

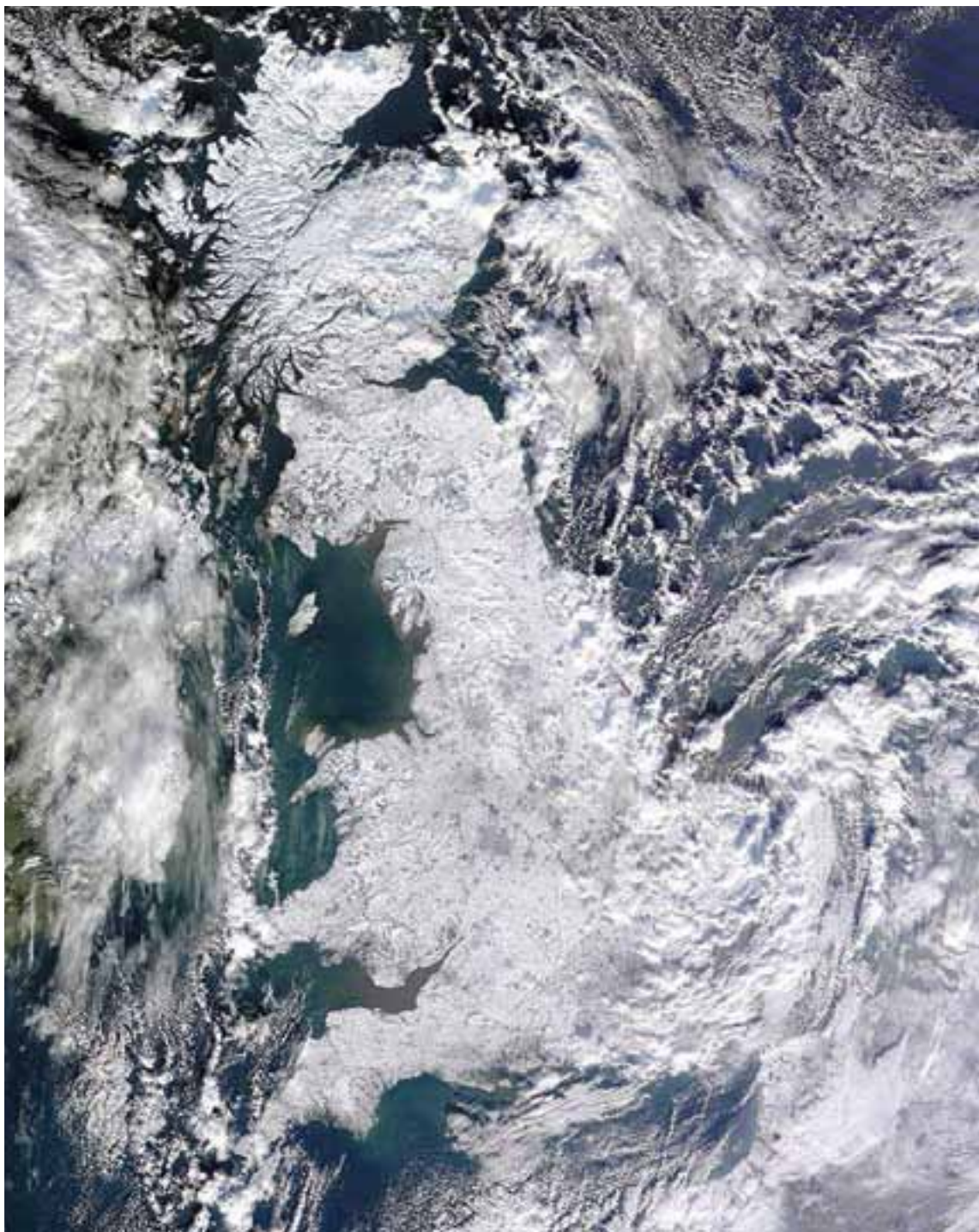


The Resilience of England's Transport Systems in Winter

An Independent Review

Final Report

October 2010



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ISBN 978 1 84864 111 2

Cover photo – Britain in snow, 6 January 2010
Image courtesy of NASA, MODIS Rapid Response Team

Contents

Note:

Parts A (Background and evidence) and B (Key issues and recommendations) and a number of the Appendices are located in the Interim Report, which focuses on highways winter maintenance.[†]

Executive Summary and Recommendations	9
Background	9
The Interim and Final Reports	9
Highway authorities	10
Footways and self help	11
Salt utilisation and technical standards	12
Salt and the supply chain – short term	13
Salt and the supply chain – longer-term resilience	16
Railways	18
Aviation	21
The economics of winter resilience	24
Findings from the Review	25
Recommendations from the Final Report	27
Recommendations from the Interim Report	28
1. Introduction	32
Context and purpose of the Review	32
The approach of the Review	33
Structure of this Report	33
Some general principles	34
Acknowledgements	34
Part C: The rail sector	35
2. Background: roles and responsibilities	36
3. Experience of the last two winters	37
Introduction	37
Winter 2008/09	37
Winter 2009/10	37

[†] *The Resilience of England's Transport Systems in Transport Systems in Winter, An Independent Review, Interim Report* July 2010; <http://transportwinterresilience.independent.gov.uk/docs/interim-report/>

4. Overview of evidence submissions	42
The Call for Evidence and approach adopted	42
Department for Transport	42
Office of Rail Regulation	43
Passenger Focus	44
Network Rail/National Task Force	44
Long distance train operators	46
London and South East	47
Regional	51
Freight	52
5. Key issues and recommendations	53
Resilience of operations	53
Resilience of infrastructure	54
Resilience of train fleets	55
The station environment and access	56
Customer communications	57
International comparisons	57
Recommendations	58
Part D: The aviation sector	60
6. Background: roles and responsibilities	61
Introduction	61
Airports	61
Airlines	62
The Civil Aviation Authority	63
The Department for Transport	63
Weather forecasting	64
7. Experience of the last two winters	65
Winter 2008/09	65
Winter 2009/10	65
8. Overview of evidence submissions	68
The Call for Evidence and approach adopted	68
Principles behind the aviation sector's response to severe weather	69
Planning for severe winter weather	70
Communications and passenger relations	71
De-icing of aircraft	71

De-icing supplies	72
De-icer and environmental contamination	74
Regular review of the Snow Plan and continuous improvement	75
Access to airports	75
Sharing best practice and learning from abroad	76
Other airport issues	77
Lessons learnt	77
9. Key issues and recommendations	81
Resilience of operations – airports	81
Resilience of operations – airlines	83
Supply of de-icing and anti-icing products	84
Environmental issues	86
Customer relations	86
Liaison with highway authorities	87
Conclusions and recommendation	87
Part E: Salt and the supply chain	89
10. The salt supply chain and its longer-term resilience	90
Introduction	90
The challenge	90
Salt supply at the Britain level	91
Analysing stocks at local highway authority level	93
The need for strategic solutions at the macro level	96
Conclusions	101
Recommendations	102
Part F: Progress on issues raised since the Interim Report	103
11. Highway authority good practice	104
Planning and consultation	104
Procurement	105
Operations	106
Technical	108
Communications	108
Continuous review and improvement	110
Local highway authority conferences	111
Recommendation	111

12. The economics of winter resilience	112
Introduction	112
Current economic and social costs of winter disruption	113
Is it worthwhile to increase expenditure on winter resilience?	115
13. The Snow Code	117
Part G: Cross-modal conclusions and recommendations	118
14. Public expectations and communications	119
15. Integration of modes and communications among institutions	121
Example journey 1	122
Example journey 2	123
16. Access to ports and other key installations	124
17. Wider resilience planning	126
Introduction	126
Regional resilience	126
Appendices	128
(those appendices marked * have not been provided but are available with the Interim Report – see Note above)	
A. Terms of Reference	128
Background	128
Purpose of the Study	128
Timetable and reporting	128
Governance	129
Methodology	129
Draft scope of the Review	130
B. <i>*Historical temperature trends</i>	132
C. <i>*Department for Transport leaflet: 'Are You Ready For Winter?'</i>	132
D. <i>*Secretary of State announcements to Parliament of 8 and 12 January 2010</i>	132
E. Call for Evidence	133
F. Distribution list and responses to the Call for Evidence	138
G. <i>*Attendees at Review Hearings and meetings</i>	144
H. <i>*Local Government Association Report, 'Weathering the Storm II', July 2010 (Recommendations)</i>	144
I. <i>*Westminster City Council Press Release, 'Call for Common Sense', 11 January 2010</i>	144

J. Attendees at rail and aviation Hearings	145
Railways	145
Aviation	145
K. Federation of Small Businesses – ICM ‘Voice of Small Business’ Panel: January 2010 survey of the effects of severe winter	146
L. Acronyms	147

Winter Resilience Review

The Independent Review of Winter Resilience was announced by the then Secretary of State for Transport on 30 March 2010, to identify practical measures to improve the response of England's transport sector – road, rail and air – to severe winter weather.

The Review has been conducted by a Panel comprising:

- David Quarmby CBE, Chair, currently chairman of the RAC Foundation, a former director of consultants Colin Buchanan and former chairman of the Strategic Rail Authority;
- Brian Smith, recently retired as Executive Director, Environment Services of Cambridgeshire County Council, and former President of what is now ADEPT (Association of Directors of Environment, Economy, Planning and Transport);
- Chris Green, a career railwayman whose last executive appointment was as CEO of Virgin Trains and who was co-author of the recent Better Rail Stations independent review.

The Panel's Interim Report, published on 26 July 2010, covered the planning and execution of highways winter maintenance and the production, deployment and distribution of salt stock for the road network. It also assessed public expectations, weather forecasting and self-help by the public in clearing snow and ice. The Panel's recommendations identified quick wins that would improve resilience in preparation for next winter.

The second phase of the Review, which has culminated in this Final Report, has considered the resilience of the rail and aviation industries, progress on issues raised in the Interim Report, including how the salt supply chain might be improved in the longer term, good practice in winter service and the economics of winter resilience. Finally it identifies some common themes across all modes, which have emerged from the review, such as communications with the public and the need for an integrated, 'whole journey' approach to resilient transport.

A copy of the Review's Terms of Reference is at Appendix A.

The Winter Resilience Review Panel, October 2010 (left to right: Brian Smith, David Quarmby CBE, Chris Green)



Image courtesy of the Winter Resilience Review Panel

Executive Summary and Recommendations

This Executive Summary and Recommendations are for the whole Review, bringing together material from the Interim Report (published in July 2010) as well as from this Final Report.

Background

1. This is an independent Review of the resilience of England's transport systems to severe winter weather. It was commissioned by the then Secretary of State in March 2010 following the coldest and most extended winter to hit the UK for thirty years. The previous winter (2008/09) had also been severe, following a decade of relatively mild conditions.
2. Both winters were characterised by difficulties in all forms of travel and crises in the availability of road salt for gritting highways, which led to intervention by the Government in the form of the so-called Salt Cell, which monitored stocks and generated advisory allocations of dwindling salt stocks to highway authorities.
3. Many lessons had been learned since the 2008/09 winter, and a report in July 2009 by the UK Roads Liaison Group¹ made a wide-ranging series of recommendations to highway authorities, producers of salt and others involved in dealing with winter conditions.
4. Given the experience of the second severe winter, and with some concern how far all the lessons of the first had been acted upon, this Review was tasked to consider these matters and to recommend practical measures to improve the response of England's transport systems to severe winter weather.
5. While the Review's focus is England, it takes account of the wider UK context – particularly because the UK salt producers supply the whole of Britain, and Scotland and Wales were necessary and key partners in the Salt Cell. The Review has taken evidence from the Scottish and Welsh administrations and representatives of their highway authorities, and we have benefited from their experience and insights. The Review outcomes and Recommendations only apply to England, and it will be for Scottish and Welsh administrations to consider their relevance and what action might be taken in those countries.
6. We have received evidence from some 132 organisations in the private and public sectors, conducted Hearings with 54 of them, visited two salt mines and the operations of two highway authorities, and held many informal discussions with technical experts. We are grateful for all the help and information so freely given.

The Interim and Final Reports

7. The Review is reporting in two stages. The Interim Report, published in July 2010, focused on measures which could be implemented relatively quickly in relation to England's highway networks in preparation for winter 2010/11, particularly for salt supplies. It also dealt with winter service

¹ The UK Roads Liaison Group (UKRLG), which brings together representatives of local highway authorities with DfT, Transport Scotland, the Welsh Assembly Government, the Northern Ireland Roads Service, published. "Lessons from the Severe Weather February 2009" in July 2009

planning by highway authorities, questions around footways and self help, and weather forecasting and climate change.

8. The Final Report, which follows this Executive Summary, reports on railways and aviation, as well as longer-term issues of resilience for the salt supply chain. It also deals with the economics of winter resilience, progress since the publication of the Interim Report, and cross-modal issues of public expectation and communication, and of integration between networks and modes.
9. The substance of the Interim Report was contained in two Parts – A and B. To maintain clarity and continuity with the Interim Report, the substance of this Final Report starts with Part C.
10. This Executive Summary and Recommendations are for the whole Review, bringing together material from both the Interim and Final Reports.

Highway authorities

11. Over 150 local highway authorities are responsible for more than 97% of England's road mileage, carrying some 70% of all traffic. The rest is on the strategic road network of motorways and trunk roads, maintained and operated by the Highways Agency (HA), working through contractors. All highway authorities have statutory duties to ensure as far as is reasonably practical that 'safe passage along the highway is not endangered by snow or ice'. There is an established Code of Practice for highway authorities which covers the planning and delivery of winter service,² and this was updated in December 2009 following the UKRLG report of July 2009.
12. We asked whether the UKRLG recommendations and the updated Code of Practice were appropriate and fit for purpose: almost universally they were, although many witnesses commented that the Government's endorsement of the Recommendations and their incorporation into the updated Code of Practice came too late to have much impact on the planning for and response to last winter.
13. The HA was thought to have done a good job of keeping England's strategic roads open. Lessons had been learned from experience earlier in the decade, and there are clear procedures, standards and specifications against which HA contractors plan and deliver their winter service operations, including the procurement and deployment of their own road salt. It is important for the HA to continue to keep methods and techniques under review, and to share their findings and experience with other highway authorities.
14. Generally local highway authorities did a good job last winter too, given the problems of salt supply. Representatives of small businesses, of road hauliers and bus operators and of road users generally have said to us that local highway authorities needed to consult more widely at the planning stage on the networks they proposed to treat.
15. This was reinforced in the more recent evidence and Hearings with the rail and aviation sectors and their user representative organisations. In our Final Report, we refer again to the need for better consultation and engagement between highway authorities and transport providers about access to their passenger facilities and operational sites – whether bus stations and garages, railway stations, depots, and airports. This is not only about including such key access routes within treated highway networks, but to ensure through cooperation that 'boundary' issues – "whose responsibility is the station forecourt?" – are effectively addressed. This not only helps ensure that

2 UK Roads Liaison Group: *Well-maintained Highways – a Code of Practice for Highway Maintenance Management* July 2005; The Stationery Office

(for example) rail services can continue to operate even when roads are badly affected (as happened in many places last winter), but that travellers can readily access them too. The same need for consultation applies to key installations such as ports, power stations, utilities' plants, freight terminals and so on.

16. Many local highway authorities already do this well, but the evidence we heard suggested there was scope for improvement in a number of authorities. Equally, we are clear that the responsibility for ensuring this engagement happens also sits firmly with the other bodies as well as with the highway authorities.
17. Following such consultation, the communication of winter service plans by local authorities to their residents, businesses and other stakeholders is highly valued. While we had evidence of excellent initiatives by local authorities, there was room for improvement in both communication of their plans and real-time updating through broadcast and electronic media of their road conditions when severe weather came. We believe that such attention to effective consultation and communication is the best way to manage public expectations of what the winter response will be (especially when there is persistent snow), a concern expressed by several witnesses.
18. Market research carried out for the Local Government Association³ and made available to us suggests nevertheless that the public at large take a realistic view of how much it is worth investing to achieve resilience for winter conditions, given the relative infrequency of severe winter weather.
19. Some witnesses spoke of the difficulties of getting a full recognition of best practice in some local authorities in the preparation of their winter resilience plans. There is some evidence that winter resilience planning may not receive sufficient priority or attention in smaller authorities and in some more recently re-organised local councils. It is of course entirely a matter for local authorities who are accountable to their electorates; however the reason we think it is important for all local highway authorities to do their winter planning well is simply because in conditions of salt scarcity "baling out" a local authority because of inadequate initial stock holding could be at the expense of those who had planned their stocks well but still needed additional supplies; this issue was a cause of some resentment last winter.
20. Treating winter planning as an integral part of overall resilience planning for the local authority – as for example now happens in London – can help to ensure that appropriate processes of planning, challenge and validation are applied to the development of winter resilience plans (including salt stockholding).
21. The Local Government Association published their review of last winter and recommendations in July.⁴ Our analysis, findings and recommendations align with theirs on the areas they have covered.
22. During the preparation of the Final Report, the Panel were pleased to hear about many examples of improvement and best practice by local authorities all over the country, either anticipating or reflecting the points we have mentioned above. A number of these examples are set out in the Final Report.

³ Local Government Association poll on attitudes to winter weather, January 2010

⁴ *Weathering the Storm II*, Local Government Association, July 2010

Footways and self help

23. Local Authorities and many other witnesses spoke of public concern over the condition of footways (pavements and other pedestrian areas) in the recent severe winter. The reality is that very few local authorities prioritise the treatment of – or clearance of snow from – footways. Cycleways are also becoming more important as local transport policy focuses on alternatives to private cars. We believe that local authorities should consider whether to treat footways on key access routes to railway stations, bus interchanges and town centres, and pedestrianised areas in town centres, as well as in the vicinity of schools, hospitals and health centres.
24. Many authorities take this as an opportunity to engage lower tier authorities – district councils (who often have parks and gardens staff who can do footway clearance and treatment in winter), town and parish councils, and local communities, supporting them with salt bins.
25. Mention was also made over the confusion which arose last winter as to what steps individual householders and small businesses and shops could take to help themselves and others in tackling snow and ice, as the media had featured pieces relating to the potential legal liability of individuals if someone then had a fall.
26. We note that in other countries, including Germany, Austria and Switzerland, householders and shopkeepers can be required to keep both the pavement and their side of a local road clear of snow and ice; while there is in a place a low-cost public liability insurance which provides cover for any resulting claims.
27. So far as concerns England, although we believe the bar to proving a claim for negligence is quite high, and it is unlikely (though not impossible) that an individual would be sued under such circumstances, there is an opportunity for government to publish simple national guidelines for those who want to clear their frontages, which if observed would provide a defence in the event of litigation. These could be made available by local authorities to their householders.
28. We were impressed that some local authorities who were proactive in encouraging individuals to take action had offered reassurance to the public that reasonable action would not leave them liable. For example Westminster City Council issued a four-point guide for the public on tackling snow and ice (see Chapter 11, Footways, in the Interim Report).
29. In our Interim Report we recommended that the Department for Transport (DfT), consulting as necessary with others including experts and local government, should develop and publish as a matter of urgency a simple code of good practice – a 'Snow Code' – for members of the public and for business owners, for distribution by local authorities.
30. We are pleased to report that this was immediately accepted by the Government, and that the Snow Code is due to be published very shortly.

Salt utilisation and technical standards

31. Witnesses suggested that there is significant room for improving salt utilisation, which would reduce both costs and dependence on a potentially vulnerable supply chain for salt. The means by which research and development takes place seems to us fragmented and uncoordinated, with no strategic oversight of priorities nor of the dissemination of best practice.
32. In the Interim Report we recommended that there should be a comprehensive, authoritative review of technical standards and guidance relating to both the treatments and spread rates of

salt, and this should be led by the UKRLG, with a view to updating the standards published in *Well-maintained Highways*. We also recommended that, to support this, the valuable initiative and work of the NWSRG⁵ should be brought under the wing of the UKRLG.

33. To help conserve salt supplies, reduce cost and maintain or improve effectiveness, the HA – following technical research – are already moving to a system of salt treatment called 'pre-wet'⁶ (which is also used by a number of local highway authorities); the HA have also adopted lower spread rates for precautionary salting of their network and issued instructions to their contractors.
34. This subject has acquired a new urgency as a result of our further work on salt and its supply chain for the Final Report. As explained below, our Recommendations for creating more substantial and sustainable resilience in the salt supply chain include the adoption of lower spread rates, for strategic as well as cost saving reasons. It is clear that the comprehensive, authoritative review led by the UKRLG that we recommended in the Interim Report should be brought forward, with a view to providing clear advice on new standards by early 2011, to inform the pre-season stockbuilding for winter 2011/12, as well as other winter service decisions. As this report was being prepared for publication, we were pleased to hear that the DfT was in the process of commissioning consultants to assist such an urgent review.

Salt and the supply chain – short term

35. The main problem in the last two winters was the availability of rock salt. Following a decade of mild winters, the pre-season stockholdings of salt by English local highway authorities in November 2008 fell considerably short of what was needed for the winter of 2008/09, and led to depletion of mine-held stocks and considerable pressure on in-season salt production. The need for an emergency system of monitoring and allocating dwindling salt supplies to local highway authorities according to need was recognised in Government by the creation in January 2009 of the 'Salt Cell', which was run by the Civil Contingencies Secretariat of the Cabinet Office, with the support of DfT.
36. The Salt Cell was also activated for the winter of 2009/10. As the even greater severity of this winter became evident, it was clear that pre-season stockholdings were again going to be insufficient to meet the need, in spite of being considerable higher than the year before (though not universally in line with the UKRLG recommendations of 6 days' provision for severe weather). On this occasion Salt Cell was activated in early January 2010 and run by DfT. In addition, the then Secretary of State issued in January 2010 "strong guidance" to all highway authorities to reduce their salt utilisation by 25%, revised to 50% a few days later. This was to be achieved by reducing the networks treated and/or reducing spread rates.
37. Analysis of the salt stocks and supplies across the country from January onwards demonstrates how absolutely necessary those drastic reductions in salt utilisation were in order for highway authorities to maintain a treatment capability for the rest of the winter. Although something of a blunt instrument, the Salt Cell is generally felt to have been effective, alongside a degree of mutual aid which took place between local authorities.
38. However, our view is that the need for a Salt Cell type of Government intervention should only arise under the most exceptional circumstances, and our task therefore was to consider and recommend what measures are necessary to make the supply of salt more resilient. We have taken

⁵ The National Winter Service Research Group (NWSRG) is a group comprising representatives of national and local authorities, along with contractors and suppliers, to advance their understanding of the effective de-icing of highways.

⁶ Pre-wet salt is system involving wetting salt with a brine solution prior to spreading.

as a benchmark the need to be able to meet the salt requirements of a winter like last year, but without the need for Salt Cell allocation or forced reductions in salt utilisation.

39. For the Interim Report we focused on measures to deliver this benchmark objective for the forthcoming winter 2010/11 – the subject of this section. For the Final Report we examined a wider range of measures to help ensure longer-term resilience, analysing and modelling the supply chain in more depth (see next section and Part E, Salt and the Supply Chain, of the Final Report).
40. Our observation is that the salt supply chain as currently configured is fundamentally vulnerable and lacks resilience. There are supply chains in other sectors of the economy – such as fertilisers and agrochemicals, as well as seasonal foods – which exhibit similar characteristics of unpredictable seasonal demand coupled with highly constrained, year-round production. What is different about salt is that:
 - a) a significant shortage has profound public policy implications; and
 - b) the market has failed to organise the provision of adequate buffer stocks (the absence of which would be unusual in other sectors).
41. The second observation is that UK supply is insufficient to meet the needs of Britain’s – and England’s – highway authorities in a severe winter. Table ES 1 below sets out an analysis of salt stocks and flows for England last winter.

Table ES 1: Annual analysis of salt stocks and flows for England – 2009/10

Total salt stocks at highway authorities and suppliers – March 2009	0.5m tonnes
Production by UK suppliers for England	1.35m tonnes
Salt imported in the year	0.15m tonnes
Salt use by highway authorities during the year	-1.8m tonnes
Total salt stocks remaining – March 2010	0.2m tonnes

m tonnes = million tonnes of salt

42. This shows that the UK salt production supplied to England’s highway authorities between March 2009 and March 2010 was some 0.45 million tonnes short of the demand, and was fulfilled by drawing on stocks (held by highway authorities and suppliers) by some 0.3 million tonnes between the beginning and end of the year, and by importing some 0.15 million tonnes of salt during the winter season.
43. However, the 1.8 million tonnes use includes the effect of conservation measures introduced as an emergency during the winter – the “strong guidance” issued by the DfT in January 2010 to make drastic reductions to salt use. We have estimated that the *underlying* demand during this period – which would have continued in the absence of such conservation measures and as long as salt was available – was between 0.25 million and 0.4 million tonnes higher than the actual demand, giving a potential annual total of up to 2.2 million tonnes for England.
44. That is considerably in excess of UK salt production capability as proportioned to England (1.45 million tonnes last year), and emphasises the need for appropriate strategic action if the objective is to be able to manage severe winters – infrequent though they are – without having to invoke drastic restrictions of the kind put in place last winter.

45. Planning for winter 2010/11 is more challenging, not only to meet the unconstrained England demand of 2.2 million tonnes but also because the starting stock in March 2010 (i.e. the end of last winter) was only 0.2 million tonnes. To be able to meet this demand would require imports of some 0.75 million tonnes; this also allows for an observed uplift in UK production this year, proportioned for England, from 1.35 million to 1.45 million. See Table ES 2 below.

Table ES 2: Annual analysis of salt stocks and flows for England – Year 2010-11

Total salt stocks at highway authorities and suppliers – March 2010	0.2m tonnes
Production by UK suppliers for England	1.45m tonnes
Imports required	0.75m tonnes
Projected salt use during the year	-2.2m tonnes
Target stocks March 2011	0.2m tonnes

46. Our assessment from the monitoring data collected by DfT in June 2010 suggested that most local highway authorities were re-stocking for the forthcoming winter at significantly higher levels even than autumn 2009. Our analysis for the Interim Report suggested this would exhaust the ability of UK suppliers to meet the pre-season demand at November 2010 by some 0.15 million tonnes, and also leave suppliers with no mine stocks of their own. This analysis, which has been confirmed by more recent data and discussions with the suppliers, suggested a highly vulnerable situation for the forthcoming winter.
47. This is the background which led us to make an urgent recommendation to Government that a quarter of a million tonnes should be procured by import, in time for the beginning of the season, as a strategic buffer stock for England's highway authorities.⁷ This would be the first of a pragmatic 2-stage approach; the second stage would be a review towards the end of December with analysis updated for experience early in the winter and the latest forecasts for the rest of the winter; a decision would then be made whether further strategic stocks should be imported, and how much.
48. Given the shortage of time, we recommended that the HA should be tasked to acquire and manage this strategic stock, separately from and alongside its normal functions relating to the motorway and trunk road network. It should be made available at a premium price which (at least for salt actually used) covers the cost of the salt itself together with storage, handling and onward delivery. In this way local highway authorities are incentivised to continue to build and replenish their salt stocks in line with their normal practice, and to continue to source from the UK commercial suppliers so long as salt continues to be available – rather than to rely on the HA-managed reserve stock unless they really need it.
49. This analysis made no allowance for the voluntary adoption by local highway authorities for more economical spread rates for salt for the forthcoming winter. The Recommendation we made in the Interim Report envisaged that reduced spread rates would be researched and confirmed by the UKRLG in new standards in time for Winter 2011/2012,⁸ but our later analysis for the Final Report has given new urgency for this as a strategic response necessary to create more resilience in the salt supply chain from early 2011.

⁷ Interim Report, Recommendation 1

⁸ Interim Report, Recommendation 8

50. The activities of Salt Cell to collect data on salt stocks, monitor stock movements and disseminate the information were highly valued by all witnesses, irrespective of Salt Cell operating in 'allocation' mode. And we would not have been able to carry out the analysis, modelling and forecasting in this Review without this data nor substantiated our recommendations. That is why we recommended in the Interim Report that a year-round comprehensive data collection, monitoring and dissemination system about salt stocks and supply needs to be put in place, to provide an overview of the supply chain, to make strategic assessments and to give early warning of difficulties and problems.⁹
51. These recommendations were all accepted by Government on the day the Interim Report was published, and action has been in hand since then to implement them.

Salt and the supply chain – longer-term resilience

52. For the Final Report we consider how to ensure resilience of the salt supply chain for the longer term. Our objective still is for the supply chain to meet the requirements of a winter as severe as the last one without emergency intervention by Salt Cell – either to allocate scarce salt supplies or to require a drastic reduction in salt utilisation.
53. Our recommendation in the Interim Report for a Government-run quarter of a million tonne strategic reserve for this winter,¹⁰ which was accepted and is in hand, should not in our view be regarded as an integral part of a long-term sustainable solution – although it remains as a planned emergency action if needed. We set out to find other more sustainable measures which are more readily embedded in the supply chain and in the normal operation of the salt market.
54. In the Interim Report we identified that the UK salt suppliers can only meet the salt needs of an average winter. At the Britain level, there is a 0.9 million tonnes shortfall between the benchmark demand of 3.3 million tonnes and the UK production capacity of 2.4 million tonnes. In any particular winter this can only be made up by imports and – if available – drawing down significant stocks at the end of the previous winter and not replacing them.
55. We need a more resilient solution, and we have looked at four possible approaches.
56. **Commercial/contractual:** Customers would contract with suppliers for a guaranteed supply, with penalties applying if there is a shortfall. It falls to the supplier to organise his supply chain to supplement his production with other sources of supply (e.g. imports), and to manage his risk accordingly. The cost of providing the guarantee and the risk of additional supply not being needed is reflected in the contract price.
57. It is an approach that operates in many markets, but we do not think it can work in the salt market, for a number of reasons – the extremes in demand from one winter to the next and the difficulty of forecasting; little appetite among the suppliers for this approach and the risk involved, coupled with little collective power of 200 independent highway authorities to drive such a development; likely unwillingness of highway authorities under strong financial pressure to pay a higher price for a guaranteed-supply contract.
58. **Trading Solutions:** A range of conditions have to apply for a trading market in a commodity to evolve and be sustained – many sellers and buyers; large volumes and global scale and supply;

9 Interim Report, Recommendation 2

10 Interim Report, Recommendation 1

sophisticated customers who understand trading; volatility in supply side capacity; volatility in demand; and logistics costs which are small in relation to the commodity value. Only one of these conditions applies to the salt market – demand volatility. No market has evolved in salt, and neither of the importers has shown any appetite for being involved. We conclude that this does not offer a solution.

59. **Capacity/throughput increases at suppliers:** Though Cleveland Potash (CP) (where salt is a by-product of mining higher value potash) and Salt Union (SU) (where salt is their business) have different business models, recent months have seen the emergence not only of opportunities for each to increase their throughputs but a practical response as well.
60. As CP's salt output goes via the port terminal at Teesside, where loading of both road vehicles and ships takes place, it is possible for CP to integrate salt imports (especially from other companies within their group) into their GB distribution. It is their business decision whether to do so, but CP have been using imports to help fulfil pre-season customer orders and to replenish their own minestocks.
61. SU distribute almost entirely by road from their Winsford production site (at certain times some salt is delivered by coastal ship from Ellesmere Port). Salt is mined underground, crushed and graded in an underground plant, lifted to the surface, and held for loading into vehicles or transferred to surface storage. Production capacity is currently limited by the throughput of the crushing and grading plant, which is significantly less than either the current mining capacity or the capacity of the surface lifting. We understand that SU are exploring opportunities to increase the capacity of the crushing and grading plant so as to be able to increase output from early 2011. Other improvements in vehicle handling at the surface have been made. Again, it is SU's business decision to complete this upgrade and how and when to increase production.
62. An overall strategy for salt resilience cannot rely unduly on business decisions by commercial enterprises, but it is one component of the strategy and is encouraged by market mechanisms. It can increase UK production/throughput by at least 0.5 million tonnes per annum above current capacity of 2.4 million tonnes.
63. **Reducing Salt Utilisation and redefining standards:** Experience of the emergency reductions last winter suggested that salt spread rates might be reduced with little or no impairment to effectiveness. In our Interim Report we recommended that a thorough, authoritative review of technical standards be carried out to enable such changes to be considered and implemented confidently by local highway authorities from 2011; this would led by the UKRLG, with the benefit of the NWSRG and its good work brought under its wing.
64. It is now clear from our analysis that such reductions in salt utilisation are a necessary part of improving the strategic resilience of the salt supply chain at the macro level. We wish to give added urgency to this authoritative review, and are pleased to hear that the DfT has already commissioned research to get this process under way. If a 20% reduction in achieved spread rates could be achieved, this would reduce the benchmark nationally severe winter demand by some 0.65 million tonnes per annum across Britain, assuming no change in treated networks.
65. Alongside these two important measures, we have considered whether a different approach to stockholding would be beneficial at the local highway authority level, and carefully evaluated some key measures. We present this analysis of salt stocks and use in terms of number of 'runs'¹¹ for

11 These are taken as standard 'runs' over the treated network, at 20g/m². Evidence from many local highway authorities suggests that on average a severe winter will require 4 runs per day, and this is the conversion factor we use

individual local highway authorities; and we note that we can expect the average over all England's local highway authorities to be some 90 runs in our benchmark nationally severe winter. The measures identified are in summary:

- Achieving a large enough pre-season stock level at local highway authorities. Based on our modelling of the salt supply chain and different pre-season stock levels, a sensible balance of factors leads us to propose a benchmark level of 48 runs, equivalent to 12 days' resilience.
 - We know that nearly half of local highway authorities have less than 48 runs capacity. They should fill the capacity they have; we also recommend a careful review of usage history, mutual aid arrangements, opportunities with surrounding authorities, and whether there is a case for increasing capacity towards 48 runs.
 - Where capacity exceeds 48 runs, a similar review of usage history and mutual aid arrangements would inform decisions whether to stock at or above the 48 runs level.
 - Achieving the 'usual' pre-season buffer stockholding at mines and their own remote storage;
 - Focus on achieving these pre-season stock levels, including the use of imports where necessary. There are many ways in which the higher costs of imports can be spread among a number of authorities, through purchasing consortia, informal arrangements, or through the actions of the existing suppliers (e.g. CP);
 - All supported by the vital year round salt stocks and supplies monitoring and forecasting process, to be run by DfT, which was a Recommendation in our Interim Report.¹²
- 66.** While the 2010/11 pre-season planned stock holding intentions represent about 51 runs on average (total storage capacity in England is about 57 runs), there are some significant regional variations, with London and the South East only showing 38 runs, a shortfall of some 50,000 tonnes against a 48 runs benchmark. The London authorities' plans for a 25,000 tonne stockpile is an important measure which halves this shortfall.
- 67.** This package of measures – throughput/capacity increases at the suppliers, prospective reductions in salt utilisation, new higher targets for pre-season stockholding at highway authorities, and focusing on getting pre-season stocks in place there and at the mines (using imports if necessary) – will:
- a) Enable the UK suppliers comfortably to meet the demands of a benchmark severe winter without intervention, converting a 0.9 million tonnes shortfall into a surplus of some quarter of a million tonnes;
 - b) Increase the % of local authorities able to stock 48 runs from 50% to 62%;
 - c) Virtually eliminate the regional shortfall in London and the South East.

