

Roads Liaison Group

This is the latest version of Well-maintained Highways and it supersedes all previous versions.

A list of all changes introduced from the original Code together with the date of introduction is included at the front of the Code.

If you wish to look at a version of the Code highlighting all the changes from the previous version, please click [here](#).

Older versions of the Code are archived on the UKRLG website [here](#).

Well-maintained Highways

Code of Practice for Highway Maintenance Management

2005 Edition

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Log of updates

Reference	Action	Date	Topic
2.1.7	New paragraph added Website amended	14 May 2009 27 April 2012	Maintaining a Vital Asset
2.2.4	Paragraph amended Website amended	7 May 2010 27 May 2011 27 April 2012	LTP guidance
Figure 2	Figure amended	7 May 2010	Hierarchy of UKRLG guidance
2.2.11	New paragraph added Paragraph amended Website amended	13 August 2010 27 May 2011 24 May 2013	CIPFA Code of Practice on Transport Infrastructure Assets
2.2.12	New paragraph added Website amended	13 August 2012 24 May 2013	HAMFIG
2.2.13	New paragraph added	13 August 2013	HMEP / UKRLG Highway Infrastructure Asset Management Guidance
2.3.18	Website amended	24 May 2013	Efficiency savings
2.4.1	Website amended	24 May 2013	Sustainable highway maintenance
3.7.3	Paragraph amended	29 November 2011	Institutional framework in Scotland
4.2.1	Websites amended Paragraph amended	27 April 2012 13 August 2013	Further advice and guidance
5.2.12	Paragraph amended Websites amended	29 November 2011 27 April 2012	National and Local Transport Policies in Scotland
5.4.6	New paragraph added Website amended	13 August 2010 27 May 2011	Asset management good practice
5.4.7	New paragraph added	27 May 2011	Asset management case studies
5.5.6	New paragraph added Website amended	14 May 2009 27 April 2012	Review of progress with TAMPs

Reference	Action	Date	Topic
5.5.7	New paragraph added Website amended	14 May 2009 24 May 2013	CIPFA review of accounting management
5.5.8	New paragraph added Website amended Websites amended	15 December 2009 15 December 2010 27 April 2012	Asset Management Quick Start Guidance Notes
5.5.9	New paragraph added	10 August 2011	Audit Commission report "Going the Distance"
5.5.10	New paragraph added Website amended	29 November 2011 27 April 2012	New Code of Practice
5.5.11	New paragraph added Websites amended	29 November 2011 27 April 2012	Design and Maintenance Guidance
5.5.12	New paragraph added	13 August 2012	HMEP Pothole Review
5.8.4	New paragraph added Paragraph amended Website amended	14 May 2009 15 December 2010 27 April 2012	Manual for Streets 2
6.7.6	Paragraph amended Website amended	14 May 2009 27 April 2012	"A road builder's guide to motorcycle safety"
6.8.2	Website amended	27 April 2012	Market testing
7.7.2	Website amended	27 April 2012	Environmental legislation
7.7.5	Website amended	27 April 2012	Disability Discrimination Act
7.7.7	New paragraph added	14 May 2009	CDM regulations
7.7.8	New paragraph added Website amended	14 May 2009 15 December 2010	Traffic Management Act
7.9.1	New paragraph added Website amended	13 August 2010 27 April 2012	Minimising clutter
7.10.1	New paragraph added	13 August 2012	Signing the Way
8.3.6	Website amended	27 April 2012	Streetworks coordination
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Reference	Action	Date	Topic
8.4.2	Website amended	24 May 2013	English Heritage
8.4.10	New paragraph added Paragraph amended Paragraph amended Website amended	7 May 2010 15 December 2010 27 May 2011 27 April 2012	Commuted sums
9.5.12	New paragraph added	14 May 2009	Cost of claims on footways
9.8.1	Website amended	27 April 2012	Skidding resistance
9.8.3	Paragraph amended Paragraph amended Website amended	14 May 2009 27 May 2011 27 April 2012	Horses slipping on negatively textured surfaces
9.10.3	New paragraph added	14 May 2009	Footways and Cycletrack Management Group
9.14.5	Website amended	27 April 2012	Safety barriers and fences adjacent to railway lines
9.15.10	New paragraph added	24 May 2013	Reducing sign clutter
9.22.8	New paragraph added Website amended	14 May 2009 15 December 2010	SCANNER guidance
9.28.14	Website amended	27 April 2012	UKPMS
Section 10 comments	New paragraph added	14 May 2009	National Indicators replace BVPIs
10.3.4	Paragraph amended	14 May 2009	National Indicators
10.3.6	Website amended	27 April 2012	System intervention levels
10.3.7	New paragraph added	24 May 2013	HMEP Lifecycle Planning Toolkit
10.4.2	Paragraph amended	14 May 2009	Reporting footway condition
10.4.10	New paragraph added	15 December 2009	Footway Network Survey
10.7.11	New paragraph added	24 May 2013	HMEP Drainage Guidance

Reference	Action	Date	Topic
10.10.1	Website amended	27 April 2012	Safety barriers and fences adjacent to railway lines
10.17.1	New paragraph added	13 August 2010	The role of UKPMS
11.1.1	Website amended	27 April 2012	Performance management
11.8.8	Website amended	27 April 2012	Benchmarking groups
Section 13	Section amended	29 November 2011	Winter Service
13.4.2	Website amended	27 April 2012	Lessons from the Severe Weather February 2009
13.4.4	Website amended	27 April 2012	Secretary of State for Transport response
14.1.6	Website amended	27 April 2012	UKCIP Costing Guidelines
14.1.10	New paragraph added	13 August 2010	Climate Change Adaptation Plan
14.1.11	New paragraph added	13 August 2010	Climate Change Act
14.4.5	New paragraph added Website amended	14 May 2009 27 April 2012	The Pitt Review
14.4.6	New paragraph added Website amended	13 August 2010 27 April 2012	The Flood and Water Management Act
15.3.8	New paragraph added Website amended	14 May 2009 27 April 2012	Best Practice Guidelines for Surfacing
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15.8.4	Website amended	27 April 2012	Aggregates levy
15.9.1	Website amended	27 April 2012	Landfill tax
15.11.3	Website amended	27 April 2012	Biodiversity action plans
15.11.4	Website amended	27 April 2012	Highway verges
15.11.5	Website amended	27 April 2012	Highway verges
15.15.1	New paragraph added	14 May 2009	Climate change
15.15.2	New paragraph added	14 May 2009	Scottish Climate

Reference	Action	Date	Topic
			Change Study
15.15.3	New paragraph added	14 May 2009	Scottish Road Network Landslides Study
15.16.1	New paragraph added	14 May 2009	Sustainable highways
16.4.5	New paragraph added Paragraph amended	14 May 2009 7 May 2010	Highways Efficiency Liaison Group
16.6.6	New paragraph added	24 May 2013	HMEP Collaborative Alliances Toolkit
16.6.7	New paragraph added	13 August 2013	HMEP Standard Contract Documents
16.6.8	New paragraph added	13 August 2013	HMEP Standard Specifications
Appendix C comments	Addition to Appendix Website amended Comment added Website amended	15 December 2009 27 April 2012 27 May 2011 27 April 2012	Revised "Highway Risk and Liability Claims"
C3.4	Website amended	27 April 2012	Human Rights Act
D1.3	Website amended	27 April 2012	UKPMS systems
Appendix H	Appendix amended	18 September 2013	Winter Service Practical Guidance
Appendix H	Section amended	29 November 2011	Winter Service Issues
H4.3	Website amended	27 April 2012	Drivers' hours guidance
H6.5	Paragraph amended	13 August 2012	Graded rock salt
H7.6	Paragraph amended	16 January 2012	Moisture Content for Salt
H7.20	Paragraph amended	16 January 2012	Storage Options
H8.13	Paragraph amended	16 January 2012	Determining Spreading Capability
H8.14	Paragraph amended	16 January 2012	Determining Spreading Capability
Figure H1	Figure amended	16 January 2012	Spreading Capability Flowchart
H9.3	Bullet points renumbered	16 January 2012	Target spread rates of salt for precautionary treatment

Reference	Action	Date	Topic
H10.9	Paragraph amended	16 January 2012	Depths of snow (light, moderate to heavy snow)
Appendix L	Website amended Paragraph amended	27 April 2012 13 August 2013	References

Foreword

The first Code of Practice for Highway Maintenance endorsed by the local government associations was published in 1983 and has subsequently been revised at intervals to take account of new and emerging developments in technology, policy and good practice.

Many of the key themes of the original Code, including the need for a robust regime of safety inspection and a planned investment programme based on whole life costs, are fundamental to highway maintenance. These have been retained throughout the different editions and continue in this 2005 edition of this Code.

In recent years the growth in traffic and its attendant problems throughout the UK has brought increasingly widespread recognition of the importance of highway maintenance, and the high value placed on it both by users and the wider community. There is also an increasing understanding of the serious consequences of failure to invest adequately and effectively in maintaining the local highway network, in particular the progressive deterioration of safety, reliability, and quality, eventually requiring even greater levels of investment in the future.

There are however even wider consequences. The highway network is a key and highly visible community asset, supporting the national and local economy and contributing to the character, and environment of the areas that it serves. The adoption of a Highway Asset Management Plan will enable authorities to manage these broader transport objectives, as well as the more detailed financial and technical aspects of highway maintenance planning. This edition of the Code gives much greater prominence to asset management and risk management than earlier editions. It also provides advice on the implications of the new Traffic Management Act 2004.

The potential contribution of the local road network extends far wider even than transport. It is fundamental to the economic, social and environmental well being of the community, and its management and maintenance should seek to maximise this wider contribution. Effective management of the local road network has the potential to aid regeneration, social inclusion, community safety, health and the environment, but this will need a planned long-term programme of investment, efficiently managed and supported by effective technical and management systems. This edition of the Code gives greater prominence to these wider objectives including new advice on such matters as providing for disabled people, addressing the particular needs of motorcyclists, integrated public space and townscape management, and planning for severe weather events. New check lists for maintainability and sustainability have also been developed.

Road users prefer reasonable consistency of standards irrespective of administrative boundaries, and this edition of the Code continues to encourage harmonisation so far as practicable, both between strategic and local roads and between adjoining authorities. The Code applies throughout the UK, whilst recognising the need for reasonable local discretion and diversity, and essential regional differences.

This edition of the Code also reflects the evolution of Best Value into a more broadly based performance improvement agenda based on Comprehensive Performance Assessment in England and similar emerging arrangements elsewhere. The performance management section has been completely rewritten.

The highway network is a most highly valued physical asset, both in financial and community

terms, for which public authorities are responsible. Effective stewardship and asset management is crucially important, both to users and the community. Authorities are recommended to adopt the principles of this Code, to adapt them as necessary based on consideration of local circumstances, and apply them consistently.

Section 1

Executive Summary

1.1 STRUCTURE OF CODE OF PRACTICE

1.1.1 This Code is set out in five Parts, each of which is divided into sections:

Part A Executive summary, introduction to the Code, its scope and purpose, with links to complementary advice;

Part B Policy and legal framework for highway maintenance within the context of best value and performance improvement;

Part C Principles for developing strategy and network hierarchy. Standards for inspections and condition surveys, investigatory levels, benchmarking and assigning priorities. Guidance on planning for Winter Service and emergencies;

Part D Guidance on procurement, financial management, sustainability and monitoring all service aspects;

Part E Appendices with more detailed information, including Glossary of Terms and References.

1.1.2 Recommendations are numbered within sections and are located for convenience at the end of each section. All recommendations are brought together in a brief non-technical summary published as a companion to the main Code.

1.2 OBJECTIVES OF THE CODE

- To encourage the adoption of asset management planning as a means of demonstrating value for money in the delivery of highway maintenance;
- To encourage the development, adoption and regular review of policies for highway maintenance, consistent with the wider principles of integrated transport, sustainability and best value;
- To encourage a focus on the needs of users and the community, and their active involvement in the development and review of policies, priorities and programmes;
- To encourage harmonisation of highway maintenance practice and standards where this is consistent with users' expectations, whilst retaining reasonable diversity consistent with local choice;
- To encourage the adoption of an efficient and consistent approach in the collection, processing and recording of highway inventory, highway condition and status information for the purpose of both local and national needs assessment, management and performance monitoring;

- To encourage the adoption and regular review of a risk management regime in the determination of local technical and operational standards, rectification of defects arising from safety and serviceability inspections and investment priorities;
- To encourage continuing innovation in the procurement of highway maintenance contracts, whilst complying with high standards of corporate governance.

1.3 STATUS OF THE CODE

- 1.3.1 The suggested recommendations of this Code are explicitly not mandatory on authorities. The key best value principle of requiring authorities to involve users in the design and delivery of service implies that authorities should have reasonable discretion to respond to such involvement.
- 1.3.2 Authorities also have certain legal obligations with which they need to comply, and which will, on occasion, be the subject of claims or legal action by those seeking to establish non-compliance by authorities. It has been recognised that in such cases, the contents of this Code may be considered to be a relevant consideration. In these circumstances, where authorities elect, in the light of local circumstances to adopt policies, procedures or standards differing from those suggested by the Code, it is essential for these to be identified, together with the reasoning for such differences.
- 1.3.3 The Code is based on the assumption that available funding for highway maintenance will provide some flexibility for authorities to pursue a regime of assessment and rational planning of programmes and priorities. Where this is not the case, statutory obligations for network safety will need to take precedence.

Section 2

Introduction

2.1 THE NEW EDITION

- 2.1.1 This 2005 edition of the Code of Practice for Highway Maintenance updates the 2001 edition to take account of significant changes in legislation, policy and practice.
- 2.1.2 The 2001 edition was originally developed by officers of UK national, devolved, and local governments in partnership with the Audit Commission. It was intended to encourage co-ordination and consistency in the delivery of local highway maintenance services and to facilitate sharing of developing best practice through a framework of guidance and standards.
- 2.1.3 The Code recognised the particular relevance of best value to highway maintenance, a highly valued and visible service with the potential to contribute significantly to the wider corporate objectives of local authorities. It was developed to follow closely the principle that services should be designed to meet the needs of users and the community, rather than the convenience of service providers and was designed to facilitate the conduct of fundamental service reviews to support continuous improvement. These principles still apply in the new edition.
- 2.1.4 The production of this edition has been overseen by the Roads Board and Roads Liaison Group (Figure 1), concurrently with the production of a new edition of the Code of Practice for Road Lighting, and a new Code of Practice for the Management of Highway Structures overseen by the Lighting and Bridges Boards respectively. These three Codes, together with the new Framework for Highway Asset Management published by the County Surveyors Society (CSS) in 2004 in conjunction with other Roads Board partners, provide an integrated family of best practice guidance for highway infrastructure management.
- 2.1.5 The Code is intended to apply throughout the United Kingdom and reflects where appropriate any key differences that exist in the Devolved Administrations. It also seeks to reconcile and harmonise maintenance practice on local and strategic road networks where this is practicable and consistent with the expectations of users, whilst retaining scope for local discretion and diversity.
- 2.1.6 This edition of the Code includes cross references to web sites with their associated links throughout. In the published version of this Code the web addresses are referenced by their short title for simplicity. Users will be required to use the website search engine to locate the reference. In the web version of this Code full web addresses are embedded beneath the short title, allowing users to go directly to the referenced site.

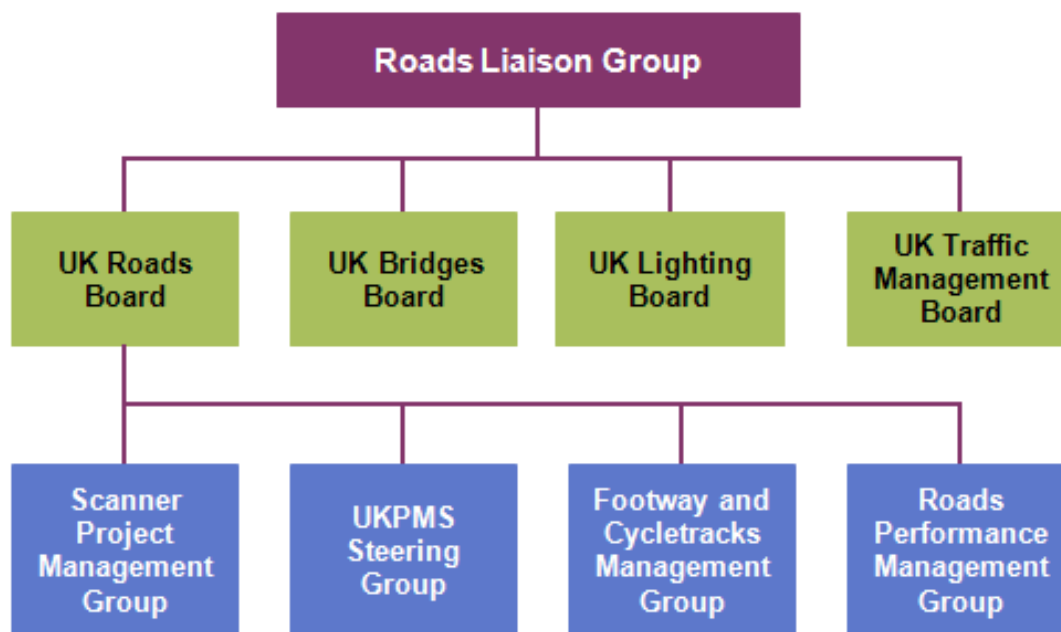


Figure 1 - UK Roads Groups

**New Paragraph
Added 14 May 2009**

2.1.7 Following the publication of these three Codes, the DfT published Maintaining a Vital Asset, a booklet aimed at highlighting the importance of maintaining the highway asset to Local Authority senior managers. The booklet, which was, at the time, endorsed by the DfT, the Welsh Assembly Government, the Mayor of London, the Scottish Executive and the Northern Ireland Office, commends the Codes to highway authorities. Maintaining a Vital Asset can be downloaded from the following website.

