included regular liaison with them as part of their resilience planning teams. Further to these improvements, several airports now employ dedicated staff (e.g. Winter Operations Mangers) to ensure conditions on the ground are observed regularly to pre-empt potential failure incidents and improve communications. Heathrow Airport has runway surface temperature sensors for direct monitoring. They also employ an on-site weather forecaster and involve a Met Office manager in specific training procedures.

12) The Environment Agency and Met Office should work to further improve their joint flood forecasting, particularly for potential coastal flooding events, where tides, storm surges, wind strength and wind direction all combine to influence the outcome, and for potential ground water flooding.

2.34 Over the winter of 2013-14, flooding - both inland and coastal, placed significant stress on our transport systems. The Government fully supports more work being conducted in the field of complex inland and coastal flood forecasting to reduce the risks from these events in the future.

2.35 The Joint Flood Forecasting Centre established by the Environment Agency and Met Office in 2009 is now a well-established and highly regarded part of the civil contingency landscape in England and Wales, providing daily flood guidance statements to Category 1 and 2 responders. The joint flood forecasting plan covers a range of activities with the aim of improving the accuracy and lead-time of the services provided. Changes have been implemented since last winter's storms and the publication of the Transport Resilience Review to improve the accuracy of the longer period surge forecasts. This has been designed to enable the specialist forecasters to supply, via the Flood Forecasting Centre, improved longer lead time forecasts of coastal water levels. The Met Office is continually seeking to improve its forecast quality by implementing new atmospheric models with a view to improving the accuracy of weather forecast information provided. We expect to see this

progress leading to incremental improvements in coastal flood forecasting.

13) All transport operators and authorities should develop, test and implement a dedicated passenger and user communications plan for times of transport disruption.

2.36 Government sees scope for significant improvement in transport operators' communications to passengers and users. We therefore endorse communications plans for times of disruption. Moreover, we endorse all the communications related recommendations in the Review as they represent positive action that can be implemented to provide a higher standard of service to the travelling public, many aspects of which can be established in advance of this coming winter.

2.37 The Highways Agency has an established customer-focused communications plan, which encompasses all aspects of the Agency's remit, including its operations during times of transport disruption due to severe weather. The National Traffic Operations Centre (NTOC) is the information hub of the network. The NTOC collect data from a variety of sources including cameras, sensors, traffic officers, police and local authorities. The NTOC works closely with approximately 250 operational partners from whom it draws and shares information to create an overview of the strategic road network. This data is processed, analysed and validated and turned into information to feed to the Agency's customer facing services that are freely available in a number of ways e.g. Traffic England website, Highways Agency Information Points (HAIPs), Highways Agency Information Line (HAIL), Highways Agency website, Twitter, variable message signs on the network and media.

2.38 For rail, the Passenger Information During Disruption (PIDD) local plans and winter preparation sessions address this recommendation. Each train operating company (TOC) has a PIDD local plan. These were developed in 2009 and have continued to be tested and updated annually since then. The ORR is involved in the process of confirming that TOCs review their local plans each year. The most recent winter preparation sessions (involving Network Rail, Cross Country, First Great Western and National Rail Enquiries) to test the communications plan and processes took place in October 2014.

2.39 The majority of key ports have systems for conveying information on travel disruption; Dover for example uses its website and tweets information on traffic and weather, while Felixstowe disseminates information on weather, ships in port and inbound and outbound rail services. The DfT works with the HA and TOCs to ensure that appropriate ports-specific messaging appears on roadside signage and on train station displays during periods of disruption.

2.40 Disruption at airports can have widespread impacts on passengers and communication is vital - not least to safeguard passenger welfare. In addition to traditional methods such as tannoy, information desks and the deployment of extra staff members, the AOA has reported an improved emphasis on communications between airlines and other parties including passengers. Actions include the use of instant text messaging (e.g. 'Esendex') to ensure Flight Information Displays (FIDs) can be

updated quickly. Other improvements reported include the upgrade of FIDs (e.g. ‘Chroma Fusion’ system) to allow free text to be displayed, deployment of mobile FIDs and other mobile devices, better use of televisions and media screens for passenger welfare purposes, website improvements and use of social networks and local media to provide clearer and fuller information about disruptions.

14) Transport and network operators should:

- **Give prominence on websites to the latest service information during periods of disruption, ensuring that marketing and promotional information is relegated to the background at these times.**

2.41 The HA's website prominently displays the latest traffic information and breaking news regarding disruptions due to severe weather on the network.

2.42 The majority of local highway authorities provide information on their websites in regards to significant weather events. Many are now also using social media such as twitter, Facebook and text messaging to ensure that people receive information of disruption to local services.

2.43 For rail, PIDD action no.1 has identified website best-practice for desktops, mobiles and apps. This 'Good Practice Guide for providing information to customers' is now being implemented by the Train Operating Companies (TOCs) and National Rail Enquiries. The first organisations to adopt this best practice will be East Coast and National Rail Enquiries which is expected to be in January 2015.

2.44 Our ferry ports and services have a good record in providing service disruption advice on their websites.

2.45 Airports are modifying their websites with adaptable profiles during disruption events to give prominence to updates, relevant links and information. For example, Gatwick Airport now has a crisis communication box on their home page, and has a protocol for holding promotion material during major disruptions. At Birmingham airport, depending on the severity of the weather and the disruption it is causing to operations, the airport use prominent 'Emergency Information' or ‘Important Information’ banners on their website. Most airports plan to review and update website information regularly based on improved forecasting that will be supported by on-the-ground communication protocols and new messaging systems.

- **Use everyday language, not technical jargon to explain what is going on and causing the disruption. There is scope to research descriptions and phrases to use to test passengers reactions during 'peacetime'.**

2.46 The Highways Agency has set up a customer panel, made up of 1,000 customers representing the full range of road users and neighbours or those directly affected by its network, to evaluate and validate customer needs. It will use the customer panel to test its messaging regarding disruption on its network and the results along with other customer

surveys will feed in to the continuous improvement of the Agency's engagement with its customers.

2.47 An agreed list of revised delay reasons has been agreed for railways by the Passenger Information Strategy Group under PIDD action 13. This list is based on Passenger Focus research (undertaken by Southern in 2012) and has increased the previous c200 reasons to around 600 and thereby introduced more detailed and accurate ways of informing passengers about the cause of any disruption.

- **Ensure consistency of information provided through different channels and by different parties. This will involve lines being agreed and re-agreed by all the key parties involved – e.g. airports and airlines, Network Rail and the train operating companies - and communicated through the variety of channels available.**

2.48 The HA has an established customer-focused communications plan, which is used daily to provide information to road users about disruptions, including for severe weather. The Agency works closely with its suppliers and partners such as the Met Office to ensure a consistent approach to providing travel information to its customers via the Agency's website, services such as Atlas Pro, social media and the press, including local radio.

2.49 For rail, PIDD action no.8 will see the implementation of a process that involves third parties checking their websites for consistency of information. This is expected to be complete by May 2015. TOCs will also look at integrating National Rail Enquiries disruption in to their websites. This follows existing work where, for example, National Rail Enquiries and Gatwick airport have ensured consistent information is displayed at transport mode interfaces.

2.50 With a direct focus on communication and disruption management, airport resilience and winter operation plans are ensuring improved consistency and clarity through all vested airport networks. Examples include Glasgow Airport's stakeholder mapping/planning exercise that has helped develop multiple strategies for specific scenarios and has been extended to include disruption to ground access to the airport. Social media is also being used extensively to link with other transport providers e.g. live traffic information from Transport Scotland, the Highway Agency, etc. To improve consistency of messages, Gatwick airport cross-reference the media messages for each media channel used. Birmingham Airport use wording supplied by their Airport Control Centre (ACC) to describe the situation and is much more capable of allowing a single version of the truth to be established and disseminated to multiple agencies, stakeholders and passengers than was previously the case. Heathrow Airport report similar capacity with their dedicated Crisis Communication Team.

- **Make greater use of photographs distributed by text or social media, to improve transport users' understanding of the reasons for disruption.**

2.51 The HA currently uses photographs to explain reasons for disruption on the strategic road network, for example on Twitter, and, following the publication of the Transport Resilience Review will do so more frequently.

2.52 Network Rail, National Rail Enquiries and train operators have already introduced a mechanism for sharing photographs via twitter. This is seen as preferable to communicating images by text, so the latter will therefore not be pursued. Rail websites also currently include links to photographs of the causes of disruption. Consideration is being given to displaying these pictures directly on the website. Under PIDD action 38, Network Rail is considering how photographs can be reviewed and distributed more quickly to the National Rail Enquiries website to ensure that they are more current and timely.

