

# IMPROVING THE RESILIENCE OF THE UNITED KINGDOM'S ROAD NETWORK TO THE IMPACT OF SEVERE WINTER WEATHER

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## 1. ABSTRACT

The severe weather of the 3 winters between 2008-11 severely challenged the UK's ability to keep its national road network open, safe and serviceable.

Up until the winter of 2008/09 the UK had experienced 20 years of relatively mild winters which, on top of the public sector budget pressures, resulted in many local highway authorities (LHAs) reducing their overall pre-season salt stocks levels and then in some cases relying on in-season restocking to replenish supplies.

This paper describes, how the events of these 3 severe winters unfolded in relation to their impact on the road transport network, the outcomes of the reviews and inquiries that followed, and finally as a consequence how the nation's resilience to future severe winter weather events has improved.

## 2. THE WINTER OF 2008/09

### 2.1 The weather

Early in 2009 saw a period of cold weather which, by recent standards over the last 2 decades, was exceptional for the UK. It was preceded by snowfall in October 2008, with snow lying for the first time in October since 1980 and freezing temperatures throughout December, January and February. The snowfall on 1<sup>st</sup> and 2<sup>nd</sup> February was reportedly the heaviest since 1991. The February event caused widespread disruption to travel across much of the UK and received significant media attention. Public transport was disrupted or unable to operate in parts of the country.



Fig 1 – Traffic congestion caused by the severe winter weather of 2009

### 2.2 The Shortage of Salt Supply

The combined effects of a long period of severe conditions across the country and a trend towards lower stocks of salt held by LHAs for de-icing resulted in a widespread salt

shortage against a background of what was at the time the worst winter weather for many years. The salt supply could not meet the immediate demand for restocking. Initially some LHAs arranged mutual aid between them to help manage the shortage, but as the severe weather persisted throughout the country and it appeared that salt availability could become critical, a response from central government was triggered.

### 2.3 The Government Response

An advisory national priority distribution system known as the Salt Cell was established for the first time and, with the co-operation of salt producers and LHAs, distribution of supplies of de-icing salt was prioritised to those LHAs most in need.

The author in his capacity as Chairman of the CSS (now known as ADEPT) Engineering Committee and the Chair of the UK Roads Board was asked by the Department of Transport to help gather and disseminate information from LHAs and to give advice on the salt supply distribution. He also produced a good practice guidance note on optimising salt usage which included advice on the use of grit and other alternatives. This advice was circulated to all LHAs not just during this winter but also over the next two.



Fig 2 – Leicestershire County Council's salt spreader being loaded for "precautionary" salting run

As a result of these conservation measures and salt cell's intervention, no LHAs actually ran out of salt. From mid February the weather became milder and the demand for salt returned to normal.

### 2.4 The UKRLG Review [1] March – July 2009

On 12 March 2009 the then Secretary of State (SOS) for Transport at the time, Lord Adonis, made a statement to Parliament on the severe weather. The statement highlighted problems caused by the heavy snowfall and announced that the UK Roads Liaison Group (UKRLG) would review lessons that can be learnt from the events of early February. The UKRLG recommended what steps could be adopted by LHAs, trunk road authorities, producers of salt and other stakeholders to ensure the effective treatment of England's road networks in order to ensure the nation is better prepared should similar events occur in future years.

The author was asked on behalf of UKRLG to oversee this review and chair the steering group. Atkins was appointed as the support consultant. This was a very intensive piece of

work that required regular engagement throughout the period April to July of 2009 to meet the reporting deadlines.

Two of the most ironic and revealing findings of the review were ; firstly in relation to the perceived lack of availability of de-icing salt stocks in the UK when actually there was no shortage of salt reserves underground. The problem being that the salt suppliers were unable to mine sufficient quantities of salt to meet the demand during the season. Secondly while salt was having to be imported to the UK during the crisis to supplement the shortfall some of the UK supply was actually being exported elsewhere due to more onerous contracts conditions imposed by overseas customers!