Railways

- 68.** Over 20,000 trains are run every weekday on the national rail network, and currently these operate at around 91% punctuality¹³ with around 3% cancellations for safety or operational reasons and around 6% late at destination. Responsibility for railway operations has been divided since rail privatisation in 1994 between:

¹² Interim Report, Recommendation 2

¹³ Defined as the Public Performance Measures (PPM); percentage of trains arriving at their final destination within 5 or 10 minutes of timetable (depending on the type of service), having made all booked calls (i.e. not cancelled or part-cancelled)

- a) Network Rail (NR) for infrastructure;
 - b) train operating companies (TOCs) who run passenger train services mostly under franchises contracted with DfT; and
 - c) the six private freight companies which have bought their assets outright and operate entirely commercially.
- 69.** NR has primary responsibility for the industry's performance, including seasonal preparedness. The National Task Force (NTF) is a standing group comprising NR, all the franchised train company owners or their TOCs, DfT, the Office for Rail Regulation (ORR), and one freight company, which meets four-weekly to address and lead collaborative action on rail industry operational, safety and performance issues. It was created in 1998, and continues to provide a valuable mechanism for the industry, particularly in the recent severe winter disruptions.
- 70.** The winter of 2008/09 hit the rail network with a short, sharp shock in the first week of February. The London and South East region was particularly badly hit by an unusually heavy snow fall which caused severe train cancellations on 2 February. Recovery was swift, and most routes were operating a normal service within two days of the event. The NTF proved an effective mechanism for ensuring that the lessons were learnt across the industry and this enabled a much swifter and more certain response in 2009/10.
- 71.** Winter 2009/10 was the coldest in the UK for 30 years, with national coverage, a month of freezing temperatures from mid-December, and heavy snowfalls. Late December brought the dramatic failure of five Eurostar trains in the Channel Tunnel and the subsequent cancellation of the entire service for three days. This breakdown was followed by poor operational recovery and also highlighted a serious lack of customer service for the thousands of passengers trapped on trains, stranded at stations and unable to travel. These failures have been the subject of an exhaustive Independent Review and its recommendations are currently being implemented. They will therefore not be further discussed in this Report.
- 72.** London Underground succeeded in running its entire sub-surface railway throughout winter 2009/10 apart from some initial problems in the first hour of opening. This was achieved through the extensive use of de-icing trains and the sheer number of trains passing over the exposed conductor rails.
- 73.** For the main railway network, more trains were cancelled last winter than previously, with much of the rail network lying under snow or ice from 18 December to 15 January. Yet as in the 2008/09 winter, recovery from the first few days of winter was swift, and over this period an average 89% of the 'standard service' was run with 72% punctuality. Many valuable lessons from the first severe winter proved to be transferable to the second – including the use of more contingency timetables, improved customer information systems and better winterisation of equipment.
- 74.** NR has the major responsibility for keeping the track available to train operators in times of severe weather, and we found that they generally performed this task well in 2009/10. The organisation had clearly learned lessons from the previous winter and generally had appropriate plans, organisation, staff and equipment to keep as much of their network open as possible.
- 75.** Many routes rightly introduced 'snow timetables' which thinned services by about 20%. While all TOCs are required to prepare contingency timetables for use in such conditions, we found a surprisingly wide range of decisions both over the actual use of such timetables in the severe weather and the level of service curtailment involved, which seemed rather haphazard and not always related to the conditions. The evidence we heard suggested that those TOCs that made

early decisions to thin out their services in a planned way, rather than 'soldiering on' with a steadily deteriorating operation of the standard timetable, tended to provide a more resilient service, whilst still being capable of matching the reduced passenger levels.

76. We recognise the many challenges and complexities in planning and implementing contingency timetables on sections of route used by multiple operators, such as the West Coast Main Line, but it is important nevertheless that effective mechanisms exist between NR and the train operators to facilitate swift decision-making about implementing pre-planned timetables when severe winter weather arrives. In addition, we would suggest that long distance operators should relax the train-specific restrictions on their cheapest tickets on such relatively rare occasions, to allow services to be thinned out without causing ticket problems for passengers on top of the service disruption.
77. From discussions with witnesses about the decision-making mechanisms, the Panel believes there is an 'accountability gap' surrounding the implementation of contingency timetables. Train companies cannot introduce a reduced timetable without first seeking DfT dispensation from their franchise commitments, as well as agreeing the reduced timetable with NR. However, in practice, when severe winter conditions arise, it is NR who formally make the judgement about the availability of the network and advise the operators what reduced services can be run. In these circumstances the DfT would normally accept the NR judgment and grant the dispensation (known as a 'derogation') to the operator concerned without further review.
78. But neither the train operator nor NR can be formally held to account by either the DfT or the ORR for decisions about the introduction of contingency timetables. While such decisions would seem like common-sense judgments made in good faith against considerable time pressures, and would not normally be questioned, the wide variety of decisions taken – ranging from Southeastern's drastic reductions to other companies' attempts to run 100% of services – would suggest that there is potential public and consumer interest in enabling these decisions to be reviewed after the event in a transparent way. We recommend accordingly.
79. The largest number of cancellations occurred on the electrified routes south of the Thames which depend on an exposed conductor rail – the 'third rail'. These services are mainly operated by South West Trains, Southern and Southeastern. In 2009/10 these operators were faced with the combined effect of 2,700 route miles of conductor rail to de-ice and some of the worst weather outside Scotland, especially Southeastern, which operates in Kent and East Sussex. First Capital Connect (FCC) operates over many of the same routes, but had the additional problem of pre-planned cancellations due to driver shortages. On a few days in January less than half the normal number of trains ran, but again the recovery to a near normal service was swift. Commuter services in south east London and in Kent were the exception, where the snow timetable went much further and removed 50% of the services whilst restricting operating hours to 07:00 – 19:00.
80. We understand the reasons for this but agree with Southeastern that a more modest service reduction with near-normal operating hours should be achievable in future winters with more resilient equipment – and especially in the relatively warmer London area. This would distinguish more clearly between London 'Metro' services (where nearly 100% should be planned to run) and the longer distance Kent services (around 80% planned to run).
81. We note and commend the continuing breadth and depth of effort to address the conductor rail problem, through a NR/TOC special project led by the NTF. Proposals already being evaluated or acted upon include trace heating of conductor rails and points heater improvements, de-icing fluids effective at lower temperatures, static de-icers at known black spots, and installation of

de-icing on a sub-fleet of passenger trains (already in hand on some Southeastern trains, similar to London Overground).

82. The availability of salt for treating footways and station car parks became a serious problem by the end of January 2010, and both NR and the train companies complained about the difficulties of obtaining salt once the Salt Cell came into action to prioritise salt for and between highway authorities. The volumes of salt required are not great, and the rail industry should take steps to ensure that sufficient salt for treatment of their own footways and estate in a severe winter is in place in advance of the season.
83. Mention has already been made in the Highways section above of the need for clarity between those public areas owned by the local highway authority and those owned by the rail industry. Often the boundary is unclear, even to the organisations involved – for example, a station forecourt, an access footway, or a cycle parking area, and we heard of many areas which were left out. In their preparations for severe weather the railway companies and local authorities should take steps to clarify between themselves the respective responsibilities for such areas, and to arrive at practical arrangements to ensure that the treatments of such areas are carried out in a sensible and coordinated way.
84. Communication with customers is absolutely critical in times of disruption. The National Rail Enquiry Service succeeded in dealing with the increase in website enquiries, with the peak-day demand of 1.5 million hits. The increased capability already delivered will be needed in the coming winter as the demand for passenger information continues to grow, due in part to the increasing confidence that passengers have about being able to obtain reliable information.
85. The Passenger Information During Disruption (PIDDD) project has been put in place under the NTF to provide clear leadership in raising communications to a high and consistent standard across the network, with the ability to communicate quickly to customers both changes in planned service and the state of service on the network in real-time. Many TOCs have developed a wider range of communication channels for keeping customers in touch with service changes and service performance – including email, texting and growing use of social media, as well as the internet. We strongly commend such initiatives; not only are these very helpful for travellers, but they also provide some counter to the necessarily simplistic media messages about winter conditions and 'don't travel unless you have to' advice – particularly given the evident ability of the rail system to achieve a rapid recovery after the initial onset of severe winter conditions. The Panel was impressed with the level of commitment and progress in this area.

Aviation

86. In the United Kingdom, airports and airlines are mostly privately owned organisations operating within a commercial market. The top 40 airports in the UK dealt with just under 2.8 million aircraft movements in 2008/09 and handled nearly 222 million passengers.
87. The Civil Aviation Authority (CAA) is the economic and safety regulator for the industry, with responsibility also for consumer protection and airspace policy. Airport operators are required to have a 'Snow Plan'¹⁴ which formalises the procedures and resources necessary to clear an airport of snow and ice. In the UK this requirement means that an airport operator will be solely responsible

14 A Snow Plan will detail the resources and procedures necessary to clear an airport of snow and ice and enable the safe operation of services to resume

for deciding whether it is safe to operate, and it will normally advise the airlines of what services it can provide in severe weather conditions.

- 88.** The impact of winter weather on airport operations can vary greatly from one airport to another, according to its location, height and intensity of capacity utilisation and other factors. The trigger for action is the level of snow, ice or slush – commonly known as “contamination” – forming on runways, taxiways and aprons, with a trigger level of a depth of 3mm.
- 89.** As salt is corrosive to airplanes and aviation equipment, prevention and clearance of snow and ice airside (i.e. on runways, taxiways, aprons and stands) is undertaken by the use of liquid chemicals – normally based on potassium acetate or glycol. However, these substances can pollute as run-off from the hard surfaces when they enter local water courses. Airports are required to prevent excessive contamination occurring, but this can be difficult in prolonged periods of severe winter weather. The importance of this issue varies considerably between airports, depending on their location in relation to specific water courses and the size of their holding lagoons. Landside parts of the airport away from aircraft operations – particularly passenger areas and access roads – can be cleared with more traditional road salt. This is to enable staff, third parties, passengers, together with servicing vehicles and deliveries, access to and egress from the airport.
- 90.** In the winter of 2008/09, southern England experienced sudden, heavy snowfall overnight on 1 and 2 February affecting all major airports in the South East and causing significant delays and cancellations. But generally the industry responded swiftly, and by 3 February the airports resumed a near normal service. It was a different story for England’s regional airports which experienced milder conditions compared to southern England.
- 91.** Last winter, the exceptionally severe weather conditions experienced across the country between mid December and through to February 2010 and the extensive snow meant that most airports had to suspend flight operations – albeit for short periods – to allow snow/ice clearance operations on runways, taxiways and stands. Nevertheless, over the whole winter period the seven major airports saw only 40 closures between them, mostly for much less than five hours. Heathrow Airport is particularly vulnerable to severe disruption when runways need to be closed; it has been operating near capacity for some time, and for airlines operating at Heathrow it is more difficult to recover lost time. Despite this, while there were seven occasions last winter when a runway was shut, Heathrow remained operational throughout by using the other runway, and the average length of a runway closure was just over an hour.
- 92.** Airlines are responsible for clearing their own aircraft of snow and ice, and this is carried out either directly by the airline’s staff or their handling agent at the airport. This is undertaken by spraying a glycol-based chemical directly onto the aircraft at the stand. Some foreign airports that experience regular severe winter weather have a separate facility for treating all aircraft at the runway entry point (‘pan de-icing’), and this method was successfully trialled by British Airways this winter at Heathrow.
- 93.** The impact on airline operations of airport or runway closures due to winter conditions depends on whether there is also disruption at other airports on their network, as well as the intensity of aircraft utilisation and the arrangements for managing disruption. The extent of disruption to flights and passengers depends on the tightness with which the airline already schedules its aircraft and crews, and this varies between companies according to their business model. Typically, low-cost airlines plan for short turn-rounds (often 30 minutes) and four journeys per aircraft per day or more. The disruption due to even short runway closures will therefore be more than for the full service airlines with longer turn rounds.

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94. The real test of the airline's capability is the speed of recovery to normal operations; this in turn depends on the experience, skill and judgments of the flight operations teams: one crucial decision is how early to cancel and/or re-schedule flights as opposed to 'soldiering on' with a near-normal schedule whose performance gradually deteriorates – a similar type of decision to that faced by the train operators.
 95. It is evident to the Panel that different airlines take different approaches – even in similar situations (as also happens with different rail operators). We recognise the unique circumstances and impact of decisions that each airline faces. But there does seem to be some generic evidence that earlier, more decisive cancellations and rescheduling (rather than 'soldiering on') helps to accelerate recovery to normality after the disruption, and is more helpful for passengers because of the certainty – even if unwelcome – against which they can make their plans.
 96. While airport and runway closures are recorded, it is difficult to track after a period of sustained cold weather what the actual level disruption was – flight cancellations, diversions and rescheduling. While the CAA publish some performance in their quarterly press notice and on a monthly basis it is not presented to a level of detail or interpreted in a way that enables the market and the public at large to see clearly how the airlines and airports managed. This is very different from the railways where such information is clearly set out and published; however we recognise there is a wider range of factors outside airlines' control affecting their performance than is the case for railways, which can make a fair interpretation more difficult.
 97. We were advised of various recent initiatives to collect and publish airline performance information over recent years by the Air Transport Users Council, the European Commission and the Association of European Airlines, but none are current.
 98. We believe nevertheless that airline performance information is important and valuable to travellers, the market and the public at large. Given the challenges of obtaining this from what is a highly competitive, commercial market, we believe the best approach would be to build on the monthly reports that the CAA make of operations at the 10 major UK airports, and develop a clearer summary and interpretation for the benefit of consumers and the public at large. We make a Recommendation to this effect.
 99. Just as supplies of road salt were severely stretched across Europe in winter 2009/10, so were the aviation sector's de-icing materials. Some airports came within hours of running out and we heard that only through the use of alternative, less environmentally desirable, products were some runways and aprons kept clear.
 100. However, witnesses spoke consistently of the intention by both airport operators and airlines' contractors to increase stocks of de-icing and anti-icing products in time for the coming season. This appears to the Panel the right response. This is a market capable of meeting demand for these products, and sufficient stocks need to be held at the point of use. We see no case for government intervention in this market.
 101. The same point applies to stocks of road salt for treatment of landside roads, footways and car parks. The volume of salt needed by airports for their own use is very small in comparison with that required for general highways use; airports or their contractors should acquire sufficient road salt ahead of the season to be able to cover their needs even in a severe winter.
 102. The burden of communicating with air travellers prior to travel falls on airlines, as does the responsibility for information and care of passengers when at the airport. It is the airline that has the direct contractual relationship with the passenger, and to whom the regulations apply about
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compensation and reimbursement of expenses incurred in disruption. We understand that reimbursement of expenses and the Denied Boarding, Cancellation and Delay arrangements generally work well at times of winter disruption.

- 103.** Generally airlines make full use of electronic media – email, texts, and increasingly social networks – for direct communication with passengers about their flights, supported by comprehensive and constantly updated website information. Some airlines take more care than others to ensure such messages are received, for example by passengers at their destination waiting to return home who may not have easy access to the internet or their email.
- 104.** Air travellers now have high expectations of the timeliness and relevance of direct communications they receive from their airline at times of disruption, and certainly for the main UK and Ireland carriers this is generally fulfilled.
- 105.** Airports' and airlines' experience of last winter clearly demonstrated a high level of resilience while maintaining required standards of safe operation. It is also clear that the airports and airlines are – like the rail industry – effective 'learning organisations' where systematic review of previous experience drive improvements which are then embedded in forward plans.

The economics of winter resilience

- 106.** It seemed appropriate that a review as wide ranging as this should look at the social and economic costs of winter disruption. Estimates of such costs were set against the current expenditure on winter resilience, and we then considered whether there was any case for increasing the level of expenditure if, by doing so, the lessening of disruption would confer disproportionate benefits to the economy and the community at large.
- 107.** The social and economic effects of limited or no transport accessibility for some or all of a severe winter period cover a wide range – from the direct economic costs of lost output if people cannot get to work, to the personal time lost from travel delays and lost journeys, additional road vehicle collisions, the personal and health service costs of slips, trips and falls causing personal injury, and so on. Estimating these in conditions of winter disruption entails making a myriad of assumptions, and ranges have been estimated to reflect the uncertainty. However, for the sake of simplicity and to give a sense of the order of magnitude, we report here the 'central' estimates.
- 108.** We have also distinguished between those elements with a 'hard' economic value to the economy – for example lost output, increased vehicle collisions, increased costs to the National Health Service – and those which economists call a 'welfare' cost, that is effects which are deleterious or inconvenient for individuals and can be valued on an estimated 'willingness to pay to avoid' basis, but have no direct impact on the economy.
- 109.** Averaging over different winters, the total cost is estimated around £1 billion – of which half is 'hard' cost to the economy, and half is 'welfare' costs to the individual. In each case, the main cost arises from lost time and lost journeys – both for vehicular travel and for pedestrians. Against this, the cost to highway authorities in England of providing winter service is around £160 million per annum.
- 110.** We have evaluated the effect of a nominal increase of 50% in highway authorities' expenditure (£80 million increase to £240 million per annum). Assuming this was spent on treating a significantly higher proportion of local road networks, extensive treatment of footways, pedestrian areas and cycleways, and deployment of more snow ploughs to clear snow more quickly from

roads (for example more farm contracts in rural areas), then we estimate that the incremental benefits lie in the range £50 million to £300 million, with a central estimate of £200 million.

- 111.** These figures are at best only broadly indicative, and do not support a generic case for increasing expenditure on winter resilience. In any case, the very considerable pressures on public expenditure by local authorities and the HA at this time make it just untenable.
- 112.** However, it is likely that carefully targeted additional activity will generate significant benefits. For example, more extensive clearance capability in areas of significant travel demand which are particularly subject to snow and adverse conditions could be good value for money, as could more treatment of key footway routes where pedestrian flows are high – even given the low probability of severe winters. They would be worth considering if the opportunity arises to increment expenditure on winter resilience, with a local economic benefit. Snow clearance benefits arise, of course, only when the weather is more severe (and less frequent), so measures which limit the 'base' cost of maintaining this capability even if it is relatively costly when brought into action, would seem a good approach.

Findings from the Review

- 113.** The lessons of the winter 2008/09 seem to have been well learnt across all the organisations involved in managing England's road networks for road users and those who maintain and operate our public transport systems – bus, rail and aviation. As a result, performance during the (unexpectedly) harder winter of 2009/10 was considerably better than it might have been.
- 114.** Nevertheless, there are still some important lessons to emerge from last winter, with some common themes that run across all modes of transport.
- 115.** The first is that the supply of salt for highways is still potentially a major issue – and there is no silver bullet to ensure resilience for all but the most exceptional winters. Our recommendation in the Interim Report for a strategic reserve of a quarter of a million tonnes for this winter, which was accepted and is in hand, should not be regarded as an integral part of a long-term sustainable solution¹⁵ – although it remains as a planned emergency action if needed. A combination of rather higher stockholding benchmarks for the beginning of winter season (and a focus on achieving those, if necessary by importing salt), permanent adoption of lower salt spread rates and a willingness by the two main suppliers to commit to higher throughput rates when the market demands it will, if successful, secure sufficient resilience to meet the needs of a severe winter – underpinned by a comprehensive whole market salt stock monitoring and forecasting system to be overseen by DfT.
- 116.** On the evidence we received, the UKRLG Report on the *Lessons of Severe Weather* of July 2009 and the updated code of practice *Well Maintained Highways* continue to provide the most comprehensive and fit for purpose advice on winter service policy and planning for local highway authorities, though with some specific features modified and reinforced by our Review and our Recommendations.
- 117.** Most highway authorities have carried out reviews and scrutinies of their own winter service policy and plans, and the whole process seems now to attract more senior management and elected member attention than in the past. We draw attention to some features of this planning process that our evidence suggests can still be improved. And the benefits of embedding winter planning in

15 Interim Report, Recommendation 1

a wider resilience planning context, with the process and disciplines this brings, are increasingly appreciated.

- 118.** There is the opportunity to engage more systematically with lower tier authorities and local communities in gritting and snow clearance, particularly for footways and cycleways about which public expectations are rising. And our proposed 'Snow Code' to give the public and shopkeepers more confidence about clearing their own frontages and guard them against negligence claims is being taken forward urgently by government.
- 119.** Both the rail and aviation sectors now demonstrate a high degree of competence and professionalism in managing the impacts of severe winter weather, and the different players in the industry work well and effectively together, learning from past experience. The 'third rail' networks south of the Thames continue to be vulnerable to ice and snow, and we welcome the continuing commitment to develop and implement further contingency measures. Both sectors should be capable of organising their own supplies and stocks of road salt and de-icing materials without needing to call on government intervention.
- 120.** Both sectors attach considerable importance to communicating with their travellers. Further improvements for rail passengers are still to come, building on their achievements so far. Meanwhile, residents and public transport customers have growing expectations about the quality and timeliness of real-time information about transport networks and services during severe winter disruption, and the means of receiving it. Given the rapid proliferation of communication technologies and channels available, local authorities and transport operators should ask themselves whether there is room for further development in the real-time services they currently provide.
- 121.** And we believe that more transparency about the performance of airlines and airports during winter can be achieved by building on the CAA's existing monthly reports.
- 122.** A common theme across rail and aviation was how decisions were made to implement contingency timetables and schedules, with wide variation in practice within each sector. While recognising the unique position of each operator, the evidence suggested that early, decisive implementation of emergency schedules rather than soldiering on with steadily deteriorating reliability not only ensured better post-event recovery but gave certainty (if unwelcome at times) to passengers for them to make their own plans.
- 123.** A constant theme through all our evidence was the need for 'joining up' the treatment plans of different modes of transport, to ensure that travellers can benefit through their whole journey and not just on parts of it. Highway authorities and transport providers of all modes need to ensure that pedestrian routes to public transport and access roads to interchanges, depots and airports are part of the 'treated' networks, and that any boundary issues of who salts which parts of the bus station or pedestrian route to the rail station are resolved well in advance.
- 124.** Finally, our brief examination of the economics of winter resilience suggests that on average winters in England incur economic and social costs of about £1 billion, of which half is 'hard' cost to the economy; while the current cost to highway authorities of winter resilience is about £160 million. It seems that increasing expenditure at the margin, in certain carefully defined areas, on such measures as treating more of the highway network, covering pedestrian routes, and providing more snow clearing capability, could deliver local economic benefits more than commensurate with the cost.

Recommendations from the Final Report

The rail sector

Recommendation 18: During the Winter planning process, the National Task Force should encourage Network Rail and the train operators to ensure that consistent criteria are developed for decision-making about the use of contingency timetables and then applied to their implementation when winter conditions require.

Recommendation 19: The Department for Transport and/or Office of Rail Regulation should provide a new mechanism under which Network Rail can subsequently be held accountable for decisions it makes (in consultation with the train operators) about the implementation of contingency timetables and the levels of service reduction involved, which addresses the current lack of formal post-event review.

Recommendation 20: The rail industry should continue its development of technical solutions to improve winter resilience, particularly those relating to the maintenance of traction contact on the third rail network south of the Thames, including best practice from elsewhere, such as Transport for London. Southeastern Trains' and Network Rail's proposal to fit de-icing equipment to some of the operator's passenger trains for winter 2010/11 as a pilot to supplement Network Rail's own de-icing trains is to be commended.

Recommendation 21: Individual rail companies and Network Rail should make regular contact with local highway authorities during the winter planning process and season to ensure that the boundaries between public and railway-owned areas regarding the road and footway access to stations, depots and signalling centres are clearly understood between their organisations, and that both are treated in a coordinated way during periods of snow and ice.

The aviation sector

Recommendation 22: That the Civil Aviation Authority considers how it might develop its currently published performance data to improve the presentation, commentary and interpretation of airline performance information, to inform passengers and the market and encourage improvements across the industry.

Salt and the supply chain

Recommendation 23: The review of best practice and technical standards recommended in the Interim Report as a task for the UK Roads Liaison Group should be given added urgency, focusing on research which would underpin recommendations for the adoption of lower salt spread rates as a strategic initiative to improve resilience of the salt supply chain; together with a timescale for adoption in early 2011.

Recommendation 24: The two main UK suppliers should be encouraged to continue their current initiatives to increase their throughputs – Cleveland Potash with its exploration of imports to meet high demand from its customers and to replenish its own mine stocks; Salt Union with its plans to increase throughput of the underground crushing and grading plant – as a means of increasing total mine output rates.

Recommendation 25: A new resilience benchmark of 12 days/48 runs should be adopted for pre-season stockholding for English local highway authorities; they should then review their history of usage and mutual aid or other arrangements to consider:

- a) whether there is a case for increasing capacity towards 48 runs if it is currently less than this, in addition to filling the capacity they have; or
- b) at what level to stock – at or above the 48 runs level – where the capacity exists to do so.

Recommendation 26: To ensure optimum resilience of the supply chain through a nationally severe winter, achieving benchmark resilience levels across Britain by the beginning of November should be treated as the key priority, facilitated where necessary by imports. The year-round monitoring system being put in place will analyse and overview this process and enable any future shortfall to be addressed.

Local highway authorities

Recommendation 27: Building on the UK Roads Liaison Group Report of July 2009, that the *Well-maintained Highways* code of practice continues to be regarded as best practice by local highway authorities for winter service policy and planning, as modified and reinforced by the specific Recommendations of this Review.

Recommendation 28: Local highway authorities should in their winter planning and consultation consider the extent of treatment of footways, especially in relation to bus stops, railway stations and other public transport interchanges as well as to town centres, business premises, schools and health facilities.

Recommendations from the Interim Report

Salt and the supply chain

Recommendation 1: That for the forthcoming winter the need for a strategic reserve stock of salt for England's highway authorities be recognised, if the resilience to handle the risk of its being as severe as last winter is to be secured, and given the projected shortfall of UK production against the possible demand; and that the Highways Agency should be tasked, on behalf of the Secretary of State, to acquire by import, store and make available on terms to be agreed an initial reserve stock of some 0.25 million tonnes of salt for 'last resort' use by local highway authorities and for itself; and that the DfT at the end of December should formally lead the consideration and review (using information and forecasts then available) of whether further additional reserve stocks should be secured for the remainder of the winter.

Recommendation 2: A systematic year-round process of collecting data, monitoring salt stocks and movements and disseminating the findings should be put in place by DfT, to give advance warning of any issues affecting prospective salt supplies and availability, and to provide the basis for regular strategic overviews of the salt supply chain and any necessary decisions by them or other parties. This should be independent of any need for the operation of Salt Cell in 'allocation' mode.

Recommendation 3: The vulnerability and lack of resilience of the salt supply chain as currently configured should be recognised; that some targeted intervention needs to be designed which will substantially improve the resilience of the supply chain with minimal impact on the normal functioning of the salt market in the UK; and to note that the development and evaluation of proposals for this is a key part of the Review's stage two work, which will be presented in the Final Report in the autumn.

Recommendation 4: DfT should consult with the Scottish and Welsh authorities about the implications for Scotland and Wales of these short term recommendations for the salt supply chain.

Local highway authorities

Recommendation 5: Every local highway authority should have a robust winter service plan, and should regularly review the key elements of it, including network coverage, operational procedures and standards and appropriate salt stockholding to meet defined resilience standards, all in line with current best practice.

Recommendation 6: Consultation on treated networks should be broadly drawn to include business representatives, passenger and freight transport operators and local communities, as well as health and education service providers; and to help manage public expectations should be followed by clear and comprehensive communications of winter service plans, supported by good real-time communications through media and on-line when winter conditions arrive.

Recommendation 7: As many local highway authorities already do, authorities should collaborate with and support lower-tier authorities to help ensure that maximum practical winter support can be given in areas and communities beyond the treated networks, including possibly the treatment of key footways and pedestrianised areas.

Recommendation 8: While recognising that research and technical information in this area is relatively fragmented and uncoordinated, and that available evidence needs to be presented more authoritatively, local highway authorities should be aware of the opportunities to improve salt utilisation through adopting lower spread rates and alternative treatment methods, both to reduce cost and to reduce demands on a potentially vulnerable salt supply chain.

Recommendation 9: Professional bodies and the Local Government Association should encourage the more widespread dissemination and adoption of best practice in the preparation and delivery of winter service plans.

Recommendation 10: While recognising that the resilience of salt supply is being addressed as a nationwide issue, local highway authorities can support this and should:

- all participate fully in the year-round systematic information collection and monitoring of salt stocks and movements which we are recommending should be adopted by DfT;
- ensure their own planning of salt stocks and supply is sound and carried out in accordance with best practice, and supported by practical measures to improve salt utilisation;
- put in place (or confirm where existing) mutual aid with neighbouring authorities to help address localised shortages.

Recommendation 11: Local highway authorities should treat their winter service planning as an integral part of wider general resilience planning for civil contingencies, bringing to the development of winter service plans the benefits of processes and disciplines associated with resilience planning, together with the culture of constructive challenge and validation.

Highways Agency

Recommendation 12: The Highways Agency should be commended for the research-based measures it has put in place to improve its salt utilisation. It should:

- continue to research and monitor the efficiency of its practices and strive to improve the cost-effectiveness of its winter service operation;
- share best practice, research and knowledge with other highway authorities.

Salt utilisation and standards

Recommendation 13: There should be a comprehensive, authoritative review of technical standards and guidance relating to both the treatment and the spread rates of salt, based on research and evidence as necessary, leading to the production of practical guidance for practitioners as well as at a policy and planning level. This should be led by the UK Roads Liaison Group (see next recommendation).

Recommendation 14: The valuable initiative and work of the National Winter Service Research Group should be brought under the wing of the UK Roads Liaison Group, who should take responsibility for and set the strategy for its work programme, including its contribution to the comprehensive review of technical standards and methods.

The 'Snow Code'

Recommendation 15: The Department for Transport should develop, in collaboration with local government representatives and appropriate experts, a code setting out good practice for members of the public, including business owners, in clearing snow and ice from footways. This should:

- be produced by the end of October 2010 in time for the coming winter;
- be short, along the lines of Westminster City Council's advice to its residents;
- set a standard which, if observed, should guard the public against negligence claims;
- be made available to households by local authorities.

Weather and climate change

Recommendation 16: We note and commend the generally high quality and accuracy of short term (0–5 days) weather forecasting now available to support the operational decisions of highway authorities and their contractors, and recommend that the weather forecasters continue to develop their capabilities both for 15–30 day forecasting to meet the resource planning needs of highway authorities, and for longer term seasonal forecasting.

Recommendation 17: Given that the probability of next winter being severe continues to be relatively small but that severe winters are still possible despite the warming trend, we recommend that winter resilience planning – and the securing of greater resilience in the supply of salt – should continue on the basis of dealing with winters of a severity similar to that of 2009/2010.