**Website Amended
27 April 2012**

<http://www.ukroadsliasongroup.org/en/utilities/document-summary.cfm?docid=88CFA222-7499-4AC3-9278D66380F2B30A>

2.2 ASSET AND NETWORK MANAGEMENT

2.2.1 The importance of highway maintenance and its relevance to asset and network management has never been more widely recognised. The significant under-investment of earlier years is now being addressed, but signs of neglect are still widespread and visible on local roads, and continue to be the subject of considerable public concern. Acceptable standards of safety and serviceability have been difficult to maintain, and perhaps more importantly, the ability of the network effectively to fulfil its wider community contribution to quality of life has been severely compromised.

2.2.2 The response of most authorities to funding constraints has been to focus on limited short term repairs to the surface of carriageways and footways in order to address their legal responsibilities for safety and mitigate the financial consequences of claims. Necessary works of resurfacing and reconstruction have

been deferred as long as possible, well beyond the optimum point for treatment, with the result that progressive deterioration has continued and eventual costs of repairs increased.

2.2.3 The need for a new approach, recognising the considerable importance of the highway asset, linked to planned investment commensurate with its value, is addressed in the *CSS Framework for Highway Asset Management*. This publication provides:

- An introduction to the concept of asset management as it applies to UK highway networks;
- A framework for authorities who wish to introduce asset management to their business processes;
- Guidance on the preparation of asset management plans.



**Paragraph Amended
7 May 2010**

**Paragraph Amended
27 May 2011**

2.2.4 The theme of asset management was strengthened by Government guidance (www.dft.gov.uk) encouraging authorities in England to draw up Transport Asset Management Plans (TAMPs), as part of their preparation for the second round on Local Transport Plans (LTP). These asset management plans should be consistent with the advice contained in the CSS (now ADEPT) Framework document. In July 2009 the guidance for the third round of LTP was published, encouraging authorities to integrate TAMPs with LTP and stating that the TAMP should cover service levels, investment, risk assessment and monitoring process. The guidance may be downloaded from the following website:

**Website Amended
27 April 2012**

<http://webarchive.nationalarchives.gov.uk/+http://www.dft.gov.uk/pgr/regional/ltp/guidance/fltp/fullguidanceonlocaltransport3657>

Figure 2 shows the hierarchy of guidance relating to local transport planning, asset management and this Code.

**Figure Amended
7 May 2010**

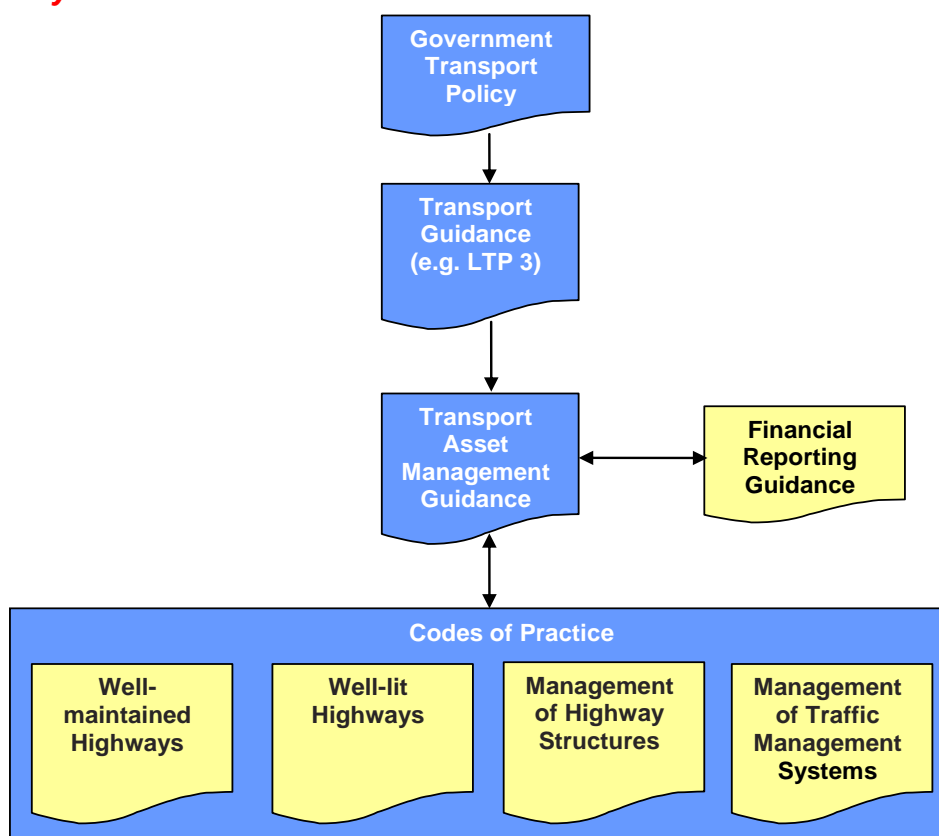


Figure 2 – Hierarchy of Guidance

- 2.2.5 The term TAMP has been used in the guidance to take account of wider assets related to the transport system (such as depots and bus facilities) owned by transport authorities, in addition to the highway network. For the purpose of this Code, since it exclusively concerns the highway asset, the term Highway Asset Management Plan (HAMP) will be used throughout. A HAMP will of course also include highway lighting, bridges and structures, which will have their own individual asset management plans, but will combine with highways to form the overall authority HAMP. A key aspect of the HAMP is asset valuation and CSS has commissioned the *Guidance Document for Highway Infrastructure Asset Valuation* which has been published concurrently with this Code.
- 2.2.6 The need for more effective funding and management of highway maintenance work was first addressed on the strategic highway network, where heavy traffic flows and the need for more consistent serviceability levels were more obviously apparent. In England, the Highways Agency (HA), secured higher and longer term

funding and applied this to a new and innovative regime of management and procurement, which is still developing. The outcome of these initiatives has been first to stabilise and then to reverse the decline in network condition for strategic highways, at least in England. Similar approaches are being pursued on the strategic network in other parts of the UK.

- 2.2.7 The Ten Year Plan targets to first arrest and then reverse the decline in the condition of local roads in England brought a similar urgency, and increased funding in recent years to those provided for the strategic highway network. These specific targets have now evolved into a more broadly based commitment to asset management which will hopefully provide the basis for continuing long term investment. Guidance for the second round of LTPs (www.dft.gov.uk) indicates that the DfT expects, as a minimum requirement, authorities to aim to ensure no overall deterioration in local road conditions from 2004/05 levels. They expect most authorities to be more ambitious than this, and to achieve significant improvements in overall condition over the second LTP period.
- 2.2.8 In other parts of the UK there has also been increased understanding, since the 2001 edition of this Code, of the extent of highway deterioration and its implications for local economies. Investment has increased along with expectations for improvements in road condition.
- 2.2.9 Highway maintenance and improvements also have the potential to increase traffic disruption, leading to increased congestion and consequent user dissatisfaction in the short term. Effective co-ordination and harmonisation, combined with careful and considerate design and programming of works, can avoid or significantly mitigate this, and this is recognised by the Traffic Management Act 2004, and similar legislation in the Devolved Administrations, which introduced a statutory duty for network management, including the appointment of a Traffic Manager. The implications of this are also reflected in the Code.
- 2.2.10 The new agenda for asset management and network management together provide the potential for a new and important approach in the funding and management of highway infrastructure. They provide the link between the value of the asset established by the HAMP and the value of access to or use of the asset (implied through fees and charges imposed by the Traffic Management Act).

**New Paragraph
Added 13 August 2010**

**Paragraph Amended
27 May 2011**

- 2.2.11 In 2010 CIPFA published a '*Code of Practice on Transport Infrastructure Assets: Guidance to Support Asset Management, Financial Management and Reporting*'. This new Code of Practice provides guidance on the development and use of financial information to support asset management, financial management and reporting of local transport infrastructure assets. It has been prepared at the request of the Government and implements a key recommendation from the CIPFA review of local authority transport assets which reported in 2008. The CIPFA code replaces the CSS (now ADEPT)/TAG Guidance Document for Highway Infrastructure Asset Valuation (2005). The Code should be used to report assets on a current value basis in Whole of Government Accounts. HM

Treasury has set a timetable for a gradual transition to reporting on this basis, starting with limited, unaudited data submissions for 2009/10, building up to a full audited dry run in 2011/12 and the withdrawal of historic cost-based reporting from 2012/13. The Code is available in book and CD-ROM format, both of which may be obtained from the following website:

Website Amended

24 May 2013

<http://www.cipfa.org/Policy-and-Guidance/Local-Authority-Transport-Infrastructure-Assets>

New Paragraph Added

13 August 2012

2.2.12 To support the implementation of the Code of Practice on Transport Infrastructure Assets, supporting material has been published in the CIPFA website. This supporting material has been developed by the Highways Asset Management Finance Information Group (HAMFIG) and can be downloaded from the following website:

Website Amended

24 May 2013

<http://www.cipfa.org/Policy-and-Guidance/Local-Authority-Transport-Infrastructure-Assets/Local-Authority-Transport-Infrastructure-Assets-supporting-documents>

New Paragraph Added

13 August 2013

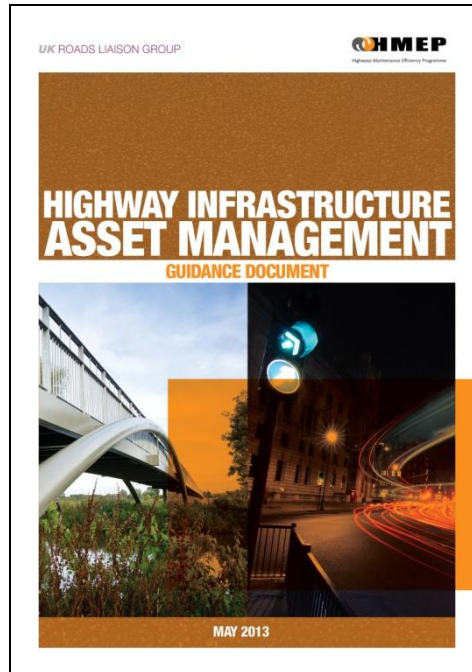
2.2.13 The Highways Maintenance Efficiency Programme has developed revised Highway Infrastructure Asset Management Guidance, which has been endorsed by the UK Roads Liaison Group, and supersedes the CSS Framework for Highway Asset Management published in 2004. This Guidance is aimed at local highway authorities and provides advice on how asset management principles may be used to support a more efficient approach to maintaining highway infrastructure assets. It includes 14 recommendations which should be considered in their entirety as the minimum requirements to achieve an appropriate level of benefit from asset management.

As a basis for providing a consistent approach to implementing this Guidance and its recommendations, a Framework for Highway Infrastructure Asset Management has been introduced. This sets out the activities that support asset management as:

- context of asset management;
- asset management planning process; and
- enablers to support implementation of asset management.

The Guidance document may be downloaded from the following website:

<http://www.ukroadsliaisongroup.org/en/utilities/document-summary.cfm?docid=5C49F48E-1CE0-477F-933ACBFA169AF8CB>



2.3 THE CHANGING AGENDA

2.3.1 In addition to the emerging agenda of asset and network management there have been a number of other developments since the production of the 2001 edition of the Code. These are summarised below and dealt with in detail in subsequent sections. They include:

- Changes and potential changes in the institutional framework;
- Changes in performance improvement regimes and increasing user focus;
- Changes in funding regimes;
- Increased importance of risk and liability management;
- Changes in condition assessment procedure and technology;
- Increased importance of Public Rights of Way;
- Developments in procurement;
- Developments in urban space and integrated streetscene management;
- Increasing frequency of severe weather events;
- Increasing emphasis on sustainability and sustainable communities.

Changes and Potential Changes in the Institutional Framework

- 2.3.2 Devolved Government is the focus for transport policy in Scotland and Wales, managing directly the strategic network and in Scotland allocating local authority funding for a range of functions, including highway maintenance. In Northern Ireland, the Roads Service continues to manage both the strategic and local road network from within the new Department for Regional Development. In Wales local roads are managed by Unitary authorities. In England the HA provides strategic road management, with local roads being managed by a range of County, Metropolitan District, and Unitary authorities. In London the strategic network is managed by Transport for London Street Management, responsible to the Mayor, with local road management being undertaken by the London Boroughs.
- 2.3.3 There are major changes taking place in the delivery of highway maintenance in Scotland. Trunk road maintenance will be transferred to a new National Transport Agency in 2007. The parallel development by statute of Regional Transport Partnerships within the same timescale provides opportunities for a wholesale review of the split in responsibility between central and local government and a review of how highway maintenance, as part of the wider transport agenda, will be delivered in future.

Changes in Performance Improvement Regimes

- 2.3.4 The best value regime has evolved to provide greater flexibility for authorities in selecting services for review and inspection, whilst retaining the strong focus on users and the framework of performance indicators. It has been supplemented in England by Comprehensive Performance Assessment (CPA) which has a broader approach, and considers the overall corporate performance of authorities together with selected services. It also takes account of established indicators of performance, for example the LTP score. Similar developments are taking place in Scotland, where Best Value is strongly linked with sustainable development and corporate performance, and in Wales through the Programme for Improvement initiative.
- 2.3.5 Authorities performing poorly in CPA can be provided with assistance through the Improvement and Development Agency. Excellently performing authorities can achieve additional freedoms and flexibilities in the management of their services. There are also a range of initiatives where authorities are encouraged to seek recognition for excellence, including the Beacon Council (www.odpm.gov.uk) and the Charter Mark (www.chartermark.gov.uk) schemes. This combination of clear incentives and sanctions has established a robust performance management and improvement regime.
- 2.3.6 In England Local Public Service Agreements provide the opportunity for authorities to earn additional funding in return for undertakings to achieve stretched targets for Best Value Performance Indicators (BVPIs). These are now evolving into Area Public Service Agreements with a broader remit. Again similar broadly based schemes are emerging in other parts of the UK.
- 2.3.7 Through all the schemes there is a strong common thread of services being managed in an integrated way, each contributing to shared corporate objectives and priorities. Guidance for the second round of LTPs also identifies four shared priorities for transport. Highway maintenance policy and practice should be sufficiently flexible to respond and add value to a wide range of local

circumstances, whilst retaining the level of consistency expected by users, particularly for those parts of the network serving more than a local function. Conversely there will be some circumstances where highway maintenance policies should legitimately influence policies and priorities of other services.

Changes in Funding Regimes

- 2.3.8 These new performance improvement regimes are matched by changes to arrangements for funding and financial management. Key aspects of this are Single Capital Pot funding to be fully operational in 2006 and Prudential Borrowing. These are all closely linked, and HAMPs will be essential to support claims for funding from the Single Capital Pot and also to support borrowing under the Prudential Code.
- 2.3.9 HAMPs are now a requirement of LTPs and they will therefore be essential in securing the continuation of funding for many aspects of highway maintenance.

Increased Importance of Risk and Liability Management

- 2.3.10 The importance of risk management as a component of asset management is now more widely recognised, both at the strategic level to inform decisions on investment and priority, and at the operational level to improve regimes of defect inspection and repair. This is dealt with in more detail in subsequent sections of this Code.
- 2.3.11 In recent years there has been a general increase in the tendency for users to pursue claims against authorities, where injury or damage has occurred, and they consider there has been a failure on the part of the authority to maintain the highway to required standards. In the light of this trend the need is stressed, throughout this Code, for authorities to establish and publish clear strategy and policies, and maintain consistent detailed regimes of inspection, repair, recording and monitoring.
- 2.3.12 This Code has also been informed by the report from the Roads and Highways Liability Claims Task Group which is due to be published in Autumn 2005. The report, which is backed by extensive web-based content and references is summarised in Appendix C.
- 2.3.13 The Government has indicated its intention to bring forward new legislation to make it easier to prosecute charges for corporate manslaughter. There have been recent examples of the use of corporate manslaughter charges in cases involving highway maintenance and this is causing understandable concern. It is too early to assess the affect of any new legislation, but compliance with this Code, so far as possible, and obtaining clear approval from Members to policies and programmes, particularly any deviations from the Code, must be the best approach.

Changes in Condition Assessment Procedure and Technology

- 2.3.14 Condition assessment methodology has been evolving consistently since the 2001 edition of the Code, one effect of which has been to complicate the BVPIs and make ongoing comparison difficult. The National Road Maintenance Condition Survey (NRMCS), which has provided statistical information on overall strategic and local road condition for over 20 years, in England and Wales, has been

revised. The Scottish Road Maintenance Condition Survey (SRMCS) has recommenced based entirely on traffic speed (formerly TRACS type now referred to as SCANNER) surveys. These machine surveys are now required for principal roads and ongoing research is considering the extent to which they could be required for other classified roads. The intention of the machine surveys is to provide greater consistency and comparability of results, leading to more efficient use of resources.