2.53 Several airports have now developed and embedded social media strategies. The AOA report that many UK airports monitor several media platforms during disruption events to allow up-to-date information to be obtained and disseminated quickly; this includes sharing photographs obtained via social media to improve transparency and passenger understanding during disruption events.

15) In the face of an extreme weather event, or a high-confidence forecast of extreme weather, transport operators should plan for the best practicable service which they can realistically deliver, and which manages expectations, providing a high degree of certainty to passengers, other users and industry partners.

2.54 Managing the expectations of the travelling public is an important aspect of customer service provision, and in addition to performance issues, there are potential welfare issues to consider resulting from overcrowding of train station concourses and airport terminals. Government is therefore in favour of transport operators planning the optimal level of service ahead of each extreme weather event.

2.55 With an open network, the HA cannot reduce the amount of traffic on the SRN at times of severe weather in order to improve reliability, but does focus on providing information on current conditions through clear information provided to the public, via various channels including social media and roadside Variable Message Signs (VMS), to advise of closures and alternative routes. The Highways Agency aims to keep its network open at all times, although there are agreed protocols in place for closing certain exposed crossings at times of high winds to ensure public safety. Where there is the likelihood that traffic may need to be restricted from using exposed bridges, the Agency will publicise this in advance wherever possible, including information about the expected times of closures and details of alternative routes.

2.56 For rail, the Extreme Weather Action Team (EWAT) process is key to this recommendation and is currently being reviewed to identify improvements. The 'Day A for Day B' timetable procedure for proposed next day rail services in light of prevailing and emergency conditions, and the relatively new process of offering passengers a quantum of trains (e.g. 5 every hour) are the principal ways of managing customer expectations. The best practicable service that can be realistically

delivered will be planned and implemented by following the revised EWAT process and contingency plans with appropriate involvement of all relevant stakeholders.

2.57 The majority of key ports and ferry operators already have effective systems for conveying information on travel disruption which will include re-scheduled services that have taken account of weather forecasts. For example, last winter operators brought sailings forward / moved them back in order to avoid the worst of the weather. On days where no sailings were possible, particularly to the Channel Islands, operators ran additional sailings on days when under normal circumstances there would have been no sailings.

2.58 Capacity at airports during extreme weather events is not determined by the airport alone, and planning and consultation carried out has to include not only the airports assets and staff but also airlines, ground handlers, security services, border force and onward transport (i.e. road and rail). The AOA reports that significant efforts to improve and learn from previous events have been shown by all its members. Recent actions include:

- Heathrow has now opened an Airport Operation Centre (APOC) aimed at providing a direct co-ordination role with specific protocol during disruption events.
- Gatwick airport has a 'capacity reduction plan' to facilitate and co-ordinate effective operations under several reduced capacity scenarios. GAL's further creation of a Commonly Recognised Information Picture (CRIP) provides additional facilitation of key responders' operational status during incidents.
- Birmingham Airport has participated fully in a CAA led initiative to allow safe operation of aircraft on lightly snow covered runways that further increases their ability to keep operations going in adverse conditions. Furthermore, the development of their multi-functional Airport Control Centre as a communication hub for the business has improved their operational performance during disruptive events.
- Luton airport has recently moved from rolling closures to defined periods of closure of the runway, allowing the airport and its partners to better arrange capabilities, particularly during prolonged events.

16) Transport operators should have checklists of resources which they will need as part of their recovery effort from different weather-related events, with details such as the location, owner and source(s).

2.59 In times of crisis, transport operators often need to call on specialist machinery, plant and resource to respond to, and recover from, events such as flooding, landslips and fallen trees. Not all transport owners have their own resources to call on and Government strongly endorses an approach that promotes transport operators obtaining the necessary resources to recover swiftly from severe weather events.

2.60 In the Highways Agency, Severe Weather Plans for each of the 13 defined geographical 'Areas' provide details of service provider staffing

levels, shift patterns, resources and equipment availability, and locations, to ensure effective recovery operations. Lists of key suppliers, such as tree surgeons, are maintained in each area, and checks are made in advance of severe weather to ensure availability. Following a review of previous flooding incidents and available resources, the HA has recently procured a high volume pump to improve its resilience by reducing dependence on the availability of such equipment from the Fire and Rescue Services.

2.61 We understand that many Local Highways Authorities have plans in place to access required resources - from sandbags to heavy plant and machinery. These are frequently sourced through collaboration with other local authorities, and councils such as Surrey are increasingly asking their highways contractors to bring in additional resources from outside the affected area to aid response and recovery from extreme weather events. This requires accurately anticipating the level of resources required and having the mechanisms in place to secure them. We urge all local authorities to ensure they have such arrangements wherever possible.

2.62 An integral element of Network Rail's post extreme weather recovery plans is an understanding of the resource requirements by season, where the resource may come from and its timeliness of receipt. A review of the centrally coordinated process is currently underway with a view to establishing a more robust strategic resource capability. This review is scheduled for completion in January 2015 and will include an assessment of Network Rail's alignment with the TOCs and Freight Operating Companies' (FOCs') capabilities and plans. A resource list has been produced and has been supplemented during industry-wide workshops that have taken place in November 2014. The recently developed process for coordinating scarce resources will be proposed as an initial mechanism for identifying and coordinating 'strategic resources'. This mirrors a Network Rail initiative which is already in progress.

2.63 For the last few years, the DfT's Maritime Security and Resilience team has issued a winter resilience business continuity planning template to the ports sector through the UK Major Ports Group and the British Ports Association. The template was issued in mid-October to remind ports to check their plans against recent events and ensure they have sought appropriate advice and assessed their communications between local government, the emergency services, supply chains, tenants and customers. In addition, the templates remind the ports sector to ensure they have checked supplies and reviewed resources such as key personnel.

2.64 As part of airport adaptation, winter operation and business contingency planning, inventories of resources, including their location and the responsible staff member have been made to aid effective response to extreme weather events. To manage winter weather the AOA report that a number of its members have acquired additional fleets (doubling in some cases) and support contracts (i.e. on-call), including on-site mechanics to ensure equipment and vehicles (i.e. de-icer, tractors, sweepers, etc.) are available at short notice to improve overall runway clearance times. For example, Edinburgh Airport's preparedness team

have a checklist of its snow fleet and its anti-icing fluid capacity and the extent of its potential coverage. Luton airport has reported similar capabilities with additional staff trained for the use of equipment when bad weather arrives. Gatwick airport has an inventory of their critical assets which need to be sustained during major disruption, and also have contingency plans in place if they fall short. In addition to these responses, all AOA members report close and regular liaison with airport retailers by management teams during disruption events to ensure shops are stocked with adequate provisions of essential items.

17) Transport operators should consider whether they have the best possible organisation of their intra-industry crisis management machinery, taking account of the benefits of working more closely with their partners. They should similarly review their participation in wider cross-sector fora, to ensure they are appropriately represented and the benefits of closer liaison between modes are secured.

2.65 Government recognises clearly that collaboration and joined-up working with partners (including, for example, other transport operators, emergency services, utilities and local authorities) is fundamental to understanding the risks, planning the response and facilitating recovery to the impacts of extreme weather events.

2.66 The Highways Agency is regarded as an active member of resilience fora, participating in every Local Resilience Forum[10] in England, attending meetings throughout the year to ensure effective joined up planning with other operators and emergency responders. During emergency situations, the Agency participates in multi-agency strategic and tactical coordination groups to contribute to the management of the event and to share information with partners. We understand the Agency is currently training additional senior managers in strategic command which will further enhance capability when faced with future events.

2.67 The refinement and development of Network Rail's strategic framework for Crisis Management will, by March 2015, lead to the establishment of appropriate links with all pertinent cross-sector fora and organisations. In addition to carrying out this study, Network Rail remains committed to improving participation in Local Resilience Forums.

2.68 Through the on-going updating and development of winter preparedness and resilience planning, airports have broadened the scope of their operations, protocols, and stakeholder networks to improve responses to extreme weather alerts and events. Engagement with the AOA also promotes the response to this recommendation. Gatwick airport has produced an Incident and Crisis Management manual which includes multi-agency actions and highlights exercises that will report directly to their Resilience Planning Group. Glasgow airport plays an active role within the West of Scotland Regional Resilience Partnership (WoSRRP).

[10] LRFs are the multi-agency partnerships made up of representatives from local public services, including the emergency services, local authorities, the NHS, the Environment Agency and others. These Category 1 responders are supported by category 2 responders, such as the Highways Agency and public utility companies which a have a responsibility to co-operate with Category 1 organisations and to share relevant information with the LRF.

This forum includes representation from road, rail, sea, and air from across the west of Scotland. Similarly, Birmingham Airport actively participates in its local and regional resilience forums, and Stansted Airport has visited European and Scandinavian operations to learn from their snow plans.