1. Introduction

Context and purpose of the Review

- 1.1 The winter of 2008/09 was severe – the worst for almost 20 years – following a decade of relatively mild weather. This resulted in disruption to transport in the road, rail and aviation sectors.
- 1.2 That difficult winter was followed in 2009/10 by one which was colder still; the most severe in the UK for 30 years, with sustained freezing conditions and coverage of the whole country. Across the UK, mean monthly temperatures were well below normal for all three months of winter. There were widespread and heavy snowfalls throughout the winter on a number of occasions, affecting almost all parts of Britain at some time.
- 1.3 Conditions were extremely challenging across the whole country – yet, for the most part, transport networks coped well. The biggest issue nationally became the availability of road salt, but the weather conditions caused disruption for rail and aviation as well.
- 1.4 The then Secretary of State for Transport commissioned this Review in March 2010 to consider the experience of winter 2009/10 and recommend practical measures to improve the response of England’s transport systems to severe winter weather.
- 1.5 An Interim Report¹⁶ was published on 26 July 2010, focusing on roads and road users, and on issues that could be addressed, and measures taken quickly in preparation for winter 2010/11. In particular, that Report made recommendations about:
 - ensuring adequate stocks of road salt for the coming winter, and in particular the urgent creation of a strategic reserve of a quarter of a million tonnes to be managed by the Highways Agency;
 - putting in place a year-round data collection and monitoring of salt stocks and supplies by the Department for Transport (DfT), with dissemination and forecasting to provide early warning of problems;
 - the need for highways authorities to plan and execute their winter operations to a high standard;
 - the need for these authorities to communicate effectively with public and businesses, both prior to winter about their plans and during severe weather events about the state of the network;
 - the need for a review of technical standards for salt utilisation by highway authorities;
 - how citizens who wished to clear pavements could be supported through a ‘snow code’.
- 1.6 This Final Report considers wider aspects of the resilience of transport services, including the rail and aviation sectors. It returns to issues raised in the Interim Report, including the salt supply chain and how that might be fine-tuned for the longer term to improve resilience, a range of good practice examples by local authorities in developing their winter service plans, the economics of winter resilience and progress with the ‘snow code’ on good practice for clearing footways. Finally, it looks at cross-modal issues which have emerged from the review, including communications

16 *The Resilience of England’s Transport Systems in Winter: An Independent Review; Interim Report*, July 2010; <http://transportwinterresilience.independent.gov.uk/docs/interim-report/>

with the public, the need for a 'whole journey' approach to planning resilient transport networks, access to key installations and facilities and wider resilience planning issues.

- 1.7** The Review has taken account of the wider GB context and has involved Scottish and Welsh administrations and interests. However, the recommendations and Review outcomes only apply to England, and it will be for Scottish and Welsh administrations to consider what action might be taken in those countries.
- 1.8** The Review builds upon the lessons learned by public authorities, network operators and transport providers from the winter of 2008/09; it also takes account of the views of transport users and stakeholders. The Review's full Terms of Reference are at Appendix A.

The approach of the Review

- 1.9** The Panel has pursued two parallel avenues of inquiry. A Call for Evidence was issued on 6 May to over 200 organisations, to the trade media and to the public at large through the Review's website, and respondents were asked to address up to 27 questions. One hundred and thirty-two responses were received, and 54 organisations attended Hearings to enable the Panel to explore their evidence. All the responses and notes of the Hearings have been placed on the Review's website alongside this Final Report.

Structure of this Report

- 1.10** The Executive Summary and Recommendations at the beginning of this report are for the whole Review, bringing together material from the Interim Report as well as from this Final Report. The rest of this Final Report, however, deals only with material and issues since the preparation of the Interim Report. The substance of the Interim Report was contained in two Parts – A and B. To maintain clarity and continuity with the Interim Report, the substance of this Final Report starts with Part C.
- 1.11** Part C of this Report summarises for winter 2009/10 the background, evidence and key issues in respect of the rail sector. Part D similarly considers the background, evidence and key issues in respect of the aviation sector. The Panel's recommendations are included in the consideration of key issues.
- 1.12** Part E builds on the initial analysis in the Interim Report of the road salt supply chain and considers how to improve its resilience, and Part F considers progress on those issues on which the Interim Report made recommendations, including technical standards and the 'Snow Code' on clearing footways. Part G finishes the Report by considering those common lessons across the different modes of transport arising from last winter.

Some general principles

- 1.13** The Panel has applied some general principles in progressing the work of the Review, which it is helpful to set out again at this stage:
- The transport sector is an interesting mix of the public and private sectors. Whilst highway responsibility is overwhelmingly a public sector concern, the market in rock salt is a commercial one. The rail sector is commercial in part, though highly subsidised, while the aviation sector almost wholly commercial. The Panel takes the view that, within this framework, the underlying aim in making recommendations to improve winter resilience should be to enable markets to function effectively and find solutions to problems, using the minimum of highly targeted interventions to improve resilience. We believe that heavily managed solutions to salt supply problems, for example, are neither sustainable, economically efficient nor helpful for suppliers or purchasers.
 - Local highway authorities are crucial to both local and national winter resilience, but we recognise that they are independent bodies, elected locally to make local decisions about local needs and priorities. They are therefore locally accountable, but we draw attention to the responsibilities of local authorities and to the need to adopt best practice, where the evidence justifies it.
 - The clear national need to cut the Government funding deficit has made us mindful of the need to maximise the cost-effectiveness of winter service operations.
 - It will not be practical to prepare for all possible weather conditions – some will be so extreme or unusual or unpredictable that the scale of preparation needed to combat them would be uneconomic. However, the Panel has set as a benchmark the need to ensure a good degree of resilience in conditions equivalent to last winter's severe weather, and in particular that road salt for highway authorities and other users should be capable of being supplied to meet this need without emergency intervention.
 - Communication with the public and business, both prior to and during severe weather events, is crucial. The aim should be to provide detailed, accessible, timely and relevant information to travellers and businesses to allow them to make their own decisions on whether, when and how to travel.

Acknowledgements

- 1.14** The Panel would like to record its considerable thanks and appreciation to all those individuals and organisations who took time to share their knowledge, experience and insights with the Panel – by responding to the Call for Evidence, by attending the Hearings, by responding to requests for further clarification, and by hosting visits or sharing information informally.
- 1.15** The Panel also expresses its considerable appreciation to the support team of Chris Watts, Lloyd Miles and Richard Mace, who carried out background analysis, report drafting, special investigations, and managed the whole administration of the Review, its evidence gathering and Hearings.
- 1.16** The Panel is especially grateful for the very valuable and innovative work of LCP Consulting, supply chain logistics specialists, who carried out most of the analysis and modelling to support the important conclusions and recommendations for the chapters 'Salt and the supply chain' in both the Interim and Final Reports. Finally, the work of the DfT Economists team in preparing all the analysis for the chapter on the Economics of Winter Resilience is greatly appreciated.

Part C:

The rail sector

2. Background: roles and responsibilities

2.1 Responsibility for railway operations has been divided since rail privatisation in 1994 among:

- a) Network Rail for infrastructure, timetabling and signalling on a network of over 10,000 route miles. Network Rail is a not-for-dividend company limited by guarantee and regulated by the Office of Rail Regulation (ORR);
- b) Train operating companies (TOCs) who run passenger train services, under licences issued by ORR. Nineteen of the 24 TOCs operate as franchises and the remainder are 'open access operators' who make their own commercial decisions and have no contractual commitment to the Department for Transport (DfT) about services provided;
- c) The six private freight companies which have bought their assets outright and are neither franchised nor fully regulated.

2.2 Network Rail has primary responsibility for the industry's performance, including seasonal preparation. The National Task Force (NTF) had been brought together in 1998 as a non-executive body to provide a single voice for the rail industry and coordinate initiatives to improve operational delivery, with representatives from all those companies involved in the industry. The NTF has remained in existence ever since and proved invaluable in the recent severe winter disruptions. It meets four-weekly and includes all the franchised train company owners, Network Rail, DfT, ORR and one freight company that attends.

3. Experience of the last two winters

Introduction

3.1 Over 20,000 trains are run every weekday on the national rail network, and these are currently operating at around 91% punctuality¹⁷ with around 3% cancellations for safety or operational reasons and around 6% late at their destination. In periods of severe winter weather, it is not always possible to keep the more congested rail corridors operating at this intensity, and the challenge is then to maintain a 'near normal' level of services. This was achieved overall in winter 2009/10 when 89% of the standard service ran on the fourteen worst affected days across Britain (see Table 3.1 below).

Winter 2008/09

3.2 The winter of 2008/09 hit the rail network with a short, sharp shock in the first week of February. The London and South East region was particularly badly hit by an unusually heavy snow fall which caused a high level of train cancellations on 2 February. Recovery was swift, and most routes were operating a normal service within two days of the event (see Figure 3.1 below). The NTF proved an effective mechanism for ensuring that the lessons were learnt across the industry, and this enabled a much swifter and more certain response in 2009/10.

Winter 2009/10

3.3 The heavy snowfalls in mid-December brought the dramatic failure of five Eurostar trains in the Channel Tunnel and the subsequent cancellation of the entire service for three days. This operational breakdown also highlighted a lack of customer service recovery for the thousands of passengers trapped on trains, stranded at stations and unable to travel. These failures have been the subject of an exhaustive Independent Review,¹⁸ and its recommendations are currently being implemented. They will therefore not be part of this report.

3.4 Figure 3.1 shows that the consecutive severe winters of 2008/09 and 2009/10 had a quite different impact on the national rail network. The blue line shows the short, deep reduction in 'trains run' on the two worst-hit days in February 2009. The red line shows the much longer – but less deep – impact that hit the system in the following year. As a result, more trains were cancelled last winter, with much of the rail network lying under snow or ice for fourteen days between 18 December and 15 January. Many valuable lessons from the first severe winter proved to be transferable to the second – including the use of more pre-planned contingency timetables, more accurate and local weather forecasting, the winterisation of some equipment and that industry daily weather planning conferences would include timetable planners, National Rail Enquiries and weather forecasters.

¹⁷ Defined as the Public Performance Measures (PPM): percentage of trains arriving at their final destination within 5 or 10 minutes of timetable (depending on the type of service), having made all booked calls (i.e. not cancelled or part-cancelled)

¹⁸ *Eurostar Independent Review*, 12 February 2010; <http://www.eurostarindependentreview.org/>

Figure 3.1: Comparison of winter 2008/09 and 2009/10 (data supplied by Network Rail)



- 3.5 The fourteen worst weekdays on the 2009/10 red line are analysed in more detail in Table 3.1 below. This demonstrates that, on average, the rail industry managed to run 89% of its normal weekday service throughout the period of severe weather, while still maintaining a punctuality measure (PPM) of 72%.
- 3.6 Table 3.1 also shows that the punctuality levels against the timetables in operation were broadly maintained through the difficult weather. We consider this to be a commendable performance in such challenging circumstances and congratulate the industry on the commitment shown by staff at all levels. There are, of course, still lessons to be learnt from the experience, and we were pleased to find that the industry is using the NTF to draw these out in a collective way that will deliver continuous improvement for future winters.
- 3.7 Passenger Focus have confirmed the belief that, when the rail network enters a period of severe weather disruption, the top priority for customers is for their local train service actually to run – punctuality becomes a secondary issue compared to reaching the destination.
- 3.8 London Underground confirmed that their sub-surface network generally ran well throughout the period of snow and ice, apart from some initial problems in the first hour of opening. This encouraging performance included the deep tube network which has many depots situated in open sections at the extremity of the lines. They attribute this performance to the extensive use of point heaters and de-icing trains – together with the sheer number of trains running over the exposed conductor rails in a relatively warm urban environment.

Table 3.1: Total trains run during severe weather 2009/10: standard weekday service 20,367 trains (data supplied by National Task Force)

Date	Percentage standard service finally run (net of extra/ cancelled trains)	Percentage punctuality of trains run
December 2009		
18 Friday	90	63
21 Monday	89	65
22 Tuesday	87	74
23 Wednesday	90	69
January 2010		
04 Monday	95	79
05 Tuesday	94	76
06 Wednesday	76	60
07 Thursday	73	50
08 Friday	80	64
11 Monday	91	83
12 Tuesday	97	87
13 Wednesday	87	66
14 Thursday	97	85
15 Friday	99	90
Average of 14 severe days	89	72

3.9 Table 3.2 below analyses the average performance of individual train companies over the same 14 severe weather weekdays in increasing order of cancellations. It demonstrates that the largest number of cancellations occurred on the electrified routes south of the Thames, which depend on an exposed conductor rail – the ‘third rail’. These services are mainly operated by South West Trains, Southern and Southeastern. In 2009/10 Network Rail and these operators were faced with the ‘double whammy’ of 2,700 route miles of conductor rail to de-ice and some of the worst weather outside Scotland, especially Southeastern, which operates in Kent and East Sussex. First Capital Connect (FCC) operated over many of the same routes, but had the additional problem of pre-planned cancellations resulting from a driver shortage. Long distance companies generally planned to run their full services, despite the impact on performance, but had to cancel many services on the day.

Table 3.2: Trains run by train company 2009/10: average performance over 14 severe weather days, 14 December 2009 to 15 January 2010 (data supplied by National Task Force)

Train company	Number of trains (standard weekday)	Percentage standard service run (net of extras and cancellations)	Percentage punctuality of trains run
London Overground	361	105	76
c2c	343	103	95
Merseyrail	587	98	92
East Midlands Trains	465	97	87
Arriva Trains Wales	945	97	88
Northern	2,472	96	77
First Great Western	1,541	95	80
NX East Anglia	1,794	94	74
Chiltern	336	94	82
London Midland	1,296	93	74
CrossCountry	288	92	72
First ScotRail	2,169	90	69
Virgin Trains	320	90	50
Trans Pennine Express	289	88	69
South West Trains	1,659	85	67
East Coast	134	85	62
Southern	2,258	84	64
Southeastern	2,024	74	55
First Capital Connect	1,085	66	62
National average	20,367	89	72

3.10 Table 3.3 below looks at the performance of train companies on individual days and shows the large variation in performance that occurred day by day across the worst-hit routes. It highlights in red any train company that cancelled more than a third of its trains on an individual day. This shows that, while most companies outside the South East got through the December 2009 weather remarkably well, the more severe cold and snow in January caused a much deeper loss of services across the country. Those that cancelled more than a third of their services were generally conductor-rail routes south of London. Other operators with conductor rails, Merseyrail and London Overground, did not have similar problems. Rail recovered swiftly from the disruptions, with virtually all routes performing at normal levels by Tuesday 12 January (see Figure 3.1 above).

Table 3.3: Rail services run during disruption by train operating companies: daily performance over the six worst days – red indicates more than a third of services cancelled (data supplied by National Task Force)

Percentage standard service finally run (net of extras/cancellations)	Monday 21.12.09	Tuesday 22.12.09	Wednesday 23.12.09	Wednesday 06.01.10	Thursday 07.01.10	Friday 08.01.10
Trans Pennine Express	91	76	95	82	69	76
NX East Anglia	96	100	98	92	76	92
Northern	99	96	98	97	85	86
First Great Western	95	95	97	81	79	91
First Capital Connect	77	68	75	56	45	43
CrossCountry	94	98	99	93	78	43
London Midland	97	98	100	82	79	74
London Overground	93	98	97	85	113	139
East Midlands Trains	95	100	100	94	96	100
First ScotRail	99	88	78	86	79	81
East Coast	99	99	100	91	83	74
Merseyrail	102	96	99	100	95	98
Virgin Trains	101	92	95	67	71	67
Arriva Trains Wales	91	100	99	89	96	92
Chiltern	94	91	93	88	80	84
c2c	100	102	100	99	95	112
Southeastern	66	53	72	39	38	49
Southern	71	72	86	63	79	87
South West Trains	88	99	86	45	49	77
National average	89	87	90	76	73	80

Note 1. The measurement of trains used in this report compares the service operating during the winter period with a standard week to create a broad understanding of the level of operation across the network. The weeks in question are also subject to planned variations in trains in operation i.e. due to changes in timetables (more or less trains running), planned major engineering works etc. In overall terms this variation is significantly less than the variation seen during the winter period, but if the chosen standard week had a lower planned train count this can cause some operators to be appearing to run more trains during the period of bad weather than is normal, i.e. more than 100%.

4. Overview of evidence submissions

The Call for Evidence and approach adopted

- 4.1** The Panel issued a Call for Evidence to over 200 organisations on 25 April 2010 with a deadline of 25 May 2010 (see Appendix E), and this was also placed on the Review's website.¹⁹ The Call for Evidence asked for responses on a wide range of issues, but for Phase Two it asked five specific questions on railways, though organisations were able to respond however they saw fit.
- 4.2** Thirteen responses were received from railway organisations (see Appendix F), and the Panel held formal Hearings with ten representatives from these (See Appendix J). Below is a summary of some of the key issues that were raised in the written evidence and in discussions held by the Panel with those involved. The evidence submitted, and notes of the Hearings, have also been published on the Review's website alongside this Final Report.

Department for Transport

- 4.3** Whilst the DfT has an overall responsibility to Parliament for providing adequate public transport across the UK, it is not expected to get involved in the day-to-day delivery of services. It does, however, have a specific responsibility for franchising rail passenger services, which includes specifying performance requirements.
- Ministers were clear that the railway should be making every effort to run a near-normal level of service – and that the nation should be making every effort to get to work. The DfT felt that the rail industry had delivered a credible result in winter 2009/10 – with the exception of electrical problems with Eurostar trains running through the Channel Tunnel on 18 and 19 December.
 - Train companies cannot introduce a reduced timetable without first seeking DfT dispensation from their franchise commitments, as well as agreeing the reduced timetable with Network Rail. In practice, when severe winter conditions arise, it is the lack of infrastructure availability which restricts the services that can be provided (assuming rolling stock is available). Formally, it is Network Rail who makes the judgement about availability of the network and advises the operator about the level of services that can be run. In these circumstances the DfT would rightly accept the Network Rail judgement and grant the dispensation (known as a 'derogation') to the operator concerned without further review.
 - The resulting amended timetables have to be agreed and loaded into timetable systems before 17:00 hours the previous day to allow Network Rail the time needed to update the industry computer systems. These are then the basis on which the industry and the DfT measures performance of the train operators.

¹⁹ <http://transportwinterresilience.independent.gov.uk/>

- DfT's Rail Directorate became aware that some parts of the railway were in desperate need of more salt supplies to treat platforms and the access to depots, signal boxes and car parks. The Salt Cell was set up by the DfT to provide advice (not direction) to salt suppliers on the allocation of the limited rock salt available between highway authorities. While the salt suppliers retained small amounts of salt for essential 'non-highway' trade, Salt Cell itself did not advise on the allocation of small quantities for non-highway organisations and asked rail operators to contact either their salt supplier or their local highway authorities for additional stocks.

Office of Rail Regulation

4.4 The ORR has the combined responsibility of being both the Economic and the Safety regulator of the rail industry. Its prime role is to overview Network Rail's infrastructure delivery, and this is monitored through quarterly public reports on the resulting delivery. The ORR attends the NTF meetings and is generally satisfied that good lessons have been learnt from both winters.

- The ORR held its own investigation into the way that Network Rail had reacted to the severe winter of 2009/10 and concluded that "it could not reasonably have been expected to meet all minimum performance requirements". They also felt that the rail industry had made every effort to deliver services and that the service provided was "commendable under the circumstances".²⁰
- The ORR did raise concerns over the information customers received during the period of severe weather, and it is giving strong support to the NTF's Passenger Information During Disruption (PIDD) initiative in order to accelerate the benefits for the coming winter.

Passenger Information During Disruption (PIDD)

A major rail initiative was launched by the NTF at the end of 2008 to make radical improvements in train service information both on stations and by personal access on websites, texts etc. The initiative includes:

- an all industry PIDD Steering Group 2008;
 - an all industry 'Code of Practice' for PIDD 2009;
 - £3m investment in the 'Darwin' project to create a single source of information data;
 - £0.3m information pilot by Virgin Trains;
 - ten work programmes to be rolled out through local routes from winter 2010.
- The ORR confirmed that they had no evidence that the rail industry was operating under any 'perverse incentive' in which it benefited from cancelling trains. They did not believe that they should subsequently investigate the level of service derogations agreed and would only do so if a formal complaint was submitted by a train company or third party.
 - The ORR were aware that it was possible to provide far greater winter resilience for the UK rail network, but recognised that this would mean taking a step change to Swiss or Scandinavian standards. Such costs of winter preparation were unlikely to be economically justified in Britain, given that levels of disruption from severe winter similar to that of Switzerland or Scandinavia last occurred in 1978/79.

Passenger Focus

4.5 Passenger Focus is an independent organisation that represents the travel interests of rail and bus passengers. It was generally supportive of the way that the rail sector kept its services running under extreme conditions, with the exception of Kent, where it felt both opening hours and services had been cut back too far in early January.

- Passenger Focus supported contingency timetables but wanted them to be both consistent across the network and well communicated. It instanced a route that was left without Thameslink services for a week last winter due to a combination of infrastructure and rolling stock issues.
- Passenger Focus was also concerned that information on contingency timetables was not always available to passengers, either nationally or locally. Its top priority was for Network Rail to get the revised timetables and train-running information onto the industry's data systems in time to help travellers. It also drew attention to the excellent visual displays on the TfL live travel website as a best practice for the whole rail industry.
- Passenger Focus research measures the "usefulness of information provided during delays", and this has shown a slight but encouraging increase on 14 out of the 24 train companies surveyed in spring 2010, despite the experiences of severe winter disruption.²¹

Network Rail/National Task Force

4.6 Network Rail and the Association of Train Operating Companies (ATOC) gave evidence jointly as members of the NTF. Network Rail explained that:

- Network Rail has the prime responsibility for keeping rail infrastructure open to traffic in severe weather. It has a fleet of special de-icing trains for use over the conductor rail routes, and it contracts locomotives and 'ghost trains' to keep overhead wires free of ice. It also maintains locomotive-propelled snow ploughs for clearing blocked routes.
- The NTF has identified a comprehensive list of physical improvements that can be made to improve winter resilience in future years. These range from trace heating to specific conductor rail locations to keep automatic couplings operational to installing de-icing equipment in selected passenger trains to add support to the specialist Network Rail infrastructure fleets.
- Network Rail is quite clear that if it is able to agree and upload contingency snow timetables by 17:00 hours the night before then all its computers and industry downstream systems can be updated in time for the next morning. This is the only way that customers can receive reliable real-time information on services running on their local routes, and is a time improvement in the process of a whole day since last winter. Network Rail gave evidence that it has taken action to ensure that it will be able to deliver this service reliably on all routes if a similar winter occurs in 2010/11.
- The NTF was generally satisfied with the detail and accuracy of local short-term weather forecasting for operational planning, giving them good information to the nearest 20 miles. They were, however, concerned that, when weather forecasts are severe, the media – sometimes on the advice of the police in particular areas – will tend to broadcast blanket 'do not travel

²¹ *National Passenger Survey Spring 2010*, published 22 June 2010; <http://www.passengerfocus.org.uk/research/nps/content.asp?dsid=496>

unless it is absolutely necessary' warnings. While some roads may continue to present serious hazards, the railway system recovers quickly and will often be running near-normal train services – especially when railway staff have successfully struggled to work.

- The additional delay minutes due to Network Rail in the period of severe weather totalled over a million, more than twice what it might expect in an average four-week period for all delays. Compensation payments to TOCs for the impact of the severe weather exceeded £35 million.
- While introducing a series of contingency timetables the night before a heavy snowfall was possible, it was an even greater challenge to get all the computer systems updated in time to alert passengers on websites, text messages, local radio and station indicators. With so many trains scheduled daily, any timetable changes can have knock-on effects across the country.
- The winter 2009/10 train plans were communicated through a much wider variety of media than previously – from SMS text messages/alerts to Twitter – in addition to the National Rail Enquiries website. However, National Rail Enquiries received nine times its normal call volumes during the severe winter, and the website faced demand up threefold to 1.5 million hits a day, the majority concentrated in a few hours. The NTF was clear that equipment and systems for handling calls and web enquiries would have to be further upgraded in time for next winter to cope with this increase in demand and independent testing by Accenture has verified that the necessary increased capacity has been provided.
- The Passenger Information During Disruption (PIDD) initiative is focusing on the need for robust systems, and its progress is being jointly reviewed by the rail industry through the NTF. The first output has been a code of practice that creates a coordinated approach to customer information across the industry, but the prime constraint is the inheritance of over 80 different customer information systems that drive the platform indicators.
- A key component trialled for 2010/11, prior to national roll out over three years, will be the creation of a single, reliable IT database (Darwin), which will allow swift updating of the many associated information systems. Ten other PIDD work packages are being developed, and these will be implemented route by route through joint champions, starting in 2010/11. Network Rail expressed some concern that progress was still patchy and the best results lay in delegating the implementation to route level through the industry's Joint Performance Improvement Planning Process.
- The *Good Practice Guide on Winter Arrangements for Stations* has been revised for winter 2010/11. This will stress the need to build up adequate salt reserves and recommend additional materials such as grit and sand. This follows concerns that the rail industry needs were invisible to the Salt Cell last winter.
- Weather related accidents such as slips and trips rose slightly in both winter 2008/09 and 2009/10. Staff made every effort to treat platforms/car parks and to warn passengers of the treacherous conditions. There are still lessons to be learnt in better surface treatment, together with heightened public awareness.

Figure 4.1 Exposed conductor rail in snow



Image courtesy of Southeastern trains

Long distance train operators

4.7 Ten train operating companies submitted evidence, and we give a summary of the key points below by the main business sectors – Long distance, London & South East, Regional and Freight.

Virgin Trains

- Virgin Trains decided to advertise a normal train service throughout the severe weather period, on the rationale that 50% of its passengers have booked in advance and are tied to specific trains and seat reservations. Suspending the advertised timetable in favour of an contingency timetable would also have suspended seat reservations and could have effectively prevented the sale of the cheapest 'book in advance' tickets.
- Virgin Trains accepted that they would effectively be running a full scheduled service with some very late running and cancellations. They felt that this was the simplest message to communicate and to get people to their destinations in exceptionally bad conditions. In the event, Virgin had to cancel 300 trains on the worst affected days, with only 50% of trains arriving punctually.
- Virgin Trains suffered winter resilience problems on both their rolling stock and the track infrastructure. Ice on overhead lines and snow in points were particular problems. Network Rail are considering greater use of an 'ice breaker' train in future winters to keep overhead lines free of ice, especially during night hours.
- Virtually all Virgin Trains services are timed up to 125mph, and it proved impossible to maintain the top speeds without the risk of serious damage to trains. Blocks of ice formed in the train underframes, and these were occasionally flung at passing trains with such force that they damaged windscreens and passenger windows. Speeds were reduced to 100mph for several periods, and this contained the problem. Virgin Trains has researched international experience,

and the emerging view is that, when snow is 15cm above rail levels, higher-speed railways should reduce speeds to 100mph to avoid damaging train underframes.

- Virgin Trains learnt many valuable lessons in winter 2008/09, which enabled it to update its participation in the PIDD processes. The Virgin Trains website has been designed to reduce the pressure on the National Rail website.
- Many train staff were very willing to struggle to work through the severe weather, but needed to know that their local schools would be kept open for their children. Access to both schools and stations/depots was an area where Virgin felt lessons could be learnt for the future.

CrossCountry

- CrossCountry handles significant challenges in severe winter weather, as it operates long routes across Britain, such as Plymouth to Edinburgh and Bournemouth to Manchester. The company philosophy was to run the full service, as they were supported by diesel fleets that proved very reliable in snow. They found that the rail network was badly hit on the first day of each snowfall, but then recovered quickly to near-normal performance on subsequent days.
- CrossCountry operates an extensive winterisation programme to enable their trains to cope with severe weather, and whilst this worked well, lessons have still been learnt. Horns need better snow protection (trains have to be cancelled if horns are defective); engines need more winter protection; fire bottles need more protection to avoid detonation; and bigger supplies of de-icing fluids are needed for sliding doors etc.
- CrossCountry found that their message of 'trains are running' was swamped by the national media message that 'transport is in chaos'. They were able to provide accurate website information on both the company and national networks, and they had some success in getting local media briefed on the positive message of what trains were actually running.

London and South East

4.8 Around 60% of London 'heavy rail' commuters arrive from south of the Thames, and it is this busy electrified network that is dependent on an exposed conductor rail for its traction current. It is unique in the world in extending a conductor rail system outside a conurbation and to the coast through the exposed areas of the North and South Downs. All three train companies concerned gave detailed evidence on the problems that this caused them in the last two winters.

South West Trains (SWT)

- SWT have developed a pre-planned contingency timetable called 'Snowplan', which is based on a reduced hourly service pattern and the withdrawal of service from some minor routes to avoid points being moved on main lines. Snowplan was, however, only used once on 6 January, when 34% of the service was run at 50% punctuality. Without 'Snowplan' on the following day, performance fell to 24% of trains run, with only 11% on time.
- SWT reported that Network Rail had real problems in entering the major Snowplan timetable changes onto its IT systems, and this meant that both operational systems and customer information systems were not up to date, with local staff attempting to update station indicators manually. On the two worst days of disruption, both the web and the telephone information systems became seriously overloaded and they too were not updated in real time.

- SWT has held a review of winter 2009/10 and has six work streams which will be implemented by November 2010. The company is working with Southern and Southeastern to encourage the NTF to explore new technical solutions such as better de-icing fluids.

Figure 4.2 Snow impact on train automatic coupling and horn



Image courtesy of the Association of Train Operating Companies

Southern

- Southern introduced a two-level timetable for the severe weather period. The South London Metro services were planned to run in full, but the longer distance Coastal services (which pass through the more exposed countryside) were thinned out on five of the eleven worst days. This still delivered 82% of the train service (920 trains a day instead of 1,120 trains). The 20% reduction in the Coastal services was achieved by eliminating services that split/joined intermediately – where there was a risk of automatic couplings failing.
- An action from the February 2009 winter experience was for Southern to fit an enhanced 'ice mode' button to the traction control software in its entire fleet in time for winter 2009/10. This makes the trains less sensitive to spikes in the current supply when running over icy conductor rails and allows more heat to be generated at the conductor rail. It also helps to clear the ice and reduces the risk of trains losing their electrical supply, with all the on-going problems to

lighting and heating systems. Southern is also supporting the 'third rail winter work-stream' at the NTF and will be trialling some of the new ideas this winter including trace heating on selected stretches of conductor rail.

- Local weather forecasts were generally reliable, but they under-estimated the level of snow on 13 January, and this resulted in a much poorer train performance. Customer communications were better managed in 2009/10 and included an enhanced website which could cope with larger volumes of enquiries. A lesson for the future is to ensure that the national Live Departure Boards are also upgraded to ensure up-to-the minute information.

Southeastern

- The Kent rail network is particularly exposed to severe weather conditions, and it proved especially hard to keep it operational on the worst days in winter 2009/10. Not only is it open to arctic winds from the continent, but it also operates through the steep gradients and deep cuttings of the Weald and North Downs. Temperatures fell to -12C in Kent, with 34cm of snow in the Sevenoaks area, making it the coldest winter in Kent since 1978/79.
- Southeastern had a particularly bad experience on 2 February 2009 when they attempted to run a normal service and ended up having to suspend their entire operation, leaving passengers trapped on trains with no power or light for extended periods. Another bad experience on 18 December 2009 gave Southeastern further cause to approach the remaining winter with extreme caution. The exceptional Kent weather resulted in over 100 instances of passenger trains suffering extensive delays due to ice on the conductor rails in December. In one case, passengers were stranded for seven hours near Swanley when a train lost contact with the conductor rail and lost all heating, lighting and public address.
- These experiences led Network Rail and Southeastern to cut services by 50% on 6, 7 and 8 January 2010, when similar conditions returned in 2010, and to limit hours of operations from 07:00 to 19:00 hours.
- Southeastern and Network Rail have now taken action to ensure that this level of rail service reduction can be eased in future winters. They assure us that they plan in future to move to a two-level timetable based on near 100% Metro services in the more protected urban areas, but only about 80% of Coastal services through the more exposed rural areas.
- Southeastern have worked in close partnership with Network Rail to keep the conductor rail clear of ice. Four new technical initiatives are now under way:
 - a) trace heating on stretches of conductor rail in ice-prone areas by November 2010;
 - b) trials of an improved de-icing fluid which will operate at lower temperatures;
 - c) fitting scrapers and brushes to Network Rail de-icing trains;
 - d) Equipping of 20 Southeastern Electrostar passenger trains with de-icing fluid at a cost of around £3 million. London Overground has already fitted a proportion of their similar fleet and this allows the trains to supplement the efforts of Network Rail's own de-icing trains.

Figure 4.3 Snow envelops a speeding train



- The Electrostar fleet was converted to 'ice mode' operation in time for the winter, and this saved trains from cutting out unnecessarily on icy conductor rails. 'Ghost' empty trains were run throughout the night to supplement the de-icing trains. The Southeastern 'Javelin' Class 395 fleet performed particularly well in Kent, with virtually no problems on either the overhead wire or the traditional conductor rail mode. The fleet performed significantly better than the Electrostars on icy conductor rails, and there may be transferable lessons in the design of conductor shoes and the tolerance of electronic equipment.
- Customer information systems were swamped with enquires about the heavily reduced timetables in Kent. Information indicators were often unable to display the emergency service. Passengers who had signed up for text and email alerts on the Southeastern website did, however, receive regular and accurate updates.

First Capital Connect

- FCC was already struggling with a 50% service reduction due to train crew shortages when it was hit by the severe winter weather in Kent, Sussex and the Home Counties.
- It was further affected by the poor snow performance of unmodified Class 319 units which had a history of unreliability in the winters of 1991 and 2009. Of these, 80% had been modified when the latest snow problems hit the fleet.