Increased Importance of Public Rights of Way

- 2.3.15 Public Rights of Way, although part of the public highway network, have traditionally been regarded as primarily for leisure and recreation and have been managed and funded separately from the remainder of the network. Over the course of the second LTP period, Rights of Way Improvement Planning is to be progressively incorporated into local transport planning to ensure that the most effective use is being made of the rights of way network, in both urban and rural areas, in delivering better networks for walkers and cyclists. The Rights of Way Improvement Plans required by the Countryside and Rights of Way Act 2000 will be progressively integrated with LTPs. Guidance on the preparation of Rights of Way Improvement Plans is available from the Countryside Agency (www.countryside.gov.uk).



- 2.3.16 In Scotland the Land Reform (Scotland) Act 2003 requires authorities to designate Core Paths which play a particularly important role in the wider integrated transport network (www.scotland.gov.uk).

Changes in Procurement

- 2.3.17 A key area of performance improvement is that of procurement, with the expectation that Best Value Reviews should specifically consider the potential for competition in service delivery. The procurement regime has continued to evolve since the 2001 edition of the Code, with the introduction of the Capability Assessment Toolkit by the HA, developments in public private partnerships including PFI and a wide variety of partnering arrangements based on the principles of the Egan report, which are continuing to develop and evolve.
- 2.3.18 The *Gershon* efficiency review identified the potential for obtaining better value for money through collective purchasing, and the HA in England has subsequently been working with authorities to identify opportunities for this. The emerging output from this work and general developments in procurement are reflected in

this Code, so far as possible, and will be included in subsequent updates. In England authorities will be required to report progress towards achieving 2.5% efficiencies with at least 1.25% of this as cash savings.

Website Amended
24 May 2013

http://webarchive.nationalarchives.gov.uk/+http://www.hm-treasury.gov.uk/spending_sr04_efficiency.htm

Developments in Urban Space and Integrated Streetscene Management

- 2.3.19 The contribution of public space to Quality of Life was alluded to in the 2001 edition of the Code and there has been further development in this area, including the imminent publication of Regional Guides *Streets for All* by English Heritage in conjunction with DfT. Increasing importance of public space management has lead some authorities to introduce new arrangements providing an integrated streetscene approach. This combines maintenance with street cleansing and in some cases with new responsibilities under crime and disorder legislation.



Increasing Frequency of Severe Weather Events

- 2.3.20 Increasing frequency of severe weather events associated with climate change has brought new challenges for the highway maintenance service including, in some cases, considerable damage to the highway asset. This situation will need to be taken into account in authorities' risk management strategies, together with research on new materials and practice to mitigate its effects. Further advice on planning for severe weather events is given in Section 14.

2.4 TOWARDS SUSTAINABLE HIGHWAY MAINTENANCE

- 2.4.1 The impact of new taxes on landfill and mineral extraction are already affecting the economics of highway maintenance and influencing changes in practice particularly in the use of materials. Continuing increases in levels of the taxes accompanied by innovation could eventually make recycling and re-use, increased energy efficiency and reduced emissions the norm and drive further innovation.

Website Amended

24 May 2013

<http://www.defra.gov.uk/environment/waste/legislation/>

- 2.4.2 Perhaps the most important area of continuing challenge for highway maintenance is to maximise its contribution to sustainability. In order to deliver this challenge the community must understand the wider economic, social, and environmental implications of both the service and its individual schemes and how these relate to the best quality of life outcomes. This is a complex, difficult and presently not well understood process, but one that potentially could deliver the most long-lasting benefits not only to the community, but to the development, stimulation and motivation of all involved in service delivery.

Section 3

Purpose and Scope

3.1 OBJECTIVES OF CODE OF PRACTICE

3.1.1 The purpose of this Code of Practice is to encourage best practice in highway maintenance, within the new context of asset management and the new statutory duty of network management. Earlier editions of the Code were intended to encourage the use of sound management systems and defined minimum standards for maintenance practice within, what was then, a fairly stable procurement regime. This is now evolving, through asset management, into a more holistic stewardship of the highway, embracing both its operational role and its wider contribution to the community.



3.1.2 The Code recognises the need for local flexibility implied by the need to focus on the needs of users and the community. It encourages authorities to respond enthusiastically and creatively to the challenges posed by sustainability and the need for continuous improvement. From time to time, it includes examples of individual authority approaches, as a demonstration of good practice.

3.1.3 The objectives of the Code are:

- to encourage the adoption of asset management planning as a means of demonstrating value for money in the delivery of highway maintenance;
- to encourage the development, adoption and regular review of policies for highway maintenance, consistent with the wider principles of integrated transport, sustainability and best value;
- to encourage a focus on the needs of users and the community, and their active involvement in the development and review of policies, priorities and programmes;

- to encourage harmonisation of highway maintenance practice and standards, where this is consistent with users' expectations, whilst retaining reasonable diversity consistent with local choice;
- to encourage the adoption of an efficient and consistent approach in the collection, processing and recording of highway inventory, highway condition and status information for the purpose of both local and national needs assessment, management and performance monitoring;
- to encourage the adoption and regular review of a risk management regime in the determination of local technical and operational standards, rectification of defects arising from safety and serviceability inspections, and investment priorities;
- to encourage continuing innovation in the procurement of highway maintenance contracts, whilst complying with high standards of corporate governance.

3.1.4 This Code should be used by authorities as a benchmark against which to develop and review local highway maintenance policy and, where necessary, to identify the nature and extent of local variations.

3.2 CONTEXT FOR THIS CODE OF PRACTICE

3.2.1 The suggested recommendations of this Code are explicitly not mandatory on authorities. The key principle of best value, requiring authorities to involve users in the design and delivery of services, implies that authorities should have reasonable discretion to respond to such involvement.

3.2.2 Authorities however have certain legal obligations with which they need to comply, and which will, on occasion, be the subject of claims or legal action by those seeking to establish non-compliance by authorities. It has been recognised that in such cases, the contents of this Code may be considered to be a relevant consideration. In these circumstances, where authorities elect in the light of local circumstances to adopt policies, procedures or standards different from those suggested by the Code, it is essential for these to be identified, together with the reasoning for such differences. This is particularly important in the light of recent instances of the use of corporate manslaughter charges in highway maintenance cases and Government proposals to strengthen legislation in this area.

3.2.3 Authorities also now have a statutory duty for network management requiring them to achieve, so far as may be reasonably practicable, having regard to their other obligations, policies and objectives, the expeditious movement of traffic on their road network. This includes enhanced powers of co-ordination, regulation and direction for all road and street works including those by the authority. Highway maintenance will need to facilitate and support the authority in its network management role.

3.2.4 This Code is based on the principle that highway maintenance should be managed in accordance with the principles of best value and continuous improvement, as an important component of a more broadly based Highways Asset Management Plan (HAMP). The focus of maintenance management should be primarily on the condition of the infrastructure itself and the focus of the HAMP primarily on the level of service provided by the infrastructure. The core objectives

of highway maintenance are to deliver a safe, serviceable and sustainable network. These three objectives set the context of sound financial and risk management and define the framework both for the service and for this Code, including arrangements for inspection, standard setting and performance. They could also form the basis on which to develop outcome-based contracts.

- 3.2.5 Bearing in mind the established legal obligations referred to above, authorities should already have adopted reasonably consistent and well-defined approaches in addressing the safety objective. Practice in addressing the issues of serviceability and sustainability, where statutory obligations are less well defined, is more variable and the Code reflects this, but suggests that practice is reviewed and refined locally in the light of individual circumstances, including user involvement.
- 3.2.6 There are some legal obligations relating to serviceability, associated with the duty for network management and some others relating to sustainability from environmental legislation. In such cases, this Code reflects the statutory position and provides guidance on application.
- 3.2.7 This Code is designed to provide guidance for UK-wide application, and attempts to address the most significant differences between the Devolved Administrations of particular relevance to highway maintenance, but there will inevitably be some omissions of detail.
- 3.2.8 Detail has also been omitted in other areas, where operational policies, practice, and standards are well documented elsewhere and need not be replicated. In such cases, cross-referencing and indexing is provided together with weblinks, where appropriate.
- 3.2.9 The increased interest and emphasis on highway maintenance has brought a corresponding acceleration of research and technical developments. Best Value Reviews are also increasingly identifying new initiatives and developing good practice, especially in procurement. This Code therefore represents practice at the time of publication and will need to be updated from time to time.
- 3.2.10 Last but not least, this Code is based on the assumption that available funding for highway maintenance will continue to provide some flexibility for authorities to pursue a regime of assessment and rational planning of programmes and priorities.

3.3 TERMINOLOGY

- 3.3.1 The terminology established by the 2001 edition of the Code to improve consistency has been retained in this edition:
- adoption of the term ‘investigatory levels’ rather than ‘warning levels’, which reflects more accurately their status;
 - adoption of the term ‘system intervention levels’ rather than ‘intervention levels’ to clarify that these are only applied automatically within the UKPMS system;

- adoption of the term ‘service inspection’ rather than ‘detailed inspection’ to maintain consistency with the defined maintenance objectives and to avoid confusion with Detailed Visual Inspections (DVI).

3.3.2 This edition of the Code also continues to retain industry rather than user definitions for parts of the highway. There is an argument for moving to user focussed definitions but, with much of the supporting documentation continuing to use industry definitions, such a change would need to be coordinated to avoid confusion. The main relevant definitions are:

- the term ‘carriageway’ is used for facilities used by motor vehicles;
- the term ‘footway’ is used for segregated surfaced facilities used by pedestrians. Where these are not immediately adjoining a carriageway the term ‘remote footway’ is used. The term ‘footpath’ is retained for other forms of Public Rights of Way (PROW). The term ‘housing footway’ is used for those footways serving predominantly housing areas, and may be unadopted as highways, but maintained by the authority as part of its housing function;
- the term ‘cycle route’ is used as the collective term for all segregated facilities used by cyclists. For more detailed definitions see Section 8;
- the term ‘running surface’ is used as the collective term for all hardened surfaces within the highway, including carriageways, footways and cycle routes;
- the term ‘pavement’ is used as the collective term for the construction of all running surfaces, particularly carriageways.



3.3.3 The Code is intended to apply to all parts of the UK and, where necessary, refers in detail to differences in legislation, policy and practice. There are however a number of differences in terminology which it would be inappropriate to repeat at length and in such cases the English term is used. The main items include:

- the term ‘highway’ is used to include ‘road’ or ‘street’;
- the term ‘Local Transport Plan’ (or policy) is used to include all similar arrangements;

- the term ‘authority’ is used to include all forms of national and local authority having responsibility for highway maintenance;
 - the term ‘Winter Service’ is used to include all ice prevention, snow clearance and all forms of winter maintenance activity.
- 3.3.4 For further details of terms used in the Code, reference should be made to the Glossary of Terms in Appendix A.
- 3.3.5 Where the Code makes reference to supporting or complementary advice, for example UKPMS Rules and Parameters, all such references are to the most current version, unless otherwise indicated. A list of all documents referred to is provided as Appendix L.

3.4 PURPOSE OF HIGHWAY MAINTENANCE

3.4.1 The main purpose of highway maintenance is to maintain the highway network for the safe and convenient movement of people and goods. The core objectives of highway maintenance are to deliver a safe, serviceable and sustainable network, taking into account the need to contribute to the wider objectives of asset management, integrated transport, corporate policy and continuous improvement.

3.4.2 These objectives were established in the 2001 edition of the Code and have been modified only slightly in the light of experience:

Network Safety

- Complying with statutory obligations;
- Meeting users’ needs for safety.

Network Serviceability

- Ensuring availability;
- Achieving integrity;
- Maintaining reliability;
- Enhancing condition.

Network Sustainability

- Minimising cost over time;
- Maximising value to the community;
- Maximising environmental contribution.

3.4.3 Although most of these core objectives include or imply a focus on the needs of users, further developments in performance management since the 2001 edition of this Code suggested that a more explicit objective of ‘Customer Service’ should be adopted. This objective will apply to the highway service overall, as users may not be able easily to distinguish between maintenance and improvement works. This is dealt with in more detail in Sections 8 and 11.

3.4.4 The fourth sub-objective of network serviceability is now defined as enhancing ‘condition’ rather than ‘quality’, to be consistent with the approach of the Asset Management Framework and enable more objective measurement. The broader

‘quality’ aspects will be considered within the ‘maximising value to the community’ sub-objective of network sustainability.

3.4.5 Each of the core objectives is now equally relevant to the more broadly-based asset management function and the statutory network management duty. This close linking is an essential requirement for delivering an integrated user-focussed service and is emphasised throughout this Code.

3.5 SCOPE OF HIGHWAY MAINTENANCE

3.5.1 Highway maintenance is a wide ranging function, including the following general types of activity. These are explained in more detail as follows:

- reactive maintenance responding to inspections, complaints or emergencies;
- routine maintenance providing works or services to a regular consistent schedule, generally for patching, cleaning and landscape maintenance;
- programmed maintenance providing larger schemes primarily of resurfacing, reconditioning or reconstruction to a planned schedule;
- regulatory maintenance inspecting and regulating the activities of others. In England much of this will be undertaken by the Traffic Manager under the new statutory duty for network management;
- winter Service providing salting and clearance of snow and ice;
- weather and other emergencies providing a planned emergency response.



3.6 RELATED ACTIVITIES

3.6.1 There are a number of related functions, which are not dealt with in detail by this Code, but which could affect and be affected by highway maintenance activity. They also have the potential for value to be added through cooperation and co-ordination. Such functions include:

- asset management, including production of the HAMP;
- network management, including implementation of the new statutory duty;
- highway development control, including securing commuted sums from developers;
- street cleansing, including integrated street management;
- town centre management, including use of public space;
- maintenance of sustainable drainage systems.

3.7 APPLICATION TO DEVOLVED ADMINISTRATIONS

3.7.1 This Code is intended to apply throughout the UK and has been drafted so far as possible to take into account the most important differences in statutory duties, policy and practice existing within England and the Devolved Administrations of Scotland, Wales, Northern Ireland and London.

3.7.2 The main strategic differences include:

- institutional framework;
- strategic and local transport policy;
- financial regime;
- key legal and statutory basis;
- statutory basis of best value and performance improvement;
- definition of performance indicators and targets.

3.7.3 The key aspects of most of these differences are dealt with in the relevant sections of the Code, but the main differences in the institutional framework are as follows:

England

- the DfT sets strategic policy;
- the Highways Agency (HA) is network operator for the motorway and trunk road network, which is maintained through an evolving procurement regime of Managing Agents and Managing Agent Contractors. Following the *Gershon*

efficiency review the HA are working with authorities in seeking efficiency gains from collaborative roads procurement;

- County and Unitary local highway authorities are responsible for local road maintenance through evolving and locally determined procurement regimes;
- the Audit Commission administers the statutory local authority performance improvement regime, involving Comprehensive Performance Assessment (CPA) and Best Value Performance Indicators (BVPIs).

London

- The Mayor and the Greater London Authority set strategic policy;
- Transport for London Street Management is responsible for maintenance of the strategic road network;
- the London Boroughs are responsible for local road maintenance through evolving and locally determined procurement regimes;
- the Audit Commission administers the statutory local authority performance improvement regime, involving CPA and BVPIs.

Wales

- The Welsh Assembly Government sets strategic policy;
- a framework of 'lead authorities' is responsible for maintenance of the motorway and trunk road network;
- local highway authorities are responsible for local road maintenance through evolving and locally determined procurement regimes;
- performance improvement is driven by Policy Agreements between local councils and Welsh Assembly Government and the Wales Programme for Improvement;
- a range of national and local performance indicators are collected annually and reported on by Wales Audit Office.

***Paragraph Amended
29 November 2011***

Scotland

- The Scottish Government sets strategic policy;
- Transport Scotland, an agency of the Scottish Government, is responsible for managing the operation and maintenance of the trunk road network through arrangements with private operating companies;
- local road authorities are responsible for local road maintenance through locally-determined procurement regimes;

- performance improvement on local roads is driven by a statutory duty of best value and a range of performance indicators reported annually by Audit Scotland; for trunk roads by annual Performance Audit Group reports and targets reported annually by Transport Scotland.

Northern Ireland

- The Department for Regional Development (DRD) sets strategic policy;
- the Roads Service, an Executive Agency within DRD, is responsible for maintenance of all roads;
- performance improvement driven by performance indicators published annually through an annual report.

3.7.4 There are also, however, a number of operational and practical differences, including:

- road and traffic characteristics;
- hierarchy differences, for example unclassified town centre streets with high traffic levels;
- climate;
- topography and ground conditions;
- users' expectations.

3.7.5 Road and traffic characteristics vary widely throughout the UK. For example, Northern Ireland has approximately 2.5 times the road length per head than other parts of the UK. Certain remote parts of Scotland depend upon the maintenance of extremely long cul-de-sacs, and self-sufficiency will be a crucial requirement for many island and peninsular communities. Some trunk roads in Scotland, indeed, have passing places.

3.7.6 There are obviously very different climatic conditions throughout the UK that will affect the extent of expenditure on weather sensitive services, particularly salting and snow clearing, but also, increasingly, assistance with flood protection.

3.7.7 Topography is also clearly different, especially in Wales and Scotland, and the existence of peat and other difficult ground conditions will have implications for the rate of deterioration and maintenance requirements.

3.7.8 Users' expectations will also vary widely, usually tempered by the reality of their situation. For example, a risk assessment of the need to retain emergency access to remote parts of Scotland or Northern Ireland may suggest compromises in management, which would be difficult to justify elsewhere. The dependency of the local economy on the highway network will also be a consideration. Many parts of the country will experience very considerable traffic resulting from tourism, with summer flows increasing in some cases by as much as a factor of ten over winter levels. This will inevitably affect the programming and procurement of works. It may also have implications for varying inspection frequencies and standards.