Trying to reach agreement on the ultimate recommendations of the review with all the key stakeholders within the timescales was a real challenge. This was particularly the case in relation to the concerns that were raised where there was any potential risk of imposing extra burdens on LHAs. This was a real stumbling block in trying to determine any new resilience standards but ultimately a compromise was agreed.



Fig 3 – The UKRLG Review

Despite the conflicting interests the UKRLG review was published on 4 August 2009 and included a package of 19 recommendations to develop and improve the highway maintenance for future winters.

2.5 The key recommendations from the UKRLG Report were as follows:-

- Improve communication with the public, before and during severe winter weather.
- Consider, consult on and formally adopt a defined minimum winter salting network, including strategic routes, access to key facilities and other transport needs.
- Review pre-season salt stocks and in-season stocking arrangements to ensure they have sufficient salt stocks to deliver the locally defined standard. UKRLG recommended at least six days' severe weather resilience, covering the core winter period.
- Review winter service plans and ensure appropriate consultation and co-ordination with other highway authorities, key public services and other stakeholders to ensure well co-ordinated plans, and consider whether collaboration with other services would improve service for the public.
- Prepare contingency plans for providing winter maintenance in a scenario of constrained salt stocks, such as salting a minimum winter network and reducing salt usage.

- Consider jointly with salt suppliers whether supplier owned salt stocks can be held in widely distributed locations around the country.

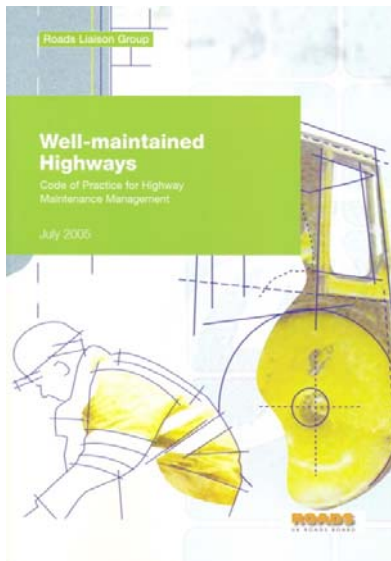


Fig 4 – The UKRLG Code of Practice – Well Maintained Highways

- Consider innovation in salt procurement, such as collaborative purchasing arrangements with neighbouring authorities, greater specification of supply contracts and a more diverse supply base.
- To strengthen ‘*Well Maintained Highways*’, the UKRLG code of practice for highway maintenance management, with a view to influencing winter service plans for 2010/11.
- To publish an information leaflet for highway authority elected Members and senior managers on preparation for severe winter conditions.

The report was well received and addressed many of the key issues but it was recognised there would be insufficient time to complete some of the recommendations by the next winter and where investment was needed (for example storage capacity) then it could take some LHAs 2 to 3 years to complete.

## 2.6 Government Response to the UKRLG Report

Despite having completed the work in advance of the 2009/10 winter season it took the Government over 4 months to respond when in a written ministerial statement, the then SOS for Transport welcomed the report as a thorough review and endorsed all 19 UKRLG recommendations. At the same time, the DfT issued a leaflet entitled *Are You Ready For Winter?* which raised awareness of the importance of good winter planning to locally elected members and senior managers.



Fig 5 – The DfT Leaflet – Are you Ready for Winter?

In tandem with the DfT announcement, UKRLG issued its updated version of *Well Maintained Highways*. The guidance was strengthened in a number of areas in accordance with recommendation 11 of the UKRLG report and provides formal advice to LHAs to take into account when reviewing their winter service operations for winter 2010/11.

### 3. THE WINTER OF 2009/10

#### 3.1 The weather

The winter of 2009/10 was the coldest in the UK for 30 years and the duration of freezing temperatures and the extent of coverage of both snow and ice were highly unusual.