3. Strategic Road Network

Chapter summary

Government response and actions to Strategic Road Network recommendations

- The DfT will monitor the progress of the HA in completing their drainage asset inventory within the first Roads Investment Strategy control period to 2020-21.
- The DfT will work with the HA to further investigate how communications can be improved via its variable message signs and through online channels.
- We are pleased that the HA has started working with the freight sector to mitigate adverse impacts from wind, while optimising overall access of road users to vulnerable stretches of the network at times of high wind.
- In managing the risk of vehicles overturning in high winds, we expect to see the HA support the development of specific wind modelling capability being developed by the Met Office.
- The Driving and Vehicle Standards Agency will use advancements in computer generated imagery to establish what opportunities are available for assessing a candidate's ability to identify hazards in driving conditions that learners have little opportunity to practice with an instructor.

Government response to recommendations

18) The Highways Agency should consult with the Freight Transport Association, Road Haulage Association and other affected groups in developing proposals to restrict vulnerable vehicles from using exposed sections of the Strategic Road Network, in particular the QEII Bridge at Dartford, during times of high winds so that the crossing can be kept open for all other users for as long as possible. The Highways Agency should then work with the DfT to establish how best to implement any additional restrictions considered appropriate, including how to ensure road user compliance.

3.1 The Government welcomes efforts to balance the need to optimise access to exposed portions of the strategic road network whilst maintaining the safety of road users. We are pleased to see the pace of progress on this recommendation.

3.2 Since the publication of the Resilience Review, the HA has begun initial consultation on the general principles of such restrictions with the Freight Transport Association (FTA) at a series of 11 Transport Manager Conferences across the country. These are raising awareness and encouraging dialogue on the issues involved. On completion in December 2014, the FTA will collate the feedback from their members to inform on-going discussions with the HA. Alongside this, a review of the traffic management methodology has taken place for the installation and removal of a full bridge closure at QEII Bridge, Dartford.

3.3 In relation to the filtering out of vulnerable vehicles from using exposed sections of the Strategic Roads Network, work at Dartford is looking to utilise some of the segregation methods currently in place on the M20 and the A14 for disruption to operations as a result of high winds - Operation Stack. The Agency's Emergency Planning Manager for the M25 will be discussing the proposals within the Essex and Kent Local Resilience Forums by the end of March 2015, along with Dartford and Thurrock traffic planners to fully evaluate the opportunities for filtering arrangements.

3.4 Finally, the benefits of effective communication cannot be overlooked with respect to this recommendation. Travel Demand Management has proved a useful tool during events such as the London 2012 Olympics. The HA will work with key partners to ensure that messaging on the SRN better reflects the local conditions for all road users and is due to submit proposals to put forward a suite of new legends (authorised VMS text) associated with the QE2 bridge crossing.

19) The Highways Agency should work with the Met Office to agree how best to utilise the improving granularity of wind forecasts to give the best possible wind forecast information to lorry fleet operators, ensuring it includes more specific and more useful information on its website and wider Highways Agency information services. This should include more specific information as to what drivers should do in the event of high winds after starting their journey.

3.5 We commend approaches that look to utilise developments in weather forecasts and climate projections to mitigate the impact of weather events in both the short and long-term.

3.6 Working in conjunction with the Met Office, the HA issues severe weather alerts to lorry fleet operators (and others) at times of forecast disruption to the Strategic Road Network from high winds. The HA and the Met Office continue to work together to develop and improve these alerts further. One initiative under Met Office development is a prototype Vehicle Overturning (VOT) Hazard Impact Model. This is being used as proof of concept for the development of more complex Hazard Impact Models e.g. for surface water flooding. The VOT aims to more accurately predict the risk of disruption to the HA network as a result of vehicles being blown over by high winds. The HA is collaborating by providing the Met Office with traffic incident data to verify the model so that the Met Office forecasters embedded within the HA National Traffic Operations Centre can deliver more accurate predictions of wind impact on a range

of vehicles and range of routes in the future. The delivery date for the new model beyond the existing prototype, is dependent on further investment in terms of resource and the provision of vulnerability and exposure data to the Met Office. The Government looks forward to seeing the HA support the Met Office fully deliver this model beyond its prototype stage.

20) The Highways Agency should conduct a flooding risk assessment exercise using the newly updated Environment Agency flood risk maps and other data to identify potential flood risk locations on the Strategic Road Network, to supplement its log of actual flooding events.

3.7 Government is pleased to hear that the HA has already assessed the vulnerability of its network to flooding using the EA flood maps, but the HA will need to refresh their risk assessments using the updated maps produced by the EA in December 2013. This task is part of a wider project and will be awarded by end of November 2014 and will run for 18 months. The flood mapping task has a milestone of a draft output by April 2015.

21) The Highways Agency should carry out the necessary work to complete its drainage asset inventory and if appropriate should make the case, in the process of establishing the new government owned company, for funding of the survey work necessary to significantly improve its understanding of the condition of its drainage assets and the interfaces with adjoining drainage networks.

3.8 Flooding is a significant weather-related vulnerability for the SRN. The drainage asset is vast, and effective maintenance requires a good understanding of the asset and its condition. Government is pleased to hear an action to complete the drainage records for the strategic road network has begun. It is being carried out through two distinct processes:

3.9 1) A dedicated central programme of drainage surveys is commencing in the 2014-15 financial year, targeting prioritised sections of network to complete drainage inventory and condition information. The specification for this work is currently being developed, with a target to procure and commence a dedicated task in March 2015.

3.10 2) In parallel to the dedicated drainage surveys, guidance is being developed and issued for detailed drainage surveys to be carried out as part of any major intervention on the network - covering both major renewals and improvements.

3.11 The timescale for completion of the whole inventory and condition data records, based on the combined delivery of the two above elements, will be completed within the first Roads Investment Strategy control period to 2020-21. Asset management is expected to form a key specification of performance of the Highways Agency as it transforms into a strategic highways company in 2015.

22) The Highways Agency and the DfT should review the range and wording of messages displayed on variable message signs at times

of disruption, including severe weather, and establish a dialogue with road users to determine what is seen as useful and credible.

3.12 Government welcomes recommendations that provide the road user with clear travel information during their journey (providing safety is not compromised).

3.13 The HA continually review the tactical[11] and strategic[12] legends used at times of disruption, including severe weather. It is commissioning research via the recently formed Customer Panel (which conducts activities including focus groups, online surveys, in-depth interviews and mystery shopping) to determine what legends are useful and credible. The customer research will then be used to implement changes to wording.

23) The Highways Agency should continue to improve and refine the content of its website to make it still more useful and influential, regularly canvassing feedback from users. The Highways Agency should also be allowed appropriate flexibility to use variable message signs to direct road users to more comprehensive sources of information, such as its website, twitter channels and its contact centre number. This will help to build awareness and encourage drivers to check for information before starting their journeys during extreme weather and any resulting disruption.

3.14 We are encouraged to learn that the Traffic England website, which provides live traffic information of the HA's roads, is to be refreshed as part of the Agency's National Traffic Information Service transformation which is due for completion by the end of March 2015. The HA is keen to use variable message signs to direct customers to other sources of information, such as its website, Twitter channels and its contact centre number, subject to DfT agreement. The HA is investigating a technical solution to achieve this so that discussions can take place with the DfT prior to the end of this financial year.

24) The DfT should review the content of the Driving Theory Test, and the associated materials available, to ensure it gives adequate coverage to driving techniques that can be used in adverse weather conditions, and travel preparations.

3.15 The Driving and Vehicle Standards Agency (DVSA) and its publishers have reviewed the guidance available and collated much of it into a dedicated e-book to support learners and experienced drivers alike as road conditions change. The advice is sound, but the emphasis given to adverse road conditions can be increased in new editions of the Highway Code and other learning resources as required. Advances such as computer generated imagery (CGI), which the DVSA has developed for the hazard perception part of the theory test, is offering the opportunity to assess a candidate's ability to identify hazards in driving conditions that learners have little opportunity to practise in with an instructor.

[11] Tactical legends are located a maximum of 5km or 2 junctions from either the scene of an incident (or other event which drivers need to be informed of), or from the rear of any queues which have formed as a result of the incident

[12] Strategic legends are mainly located outside of the tactical area, which warn drivers further away of the reasons for any tactical signs

25) In establishing the new Highways Agency Government Company, the DfT should ensure that its top-level performance indicators encompass network availability and that this is supported by appropriate indicators of asset condition.

3.16 The Highways Agency is being transformed into a strategic highways authority at arm's length from the central Department that will operate, maintain and improve the Strategic Road Network. The change of status to a Government-owned Company will be completed in 2015 following the passage of the Infrastructure Bill.