3.8 LOCAL HIGHWAY MAINTENANCE AUTHORITIES

- 3.8.1 Different arrangements for local highway maintenance apply throughout the UK. In England local roads are maintained either by County, Unitary, Metropolitan District or London Borough Councils. Some Shire District Councils provide highway maintenance services under the terms of agency agreements with County Councils, although the number has been reducing in recent years.
- 3.8.2 In Scotland and Wales, local highway maintenance is currently provided by the Unitary Councils, although in Scotland the Regional Transport Partnerships could provide this in the future. In Northern Ireland local and national road maintenance is provided by the Roads Service of the Department for Regional Development.
- 3.8.3 This Code is intended to be adopted by all authorities within the UK, which will have widely varying characteristics. Some authorities will manage predominantly densely populated urban areas, whilst others will be responsible for rural areas with widely dispersed settlements. Each will need to interpret the guidance provided in the Code to suit their own local circumstances, whilst retaining the broad consistency of approach sought by users.

3.9 ARRANGEMENTS FOR UPDATING AND REVIEW

- 3.9.1 It is intended to provide on-line availability and updating of the Code, and further details are provided in Section 18.

Section 4

Complementary Guidance

4.1 LIMITATIONS TO THE CODE OF PRACTICE

4.1.1 This Code provides guidance on the strategic planning and management of highway maintenance within the context of best value and performance improvement. It is not intended as a detailed technical reference for all aspects of highway maintenance or to repeat technical guidance available elsewhere. Areas referred to but not dealt with in detail include:

- network management;
- highway improvement and new construction;
- maintenance of bridges and structures;
- installation and maintenance of highway lighting;
- network management including management of utilities;
- details of maintenance of Public Rights of Way;
- management of street cleansing;
- highway improvements;
- integrated urban drainage management.

4.2 FURTHER ADVICE AND GUIDANCE

4.2.1 In recognition of the wider related areas that are not covered in detail, the Code makes reference where appropriate to complementary publications and guidance. A complete list of these is provided as Appendix L, but the most relevant items are:

Websites Amended
27 April 2012

Paragraph Amended
13 August 2012

- HMEP / UKRLG Highway Infrastructure Asset Management Guidance (<http://www.ukroadsliasongroup.org/en/UKRLG-and-boards/uk-roads-liason-group/transport-asset-management-guidance.cfm>);
- CIPFA's Code of Practice on Transport Infrastructure Assets (<http://www.cipfa.org/policy-and-guidance/local-authority-transport-infrastructure-assets>);

- Guidance on Local Transport Plans. Second Edition (<http://webarchive.nationalarchives.gov.uk/+/http://www.dft.gov.uk/pgr/regional/tp/guidance/fltp/fullguidanceonlocaltransport3657>);
- Well-lit Highways - Code of Practice for Road Lighting Management (<http://www.ukroadsliasongroup.org/en/UKRLG-and-boards/uk-lighting-board/welllit-highways.cfm>);
- Management of Highway Structures - A Code of Practice (Autumn 2005)(<http://www.ukroadsliasongroup.org/en/UKRLG-and-boards/uk-bridges-board/management-of-highway-structures.cfm>);
- Management of Electronic Traffic Equipment – A Code of Practice (<http://www.ukroadsliasongroup.org/en/UKRLG-and-boards/uk-roads-board/management-of-electronic-traffic-equipment.cfm>);
- Code of Practice on Litter and Refuse issued under Section 89 of Environmental Protection Act 1990 (<http://archive.defra.gov.uk/environment/quality/local/litter/code/index.htm>);
- UKPMS Visual Survey Manual and other guidance (<http://www.pcis.org.uk/index.php?p=25/42/0>);
- ICE Design and Practice Guide Highway Winter Maintenance;
- Highways Agency Routine and Winter Maintenance Code;
- Codes of Practice for Network Management including the Statutory Duty and Co-ordination (www.dft.gov.uk).

Section 5

Policy Framework

5.1 STRATEGIC POLICY INTEGRATION

5.1.1 The planning and delivery of local services by authorities and others has historically tended to be undertaken within individual specialist departments, often in isolation from other services. At best, such arrangements did not provide opportunities for adding value between services, and at worst lead to unresolved conflicts between the policies, programmes and priorities of different services, consequently providing poor value for money and overall quality of service.

5.1.2 This was particularly the case with highway maintenance, which was often poorly integrated even with other highway works, to say nothing of wider policy areas. This tendency was exacerbated by financial restrictions, which until recent years had resulted in reductions in planned work and corresponding opportunities for policy co-ordination.

5.1.3 The requirement for policy integration is an important principle of Best Value, which has been further strengthened by the new Comprehensive Performance Assessment (CPA) regime. It requires authorities to define, in consultation with their community, overall strategic objectives, which may be unrelated to traditional service areas, thus creating a stimulus for policy integration. Typical strategic objectives would be:

- building safer communities;
- continually improving educational achievement;
- developing and supporting the local economy;
- developing social welfare and promoting health;
- protecting and improving the environment;
- reducing inequality and poverty;
- improving accessibility of services;
- improving social inclusion.

5.1.4 Significantly, none of these objectives relate specifically to transport, let alone highway maintenance, though clearly these have the potential to contribute in some cases very significantly to their achievement. They also, of course, have the potential to detract from the achievement of the objectives. The key requirements are therefore, to:

- identify key areas of interaction between highway maintenance and each of the corporate objectives;

- maximise so far as is practicable the contribution towards them;
- ensure that potential areas of conflict are resolved.

5.1.5 The Local Government Act 2000 required local authorities to produce Community Strategies although most are prepared by Local Strategic Partnerships. These strategies will also address transport and highways investment and need to align with highway maintenance policy. Community Strategies should, through engagement with local communities:

- set out a long term vision for an area focusing on improving the quality of life;
- contain economic, social and environmental objectives to ensure that the vision contributes to sustainable development objectives;
- produce action plans explaining how the long term vision will be delivered;
- develop a shared commitment to implementing action plans;
- set out arrangements for monitoring and reviewing strategies and reporting progress to communities.

5.1.6 Guidance on preparation of Community Strategies has been published by Government, together with proposals for rationalisation of the overall planning process (www.odpm.gov.uk). It is important that those involved in highway maintenance have a clear understanding of Community Strategies and are influential in shaping the wider policy framework. This is challenging but provides real opportunity to develop and present the service in a way which is likely to demonstrate more effectively its value to the community.

5.2 TRANSPORT POLICY INTEGRATION

5.2.1 The Government published its overall transport strategy 'The Future of Transport' in July 2004 taking forward the strategy originally set out in 2000 (The Ten Year Plan for Transport). This recognises the vital role that improving mobility plays in meeting the wider objectives for the economy and an inclusive society. The Government wants to ensure the benefits of greater mobility and access, while minimising the impact on other people and the environment, now and in the future. The strategy is built around three central themes:

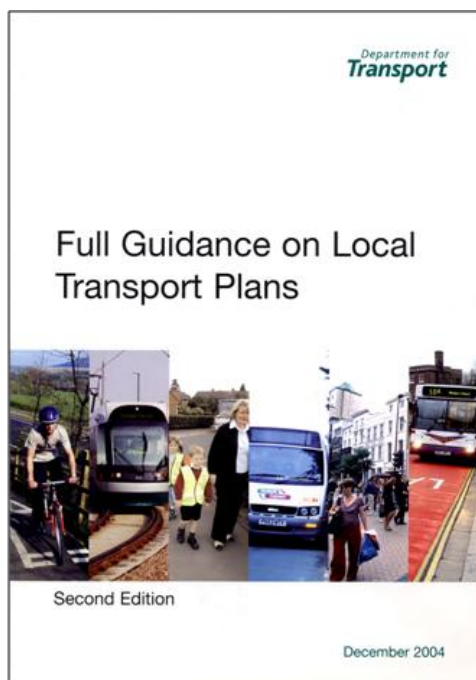
- sustained investment over the long term whilst ensuring value for money;
- improvements in transport management, to achieve better value for money from both existing and new infrastructure;
- planning ahead of transport policies and programmes, sharing decision-making with regional and local stakeholders, ensuring that planning at regional and local levels is based on a shared view of priorities, deliverability and affordability.



- 5.2.2 The Government and the Local Government Association have agreed a shared priority for transport which captures the continuing aims of *'Improving access to jobs and services, particularly for those most in need, in ways which are sustainable: improved public transport; reduced problems of congestion, pollution and safety'*.
- 5.2.3 Guidance for the second round of Local Transport Plans (LTP) emphasises the need for setting transport in its wider context. Local transport planning, perhaps more than any other area of local policy needs to be joined up, with the wider planning and policy framework at the corporate level. LTPs will need to provide stronger evidence of an effective corporate approach and highway maintenance will play an important part in delivery of this overall strategy.
- 5.2.4 LTPs will also need to address the longer term strategy and its relationship to the five year LTP. All local transport authorities should maintain, review and update a local transport strategy separate from the LTP in which highway maintenance should be of prominent importance.
- 5.2.5 Policies for transport have also been developing within the Devolved Administrations and the most recent policy documents, at the time of publication of this Code, are summarised later in this section.

Identifying Value for Money Solutions

- 5.2.6 The LTP guidance states that authorities should follow two key principles of value for money asset management when preparing and delivering their LTP. Firstly, to achieve the best possible value for money, maintenance work must be carried out in good time. It is essential that authorities do not allow the total costs of maintenance to escalate, by allowing assets to deteriorate to the extent that routine maintenance is no longer possible. Similarly, authorities should aim to ensure that maintenance works are not carried out more frequently than necessary.



5.2.7 Secondly, authorities should consider carefully the future maintenance requirements of proposed new infrastructure. It may be that the whole life cost of a capital scheme will be such that the transport need that it is designed to address could be more efficiently met through less capital-intensive or even revenue-funded interventions. This 'Designing for Maintenance' issue is discussed further in Section 8 of this Code.

Highway Maintenance in the Wider Context

- 5.2.8 The guidance for LTP encourages highway maintenance to be promoted in the wider context. In developing their LTPs, authorities should consider the added value of maintenance in delivering the wider objectives. There are direct and indirect benefits arising from maintenance in the wider context of delivering a transport strategy. Authorities need to determine ways of identifying spending in value for money terms.
- 5.2.9 Safety benefits from maintenance should be considered as part of the overall investment choice and as such should assist authorities to demonstrate value for money as part of their transport programmes.
- 5.2.10 Economic benefits created through effective road maintenance should be considered, through the promotion of maintenance on the existing network to improve accessibility. This could also improve the street environment, improving access from deprived communities to jobs and key services, improving the availability of transport, improving road safety and supporting economic growth. Measures such as improved access to jobs, and reduced congestion can impact positively on economic vitality.
- 5.2.11 Transport-related noise is an important quality of life issue for many communities. As part of highway maintenance schemes authorities could reduce existing sources of problem noise and minimise any adverse noise impacts of new proposals. This may, for example, include the maintenance of highway surfaces, and the design of traffic management.

- 5.2.12 Although the policy theme of transport integration is common throughout the UK, there are differences of expression and emphasis within the Devolved Administrations. The basis of national and local transport policy in the various parts of the UK are as follows:

Websites Amended
27 April 2012

England

- The Future for Transport - A Network for 2030. White Paper July 2004 (<http://webarchive.nationalarchives.gov.uk/+http://www.dft.gov.uk/about/strategy/whitepapers/previous/fot/>);
- Regional Transport Strategies (<http://www.dft.gov.uk/webtag/overview/regional.php>);
- Local Transport Plans Second Round From 2005/6 (www.dft.gov.uk).

London

- Mayor's Transport Strategy (<http://www.tfl.gov.uk/corporate/11610.aspx>);
- Borough Local Implementation Plans, to be submitted by July 2005 (www.tfl.gov.uk).

Wales

- The Transport Framework for Wales November 2001 (<http://webarchive.nationalarchives.gov.uk/20031220221857/http://www.wales.gov.uk/subittransport/content/policy/framework/framework-full-e.pdf>);
- Wales Transport Strategy- required by the Transport (Wales) Bill 2004 (<http://www.parliament.uk/documents/commons/lib/research/rp2005/rp05-004.pdf>);
- Local Transport Plans (<http://wales.gov.uk/topics/planning/policy/developplans/?lang=en>);
- Proposals for Joint Transport Authorities (www.walesoffice.gov.uk).

Paragraph Amended
29 November 2011

Scotland

- Transport (Scotland) Act 2005 (www.scotland.gov.uk)
- Scotland's National Transport Strategy, April 2006 (www.scotland.gov.uk)
- Local Transport Strategies (www.scotland.gov.uk)
- Regional Transport Strategies (www.transportscotland.gov.uk)

- Maintaining Scotland's Roads, Audit Scotland, November 2004 (www.scotland.gov.uk)
- Maintaining Scotland's Roads - a follow-up report, Audit Scotland, February 2011 (www.scotland.gov.uk)
- Strategic Transport Projects Review, Transport Scotland, October 2009 (www.transportscotland.gov.uk)



Northern Ireland

- Regional Development Strategy, September 2001 (www.drdni.gov.uk);
- Regional Transportation Strategy, July 2002 (www.drdni.gov.uk);
- No specific local policy framework: the Department for Regional Development (DRD) is the sole roads authority (www.drdni.gov.uk).

5.2.13 All policy documents acknowledge the importance and priority to be given to highway maintenance. The previous 'Ten Year Plan for Transport' in England went further than this and identified targets to arrest the deterioration in the condition of local roads by 2004 and to eliminate the backlog by 2010.

5.2.14 Current national policy, 'The Future for Transport', makes little explicit reference to highway maintenance and new LTP guidance does not now expect authorities to set local targets to abolish maintenance backlogs by a particular date, where the authority would consider such a target to be unrealistic. DfT will however expect, as a minimum requirement, local authorities to aim to ensure no overall deterioration in local road condition from 2004/05 levels. DfT will expect most authorities to be more ambitious than this, and to achieve significant improvements in overall condition over the second LTP period.

- 5.2.15 In England the 2004 National Road Maintenance Condition Survey (NRMCS) shows that the target in the Ten Year Plan of arresting deterioration on the local authority network has been met. However, there remains concern regarding footway deterioration.

5.3 INTEGRATED NETWORK MANAGEMENT

- 5.3.1 Highway maintenance policy needs to be developed integrally with the overall management of the network. Transport users, whatever their mode, do not distinguish between categories of road, or types of work, whether maintenance or improvement. It is irrelevant to them who is undertaking the work, whether local authority, contractor or utility. They expect the network to be managed and maintained holistically to provide consistent and appropriate levels of service and the ability to change modes as easily as possible.
- 5.3.2 The Traffic Management Act 2004 now provides a legal basis for this expectation. The Act imposes a duty on local authorities in England to secure the expeditious movement of traffic on the authority's road network and to facilitate the same on other authorities' networks. The Transport (Scotland) Bill provides for a Roadworks Commissioner who will have overall monitoring role and take charge of the roadworks register currently run by the Roadworks and Utilities Committee. The Scottish Bill omits many of the detailed requirements of the English legislation.
- 5.3.3 The Act requires that all works on the highway network, including maintenance, improvement, and new construction, are planned and managed integrally and also have regard to other influences on the network. It requires all those undertaking works on the highway to co-operate with the authority and each other. The framework of permits and sanctions is strengthened and authorities are expected to deal even-handedly with their own works.
- 5.3.4 Users expect reasonable consistency of policy, standards and levels of service on similar categories of highway, irrespective of the responsibility for maintenance, which implies that all authorities, both local and national should seek to deliver these expectations wherever possible. Authorities should consider the needs of all road users, particularly vulnerable road users, for example cyclists and motorcyclists, in planning and managing the network. This has special implications for the maintenance function, as when schemes are planned and programmed there may be an opportunity to incorporate added value to the safety, priority, integrity or quality of:
- footways and crossing facilities (particularly for older and disabled people);
 - cycle routes and crossing facilities;
 - riders of motorcycles;
 - horse riders and crossing facilities;
 - facilities for public transport and users (and also to influence reliability);
 - facilities for freight movement.



5.3.5 Planning for highway maintenance should also take into account and add value to other elements of local transport strategy, wherever possible including:

- Quality Bus Partnerships;
- Quality Freight Partnerships;
- Accident Reduction and Prevention Programme;
- Safer Routes to School and Travel Planning;
- Routes to Stations and Other Interchange Facilities;
- Urban and Rural Regeneration Programmes.

5.3.6 Planning and budgeting for highway maintenance should also recognise that integrated transport, especially in urban areas, is likely to result in a more complex and diverse streetscene. A wider range of more expensive signs, road markings, coloured surfacing and other materials may be necessary for regulation and management. The overall maintenance cost of keeping this more complex arrangement in good order is still likely to increase.

5.3.7 Increasing emphasis on quality of public space and streetscene brings increased importance to the avoidance of 'clutter'. Signing which is inappropriate or no longer necessary is, at best, intrusive and, at worst, a distraction and risk to users. The removal of such signing clutter should be an essential feature of maintenance and improvement schemes. This is dealt with further in Section 15.

5.3.8 The deregulation of public transport (except in London and Northern Ireland), also means that the routes of services may be less predictable and vary more frequently, and close liaison with operators will be necessary if works are to be co-ordinated so as to minimise disruption to public transport users. New forms of public transport, including light rail and guided bus schemes, are also bringing new challenges for maintenance, especially Winter Service.