- FCC wanted to adopt the Southern/Southeastern emergency service reductions, but found this was often incompatible with its north of Thames operation, where East Midland Trains were trying to run a normal service over the same route. FCC told us that it had not given consideration to splitting Thameslink into two independent services north and south of the Thames for greater resilience in this severe weather period.

Regional

- 4.9** Other commuter and local services across England generally ran well, despite encountering serious obstacles from snow drifts to frozen trains and infrastructure.

Merseyrail

- 4.10** Merseyrail have the only exposed conductor rail Metro network outside London. Despite heavy ice and snowfalls, this urban network maintained a near-normal service through curtailed engineering work, de-icing trains, and staff stationed at key sets of points. Merseyrail avoided contingency timetables and adopted a policy that all trains should run and all staff should get to work. Network Rail provided two dedicated de-icing trains, and Merseyrail ran the ghost trains every 45 minutes throughout the night.

Seamless winter travel on Merseyside

Despite 15cm of snow on an all-conductor rail network, Merseyrail ran a full timetable with virtually no cancellations throughout the severe weather of 5–8 January 2010. When all bus services were suspended due to the condition of the roads, rail was the only resilient form of transport. Merseyrail agreed to accept all bus tickets on their network without compensation payments. This won praise from the Liverpool Echo on 7 January: *“People arrived at stations more in hope than expectation and, in light of the chaos all around, were amazed that services were running normally.”*

London Midland

- London Midland chose to run a full service on all the dates, albeit with some cancellations and a big drop in punctuality. This was partly to get all passengers to their destination and partly due to the complexity of the train crew diagrams, which do not lend themselves to sudden revision. Problems arose on 6 and 7 January, when numerous points failures occurred together with an overhead wire failure – and Network Rail asked all operators to thin out their services.
- London Midland increased its website bandwidth and provided a summary of services being run on each route. The message was that a full service would be running, but delays should be expected. It supplied the media with the message that normal rail services were running – but this was swamped by the general ‘don’t travel’ road message. Telephone enquires more than doubled during the severe weather.
- Lessons learnt by London Midland in winter 2008/09 resulted in a much more resilient winter plan in the following year, including regular team conference calls, more key staff in control rooms and depots, together with better measures to avoid frozen doors and automatic couplings.

ScotRail

- Whilst Scotland is excluded from our recommendations, we were pleased to receive evidence from ScotRail setting out their valuable experience in dealing with the most extreme weather conditions in the UK.
- ScotRail had the support of Ministers in seeking to run as full a service as possible across the entire Scottish network. They succeeded in running 81% of their train service over the 14 worst affected days, despite a sustained period of heavy snowfalls and very low temperatures. Weather forecasting is now far more detailed, and the Met Office provides information on 27 zones where this was previously limited to seven.
- Customer Information Systems could not keep up with the service disruptions, because the supporting Network Rail computer systems were swamped with changing data. ScotRail staff had to re-type all information manually to get the correct input codes. ScotRail is also introducing improved customer texting services that will focus on lines of route, together with 'pop-up' screens on the web site that will automatically update customers on disruptions.
- Lessons learnt include: warning signs at depots and at 92 stations to provide a low temperature alert; the possibility of hiring external contractors to clear snow and ice from unmanned stations, together with the earlier purchase of salt supplies and more robust snow clearing equipment. ScotRail is also reviewing whether a more resilient service could be provided through the earlier introduction of contingency timetables – i.e. running fewer trains more reliably.

Freight

- 4.11** Both DB Schenker and the Railway Freight Group felt that freight services were given a reasonable share of the restricted capacity and generally ran well. DB Schenker only lost 60 trains out of more than 7,000 operated last winter and they felt that this was a good result for the UK rail industry. However, some customers cancelled trains because of the condition of their private sidings and local signalling.
- 4.12** Two different safety issues arose when two freight trains were unable to brake in severe winter conditions in Scotland. The first occurred at Carstairs on 22nd December 2009 when a Freightliner was unable to brake and ran through two red signals, narrowly avoiding colliding with two passenger trains. The second occurred at Carrbridge on 4th January 2010 when a DBS freight train was unable to brake at the end of a loop and ran down a steep embankment. Both incidents are currently under independent investigation by the Rail Accident Investigation Board.
- 4.13** Locomotives generally performed well and 'winterisation' measures involved keeping engines running and parking them under cover wherever possible. The freight operator's main concern lay in the problems of getting road accesses to their depots, yards and ports treated.
- 4.14** Operational problems included keeping remote signalling operating (usually ground frames²² for local shunting) and dealing with coal frozen in hopper wagons. DB Schenker sprayed wagons to prevent them from freezing, but in the worst conditions they just had to wait for the wagons to thaw out.
- 4.15** DB Schenker is also responsible for providing locomotives and crews for Network Rail's various fixed snow ploughs, but these were not in great demand. Many locomotives and diesel units are equipped with their own mini-snow ploughs in areas regularly hit by snow, such as Scotland.

²² A ground frame is a small lever frame typically used to control the points giving access to an infrequently used siding or an emergency crossover. It is usually operated by train crew and not permanently staffed

5. Key issues and recommendations

Resilience of operations

- 5.1** The rail network recovered quickly and effectively after the initial impact in winter 2009/10. The industry had clearly learnt valuable lessons from the winter of 2008/09 and responded well to the severe winter conditions, which were more extended and more geographically widespread. We were particularly impressed at the mature way in which industry players are now using the NTF to learn and share the lessons and jointly develop more resilient services for the future.
- 5.2** The rail industry can be proud of a good overall performance, keeping 89% of the scheduled service operating across the national network at a punctuality of 72% over the 14 most severe weather days. This average does, however, hide some serious problems on individual routes and days, and we would expect to see these brought closer to the national average in future winters.
- 5.3** Many commuter routes rightly introduced 'snow timetables' which thinned services by about 20%. Commuter services in south east London and in Kent were the exception, where the snow timetable went much further and removed 50% of the services while restricting operating hours to 07:00–19:00. We understand the reasons for this but agree with Southeastern that a more modest service reduction with near-normal opening hours should be achievable in future winters with more resilient equipment – and especially in the warmer London area. This would distinguish more clearly between London 'Metro' services (near 100% to run) and the longer distance Kent services (around 80%).
- 5.4** We found a surprisingly wide range of decisions, both over the use of contingency timetables in the severe weather and the level of service curtailment involved, which seemed rather haphazard and not always related to the conditions. The evidence we heard pointed to the near impossibility of keeping a 100% service operating reliably on the more congested networks and main lines, and the routes that thinned out their services in a planned way tended to provide a more resilient service, whilst still being capable of matching the reduced passenger levels.
- 5.5** We recognise the many challenges in planning and implementing contingency timetables on sections of route used by multiple operators, such as the West Coast Main Line, but we would urge that serious consideration is given to creating more emergency plans, which would facilitate swift action when severe winter weather arrives. In particular, we would suggest that long distance operators should relax the train specific restrictions on their cheapest tickets on such relatively rare occasions to allow services to be thinned out.
- 5.6** A big lesson from winter 2009/10 was that those routes that did create contingency timetables were in some cases frustrated in communicating the changes to passengers the next morning, whether through websites, text messages or on station indicators. We have been assured that the NTF has accepted the challenge and that Network Rail will be upgrading the industry's timetable planning systems to ensure that all contingency timetable changes made up to 17:00 hours will be automatically communicated to passengers, staff and websites by the following morning.
- 5.7** It was clearly helpful that the rail industry preparedness for winter 2009/10 included improved weather forecasting, from a new supplier, which provided 48 hour accuracy down to a 20 mile radius in most cases. This was used to direct equipment and staff to where it was most needed.

We were particularly pleased to find more routes planning contingency timetables to match these local forecasts.

- 5.8** We did consider whether Schedule 8 compensation and franchise penalty arrangements might create the incentives to implement deeper cuts than necessary in contingency timetables, against the risk of underperformance either by Network Rail or by train operators, but we are satisfied that decisions were made under tight timescales, in good faith and in the interests of the passengers.
- 5.9** Nevertheless, we do believe there is an 'accountability gap' surrounding the implementation of contingency timetables. Train companies cannot introduce a reduced timetable without first seeking DfT dispensation from their franchise commitments, as well as agreeing the reduced timetable with Network Rail. However, in practice, when severe winter conditions arise, it is Network Rail who formally makes the judgement about the availability of the network and advises the operators what reduced services can be run. In these circumstances the DfT would normally accept the Network Rail judgment and grant the dispensation (known as a 'derogation') to the operator concerned without further review.
- 5.10** We are concerned that neither the train operator nor Network Rail is formally held to account post-event by either the DfT or the ORR for their decisions to introduce contingency timetables. While on the face of it these look like common-sense judgments that would not normally be questioned, the wide variety of decisions taken – ranging from Southeastern's drastic reductions to other companies' attempts to run 100% of services – would suggest that lessons could be learnt from a more transparent accountability. We recommend accordingly.

Resilience of infrastructure

- 5.11** We found that Network Rail had generally performed well in meeting its responsibility for keeping the network operational in 2009/10. The organisation had clearly learnt lessons from the previous winter and generally had appropriate plans, organisation, staff and equipment to keep as much of its network open as possible.

Smart technology

Virgin Trains and Network Rail are developing new technical solutions to improve the resilience of the West Coast 25kV overhead wire networks in future winters. These include:

- ice-breaker trains to clear ice from the overhead contact wire;
- modifying the electric brake to use the resistors to melt ice in the roof areas;
- modifying a Pendolino to identify ice damage to overhead wires;
- a silicon-based coating to prevent ice sticking to underframes is under trial.

- 5.12** The biggest remaining challenge to running effective rail services in ice and snow is still the need to keep the 2,700 route miles of exposed conductor rails on the network south of the Thames fully operational. This was generally achieved, albeit at the price of some closures of secondary routes and derogation of service levels and performance. The impact of snow and ice on the running of services – especially in Kent – and the scale of the effort involved to clear the track and maintain traction current for trains was well set out in the evidence from the NTF and the four train companies involved.

- 5.13** We note that the weather impact is usually less severe within Greater London, where the 'Metro' services face conditions similar to those of London Underground's surface routes and London Overground, who both maintained good levels of service throughout the winter. We also note that the largely conurbation-based rail network, Merseyrail, proved to be the best-performing UK conductor rail operator, achieving a near-normal service with negligible cancellations, despite 12cm of snow and severe icing that virtually closed the road and bus networks (see Table 3.2 above).
- 5.14** We note and commend the continuing breadth and depth of effort to address the conductor rail problem, through a NR/TOC special project coordinated by the NTF. A number of proposals already being evaluated or acted upon include:
- a) introducing sections of trace heating of conductor rail;
 - b) de-icing fluids that operate at lower temperatures;
 - c) improved design of the conductor rail shoe;
 - d) static de-icers including sandite facilities at black spots;
 - e) installation of de-icing on a sub-fleet of passenger trains (already in hand on some Southeastern trains);
 - f) improvements to some types of point heater.

Resilience of train fleets

- 5.15** Passengers clearly saw the benefit of the many new train fleets that have been introduced in the last decade during the recent winters. The modern train fleets have generally proved to be more robust in the extreme weather conditions, though there were low levels of failures experienced due to emerging age related failures not previously observed. The diesel fleets and 25kV overhead wire fleets generally performing better than the conductor rail fleets. All train companies reported they had identified action plans to improve the winter resilience of horns, couplings, traction motors, fire protection systems etc., and these are in hand.
- 5.16** We were, however, concerned that some electric trains from the 1990s (eg the Class 317 National Express East Anglia and 317/319 fleets on First Capital Connect) continued to perform badly in heavy snow and are clearly overdue for some robust 'winterisation' modifications to their d.c. traction motors. We would see this as a priority for completion by this winter.
- 5.17** The biggest remaining concern lies in the lack of resilience shown by Electrostar fleets, compared to others, on icy conductor rails on both Southern and Southeastern routes. Train control software has been successful in preventing significant damage to on board electrical equipment when these conditions are experienced and we applaud the decision to further enhance 'ice mode' by implementing further improvements to the control software to improve electrical pick up when struggling to get traction current and it should be a priority to fit this modification to the remaining new generation conductor rail fleets on all the relevant train companies. No significant passenger incidents came to our attention on passenger trains in this challenging period, but we would endorse the decision to reduce high speed services to 100 mph in periods of extreme ice and snow to avoid potential damage to driver windscreens, passenger windows and underfloor equipment. The industry should formalise this in a clear national policy and ideally build the extra time into contingency timetables.

Figure 5.1 Damage to underfloor train equipment by snow and ice



The station environment and access

5.18 Slipping and tripping accidents only rose slightly in winter 2009/10 across the network, thanks to the treatment of so many platforms and car parks and to the good sense of staff and passengers. The availability of salt for treating footways and station car parks became a serious problem by the end of January 2010, and both Network Rail and the train companies complained about the difficulties of obtaining salt once the Salt Cell came into action to prioritise salt for and between highway authorities. The volumes of salt required are not great, and the rail industry should take steps to ensure that sufficient salt for treatment of their own footways and estate in a severe winter is in place in advance of the season.

5.19 We were, however, concerned over the invisible boundary that lies between those public areas owned by the local highway authority and those owned by the rail industry. Often the boundary is unclear, even to the organisations involved – for example, a station forecourt, an access footway, a vehicle turning circle, a cycle parking area. We heard of more than one occasion when one area was cleared of snow and ice and another was not, creating a potential hazard and confusion amongst passengers. In their preparations for severe weather, the railway companies and local authorities should take steps to clarify between themselves the respective responsibilities for such areas and to arrive at practical arrangements to ensure that the treatments of such external and access areas are carried out in a sensible coordinated way. A similar requirement for collaboration and clarification applies to rail depots, maintenance and operational facilities – where good access is essential for good performance.

Road–rail coordination in Kent

Southeastern Trains had serious problems in winter 2009/10 in keeping the access roads to local stations operational. They asked Kent County Council to prioritise the gritting of station approach roads to enable passengers to use the available rail services at a time when long road journeys were impracticable. Kent County Council responded positively, and this arrangement is now formalised for future periods of severe winter weather.

Customer communications

- 5.20** The National Rail Enquiry Service is commended for dealing with the increase in website enquiries, with the peak-day demand of 1.5 million hits and for increasing capability for the start of this winter given that the demand for passenger information continues to grow, due in part to the increasing confidence that passengers have about being able to obtain reliable information.
- 5.21** We were pleased that the Passenger Information During Disruption (PIDD) project has been put in place under the NTF with the objective of raising communications to a high and consistent standard across the network, improving the ability to communicate quickly to customers both changes in planned service and the state of service on the network in real time. This is clearly of the utmost importance to customers, and successful delivery will also underpin TOCs' confidence in introducing contingency timetables at short notice. We see the Darwin project as both high priority and good value at £3 million, but are concerned that timescales for the pilot introduction have been allowed to slip into 2011, and that full introduction will not be complete until 2013.
- 5.22** We were also pleased that so many TOCs have developed a wider range of communication channels for keeping customers in touch with service changes and service performance – including email, texting and growing use of social media, as well as the internet. The TfL travel news is a particularly clear way of displaying information on disrupted services which could become a best practice for all train companies. We strongly commend such initiatives; not only are these very helpful for travellers, but they also provide some counter to the necessarily simplistic media messages about winter conditions and 'don't travel unless you have to' advice – particularly given the evident ability of the rail system to achieve a rapid recovery after the initial onset of severe winter conditions.

International comparisons

- 5.23** We note that European rail systems, which faced similar occasional severe winters to the UK seem to have faced much the same level of disruption, or worse. The Netherlands, for example, suffered three weeks of disruption, which resulted in a government review and seven major recommendations for improvement. Three areas for improvement have been set, with targets shown in the box below, and are close to the emerging UK rail industry view that contingency timetables should deliver around 80% of normal train services.

Netherlands railway experience

ProRail owns the rail infrastructure in the Netherlands, and it experienced similar conditions to the UK in winter 2009/10. Train services were severely disrupted from 17 December 2009 to 15 January 2010. The three areas for improvement during winter 2010/11 have been agreed and targets set as follows:

a) Reduced disruptions

87% of trains to run in severe weather and train failures not to exceed 4%.

The operational priority will be point heaters, bigger stock of spare parts and more manpower available.

b) Reduced impact on passengers

100% of passengers able to travel, but with 30% reduction in capacity (seats) and journeys extended by up to 60 minutes.

The priority will be contingency timetables with fewer trains but at maximum formations.

c) Better customer information

Contingency timetables to be published by 22:00 hours on previous night.

The priority will be to maximise the use of websites and local radio.

5.24 We agree with the ORR that there is unlikely to be an economic case to justify a step change in investment to create a 'Scandinavian-type' winter-proofing of the UK rail network. Our weather pattern is far milder, and forecasters are predicting a slow but steady reduction in the incidence of wintry temperatures over the decades ahead. Network Rail has calculated, for example, that just replacing the exposed conductor rail with overhead wires would cost in excess of £1 billion. We conclude that, given the frequency of occurrence of severe winters in the UK, it is better value to invest in the wide range of appropriate incremental steps identified to improve and sustain the performance of the existing system.

Recommendations

Recommendation 18: During the winter planning process, the National Task Force should encourage Network Rail and the train operators to ensure that consistent criteria are developed for decision-making about the use of contingency timetables and then applied to their implementation when winter conditions require.

Recommendation 19: The Department for Transport and/or Office of Rail Regulation should provide a new mechanism under which Network Rail can subsequently be held accountable for decisions it makes (in consultation with the train operators) about the implementation of contingency timetables and the levels of service reduction involved, which addresses the current lack of formal post-event review.

Recommendation 20: The rail industry should continue its development of technical solutions to improve winter resilience, particularly those relating to the maintenance of traction contact on the third rail network south of the Thames, including best practice from elsewhere, such as Transport for London. Southeastern Trains' and Network Rail's proposal to fit de-icing equipment to some of the operator's passenger trains for winter 2010/11 as a pilot to supplement Network Rail's own de-icing trains is to be commended.

Recommendation 21: Individual rail companies and Network Rail should make regular contact with local highway authorities during the winter planning process and season to ensure that the boundaries between public and railway-owned areas regarding the road and footway access to stations, depots and signalling centres are clearly understood between their organisations, and that both are treated in a coordinated way during periods of snow and ice.

Part D:

The aviation sector

6. Background: roles and responsibilities

Introduction

- 6.1** UK airports and airlines are privately owned organisations operating within a commercial market. There are approximately 140 'aerodromes' licensed by the Civil Aviation Authority (CAA), of which 44²³ are airports providing regular air passenger services. The top 40 airports in the UK dealt with almost 2.8 million aircraft movements in 2008/09 and handled nearly 222 million passengers. The busiest UK airport is London Heathrow, which had over 66 million passengers, 466,000 aircraft movements and was served by over 90 airlines in 2009.
- 6.2** As aviation is an industry that operates without subsidy, the Government's role, through the Department for Transport (DfT), is to develop policies and long-term strategies, to facilitate their implementation and to lead international negotiations in this sector.
- 6.3** Snow and ice hazards present safety risks to the aviation industry, that can lead to runway closures, flight delays and cancellations. Operators are required to develop plans to mitigate these risks and ensure minimal disruption while maintaining safe operations but, with a large number of organisations involved, these require careful coordination.
- 6.4** The impact of winter weather on airport operations can vary from one airport to another and is affected by a number of factors. The key trigger for the deployment of airport winter maintenance teams is the level of snow, ice or slush – commonly known in the industry as 'contamination' – forming on the runways, taxiways and aprons. The consequential impact on airline operations depends not only on the specific weather conditions at airports but on the network of services, other diversion airports used, the intensity of aircraft utilisation and the arrangements each airline has for managing disruption.

Airports

- 6.5** Under the airport licensing terms regulated by the CAA, the airport operator is required to keep critical areas clear of snow and ice. Formal guidelines²⁴ reflect the Standards and Recommended Practices (SARPS) of the Convention on International Civil Aviation. Under these regulations, airport operators are required to have a 'Snow Plan'²⁵ which formalises the procedures and resources necessary to clear an airport. In the UK this requirement means that an airport operator will be solely responsible for deciding whether its infrastructure is available for use, and it will normally advise the airlines of what services it can provide in severe weather conditions.

23 Airports handling over 10,000 passengers in 2009 (source: CAA)

24 CAA policy document CAP 168, <http://www.caa.co.uk/docs/33/CAP168.PDF>

25 A Snow Plan will detail the resources and procedures necessary to clear an airport of snow and ice and enable the safe operation of services to resume

Figure 6.1 Snow ploughs clearing an airfield



- 6.6** Salt is corrosive to aircraft and aviation equipment, so prevention and clearance of snow and ice airside are undertaken by use of liquid chemicals – normally based on potassium acetate or glycol. However, these substances can pollute as run-off from the hard surfaces when they enter local water courses. Airports are required to prevent excessive contamination occurring, but this can be difficult in prolonged periods of severe winter weather. Landside parts of the airport away from aircraft operations – particularly passenger areas and access roads – can be cleared with traditional road salt.
- 6.7** Maintaining access beyond the airport’s perimeter is the responsibility of the relevant highway authority or public transport operator, but requires coordination among all the relevant organisations. Providing information regarding an airport’s status is the responsibility of its operator and is normally communicated via both its website and local and national media.

Airlines

- 6.8** Airlines are responsible for clearing their own aircraft of snow and ice, and this is carried out either directly by the airline’s staff or their handling agent. This is undertaken by spraying a glycol-based chemical directly onto the aircraft at the stand. However, some foreign airports that experience regular severe winter weather have a separate facility for treating all aircraft at the runway entry point ('pan de-icing').
- 6.9** The airline will decide what flights it will operate, delay or cancel, given the severe weather. The aircraft commander has the ultimate decision on whether it is safe for the aircraft to operate on the aerodrome surfaces available. It is the airline which has primary responsibility for providing information on a flight’s status to passengers, and all advice to passengers issued by airports directs passengers to contact their airline for information about specific flights. Communication of information to passengers is undertaken by a wide variety of methods, including websites, regional and national media, text messaging and emails – and increasingly social networks. Airlines are very dependent on their staff, agents and suppliers being able to reach the airport in severe weather to

enable their services to be operated. Compensation for delayed or cancelled flights, and arrangements such as alternative travel or accommodation for stranded passengers, are also the responsibility of the airline.

The Civil Aviation Authority

6.10 The CAA's primary role is to act as an independent economic and safety regulator with responsibility also for consumer protection and airspace policy. It pursues its safety function in partnership with the new European Aviation Safety Agency (EASA), which is the rulemaking and standard-setting organisation for all EU aviation safety regulation.²⁶ As a consequence of the state's obligations to the International Civil Aviation Organisation, CAA exercises full rulemaking and oversight responsibility for all those aspects of safety not being adopted by EASA, but also oversees UK compliance with pan-European rules and standards. The CAA advises Government on aviation issues and collects, analyses and publishes statistical information on airlines and airports. It is funded through charges on those commercial concerns it regulates.

The Department for Transport

6.11 As the industry operates on a commercial basis, DfT's role is limited. During periods of severe weather, DfT's Aviation Directorate looks to gain an accurate understanding of any disruptions to airport operations, maintaining close contact with affected airport operators and airlines on disruption and contingency issues, in order to provide regular reports to DfT Ministers. Ministers have a particular interest in the effect of airport closures on the travelling public, as well as how airports and airlines are managing disruption and communicating with their passengers.

Figure 6.2 Clearing Birmingham International Airport of snow and ice



Image courtesy of Birmingham International Airport

26 Rules for aerodromes are due to come into effect in 2014

Weather forecasting

- 6.12** Weather forecasts are important to both the airport operators and the airlines during the winter season. The operational costs involved in a single clearance of an airfield (of the order of £10,000) and de-icing aircraft are comparatively high, but are significantly outweighed by the costs of delaying, cancelling or diverting flights. The forecasts are therefore highly valued by the industry. Airport operators will tend to use at least one and sometimes two specialist services alongside the national weather forecasts to provide a degree of validation. The specialist aviation forecasters take actual site data from airfield sensors to improve their monitoring of conditions and the accuracy of their forecasts.
- 6.13** Short-term forecasts assist operational staff in determining the likelihood of contaminated surfaces or freezing flight conditions and in deploying the appropriate responses, such as de-icing teams or flight alterations. During the winter, operational managers will respond to one of three weather scenarios: clear ('black top'), marginal (wet snow/slush) and frozen (compacted snow and ice). Clear and frozen scenarios provide operational staff with a transparent view of the necessary response, but it is marginal winter conditions that require more careful planning and decision making.
- 6.14** Wet snow and slush conditions are particularly challenging for the aviation sector as it is not currently possible to accurately measure runway friction levels in these conditions for the safe landing and take-off of aircraft. If allowed to accumulate, wet snow and slush can cause wheel drag and hydroplaning of aircraft. Because these conditions are fairly common in UK winters, the UK operates a low tolerance level for ice and snow, meaning all movement areas have to be cleared completely (known as 'clear to black') as soon as the level of contamination reaches a depth of 3mm. In comparison, aircraft braking action can be predicted more accurately on compacted snow and ice, which is often the norm on the continent.

7. Experience of the last two winters

Winter 2008/09

- 7.1** Southern England experienced sudden, heavy snowfall overnight on 1 and 2 February, which affected all major airports in the South East and caused significant delays and cancellations. Generally, the industry responded swiftly, and by 3 February the airports resumed a near normal service.
- 7.2** Heathrow airport had to be closed for a short period. The southern runway reopened at 10:30, having been cleared of snow. Flights were able to take off and land once more, but there were significant delays and over 760 cancellations. All British Airways flights were cancelled until 17:00. London Gatwick remained open, but there were significant delays and cancellations. Rail and coach operations to and from the airport were also affected. The runway at Stansted was initially closed, but reopened at 07:00.
- 7.3** It was a different story for England's regional airports, which experienced comparatively milder conditions compared to southern England. For example, Manchester Airport experienced a relatively normal winter season and was able to accept a good number of diverted inbound flights.

Winter 2009/10

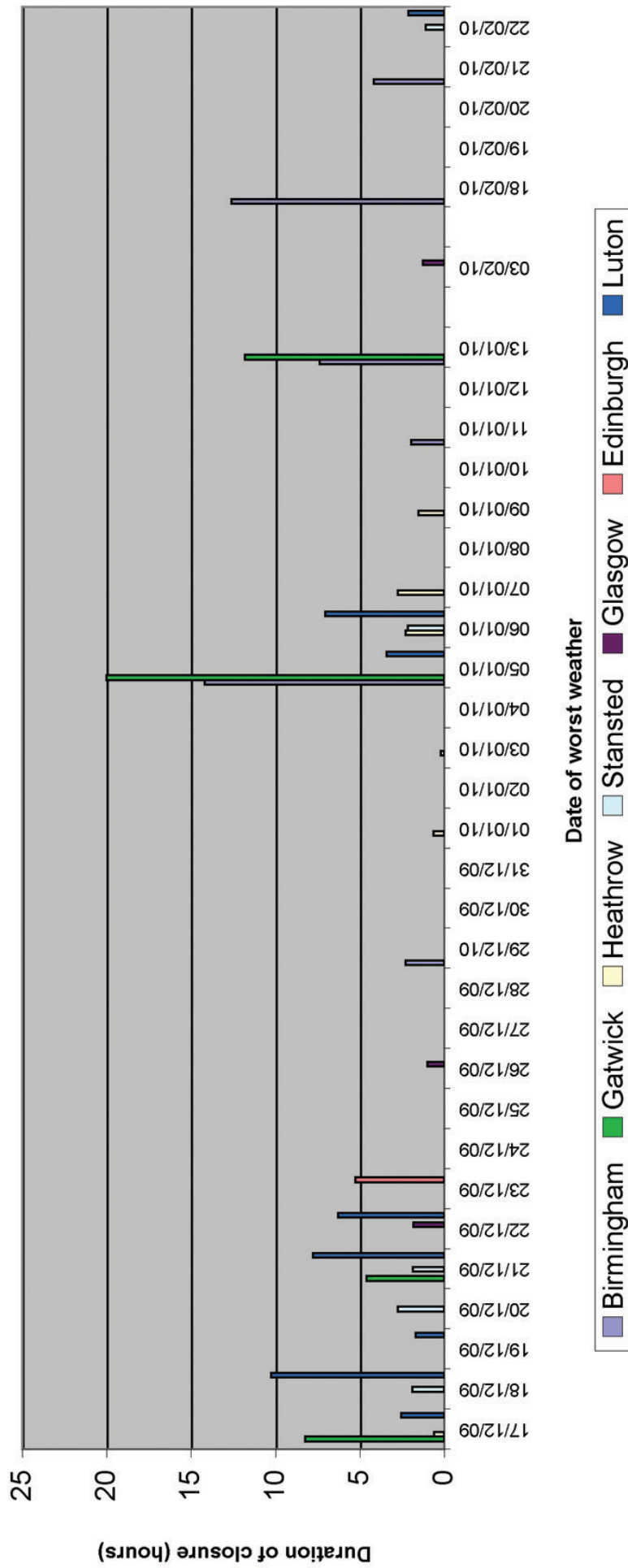
- 7.4** The exceptionally severe winter weather conditions experienced across the country in 2009/10 meant that most airports had to suspend flight operations, on occasion, to allow snow/ice clearance operations on runways, taxiways and stands. The severity of the conditions and the extent of ground areas at airports that needed to be cleared cascaded delays into flight operations.
- 7.5** In December 2009, 337 (0.45%) of a total 74,716 UK arriving flights were diverted to other UK airports. In January 2010, 391 (0.54%) of a total 72,482 UK arriving flights were diverted to other UK airports. Most major airports experienced three days where more than two-thirds of their flights were delayed.

Figure 7.1 Clearing aircraft stands of heavy snow



- 7.6** With the increasing need for low-cost airlines to operate three to four rotations (return flights) of an aircraft in each day, even a one-hour closure can potentially result in widescale cancellations and passenger disruption. Public awareness of this is probably very limited and may lead to unreasonable expectations of the levels of service that can be maintained in severe weather.
- 7.7** Figure 7.2 shows runway closures during the winter 2009–10 for seven major UK airports. Over the whole winter there were fewer than 40 closures, with most being significantly under five hours. The closure of airport runways does not usually mean that the airport itself has to shut; it may remain open in anticipation of re-opening the runway once the contamination is cleared. Airports with two runways may be able to maintain air services by alternating closure and clearance of their runways.
- 7.8** Heathrow Airport is particularly vulnerable to severe disruption when runways need to be closed, because the airport is operating near capacity and does not have the ability to recover lost time. Despite this, while there were seven occasions last winter when a runway was shut, the airport remained operational and the average length of a runway closure was just over an hour.

Figure 7.2: Runway closures during winter 2009/10 (data supplied by airports, July 2010)



8. Overview of evidence submissions

The Call for Evidence and approach adopted

- 8.1** The Panel issued a Call for Evidence to over 200 organisations on 25 April 2010 with a deadline of 25 May 2010 (see Appendix E), and their letter was also placed on the Review’s website.²⁷ The Call for Evidence asked for responses on a wide range of issues, but for Phase Two it asked five specific questions on aviation, though organisations were able to respond however they saw fit.
- 8.2** Eight responses were received from aviation organisations (see Appendix F), and the Panel held formal Hearings with all of these, plus three other bodies (see Appendix J). Below is a summary of some of the key issues that were raised in the written evidence and discussions held by the Panel concerning the aviation sector. The evidence submitted, and notes of the Hearings, have also been published on the Review’s website alongside this Final Report.

Figure 8.1 A fleet of snow ploughs clears a runway



Image courtesy of BAA Limited

27 <http://transportwinterresilience.independent.gov.uk/>

Principles behind the aviation sector's response to severe weather

- 8.3** The primary snow clearance procedure at airports involves sweeping and removing snow from runways and other ground surfaces used by aircraft and vehicles, and for ice, by scraping and/or anti- and de-icing. Guidance on procedures is set out in detail in the CAA's Licensing of Aerodromes provisions (CAP168).
- 8.4** The airport is required as a condition of its licence to maintain and implement a robust 'Snow Plan'²⁸ that describes how it will deal with winter conditions. It is reviewed annually and involves:
- a fleet of specialist snow clearing equipment;
 - staff being annually refreshed on the equipment and clearance techniques;
 - a pool of 'on-call' staff that are utilised in the event of snow conditions, drawn primarily from the airport Fire Service, Airfield Operations and Airport Management Teams. These are supplemented with an external contractor;
 - a stock of de-icing fluid for use on all of the paved areas and a fleet of de-icing rigs for applying the de-icer to runway, taxiways and aprons (Birmingham International Airport – BHX).
- 8.5** There is significant cost for an airport in terms of snow clearance and de-icing equipment:
- one runway sweeper typically costs £250,000;
 - much winter equipment sits around most of the year doing very little;
 - additional cost of maintenance and staff training;
 - de-icing fluid is expensive and one anti-ice application to the Airfield is typically £10,000 (BHX).
- 8.6** However, if an airport is not prepared, it will potentially lose much more business; the target for the airport is always to minimise the closure time and restore operations as quickly as it is safe to do so (BHX).
- 8.7** The exceptionally severe winter weather conditions experienced meant that some affected airports had to suspend flight operations temporarily to allow snow/ice clearance operations. However, given the severity of the conditions and the extent of ground areas at airports, the time taken for clearance operations inevitably impinged upon flight operations (DfT).
- 8.8** Airport operators felt that winter 2008/09 clearly demonstrated the need for a coordinated response by all airside business partners and stakeholders in severe winter weather. However, in 2009/10 it became apparent that some third parties still hadn't taken sufficient action to apprise their operational teams of the processes and procedures that would be employed by the airport to deal with significant snowfall and icing conditions (DfT).