3.17 A number of governance documents will be published which will set out the duties of the New Company, and Government's requirements as client and shareholder of the New Company. As part of this, Government will issue a Road Investment Strategy (RIS) to set out clear long-term plans and performance expectations, with the stable funding needed to plan ahead effectively. These expectations will be detailed in the RIS Performance Specification that will contain a number of key performance measures, which will be important to those that use and are affected by the SRN. In addition, the New Company's Strategic Business Plan will explain what activities the New Company will undertake to deliver against the Government's requirements and expectations. Details of the RIS will be announced later this year, at which time it will be clear how the recommendation made by Richard Brown's Review has been incorporated.

4. Local Roads

Chapter summary

Government response and actions to Local Roads recommendations

- The DfT have asked Local Enterprise Partnerships to consider the recommendation for them to fund resilience of transport to support businesses in their areas.
- The DfT is currently reviewing the feedback to the provisional road condition statistics published in April 2014 with a view towards using it to further improve the robustness of road condition figures.
- The DfT commissioned a project in September 2014 to review the highways codes of practice. This will incorporate the UK roads sector, including the UK Roads Liaison Group and will reflect the recommendation on monitoring and maintenance of bridges, reporting in autumn 2015.
- Although Government is pleased to see evidence of local authorities taking heed of the lessons learned from last winter, we strongly encourage all local highway authorities to undertake a review of lessons learned.
- With the increase in local highways funding from 2015 onwards, the need for Government to provide emergency funding should diminish.
- With the clear benefits of following asset management principles, Government fully supports the recommendation of local authorities developing and utilising asset management strategies to achieve efficiencies in the maintenance of their highways asset.
- The DfT will very shortly consult on future local highways maintenance block funding from 2015/16 onwards. As part of the consultation, the Department will seek views on whether a proportion of the funding should be set aside as an 'incentive element', to encourage authorities to develop asset management strategies as a commitment to undertake efficiencies.
- Given the problems caused by the localised and regional flooding of last winter, Government advises highway authorities to act promptly on the drainage guidance available to them in highways codes of practice.
- Government agree that the identification of a prioritised 'resilient network' of local roads be undertaken as we believe it will bring significant benefits to the overall local road network.
- Collaboration between LHAs is to be encouraged and we are aware of the benefits being achieved where this is already taking place.

Government response to recommendations

26) When bidding for funds, Local Enterprise Partnerships should consider the need for funding to ensure the resilience of the existing transport network which supports businesses in their areas.

4.1 The DfT has sent a letter to Local Enterprise Partnership Chairs and this has also been published - http://www.lepnetwork.net/transport/transport-resilience-review/ - which draws the Review and this recommendation to the attention of the LEP Network's members.

27) The DfT, working as necessary with the Local Government Association and Local Highway Authorities should complete the analysis of road condition statistics as soon as possible, and ensure the time-series is kept up-to-date.

4.2 The Transport Resilience Review raised concerns relating to figures published as the Road Condition Indicator (RCI) and Highways Condition Index (HCI) National Statistics series for classified local authority managed roads. The DfT produced and published revised provisional RCI values for the years 2009/10 and 2010/11 in April 2014. The revised RCI figures were released as "provisional National Statistics" in recognition of the important role the sector can provide in completing quality assurance.

4.3 Although the DfT has full confidence that issues highlighted in the Review have been rectified, it also recognises that confidence of local authorities in these figures is crucial towards ensuring their acceptance.

4.4 The Department launched a call for feedback on the provisional figures in tandem with the April 2014 publication. This exercise was promoted through the sector-led Road Conditions Management Group and through Local Highways Authority contacts who provide data for the publication, as well as in the publication itself. The Department is currently reviewing this feedback with a view towards using it to inform ongoing work to further improve the robustness of these figures and an aim to reinstate a set of final figures.

28) The DfT should use the UK Roads Liaison Group to undertake a review of all matters relating to the monitoring and maintenance of bridges.

4.5 Bridges, especially older masonry bridges, can be put under immense pressure from swollen rivers which can scour foundations and undermine supporting piers. The DfT commissioned a 12 month project in September 2014 to review certain sections of 'Well Maintained Highways', 'Management of Highway Structures' and 'Well Lit Highways' Code of Practices. These are the codes of practice for highway maintenance endorsed by local government. This project, working with the sector including the UK Roads Liaison Group, UK Roads, UK Bridges and UK Lighting Boards, will consider this recommendation in respect of the monitoring and maintenance of bridges and is looking to report in autumn 2015.

29) All local highway authorities need to learn from the events of winter 2013-14 and ensure they are prepared for, and able to respond to, similar extreme weather events in the future.

4.6 The Department strongly encourages local highway authorities to undertake a review of lessons learned in respect of the challenging weather encountered during winter 2013-14. It is expected that lessons are included in updated contingency and operational plans which local highways authorities are responsible for. Government is pleased to see evidence of this having taken place already in a number of authorities.

4.7 For example the Department for Transport have been informed by Bracknell Forest Council that it reviews its winter servicing and adverse weather plan annually, as well as their other emergency plans. They also work closely with the respective Local Resilience Forum to ensure that they are prepared for any extreme weather events that may occur. Like other councils, Bracknell Forest have also taken on board lessons learnt from the 2013-14 winter and have put additional resources into highway drainage.

4.8 Nottinghamshire County Council's maintenance contractor is currently engaged in the first of two 18 month cyclic gully cleansing programmes. Silting information obtained during these cycles will be used to develop an optimised gully cleansing programme which will extend the time between visits to gullies which experience low levels of silting. Conversely, gullies which experience high levels of silting will be cleansed more frequently. It is anticipated that these strategies will allow the Authority to undertake programmed maintenance of its drainage infrastructure minimising costly reactive works.

30) Government should consult Local Highway Authorities on a set of criteria to be applied consistently to emergency highway repair funding through the DfT whenever such funding is made available. These standard bidding criteria should include a period of time in which to invest additional funding which is long enough to encourage a longer-term approach to roads maintenance, are spent in accordance with an asset management approach, and do not skew the market.

4.9 We note the recommendation made by the Review Panel. The DfT allocated £183.5 million to local highway authorities in England, including £10 million to London to help repair roads damaged by the 2013-14 winter. From this, £70 million was allocated to authorities who had submitted a claim through the Severe Weather Recovery Scheme announced in February 2014 - https://www.gov.uk/government/publications/severe-weather-recovery-scheme .

4.10 Over the longer term, the need for the Government to provide emergency funding should diminish. The Department's funding for local highways maintenance is increasing from 2015 onwards and it should be for each local highway authority to retain a contingency for future extreme weather events.

31) Local Highway Authorities should follow asset management principles in managing their assets, and informing spending decisions.

4.11 The Department for Transport continues to work closely with the all parts of the sector to help spread best practice in highways asset management, including through the Highways Maintenance Efficiency Programme which promotes local highways authorities collaborating and sharing best practice across the sector. The HMEP has already published asset management guidance as a means to encourage a more efficient and effective approach to management of highway infrastructure assets.

4.12 Whilst the development of highways asset management plans and strategies is a matter for each highway authority, Government agrees with this recommendation that local highway authorities have asset management strategies in place to ensure the efficient delivery of highway maintenance service for which they are responsible.

32) The DfT should proceed with its proposal to consult on using part of the capital maintenance monies to encourage the development and adoption of Asset Management Plans. However, in order to allow adoption of plans by more authorities, this should be delayed at least until financial year 2016/17.

4.13 The Review recognised the efforts of the DfT in looking to encourage more widespread use of asset management plans. The DfT recently consulted on future local highways maintenance block funding from 2015/16 onwards. As part of this, the Department sought views on whether a proportion of the funding should be set aside as an 'incentive element', to encourage authorities to develop asset management strategies as a commitment to undertake efficiencies. Incorporated within the consultation was consideration of timescales for the proposal.

33) Local Highway Authorities must ensure that drainage assets are maintained in good working order, to reduce the threat and scale of any flooding, paying particular attention to those parts of the network known to be prone to problems, so that the drainage systems operate close to their designed efficiency.

4.14 This recommendation highlights a pervasive issue for local highways infrastructure. The 'Well Maintained Highways, Code of Practice' provides guidance to highway authorities on inspection, clearance and maintenance of drainage systems including gullies, ditches and culverts. Government encourages highway authorities to act on this guidance and make use of other tools and local knowledge to maintain the drainage asset at optimal capacity and manage their risk of failure.

34) Drainage assets should be an integral component of a Local Highway Authority's Asset Management Plan; in addition, all Local Highway Authorities should adopt the recommendations in the Highways Maintenance Efficiency Programme Guidance on the Management of Drainage Assets.