5.4 HIGHWAY ASSET MANAGEMENT

5.4.1 Arrangements for the management of highway maintenance need to be set within the context of an overall asset management regime. The development of a Highway Asset Management Plan (HAMP) is fundamental to demonstrating the value of highway maintenance in delivering the wider objectives of corporate strategy, transport policy and value for money.

- 5.4.2 Well maintained local transport assets, including roads, footpaths, bridleways and cycle paths, are essential to the delivery of better transport outcomes. They encourage walking and cycling, and contribute to road safety outcomes. They promote the quality and comfort of bus services, improve journey ambience, minimise wear and tear to vehicles and promote better environmental outcomes including emissions and noise. Well maintained roads, footways, footpaths, streetlights, street furniture and public rights of way, make an important contribution to the quality and liveability of public spaces.
- 5.4.3 The theme of asset management is strengthened by Government guidance encouraging local authorities in England to draw up Transport Asset Management Plans (TAMPs) as part of the second round of LTP preparation consistent with the advice contained in the CSS Framework document. A report on progress will be required as part of the provisional submissions.
- 5.4.4 These plans must be set in the context, where necessary, as well as being consistent with the arrangements established by the authority for the management of its wider asset base. This will include land, property and other key owned or leased assets used for the service delivery and its wider local democratic role.
- 5.4.5 The need for asset management plans is not yet a specific policy requirement in other parts of the UK but is likely to increase in importance. In Scotland the report 'Maintaining Scotland's Roads', published by Audit Scotland in November 2004, effectively introduced a requirement for authorities to produce asset management plans.

***New Paragraph
Added 13 August 2010***

- 5.4.6 In 2008 the DfT announced a support package for authorities to assist them in the implementation of transport asset management. As part of this package, authorities who could demonstrate innovative use of data in making investment and maintenance decisions on the highway were invited to apply for additional funding. A condition of access to this funding was that the authority act as a regional champion, working with the region, to disseminate improvements in highway maintenance achieved through better use of data. The successful applications have been published in the website of the Highways Efficiency Liaison Group and can be downloaded from the following address:

***Website Amended
27 May 2011***

<http://helg.org/category/knowledge-bank/asset-management-case-studies/>

***New Paragraph
Added 27 May 2011***

- 5.4.7 The Highways Efficiency Liaison Group (HELG) has published a series of case studies to help the public and private sector improve the efficiency of highway maintenance through better highways asset management. Fourteen case studies covering asset management activity in over 50 highway authorities have been made available on the following address:

<http://helg.org/category/knowledge-bank/asset-management-case-studies/>

5.5 ASSET MANAGEMENT PLANS

5.5.1 The guidance for preparation of LTPs encourages local authorities to prepare TAMPs, informed by LTPs and other services and corporate plans. It advises that the compilation of an asset management strategy will provide an authority with a tool to:

- support the corporate provision of detailed information on the assets held by the whole authority, enabling better definition of longer term corporate need and continual challenge to asset holding and use;
- establish and communicate a clear relationship between the programme set out by the TAMP and the authority's LTP targets and objectives, and ensure that existing assets are in a condition compatible with the delivery of the LTP;
- obtain and organise information to support the forthcoming (2006/7) requirement for Whole Government Accounting (WGA);
- enable the value for money of local road maintenance to be considered more effectively against other local transport spending, and eventually assist local transport strategy and plan development.

5.5.2 Effective asset management planning will provide the means for authorities to understand the value and liability of their existing asset base and make the right strategic decisions, to ensure this base is exploited to its full potential and its value safeguarded for future generations.

5.5.3 LTPs should include a TAMP report setting out the state of each local authority's progress in developing effective asset management planning, what has already been achieved, and any remaining challenges. As well as detailing progress towards a whole life maintenance approach for existing assets, the TAMP report should cover briefly such issues as the ambition and realism of LTP asset management targets, the whole-life maintenance resource implications of the major and other integrated transport schemes proposed in their local transport plans, and the implications of any LTP proposals to delay or bring forward maintenance work.

5.5.4 The HAMP will be the key component of the TAMP and typically will include:

- a set of objectives and policies linked to business objectives;
- an asset register (or inventory);
- levels of service;
- maintenance strategies for the long term based on sustainable use of physical resources and whole life costing;
- identification of future funding requirements to maintain required level of service;
- managing risk of failure or loss of use;

- development of co-ordinated forward programmes for highway maintenance, operation and improvement;
- measurement of performance and continuous improvement.

5.5.5 These principles underpin this Code and are dealt with in more detail in the relevant sections. It is important however to stress the importance of risk management.

**New Paragraph
Added 14 May 2009**

5.5.6 A review of progress with TAMPs was commissioned by the DfT and was completed in January 2008. The report concluded that, although some progress has been made with the development of TAMPs, there is still scope for improvement. The report can be downloaded from the following website:

**Website Amended
27 April 2012**

<http://www.ukroadsliaisongroup.org/en/utilities/document-summary.cfm?docid=A2D213C9-93A1-4028-AABA67F90BFE3E82>

**New Paragraph
Added 14 May 2009
Website Amended
24 May 2013**

5.5.7 A report was commissioned by the Government to review the accounting, management and financing mechanisms for local authority transport infrastructure assets. The report, published in June 2008, concluded that comprehensive transport asset management has the potential to deliver significant value for money benefits and improvements in the services delivered to users. The timetable for implementing transport infrastructure asset valuation was also included in the report. The report can be downloaded from:

www.cipfa.org/Policy-and-Guidance/Local-Authority-Transport-Infrastructure-Assets

**New Paragraph
Added 15 December 2009**

5.5.8 The UK Roads Board has produced four Quick Start Guidance Notes on asset management, namely *Getting Started*, *Levels of Service*, *Risk Management* and *Life Cycle Planning*. The notes form part of a suite of documents and give an overview of asset management, aiming to help local authorities to progress the implementation of an asset management approach. The guidance notes can be downloaded from:

**Website Amended
15 December 2010
Websites Amended
27 April 2012**

<http://www.ukroadsliaisongroup.org/en/utilities/document-summary.cfm?docid=B1A03B50-4D13-456F-B45408A73F631831>

<http://www.ukroadsliaisongroup.org/en/utilities/document-summary.cfm?docid=371E63ED-62FF-4CD4-B37E57DB4787DCF1>

<http://www.ukroadsliaisongroup.org/en/utilities/document-summary.cfm?docid=F5B62661-EDE7-4727-9B38646FC5AAC56F>

<http://www.ukroadsliaisongroup.org/en/utilities/document-summary.cfm?docid=39C30344-3594-4BAF-A60C6D4C59CF3EBF>

New Paragraph
Added 10 August 2011

- 5.5.9 The Audit Commission published a report on highway maintenance titled *Going the Distance: Achieving better value for money in road maintenance*. The report highlights how councils can get more for their money, including cost-saving collaborations with neighbours, asset management to show when road maintenance will be most effective, new ways of keeping residents informed, and weighing short-term repairs against long-term resilience. The report may be downloaded from:

<http://www.audit-commission.gov.uk/nationalstudies/localgov/Pages/20110526goingthedistance.aspx>

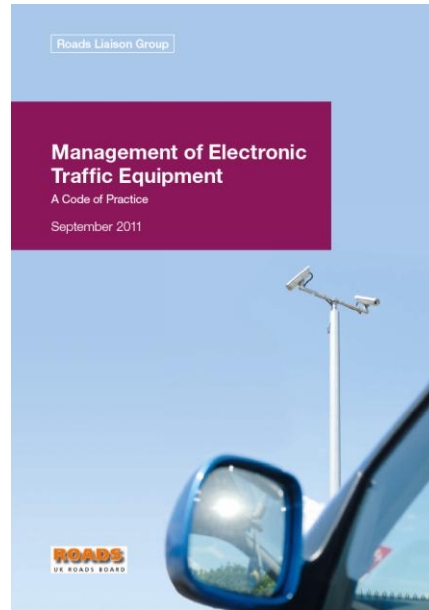
New Paragraph
Added 29 November 2011

- 5.5.10 A new UK Roads Liaison Group (UKRLG) Code of Practice, entitled Management of Electronic Traffic Equipment was published by TSO on 22 September 2011. This Code is the fourth Code within the current suite of Codes, and sits alongside Well-lit Highways, Well-maintained Highways and the Management of Highway Structures. Most authorities in England have started to implement asset management for their highway assets, with many benefits, and similar principles may be applied to the management of electronic traffic equipment. There is widespread recognition of the value of the systematic approaches to management of highway network assets promoted by these codes. This fourth Code has been developed using a similar approach with the aim of incorporating the stewardship of such systems into the wider highway asset management agenda. The Code is available as free electronic download from the UKRLG's website and hard copies are available from the TSO online bookshop at the following websites:

Website Amended
27 April 2012

<http://www.ukroadsliaisongroup.org/en/utilities/document-summary.cfm?docid=B089A94C-6174-4584-A3E12AC2C7CB3706>

<http://www.tsoshop.co.uk/bookstore.asp?FO=40152&ProductID=9780115531699&Action=Book>



**New Paragraph
Added 29 November 2011**

- 5.5.11 The UKRLG has carried out a study into the provision of design and maintenance guidance for local highway authorities. Through consultation with local authority practitioners, the study identified examples of relevant good practice documents that have been produced around the UK. 48 examples of good practice documents collated from local authorities from across the UK can be uploaded from the following website:

<http://www.tap.iht.org/>

The same study identified gaps in guidance and produced three new guidance documents to address these gaps. The first guidance document is entitled *Provision of Road Restraint Systems on Local Highway Authority Roads* and provides a process to help local highway authorities decide when a road restraint system is justified. This document can be adapted by local highway authorities to create a pragmatic system for decision making to help them make best use of the finite resources available.

The second guidance document is entitled *Departures from Standards: Procedures for Local Highway Authorities* and offers pragmatic methods for preparing departures from standards including the introduction of a new simple proforma. It recognises that published design standards offer benefits but also potential constraints and progressive local highway authorities may seek to work beyond the limits of standards in delivering “more for less”.

The third guidance document is entitled *Whole Life Costing for Option Appraisal of Maintenance Schemes for Local Authorities* and provides local highway authorities with a consistent process for undertaking whole life costing for maintenance option appraisal. The outcomes from this process enable informed investment decisions to be made to support the delivery of value-for-money objectives.

The three guidance documents may be downloaded from the following website:

Websites Amended
27 April 2012

<http://www.ukroadsliaisongroup.org/en/utilities/document-summary.cfm?docid=5803F825-EFC0-4858-B2A75D0DCE3382A9>

<http://www.ukroadsliaisongroup.org/en/utilities/document-summary.cfm?docid=80C69D67-CABC-4428-815B8143D0833943>

<http://www.ukroadsliaisongroup.org/en/utilities/document-summary.cfm?docid=D0FD6F76-E612-4435-A65E97F7E5E1FE92>

New Paragraph Added
13 August 2012

5.5.12 In April 2012 the Highway Maintenance Efficiency Programme (HMEP) published a review into the problem of potholes. The review makes 17 recommendations that will, if implemented, provide an improvement in highway maintenance and reduce the number of potholes occurring. There are three key messages in this review. Firstly, Prevention is better than cure; secondly, Right first time for better repairs; thirdly, clarity for the public. The review, which is titled “Potholes Review, Prevention and a Better Cure” can be downloaded for the following website:

5.5.13 <http://www.dft.gov.uk/publications/pothole-review/>

5.6 RISK MANAGEMENT

5.6.1 The management of highway maintenance, including the establishment of regimes for inspection, setting levels of service, determining priorities and programmes and procuring the service should all be undertaken against a clear and comprehensive understanding and assessment of the risks and consequences involved.

5.6.2 The most commonly understood risks affecting the service relate to the safety of the network and liability for accident, injury or health risks to users and employees. There are however a wide range of other risks relating to other key objectives the evaluation of which is a crucial part of the asset management process. These risks include:

- asset loss or damage;
- service failure or reduction;
- operational;
- environmental;
- financial;
- contractual;
- reputation.

- 5.6.3 These risks are not dealt with by this Code in so much detail as those relating to health and safety, but the main issues are addressed in subsequent sections. The establishment of a risk register is an important priority, and where partnerships are involved this will need to identify the assignment of risks between the respective parties.
- 5.6.4 The understanding and management of risk is fundamental to effective asset management and should figure strongly in the training and development programmes for service managers. The publication *Chance or Choice* jointly by the Society of Local Authority Chief Executives and Zurich Municipal provides a useful starting point. Risk assessment need not be a highly technical process, and is fundamentally the structured and systematic expression and recording of collective good judgement based on the best available data.

5.7 SUSTAINABLE HIGHWAY MAINTENANCE

- 5.7.1 The core objective of sustainability is applied in this Code in the accepted sense of securing a balance of social, economic and environmental wellbeing that does not compromise the ability of future generations to meet their own needs. It is also applied in terms of financial and operational sustainability, ensuring that investment and operational resources procured are provided to avoid progressive deterioration of the asset. These are not incompatible, but together provide a significant challenge for the highway maintenance industry. The issue of sustainability is dealt with in detail in Section 15.

5.8 PUBLICATION, ADOPTION AND INCORPORATION OF POLICY AND STRATEGY

- 5.8.1 Authorities should ensure that policies, priorities, and programmes for highway maintenance are formally approved and adopted by the authority and published. They should also be incorporated into the HAMP. They should also influence and be influenced by the Best Value Performance Plan.
- 5.8.2 There have been significant changes in the constitution of local authorities since the 2001 edition of this Code. Responsibility for highway maintenance may no longer rest with a Committee, but with an Executive or Cabinet including a lead member or portfolio holder for the service. The role of formal Council meetings may have changed. Bearing in mind the liabilities and risks involved in highway maintenance, authorities should establish an approval and adoption process that includes the Executive and is explicit, transparent and inclusive.
- 5.8.3 In adopting policies, priorities and programmes for highway maintenance, authorities will need to have regard to the resources available and ensure that the standards set are deliverable.

***New Paragraph
Added 14 May 2009
Amended 15 December 2010***

- 5.8.4 The DfT and the Department for Communities and Local Government (DCLG), with support from the Commission for Architecture and the Built Environment (CABE), developed a Manual for Streets to give guidance to a range of practitioners on effective street design. The Manual for Streets, launched in March 2007, provides guidance for practitioners involved in the planning, design,

provision and approval of new residential streets, and modifications to existing ones. It aims to increase the quality of life through good design which creates more people-orientated streets. The manual can be downloaded from:

Websites Amended
27 April 2012

<http://www.dft.gov.uk/publications/manual-for-streets>

In September 2010 the Chartered Institution of Highways and Transportation published Manual for Streets 2 (MfS2). MfS2 does not supersede Manual for Streets; rather it explains how its principles can be applied more widely. Further information on MfS2 may be downloaded from:

<http://www.ciht.org.uk/en/publications/index.cfm/manual-for-streets-2--wider-application-of-the-principles-2010>

RECOMMENDATIONS FOR SECTION 5

R5.1 Use of Code by Authorities

This Code of Practice should be used by authorities as a benchmark against which to develop and review local highway maintenance policy, and where necessary, to identify the nature and extent of local variations.

R5.2 Context of Corporate Policy

Policies, priorities and programmes for highway maintenance should be developed within the context of the wider corporately defined strategic objectives of the authority and cross-cutting issues, such as regeneration or social inclusion, in order to maximise opportunities for added value and to identify and resolve any potential conflicts. Conversely, maintenance policy and priorities should also where necessary help to influence and shape the wider policy agenda.

R5.3 Context of Transport Integration

Policies, priorities and programmes for highway maintenance should be developed within the context of the wider objectives for transport integration and network management, including strategies for public transport, walking and cycling, to ensure programme coherence, and to realise opportunities for added value.

R5.4 Principle of Sustainability

Policies, priorities and programmes for highway maintenance should have particular regard to the principles of sustainability and the application of the 'precautionary principle'.

R5.5 Highway Asset Management Plans

Policies, priorities and programmes setting out the longer term strategy for maintenance of the network and its contribution to the wider objectives of transport strategy should be set out in a Highway Asset Management Plan. The

underpinning principle of this plan is to substantiate investment in highway maintenance by demonstrating value for money over the life of the asset.

R5.6 Risk Management

Authorities should adopt a risk management regime for all aspects of highway maintenance policy, investment and operations including: safety, service and condition inspections, setting levels of service, determining priorities and programmes, and procurement.

R5.7 Publication and Adoption of Policy

Policies, priorities and programmes for highway maintenance should be formally approved and adopted by authorities after consultation, published and incorporated into the Highway Asset Management Plan. The approval and adoption process should involve the authority's Executive and be explicit, transparent and inclusive.

Section 6

Context of Best Value and Continuous Improvement

6.1 RELEVANCE TO HIGHWAY MAINTENANCE

6.1.1 From 1st April 2000 the Government placed a new duty of best value on local authorities in England and Wales, establishing challenging new arrangements, under which they will fund, procure and deliver all of their services. It required defined local authorities:

- to ensure that services are responsive to the needs of citizens, not the convenience of service providers;
- to secure continuous improvement in the exercise of all functions undertaken by the authority, whether statutory or not, having regard to a combination of economy, efficiency and effectiveness.

6.1.2 Other principles of best value include:

- ensuring that public services are efficient and of high quality;
- ensuring that policy making is more joined up and strategic, forward looking and not reactive to short term pressures;
- using information technology to tailor services to the needs of users;
- valuing public services and tackling the under representation of minority groups.