From mid December 2009 to mid January 2010 the UK experienced a spell of very low temperatures and significant snowfalls that affected almost the whole country. This was the most widespread and prolonged spell of this type across the UK since the winter of 1981/82. Large areas of England, Wales and Northern Ireland regularly saw night-time temperatures falling well below freezing, and on occasion below  $-10^{\circ}\text{C}$ . Daytime temperatures in many areas frequently struggled to rise above freezing, often remaining several degrees below.

The freezing temperatures were accompanied by widespread snowfalls on many days throughout the period. With daytime temperatures often failing to rise above freezing, little thawing occurred so fresh snowfalls added to previous accumulations. Depths of 10 to 20cm were widespread across England and Wales, whilst across upland areas of northern England and in the Scottish Highlands, depths exceeded 30cm in many areas.



Fig 6 – The winter of 2009/10, the coldest in the UK for 30 years

### 3.2 The Government Response

The Government again had to put in place emergency arrangements (the “Salt Cell”) to monitor salt demand and stocks and to advise the salt suppliers where the scarce supplies were best directed.

The author for the second winter in succession was asked to join Salt Cell, to give advice and disseminate information. The situation this winter was even worse than that in 2008/09 due to the more widespread coverage of snow which is clearly shown in the iconic satellite picture showing the whole of the UK completely white on the front cover of the *Winter Resilience Review Report* [2].

The delay in the Government response to the recommendations of the UKRLG report and the increasing concern about salt supplies were raised in Parliament and the Prime Minister at the time Gordon Brown made a statement to the house on 9<sup>th</sup> January 2010.

With the ongoing cold weather in January the SOS for Transport issued “strong guidance” to all LHAs to reduce their salt utilisation by 25% and then only a few days later, as the situation continued to worsen he revised this to 50% with the advice that this was to be achieved by reducing the networks treated and/or reducing spread rates.

The cold weather continued well into March and as a result Salt Cell met weekly for 14 weeks with most of the participants interacting by conference call. The usual format being a situation update from the Met Office then an overview on the supply situation followed by more detailed analysis of specific delivery proposals. Through reduced usage, rationing, increased output by suppliers and some timely arrival of imported deliveries further sanctions were avoided enabling LHA’s to get through the worst of the winter.



Fig 7 – Snow clearing continued well into March 2010

With the experience of the second severe winter and with some concern as to whether all the lessons learned from the previous winter had been acted upon, the then SOS for Transport commissioned a further but independent review in March 2010. A three-man Panel led by David Quarmby, Chair of the RAC Foundation with its purpose to consider and recommend practical measures to improve the response of England's transport systems to severe winter weather.

### 3.3 The Independent Review led by David Quarmby

The Quarmby Review reported in two stages with an Interim and a Final Report. The focus of the interim report was on roads and road users, on issues that needed to be addressed and measures that could be implemented relatively quickly in preparation for winter 2010/11. The final Report published in October covered the wider aspects of resilience of transport services, including rail and aviation as well as recommending how the salt supply chain might be improved for the longer term.

The Review found that the lessons of the winter 2008/09 had been well learnt across all the organisations involved in managing England's road networks and those who maintain and operate public transport systems. As a result it was recognised that the performance during the winter of 2009/10 was considerably better than it might have been.

However, the Review recognised that there were still some important lessons to emerge from the 2009/10 winter, with some common themes that ran across all modes of transport.

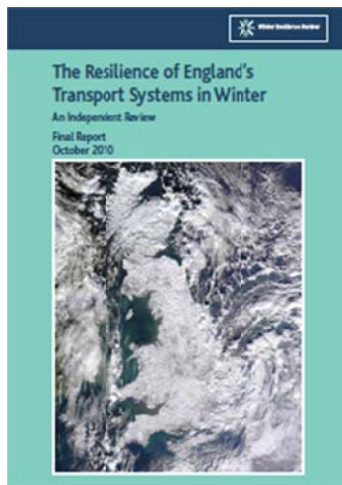


Fig 8 – The independent Review into the resilience of England's Transport Systems in Winter