28 A Snow Plan will detail the resources and procedures necessary to clear an airport of snow and ice and enable the safe operation of services to resume

Figure 8.2 Clearing the airfield at Birmingham International



- 8.9** Airlines have detailed procedures for winter operations, including clearing snow and ice from aircraft windscreens, wings, control surfaces and undercarriages, take-off and landing criteria for contaminated surfaces, as well as 'hold-over' times during which treatments remain valid. Typically aircraft de-icing is sub-contracted at the airport to a ground-handling agent, and in the UK this is normally undertaken at the stand, while airports in more inclement climates often have facilities closer to runway entry points (CAA and DfT).

Planning for severe winter weather

- 8.10** A 'Snow Plan' details the actions to be taken by an airport operator and the relevant stakeholders. This document is produced and distributed after reviews of the previous winter are completed and any other updates or amendments made.
- 8.11** The Plan will describe the process, priority, safety, resources, equipment and communication arrangements at each airport, and is communicated to airlines and handling agents before the winter season by a number of different methods so they are aware what will happen and what is expected of them (BAA).
- 8.12** Clearing the runway can be relatively straightforward, though it is a much bigger area, whereas clearing the apron and stands are more complex due to the proximity of aircraft and the restrictions on some aircraft only using certain stands (BHX).
- 8.13** 'Self help' items are provided to airlines and handling agents to use, eg granular de-icer and shovels. The concept of 'self help' is being progressed by inclusion in Ground Handling Licences, so that third party companies can resolve some of the snow/ice issues themselves rather than waiting for the airport operator (BAA).
- 8.14** Once a 'snow event' occurs, key personnel from the airport, air traffic control, airlines and handling agents are invited to attend a 'disruption cell' to manage the situation, selecting priorities for clearance depending on aircraft traffic patterns, the schedule, resource availability, weather forecasts etc. All tactical decision making is undertaken in this joint forum (BAA).

- 8.15** BAA will prioritise in-bound flights, due to fuel safety considerations and passenger comfort, and any flights unable to land at their designated airport are considered within a regular review (BAA).
- 8.16** Airlines themselves will take different approaches when they suffer disruption. Some will cancel more flights than others and try to recover a full service the next day. In all cases, passenger information is the airlines' responsibility (BAA).

Communications and passenger relations

- 8.17** The procedures are:
- An airfield's status is immediately communicated to Air Traffic Control (BHX).
 - Airport issues a Notice to Airmen (NOTAM) advising airlines and flight crew (BHX).
 - A text service is used to keep stakeholders advised of the airport status (BHX).
 - Information systems including websites, text messages and emails to passengers provide updated information to customers (BHX and BA).
 - Customer letters are made available at all airports explaining the situation and assistance available, sales team communicate to corporate customers and the 'trade', and briefings are made to all call centres and airport customer service staff (BA).
- 8.18** Some airport operators would also like Government to remind airlines of their obligations to passengers when flights are cancelled/delayed due to adverse weather conditions (DfT).
- 8.19** During the last winter its Crisis Management Centre was operational for substantial periods of time. Briefings were given to airlines, handling agents, statutory bodies, airport staff and other agencies, and the methodology for this has been improved for next season (Manchester Airport – MAN).
- 8.20** For its passengers, Manchester Airport initiated its Major Disruption Plan, which included:
- provision of catering to stranded passengers, including ensuring retail units remained operational;
 - provision of additional seating and blankets;
 - additional information to passengers, both within the terminal and through external media;
 - assisting passengers by booking local hotels;
 - employing additional staff to assist passengers;
 - text messaging alert system will be improved for next winter.

De-icing of aircraft

- 8.21** Once an amber warning level is reached, the snow/ice desk team initiates a process with tactical planning and operational lead teams to identify the level of planned schedule that can be operated based on forecast weather (BA).
- 8.22** Work was started with NATS post February 2009 to investigate a remote pan de-icing facility that would allow some aircraft to push from stands before de-icing, thus vacating them for arriving aircraft. This was opened by the northern runway (at Heathrow) in 2010 and a process was

introduced to determine the acceptable rate per hour of aircraft that could be handled. This is now used to plan the operating schedule. BA now can now activate a dedicated team to oversee the de-icing operation, and a new training package for de-icing teams has been introduced (BA).

8.23 Selection and training of staff from other work groups is done to support de-icing team (BA).

Figure 8.3 De-icing of British Airways aircraft



De-icing supplies

8.24 Suppliers of anti- and de-icer products to airports and airlines worked at full capacity to try and meet additional demand, and further supplies were shipped from North America. But the increased demand across Europe was such that, had the freezing weather continued for another couple of days, available stocks of the major base raw materials (glycols) would have been exhausted, which would have closed most of Europe's airports (DfT).

8.25 Government needs to take an early and proactive role in future similar crises to achieve improved coordination, supply and prioritisation of the raw materials required. It is unrealistic to expect the aviation industry itself to undertake such a role, and no non-government body exists which could undertake coordination of supplies across differing industries competing for available supplies (Industry responses to DfT).

8.26 Significant resilience has now been gained by increasing storage capacity, and the re-tendering process placed requirements on suppliers to demonstrate security of product. Review was also undertaken on the effectiveness of products used last winter where the very low temperatures had required up to five times the normal level of use (MAN).

- 8.27** The selection and contracting of other companies to supply BAA with de-icing products led to greater resilience throughout the winter (BAA).
- 8.28** Storage capacity was increased at airports for de-icing products, and a further increase for the coming winter is planned at Heathrow (BAA).
- 8.29** BA noted that the suppliers' location in the North East had been exacerbated by the road conditions (BA). Some deliveries to airports and airlines took longer because of poor road conditions caused by severe weather, distances between supply depots and airports, and tanker driver availability. To assist driver availability, DfT agreed a temporary, limited, emergency relaxation (not suspension) of the enforcement of EU drivers' hours and working-time rules for drivers involved in the distribution of (among other specified commodities) de-icer products direct to airports. DfT also worked with local authorities and the Highways Agency to prioritise clearance of routes used by de-icer suppliers (DfT).
- 8.30** Airport operators reported that for 2009/10 the use of glycol-based anti-icing media undoubtedly helped to reduce the impact of the severe weather. The use of potassium acetate-based runway anti-icing media was not sufficient for severe icing and resulted in extended closure time and huge operational costs. Subsequently the decision was taken to procure and use glycol-based media, which proved much more effective and longer-lasting, although the subsequent environmental management challenges should not be underestimated (DfT).
- 8.31** In 2009/10 BAA did not run out of de-icing supplies for runways and taxiways, which are the priority areas. However, Heathrow and Glasgow did run out of solid de-icer used on the aprons due to demand for the product and difficulties delivering it by road across the UK (BAA).

Figure 8.4 De-icing storage tanks



Image courtesy of BAA Limited

8.32 Lessons learnt by Birmingham during the last two winters included:

- Need larger stock of granular de-icer (focus had been on previously increasing liquid).
- Not enough attention paid to aircraft de-icer stocks held by handling agents.
- More airfield de-icing capacity required (and brought on stream during 2009), timely re-stocking and integrity of supply chain for de-icing chemicals given greater emphasis in procurement process (validated during winter 2009/10).

De-icer and environmental contamination

8.33 The severe winter weather demands the use of large quantities of de-icing products which, when applied, can cause a significant decrease in the quality of the water run-off from BAA airports. Surface water storage and treatment systems provided at airports are not designed to cope with prolonged and extreme events, and can become inundated (BAA).

8.34 If discharge consent is withheld or the discharge limits reduced below practical levels, the airport operator would be faced with a decision between prosecution and the closure of the airfield until such time as the snow or ice is naturally dissipated. The environmental regulator needs to understand the pressures that BAA's surface water pollution control systems are placed under. By comparison, the water industry benefits from widely applied dispensations from enforcement action by the environmental regulator in times of heavy rainfall and flooding. It appears that the environmental regulator does not have a consistent approach in dealing with discharges to the environment of de-icer contaminated surface run-off, with airports in different parts of the country being dealt with in different ways (BAA).

8.35 A review of environmental regulations regarding discharge from airports to allow more flexibility in choice of de-icing materials when in severe conditions would be welcomed. Birmingham itself did not suffer with the run-off problems experienced at other airports, but this depends on the airport's individual drainage system and the approach of the local Environment Agency office (BHX).

Figure 8.5 Clearing the taxiway at Birmingham International



Image courtesy of Birmingham International Airport

8.36 The more environmentally friendly potassium acetate de-icers are less effective in very severe conditions than traditional glycol-based chemicals (as used on aircraft), and the former's increased usage for the same effect negates much of the environmental benefit (BHX). The clarification that stronger products used more sparingly could be less harmful to the environment than heavy usage of other products meant that, in some cases, the application had a greater impact and was longer lasting (BAA).

Regular review of the Snow Plan and continuous improvement

8.37 It is important to develop a culture of continuous improvement – in addition to the annual 'Snow Plan' review, the airport will also now review each snow event through a 'hot de-brief' to see what lessons can be learnt and improvements made before the next one (BHX).

8.38 The Snow Plan annual review is to commence in June (London Gatwick – LGW).

8.39 An annual review of the published Snow Plan needs to be scheduled as soon after winter as possible (BHX).

8.40 Airports and airlines need regular coordination, updating and testing of contingency plans (BA).

8.41 Clear Service Level Agreements have been established with airport authorities at Heathrow and Gatwick on snow and ice clearance (BA).

8.42 There needs to be a review of contingency plans and escalation with airport authorities and all airport teams at Heathrow and Gatwick (BA).

8.43 A table-top exercise was undertaken in October 2009 with all operational areas at Heathrow to cross-functionally test plans for all British Airways ramp teams and the airport centre (BA).

8.44 A review needs to take place with airport authorities of the communications flows, immediate actions and mitigations involved in the red/amber/green system of snow closure warnings for airports is required (BA).

8.45 An annual review of contingency plans led by the airport authority with all airlines and the airport authority suppliers is needed and will help to clarify responsibilities/actions/mitigations for all airlines during winter disruption (BA).

Access to airports

8.46 It is essential for the airport that approach roads, the road network and rail links are maintained for passengers and staff to access and leave the airport. The experience of the last two winters was generally good; but there were a few issues when the salt shortages occurred (BHX).

8.47 The road infrastructure and public transport links to get both customers and, more critically, staff to the airport are vital. This enables BA to run as much of the operation as possible; ensures that they have sufficient resources to look after customers; allows deliveries to the airport for critical supplies; and ensures that staff are able to come in for later shifts to relieve colleagues. Better coordination is needed between the highway authorities and the airport on responsibilities for clearance around the airport (BA).

8.48 A more joined-up way of working between local councils and the Highways Agency is needed to enhance preparedness for clearing trunk and local roads to allow the public to travel to, and enable delivery of key products to, airports (Industry responses to DfT).

Sharing best practice and learning from abroad

- 8.49** Wider sharing of industry best practice and more cross-industry engagement is needed to better understand customer constraints, and much can be gained from airports across the UK coming together to share learning, best practice and engage in cross-industry discussions on improvements, as per the CAA example below (BHX).
- 8.50** In May 2010 the CAA organised and hosted an 'Aerodrome Winter Wash Up' to formally review the experience of airport and airline operations last winter, identify common issues and share solutions. It was well attended by airports, airlines and other operators and stakeholders. Common themes did emerge, but it was also clear that each airport experienced different problems and dealt with these individually (CAA).
- 8.51** London Gatwick held a number of reviews with airlines, handling agents and the executive committee (LGW).
- 8.52** An annual winter review meeting with European airports including Frankfurt, Copenhagen, Amsterdam, Oslo, Zurich, Munich, BAA and London Gatwick. The basic principles of dealing with winter weather are the same, but the equipment and products used can vary, and these are discussed and learning shared. Many of the other participants have longer and more severe winter weather, and there can be a significant difference between their experience and that of the UK (BAA and LGW).

Figure 8.6 Snow plough in action at Birmingham International Airport



Image courtesy of Birmingham International Airport

Other airport issues

- 8.53** The 'no-win, no-fee' litigation culture is reducing the willingness of stakeholders to involve their own staff in the airport's winter clearance operations. Where prevalent slippery conditions exist, recognition is needed in law that people have to exercise a degree of personal responsibility – a 'common sense approach' (BHX).
- 8.54** London Heathrow, one of their key airports, had additional problems due to its operating close to capacity and was not able to recover quickly from any closure without cancelling flights (BMI).

Lessons learnt

London Gatwick

8.55 London Gatwick identified the following changes for next season:

- New runway surface friction tester has been purchased. This will allow the airport to deploy de/anti-icer in a more controlled manner and reduce environmental impact;
- Additional de-icer vehicle purchased;
- Current snow fleet will be refurbished;
- Agreements will be in place with building contractors for equipment to assist with snow clearing and removal;
- Operational procedures regarding clearance of taxiways have been revised, with clearance to centrelines agreed unless requirements differ, based on best practice from the benchmarking study;
- Administrative and third party staff will be trained and utilised more extensively for clearing passenger walkways;
- Communication procedures to passengers have been improved and arrangements made for free access at the internet café during disruption;
- A single key hub has been identified to coordinate airport, airline and handling activities;
- Improvements to the site pond facilities to handle larger quantities of de-icing contamination.

British Airways

8.56 BA advised of the following changes to its winter plans:

- BA has revised its equipment requirement and has placed an order for four new de-icing vehicles plus two spot de-icing vehicles at a cost of £3.2 million.
- An electronic form has been launched on the BA website for passengers to report missing or damaged baggage. This enables customers to leave the airport and claim online, rather than speaking to staff at the airport (BA).
- An increased pool of British Airways volunteers has been trained to support the call centres during disruption, who are mainly used for straightforward re-bookings, releasing experienced staff to deal with complex cases (BA).

Figure 8.7 Clearing Gatwick Airport of snow and ice



Birmingham International Airport

8.57 During winter 2005/06 and 2006/07 Birmingham Airport suffered severe freezing conditions and consequent disruption. A review of the winter operation and the prioritisation of resources was undertaken and led to significant investment in snow clearance and winter equipment. Despite considerably worse conditions, the lessons learnt and investment significantly mitigated the impact of the last two winters. Areas that went well for Birmingham International Airport included:

- New procedure agreed with Highways Agency to put airport status messages on motorway network information signs within a 100 mile radius. A reciprocal arrangement also exists whereby the Highways Agency notifies the airport of severe traffic disruption so that the airport can advise airlines and passengers;
- Staffing resource and response;
- Validation of the substantial investment in snow-clearance equipment (major fleet renewal in 2007), but it also re-enforced need to keep fleet renewal going;
- Good feedback from airlines.

8.58 Areas that went less well for Birmingham and need to be improved:

- Need to do more work around partner organisations' involvement in the Snow Plan;
- Road salt supplies (used for landside areas of airport and approach roads) were an issue during the last winter once they became restricted to highway authorities only, and a higher level of road salt will now be stored, but they have limited covered facilities.

Department for Transport

8.59 Areas that DfT was able to identify included:

- Seeking enhanced weather forecasting information systems for winter 2010/11, and training of operational staff;
- Revising snow clearance plans and snow-clearing equipment;
- Revising contingency plans to allow speedier access to restricted zones for snow clearance operations;
- Reviewing the role and function of airport crisis management and overall command and control structures, including ways to improve communications with duty manager(s) and snow clearing teams;
- Revising staffing arrangements to increase availability and improve resilience to deal with prolonged snow events;
- Improving provision of information to airlines and handling agents;
- Improving airside fuelling supply points.

Figure 8.8 Clearing snow piles at London Gatwick Airport



Image courtesy of London Gatwick Airport

Manchester Airport Group

8.60 Manchester Airport Group identified the following areas in its evidence:

- Lack of suitable snow clearing equipment, especially around aircraft parked on stands and consideration being given to replacing the older snow-fleet vehicles;
- Opportunities identified to improve staffing utilisation, overall management control and operation of the crisis centre, including two-way information flow between the centre, duty managers and snow clearing teams;
- Snow Plan revised to take greater account of heavy snow fall events, especially removing large amounts of snow;
- Weather forecasting had been reasonably accurate, but the difficulty lay in the intensity and depth of snow which can vary greatly over short distances. The airport group is obtaining enhanced weather forecasting services for next winter, and associated training of key operational staff.

BAA

8.61 BAA lessons learnt and improvements included:

- Replacement of some snow clearance vehicles with newer ones;
- An improved resource availability chart for use by the snow cell.²⁹
- Discussion of staff training issues and identification of improvements, and at some airports this evolved into a detailed review;
- Resources allocated to different tasks were changed and improved to increase the ability to clear more of the airfield at one time;
- Introduction of area coordinators at one of the larger airports to take responsibility for tasking resources in subdivisions of the whole airport;
- At some airports, trained staff were given accommodation in airport hotels to offer easier rest and to remove the risk of travel disruption when returning to the airport.

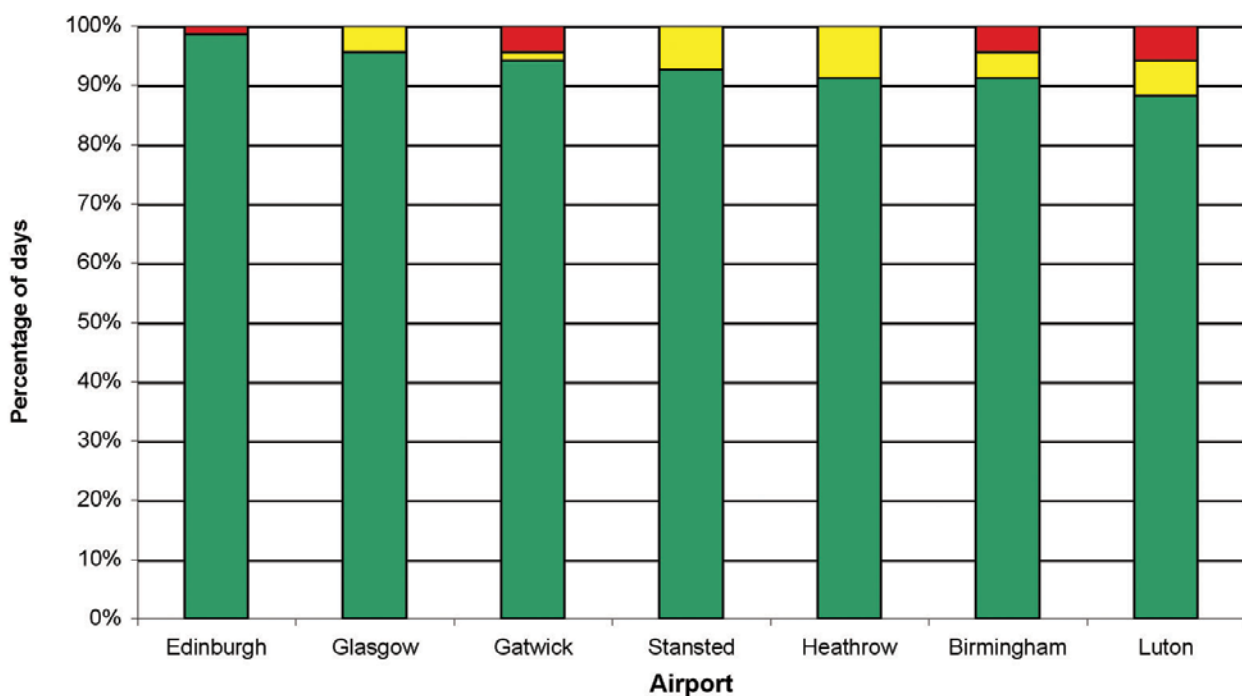
²⁹ A name sometimes used to refer to the group of persons and organisations with responsibility for restoring an airports' services following a snow event.

9. Key issues and recommendations

Resilience of operations – airports

- 9.1** Airport operators have to balance their duty of care to ensure that runways and aprons are safe and clear of contamination by snow and ice while maintaining the standard of service to airlines and the public, which can be greatly hampered by runway and apron closures. In striking this balance, safety is rightly seen to be paramount.
- 9.2** On the evidence from airports, airlines, air passengers and the CAA, the Panel takes the view that the UK aviation sector generally managed these competing demands well during 2009/10, as evidenced by Figure 7.2 above and Figure 9.1 below. Its approach to dealing with the effects of severe weather seemed to be appropriately precautionary without causing unduly prolonged delays to travellers. Given the relatively low frequency and duration of runway closures for these two severe winters, and evidence about the detail of how airports manage the consequences of severe winter weather, we believe that the airports generally managed their snow plan operations well.

Figure 9.1: Percentage of days between 17 December 2009 and 22 February 2010 by duration of runway closure (data supplied by airports, July 2010)



- 9.3** However, the Panel was struck by the contrast with the rail industry in terms of the structure of financial incentives. On the railways, Network Rail pays financial penalties for every minute it is unable to provide infrastructure to the train operator. In the aviation sector, there is no such regime by which an airport compensates an airline for the lack of availability of the aerodrome infrastructure, so there is no direct financial incentive to airport operators to re-open runways and taxiways – other than the loss of landing fees where flights are diverted or cancelled. Indeed,

airlines pay to continue to occupy stands while operations are suspended, and it is airlines who must meet the costs of flight delays for their passengers and compensation under the Denied Boarding, Delay and Compensation regulations.

- 9.4** Nevertheless, the Panel has no doubt that the commercial and reputational imperative weighs sufficiently heavily on an airport to ensure sufficient planning and resources are committed to winter resilience. As long as this continues to be the case, and based on the evidence from the airlines and their representatives, there is no appetite for a rail-type regime whereby the airlines are compensated by the airports for lack of infrastructure availability.
- 9.5** A notable development in aircraft de-icing was the adoption by BA at Heathrow of a temporary, stand-alone de-icing station for aircraft near the runway entry point ('pan de-icing'), in place of the normal de-icing which takes place on the stands prior to pushback. As this allows departing aircraft to vacate their stand before de-icing, it eliminates the pressure on the de-icing teams in periods of disruption and allows incoming flights to be brought to their stands promptly. Given the limited 'holdover' time of some 30 minutes – ie duration of effectiveness of the de-icing treatment – pan de-icing can be a solution to the loss of holdover time caused when queues of aircraft on taxiways build up before takeoff.
- 9.6** These pan de-icing facilities are found at some overseas airports with more frequent and regular severe winters. The business case for investment in the equipment and facilities seems to be weak at UK airports given the typical number of days in a year and periods in the day it would be used; in any case, space for the facility is not readily available at many of the UK's relatively cramped airports where runways are used intensively. The Panel understands that an initial proposal for a permanent facility at Heathrow under the Terminal 5 development was dropped because of the cost. The success of BA's temporary facility last winter should nevertheless be noted by other operators: the case at Heathrow would appear to be stronger because it operates so close to capacity, and the ability to mitigate yet another potential cause of disruption and delay in ground operations has more value. We have not examined the feasibility, costs and benefits of installation, nor the acceptability to and likely use by the airlines, but suggest it is worth revisiting, at least for Heathrow.

Figure 9.2 Clearing the taxiway at Birmingham International Airport



Image courtesy of Birmingham International Airport

Resilience of operations – airlines

- 9.7** Due to the international nature of the aviation sector, the factors affecting airline operation in winter conditions are more disparate and beyond the control of airlines than is the case for rail operators. The effect on flight schedules of winter disruption depends on airport availability across the airlines' network as a whole.
- 9.8** The extent of disruption depends on the tightness with which the airline already schedules its aircraft and crews, and this varies among airlines according to their business model. Typically the low-cost airlines plan for short turn rounds (often 30 minutes) and four journeys per aircraft per day or more, and the disruption due to even short runway closures, will be more than for the full-service airlines with longer turn-rounds.
- 9.9** The real test of the airline's capability is the speed of recovery to normal operations; this in turn depends on the experience, skill and judgments of the flight operations teams: one crucial decision is how early to cancel and/or re-schedule flights as opposed to soldiering on with a near-normal schedule whose performance gradually deteriorates – a similar type of decision to that faced by railway operators, as we see in Part C.
- 9.10** It is evident to the Panel that different airlines take different approaches – even in similar situations (as also happens with different operators in the rail network). We recognise the different circumstances that each airline faces and the unique impact of decisions each airline makes. But there does seem to be some generic evidence that earlier, more decisive cancellations and rescheduling (rather than 'soldiering on') help to accelerate recovery to normality after the disruption and are more helpful for passengers because of the certainty – even if unwelcome – against which they can make their plans.
- 9.11** It is difficult to track after the event what the actual disruption was, in terms of flight cancellations, diversions, rescheduling and so on, and the consequent impact on service to customers. The following information is available in relation to UK airlines and passengers, but other sources of data on airline performance are published by private sector organisations, though without independent validation:
- The CAA publishes UK punctuality statistics, based on the ten main UK airports.³⁰ Information is published each month showing the average delays on scheduled and charter services at these airports, both in total and at an individual route/airline level. The CAA issues quarterly press notices covering the latest data and trends.
 - Monthly aggregate information is collated by the CAA on UK airlines for each route served, together with quarterly returns of fleet and personnel data.
 - Since 1968, the CAA has undertaken a series of passenger surveys to obtain information about air travellers and the travel market;
 - Airport operator BAA produces a customer service report which contains results for each of its six UK airports (Heathrow, Stansted, Southampton, Edinburgh, Glasgow and Aberdeen) based on its well-established passenger perception survey.
- 9.12** While extensive, the range and availability of airline performance data is both more diverse and diffuse compared with that available from the rail sector, where such information is clearly set out and published (as we demonstrated in Part C above). While airline performance information is

30 Heathrow, Gatwick, Stansted, Luton, London City, Manchester, Birmingham, Newcastle, Edinburgh and Glasgow.

highly desirable from the passenger perspective, it is difficult to interpret airline performance as clearly as one can for rail performance, because there are many more factors outside the control of the airline that affect its operation and performance.

9.13 We were advised of various initiatives in the recent past to publish performance information:

- The Air Transport Users' Council previously published a league table for charter flight delays from ten UK airports in the summer season, but discontinued it a few years ago, as charter flights became a much smaller part of the airline business;
- The European Commission began developing a system of reporting under the Air Passenger Rights programme, but we understand this has become too complex for implementation and has been discontinued;
- The Association of European Airlines, representing 27 airlines, began to publish statistics on delays and cancellations, baggage losses, etc but has ceased, on the grounds (we understand) that the ability to interpret a relatively simple set of statistics would always be compromised by different patterns of flights, airports used, transit percentage, etc.

9.14 In a wholly commercial and international industry, the Panel recognises the challenges associated with drawing accurate and meaningful airline performance data. As such we do not recommend that any further burdens are placed on the aviation industry by gathering new sources of data. Nevertheless, more can be done to bring together existing data in order to meet the public interest in the performance of airlines during winter disruption. This viewpoint is supported by research commissioned by the CAA in 2008,³¹ which shows that only 35% of passengers are satisfied with their ability to compare service quality of airlines when buying a ticket. While some helpful punctuality statistics are available from the CAA website, the information is not currently marshalled or interpreted in a way that helps passengers and the market generally to see how the airlines and airports perform. The Panel believes that building on what the CAA does now and improving the presentation and interpretation of its performance data would be a pragmatic response to this need. We make a recommendation to this effect.

Supply of de-icing and anti-icing products

9.15 Just as supplies of road salt were severely stretched across Europe in winter 2009/10, so were the aviation sector's de-icing materials. We heard of particular problems in getting sufficient supplies of both airfield and aircraft de-icing and anti-icing products around the country. Some airports came within hours of running out, and we heard that only through the use of alternative, less environmentally desirable, products were some runways and aprons kept clear.

9.16 It was also noted by operators that the potassium acetate-based products, which are generally favoured due to their lower environmental impact, were less effective in the extremely low temperatures experienced this winter. Glycol-based products were more effective and, although more environmentally damaging, could be used in much lower quantities, which tended to offset the disbenefits.

9.17 The supply problems appear to have been exacerbated by the location of the suppliers (some distance from the London airports) and access to the North East ports, where the imports arrived, which delayed deliveries due to difficult road conditions. However, it was notable that witnesses

³¹ Research on the air passenger experience at Heathrow, Gatwick, Stansted and Manchester airports – http://www.caa.co.uk/docs/33/ORC_CAA_report.pdf

spoke consistently of the intention, on the part of both the airport operators and the airlines' contractors, to increase stocks of de-icing and anti-icing products in time for the coming season.

- 9.18** Increasing stocks appears to the Panel to be the right response. This is a market capable of meeting demand for these products, and sufficient stocks need to be held at the point of use. Given the massive financial and reputational cost of closures, and even allowing for the limited shelf-life of aircraft de-icer, stocks of these products ought to be sufficiently resilient to withstand a 1 in 20 year winter.
- 9.19** The Panel has concluded that there is no case for Government intervention in the market for de-icing and anti-icing products for airport and airline use, and that the market and the professionalism of the operators should ensure sufficient resilience and availability of supplies.
- 9.20** The same point applies to stocks and supply of road salt for treatment of landside roads, footways and car parks. The volume of salt needed by airports for their own use is very small in comparison with that required for general highways. While there were some complaints that additional supplies of salt could not be obtained from main suppliers for airports once the Salt Cell was in 'allocation' mode, we would suggest that, for the future, airports or their contractors acquire sufficient road salt ahead of the season to be able to cover their needs even in a severe winter.

Figure 9.3 Clearing snow at Birmingham International Airport



Image courtesy of Birmingham International Airport

Environmental issues

- 9.21** The environmental impact of run-off from de-icing and anti-icing products is an important consideration. These chemicals – potassium acetate (and occasionally the more hostile glycol and urea) for airfields and glycol for aircraft – can be damaging to watercourses and associated wildlife. A few airport operators made clear to us their concern that the Environment Agency (EA) licences governing the maximum concentrations of run-off from holding lagoons discharged into watercourses seemed particularly restrictive in times of severe weather like that experienced in winter 2009/10. There was some concern that the Agency's pursuit of breaches of licence might be inconsistent among industries, with the aviation sector more harshly treated than others, and perhaps even inconsistent among regions. It was thought that perhaps the EA lacked a full understanding of the difficulties of maintaining environmental standards during periods of prolonged severe weather when run-off would inevitably be potentially more polluting, but treatment was clearly necessary. The Panel noted that fines were levied by the EA on some airports for exceeding licensed concentrations. The Panel also noted that measures can be taken – such as increasing the capacity of holding lagoons – which require investment but where the business case may not appear to be very strong.
- 9.22** The Panel appreciates that the effect of run-off will depend on the number and nature of local watercourses, and that the effluent treatment provided to enable the continued functioning of the airport in adverse weather, may therefore vary from location to location. However, it did appreciate the reassurance from the Environment Agency that, if the weather event is of exceptional severity, it will look sympathetically at bone fide incidents where the treatment capacity of the airport is unable to cope with the demand, and will work with the airport to minimise and mitigate any pollution caused.

Figure 9.4 A fleet of snow ploughs on standby at London Gatwick Airport



Image courtesy of London Gatwick Airport

Customer relations

- 9.23** The burden of communicating with air travellers – both prior to travel, during the journey and at the airport itself – falls on airlines, with whom the passenger has the direct contractual relationship. Airport websites always urge travellers to contact their airline, as the status of the airport itself is no guide to the status of particular flights.
- 9.24** Generally, airlines make full use of electronic media – email, texts, and increasingly social networks – for direct communication with passengers about their flights, supported by comprehensive and constantly updated website information. Some airlines take more care than others to ensure such messages are received, for example by passengers at their destination waiting to return home who may not have easy access to the internet or their email. We were also impressed by the extent to which many airlines had honed their operations to support passengers in times of disruption, for example by training back-office volunteers to assist stranded passengers.
- 9.25** Airports also are increasingly focused on stranded passengers, but there are still stories of concessionaires and contractors who clock off at the end of their day just when the demand for passenger support and assistance is rising.
- 9.26** Air travellers now have high expectations of the timeliness and relevance of direct communications they receive from their airline at times of disruption, and certainly for the main UK and Ireland carriers this is generally fulfilled. It does set an example to be emulated by transport operators in other sectors. We discuss the wider issue of communications with the public and between institutions in Part G (Cross-modal conclusions and Recommendations) below.
- 9.27** The issue of compensation and reimbursement of expenses incurred in disruption is covered for many European passengers in the Denied Boarding, Delay and Cancellation (DBC) regulations.³² DBC is not payable if the airline can demonstrate 'exceptional circumstances'; but whether or not winter conditions are counted as exceptional, and whether it can be argued – in some countries at least – they are predictable and should be properly planned for, is something that regulators and airlines are still wrestling with. Passengers that are not covered by the EC regulation are not entitled to any assistance from their airline.