6.1.3 These principles have a particular relevance to highway maintenance, for the following reasons:

- highways are a major public asset highly valued by the community;
- their maintenance attracts a high level of public interest and concern;
- performance indicators have historically been difficult to quantify;
- there has tended to be no robust framework for local comparison;
- there has been an inefficient approach to whole life costing;
- there is a wide and developing range of service delivery options.

6.1.4 The best value approach has continued to develop and evolve through the process of Comprehensive Performance Assessment (CPA), which focuses on the corporate and service performance of the authority, promising greater flexibility in

return for performance improvement. An authority's approach to transport, informed by Local Transport Plan (LTP) assessment, features significantly in the corporate part of the CPA.

6.1.5 Similar arrangements to encourage best value and performance improvement apply throughout the UK, but there are detailed differences within each of the Devolved Administrations. These are summarised in Section 7. Although the statutory duty mainly applies to local government services, the broader principles of performance improvement apply equally to government agencies including the Highways Agency (HA) and equivalent strategic roads authorities within the Devolved Administrations.

6.2 USER AND COMMUNITY FOCUS

6.2.1 The increased focus on the needs of users and the community are explicit in national transport policy and similar aims are contained in transport policies for Scotland, Wales, and Northern Ireland. Guidance for the second round of LTPs suggests:

- the need for 'a transformation of the way services are delivered to the public - putting the emphasis on the experience of customers and users';
- the DfT will look for evidence that consultation has offered a genuine opportunity for local communities and interested parties to influence and improve the development of LTP policies, programmes and schemes;
- the need to 'set transport within a wider context'.

6.2.2 The engagement of users and communities is also a requirement in preparation of community strategies, which are dealt with in Section 5.



6.2.3 This commitment to consult and involve users and the community, although highly desirable and relevant, does bring some complications:

- many aspects of the maintenance process are highly technical and may be difficult to explain, but it is important that legal duties and obligations are understood;
- users' concerns may tend to focus on the short term more visible deficiencies in the network rather than the underlying less apparent problems;

- consultation can be expensive both in time and resources.

6.2.4 Despite these difficulties, the involvement of users and the community in informed consultation on the highway maintenance service is likely to be beneficial in the longer term in building understanding and support. More detailed guidance on this is contained in Appendix J.

6.3 CONSISTENT STANDARDS OR LOCAL DISCRETION

6.3.1 An important issue for the involvement of users and the community in highway maintenance is the management of inevitable tension between the need to provide reasonable consistency of highway standards, both nationally and locally, and the need to enable some local diversity. Indeed, it is possible for users to hold both views simultaneously, for example in the case of speed limits.

6.3.2 The emphasis on the needs of users and consultation implies that authorities should be open to and encourage local diversity where appropriate, but this will require careful management.

6.3.3 The most useful vehicle for the management of these tensions is the local road hierarchy. This will be the framework around which local standards and priorities are based and can provide the focus for consultations and community involvement on the scope for local or neighbourhood discretion, which will inevitably be greater for the less strategic parts of the network.

6.3.4 It will also be important for authorities to demonstrate reasonable consistency within their area between parts of the network that may be managed separately. For example, 'housing footways' serving some residential areas may be managed and maintained by the housing authority rather than the highway authority, but users may be unaware of this and will rightly expect consistency of standards.

6.4 BEST VALUE REVIEWS

6.4.1 Regular performance review with independent inspection is an essential part of the best value and comprehensive assessment process, although authorities now have more discretion in undertaking these. When undertaking reviews they will still need to demonstrate that their process is:

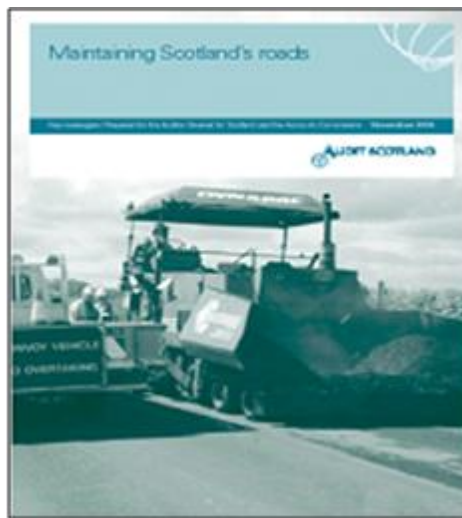
- challenging why and how the service is being provided;
- comparing their performance with others;
- embracing fair competition as a means of securing efficient and effective services;
- consulting with local taxpayers, customers and the wider business community.

6.4.2 The Audit Commission (in England and Wales), inspect the outcome of reviews but again with increased discretion about whether and at what scale to inspect. The purpose of inspection is so that:

- the public can see whether best value is being delivered;
- the authority can check how well it is doing;

- the Government can see how well policies are working;
- action can be taken where services are failing;
- best practice can be identified and shared.

6.4.3 In Scotland, the equivalent body is Audit Scotland, and in Northern Ireland the Northern Ireland Audit Office, but at present there are no arrangements for formal Best Value Reviews or audit arrangements. Audit Scotland does require Performance Management and Planning Audits for local authorities and in November 2004 published a detailed review of road condition, 'Maintaining Scotland's Roads' (www.audit-scotland.gov.uk). In Wales best value has evolved into the Programme for Improvement but District Audit are still involved in assessing progress with statutory indicators (www.audit-commission.gov.uk).



6.4.4 A number of Best Value Reviews of highway maintenance services have already taken place, either separately or as part of wider reviews incorporating all network management functions. There is a strong argument for the wider approach as this provides a more coherent user focus. Reports of all completed reviews are available on the Audit Commission website (www.auditcommission.gov.uk).

6.4.5 In addition to Best Value Reviews of highway maintenance or network management, it is important that opportunities are taken to provide highway maintenance input to relevant reviews of other services or corporate themes.

6.4.6 This Code should provide a template for authorities to use during Best Value Reviews and as an indicator of good practice against which to benchmark their own performance.

6.5 CHALLENGING PRESENT PRACTICE

6.5.1 A key aspect of Best Value Reviews is to challenge present practice, including whether all current activities are necessary, relevant, or could be done better by others. They are also to challenge present levels of economy, efficiency, effectiveness and methods of service delivery.

6.5.2 In a number of authorities the presence of longstanding arrangements based on in-house provision and possible complex agency agreements with other

authorities may prove fairly resistant to challenge. Providing effective challenges to long established practices will be assisted by taking steps to encourage confidence, ownership of the process and creativity amongst those involved and also to ensure active involvement from others outside the service.

6.5.3 Useful vehicles for encouraging creativity and active participation in challenging established practice are to use workshops for:

- facilitating an informal sustainability audit of the service;
- facilitating an informal policy audit of the service against the corporate objectives of the authority.

6.5.4 Ideally the outcome of a Best Value Review and subsequent improvement plan should be to incorporate continuous challenge into the future systems of procurement and review for the service. The Audit Commission, or other auditing authority, will want to know that the outcome can be delivered.

6.6 COMPARING OUTCOMES AND PERFORMANCE

6.6.1 Comparisons of performance are a key element of Best Value Review. Section 11 of this Code is intended to provide guidance on how this might be achieved, together with some suggestions for possible performance indicators.

6.6.2 Accurate indicators of performance have traditionally been difficult to develop for highway maintenance, primarily because of the range of potential variables, including climate, topography, materials availability, network and traffic characteristics. There have also been difficulties in reconciling differing methods of central and service overhead allocation.

6.6.3 These difficulties still exist, but continuing work by regional and national benchmarking networks is increasing understanding and providing a more reliable framework for comparison. New forms of procurement involving public-private sector partnerships, based on outcome specifications, and supported by performance indicators are also contributing new approaches. There are also a number of authorities demonstrating best practice through the award of Charter Marks, recognition as centres of excellence for procurement, asset management or as Beacon Councils for Street and Highway Works. Details of these are available on the respective websites (www.chartermark.gov.uk, www.odpm.gov.uk).

6.6.4 The most reliable performance indicators are of course those which enable authorities to monitor their own performance and continuous improvement year on year and these will be of equal importance to external comparisons.

6.7 CONSULTING SERVICE USERS, PROVIDERS AND THE COMMUNITY

6.7.1 Consultation with service users, providers and the community is a fundamental part of Best Value Reviews. There is extensive advice for local authorities provided elsewhere on consultation methods and the interpretation of results and information can also be obtained from completed reviews. Polling organisations such as MORI have conducted surveys for a wide range of authorities and have built up a comprehensive picture of public perceptions of both the importance and

quality of service delivery for a range of highway maintenance activities (www.mori.com).

- 6.7.2 There are four main levels of user and community involvement. These can sometimes be confused and it is important to be clear about what is intended:
- informing - providing clear information to which a response is not sought or necessarily required but which will be replied to if sent;
 - consulting - seeking structured responses to a defined series of questions with or without supplementary briefing;
 - participating - involving in generalised discussions about services including the provision of unstructured views and perceptions to assist with the development of issues and scenarios for further consultation;
 - empowering - providing encouragement and support for the devolvement of certain decisions or aspects of service delivery.
- 6.7.3 User and community involvement should be a high priority and ongoing aspect of highway maintenance. The nature and scale of involvement will depend on the scale and effect of the works, and in most cases for maintenance works the key issue will be the provision of information, which is dealt with in detail below. It will be important however to undertake post completion surveys for at least a sample of maintenance schemes, both for good public relations and to assist performance improvement. Further advice on user and community consultation is provided in Appendix J.
- 6.7.4 Ongoing consultation will also be necessary with adjoining authorities and service providers as part of the new network management duty in order to ensure consistency and integrated programming of works. Consultation will also be required with utilities, public transport operators and other key stakeholders. Guidance on the duty suggests that when developing strategies and processes for improving the operation of the road network, authorities should consult with the public, frontagers, representatives of road users and neighbouring authorities with an interest. The regular public consultation process carried out by the authority should be reviewed and if possible, amendments made to it so that consultation on network operation is included as part of this regular process.
- 6.7.5 It is important that consultation arrangements are inclusive and reflect the diversity of users and communities, and particular efforts made to include those harder to reach, such as people with disabilities or from ethnic minority communities. The implications of the Disability Discrimination Act 1995 for highway maintenance are dealt with in Section 7 of this Code.

Paragraph Amended
14 May 2009

Website Amended
27 April 2012

- 6.7.6 Vulnerable users, including children and older people, should also be considered together with users of cycles and motorcycles, who can be particularly affected by differing maintenance standards. Guidance on providing for motorcyclists has

recently been published by the Institute of Highway Incorporated Engineers (www.theihe.org). In Australia, recognising the need to assist road design and maintenance practitioners understand the needs of motorcyclists and hence provide safe road conditions for all road users, the Victorian Motorcycle Advisory Council has produced a leaflet titled *A road builder's guide to motorcycle safety*. The document may be downloaded from the following website.

<http://www.vicroads.vic.gov.au/NR/rdonlyres/E9A40513-5DB7-4BCA-BC60-7EBE5A1988B0/0/tr2000067.pdf>

6.7.7 For Public Rights of Way, Local Access Forums will provide a convenient means of user and community consultation, particularly for preparation of the Rights of Way Improvement Plan.

6.8 MARKET TESTING

6.8.1 Authorities are required to embrace the principles of competition in procuring the delivery of services, and will need to consider how best this requirement might be satisfied. It will need a market testing process including analysis of present procurement arrangements and close comparison of costs and practices with others, including consultation with a range of private sector providers. It will also need to take into account the outcomes from work being undertaken by the HA on collaborative roads procurement following the Gershon Efficiency Review.

Website Amended 27 April 2012

6.8.2 Authorities will then need to consider carefully in the light of this information the nature and extent of more formal participation by the private sector and how this might be facilitated. A number of options are outlined for consideration in Section 16 of this Code and experience is developing in this field. The Institution of Highways and Transportation has also published *A Guide to Procuring Local Authority Services* (www.ciht.org.uk).

6.8.3 Authorities within two-tier areas that have established agency arrangements with other authorities will need to reappraise these arrangements as part of reviews to ensure that they provide value for money. Such reappraisals should, of course, be undertaken in close consultation with the authorities concerned.

6.9 ADDING VALUE - RESOLVING DIFFERENCES

6.9.1 A key element of CPA is to ensure that all services are managed to support the key corporate objectives and priorities of the authority. Authorities should therefore:

- identify all areas of interaction of highway maintenance with each of the key corporate objectives of the authority;
- where these interactions provide opportunities for added value these should be investigated and pursued wherever practicable;
- where these interactions suggest possible conflicts, then these should be investigated and arrangements put in place to resolve the differences.

Whether the difference is resolved in favour of corporate or service policy is less relevant than the fact that it is resolved.

- 6.9.2 This process can be particularly challenging, but rewarding, as it should result in a much wider understanding of highway maintenance and a broader base of support for the service.

6.10 INFORMATION AND PUBLICITY

- 6.10.1 This Code deals elsewhere with the need to publish and make widely available information on policies and standards. This will help to ensure that expectations are realistic and consistent with the resources available. This section deals with more site-specific requirements for information and publicity. It should be read in conjunction with guidance for the new network management duty in England introduced by the Traffic Management Act 2004. This is dealt with in Section 7 of this Code.
- 6.10.2 The provision of clear, accurate and timely information to users and communities affected by highway maintenance works, is one of the most important responsibilities of authorities, but one which sometimes receives insufficient attention. Authorities should set out clear policies and procedures defining user and community information requirements for maintenance work according to their potential for inconvenience and disruption.



- 6.10.3 Information provided sufficiently early will enable users to change their travel plans, and local residents or industry to adjust their arrangements to accommodate the works, with minimum inconvenience and disruption. It is also likely to influence their perceptions of the authority. The information medium used will depend on the scale of works and potential disruption and could involve letters, posters, media advertisements and information boards on site both prior to and during the works.
- 6.10.4 Information is of particular value to users and providers of public transport. Maintaining service frequency and reliability are crucial to the encouragement of increased public transport use, and can easily be compromised, albeit unintentionally, through insensitively planned and publicised works.
- 6.10.5 Where temporary closures and diversions are planned, which affect public transport, authorities should co-operate with the Traffic Manager in carefully planning and co-ordinating works to keep closures and diversions to a minimum

period. It has sometimes been the practice to seek orders for closures and diversions for periods well in excess of that expected. Although this is understandable and provides flexibility for the works, it can be confusing and frustrating for public transport users. The objective should be to plan realistically and keep to the timing agreed.

- 6.10.6 It is important in the case of major works to establish effective working arrangements with local press and broadcast media to enable the presentation of timely and accurate current information and advice on network condition and use. Local radio, in particular, considers this to be a most important aspect of their service to the community, and it therefore provides the opportunity to build good working relationships over wider issues. Many authorities have specialist press and public relations personnel and it will be important to clarify and agree respective service and specialist responsibilities.
- 6.10.7 It is also important to provide information directly to key stakeholders, including all emergency services, public transport operators, motoring organisations and key local organisations. This provides an important opportunity to demonstrate an understanding of users' needs, and a strong service commitment. The internet and authority web pages will be an increasingly important source of such information and it will be important that these are regularly updated. The National Strategy for Local e-Government published in November 2002 requires the achievement of 100% capability in electronic delivery of priority services by 2005, in ways that customers will use. Information on traffic delays due to highway maintenance works is a crucially important user requirement and there are several examples of good practice from Beacon Councils and others (www.idea-knowledge.gov.uk, www.localgov.gov.uk, www.odpm.gov.uk).
- 6.10.8 In the case of Winter Service, and weather and other emergencies even closer and more immediate communication will be required and this is dealt with in Sections 13 and 14 of this Code.

6.11 MANAGING COMPLIMENTS, COMPLAINTS AND CLAIMS

- 6.11.1 Managing compliments, complaints and claims efficiently and effectively can make a significant difference to the public perception of service delivery, not merely for the service in question but for the authority as a whole. This is recognised as a key criterion for Charter Mark recognition and other excellence awards. In Scotland the new agenda of 'Customer First' places an obligation on authorities to have a single point of contact (www.scotland.gov.uk).
- 6.11.2 Highway maintenance is a high profile and highly valued public service, and authorities will need to accommodate and process considerable volumes of correspondence, telephone calls and other forms of communication from users and the community. The efficiency and courtesy of response will determine, to a large extent, the local opinion of the service and the authority.
- 6.11.3 This Code is not intended to deal in detail with principles and practices of customer care or integrated customer relations management, but Appendix J provides advice on certain key aspects of particular relevance to highway maintenance.
- 6.11.4 The first key issue is the need to differentiate between service requests and complaints. Most of the communications received will initially be service requests

and the main objective is to prevent them becoming complaints. Where complaints arise, the next objective is to avoid them becoming claims and they will need to be managed to this effect through a detailed complaints management system, which authorities are already required to have in place.

- 6.11.5 All communications received, however, whether compliments, service requests, complaints, or claims, from whatever source should be recorded, together with any action taken, including nil returns. This will be crucial to the management and defence of any claim against the authority for failure to maintain. Although recording compliments may seem unnecessary, they could also assist in defending other claims in some circumstances, and will also be useful in supporting morale.
- 6.11.6 Authorities are increasingly adopting Contact Centres for the management of telephone service requests and complaints, either for the authority as a whole or for highway services. The Clarence freephone service is used by a number of authorities. In these circumstances it is important to ensure that all personnel involved receive training and also are provided with a checklist for interviewing callers and recording information and action. Where call centre personnel are not experienced and trained in highway maintenance they will need to have access to advice and support, in order that urgent action can be taken to assess and rectify potential Category 1 defects, in accordance with authority policies.
- 6.11.7 It is important that authorities put in place effective procedures for claims management. These should ensure the efficient processing of claims whilst protecting the authority from unjustified and fraudulent claims. Appendix C, which comprises a summary of the Roads and Highways Liability Claims Task Group Report, provides detailed advice on procedures.