The first lesson was that the supply of salt for highways was still potentially a major issue. The recommendation in the Interim Report was for a strategic reserve of a quarter of a million tonnes for 2010/11 (this was accepted by Government). It was made clear that this was not to be regarded as an integral part of a long-term sustainable solution although it should remain as a planned emergency action if needed. The Review recommended a combination of higher stockholding levels for the beginning of the winter season (with a new resilience bench-mark of 12 days/14 runs pre-season), 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 .If successful these measures would secure

sufficient resilience to meet the needs of a severe winter. However, the measures would need to be underpinned by a comprehensive whole market salt stock monitoring and forecasting system to be overseen by the DfT.

On the evidence received through the review, the UKRLG Report on the *Lessons of Severe Weather* of July 2009 and the updated code of practice *Well Maintained Highways\** continued to provide the most comprehensive and fit for purpose advice on winter service policy and planning for LHAs, but with some specific features modified and reinforced by the Review and its Recommendations.

The independent Review highlighted the importance of engaging more systematically with lower tier authorities (District Councils) and local communities in gritting and snow clearance, particularly for footways and cycleway about which public expectations were rising. The Review proposed a 'Snow Code' to give the public and shopkeepers more confidence about clearing their own frontages and guard them against negligence claims.

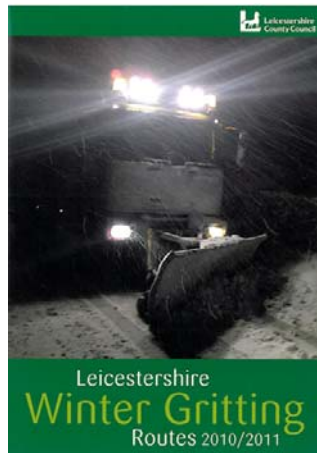


Fig 9 – Leicestershire County Council leaflet showing its winter gritting routes

#### 4. THE WINTER 2010/11

##### 4.1 The weather

Hardly before the ink had dried on the Independent Review severe winter weather arrived again in early (November), with temperatures below freezing and widespread light snow. However there were some extraordinarily localised, intense and sustained snow falls in the north east, parts of eastern and central England and the home counties south of London – intensities not seen since 1965. It was these snow falls which caused particular problems and delays on the transport networks in those areas.

Temperatures struggled during this period to rise above freezing during the day and there were very severe frosts at night. Temperatures widely fell below  $-10^{\circ}\text{C}$  on several nights and on occasion below  $-20^{\circ}\text{C}$  in Scotland.

There was a short respite before a second spell of severe weather began on 16th December. The UK remained bitterly under cold Arctic air until Boxing Day. Overall the prolonged freezing conditions resulted in an exceptionally cold December across the UK in fact the coldest for 100years!



## 4.2 The Government Response

Salt cell was again mobilised for the third winter in succession but this time there was not the same need or intensity as the two previous winters.

The disruption to transport during November and December went across all modes of transport with Heathrow having to face an unprecedented closure due to heavy snow falls for 4 days. There was widespread disruption on the rail network particularly in the South East. Although there was some more limited problems on the road networks it was not as bad as the previous two winters.

In the light of the concerns that were again being raised, the new SOS for Transport Philip Hammond enlisted David Quarmby's help again to undertake an urgent audit of the situation.

## 4.3 An Independent Audit by David Quarmby December 2010 [3]

The results of this audit identified that LHAs were in a good state of readiness for the unexpectedly early winter episode, particularly in relation to gritting operations. Albeit those who suffered high levels of snowfall were put under early pressure with substantial operational demands.