4.15 Closely aligned with the response to recommendation no.31, the Department for Transport encourages local highway authorities to adopt

the principles in the Highways Maintenance Efficiency Programme Guidance on the management of drainage assets.

35) Each Local Highway Authority should make an early start in identifying a 'resilient network' to which it will give priority through maintenance and other measures in order to maintain economic activity and access to key services during extreme weather.

4.16 Richard Brown detailed the need to understand and identify local resilient networks alongside the critical national transport network. We agree that understanding these vulnerabilities at the local highway level is vitally important. A number of Local Authorities are making significant steps toward developing resilient network plans. Evidence from Local Highways Authorities in the south-west of England highlights a well - developed methodology for creating a local resilient road network which we strongly encourage others to follow. This could offer a potential blueprint for other regions. Further related evidence of planning includes Operation Resilience in Hampshire which aims to 'future proof' the road network in the region, and the Severe Weather Impacts Monitoring System (SWIMS), originally developed by Kent County Council, that aims to provide a decision support tool for service providers. Although clear progress is being made, we recommend more widespread adoption of, and engagement with such initiatives.

36) Where Local Highway Authorities are faced with stretched capacity and thus find it difficult to develop and deliver the Asset Management approach and incorporation of drainage, they should investigate the potential for delivering through collaboration with other authorities.

4.17 Government agrees that local highway authorities should collaborate with one another in order to pool resources where feasible to achieve efficiency savings.

4.18 It is for each local highway authority to decide on whether this is feasible. The Highways Maintenance Efficiency Programme has produced the Local Highway Authorities Collaborative Alliance Toolkit - http://www.highwaysefficiency.org.uk/efficiency-resources/collaboration--change/local-highway-authorities-collaborative-alliances-toolkit.html - which outlines how collaboration between authorities has achieved efficiency savings through: entering into contracting or professional services frameworks; achieving greater buying power in procurement activities for services or commodities; standardising within their area either for specifications or services, sharing services; developing LEAN processes and the up-skilling of local authority staff.

4.19 The Department for Transport is also aware of a number of local highway authorities already collaborating on various highway maintenance activities. For example on winter service, Cheshire East local highway authority collaborates with a number of neighbouring authorities on highway management activities such as winter maintenance gritting routes with Stockport Metropolitan Borough Council and a Weather Monitoring and Forecasting Contract with Cheshire West and Chester, Wirral, Halton and Warrington.

37) All Local Highway Authorities should make themselves familiar with the guidance and good practice promoted by the Highways Maintenance Efficiency Programme and ensure it informs their decision-making.

4.20 We recommend Local Highways Authorities using and interacting with the HMEP, and this can be achieved in many ways, including via their website and subscribing to their regular electronic updates.

4.21 HMEP, with the National Highways and Transport (NHT) network and Association of Public Service Excellence (APSE) are running a series of 'Connect and Share' workshop events around the country, the first of which was in Exeter on 13 November 2014. They are working together to achieve two objectives:

- To gather existing good practice material from across the sector and from all regions of England, to validate it through a peer review process and make it available to all as case studies via the HMEP website.
- To encourage engagement between all those involved in providing highways services.

38) The update to Well-Maintained Highways should be used to reflect the drive towards asset management in highways maintenance, with the inclusion of drainage. It should also reflect the points covered in this Review, and particularly address the issue of risk and resilience.

4.22 The Department for Transport's project to review certain sections of Well Maintained Highways, Management of Highway Structures and Well Lit Highways Code of Practices will give consideration to issues raised by the Transport Resilience Review, and will publish its findings by autumn 2015.

5. Railways

Chapter summary

Government response and actions to rail recommendations

- In addition to the priority of safety, we look forward to seeing how Network Rail's asset policy will be developed to incorporate the economic importance of slope failure.
- With the advancement in sensor technologies, we hope to see a step change in deployment of sensors for monitoring the rail asset.
- We expect to see Network Rail's vegetation management strategy have a positive impact on the performance of our railways during periods of high winds and storms.
- The DfT is currently considering the introduction on non-statutory guidance to clarify existing legislation on access to neighbouring land to conduct necessary maintenance works.
- Government is pleased with Network Rail's assurances on the improved knowledge of their flooding risk, including LiDAR mapping of the asset, which we expect to see maintained and updated.
- Network Rail, through its route-based Weather Resilience and Climate Change Plans is identifying and mitigating threats to existing electrical installations including location cabinets so we are less likely to see a repeat of the issues experienced at Maidenhead last winter.
- We look forward to seeing improved resilience in the rail asset through the adoption of axle counters in locations prone to flooding and expect fewer signal-related delays as a result.
- Following the failure of the Dawlish sea-wall, Government will closely follow the progress of Network Rail's assessment of its coastal assets, due to complete by March 2015.
- We learn a review of stress-free temperature, based on assessment of rail track at sites over a twelve month period is due to report in early 2016.
- Design standards will also be periodically reviewed for the overall asset, taking into consideration additional stresses resulting from projected climate change impacts.
- Network Rail has heeded the recommendation on electricity supply and has put in place a 'low voltage supply resilience' programme which will assess and document all sites by October 2016.
- The review of the National Extreme Weather Action Team, due for completion before this winter will be fully embedded in 2015.

- Network Rail must liaise regularly with the Met Office to fully exploit the weather forecasting tools available for the operation of its network.
- We expect to see the majority of operators having additional contingency timetables available in time for this 2014-15 winter season.
- We agree that the Rail Delivery Group proceed with its proposed task and finish group to investigate an amended approach to the compensation regime in times of severe weather disruption.

Government response to recommendations

39) Network Rail should amend its classification system for embankment and slope stability risk to take account of the economic importance of the traffic on a route in addition to the risk to train safety from a slope failure.

5.1 With over 15,000km of embankments and cuttings, mostly constructed over 150 years ago, the Government recognise the potential economic impact of slope failures on the rail network and recognises that some progress has recently been made in this area.

5.2 During 2013-14, Network Rail reviewed and modified its earthwork examination system that had been in use for almost 10 years. This review has produced a new five point scoring system that introduces improved predictability of the examination tool. The revised examination system will shortly be implemented for the first round of earthwork examinations in Control Period 5 (CP5). These recent changes also provide a better understanding of the consequence of a slope failure across the geotechnical asset group on a common risk matrix.

5.3 Whilst Network Rail's earthworks asset policy focuses heavily on safety, proposals are also currently being developed for additional works that will improve their weather resilience; these will be prioritised on the direct and indirect economic importance of disruption. Finally, as part of Network Rail's initiative to develop Resilience Strategies for the network, the economic and social consequences of earthworks (as well as other key asset types) will be included within this work.

40) Network Rail should maintain a strong focus on trialling newly available condition monitoring and slope stabilisation technologies, working with academic and other researchers and with other railway administrations, to improve its ability to identify and anticipate slopes that will fail and target remedial work as efficiently as possible. In addition Network Rail should continue to commission academic research into possible slope stabilisation techniques short of physically rebuilding.

5.4 The Government supports the need for innovative slope stabilisation techniques and for Network Rail to focus on trailing new slope condition monitoring in order to anticipate and mitigate the risk of failures. We are pleased progress is being made, but with the advancement in sensor

technologies, we expect to see a step change in the capability of slope monitoring of the rail asset.

5.5 As commented by the DfT's Science Advisory Council during the Review, there is significant scope for the use of a wider range of remote sensing technologies to support asset management and maintenance. There are a number of emerging technologies (including embedded fibre optics, satellite and aerial remote monitoring and networks of cheap point sensors) that could provide additional capability, which we expect Network Rail to fully investigate the use of.

5.6 For remote monitoring, Network Rail commissioned a technology horizon scan in 2013 to summarise the technology available and its state of readiness for deployment across the rail network. An earthworks monitoring pilot is due to commence installation as early as December 2014. This will test the effectiveness of currently available technology and how this technology can be implemented into weather response procedures. In parallel to the Pilot, alternative technologies earlier in their development phase will be considered and ideas developed as appropriate. For example, Scotland Route is currently engaged in a trial for using digital acoustic sensors to detect rockfalls. Network Rail is involved in research and development work regarding slope stabilisation technology, including for example a Rail Safety Standards Board (RSSB) funded project on tonnage loading effects and settlements on formation and embankments.