Liaison with highway authorities

- 9.28** Our Interim Report was very clear about the need for highway authorities to engage key transport providers in discussions of their planning of winter services. This was to ensure that proper account was taken of the needs of passengers, staff and those servicing other vital modes of transport. However, this cuts both ways. Airport operators need to be pro-active in their communication with highway authorities (both local and national) to ensure that their interests are fully understood and taken into account. Similar conversations need to take place between local highway authorities and major suppliers to the aviation sector – we understand that there was some potential difficulty with road access for one of the de-icing product suppliers.

32 EC Regulation 261/2004 established common rules on compensation and assistance to passengers in the event of denied boarding, cancellation or delay. The Regulation includes obligations for airlines to provide assistance to passengers and covers passengers on all European Union and foreign airlines operating from any EU state to any part of the world, and to passengers travelling into the EU on EU carriers.

Conclusions and recommendation

- 9.29** Generally, we believe that the aviation sector in the UK anticipates and manages the effects of severe winter weather to a very high standard of resilience and has in place the processes and disciplines that enable lessons to be learnt from one winter and adopted for subsequent seasons. Communications with passengers are generally effective and well coordinated.
- 9.30** Airlines face dilemmas similar to those in railways as to exactly how, when and to what extent they should cancel and reschedule services rather than 'soldier on'. A similar conclusion emerges that – other things being equal – early decisive action will generally lead to a swifter recovery as well as more certain information for passengers. Experience of the last winter – given the different approaches adopted by different airlines – underlines this.
- 9.31** Liaison over the treatment of the appropriate public road networks could be improved between airports and their local highway authorities.
- 9.32** We believe there is no case for Government intervention in the markets and supply chains for de-icing and anti-icing products or of road salt for the aviation industry.
- 9.33** Finally, the Panel believes that there is case for improving access to performance statistics for airlines and airports relating to the management of disruption. There have been various failed attempts to deliver this in recent years; a practical way forward is for the CAA to improve the presentation and interpretation of certain of its regular performance reports.

Recommendation 22: That the Civil Aviation Authority considers how it might develop its currently published performance data to improve the presentation, commentary and interpretation of airline performance information, to inform passengers and the market and encourage improved performance across the industry.

Part E:

Salt and the supply chain

10. The salt supply chain and its longer-term resilience

Introduction

- 10.1** The Interim Report (Chapter 7) gave an initial diagnosis of the issues surrounding salt and the supply chain and recommended short term action for next winter – in particular the creation of a strategic stockpile of one quarter of a million tonnes of salt, to be procured and managed by the Highways Agency (HA) on behalf of England’s local highway authorities (LHAs), and secondly the establishment and operation by the Department for Transport (DfT) of a year-round monitoring and reporting system for salt stock and supply across the nation, to support a continuing strategic overview of the salt supply situation and to give early warning of problems likely to arise.
- 10.2** Further time was needed to carry out a thorough, detailed analysis of the salt supply chain at a more disaggregated level, and to develop and evaluate longer-term, sustainable measures that would build sufficient resilience for highway authorities to meet their operational needs for salt. This has now been carried out, with the support of consultants commissioned by the Review Panel. This chapter now presents our overview of the analysis, issues, and recommendations. The detailed analysis which sits behind this is separately available on the Winter Resilience Review website.³³

The challenge

- 10.3** In the Interim Report we observed that the current supply chain for salt is fundamentally vulnerable and lacks resilience – largely as a result of the combination of highly constrained production, volatile seasonal demand uncertain in its amount, timing, duration and geographical location, and relatively low stockholding in the system (and no strategic buffer stocks).
- 10.4** With the experience of the last two winters, including the operation of Salt Cell and the drastic cuts required in salt utilisation, the benchmark we set for the salt supply chain was that a seasonal salt requirement equivalent to the unconstrained demand of last winter should be met without resort to Salt Cell-type interventions or emergency reductions in salt utilisation. We still believe this is the appropriate benchmark, even though the chance of such severe winters in any one year is around 1 in 20, and declining.³⁴
- 10.5** We now consider and evaluate various solutions and measures designed to deliver this for the salt supply chain over the longer-term. Although our remit is for England, given the nature of the market we needed to model and evaluate salt stocks and supplies for Britain as a whole; we are able to draw conclusions about all three nations in GB and will be pleased to share their implications with colleagues in Wales and Scotland, as we did for the Interim Report. But our Recommendations will relate to England alone.

33 <http://transportwinterresilience.independent.gov.uk/>

34 See Interim Report, Chapter 12, Weather forecasting and climate change.

Salt supply at the Britain level

- 10.6** The first key point is that current UK production capacity is sufficient only to meet the British demand in an average winter (Table 10.1). It falls considerably short in a moderately severe winter (as in 2008/09) or a nationally severe winter (as in 2009/10). Even if demand is constrained – such as when the Secretary of State requested that highway authorities reduce their usage in January 2010 – nationally severe winter demand cannot be met by UK production alone.

Table 10.1: Salt demand and production capacity in Britain (m tonnes = million tonnes of salt)

For Britain	Average winter	Moderately severe winter	Nationally severe winter
Unconstrained demand	1.5m tonnes	2.8m tonnes	3.3m tonnes
Constrained demand	n/a	2.2m tonnes	2.7m tonnes
UK production capacity	2.0m tonnes	Up to 2.4m tonnes	Up to 2.4m tonnes

- 10.7** To meet our benchmark of being able to meet the unconstrained demand of a nationally severe winter, the supply chain has to be able to resource Britain’s highway authorities to the extent of 3.3 million tonnes. That means imports of about 0.9 million tonnes are at some point an inevitable and necessary feature of the supply chain. But **when** they are required depends on the cycle of average and severe winters and on the way in which stock is managed.
- 10.8** The difficulty is that imports typically cost 50–100% more per tonne than UK production delivered to the highway authority’s barn. No one highway authority wants to be ‘caught’ at the end of the queue for UK production (either pre-season or in-season) and then having to pay the additional costs for imports. The pressure on suppliers may be such that few if any authorities actually receive nothing, but a number may not have all their pre-season orders fully completed by the start of the season; this may mean that sufficient imports may never get ordered and the strategic shortfall may never get properly addressed. There is some evidence that exactly this is happening during the current pre-season stockbuilding.
- 10.9** The second key point is that the salt needs to be in the right place at the right time. The most important requirement is for the pre-season stockholding (i.e. at 1 November) at highway authorities and at the mines to be high enough: the ability to source salt in-season is constrained by in-season UK production capability, and by the higher price and more limited availability of imports during winter.

Building stocks for 2010–11

- 10.10** In our Interim Report we identified a major challenge in building pre-season stocks for the coming winter 2010–11. The unusually low stockholding coming out of last winter (0.3 million tonnes total across Britain), combined with the understandably ambitious plans for highway authorities to build adequate stocks for next winter, has generated a pre-season demand which significantly exceeds the pre-season production capacity of UK producers.

- 10.11** Our analysis of this shortfall suggested that – against the benchmark of meeting the needs of a nationally severe winter – up to 0.75 million tonnes could need to be imported. We understood in July that some imports were already on order by some authorities. Subsequently our Recommendation for a strategic national stockholding of a quarter of a million tonnes to be procured by import was accepted and is being implemented;³⁵ in addition the London authorities have secured a reserve stock by import; other local authorities have been importing; and we understand Cleveland Potash has been fulfilling some of its customer orders through import (and replenishing its own mine stocks). Even so, it seems that the mines will enter the winter season with mine stocks considerably lower than their normal target levels, as their pre-season production is virtually all needed to fulfil customer orders. And not all customers will receive their orders by the usual deadline of 1 November, so some post-October in-season production will be used to fulfil outstanding pre-season orders, rather than to build mine stocks and to start to meet in-season demand.
- 10.12** This is the background against which we recommended that (in addition to the procurement of the quarter of a million tonnes strategic reserve) the situation is reviewed again towards the end of December to see whether a further acquisition of (say) a quarter of a million tonnes is needed. A review of use to date by mid-December, and of the weather forecasts for January, will clearly indicate whether this is needed.

Planning for future winters

- 10.13** Table 10.2 proposes a general planning framework for meeting the benchmark of 3.3 million tonnes under two different scenarios – first, after an average or regionally severe winter, and second after a nationally severe winter.

Table 10.2: Total salt stocks, supply and use scenarios for Britain: at local highway authorities and strategic road authorities, and at mines and their stock locations

For benchmark severe winter	After average or regionally severe winter	After nationally severe winter
Total stocks at end of previous winter (highway authorities and mine-held)	0.8m tonnes ¹ (e.g. as 31 March 2009)	0.3m tonnes (e.g. as 31 March 2010)
Pre-season supply UK production (7 months): Imports needed	1.65m tonnes	1.65m tonnes
Pre-season Stockholding at 1 Nov (highway authorities and mine-held)	2.45m tonnes	1.95m tonnes
In-season supply UK production (5 months): Imports needed	1.65m tonnes	1.65m tonnes
UK usage of salt³	-3.3m tonnes	-3.3m tonnes
Total stocks at end of winter (highway authorities and mine-held)	0.8m tonnes	0.3m tonnes ²

35 Interim Report, Recommendation 1

Notes

1. This is taken as 0.5 million tonnes mine-held stocks and 0.3 million tonnes at highway authorities.
2. This is a dangerously low level of stocks with which to exit winter; to reach a healthier level of pre-season stockholding for the subsequent winter – i.e. nearer 2.45 million tonnes than 1.95 million tonnes – and to be able to exit that subsequent winter at a more comfortable level of stocks, it would be necessary to increase the pre-season imports to substantially more than 0.4 million tonnes, or to secure significantly higher UK pre-season production than 1.25 million tonnes.
3. No specific allowance has been made in the estimated usage of salt for that required for additional footway treatment, as suggested elsewhere in this Report. But this usage would be relatively small in relation to the highways requirements and alternative treatments to salt are available for footways.

10.14 The key points to take out from this table are:

- a) A reminder that UK production capacity of 2.4 million tonnes must be supplemented by 0.9 million tonnes of imports to meet GB usage of salt of 3.3 million tonnes in the benchmark nationally severe winter; how much is needed in a particular year and when in the season depends on the starting stock levels;
- b) Even more imports would be needed (or UK production further increased) in order to exit a severe winter with a healthier level of highway authorities' and mine-held stocks than was the case in March 2010, and to be able to rebuild the pre-season stocks to a healthier starting level nearer the suggested benchmark 2.45million tonnes.

Analysing stocks at local highway authority level

10.15 A key element of the planning framework we are proposing would be achieving the benchmark pre-season stockholding of 2.45 million tonnes, summed over all highway authorities in Britain (1.65 million tonnes) together with an assumed 'usual' level of supplier held stocks (0.8 million tonnes). LHAs in England would account for 0.9 million tonnes of those stocks.

10.16 To help comprehend what these figures mean at highway authority level, we analysed stocks and utilisation in terms of numbers of 'runs' made by highway authorities during the winter season, calculated at an equivalent 20g/m² spread rate. Based on our understanding of how LHAs treat their networks under severe conditions, we are taking 1 day's resilience as equivalent to four runs; we know the Highways Agency (HA) base their resilience on 6 runs for 1 day's severe conditions.

10.17 For all England's 155 local highways authorities (LHAs), one 'run' uses about 20,000 tonnes; for the HA one 'run' uses 3,000 tonnes for their network. From data compiled by the DfT for the Salt Cell, we estimate the usage shown in Table 10.3.

Table 10.3: Local authorities usage in severe winter, capacity and pre-season stocks

	Salt use in benchmark severe winter ³⁶	Storage capacity	Pre-season stockholding intentions for winter 2010–11 (at June 2010)
England: local highway authorities	1.75m tonnes 88 runs average	1.15m tonnes 58 runs average	1.00m tonnes 51 runs average

36 Equivalent to unconstrained demand for salt during the 2009–10 winter.

- 10.18** This would indicate that LHAs are stocking up for the forthcoming winter to considerably higher levels than the previously recommended levels of 6 days’ resilience (equivalent to 24 runs), and to 100,000 more tonnes than our benchmark proposal of 900,000 tonnes.
- 10.19** However, the key question is how this is distributed across LHAs, as they have very varying stockholding capacity (Table 10.4).

Table 10.4: Salt storage variations in England (taken from data supplied by local highway authorities in June 2010)

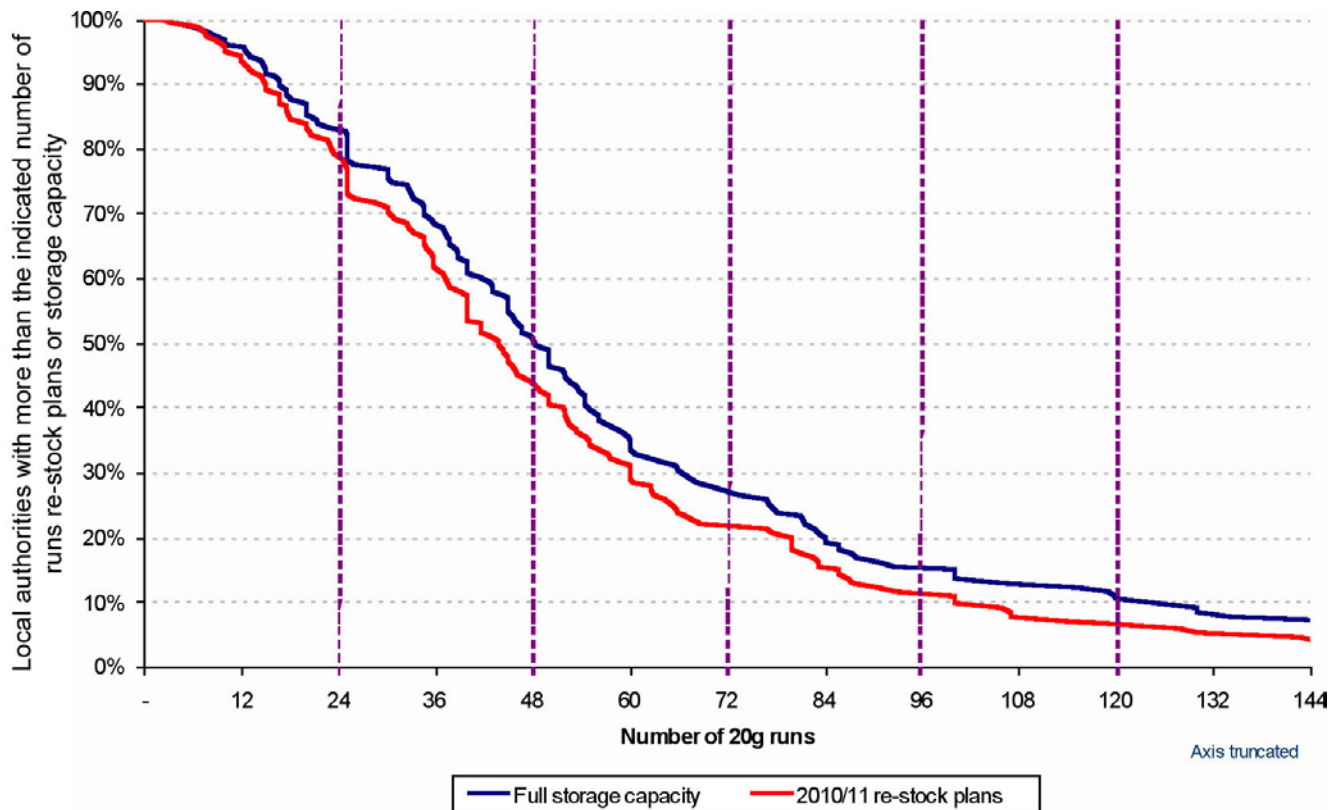
	Less than 6 days/24 runs resilience	6 days/24 runs – 12 days/48 runs	More than 12 days/48 runs	Total
Number and percentage of local highway authorities in England	27 17%	51 33%	77 50%	155 100%

- 10.20** Although the average pre-season stockholding for the forthcoming winter is 51 days, there is considerable variation in capacity and therefore in stockholding at individual LHAs, with half of them with less than 48 runs capacity. In practice, this does not take account of mutual aid agreements between adjacent authorities with different capacities, plans for shared regional stockpiles (for example in London) and supplier or importers’ buffer stocks at nearby ports. It therefore is likely to understate the actual capability.
- 10.21** Nevertheless, this analysis would suggest that the level of 6 days/24 runs recommended by the UKRLG³⁷ in July 2009 is too low were it adopted by LHAs as a general basis for stockbuilding in future years. We have modelled the salt supply chain with alternative pre-season benchmark resilience levels for local highway authorities; this analysis suggests that 12 days/48 runs represents a sensible balance between the ability to restock after a severe winter (and the cost of doing so) and the ability to meet the forward requirements of a severe winter given the constraints on in-season supply. We propose 12 days/48 runs as a new benchmark resilience level, and that it is interpreted as follows:
- a) LHAs with capacities less than 12 days/48 runs should fill their storage; they should also carefully review their history of usage and mutual aid arrangements, opportunities with surrounding authorities, and consider whether there is a case for increasing storage capacity towards 48 runs;
 - b) LHAs with capacities in excess of 12 days/48 runs should consider whether and to what extent they should stock at or above these levels, taking account of their own pattern of usage, their costs, and the levels of resilience in neighbouring authorities with whom they may have or could have mutual aid arrangements.
- 10.22** This is close to the actual pattern emerging this autumn (Figure 10.1), although it should be noted that some LHAs with relatively low capacities (under 24 runs) appear not to have had plans as at June 2010 (when this data was collected) to fill that capacity. This may reflect delays in finalising pre-season stock plans, or other arrangements not captured in the data collection, such

³⁷ The UK Roads Liaison Group (UKRLG) brings together those bodies responsible for operating the UK’s highways: Department for Transport, Scottish Government, Welsh Assembly, Northern Ireland Roads Service and representatives of local highway authorities. UKRLG provides advice to central and local government on roads issues

as mutual aid already in place with neighbouring authorities. It is significant that many local authorities with capacities considerably in excess of 48 runs are filling all or a substantial proportion of that capacity.

Figure 10.1: English local authorities with more than the indicated number of runs



10.23 The purpose of adopting a 12 days/48 runs benchmark level is to ensure that there is enough pre-season stockholding across England and ideally across groupings of authorities – even if it is not all in exactly the right place, nor is it all at the 48 runs level – to avoid activating Salt Cell or triggering substantial imports. This is illustrated by the effect of different benchmarks in Table 10.5.

Table 10.5: Local highway authorities' in England proposed benchmark levels

	Benchmark level	Benchmark level
Current 2010-11 pre-season stock plans	51 runs average	1.00m tonnes
Fill to capacity (if less than 48 runs) or decide stocks in light of circumstances if capacity is 48 runs or more	52 runs average	1.05m tonnes
Fill to capacity (if less than 48 runs) or fill only to 48 runs	40 runs average	0.80m tonnes
Fill to capacity (if less than 24 runs) or fill just to 24 runs	23 runs average	0.45m tonnes

10.24 Finally, we examine whether the current pattern of stockholding has significant variations between regional areas that might indicate some resilience problems (Table 10.6). These regional areas are based on the HA regions.³⁸

Table 10.6: Regional stockholdings in England (based on June 2010 data)

Regional areas	SW	SE	E	Mid	NW	NE
LHA stock in runs	47	38	41	52	57	71
Shortfall in tonnes in regional areas compared with benchmark resilience of 12 days/48 runs	1,000	53,000	14,000	0	0	0
Shortfall in tonnes in smaller groupings ³⁹ compared with benchmark resilience of 12 days/48 runs	7,000	53,000	14,000	18,000	15,000	2,000

10.25 The shortfall within regional areas nets out individual 'overs' and 'unders' compared with the 48 runs benchmark. However, given the wide geographical extent, this analysis does not indicate whether the 'overs' and 'unders' are close enough in practice to practically net off through mutual aid arrangements.

10.26 Our informal work, which considered smaller groupings within these regions, suggests that the regional figures conceal some wide variations, and this is particularly noticeable in the South East. The decision by the London authorities to acquire a strategic reserve of 25,000 tonnes is clearly addressing half the regional shortfall against the 48 runs benchmark.

10.27 However, this leads us to suggest that LHAs with less than 48 runs capacity may particularly wish to review their own capacities, history of use and opportunities, as proposed in our Recommendation 25.

10.28 The benchmark resilience we are proposing amounts to, on average, holding in stock pre-season about 55% of likely usage under benchmark severe winter conditions. Our recommendation would be that individual local authorities carry out a review of their own actual recent and earlier usage against their stockholding capacity and plans, and consider whether given their existing and potential mutual aid arrangements, and the service provided by their supplier, there is a need to revisit their storage capacities.

The need for strategic solutions at the macro level

10.29 Our Interim Report Recommendation⁴⁰ for the quarter of a million tonnes strategic reserve for England's LHAs to be actioned by Government through the HA is a necessary response to the particular circumstances of the current year, which have been well described in the previous section. However, we do not believe that this action by Government should be a necessary or expected part of a strategy for the longer-term resilience of the supply chain (although it is

38 These correspond roughly with government regions except that 'Northeast' includes North East and Yorkshire; 'Midlands' includes West Midlands and East Midlands, and 'South East' includes South East and London.

39 Smaller groupings have been brought together on an ad hoc basis for this analysis

40 Interim Report, Recommendation 1

available as an emergency action if needed). That is why it is important also to explore other possible strategic initiatives, alongside the logistical and supply chain solutions we discuss above.

10.30 We have looked at four possible approaches.

1. Commercial/contractual solutions

10.31 In many markets, customers contract with suppliers for a guaranteed supply, with penalties applying if there is a shortfall. The supplier typically organises his supply chain to supplement his production with other sources of supply (for example imports, in our case), and manages his risk accordingly. The cost of providing the guarantee and the risk of additional supply not being needed is reflected in the price.

10.32 An advantage of such an approach is insulating the customer from the price difference between domestic production and imports, currently a substantial brake on the market's willingness to import sufficiently to provide resilience.

10.33 However, the risk – which would be carried by the supplier – is considerable, given the extremes of demand in the UK from one winter to the next and the difficulty of forecasting. Informal discussions suggest that there is little appetite among the suppliers for such contracts. A commitment by the customer to accept a minimum order (whatever the weather) – as is often found in the US where severe winters are more commonplace – could make it more attractive, but would transfer some of the risk to the LHA, who are unlikely to welcome it.

10.34 We believe the idea of paying a higher price to obtain a guaranteed delivery for the relatively infrequent occurrence of severe winters, against today's contract price for delivery but with no formal guarantee, is unlikely to be attractive to LHAs – especially at this time when they are faced with unprecedented pressures to reduce their expenditures. However, some authorities, particularly those in purchasing consortia, may wish to explore this, as part of 'smart purchasing' initiatives which could also seek a breakdown of ex-works and transport costs.

10.35 With three UK suppliers, a couple of importers and over 200 independent highway authorities/contractors there is little collective power of customers to drive the development of a type of contract which transfers so much risk to the supplier. Though a neat solution, this form of contract has not emerged seriously in the UK market, and we believe it is unlikely to do so, or be sustainable for the reasons given.

Figure 10.2 Highways Agency gritters



Image courtesy of Highways Agency (Crown copyright)

2. Trading solutions

10.36 We have considered whether a trading solution – which has been suggested to us – could provide some resilience. A market in salt would arise where most of the following conditions are present:

- many sellers and buyers, with large volumes, scale and global supply;
- sophisticated customers who understand the trade;
- volatility in supply side capacity;
- volatility in demand due to external factors;
- logistics costs that are relatively low in relation to the commodity value.

10.37 The salt market satisfies only one of these conditions – demand volatility. The high logistics costs in relation to value diminishes the prospects for trading globally or even regionally. And for LHAs the cost of the salt they need is still a relatively small part of their total procurement, and would be unlikely to justify the degree of attention or sophistication that trading would require. Finally, neither of the known importers has shown any appetite for making markets in salt – nor has anyone else. We conclude that this approach does not offer a solution.

Figure 10.3 Highways Agency salt barn being filled



Image courtesy of Highways Agency (Crown copyright)

3. Capacity/throughput increases at the suppliers

- 10.38** Cleveland Potash (CP) and Salt Union (SU) have different business models, but if the suppliers were able to flex their production/throughputs to a greater extent than today, this would go a long way to providing more resilience, both in the pre-season stock-building period and in-season.
- 10.39** At CP, salt is a by-product of the extraction of potash, which is much more profitable to mine, and the extraction rates for salt are governed by what is necessary to enable potash to be mined at the optimum rate. We recognise the difficulty of significantly increasing salt production without reducing potash production and unbalancing both the mining operation and economics of the business.
- 10.40** However, as CP's salt output goes via the port terminal at Teesside, where loading of both road vehicles and ships takes place, it is possible for CP to integrate salt imports (especially from other companies within their Group) into their GB distribution. To what extent they can and will do so depends on prices and costs, but also on their commitment to their established customers. It is significant that, as we understand it, discussions have been taking place between CP and its customer base about their possible use of imports to fulfil re-season customer orders and replenish their own mine stocks. We welcome this, reflecting as it does a more flexible market response on the supply side.
- 10.41** While such measures will always remain business decisions of CP, it is important for the successful strategic overview of the salt supply chain that they are visible to the market – as indeed they currently are.
- 10.42** SU's business is entirely salt, and is distributed by road from their Winsford Mine.⁴¹ The production process consists of mining underground, crushing and grading in an underground plant, lifting graded product to the surface, and loading either straight into vehicles or to surface storage. Production capacity is currently limited by the throughput of the crushing and grading plant, which is significantly less than either the current mining capacity or the capacity of the surface lifting.
- 10.43** We understand that SU are exploring opportunities to increase the capacity of the crushing and grading plant so as to be able to increase output from early 2011 – certainly for defined periods of high demand. Meanwhile, some reconfiguration of the vehicle loading arrangements at the surface has been carried out to improve handling efficiency at high volume. We strongly commend these measures, and urge SU to position themselves to be able to step up production for reasonable periods of time when the stock/supply position is adverse.
- 10.44** Together we believe that such measures by the two companies could increase output/throughput for UK customers by well over half a million tonnes per annum beyond the current winter.

⁴¹ SU will sometimes deliver to more distant UK customers by coastal ship from Ellesmere Port when road transport capacity is under pressure or winter road conditions are severe

4. Reducing salt utilisation and redefining standards

10.45 Experience of the emergency reductions last winter has suggested that spread rates could be reduced on many occasions – for example from 20g/m² to 15g/m² – without impairing effectiveness of treatment on the highway; the HA (having researched it for its own network, using the pre-wet system) has already issued new schedules to its contractors with reduced rates for precautionary treatment. And some local highway authorities are already using lower spread rates. In our Interim Report we recommended that a thorough, authoritative review of technical standards be carried out to enable such changes to be considered and implemented confidently by LHAs; this would be led by the UKRLG, with the benefit of the NWSRG⁴² and its good work brought under its wing.

10.46 It is now clear from our analysis that such reductions in utilisation would make a vital contribution to the strategic resilience of the salt supply chain at the macro level, as well as reducing cost for individual highway authorities. For example, a nominal 25% reduction in normal spread rates could reduce the GB demand for salt in our benchmark conditions by (say) 20%, that is by some 0.65 million tonnes to 2.65 million tonnes based on current network coverage. Setting new standards for winter 2011/2012 should now be an urgent task for the UKRLG. The aim should be to issue new guidance early in 2011 so that it can be reflected in re-stocking plans by LHAs and in the recalibration of vehicles during their post-winter maintenance.

Figure 10.4 – Highways Agency salt barn with loader



Image courtesy of Highways Agency (Crown copyright)

10.47 From these four possible strategic solutions, we do not believe that either contractual or trading solutions are realistic or sustainable in this particular market. But there are two which should be pursued with some urgency:

- a) The ability and willingness of the two main suppliers to flex their throughput – CP through selective uses of imports to supplement domestic production, and SU through investment in underground plant to increase mine output. Both of these are currently happening or

⁴² The National Winter Service Research Group (NWSRG) is a group comprising national and local authorities, along with contractors and suppliers, who have developed a plan of research in winter service

planned and we welcome them; they have the capability to close the gap between UK production capacity and the benchmark demand for salt under severe winter conditions to the extent of at least 0.5 million tonnes per annum.

- b) Adoption throughout the highways community of reduced spread rates under appropriate conditions, based on authoritative research to demonstrate no impairment to effectiveness, with new standards to be issued by Spring 2011, led by the UKRLG. If this were to deliver an achieved reduction of 20% in salt utilisation this would make a substantial contribution to improving the resilience of the supply chain, of up to 0.6 million tonnes per annum. This gives an added urgency – on strategic supply chain grounds – to the Recommendation in our Interim Report for a review of technical standards.⁴³

Conclusions

10.48 We have identified two strategic initiatives – higher supplier production/throughput and reduced spread rates. These sit alongside a proposed planning framework for salt supply and logistics at the England level, with proposals for stockholding and review at the individual LHA level. The key features of this are:

- a) Based on a Britain-level analysis, recognition of the need to establish pre-season stockholding England-wide equivalent to some 50 runs at LHAs, assuming current stockholding in the HA and contractors, and 'usual' levels of supplier stocks at mines and elsewhere amounting to some 0.8 million tonnes.
- b) Adoption by LHAs of a benchmark 12 days/48 runs resilience, interpreted as a) stock up to capacity where less than 48 runs; b) where more than 48 runs capacity, consider what stock levels to plan for in the light of local experience and possible mutual aid arrangements depending on the situation in surrounding authorities.

10.49 The beneficial effects of these can be summarised as shown in Tables 10.7 and 10.8.

Table 10.7: Impact of improved salt utilisation and increased production

Salt requirement for benchmark nationally severe winter (Britain level)	3.3 m tonnes
Effect of achieved 20% reduction in salt spread rates	-0.65m tonnes
Demand	2.65m tonnes
UK production capacity (current arrangements)	2.4m tonnes
Effect of improvements in throughput/capacity	0.5m tonnes
Supply from UK suppliers	2.9m tonnes

43 Interim Report, Recommendation 13

Table 10.8: Impact of improved salt utilisation on English highway authorities resilience

Percentage of England LHAs with 12 days/48 runs capacity	50%
Percentage of England LHAs with 12 days/48 runs capacity assuming 20% achieved reduction in spread rates	62%

10.50 The effect of these measures is to enable UK production comfortably to meet the salt demand from a nationally severe winter; for more LHAs to be able to stock for the proposed 12 days/48 runs within their existing capacities; and for the resilience shortfalls in parts of the country, and the South East particularly, to be substantially mitigated.

10.51 All this reinforces the Recommendation made in our Interim Report about the need for a year-round, comprehensive, Britain-wide monitoring and disseminating of salt stocks and supplies,⁴⁴ allied with whole market analysis and forecasting to identify and track the performance of the supply chain, and to give early warnings of situations requiring review and response.

Recommendations

Recommendation 23: The review of best practice and technical standards recommended in the Interim Report as a task for the UK Roads Liaison Group should be given added urgency, focusing on research which would underpin recommendations for the adoption of lower salt spread rates as a strategic initiative to improve resilience of the salt supply chain; together with a timescale for adoption in early 2011.

Recommendation 24: The two main UK suppliers should be encouraged to continue their current initiatives to increase their throughputs – Cleveland Potash with its exploration of imports to meet high demand from its customers and to replenish its own mine stocks; Salt Union with its plans to increase throughput of the underground crushing and grading plant – as a means of increasing total mine output rates.

Recommendation 25: A new resilience benchmark of 12 days/48 runs should be adopted for pre-season stockholding for English local highway authorities; they should then review their history of usage and mutual aid or other arrangements to consider:

- a) whether there is a case for increasing capacity towards 48 runs if it is currently less than this, in addition to filling the capacity they have; or
- b) at what level to stock – at or above the 48 runs level – where the capacity exists to do so.

Recommendation 26: To ensure optimum resilience of the supply chain through a nationally severe winter, achieving benchmark resilience levels across Britain by the beginning of November should be treated as the key priority, facilitated where necessary by imports. The year-round monitoring system being put in place will analyse and overview this process and enable any future shortfall to be addressed.

Part F:

**Progress on issues raised since the
Interim Report**

11. Highway authority good practice

- 11.1** On the evidence we received, the UK Roads Liaison Group (UKRLG) report on the *Lessons from the Severe Weather February 2009* and the updated code of practice, *Well-maintained Highways*, continue to provide the most comprehensive and fit for purpose advice on winter service policy and planning for local highway authorities. We recommend below that some specific features of the *Well-maintained Highways* guidance are modified and reinforced by our Review and its Recommendations.
- 11.2** Our Interim Report highlighted a range of practical solutions and opportunities for highway authorities to improve their winter maintenance planning and operational activities, with a view to bolstering resilience levels both for this winter and the longer-term. Following both our Interim Report and the UKRLG review of winter 2008/09, we are aware that many highway authorities have already been reviewing their own winter service operations and implementing new initiatives. In this section we profile some of the many local schemes currently in development or implemented.