6.12 DELIVERING CONTINUOUS IMPROVEMENT

- 6.12.1 The pursuit of continuous improvement will only be effective in an organisation that is able to embrace change, encourage risk and innovation, and is able to learn both from its successes and failures. This principle applies irrespective of the procurement and service delivery arrangement, and all parties involved, whether public, private or voluntary sector, will need to establish a common culture, values and methods of working.
- 6.12.2 It will be important to have effective systems of appraisal, training and development and reward that encourage commitment and excellence, and build pride in the service.

RECOMMENDATIONS FOR SECTION 6

R6.1 Principles of Service Delivery

Policies, programmes and service delivery arrangements for highway maintenance should provide for efficient, effective and economic maintenance of the highway asset, giving priority to the needs of the user, and support to the wider corporate objectives of the authority. Network safety and statutory duties should be prime considerations, even if not specifically identified by users.

R6.2 Best Value Reviews

Best Value Reviews should seek to identify opportunities for highway maintenance to add value to other services provided by the authority and others, and also to reconcile service conflicts where these exist. This Code should be used in Best Value Reviews as an aid to benchmarking the policies and practices of the authority.

R6.3 User and Community Consultation

The views of users, the wider community and their representatives should be sought in the development and review of highway maintenance policies, programmes and priorities and subsequently reflected back to them.

R6.4 Reflecting User and Community Diversity

Policies and procedures for consultation and information should take into account the diverse needs of all users and communities, particularly older or disabled people, ethnic minorities and vulnerable road users.

R6.5 Consultation with other Authorities

Consultation should take place with adjoining authorities and agencies in the development and review of highway maintenance policies, programmes and priorities. The consultation should particularly address issues of consistency and the scope for joint or cross boundary working, and should be undertaken in conjunction with the Traffic Manager.

R6.6 Information and Publicity

Clear policies and procedures for providing timely information to users about maintenance work should be established in conjunction with the Traffic Manager, to enable those affected to make alternative arrangements where necessary to mitigate the affects of delay. The information and distribution should be appropriate to the scale and potential disruption of the works and use all available means, including the authority's website. Where practicable, information should be updated if works are delayed or extended.

R6.7 Public Transport Reliability

Particular attention should be paid to the quality and timeliness of information to providers and users of public transport, in view of the importance of maintaining confidence in the timetables of advertised services. Closures and diversions should be for the minimum period required for efficient completion of the works and authorities should ensure compliance with the planned date for their removal.

R6.8 Post-Completion Surveys

Post-completion surveys of users and communities should be undertaken for a sample of maintenance schemes and regularly reviewed as a contribution to performance improvement.

R6.9 Management of User and Community Contacts

Arrangements should be established to receive and deal with requests, compliments, complaints and other information from users and the community, including standards for response, arrangements for immediate or planned action, and recording of all transactions.

R6.10 Competence in User and Community Contact

Personnel responsible for dealing with user and community requests, compliments, complaints and information should be competent to determine the relative urgency of response and to enable immediate action where necessary. This is of particular importance in the case of Contact Centres potentially dealing with a wide range of services, and clear checklists and procedures should be provided, together with relevant training and support.

R6.11 Out of Hours Arrangements

The arrangements should enable the authority to receive and respond to user and community requests for emergency action at all times.

R6.12 Management of Claims

Authorities should establish procedures and information systems in accordance with Appendix C of this Code to ensure efficient management of claims, whilst protecting the authority from unjustified or fraudulent claims.

R6.13 Monitoring of User and Community Contact

The arrangements should provide for: the regular monitoring of requests, compliments, complaints, information and the nature and standard of responses and the subsequent review of practice in the light of this.

R6.14 Involvement of Employees, Contractors and Agents

Arrangements should be established to facilitate the involvement of all authority elected members, employees, contractors and agents in building commitment and pride in the highway maintenance service and maximising individual contributions to the process of continuous improvement.

Section 7

Legal Framework

7.1 DUTY OF CARE FOR HIGHWAY MAINTENANCE

- 7.1.1 Much of highway maintenance activity is based upon statutory powers and duties contained in legislation and precedents developed over time, as a result of claims and legal proceedings. The most important aspects of these statutory powers and duties are summarised in this section and developed in more detail, where appropriate, in subsequent sections. The work of the Roads and Highways Liability Claims Task Group has also been summarised in Appendix C of this Code. The complete report of the Group is being published in Autumn 2005.
- 7.1.2 The issue of risk management has grown in importance since the 2001 edition of the Code, both in assessing the implications of investment decisions for asset management purposes and also in determining appropriate responses to highway deficiencies. The principles of risk management are introduced in this section and are again referred to, as appropriate, in subsequent sections.
- 7.1.3 It is crucially important that all those involved in highway maintenance, including Members of authorities, have a clear understanding of their powers and duties, their implications, and the procedures used to manage and mitigate risk.
- 7.1.4 Even in the absence of specific duties and powers, authorities have a general duty of care to users and the community to maintain the highway in a condition fit for its purpose. This principle should be applied to all decisions affecting policy, priority, programming and implementation of highway maintenance works.
- 7.1.5 The uncertainties about the statutory basis for Winter Service in England and Wales in the 2001 edition of the Code have been addressed through a modification to Section 41 (1) of the Highways Act on the 31st October 2003, by Section 111 of the Railways and Transport Act 2003. The first part of Section 41(1) now reads:
- 7.1.6 a) 'The authority who are for the time being the highway authority for a highway maintainable at the public expense are under a duty, subject to subsections (2) and (3) below, to maintain the highway.
- 7.1.7 b) (1) In particular, a highway authority are under a duty to ensure, so far as is reasonably practicable, that safe passage along a highway is not endangered by snow or ice'.



- 7.1.8 Although this has clarified the position with respect to the duty for Winter Service, the issues raised by the ‘Goodes’ case concerning the limitation of the maintenance duty to the ‘highway fabric’ and which have potentially wider implications than for Winter Service, still remain and will evolve over time.
- 7.1.9 Section 150 of the Highways Act 1980 also imposes a duty upon authorities to remove any obstruction of the highway resulting from *‘accumulation of snow or from the falling down of banks on the side of the highway, or from any other cause’*.
- 7.1.10 The statutory basis for Winter Service in Scotland and Northern Ireland is more explicit and is unchanged from the 2001 edition of this Code. It is set out in Section 13.

7.2 RISK MANAGEMENT

- 7.2.1 The management of highway maintenance, including the establishment of regimes for inspection, setting standards for condition, determining priorities and programmes for effective asset management, and procuring the service should all be undertaken against a clear and comprehensive understanding and assessment of the risks and consequences involved.
- 7.2.2 The most commonly understood risks affecting the service relate to the safety of the network and accident, injury or health risks to users and employees. The principles and practice involved in managing these crucially important risks are dealt with in detail by this Code. There are also a wider range of other risks summarised in Section 5 of this Code, which are not dealt with so specifically by this Code.
- 7.2.3 The risk management process should include risk assessment of all key policies, procedures and operations based upon a risk register. Section 9 deals in more detail with risk assessment of the inspection process, which could be used as a model for other maintenance processes.

7.3 HEALTH AND SAFETY

- 7.3.1 The importance of health and safety has been heightened since the 2001 edition of the Code, increased by the Government indicating its intention to bring forward new legislation to make it easier to prosecute charges for corporate manslaughter.

There have been a number of examples of the use of corporate manslaughter charges in cases involving highway maintenance and this is causing understandable concern. This is dealt with in more detail in the report of the Roads and Highways Liability Claims Task Group, which is summarised in Appendix C of this Code.

- 7.3.2 The Health and Safety at Work Act 1974, together with the Construction (Design and Management) Regulations 1994 provide for a requirement for highway, traffic and street authorities to carry out work in a safe manner and establish arrangements for the management of construction works. In Northern Ireland the equivalent legislation is the Health and Safety at Work Order (NI) 1978 and the Construction (Design and Management) Regulations (NI) 1995.
- 7.3.3 All those involved in the planning, management and delivery of highway maintenance services should receive training and regular updating, as necessary, in health and safety requirements of the service. Such training is of special importance for those involved in Winter Service, and more detailed guidance on this is provided in Section 13 of this Code.
- 7.3.4 The document Revitalising Health and Safety - Strategy 2000 published by the Health and Safety Commission and the then DETR, indicated, together with 44 action points that, 'One of the key barriers to further progress on standards in construction is thought to be that health and safety considerations are not properly taken into account at the design'.

7.4 MANAGEMENT SYSTEMS AND RECORDS

- 7.4.1 The efficiency, accuracy and quality of information and records maintained by authorities will be crucial both to the effective management of the service and to the defence of claims against the authority for alleged failure to maintain. The system will need to support compliance with standards of evidence provision consistent with the 'Woolf' protocols which, in most cases, require production of all documentation within 12 weeks. Record systems should include all user contact information, referred to in Section 6, records of inspection and condition and records of all maintenance activity. They should be co-ordinated with other relevant record systems, for example road accidents database, as part of the asset management regime.
- 7.4.2 Managing the safety and wide range of other risks associated with the delivery of highway maintenance will require effective and co-ordinated information systems. The best value regime also requires that opportunities be taken to make the best use of Information and Communications Technology (ICT). Although not dealing with ICT in detail, this Code sets out in respective sections the requirements for information systems and records in order to ensure that the service is able to respond flexibly to changing circumstances.
- 7.4.3 Where public private sector partnerships or agency arrangements are involved in service delivery, it will be important to establish common systems, so far as practicable, to facilitate consistency and information exchange.

7.5 POWERS AND DUTIES FOR HIGHWAY MAINTENANCE

- 7.5.1 In addition to a general Duty of Care, there are a number of specific pieces of legislation which provide the basis for powers and duties relating to highway

maintenance. The main legislation in England and Wales is given below, followed by the key territorial differences.

- 7.5.2 The Highways Act 1980 sets out the main duties of highway authorities in England and Wales. In particular, Section 41 imposes a duty to maintain highways maintainable at public expense, and almost all claims against authorities relating to highway functions arise from the alleged breach of this section. Section 58 provides for a defence against action relating to alleged failure to maintain on grounds that the authority has taken such care as in all the circumstances was reasonably required to secure that the part of the highway in question was not dangerous for traffic.
- 7.5.3 In Scotland, the key road maintenance legislation is contained in the Roads (Scotland) Act 1984, Section 1, which provides a duty for local roads authorities to keep a list of ‘public roads’ and to maintain and manage them. There is no direct equivalent of the Highways Act 1980 Section 58 providing defence against alleged failure to maintain, although case law will have established some basis for this.
- 7.5.4 This Act also provides in Section 34 for a duty to ‘take such steps as they consider reasonable to prevent snow and ice endangering the safe passage of pedestrians and vehicles over public roads’.
- 7.5.5 In Northern Ireland, the duty to maintain is contained in The Department for Regional Development - the Roads (NI) Order 1993 SI 1993/3160 (NI 15) Article 8, which includes provision for defence against alleged failure to maintain, similar to the English legislation. The Order also includes at Section 9 a power to treat roads affected by snow and ice and at Section 10, a duty to remove snow, soil etc which has fallen on a road. However, paragraph 7 of Article 10 provides protection from liability and states that ‘*Nothing in this Article operates to confer on any person a right of action in tort against the Department for failing to carry out any duty imposed on it under the Article*’.
- 7.5.6 The Traffic Management Act 2004 introduces in England a number of provisions including:
- Highways Agency Traffic Officers;
 - local authority duty for network management;
 - permits for work on the highway;
 - increased control of utility works;
 - increased civil enforcement of traffic offences.
- 7.5.7 The most important feature of the Act is Section 16(1) which establishes a new duty for local traffic authorities ‘to manage their road network with a view to achieving, so far as may be reasonably practicable having regard to their other obligations, policies and the following objectives:
- securing the expeditious movement of traffic on the authority’s road network;
 - facilitating the expeditious movement of traffic on road networks for which another authority is the traffic authority’.

- 7.5.8 Section 31 of the Act specifically states that the term ‘traffic’ includes pedestrians, so the duty requires the authority to consider all road users.
- 7.5.9 The duty is not limited to the actions of the department responsible for traffic within an authority. Local authorities will need to consider the duty when exercising their powers under any legislation where this impacts on the operation of the road network. Authorities should therefore ensure that the whole organisation is aware of the duty and the implications for them. Authorities are required to appoint a Traffic Manager to administer the network management duty.
- 7.5.10 The Act also strengthens the regulatory regime with regard to the works of utilities and others within the highway including permit schemes, new conditions, and fixed penalty notices.
- 7.5.11 A range of guidance notes and Codes of Practice are being issued to assist authorities with the implementation of the Act and those currently available are listed in Appendix L. The Act changes significantly the provisions of the New Roads and Street Works Act 1991, but much of the guidance may still be valid.
- 7.5.12 A most important issue for highway maintenance planning and programming is that authorities are expected to operate the Act even-handedly, leading by example and applying conditions and enforcement activity equally to their own and utilities works. The Traffic Manager may require the programme for authorities’ own works to be compromised on occasion to facilitate utilities works, where these are considered to be of greater priority.
- 7.5.13 The provisions of the Traffic Management Act do not apply in other parts of the UK, where the problems of congestion are generally less acute. In Scotland the Transport (Scotland) Bill presently being considered by the Scottish Parliament Transport Committee includes a similar provision. It proposes a Roadworks Commissioner who will have overall monitoring role and take charge of the roadworks register currently run by the Roadworks and Utilities Committee (RAUC). There is still some discussion about the respective roles of RAUC and the Commission, and the creation of a level playing field for authorities. The Scottish Bill omits the permits, overrun charges and the Traffic Manager duties of the Traffic Management Act.
- 7.5.14 In Northern Ireland also the powers relating to Street Works are contained in the Street Works (NI) Order 1995. The powers of Traffic Authority are provided by The Department for Regional Development - the Road Traffic Regulation (NI) Order 1997.

7.6 MAINTENANCE AND MANAGEMENT OF PUBLIC RIGHTS OF WAY

- 7.6.1 Responsibilities for Public Rights of Way (PROW) vary considerably throughout the UK. In England and Wales authorities have duties under the Wildlife and Countryside Act 1981 and the Highways Act 1980 to maintain and keep the definitive map and statement of PROW and to ensure that ways are adequately signposted, maintained and free from obstruction.
- 7.6.2 The definitive map and accompanying statement form the legal record of the position and status of PROW in England and Wales. They have been described as being to rights of way what property deeds are to land. The concept of the definitive map and statement was introduced by the National Parks and Access to

the Countryside Act 1949. The legislation governing the compilation of these records and their review and amendment has been altered since the coming into effect of that Act, principally by the Countryside Act 1968 and the Wildlife and Countryside Act 1981.

7.6.3 The Countryside and Rights of Way Act 2000 (Section 60) introduced a new duty for authorities to prepare Rights of Way Improvement Plans (ROWIPs). These are to be completed by November 2007 and are intended to provide:

- an assessment of the need to which rights of way meet the present and future needs of the public;
- an assessment of the opportunities provided by local rights of way for exercise and recreation;
- an assessment of the accessibility of local rights of way to all members of the community, including those with visual impairment or mobility problems.



7.6.4 ROWIPs should also include a statement of the action authorities propose to take for the management of local rights of way and for securing an improved network. Local rights of way are the footpaths, cycle routes, bridleways and restricted byways, and the ways shown in definitive maps and statements as restricted byways and byways open to all traffic within each authority's area. Cycle routes, other than those in or by the side of a highway consisting of or comprising a made-up carriageway, come within the scope of ROWIPs.

7.6.5 The Government intends that ROWIPs and LTPs should be progressively integrated in recognition of the role that PROW play in achieving shared transport priorities and quality of life objectives. Full integration is expected from 2010 onwards. Detailed advice on the preparation of ROWIPs is available (www.prowgpg.org.uk).

7.6.6 In urban areas PROW can present wider problems relating to corporate issues, particularly relating to crime. The Crime Prevention (Designated Areas) Orders

have been taken through Parliament in tranches, as enabling legislation to the Countryside and Rights of Way Act to facilitate closure of rights of way. In early 2005 most, but not all, of the orders have gone through Parliament. The Government has subsequently enacted the Clean Neighbourhoods Act, to close alleyways designated as Rights of Way in a much more streamlined way.

7.6.7 In Scotland the role of authorities in relation to PROW is established by the Countryside (Scotland) Act 1967, which permits its operation over any land or water over which there is an agreement with the authority and including PROW. The Land Reform (Scotland) Act 2003, establishing new statutory rights of public access, extends the remit of the service to all land and water over which the right of access applies.

7.6.8 The Land Reform Act provides a duty for an authority to assert, protect and keep open and free from obstruction or encroachment on any route, waterway or other means by which access rights may reasonably be exercised. It also includes a duty for the authority (not later than 3 years after the Act) to draw up a plan for a system of 'Core Paths' sufficient for the purpose of giving the public reasonable access throughout their area.

7.6.9 The Land Reform Act also establishes powers for the delineation, creation and maintenance of existing or new paths, either by:

- path 'agreements', which may specify respective responsibilities;
- path 'orders', which impose a duty on the council for subsequent maintenance.