41) Network Rail should substantially strengthen their focus on the management of vegetation by:

- **Developing a ten year strategy to bring about a significant reduction in the number of line side trees and the overall level of vegetation. It should support this strategy with appropriate business plan and budget provision.**
- **Developing an active biodiversity strategy to adopt alternative vegetation approaches on cleared sections and engage in off-setting tree planting, generally away from the railway.**
- **Revising their vegetation management strategy to include at-risk embankment slopes, particularly on more vulnerable clay embankments, with ideally trees confined to the bottom one third or so of the slope where they can help stabilise the toe of the slope.**
- **Developing a strategy to prevent vegetation re-growth on embankments, cuttings and the lineside after vegetation clearance. We note that significant sections of route which have had trees cleared over past years are already seeing significant re-growth of saplings and small trees. This will also require a separately identified fund for maintenance.**

5.7 Richard Brown's Review alerts us to the fact that last winter, there were over 1500 incidents where trees or substantial branches were blown over on to railway lines. Included in this figure were 430 reports of trains striking trees or branches, often causing significant damage and disruption. Government agrees that an effective programme of

vegetation management should be implemented, providing it is sufficiently sensitive to the environment and neighbours. We are reassured that plans are well underway.

5.8 In order to reduce the impact of high winds and poor adhesion during the autumn and winter of 2014-15, Network Rail has significantly increased the volume of its vegetation management work whilst remaining sensitive to the views of its line side neighbours. As part of its plans to improve its resilience to extreme weather events and climate change, Network Rail has created a Vegetation Management Capability Development programme that will deliver:

- a review of standards for the management of lineside vegetation to ensure they are appropriate, take account of lessons learned from last winter and the requirements of all key stakeholder groups.
- a biodiversity protocol with a net positive impact on the environment. This will be developed in consultation with external environmental organisations to balance Network Rail's need to remove trees and vegetation for safety and performance reasons with its commitment to habitat management that will benefit biodiversity. This will include offsetting activity involving engagement with impacted local communities to plant trees away from the railway.
- appropriate action to maintain vegetation and prevent significant regrowth.

42) Network Rail should also work with train operating companies and the Office of Rail Regulation to sharpen the economic signals it receives to drive the case for a sustained vegetation management strategy. This should include the cost of rolling stock damage, and the subsequent losses associated with overcrowding and poor performance as a result of reduced rolling stock availability, as well as the risk to safety from collision or derailment.

5.9 We understand Network Rail has gathered information on costs of rolling stock damage to support its case for sustained vegetation management and will continue to develop the business case up until the end of this financial year.

43) The DfT should review, and at the earliest opportunity modify or replace, the 1842 legislation governing Network Rail's ability to access neighbours' property, with more explicit powers to deal with both potential threats to the safe operation or resilience of the railway and for planned maintenance.

5.10 The DfT recognises the Railway Regulation Act 1842 is a long established piece of legislation and the terminology on the use of the powers of entry in section 14 is somewhat antiquated and can be hard to understand. The DfT is considering whether the introduction of a non-statutory guidance on the use of the powers including the DfT's role would assist landowners and the railway companies. In the light of experience with that guidance, consideration could then be given to whether any legislative changes would still be useful also. The guidance would assist by providing a standardised procedure for using the power that is easily understandable.

44) Network Rail should use the recently updated Environment Agency Flooding Risk Maps to identify sections of line that are potentially at risk of fluvial flooding, to supplement its register of at-risk sections based on historic experience.

5.11 Numerous locations on the rail network were subject to flooding during last winter and Government agree that, as asset owner, Network Rail should identify and maintain thorough knowledge of its flooding risks. We are therefore pleased that Network Rail has already incorporated the latest EA maps into its GIS-based asset maps. In addition, Light Detection and Ranging (LiDAR) aerial surveys have very recently been flown and will provide the height of all Network Rail assets above sea level. This is fundamental to the mapping against EA datasets to accurately assess the risk of flooding and represents a significant step forward. Whilst the recommendation has already been addressed, a significant additional enhancement to the asset risk knowledge will occur when the height data becomes available in April 2015.

45) Development of the route Resilience Plans by Network Rail will identify locations where the railway is at risk of flooding. For these locations Network Rail should examine the feasibility of raising location cabinets and track height and make an economic appraisal of the cost and benefits of achieving higher resilience to future flood events.

5.12 We have heard that as part of their resilience planning, Network Rail has improved the resilience on the Great Western route by already raising at-risk lineside electrical equipment. The Government commends this and agrees that similar procedures and measures should be assessed and made available on other routes. As such, at-risk locations and potential mitigations have been identified by Network Rail through the development of the Route Weather Resilience and Climate Change Plans. Potential mitigations are being prioritised and developed further in order to seek funding through incorporation into existing renewal and enhancements workbanks, including in the civils adjustment mechanism, funding through the London and South East weather resilience programme and/or using other funding sources.

46) Network Rail should consider accelerating the conversion of track circuits to axle counters at those sites identified through the route resilience plans as being at high risk of flooding.

5.13 One of the major impacts of flooding on the railway is standing water short-circuiting the electrical circuits installed in the track. Flood water disables the automatic signalling that detects the presence of trains and the normal remedy of deploying hand signallers on the track is a slow process and reduces the line capacity during the incident. The Government supports the need to accelerate the conversion of track circuits to axle counters - which are much less sensitive to water ingress - in areas prone to surface flooding.

5.14 The replacement of track circuits with axle counters at sites with a high risk of flooding was considered by the Routes when they constructed their Weather Resilience and Climate Change Adaptation Plans.

47) Network Rail should work up and deploy its new temporary automatic signalling system widely whenever appropriate.

5.15 In response to flooding at Maidenhead last winter, Network Rail deployed a temporary signalling system enabling services to run much closer to normal speed and capacity. Due to inland flooding taking many forms (i.e. pluvial, fluvial, groundwater, etc.), Government recommend that such innovative techniques to reduce service disruption are used more widely and effectively.

5.16 The temporary solution implemented at Maidenhead was an axle counter system that was replaced after a couple of months when normal signalling capability was restored. However, using this approach, Network Rail will deploy similar solutions in the event of sustained disruption resulting from flooding wherever practicable. Network Rail is developing longer term plans to deploy this technology more quickly in the future. The factors that must be considered when a temporary solution is implemented have been captured and these are being used to develop a solution that is as generic as possible (and thereby minimising the extent of tailoring required). Solutions to the operational difficulties of deploying track circuit and axle counter systems in close proximity (involving different emergency procedures) are also being assessed.

48) Network Rail should commission studies of the resilience of its sections of coastal railway.

5.17 The prolonged line closure at Dawlish last winter demonstrated the risk to coastal sections of track from coastal storms. Whilst the speed of reinstatement is highly commendable, and this coastal and estuarine sections of the Western route has undergone detailed analysis, other sections of coastal railway may face similar risks and Government recognise that future sea-level rise will only increase the frequency and magnitude of these events. We will closely follow the progress of Network Rail in the assessment of their coastal assets. Network Rail is committed to completing individual Asset Management Plans for all of its Coastal and Estuarine Defences. As part of Network Rail's existing asset management practice, it is reviewing its coastal and estuarine defences to ensure that appropriate risk assessments (that take into account increases in extreme weather events) are carried out to allow the development of plans for their maintenance and/or enhancement. This will complete by the end of March 2015 and be used for prioritisation of future work on these assets.

49) Network Rail should keep the Stress Free Temperature under regular review in the light of evolving climate change guidance on extreme summer heat.

5.18 The stress free temperature of track is chosen to balance between the coldest expected winter temperatures and the highest expected summer temperatures. It is clearly important to calculate this correctly, to avoid expansion from summer heat buckling the track. We see this as especially important to consider given the projected increases in both average and peak summer temperatures in the future due to climate change.

5.19 The anticipated change in maximum temperature and its impact on the track has been analysed. In parallel, a project is being commissioned to provide information on how seasonal variations in temperature impact the stress within rails. This will provide a picture of temperature variations seen over a full 12 month period which will provide evidence of the effectiveness of the current stress free temperature range used. This data will provide evidence of the stress distribution throughout the test sites and will either confirm the validity of the existing approach or provide information to support a review of the method of future stressing. Current timescales suggest that this information will be available in early 2016.

50) Network Rail and the rail industry should keep their design standards for new infrastructure and rolling stock under regular review in the light of evolving understanding of the impact of climate change on extreme weather.

5.20 Similarly to recommendation 49, it is accepted that climate projections will place greater stress on some aspects of the physical asset and rolling stock. Revised requirements for temperatures and wind speeds are already being set within specifications. The Asset Management Improvement Programme is reviewing the design standards against weather and climate change and is based on revised parameters accounting for the projected changes to climate variables. Future reviews will be conducted as part of Periodic Reviews.

51) Network Rail should liaise with its electricity suppliers to trace through the routes and sub-stations through which it is supplied to ensure adequate system redundancy and any single points of failure are identified and made suitably resilient. To assist in preparation and planning for times of power disruption the Electricity Networks Association chairs an Emergency Planning Managers' Forum which we would recommend that Network Rail should consider joining.