Planning and consultation

- 11.3** Throughout the Review, we have recognised and highlighted the importance of viewing winter service planning as a year-round process, anchored to an authority's wider resilience planning strategy. Comprehensive consultation can also be an effective way of ensuring that winter maintenance plans are communicated to, and meet the needs of local partners.
- 11.4** Herefordshire County Council's winter service review traditionally took place during the summer months. The authority has now brought the review forward to May, enabling sufficient time to embed changes to operational practices prior to the winter season.
- 11.5** Kent County Council is undertaking a survey and consultation on its winter service with the objective of recognising the contributions key stakeholders can make towards improving and refining its winter service policy. This will include options for re-prioritising elements of the service. The project will consist of interviews and online surveys of key stakeholders across the county, including district and parish councils, and county and district elected members. Through this process, Kent aims to establish closer working arrangements with its lower tier authorities for a more effective winter service.
- 11.6** Devon County Council is reviewing its primary and secondary treated networks in light of its key essential services (buses, hospitals, schools etc) and critical infrastructure. Whilst much winter service information is put into the public domain each year, Devon has identified a clear need for further communication with professional partners so that they are clear about what the county council plans to do and their own responsibilities. This will take the form of a local pre-winter conference engaging a broad range of stakeholders.

Procurement

- 11.7** We saw from Part E Chapter 10, on salt and the supply chain, that collaborative procurement can stimulate economies of scale for groups of authorities, as well as bringing a positive contribution to consolidating management, monitoring and regional storage capacity. The associated costs can also be shared, creating cross-highway authority boundaries.
- 11.8** All 22 authorities in Wales are working with the Welsh Local Government Association (WLGA) and Welsh Assembly Government to develop collaborative working arrangements in relation to planning and procurement. An all-Wales meeting with the main supplier, Salt Union, was organised earlier this year; this will now continue to meet as a salt 'user group'. WLGA has collated information from all authorities and circulated this so that each authority is aware of the position across Wales. WLGA have also been monitoring restocking this year which has enabled informed decisions to be made as to the need for additional strategic salt reserves. The Welsh authorities are now looking into the development of strategic reserves of salt around Wales to avoid overdependence on a single location for supplies.

Figure 11.1 Roundabout in snow



- 11.9** The Panel commends the work of the Association of Greater Manchester Authorities (AGMA) who are striving to develop unified technical standards for winter operations by the 10 metropolitan councils in the Greater Manchester area. The flexibility of Greater Manchester's response to the severe winter conditions experienced in 2009/10 was reduced due to a lack of interoperability between equipment and the use of different grades of salt by different local authorities. In order to improve resilience levels for future winters, AGMA members are reviewing their technical standards with a view to purchasing the same grade of salt for treating the Greater Manchester area, as well as developing a more coordinated approach to the utilisation of gritting equipment. An initial benchmarking survey has been undertaken to establish the existing practices of local authorities, which will provide a foundation for further joint working towards unified standards.

AGMA has also identified a need for a collaborative winter maintenance plan to ensure integrated approaches to the cross-boundary prioritisation of the road network.

- 11.10** Devon County Council is developing a policy for conditions of mutual aid when working in partnership with other South West authorities when shortages occur due to an authority having made no adequate contingency plans.
- 11.11** Herefordshire established alternative salt supply options (building on the experience of February 2009) which were utilised in 2010 to ensure that they had sufficient product to continue to treat all priority routes throughout the winter season.
- 11.12** East Sussex County Council are considering a central salt store and the practicalities of procuring and storing salt so that sufficient quantities would be available to all the districts, boroughs, parishes and other partners such as Fire and Rescue and police.

Operations

- 11.13** Throughout the Review we have seen many examples where highway authorities have introduced innovations in their winter service operations, as part of continuously improving their overall winter resilience.
- 11.14** Haldon Hill is an isolated piece of high ground (220 metres) to the south of Exeter which accommodates both the A38 dual carriageway trunk road and the A380 dual carriageway principal county road; they connect Plymouth and Torbay to the M5. During the winters of 2008/09 and 2009/10, heavy snowfall was experienced on the hill, which brought both routes to a standstill and several hundred motorists became stranded. Since February 2010, the Highways Agency has been working closely with Devon County Council and Devon and Cornwall police to develop a proactive traffic management plan that can be implemented by those mentioned in advance of heavy snowfall. The plan involves control of traffic approaching the hill: it will maintain access for the winter fleet to continue treating the hill and establish appropriate turn-around points should traffic become trapped. A multi-agency table-top exercise is scheduled to test the plan in November.
- 11.15** For many years, Peterborough City Council has used street cleansing staff to spread salt throughout the main shopping/pedestrianised areas of the city centre. The Council treats 'pay and display' car parks and has a route of 30 pedestrian bridges and subways which receive precautionary treatments which are carried out by a term maintenance contractor. A secondary gritting network also links the main car parks, hospital and train station to the city centre. Peterborough are currently trialling alternative de-icing/non-slip products for footbridges as an alternative to salt which can cause corrosion. The authority, and several others, are also trialling a new liquid spray treatment which can be applied to pavements using weed-killer spraying backpacks. It is hoped that these techniques will save on rock salt and waste when compared to traditional spreading methods.
- 11.16** In rural areas, authorities such as Wiltshire, Gloucestershire and Somerset have for many years provided snow ploughs and blowers for farmers to enable them to clear snow on local roads at known trouble spots. Staff working in local highway offices establish retainer agreements with farmers, so that significant costs are only incurred when their assistance is required. Remuneration rates are published prior to the start of each season and farmers are invited to

continue participation in the scheme. Potential new farmers can be identified as well as any shortfalls in area coverage. Modern tractors have excellent traction and are relatively short and manoeuvrable, so are effective at snowploughing and can cope with severe snow conditions. Councils' own lorry-mounted snowploughs – even those on 4x4 or 6x4 chassis – are less manoeuvrable and will generally be less effective than tractors on rural roads in severe conditions. Tractor-borne snowploughs can be a valuable supplement to Council's existing fleets.⁴⁵

11.17 Lincolnshire's review, in relation to the treatment of footways in severe weather, recommended that:

- a) officers explore with district and parish councils the possibility of redeploying operatives from other activities to assist the clearance of snow and ice from footways; and
- b) the hierarchy of footways in and around public transport interchanges are reviewed and where possible considered to be, in times of severe weather, in the category of 1A footways so that they will be treated at more frequent intervals.

Figure 11.2 Snow plough up close



Image courtesy of East Riding of Yorkshire Council

⁴⁵ HM Revenue and Customs Notice 75, available from the HMRC website (www.hmrc.gov.uk) contains details of the circumstances in which vehicles engaged in snow clearing such as farm contractors may use red diesel on public roads.

11.18 West Sussex County Council's Snow Summit identified the following options:

- a) The Council should take a more strategic role in the co-ordination of bulk purchasing of grit/salt, and work with the other local authorities to pre-position supplies at key locations in advance of seasonal weather;
- b) This would support the Health Service to function and make it easier for staff and children to get to work and schools respectively;
- c) The County Council could agree a snow clearance scheme with farmers and supply them with equipment to enable this to happen;
- d) Ensure partners know what resources are available and where, e.g. refuse drivers available for other work. The Environment Agency also suggested it would be willing to work with partners to redirect some of its teams.

11.19 Birmingham City Council's review has recommended that a procedure is developed for staff who cannot perform their normal duties to be redeployed to winter maintenance activities e.g. pedestrian walkway clearance etc. This procedure will form part of the winter maintenance plan and will contain a process for managing the convergence of staff and any health, safety, management or other aspects required.

Technical

11.20 The experience of the last two winters has brought into sharper focus the need to review salt spreading techniques and the benefits that technological developments can bring to winter maintenance operations.

11.21 Typical of many authorities, East Riding of Yorkshire Council has fitted all of their gritting vehicles with GPS systems that allow sections of the road that have been treated to be clearly identified along with the time and nature of the treatment. Pre-season spreader checks and calibration of all carriageway spreaders is undertaken, following summer maintenance by trained and authorised service technicians. The vehicles are also equipped with two-way radio equipment in order that contact can be maintained with the control room. The winter services decision-makers and scouts are also issued with mobile phones. All winter service decision makers participate in appropriate specialised meteorological training and on all other aspects of their duties prior to the onset of the winter season.

11.22 Many authorities have increased stock levels and invested in their equipment. For instance, Staffordshire County Council has increased stock levels for next season, and begun restocking as early as possible. They have also continued a programme of fitting new gritters with the pre-wet system in anticipation of reducing salt usage by 30%.

11.23 Kent County Council has developed a matrix to track salt use, and this includes variables in relation to how the salt was mixed with sharp sand.

Communications

11.24 In Part G of this Final Report (Cross-modal conclusions and recommendations), we highlight the importance of maintaining effective communications with the public in order to convey travel information and the level of service that can be reasonably expected. Many authorities are already implementing improvements in this area.

- 11.25** Northamptonshire County Council has set up a network of key partners to help achieve an end-to-end delivery of highways winter services to the public, including their term contractor, communications team and customer services centre. By bringing together key partners, taking ownership and sharing responsibility, Northamptonshire was able to maintain a safe and usable road network during the most extreme weather conditions in over 20 years.
- 11.26** Northamptonshire provided twice daily media updates of conditions and action being taken. A total of 46 articles appeared in the local press over the two week period 4–15 January. There were four radio interviews and four television features. Throughout the extreme weather conditions, the public were kept informed on **When, Where** and **Why** gritting would take place which allowed the public to be able to plan journeys. Daily meetings were held to identify levels of salt, monitor national restrictions and consider any advice received from Government. This resulted in a list of actions which was collated and communicated to the public in order to manage expectations and help with journey planning.

Figure 11.3 Minor road in severe winter weather



- 11.27** Durham County Council has undertaken a major push to maintain effective communication with its residents. In times of severe weather, communication is a vital tool in keeping everyone informed and maintaining these links has been a strategic priority for Durham. The authority's website has been upgraded and now includes severe weather warnings, automated weather forecasts daily throughout the winter, roads closed or passable with care and practical tips for drivers. In addition Durham has set up an SMS/text facility to alert subscribers via their own mobile to impending severe weather. This facility is open to everyone following a short sign-on procedure.
- 11.28** Herefordshire County Council has developed a pro-active approach to communication: pre-season, during the severe weather and post-winter in relation to damage to road surfaces or elsewhere. This has helped manage customer expectations as to the extent of gritting operations, the availability of salt supplies and remedial actions. This has led to regular local, regional and

even national media coverage, most of which has portrayed Herefordshire in a positive light. During the severe weather, communication was co-ordinated between all Herefordshire agencies, resulting in generally clear, timely, consistent and comprehensive messages being issued to the media.

11.29 East Sussex has identified many lessons learnt and improvements in communications as a result of the bad weather experience:

- The need for greater clarity, with clearer online maps, on which roads are salted and which are not;
- The need to include clarity about what the County Council and other authorities intend to do, and not do, under different weather circumstances;
- The need for clarity about who the public needs to talk to if the information they need or the means to address concerns are not available;
- Not all members of the public have computer access and leaflet and poster campaigns should be considered;
- The need for greater clarity when describing how the winter maintenance policy is implemented, for example the terms 'standard route' and 'snow route' are not easily understood by the public;
- The need for greater media encouragement of and advice about: self help options, safer driving and deterring selfish driving and parking behaviour;
- Consideration of the use of social media (Facebook, Twitter etc) to disseminate up to date information;
- Use of the autumn edition of the County Council's 'Your County' magazine to provide precautionary advice for cold weather on every aspect from checking home fuel stocks, safer driving, using the right footwear in icy conditions, preparing for power cuts etc.

Continuous review and improvement

11.30 Many of the responses received from highway authorities, railway companies and airport operators indicated that following the events of the last two winters they were undertaking their own reviews of their winter service. These varied in scope and scale, from internal reviews on identified key issues, to local authority scrutiny reports to wholesale reassessment of the winter service provided. All saw that learning the lessons from the last two years of severe winter weather through regular reviews was key to making continuous improvements to winter maintenance operations and the resilience of transport networks in the future.

11.31 The examples provided in this chapter, and in Parts C and D on railways and aviation, demonstrate that there are many ways that service can be assessed and improved as part of the resilience process.

Local highway authority conferences

11.32 A number of local highway authorities organised conferences to review their experiences of the last winter. 'Lessons learnt' events were hosted, by Northamptonshire, Durham and Essex County Councils, among others. The conferences were well attended by local and strategic highway authority practitioners and contractors. Delegates were also provided with a national perspective with presentations from the Department for Transport and salt suppliers. The events helped to raise awareness of best practice in winter service delivery, such as improving communications and promoting self help; as well as promoting more efficient usage of salt, and dispelling some of the myths relating to salt spreading techniques.

Figure 11.4: The 'True Grit' Conference hosted by Northamptonshire County Council in March 2010



Image courtesy of Northamptonshire County Council

Recommendation

Recommendation 27: Building on the UK Roads Liaison Group Report of July 2009, that the *Well-maintained Highways* code of practice continues to be regarded as best practice by local highway authorities for winter service policy and planning, as modified and reinforced by the specific Recommendations of this Review.

Recommendation 28: Local highway authorities should in their winter planning and consultation consider the extent of treatment of footways, especially in relation to bus stops, railway stations and other public transport interchanges as well as to town centres, business premises, schools and health facilities.

12. The economics of winter resilience

Introduction

- 12.1** About £160 million per annum is spent on winter service by local highway authorities and the Highways Agency in England. In the Interim Report we noted that – in spite of the self-deprecating cliché of the British that ‘snow brings Britain to a dead halt while other countries manage it better than we do’ – there seems little appetite among the public to spend more on winter resilience, given the relative infrequency of severe winters, and the generally short duration of their impact.
- 12.2** Even the experience of the last winter seemed not to change that view, as illustrated by the social research carried out by the Local Government Association⁴⁶ in January 2010.
- 12.3** Nevertheless, it is appropriate that a review as wide-ranging as this should at least ask the questions:
- How does the cost of providing winter resilience to current standards and policies compare with the economic and social costs of winter disruption when it occurs?
 - Would increasing the resources spent on winter resilience give rise to a disproportionate benefit in reducing the cost of winter disruption when it occurs (allowing for frequency/probability of occurrence)?
- 12.4** We set out to answer these questions, and are grateful for the work of the Department for Transport economists’ team in tackling the analysis.⁴⁷

Figure 12.1 Vehicle jack-knifed on a major road



Image courtesy of the Highways Agency (Crown copyright)

⁴⁶ The Local Government Association commissioned a ComRes poll to look into people’s attitudes about the winter weather experienced in 2009/10. See their report *Weathering the Storm II*, July 2010.

⁴⁷ This analysis uses 2002 prices to be consistent with DfT’s current ‘New Approach to Appraisal’ (NATA) practices.

Current economic and social costs of winter disruption

- 12.5** Some of those submitting evidence suggested a cost to the community and economy of disruption in a typical winter, but we were unable to substantiate their assumptions. We sought to produce our own estimates.
- 12.6** The effects of limited or no transport accessibility for the duration of a severe winter period cover a wide range – from the direct economic costs of lost output if people cannot get to work and of freight vehicle delays, to the personal time lost from travel delays and journeys not made at all, additional road vehicle collisions, the personal impacts of slips, trips and falls, as well as the costs to the health service, hardship endured by those dependent on access by carers and service providers, and other categories.
- 12.7** Preparing estimates of such social and economic costs involves making a myriad of assumptions about what exactly happens to people’s travel patterns, accident rates and the consequential impacts when disruption occurs. The way we have ‘ranged’ our estimates of disruption costs is designed to reflect the uncertainty surrounding the estimating process. More detail on the analysis is available from our website.⁴⁸
- 12.8** In presenting the estimates we distinguish between those elements with a ‘hard’ economic value to the economy – for example, lost output, increase in vehicle accidents, increased costs to the NHS – and those with what economists call a ‘welfare’ cost, that is effects which are deleterious for individuals and can be valued on an estimated ‘willingness to pay to avoid’ basis, but which do not directly impact the economy.
- 12.9** The estimates are proportioned using the analysis of mild, average and severe winters, based on their different frequencies of occurrence, and with estimates of duration, coverage and intensity. The quoted range reflects the uncertainty in all the assumptions taken together (see paragraph 12.7 above) However, to give a simple illustration of the scale of overall average annual costs, the centre of range figures are as shown in Table 12.1.

Table 12.1: Centre of range figures

	Average annual costs
Hard costs	£450 million
‘Welfare’ costs	£500 million
Total costs	£950 million

- 12.10** The relative importance of the different sources of costs is given in Table 12.2.

⁴⁸ www.independent.gov.uk/transportwinterresilience

Table 12.2: Estimated costs of winter weather ('very high' is more than £300 million per annum; 'high' is more than £100 million per annum; 'medium' is between £10 million and £100 million per annum; 'low' is less than £10 million per annum)

England only, averaged over different winters weighted for occurrence	Hard costs	Welfare costs
Journey time delays (bus and car) – personal travel		High
Lost journeys – personal travel		High
Pedestrian delays		High
Pedestrian accidents	Medium	Medium
Road vehicle collisions	Low	
Reduced economic output from lost commuting and in-business journeys, and from journey delays	Very High	
Goods vehicle delays	Low	
Lost education		Medium
Lost output from working parents with dependent children not at school	Medium	
Lost hospital appointments	Low	
Social adversity from reduced access by service providers		Low

- 12.11** The main source of both economic loss and welfare cost is through travel delays and lost journeys, vehicular and pedestrian journeys; and the effect of school closures on lost output from working parents is also significant. Accidents and collisions account for less cost than one might have expected; while there may be a higher rate of collision and personal accident in winter conditions this is offset by a lower actual volume of vehicle miles and of walking, as people stay at home. A survey undertaken by the Federation of Small Businesses of more than 1,600 of its members last winter indicates that four in five small businesses were affected in some way by the extreme weather conditions (see Appendix K for further details).
- 12.12** In general, we can say that, even with the wide range of assumptions behind the cost estimates, the social and economic costs of winter disruption of about £1 billion (averaged over the different intensities of winter that England gets) substantially exceeds the current level of expenditure of some £160 million by highway authorities on winter resilience. However, this comparison offers no guidance as to whether or not increasing the expenditure on winter service would generate a commensurate reduction in the economic and social costs of disruption.

Figure 12.2 Snow equipment on display



Is it worthwhile to increase expenditure on winter resilience?

12.13 We have set out to throw light on this question by:

- proposing a specific increase in winter service expenditure;
- then tracking through and estimating the effects that would have on the nature and duration of the disruption to transport;
- then in turn estimating the consequential changes in the economic and social costs of disruption.

12.14 The effect of a nominal 50% increase in highway authorities' expenditure – i.e. increasing by £80 million per annum to £240 million per annum – has been estimated. This is assumed to be applied in the following way, though precise costings have not been prepared:

- Treating a higher proportion of the road network than currently, with the associated costs of additional salt, and the equipment and storage to support that;
- Extensive treatment of footways and pedestrian area; and
- Use of more snow ploughs to clear snow more quickly from roads; includes equipment and operating costs, and involvement of farm contractors.

12.15 The results vary considerably according to the assumptions made, and are different depending on the severity of the winters concerned. Averaging over different severities of winter, according to their frequency of occurrence, the hard and welfare benefit analysis is given in Table 12.3.

Table 12.3: Estimated benefits from £80 million increase in highway authorities' expenditure (England only)

	Range	Central estimate
Hard benefit	£15m – £225m	£100m
Welfare benefit	£35m – £200m	£100m
Total benefit	£50m – £425m	£200m

12.16 On the face of it, the benefits could be more than twice the incremental costs. And while the analysis does not support a generic case for increasing expenditure on winter resilience, especially as the benefits are not reflected back in highway authority budgets, it is possible nevertheless to draw the following general conclusions:

- The economic and social costs associated with winter disruption are high, and specific well-targeted measures to manage disruption are likely to offer high value for money;
- The costs and benefits of particular increments are sensitive to a number of assumptions and the case for investment will vary considerably from area to area. This suggests there is not a 'one size fits all' solution for the country;
- The analysis would suggest that more extensive clearance in areas of significant traffic flows particularly subject to snow, and more treatment of key footway routes where pedestrian flows are high, could deliver worthwhile benefits. Snow clearance benefits arise, of course, only in more severe (and less frequent) winters with many snow events, so measures which limit the 'base' cost of maintaining this capability even if it is relatively costly when brought into action, would seem a good approach.

13. The Snow Code

- 13.1** One of the Recommendations from our Interim Report, published in July, is the introduction of a 'Snow Code', setting out good practice for members of the public, including business owners, in clearing snow and ice from footways.⁴⁹ The aim was to set a standard to guard the public against negligence claims. We see this as an important improvement for next winter, which will help eliminate confusion over what steps individuals and shopkeepers are able to take to help themselves and others in tackling snow and ice on their frontages.
- 13.2** The Snow Code has been drawn up and was considered by local authority highway practitioners through the UK Roads Board and the Highways Agency. The Code is a cross-government initiative, with Communities and Local Government, the Ministry of Justice and Cabinet Office all consulted on the content and format, as well as the Code being independently reviewed by the Health and Safety Executive.
- 13.3** The Panel is pleased to report that the Snow Code will be published very shortly and made available to local authorities and others for onward communication to residents and businesses in readiness for the coming winter.

49 Interim Report, Recommendation 15

Part G:

Cross-modal conclusions and recommendations

14. Public expectations and communications

- 14.1** A strong theme coming through the evidence we received – applying to all modes of transport – is the importance of timely, relevant and appropriate communication by highway authorities and transport operators, both before and during severe weather. The priorities were:
- at the planning stage, advising transport users what will happen in the event of severe weather – what highway networks will be treated, and how to get further information about public transport operations;
 - during severe weather, communicating as swiftly and as clearly as possible to the end user, through the best combination of communication channels, the conditions of transport networks, the services actually being run and their performance, advice to travellers and sources of further information.
- 14.2** Both these aspects have improved in recent years, but more can be done. We made recommendations in our Interim Report about how local highway authorities could improve the communication of their treated networks to the public and business.⁵⁰ And there are some excellent examples of good practice by a number of authorities in Chapter 11 (Highway authority good practice).
- 14.3** During severe weather events, users of public transport systems want to be notified as soon as any changes are made affecting their regular travel plans. Key factors include:
- Early decisive decisions by transport operators to put in place alternative schedules and timetables; evidence from both rail and airline operators and passenger representatives suggests that the clarity and certainty of schedule changes (if unwelcome) are valued over attempts to 'soldier on' with a deteriorating service; such an approach also eases operational recovery post-event;
 - Embracing the wide range of communication channels available today, including email, text and social networks such as Facebook and Twitter, as well as websites and telephone-based messages and inquiry services. Travellers themselves enjoy growing capacity to receive and handle such information through their sophisticated mobile devices. There are many examples of good practice, in highway authorities, airlines and train operating companies. We commend the PIDD (Passenger Information During Disruption) project being taken forward within the rail industry to establish new techniques and common standards and protocols for passenger communication;
 - The demand for web-based travel information in particular has grown exponentially in recent years; the more effective and valuable it is, the more it is used, especially when major travel disruption occurs. Many transport providers such as Transport for London have invested in major upgrades of their web capabilities to cater for much higher levels of customer demand, and it is clear this will continue.

50 Interim Report, Recommendations 5 and 6

- 14.4** With the richness, detail and reach of travel information increasingly available to travellers, and travellers' ability to receive and process this information, the generic messages sometimes put out by the media to the effect that there is 'transport chaos', 'severe disruption to transport' or that only 'essential travel' should be undertaken, seem unhelpful and indeed, have knock-on impacts if people do not go to work and other activities. Whilst there are some concerns that the public becomes complacent about severe weather warnings, targeted warnings and more precise information made available and tailored to individuals' own travel patterns should become more commonplace.
- 14.5** Meanwhile, transport operators and local highway authorities are becoming increasingly aware of public and customer expectations about the quality and timeliness of information they should receive; this becomes a key feature of the customer 'offer' which drives reputation and, for transport operators, competitive edge in the market.
- 14.6** Recognising the growing expectations of residents and customers about the quality and timeliness of real-time information about transport networks and services during severe winter disruption, and the rapid proliferation of communication technologies and channels available, local authorities and transport operators should ask themselves whether there is room for improvement in the real-time services they currently provide.

15. Integration of modes and communications among institutions

- 15.1** A common thread through the evidence, and not only from user representatives, is the challenge of interfaces and integration among transport modes. We identified a number of instances where improvements can be made. For example:
- Train drivers and other key railway staff experienced difficulty accessing train depots because access roads were not being treated, hampering the response of the rail industry at times when rail is sometimes the only transport mode available;
 - Strategic roads leading to airports were generally well maintained by the Highways Agency, but on local roads leading to the airport there was a mixed level of service from different local highway authorities, making it difficult for some staff to access the airport;
 - Hauliers experienced difficulties on some final legs of journeys on locally managed roads to ports and other installations.
- 15.2** The transport community was presented with particularly difficult challenges last winter – salt stocks were in short supply, and strong guidance was issued by the then Secretary of State to significantly reduce salt usage. But, in a severe winter, it is all the more important that transport operators and highway maintenance teams work together to maintain cross-boundary and cross-modal accessibility.

A multi-modal journey to a major airport

A journey by public transport for a flight from a major airport could involve a number of steps, all of which need to function effectively during extreme weather for the journey to be completed successfully:

- Bus, car or taxi journey by road to a train station;
- Train journey to the station serving the airport;
- Transfer bus from the station to the airport;
- The airport itself will also need to have cleared snow and ice from its operational areas, and all the necessary staff arrived, for it to be functioning normally.

The Panel became aware of one instance where all these areas coped well during the extreme weather. However, there was confusion over clearing and gritting the station approach roads, and subsequently the transfer bus to the airport was not able to operate for a number of hours. Eventually the airport itself treated the station approaches so the buses could operate, but the passengers delayed by the initial suspension of the bus service will have experienced frustration and possibly a missed flight.

15.3 A typical door-to-door journey may well involve a number of transport modes and cross many strategic and local highway authority boundaries. The examples below set out just how many different players can be involved:

Example journey 1

15.4 Jane is a staff nurse living in Bedworth, Warwickshire. She commutes every day to University Hospital, Coventry.

Journey leg	Winter maintenance responsibilities	Commentary
Walk to Bedworth Station	Warwickshire County Council and London Midland	Jane starts her journey with a short walk to Bedworth station on roads maintained by Warwickshire County Council. The majority of footways will not be treated, but some areas with a high level of footfall such as the station approach may receive treatment. She arrives at the platform of Bedworth Station. Snow is cleared from the platform by the local train operator – London Midland.
Train from Bedworth to Coventry	Network Rail and London Midland	Jane boards her train to Coventry. Network Rail has the prime responsibility for keeping the railway open in severe weather. During the previous evening, hours before her journey, Network Rail will have advised London Midland on the likely condition of the rail infrastructure, based on weather forecasting information. This enables London Midland to make an operational decision as to whether it is necessary to introduce an contingency timetable.
Bus 85 from Coventry station to University Hospital	Coventry City Council and Travel de Courcey	Jane arrives at Coventry station and boards the 85 bus operated by Travel de Courcey. The bus route to the city centre lies on Coventry City Council's priority gritting network.
Walk to hospital ward	University Hospitals Coventry and Warwickshire NHS Trust	Jane arrives at the hospital and walks to her place of work. Responsibility for gritting any pavements and access roads within the hospital estate lies with the relevant NHS primary care trust.

Example journey 2

15.5 Steve is a web developer living in Hailsham, East Sussex. Twice a week, he commutes to his company's office by car, via the Withdean park-and-ride site on the outskirts of Brighton.

Journey leg	Winter maintenance responsibilities	Commentary
Local roads to the A27	East Sussex County Council	Steve starts his journey by driving on local roads to the A27. East Sussex County Council will have decided before the winter season which roads will be gritted. Most residential roads are not treated, but authorities may decide to treat key radial routes from town centres to the strategic road network.
A27 to Brighton	Highways Agency	The A27 is operated by the Highways Agency, who will be responsible for gritting activities along this leg of Steve's journey.
Bus 27 from Withdean park-and-ride to Brighton city centre	Brighton & Hove City Council and the Brighton & Hove Bus Company	Steve leaves his car at the park and ride site and uses his PDA to obtain real-time travel information from the Brighton & Hove bus company website. He boards the 27 bus to the city centre. This bus route is gritted by Brighton & Hove City Council as part of its winter maintenance strategy.
Walk to the office	Brighton & Hove City Council	Steve arrives at Brighton city centre and walks the final few hundred yards to his office through the main shopping area, which is gritted by Brighton & Hove City Council.

15.6 These examples illustrate the number of elements in many journeys and the importance both of good links and route continuity for the user. We suggest that all operators need to have regard to the 'whole journey' aspect for the user, and this means talking to each other. On many legs of the examples the commuter was also dependent on public transport staff being able to get to work. The public expectation is to experience a consistent level of service during each component of their journey, and this means a key role for highway authorities.

15.7 This links back to the findings of our Interim Report, as well as to the need for good communication and consultation on the part of highway authorities at the planning stage on the networks they propose to treat.⁵¹ Such communication can take place as part of an authority's regular review of its winter plan and needn't be complicated or time consuming. Nevertheless, this was an area that came across in our evidence as requiring further improvement and can bring a 'quick win' to enhancing resilience.

16. Access to ports and other key installations

- 16.1** During severe winter conditions, it is vital that access is maintained to the nation's key installations, such as ports, power stations, utilities' plants and depots, bus facilities, freight terminals, airports and railway infrastructure. Many of these strategically important facilities experienced access difficulties last winter.
- 16.2** The Panel received evidence from a number of ports who experienced difficulties securing additional salt supplies beyond the stocks they held entering the winter season. In 'normal' winter conditions, it is common for ports to supplement their own salt stocks either direct from their supplier or with 'mutual aid' from their neighbouring highway authority. However, due to the national shortage of salt in winter 2009/10, salt suppliers had very little stock available for non-highway organisations and with the scenario whereby many highway authorities themselves were struggling to maintain their own networks, mutual aid was often unachievable.
- 16.3** The Salt Cell took action by advising salt suppliers to retain some stock for ports and other key installations, which were prioritised. In addition, the Salt Cell worked directly with the Port of Felixstowe to help producers understand the urgency. However, despite these actions, the conditions were so severe that many ports still experienced operational delays and service backlogs due to the severe winter conditions and a lack of road salt.
- 16.4** There is a clear economic case for maintaining access to ports during severe winter conditions. From a national perspective, they are important hubs which must be kept open in order to maintain the movement of goods, services and people in the country – and some ports serve as gateways for salt imports. They also bring value to the local economy as centres of employment. From a resilience planning perspective, the Panel supports the concept of considering routes to England's ten busiest ports as strategic corridors of national importance, termed "international networks" in the Department for Transport's (DfT) 2008 report *Delivering a Sustainable Transport System*,⁵² updated in September 2010 to promote connectivity between the capital cities of the United Kingdom.
- 16.5** The economic returns are high in terms of salt usage, for example:
- It can take as little as two tonnes of salt per treatment to keep a major facility such as a port's roads operational, costing less than £100;
 - A major port can handle around 300,000 vehicles entering and leaving the country;
 - Failure to keep this level of traffic moving causes a rapid build up of congestion on both local and strategic roads, with consequential delays to thousands of motorists and other road users.

52 *Delivering a Sustainable Transport System: Main Report*, November 2008; <http://webarchive.nationalarchives.gov.uk/+/http://www.dft.gov.uk/about/strategy/transportstrategy/dasts/dastsreport.pdf>

Figure 16.1 Major road in severe snow conditions



Image courtesy of Southeastern Trains

16.6 This problem can be addressed on two fronts:

- a) As the amounts involved can be small and inexpensive, key installations such as ports should increase their own salt stock holdings entering winter 2010/11 to minimise reliance on in-season re-stocking;
- b) There should be dialogue between these facilities and the relevant highway authority(s) to ensure:
 - i) a clear understanding is reached on boundaries – that is, who is responsible for gritting the access roads to the facility and its estate;
 - ii) that then the relevant access roads feature on the highway authority's priority gritting network.

16.7 In conclusion, the same principles apply to many different key installations across the country, whether it be a port, hospital or power station. The costs of ensuring that these facilities are capable of maintaining their services, even in very severe weather conditions, are heavily compensated by the economic benefits of keeping them running. For every key national or regional asset, there needs to be effective dialogue between its operators and the relevant highway authorities as part of the year-round resilience planning process to ensure it receives sufficient priority. All such facilities should be viewed from a national and economic perspective.

17. Wider resilience planning

Introduction

- 17.1** Both of the Review's Interim and Final Reports have discussed the specific needs regarding the transport sector and winter resilience. Snow, ice and extreme cold represent unique challenges for the road, rail, aviation and maritime sectors that require specific preparation and remedies.
- 17.2** But it became clear during our Review, both from the evidence and in our Hearings, that planning for dealing with severe winter weather is best dealt with not in isolation but alongside preparation for other events as part of the general resilience planning which all local authorities are required to do under civil contingencies legislation.

The Department for Transport and resilience

The Department has a dedicated Civil Contingencies Planning unit which is part of the wider cross-Whitehall contingency planning and emergency response machinery overseen by the Cabinet Office's Civil Contingencies Secretariat.