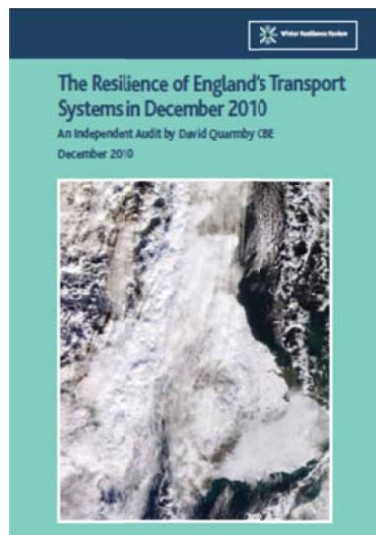


Fig 10 – An Independent Audit into the resilience of England's Transport Systems in December 2010

However the audit recognised again that there were no silver bullets. Quarmby's conclusion was that given the unpredictable and volatile nature of the UK weather with added uncertainties associated with the timing, severity, geographical extent and persistence of winter conditions that there has to be some limit to the resources the nation can afford and within this context it is down to LHAs and their communities to do the best job they can.

Perhaps the most challenging task was the negotiation with the National Winter Service Response Group (NWRSG) in persuading the Group to make the information on optimum spread rates they had commissioned universally available. This was tricky as not all LHAs subscribed to NWRSG and understandably they did not want to give this away freely. In

the light of national importance of this information the author succeeded with some financial inducement from the DfT in ensuring that this guidance was released nationally just before Christmas 2010 (*Recommended Precautionary Treatments and Post Treatments including revised salt Spread rate*). Over the next 2 to 3 months I was also instrumental in striking a deal for the NWSRG to become a sub-group of the UK Roads Board which delivered another of the Quarmby Review recommendations.

## 5. PLOUGHING ON – A REVIEW OF HIGHWAY RESILIENCE IN THE WINTER OF 2012/13 [4]

The winter of 2011/12 was relatively mild in comparison with the previous succession of 3 severe winters but the winter of 2012/13 again tested the resilience of the UK roads network. As a consequence the RAC Foundation commissioned a report entitled “Ploughing On – A Review of the Highway Resilience in Winter 2013”.



Fig 11 – Ploughing On – A review of highway resilience in Winter 2013

### 5.1 The Weather

Snow and cold weather reached the country in mid-January. It stayed cold throughout the next 2 weeks. There was also another period of cold weather in March when heavy snow, particularly in the South East of England, caused significant disruption on the roads.

### 5.2 Performance of the local highway authorities

Feedback from the LHAs suggested the Quarmby review and the follow-up Audit were important in shaping the current winter service. Although there was already a lot of good practice the review and audit served as a prompt for many LHAs to review many aspects of the service, and to stimulate improved practice and innovation.

The issue at the heart of the 2012 Review was salt stock levels, which had run low in the two preceding winters. This review revealed that more salt is now stocked, giving much greater resilience, and that various arrangements have been put in place to reinforce this resilience, such as joint additional storage arrangements with other LHAs. In addition, many LHAs have reviewed their salt spread rates in conjunction with the new national guidance, and/or improved their fleet.

This resilience was clearly demonstrated during the two-week period. Salt use was very heavy, but no LHA reached a point where there was any risk of running out; indeed, both England and Wales had, in overall terms, significant reserves which could have been used.

Many of the authorities reported how plans had been strengthened or developed to work with community groups, as well as lower-tier councils, for instance parish or community councils where these exist. Other councils pointed to arrangements for groups of LHAs to work together; this is particularly a feature of the large metropolitan areas, and the winter service in Wales.

One indicator of good performance was positive feedback. Every authority reported that they have never before received so much thanks and praise from a range of sources. Some pointed to Twitter feedback as a contributory factor, but it does seem that improved communication and a high standard of performance generated much positive feedback.

#### REFERENCES

1. UK Roads Liaison Group – Lessons from the Severe Weather February 2009
2. The resilience of England's Transport Systems in Winter – an Independent Review – Interim and Final Reports 2010
3. The Resilience of England's Transport Systems in December 2010 – an Independent Audit by David Quarmby – December 2010
4. RAC Foundation – Ploughing on – A review of highway resilience in Winter 2013