5.21 Government needs to be assured that sufficient redundancy exists in the supply of power to railways. We are pleased to hear Network Rail has been working with UK Power Networks and National Grid on Emergency Planning for London. This is now being extended to work with the Energy Networks Association and all other Distribution Network Operators (DNOs) in the Emergency Planning Managers' Forum to build a national approach.

5.22 Traction supply connections are considered sufficiently large to be readily visible to DNOs, and are documented and can be managed. The lower voltage supplies are much less visible, more numerous (over 400 points of supply to over 80,000 equipment supplies) and installed over the years to evolving designs and standards which had not included weather resilience as currently understood. Network Rail is establishing a new project involving its Routes and the Electricity Supply Industry to specifically focus on low voltage supply resilience and provide documented visibility of connections and impact within the DNO networks to support future emergency planning. This will be in place by November 2014. Specific milestones will include the assessment and

documentation of high priority sites by October 2015, with all sites assessed and documented by October 2016.

52) Network Rail should investigate the feasibility of convening multi-route Extreme Weather Action Team conferences where appropriate to assist those Train Companies who operate over multiple routes. Extreme Weather Action Team conferences should always be timed to ensure decisions on contingency timetables can be implemented.

5.23 Government strongly agree that the management of disruption and recovery is vital to reduce the impacts of extreme weather on transport services. Although the development and refinement of management processes based on past events is working well, there are still difficulties where operations cross multiple routes.

5.24 Network Rail is taking this forward within its review of the National Extreme Weather Action Team process by November 2015 which was noted in recommendation 10. Full embedment of the process will extend into 2015.

53) Network Rail, on behalf of the rail industry, should liaise with the Met Office to inform how most usefully to exploit greater granularity of forecasts as forecasting capability improves further.

5.25 Weather forecasts are becoming increasingly reliable, with improvements in the granularity of specific spatial and temporal data. Ultimately, dialogue between suppliers and users of forecasts can only improve the capabilities of both parties. Network Rail must therefore fully exploit the tools available to them. Within Network Rail, improved forecasting capability is being delivered by the Weather Resilience and Climate Change (WRCC) Weather Event Response programme. This will result in the phased introduction of an improved forecasting capability initially from April 2015 but then with subsequent upgrades in capability taking place until March 2016.

54) The Rail Delivery Group should continue to investigate improved techniques and technologies for producing contingency timetables so as to be able to have a wider range of timetables on hand to better match different weather events.

5.26 The majority of train operators are expected to have additional contingency timetables available in time for the 2014-15 winter season; Network Rail is leading an initiative to increase the number of contingency timetables that can be employed when short notice severe disruption is caused by weather events, and the cross-industry Sustained Delay Working Group is agreeing an improved process for managing future extended disruption events that will:

- build upon existing processes (the so-called Day A for Day B process) to enable easy implementation of amended timetables during sustained disruption;
- support the Railway Operating Code process for Emergency Timetabling Procedure in the event of an extended disruption;
- deliver improved passenger information, and

- provide clarity on who makes decisions about amended plans and who provides information regarding infrastructure availability.

5.27 In the longer term, the Traffic Management Programme will support the management of reactionary delay. Route studies, which are scheduled to be published in April 2015 will inform the accelerated rollout of the Traffic Management System (TMS). Although the integrated TMS solution will take until the end of Control Period 7 to complete, the 'isolated solution' may be available from 2016 onwards.

55) The DfT, the Office of Rail Regulation and Passenger Focus should work with the Rail Delivery Group to develop an amended approach to performance and compensation regimes during periods of extreme weather-related disruption, which gives the right signals to the industry but is seen to be fair for passengers.

5.28 The Rail Delivery Group has established a small task and finish group to work with the DfT, the ORR and Passenger Focus. This group will report in January 2015 with an update of implementing this initiative.

56) Network Rail should increase the resource available for clearing fallen trees, including considering training more of its own staff in the use of chainsaws. Additionally it should fit multi-purpose vehicles and other trains with powerful lighting to facilitate night time line inspections. It should also investigate other means of identifying fallen trees to direct teams to their location more speedily.

5.29 It has been noted earlier in this section the significant disruption that fallen trees can have on rail services. Government agree with this recommendation as a response to shorten the time taken to deal with fallen trees by reducing the reliance of third parties that are in high demand during storm events. In response, more Network Rail staff, including Mobile Operations Managers, have been trained to use equipment to clear fallen trees. In addition to the greater availability of route clearance teams (e.g. chainsaw gangs) that has resulted from this widening of the skills and competences, the ability to increase the resources available from within the supply chain when required has also been established by the Routes. Network Rail's Sustainable Vegetation Management Strategy, set out in the response to recommendation no. 41, will include work streams incorporating the requirements of this recommendation further.

6. Ports and airports

Chapter summary

Government response and actions to ports and airports recommendations

- We see it as essential for the owners of ports and airports to ensure the resilience of supporting power, communications and IT infrastructure to flood risks.
- Ports must make use of the joint Met Office and Environment Agency flood forecasting capability to more effectively plan and prepare for extreme weather events, including tidal surges.
- The DfT will look at the potential to further develop its modelling on seaport resilience, while in practical terms we see determined action in the Humber to improve the resilience of the region's ports, with Immingham investing in 1:1000 year flood protection.
- The DfT has planned further workshops with the ports sector for general ports resilience and port led regional planning groups are being set up down the East Coast to take forward a tidal surge recovery agenda based on the outputs from last year's surge workshops.
- Government agrees with the importance of having detailed joined-up contingency planning between airports and their major airlines.

Government response to recommendations

57) All major ports and airports should review the location and flood-protection of their power, communications and IT infrastructure in light of the winter's experience at Immingham and Gatwick.

6.1 The Brown Review found similarities between the impacts of extreme weather on ports and airports last winter. The Review cites two examples of flooding at Immingham port and Gatwick airport which highlighted significant scope to improve contingency planning in respect of protecting the supporting infrastructure their operations rely on. While we note both maritime and aviation sectors are strengthening resilience programmes to ensure future weather events do not cause such impacts, the consequences and disruption caused by these incidents last winter means it is essential for this recommendation to be carried out fully.

6.2 In light of the events, Gatwick commissioned the McMillan report into the incidents of winter 2013-14 which outlined a significant number of near-term and long-term programmes to improve resilience. These include:

- Updating flood models in conjunction with the Environment Agency.
- Revising the business level target for flood resilience up to a 1:100 year event.
- Revising electrical and IT installations, lighting, control systems and navigation aids to reduce the risks from flooding and ensure assets are resilient.
- Implementing resilience and redundancy reviews for power and IT infrastructure.

6.3 Similar improvements have been made at Heathrow using updated flood plans and surface water management plans. Critical assets have also been designed with back-up structures.

6.4 The Department's Maritime Security and Resilience team has developed a Tidal Surge Planning template. The template has been circulated to ports through the UK Major Ports Group and the British Ports Association and includes sections on evaluating the current resilience within the ports, damage assessment, recovery planning, communications and workforce planning. In assessing the current situation, ports are advised to consider how they will move and store, on or off site, moveable assets such as cranes and vehicles as well as protect key infrastructure such as transformers, power grids and emergency generators. The port of Immingham which suffered inundation on 05 December 2014 has begun a programme of raising the transformers on site and has also begun working on creating well sign-posted safe exits routes from the port.

58) The Environment Agency and Met Office should work together to improve the granularity and accuracy of coastal flooding forecasts, taking in the complex interaction of tides, wind, wave height and estuarine modelling. Ports should look to be involved in this work to ensure that forecasts take account of known vulnerabilities and are suitably tailored to assess key impacts.

6.5 The Environment Agency and Met Office are currently exploring ways to modernise and improve their coastal surge modelling capability however meaningful progress in this area will require sustained additional investment. We have heard the EA, Met Office and partners would welcome an approach from Port Authorities to better understand their requirements for coastal forecasting services and to discuss the opportunities and challenges inherent in the complex coastal regions. We encourage ports to participate fully by working closely with them in discussing their forecasting requirements for resilience purposes.

6.6 The provision of granular and accurate weather and sea-state data is highly complex but we are pleased to note work is already underway to develop forecasting capability in this area. The Met Office, with support from the EA, has implemented changes since last winter's storms and the Review's publication. The changes have been designed to improve the accuracy of the longer period input data to one of the Met Office's

models that supports the forecasting of total water levels on the coast. This will enable improved longer lead time coastal forecasts, giving ports additional time to prepare for severe weather events. The Met Office continues to seek improvements in its forecast quality by implementing new atmospheric models with a view to improving the accuracy of weather forecast information provided. This will contribute to incremental improvements in coastal flood forecasting of direct value to the ports sector.