The unit engages in an ongoing process of resilience and contingency planning across all transport modes to assure the security and resilience of the transport network. It does so with the active engagement of the transport industry and other Government Department's. The key objective is to ensure that both the DfT and the transport industry are better placed to respond effectively to substantial civil emergencies or incidents that could severely disrupt national transport systems and operations. In the event of a major emergency that has a widespread cross modal impact, the unit is responsible for co-ordinating the Department's and the transport industry's response.

- 17.3** The disciplines, structures and processes involved in resilience planning and in conducting the operational response to exceptional events – extreme weather, floods, major accidents or terrorist incidents – can bring a degree of rigour and challenge to the preparation of plans for severe winter weather. Having made a recommendation about this in our Interim Report,⁵³ we have learnt that one benefit of this approach is to bring winter service planning more clearly to the attention of local authority senior management and elected members.

Regional resilience

- 17.4** Regional Resilience Teams (RRTs) operate in the English regions. These teams, led by a senior official with support from a small team drawing heavily on external civil protection experience, facilitate much of the regional activity. They take the lead in managing relationships with local responders, communicating among regional partners and between the regions and central government Departments. During the operation of Salt Cell last winter they provided a key link between central Government and local highway authorities. They were also crucial in the collection of data regarding the levels of salt that local authorities held and required. There were examples last winter of RRTs successfully supporting mutual aid arrangements between local highway authorities.

53 Interim Report, Recommendation 11

- 17.5** While in many ways London is an exceptional case, its preparations for responding to a wide range of events based on experience do offer a model for other cities and communities on how to ensure they are prepared for any circumstances. It is a multi-agency approach, involving key public and private partners across the transport and other sectors in resilience planning from initial assessment, through planning and training, and finally response and recovery.

London's resilience framework

London's resilience network was originally established to deal with high-impact spontaneous events, but is effectively utilised to respond to severe winter weather. The hierarchical structure involves a number of organisations:

- The London Regional Resilience Forum was set up under the Civil Contingency Act 2004 and is chaired by the Mayor.
- The London Resilience Team provides administrative support for the Forum.
- The Local Authority Panel coordinates resilience issues across the 33 boroughs and is supported by the Emergency Planning Department of the London Fire Brigade.
- London Local Authority Gold (LLAG): When the emergency services convene Strategic Gold Command, LLAG will attend and convene the London Local Authority Coordination Centre, which is responsible for coordination and supporting the local authority response to events such as severe weather. This facility is also supported by the London Fire Brigade.

Using this framework, London was able to set up its own regional Salt Cell, which had a very similar role as the national Salt Cell, but on a devolved basis. The London Salt Cell enabled a region-wide approach to be adopted and became the mechanism for mutual aid across authorities, including Transport for London, and deciding where salt was moved and delivered to.

- 17.6** The Panel are clear from the evidence put to us and what we have learnt that the benefits of bringing winter service planning within the structure and disciplines of general resilience planning are significant, and that this should be the practice for all local authorities and – where appropriate – transport providers.

Appendix A: Terms of Reference

Background

The winter of 2009-10 has been the coldest in the UK for 30 years, creating extremely challenging conditions for the travelling public across the whole of the country. For the most part, our transport networks have coped well in the circumstances. However it is important that lessons are learned in order to improve our resilience for future winters.

Following a decade of relatively mild conditions, the winter of 2008-09 was severe and the worst for almost 20 years. A number of reviews followed, including by the House of Common Transport Select Committee, the London Assembly, the Local Government Association and the UK Roads Liaison Group (UKRLG). The July 2009 report by UKRLG made 19 recommendations to highway authorities, producers and suppliers of salt and other stakeholders to improve preparedness.

The winter of 2009–10 has seen an even more sustained period of sub-zero temperatures. The biggest issue was the availability of road salt, but additionally the severity of the weather conditions caused disruption across most modes of transport including rail, air and sea. The response of central and local government to severe winter weather must aim to maintain public access to key services such as health, education and employment. However, the scale of the response must provide value for money to the public purse.

Purpose of the Study

The aim of this study is to identify practical measures to improve the response of England’s transport systems – road, rail and air – to severe winter weather. The study will build upon the recommendations of the UK Roads Liaison Group “Lessons from the Severe Weather February 2009”, and will take account of reviews of experience and lessons learned by public authorities, network operators and transport providers. The study will consider the views of transport users and stakeholders, the effectiveness of communications about travel conditions, and the contribution of weather forecasters.

There will be an immediate focus on measures that should be adopted to improve preparation for and management of winter 2010-11; the study will also consider and make recommendations about longer term measures.

Timetable and reporting

The Review will report in two phases, reflecting the need to:

- a) identify measures that can be implemented relatively quickly in preparation for next winter 2010/11, and
- b) to take a longer term view of our preparedness for severe winter weather in future years.

Phase one

The phase one report will aim to identify quick wins aimed at improving resilience in preparation for next winter 2010/11. This will largely focus on the planning, production, deployment and distribution of salt stock for the road network, including possible enhancements to the supply chain. It may include recommendations across other modes if opportunities are identified. The phase one report will be published in July, before the summer parliamentary recess.

Phase two

The phase two report will consider wider aspects of resilience of transport services across various modes through the winter season. It will review communications, economic impacts, public expectations and issues around weather forecasting. Publication will be targeted for autumn 2010.

Governance

The Review will be steered by a panel of three independent experts:

- David Quarmby CBE (Chair)
- Brian Smith
- Chris Green

A Review team, comprising DfT officials, will provide administrative, project management and analytical support.

The Review outcomes formally recommended to the Secretary of State for Transport will only apply to English authorities, but will take account of the wider UK context. The Scottish and Welsh administrations will be fully involved in the work of the Review. It will be for Scottish and Welsh Ministers respectively to decide what action is required in those countries.

Methodology

An initial review of previous winter service reports will be undertaken in order to avoid unnecessary duplication and to ensure any recommendations complement actions already being taken by network operators and transport providers to improve their winter service. The Review will build on the recommendations of the UKRLG report "Lessons from the Severe Weather February 2009". This initial review will inform the development of a more detailed schedule of questions and issues for investigation.

The Review will be seeking evidence and views from a range of key stakeholders, including transport network operators and transport providers, salt suppliers and distributors, transport users, businesses, the general public, weather forecasters, and the media. Evidence will be gathered through stakeholder workshops and calls for written evidence covering the full scope of the Review. This evidence will be used to identify practical measures to improve the national response to severe winter weather, presenting case studies of best practice and culminating in a package of recommendations.

The rail industry is already reviewing performance during the severe winter 2009/10. Similarly, the salt industry is currently identifying immediate action for re-stocking during the summer period.

Draft scope of the Review

(FOR CONSIDERATION AND ADOPTION BY THE PANEL AT ITS FIRST MEETING)

Phase One – Winter resilience and salt stock management

1.1 Weather forecasting

Review of the availability and accuracy of weather forecasts, their communication and interpretation for highway authorities.

1.2 The complete salt supply chain and treatment strategies by highway authorities

A critical review of the complete salt supply chain, in the context of the lessons learned and actions implemented from the 2008-09 winter season, and how it might be most effectively planned and managed. Review the actions already under way by authorities following experience of the 2009-10 winter season.

Consider and evaluate the different treatment regimes adopted by different authorities. Review the monitoring and reporting processes for levels of readiness including salt re-stocking.

Critically examine a range of options covering resilience levels, diversification of supply, collaborative storage and procurement, mutual aid between authorities, and the contribution of innovations and technology in winter servicing.

Critically examine the case for national regulations, and powers of ministerial intervention, to ensure that adequate supplies are maintained at local level and by the Highways Agency.

Make recommendations designed to make better preparation for next winter season and achieve improved winter resilience on the roads.

Phase Two – maintaining cross-modal winter transport service provision

2.1 Coordinating an immediate response to severe winter weather

Review how well existing approaches work in achieving a co-ordinated and efficient response to severe winter weather in the UK, including:

- Clearance of snow from transport infrastructure
- Maintaining access to and resilience of critical infrastructure e.g. emergency services, motorways and other strategic highways, railway depots and stations, airports, ports, freight routes, power stations, hospitals
- Effective communication to travellers and transport users, communities, and providers of critical services

Identifying examples of best practice in providing a fast and efficient response (e.g. service delivery, communications, resilience networks), including practices of other European countries who experience similar winter patterns to the UK.

Advice on the most appropriate central government role in facilitating co-operation between key delivery agencies.

2.2 Resilience of rail services in severe winter weather

Review the overall approach taken by Network Rail and the Train Operating Companies in preparing the network and its infrastructure for severe winter weather. Review experience and lessons learned by NR and TOCs in service planning and delivery, and in sustaining network availability. Review the effectiveness of communications to passengers and freight users, and lessons learned in handling the consequences for operations and for passengers of service disruption.

Make recommendations as appropriate.

2.3 Resilience of airports and air services in severe winter weather

Review the approach taken by airport operators and airlines in planning and managing the consequences for airports and air services of severe winter weather in the UK. Review their experience and lessons learned; review the effectiveness of communications to passengers within the UK and overseas, and lessons learned in the handling the consequences for operations and for passengers of service disruption.

2.4 Weather and long term trends

Review and analyse current thinking on likely trends in weather and winter temperatures and conditions for the UK, the accuracy of forecasts and possible developments, and their relevance for winter resilience strategy in England.

2.5 Economic analysis

Analysis of the likely costs and benefits of different approaches to winter resilience, bringing together costs of alternative levels of preparation and intervention with the benefits of greater resilience to business, travellers and the community at large. Account will be taken of approaches taken in other countries with similar weather patterns to the UK. This will include a review of the policies and standards relating to treatment of footways, costs of accidents and public liability

2.6 Communications and public expectations

Consider public attitudes and expectations of winter resilience and whether these can be met. How well communications work between public authorities, service providers and their users, the role of media and how communications can be improved. Enabling end users to help themselves (use of grit bins, snow clearance, etc)

Appendices B, C and D

These appendices are the same as in the Interim Report and can be found there.

Appendix E: Call for Evidence



26th April 2010

Dear Colleague,

INDEPENDENT WINTER RESILIENCE REVIEW: CALL FOR EVIDENCE

The Secretary of State for Transport has asked me to carry out an independent Review of the transport industry's response to severe winter weather. I am delighted that Brian Smith and Chris Green have agreed to join me to create a Panel to conduct the Review.

Brian has just retired as Executive Director, Environment Services of Cambridgeshire County Council, and was recently President of what is now ADEPT (Association of Directors of Environment, Economy, Planning and Transport). Chris is a career railwayman whose last executive appointment was as CEO of Virgin Trains; he is co-author of the recent *Better Rail Stations* Independent Review. I am currently chairman of the RAC Foundation, a former director of consultants Colin Buchanan and former chairman of the Strategic Rail Authority.

The aim of the Review will be to identify practical measures to improve the response of the transport sector – road, rail and air – to severe winter weather. The study will build upon the recommendations of the UK Roads Liaison Group "Lessons from the Severe Weather February 2009"; it will take account of the experience and lessons learned by public authorities, network operators and transport providers, and those involved in supporting and supplying them. We know that many of these are conducting their own reviews. The study will also consider the views of transport users and stakeholders, the effectiveness of the communications about weather and travel conditions, and the contribution of weather forecasters.

The Review will be reporting in two phases:

- a) by July 2010, identifying and reporting on measures that can be implemented relatively quickly in preparation for winter 2010/11; and
- b) reporting in the autumn 2010 with a longer term view of our preparedness for severe winter weather in future years and measures that can improve future resilience.

The Review's conclusions will be in respect of the issues as they apply to England. But it will take account of the wider UK context, and I intend to consult Scottish and Welsh interests and hope that the findings of the Review will be of use in Scotland and Wales.

The full terms of reference for the Review are at:

<http://www.dft.gov.uk/pgr/regional/reviewofwinter0910/>

Submitting your views

Chris, Brian and I wish to consider a broad suite of evidence on the transport industry's ability to withstand harsh winter conditions and to meet as many interest groups as the timetable for the Review allows. I would also welcome written submissions from interested organisations and members of the public in response to what I see as the Review's key questions. These questions are attached, but broadly I am seeking views in particular from:

local highway authorities;

other network operators, the salt supply chain and others who support and supply them;

transport operators – passenger transport companies and freight and logistics companies in road, rail and airline operations;

transport users – individuals, businesses, communities and major customers, such as hospitals, schools, business parks and others who were adversely impacted by the severe winter weather

We will appreciate receiving views of organisations presented through their trade associations or the equivalent, and submissions from individual organisations will also be welcome. Should you wish to submit your views on any or all of the questions, please do so by **25th May 2010**. You can submit your views:

- by e-mail to: winterresiliencereview@dft.gsi.gov.uk
- by post to: Winter Resilience Review Team, Zone 3/21, Great Minster House, 76 Marsham Street, London SW1P 4DR (and marked for the attention of Lloyd Miles).

We will be conducting Hearings in London between 1st June and 11th June, and we may ask you to attend to discuss your submission.

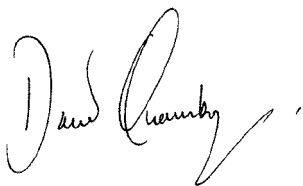
Unless you ask otherwise, it will be assumed that any response you make is capable of being made public. A standard confidentiality statement in an email message will not be regarded as a request for non-disclosure. We will not edit personal information (such as telephone numbers or email addresses) from responses, therefore only information that you wish to be published should be submitted.

To help us take account of all the responses received, please will you:

- keep any response to 3,000 words or less;
- number your paragraphs to match the numbers of the questions to which you are responding.

If you would like to make more general comments related to the terms of reference, please do so by way of a short summary.

Yours faithfully,



David Quarmby CBE

On behalf of the Panel

Winter Resilience Review

An independent review of the resilience of England's transport systems

Key Questions

We are seeking evidence from people and a wide range of organisations, covering highways and other modes of transport. Please respond to those questions which are relevant to you.

Phase One – Winter Resilience and salt stock management

The UK Roads Liaison Group published its review *Lessons from the Severe Weather February 2009* in July 2009, and reflected many of its recommendations in an updated guidance section on Winter Service (published December 2009) in *Well Maintained Highways*, the UKRLG Code of Practice for Highway Maintenance Management. Other guidance also exists for highway authorities on planning for and managing winter conditions.

Some of these questions are framed for individual organisations and authorities; we will be pleased to hear from trade associations and equivalent where there is a collective sector or industry view.

1. *UKRLG Review and its recommendations*

- 1.1 In the light of your experience of the 2009–2010 winter, do you think the Review and its recommendations appropriately and sufficiently address the winter resilience issues?
- 1.2 To what extent has your authority or organisation acted upon – as appropriate – the Recommendations of the Review and the updated guidance on Winter Service in *Well Maintained Highways*?

2. *The approach to winter resilience – highways*

- 2.1 What has been the experience of your authority, organisation of the winter 2009–10, and what are the lessons you have learned? If you have conducted a formal review we would be pleased to see a copy.
- 2.2 What has been your own practice about salt stocks, and your experience of the salt supply chain? What views do you have about the operation of the Salt Cell?
- 2.3 What action is now under way as a result of the challenges you faced? How well prepared are you for future winters of similar severity?
- 2.4 What has been your experience as a passenger or freight transport operator, and what lessons have been learned?
- 2.5 What action would you like to see taken by others – whether in relation to salt supply and use or to other matters?
- 2.6 Should further action or powers be taken by central government or its agencies to assure salt supplies or winter resilience generally?

3. *Weather forecasting and communications – highways*

- 3.1 How accurate have you found the available short, medium and long term weather forecasting in predicting extreme winter weather, and how have you acted on the forecasts?
- 3.2 How could the system be improved?

Phase Two – maintaining winter transport service (all modes) and longer term issues

4. *Resilience of rail services in severe winter weather*

- 4.1 How was the service provided to customers modified and how well was it communicated in response to winter conditions, and what were the consequences of this?
- 4.2 What lessons were learned by Network Rail and the Train Operating Companies and Freight Operating Companies from the 2008–09 severe winter – to maintain service, to protect and sustain the infrastructure and to communicate with customers?
- 4.3 What was the experience of the 2009–10 winter? To what extent were the lessons learned from 2008–09 applied, and what has been learned since from that? Where formal reviews have been carried out we would be pleased to see them.
- 4.4 How well equipped and prepared is the rail industry to handle future winters of similar severity?
- 4.5 What action would you like to see taken by others to support the resilience of your organisation or the rail industry?

5. *Resilience of airports and air services in severe winter weather*

- 5.1 How was the service provided to customers modified and how well was it communicated in response to winter conditions, and what were the consequences of this?
- 5.2 What lessons were learned by airport operators, passenger and freight carriers and support organisations from the experience of the 2008–09 severe winter?
- 5.3 What was the experience of the 2009–10 winter? To what extent were the lessons learned from 2008–09 applied, and what has been learned since from that? Where formal reviews have been carried out we would be pleased to see them.
- 5.4 How well equipped and prepared is the aviation industry to handle future winters of similar severity?
- 5.5 What action would you like to see taken by others to support the resilience of your organisation or the aviation industry?

6. *The consequences and economic impacts of severe winter weather*

- 6.1 How does severe winter weather impact on critical aspects of people's daily travel needs, and on the mobility of goods and services? What lessons have been learned in business, public service and other organisations about forecasting and mitigating the transport effects of severe winter weather? How effective have winter resilience measures been, and what other measures should be taken?

-
- 6.2 What major areas of economic cost and benefit arise from the transport and travel aspects of:
- a) being prepared for, and dealing with, severe winter weather?
 - b) failure to deal adequately with such weather?
- 6.3 During the recent winter weather large parts of the country experienced icy footpaths and icy conditions on minor roads for longer periods than usual. What were the consequences of this, in terms of traffic accidents, higher-than-expected injuries due to slips and trips? Should the public and local communities be able to take a more pro-active role (eg in clearing public and private paths and minor roads) and what issues are raised by this?
- 6.4 What can we learn from the experience of and approach taken by other nations who have similar weather to the UK, in terms of planning and managing winter resilience?

7. *Communications and public expectations*

- 7.1 What can the public reasonably expect in terms of the winter resilience of roads and transport services, and communication about this in severe weather?
- 7.2 Are there ways of enabling the public to be better prepared for future severe winters?

8. *Long term weather trends*

- 8.1 Recognising the uncertainties and probabilistic nature of weather forecasting, what further information or assessment is available about the likely trends in UK winters – their nature, duration and severity – over the next 10–15 years. And how might these most effectively be communicated to those who may need to act on them?

Appendix F: Distribution list and responses to the Call for Evidence

Written responses to the call for evidence are marked with a ✓

4NW ✓

Abellio

ADEPT ✓

Advantage (West Midlands RDA)

Air Transport Users Council

Airport Operators Association

Arco Ltd ✓

Arriva plc

Arriva Trains Wales

Asphalt Industry Alliance + others ✓

Associated British Ports ✓

Association for Public Service Excellence ✓

Association of British Insurers ✓

Association of Chief Police Officers

Association of International Couriers and Express Services

Association of Train Operating Companies

Association of Transport Co-ordinating Officers

Automobile Association ✓

Automotive Fellowship International

BAA ✓

Birmingham City Council ✓

Birmingham International Airport Ltd ✓

BMI

Board of Airline Representatives

BRAKE

Brighton & Hove City Council ✓

British Air Transport Association

British Airways ✓

British Chambers of Commerce

British Cycling

British Insurance Brokers' Association

British Medical Association

British Motorcyclists Federation

British Parking Association

British Ports Association

British Retail Consortium

British Salt Ltd

British School of Motoring Ltd

British School of Shopping Centres

British Transport Police

British Vehicle Rental and Leasing Association

Broste

Buckinghamshire County Council ✓

c2c Rail Ltd
Cabinet Office (Civil Contingencies Secretariat) ✓
Calderdale Metropolitan Borough Council ✓
Canterbury City Council ✓
Campaign for Better Transport
Central Motorway Police Group
Centro ITA/PTE
Commission for Integrated Transport
Charlton, Colin ✓
Chartered Institution of Highways and Transportation ✓
Chartered Institute of Logistics and Transport
Cheshire Constabulary
Child Accident Prevention Trust
Chiltern Railways
Civil Aviation Authority ✓
Cleveland Potash Ltd ✓
Confederation for Passenger Transport
Confederation of British Industry
Confederation of Passenger Transport UK
Convention of Scottish Local Authorities
Communities & Local Government ✓
Confederation of Passenger Transport ✓
Core Cities
CPRE
Cross Country Trains ✓
CTC
DB Schenker Rail (UK) Ltd ✓
Department for Business, Innovation and Skills
Department for Education ✓
Department for Energy and Climate Change
Department for Environment, Food and Rural Affairs
Department for Health
Department for Transport (Aviation) ✓
Department for Transport (Ports)
Department for Transport (Rail)
Department for Transport (Roads) ✓
Department for Transport (Transec)
Despatch Association
Devon County Council ✓
Directly Operated Railways
Dome UK ✓
Doncaster Metropolitan Borough Council ✓
Doverport ✓
Driving Instructors Association
Driving Standards Agency
East Anglian Weather Consortium (EAWC) ✓
East Coast
East Midlands Development Agency
East Midlands Trains
East of England Development Agency

Easyjet
East Sussex County Council ✓
Ecothaw
English Regions Network
Equality and Human Rights Commission
Essex County Council (part of EAWC) ✓
EURO NCAP
Eurostar International Ltd and Eurostar Group ✓
Exactrak Ltd ✓
Federation of Small Businesses ✓
Fernwood Ltd ✓
FIA Foundation
Fieldhouse, Martin ✓
First Capital Connect
First GBRf
First Great Western
First ScotRail Railways Ltd
First TransPennine Express
FirstGroup plc
Flintshire County Council ✓
Freight Transport Association ✓
Freightliner
Go-Ahead Group plc ✓
Go-Ahead North East ✓
Government Office for the East ✓
Government Office for the East Midlands ✓
Government Office for the North East ✓
Government Office for the North West ✓
Government Office for the South East ✓
Government Office for the South West ✓
Government Office for Yorkshire and the Humber ✓
Govia/Keolis UK Ltd
Greater London Authority
Greater Manchester ITA/PTE
Gregory Distribution ✓
Halcrow ✓
Halton Borough Council ✓
Hampshire County Council ✓
Health and Safety Executive
Heatherwood and Wexham Park Hospitals NHS Foundation Trust ✓
Heathrow Airport ✓
Heathrow Express
Herefordshire Council
Hertfordshire County Council (part of EAWC) ✓
Highways Agency ✓
Highways Term Maintenance Association ✓
Independent Transport Commission
Innovative Global Products Ltd ✓
Institute of Advanced Motorists
Institute of Civil Engineers

Institute of Directors
Institute of Engineering and Technology
Institute of Highway Engineers ✓
Irish Salt Mining & Exploration Company Ltd
Island Line trains
ITS UK (Intelligent Transport Systems)
J C Peacock & Company Ltd ✓
Kent County Council ✓
Kirklees Council ✓
Leeds City Council ✓
Leicestershire County Council ✓
Lincolnshire County Council ✓
Living Streets ✓
Local Government Association ✓
Local Government Technical Advisers Group ✓
London Assembly Transport Committee ✓
London Councils (joint response with TfL) ✓
London Development Agency
London Gatwick Airport ✓
London Luton Airport ✓
London Midland ✓
London Overground Rail Operations Ltd
London Travelwatch ✓
London Underground
Luton Borough Council (part of EAWC) ✓
Magistrate Association ✓
Manchester Airports Group ✓
Mayor of London
Medway Council ✓
Merseyrail ✓
Merseytravel ITA/PTE
Met Office ✓
MeteoGroup ✓
Metro (West Yorkshire PTE)
Metrolink
Milton Keynes Council ✓
Mobilise Organisation
Motor Schools Association
Motorcycle Industry Association
Motorcycle Retailers Association
Motorists' Forum
Mouchel/HTMA
National Assembly for Wales
National Association of Local Government
National Express (Bus) ✓
National Express East Anglia
National Express Group
National Farmers Union ✓
National Motorcycling Council
National Task Force (Rail) ✓

National Traffic Managers Forum ✓
National Winter Service Research Group
Nelsons Independent Bus Service ✓
Network Rail
Nexus PTE
NHS confederation
Norfolk County Council (part of EAWC) ✓
North Lincolnshire County Council ✓
North West Development Agency
Nottinghamshire County Council ✓
Office of Rail Regulation ✓
One NorthEast (Development Agency)
Oxford NHS Trust ✓
Parliamentary Advisory Council for Transport Safety
Passenger Focus
Passenger Transport Executive Group ✓
Plymouth Citybus ✓
Police Federation of England and Wales
Police Service of Northern Ireland
RAC ✓
RAC Foundation ✓
Rail Freight Group ✓
Rail Industry Association
Rail Safety Standards Board ✓
Reading Borough Council ✓
Retail Motor Industry Federation
Road Haulage Association ✓
Road Peace
Road Policing Unit Headquarters
Roads Service Northern Ireland ✓
Road Users' Alliance
Roads Service Northern Ireland
RoadSafe
Rotherham Metropolitan Borough Council ✓
Royal Society for the Prevention of Accidents ✓
Safecote Ltd ✓
Safety Grit Ltd ✓
Salinity UK Ltd ✓
Salt Union Ltd ✓
Scotland Office
Scotrail ✓
Scottish Executive (Aviation Policy)
Serco
Sheffield City Council ✓
Shropshire Council ✓
Society of Chief Officers of Transportation in Scotland ✓
Society of Motor Manufacturers and Traders
Scottish Executive
South Bucks District Council ✓
South East England Development Agency

SouthEastern Trains ✓
South West of England RDA
South West Trains (Stagecoach) ✓
South Yorkshire ITA/PTE
Southern Railway (& Gatwick Express) ✓
Staffordshire County Council ✓
Stagecoach Group plc
Stagecoach Megabus
Strathclyde ITA
Superintendents Association
Supertram
Surrey County Council ✓
Sustrans
Swindon Borough Council ✓
Telford & Wrekin Primary Care Trust ✓
Thatcham (Motor car crash repair research)
The British Horse Society
The Institute of Advanced Motorists
Transport for London (joint response with London Councils) ✓
Transport Scotland ✓
Transport Times
TUC
Tyne & Wear ITA/PTE
UK Footway Group (UK Roads Board)
UK Major Ports Group
Vaisala Ltd
Virgin Trains ✓
Wakefield Council ✓
Wales Office
Walsall Council ✓
Warwickshire County Council ✓
Weatherquest
Welsh Assembly Government ✓
Welsh Local Government Association ✓
West Sussex County Council ✓
West Yorkshire ITA
Which
Wiltshire Council ✓
Wiltshire Police
Worcestershire Primary Care Trust ✓
Yorkshire Forward (RDA)

Appendices G, H and I

These appendices are the same as in the Interim Report and can be found there.

Appendix J: Attendees at rail and aviation Hearings

Railways

D B Schenker

Department for Transport (Rail Performance)

First Capital Connect

Merseyrail

National Task Force (including representatives from the Association of Train Operating Companies, Southern Railway and Network Rail)

Office of Rail Regulation

Rail Freight Group

Southeastern

Aviation

Airport Operators Association

Air Transport Users Council

BAA Airports Ltd

Birmingham International Airport

BMI

British Airways

Civil Aviation Authority

Department for Transport (Aviation)

London Gatwick Airport

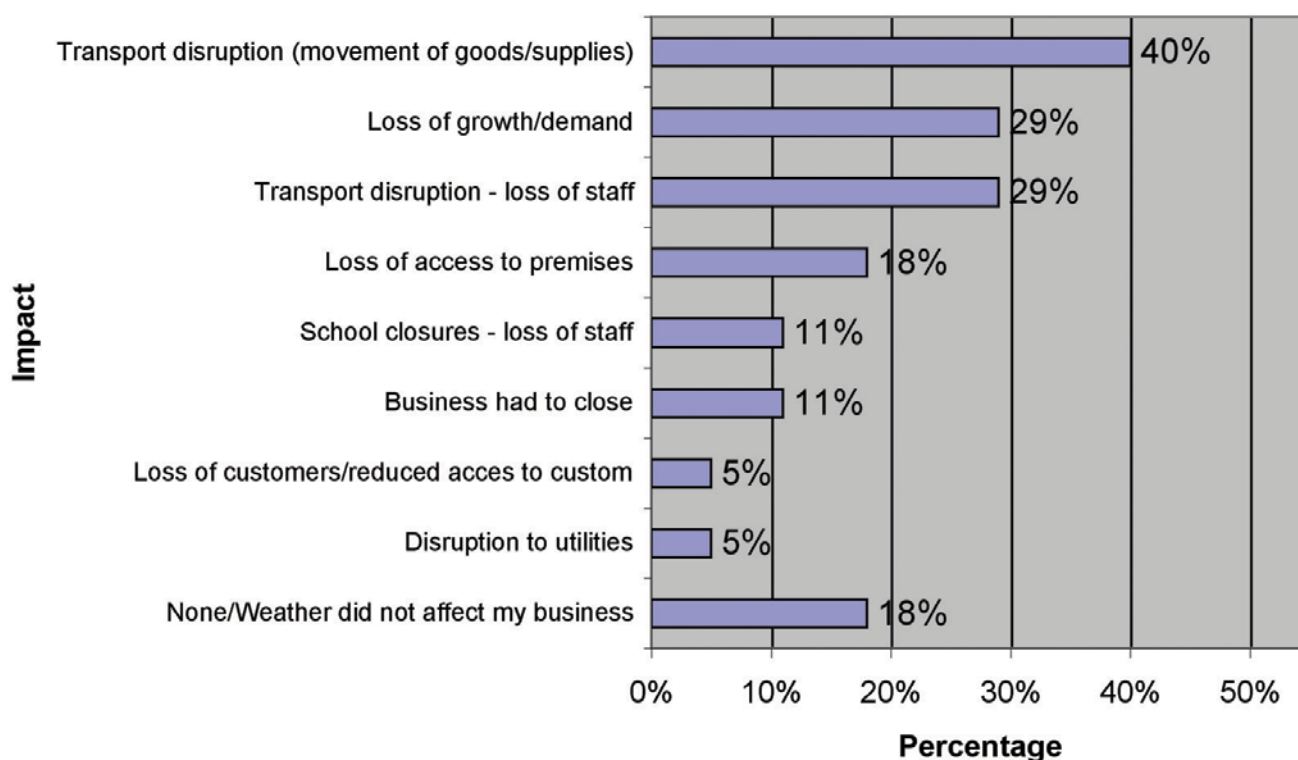
London Luton Airport

Manchester Airport

Appendix K: Federation of Small Businesses – ICM ‘Voice of Small Business’ Panel: January 2010 survey on the effects of severe winter

Question 2 of the FSB–ICM January survey asked “In what ways, if any, was your business most affected by the recent extreme weather conditions?”. Figure K1 shows the results received and published by the FSB on 22 February 2010.

Figure K1: FSB–ICM survey results on ways in which business was most affected by extreme weather conditions in 2009/10



Source: The FSB–ICM ‘Voice of Small Business’ Panel January survey was conducted between 27 January and 8 February 2010. The results are based on an online survey carried out by 1,657 members of the FSB–ICM Panel. The study was conducted by Guided Insight and ICM Research.

Appendix L: Acronyms

AGMA	Association of Greater Manchester Authorities
APSE	Association for Public Service Excellence
ATOC	Association of Train Operating Companies
BA	British Airways
BHX	Birmingham International Airport
CAA	Civil Aviation Authority
CIS	Customer Information System
CCS	Civil Contingency Secretariat (part of Cabinet Office)
CLG	Communities and Local Government
CP	Cleveland Potash Limited
DBC	Denied Boarding Compensation (EC Regulation 261/2004)
DBFO	Design Build Finance Operate
DfT	Department for Transport
DfE	Department for Education
EA	Environment Agency
EASA	European Aviation Safety Agency
EAWC	East Anglian Weather Consortium
FCC	First Capital Connect
FSB	Federation of Small Businesses
HA	Highways Agency
ISM	Irish Salt Mining & Exploration Company Limited
ITA	Integrated Transport Authority
LA	Local authority
LAP	Local Authority Panel (London)
LGA	Local Government Association
LGW	London Gatwick Airport
LHA	Local highway authority
LLAG	London Local Authority Gold
LOROL	London Overground Rail Operations Limited
MAC	Managing Agent Contract/Contractors (Highways Agency)
MAN	Manchester Airport/Group
NATS	National Air Traffic Services
NR	Network Rail
NRES	National Rail Enquiry System
NTF	National Task Force
NTMF	National Traffic Managers' Forum
NOTAM	Notice to Airmen

NWSRG	National Winter Service Research Group (previously the National Salt Spreading Research Group (NSSRG))
ORR	Office of Rail Regulation
PCT	Primary Care Trust
PFI	Private Finance Initiative
PIDD	Passenger Information During Disruption
PPM	Public Performance Measure
PTE	Passenger Transport Executive
PTEG	Passenger Transport Executive Group
PWS	Public Weather Service
RDA	Regional Development Agency
RRTs	Regional Resilience Teams (part of the Government Offices)
SARPS	Standards and Recommended Practices
SU	Salt Union Limited
SWT	South West Trains
TAG	Technical Advisers Group (Local Government)
TfL	Transport for London
TOC	Train Operating Company
TRL	Transport Research Laboratory
UKRLG	United Kingdom Roads Liaison Group
WLGA	Welsh Local Government Association