59) Given the context of rising sea levels and a higher likelihood of extreme weather events, strategic ports should commission a range of tide-height data and return periods from the Met Office, Environment Agency and other relevant partners. The port operators should decide what defences to put in place against this range of potential surge events.

6.7 Port operators will plan for defences as the riparian owner of the foreshore. Major ports such as those operated by Associated British Ports are seeking partnership arrangements with the EA and Local Resilience Forums to improve defences within each flood cell in a joined up way. ABP has joined with local authorities and local MPs and the Lincolnshire Economic Partnership to make a bid for funding to improve defences around the Humber estuary.

6.8 As a result of the tidal surge last December, Immingham has put in place plans to strengthen frontage defences and install larger lock gates which will allow it to meet a 1 in 1000 year event. The port has also moved its Operations Manager to a full time position as Head of Humber Resilience Planning with the remit to strengthen response and resilience through Humber ports. The DfT is working closely with the port on this agenda with the aim of delivering on this as soon as possible.

6.9 The DfT has recently obtained funding for a 6 month exploratory project with University College London to create a tidal surge model for major ports building on the existing framework of its 'Methodology for Assessing Resilience of Seaports' (MARS) port simulation model. This will develop a tidal surge simulation model for the ports sector to assess the impact of a range of tidal and meteorological circumstances on port sites. The DfT will look in to the possibility of creating a far more substantial piece of work with the potential to deliver significant benefits to the sector.

60) The DfT should facilitate the running of further workshops for ports, region-by-region, in order to ensure that the experience of winter 2013-14 and initiatives to improve resilience are shared within the sector.

6.10 The DfT's Maritime Security and Resilience team has built on the very successful tidal surge seminars it held in autumn 2013. Within each of the four areas that the seminars were held (and potentially Cleveland), port led planning groups are being set up to engage ports and their resilience stakeholders in planning to mitigate the impact of a future surge and speed recovery. ABP Immingham will lead a Humber Group. Harwich Haven Authority will lead an East Anglian Group, Port of London Authority will lead a Thames/ Medway Group and Dover will lead a South

East ferry ports group which will also include French interests. Teesport will potentially lead a group covering the North East. All will seek to deliver against a generic agenda developed from the output of last autumn's tidal surge workshops. Amongst other issues, these groups will look at planning in advance of a flood, planning for recovery, communications between key stakeholders and delivering a capable workforce in the event of significant damage caused by a surge or flood.

61) Port operators and operators of rail and road links to ports should liaise regularly to consider and develop the resilience of inland links to and from ports, including their physical resilience and alternative routes.

6.11 Government understands that through wider involvement in the local resilience fora, ports will liaise regularly with local transport operators to ensure their needs are fully appreciated by key stakeholders in their local community. In addition, the UK Major Ports Group has launched a five-point set of demands for the ports industry. Billed as Ports4Prosperity, the manifesto urges the Government to, amongst other things, prioritise better road and rail links to ports which should improve ports resilience. The Department will be working with the industry to address these concerns.

62) Airports should draw up contingency plans jointly with their major airlines. These should also be jointly exercised.

6.12 Airports and airlines have a well embedded culture of contingency planning due to their lean commercial regime. However, the Brown Review (2014) found evidence of these plans having been worked up to a significant degree solely on an individual operator basis. Last winter's events highlighted that the industry requires a joint effort from airlines, contractors, ground handlers and passengers to improve their response to extreme weather events. The Government agrees with this recommendation, as joint planning is the only way to improve resilience on such large scale commercial operations.

6.13 As highlighted in Chapter 2 current practices generally meet this recommendation as airports have long had in place, or have since developed, a range of planning teams and response groups to co-ordinate and facilitate disruption-based operations and protocols. All plans are agreed with the Airline Operators Committees (AOC), and are approved by their emergency planning groups or control centres which, are made up of airlines, handlers, engineering companies, emergency services, local authorities and other interested parties such as the EA, HA, and Public Health England. These groups also have full participation and mutual agreed goals for their emergency exercises.

6.14 From recent experiences, Gatwick now plan a 'Resilience Cycle' to regularly review contingency plans and operations in close collaboration with airlines and ground handlers to ensure that the plans are fit for purpose and have full commitment across all organisations. Joint disruption plans are also being drawn up with easyJet and British Airways due to the size and nature of these airlines. These plans are designed to provide "open book" style information and joint decision processes during times of crisis.

6.15 Heathrow's newly established Airport Operations Centre (November 2014) will also have a significant role in joint working, and the airport is planning a number of winter resilience roadshows to improve awareness for all business units and external stakeholders. Birmingham Airport's Airport Control Centre (ACC) will monitor operational performance and be the main communication link with airlines, handling agents, air traffic control and the emergency services. At times of severe disruption the Emergency Management Coordination Centre (MCC) may also be initiated.

63) In order to provide greater certainty to travellers and operators, airports should work with their principal airlines to adjust capacity on a pre-emptive basis when there is a high degree of confidence in the forecast of extreme weather, rather than waiting for the weather to hit.

6.16 Government sees this recommendation as being pertinent to those airports which are operating at the very highest level of capacity and the Review stated Heathrow airport's implementation of newly agreed policies on capacity constraints to improve operations - Heathrow's Air Traffic Management Demand and Capacity Balancing (HADACAB). Following a forecast of severe weather, this allows a temporary reduction in capacity to prioritise flights with the minimal alternatives (e.g. long-haul) and mitigate against the cascading effects of unexpected disruption. Gatwick, learning from last winters' events, have identified a similar plan for implementation during major incidents. Airports operating at lower capacity have spared capacity to move schedules if required. The AOA also report a number of improvements to management structures and processes, staffing, and communication protocols that will enable better pre-emptive actions. Examples include joint working parties, such as crisis management teams, between airlines and ground handlers; utilising a single point of contact in emergencies, for example Airport Control Centres; and employing "on-call" and full-time staff during prolonged events. Improvements to general airport communications, both internally and externally (see Chapter 2), will help to improve responses to the Met Office and EA warnings.

7. Post-response

Conclusion

7.1 In reviewing the recommendations made by Richard Brown in his Review, Government has considered them carefully and discussed their implications with the owners and operators of all transport modes. This Government response has shown that not only do we agree with the recommendations but have learned that many transport operators have already made good progress in implementing them.

7.2 Although the sustained wet and windy weather events of last winter served as the catalyst for Richard Brown's Review, we see there being no scope for complacency on planning for resilience at 'quieter' times. The DfT will monitor progress of the actions to the recommendations and will produce a supplementary report on progress next year.

8. Glossary

APRE	Association of Public Service Excellence
BCM	Business Continuity Management
CAA	Civil Aviation Authority
CGI	Computer generated imagery
CP5	Control Period 5
CRIP	Commonly Recognised Information Picture
DfT	Department for Transport
DNO	Distributing Network Operators
DVSA	Driving and Vehicle Standards Agency
EA	Environment Agency
EWAT	Extreme Weather Action Team
FFC	Flood Forecasting Centre
FIDs	Flight Information Displays
FOCs	Freight Operating Companies
FTA	Freight Transport Association
GAL	Gatwick Airport Limited
GIS	Geographic information system
HA	Highways Agency
HADACAB	Heathrow Air Traffic Management Demand & Capacity Balancing
HAIL	Highways Agency Information Line
HAIP	Highways Agency Information Points
HAWIS	HA Weather Information Service
HCI	Highways Condition Index
HMEP	Highways Maintenance Efficiency Programme
LEP	Local Enterprise Partnership
LGA	Local Government Association
LHA	Local Highways Authority
LiDAR	Light Detection and Ranging
LRF	Local Resilience Forum
MARS	Methodology for Assessing Resilience of Seaports
MMC	Emergency Management Coordination Centre
NHT	National Highways and Transport
NTOC	National Traffic Operations Centre
ORR	Office of Rail Regulation
PIDD	Passenger Information During Disruption
RCI	Road Condition Indicator
RIS	Road Investment Strategy
RSSB	Rail Safety Standards Board
SCG	Strategic coordination group
SHC	Strategic Highway Company
SRN	Strategic Road Network
SWIMS	Severe Weather Impacts Monitoring System
TCG	Tactical coordination group
TOCs	Train Operating Companies

TRaCCA	Tomorrow's Railways and Climate Change Adaptation
VMS	Variable Message Signs
VOT	Vehicle Overturning (VOT) Hazard Impact Model
WoSRRP	West of Scotland Regional Resilience Partnership
WRCC	Weather Resilience and Climate Change

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