7.7 OTHER RELATED POWERS AND DUTIES

7.7.1 Powers contained in the Highways Act 1980 and equivalent legislation within the Devolved Administrations, relating specifically to highway maintenance, sit within a much broader legislative framework specifying a wider range of powers, duties and standards relating to highway management. These include:

- Road Traffic Regulation Act 1984, and the Traffic Signs and General Directions 2002;
- Road Traffic Act 1988 which provides a duty for highway authorities to promote road safety, including a requirement to undertake accident studies and take such measures as appear appropriate to prevent such accidents occurring. It also requires authorities, in constructing new roads, to take such measures as appear appropriate to reduce the possibilities of such accidents when the roads come into use;
- Road Traffic Reduction Act 1997;
- The Local Authorities (Transport Charges) Regulations 1998 as applicable to RTRA 1984 and other legislation provide a power for the traffic authority to impose a charge for a number of its functions;
- the Transport Act 2000, under which an authority may designate any road as a quiet lane or a home zone. The Act also provides for the Secretary of State to review the operation of rural roads and consider whether (and if so how) the law should be amended to facilitate the introduction of rural road hierarchies.

The Secretary of State must consult Scottish Ministers and the National Assembly for Wales when carrying out the review.

7.7.2 The functions of the highway, street and traffic authority are required to comply with an increasing range of legislation regulating the environmental affects of their operations, including:

- Wildlife and Countryside Act 1981, which provides a framework of legislation relating to environmental and Countryside issues with which highway maintenance operations must comply;
- The Environmental Protection Act 1990 provides the statutory basis for other environmental issues, in particular waste management, with which highway maintenance operations must comply. It also deals with the requirement to keep the highway clear of litter and refuse which for local roads is not a duty for the highway authority;
- European Directive 2001/42/EC, also known as the SEA Directive, which was implemented in England through The Environmental Assessment of Plans and Programmes Regulations 2004. This requires Strategic Environmental Assessment of specified plans and programmes including LTPs. Further information can be obtained from (www.webtag.org.uk, www.odpm.gov.uk);

**Website Amended
27 April 2012**

- European Water Framework Directive which came into force in December 2000 requires all inland and coastal water bodies to reach defined water quality standards by establishing a river basin district structure. The Government's new strategy for flood and coastal erosion risk management, 'Making Space for Water' has implications for the role of the highway in flood management (<http://archive.defra.gov.uk/environment/flooding/documents/policy/strategy/strategy-response1.pdf>);
- The Noxious Weeds Act 1959 places a responsibility on the highway authority to take action to inhibit the growth and spread of injurious weeds growing within the highway. Weed spraying operations are also regulated by the Environment Agency and also by the Health and Safety Commission Code of Practice;
- The Clean Neighbourhoods and Environment Act 2005.

7.7.3 There is also a fairly recent framework of legislation not specifically related to highways, street and traffic functions but dealing with wider community issues with which the services are involved. These include:

- Disability Discrimination Act 1995 which requires employers and suppliers of goods and services to address discrimination against disabled people;
- Criminal Justice and Public Order Act 1994;
- Human Rights Act 1998;

- Freedom of Information Act 2000;
- Local Government Act 2000;
- Civil Contingencies Act 2004.

7.7.4 The Disability Discrimination Act 1995 makes it illegal to discriminate against disabled people in terms of access to goods, facilities or services. It has been introduced in two stages:

- from 1 October 1999 a service provider has had to take reasonable steps to change a practice, policy or procedure which makes it impossible or unreasonably difficult for disabled people to make use of its services, including the provision of an auxiliary aid or service or a reasonable alternative method of making services available.
- from 1 October 2004 where a physical feature makes it impossible or inconvenient for disabled people to make use of services, a service provider will have to take reasonable steps to either remove the feature, alter it so that it no longer has that effect, provide a means of avoiding it or provide an alternative method of making services available.

**Website Amended
27 April 2012**

7.7.5 There is no doubt that the Act applies to highway authorities, in that they are providing a service to the public. The DfT has not specifically published guidance on the applicability of the Act to highway maintenance. However, two documents, *Inclusive Mobility – a Guide on Best Practice on Access to Pedestrian and Transport Infrastructure* (<http://www.dft.gov.uk/publications/inclusive-mobility>) published by the DfT, and the Disability Rights Commission Code of Practice *Rights of Access: Goods, Facilities, Services and Premises* (www.disability.gov.uk), set out rights and duties under the Act. The Disability Rights Commission Code explicitly states that ‘where the physical features are within the remit of a highway authority and the highway is a service provider; it will have a duty to make reasonable adjustments’. It also explains that the requirement to make reasonable adjustments is ongoing and that maintenance or (re-) construction works for example, will require consideration of disabled access to services.

7.7.6 There is as yet no definition of what constitutes ‘reasonable adjustments’ as applied to highway maintenance and no legal cases have yet been reported. Transport for London Street Management has devised an audit process which is recommended as good practice. Section 12 deals in more detail with provision for disabled people as part of maintenance schemes.

**New Paragraph
Added 14 May 2009**

7.7.7 Following its initial introduction in 1994, the Construction Design and Management Regulations (commonly known as the CDM Regulations) were re-introduced in April 2007. The revised Regulations are intended to make it easier for those involved in construction projects to comply with their health and safety duties. More information may be downloaded from the following website.

www.hse.gov.uk/construction/cdm.htm

***New Paragraph
Added 14 May 2009***

- 7.7.8 The Traffic Management Act was introduced in 2004 to tackle congestion and disruption on the road network. The Act places a duty on local traffic authorities to ensure the expeditious movement of traffic on their road network and those networks of surrounding authorities. The Act gives authorities additional tools to better manage parking policies, moving traffic enforcement and the co-ordination of street works. The Act states that local traffic authorities shall make appropriate arrangements for performing the network management duty. These arrangements must include provision for the appointment of a traffic manager. The Act may be downloaded from:

***Website Amended
15 December 2010***

<http://www.legislation.gov.uk/ukpga/2004/18>

7.8 DUTY OF BEST VALUE

- 7.8.1 The Local Government Act 1999 provides for the general duty of best value. This is applied and developing slightly differently in the various parts of the UK towards a more comprehensive performance improvement regime. The main aspects are as follows:

England

- statutory basis Local Government Act 1999;
- evolved into Comprehensive Performance Assessment;
- statutory inspection by Audit Commission;
- flexible cycle of service reviews and inspections;
- defined statutory framework of BVPI.

Wales

- statutory basis Local Government Act 1999;
- evolved into Wales Programme for Improvement;
- improvement Plans;
- Audit Commission have role but no statutory requirement for inspection;
- reviews of all services on 5 year cycle;
- statutory framework of BVPI.

Scotland

- Local Government in Scotland Act 2003 requires that ‘a local authority shall discharge its duty of best value in a way which contributes to the achievement of sustainable development’;
- authorities required to have in place Public Performance Reporting Framework, which is subject to audit;
- no statutory requirement for Best Value Reviews but authorities have agreed with the Scottish Executive to review services on 4/5 year cycle;
- Audit Scotland have role but no statutory requirement for inspection;
- Statutory Performance Indicators defined by the Local Government Act 1992 and the Publication of Information (Standards of Performance) Direction 2004.

Northern Ireland

- no statutory basis at present although legislation for local authorities has been proposed by the Northern Ireland Assembly. Many authorities have already adopted and implemented the principles of best value. Roads Service, which is an executive agency of the Department for Regional Development, has also adopted the best value regime;
- no statutory requirement to publish Best Value Performance Plans. Roads Service is required to publish an Annual Report, which is subject to external audit, and it is proposed to include performance against targets set as a result of reviews;
- no legislative requirement to undertake reviews, but Roads Service will review services over a five-year cycle;
- northern Ireland Audit Office has a role, but there is no statutory requirement for inspection;
- no statutory basis for performance indicators which are set by the Department for Regional Development.

**New Paragraph
Added 13 August 2010**

7.9 MINIMISING CLUTTER

- 7.9.1 In March 2008 the DfT published Local Transport Note 1/08 *Traffic Management and Streetscape*, to help all those involved in the design of traffic management measures. It aims to enhance streetscape appearance by encouraging design teams to minimise the various traffic signs, road markings and street furniture associated with traffic management schemes, and hence minimise clutter. A copy may be downloaded from the following link:

**Website Amended
27 April 2012**

<http://assets.dft.gov.uk/publications/local-transport-notes/ltn-1-08.pdf>

***New Paragraph Added
13 August 2012***

7.10 SIGNING THE WAY

- 7.10.1 In October 2011 the Department for Transport published “Signing the Way: Traffic Signs Policy Review”. This document sets out a policy framework for ensuring that the traffic system meets the future needs of all road users, while building upon the existing and established traffic sign system. It sets out recommendations for improving the information that traffic signs communicate to road users by providing more freedom for decisions about signing at the local level. The review, which makes a series of recommendations, can be downloaded from the following website:

<http://www.dft.gov.uk/publications/signing-the-way>

RECOMMENDATIONS FOR SECTION 7

R7.1 Approval of Variations

Any variations in policies and practice from that identified by this Code should be derived following a risk assessment, then approved, adopted and published by the authority. The approval and adoption process should involve the authority’s Executive and be explicit, transparent and inclusive.

R7.2 Consistency of Application

Policies and practice should be clearly defined, consistently applied and regularly reviewed. They should include a regime of safety inspection, and response arrangements derived following risk assessment.

R7.3 Understanding Legal Obligations

All employees, elected Members, contractors and agents for the authority involved in the procurement or delivery of highway maintenance services should understand the extent and nature of the authority’s legal liabilities and risks for highway maintenance. This is particularly important with regard to the distinction between duties and powers, and how these relate to their particular responsibilities.

R7.4 Comprehensive and Accurate Records

Comprehensive and accurate records should be kept of all highway maintenance activities undertaken, particularly safety and other inspections, identifying the time and nature of any response, and subsequent required follow up action.

R7.5 Co-ordination of Records

Arrangements should be established to ensure the effective co-ordination of all highway maintenance records with other relevant record systems, including road accident information, together with a programme for regular review. The use of a relational database and GIS is desirable.

R7.6 Identification and Response to Changes

Arrangements should be established for early identification of both planned and evolving changes to the highway network and to traffic distribution and characteristics, in order that corresponding changes can be made, where necessary, to the hierarchy, frequency of inspection and response for those elements of the network affected.

Section 8

Strategy and Hierarchy

8.1 PRINCIPLES AND OBJECTIVES OF HIGHWAY MAINTENANCE STRATEGY

8.1.1 The policy framework for highway maintenance and its relationship with other transport and wider policies of the authority has been dealt with in Section 5. The general principles and objectives of highway maintenance management, including issues relating to inventory and hierarchy, are dealt with in this section.

8.1.2 Delivery of the strategy is dependent on understanding the relationship between:

- these wider strategic policies including the second round of Local Transport Plans (LTPs);
- the tactical delivery of the highway service in accordance with guidance documentation including this Code and the CSS Framework for Asset Management; and
- the delivery of the operational aspects of maintenance.

8.1.3 Highway maintenance strategy should be based on systematic logical approach in accordance with the principles of best value and continuous improvement, and should be an important component of a more broadly based Highway Asset Management Plan (HAMP). The focus of maintenance management should be primarily on the infrastructure itself and the focus of the HAMP primarily on the service provided by the infrastructure.

8.1.4 The HAMP should be developed in the context of a number of other plans that authorities are required to develop, namely:

Highway Improvement Plan This plan sets out the proposed improvements to the network necessary to meet performance targets such as safety and congestion and is set in the overall context of local transport planning requirements;

Network Management Plan This plan sets out how the network should be managed to meet the requirements of the Traffic Management Act and improve co-ordination between stakeholders in delivering works programmes;

Highway Maintenance Plan This plan sets out the operational requirements to maintain the network and identifies the resource requirements to deliver the maintenance service.

8.1.5 Figure 3 summarises the development of the HAMP in the context of these plans. It also illustrates how each of the following sections of this Code contributes to the development of an overall strategy.

8.1.6 Maintenance strategy should be aimed at optimising the maintenance contribution to the service provided by the infrastructure. The principles of highway maintenance strategy should therefore be:

- to deliver the statutory obligations of the authority;
- to be responsive to the needs of users' and the community;
- to contribute to effective highway asset management and maintain the asset value;
- to support effective delivery of the statutory network management duty;
- to support and add value to local transport objectives;
- to support and add value to wider corporate policy objectives.

8.1.7 These principles should underpin the following core objectives for maintenance strategy, and the respective sub-objectives:

Network Safety

- Complying with statutory obligations;
- Meeting users' needs for safety.

Network Serviceability

- Ensuring availability;
- Achieving integrity;
- Maintaining reliability;
- Enhancing condition.

Network Sustainability

- Minimising cost over time;
- Maximising value to the community;
- Maximising environmental contribution.

8.1.8 These core objectives are supplemented by a new overall objective of 'customer service' developed further in Section 11. This objective will apply to the highway service as a whole, as users may not be able easily to distinguish between maintenance, network management and improvement works. These objectives, together with risk management, needs based budgeting and competitive service delivery, provide the basis not only for highway maintenance strategy, but also the more broadly based asset management strategy. They should provide the framework for establishing outcomes against which service and asset performance should be measured. They should also drive the development of performance indicators for comparison and use in Best Value Reviews. They will also be helpful in monitoring performance of the statutory network management role for authorities in England established by the Traffic Management Act and similar developing legislation in Scotland.

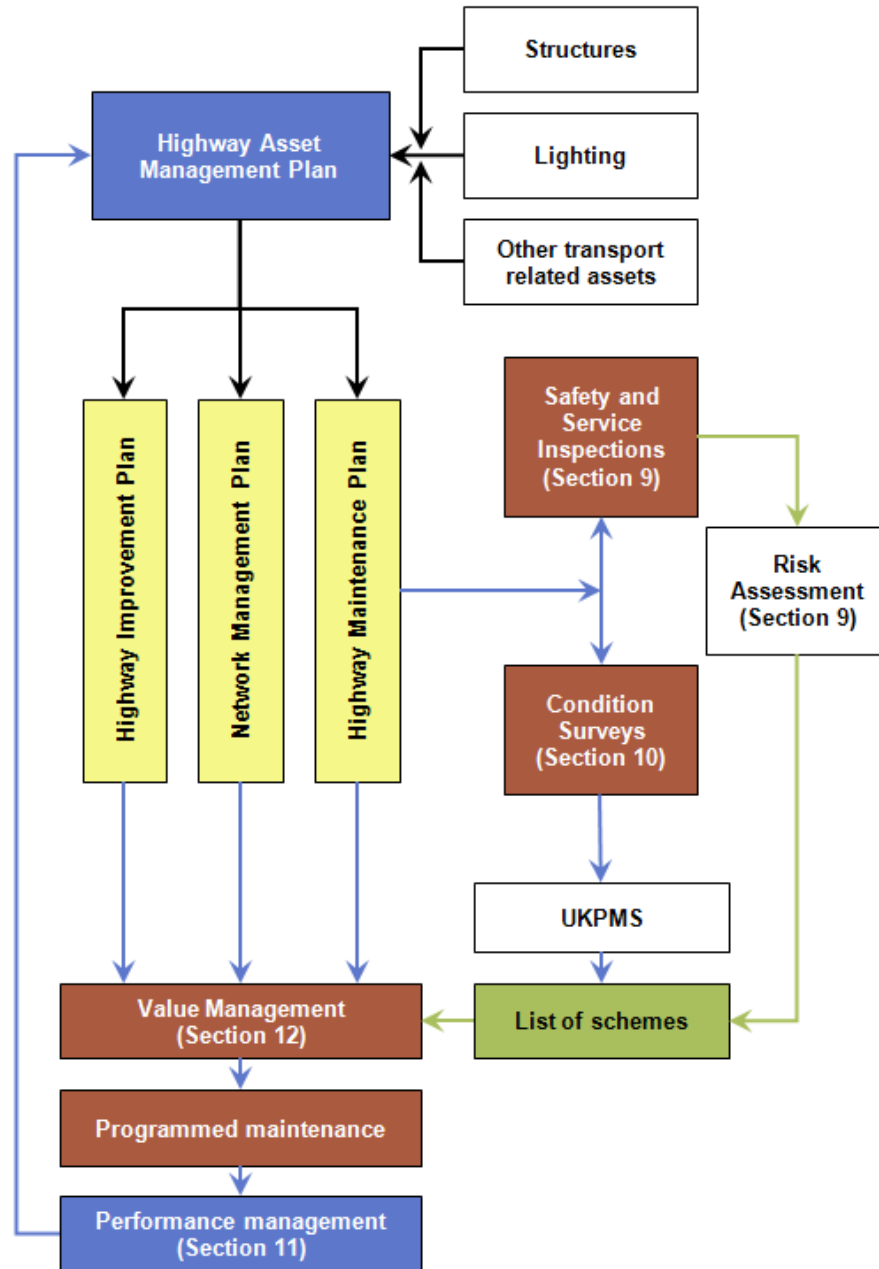


Figure 3 - Components of a Highway Maintenance Strategy

8.1.9 Each objective can be affected to a different extent by several different highway maintenance operations. For example:

- network availability can be affected by winter maintenance operations, NRSWA regulatory activity, deficiency of drainage systems and by careful planning of maintenance schemes in general;
- network integrity can be assisted by consistent, joined up and effective temporary signing, by ensuring consistent standards of maintenance on cycle routes between segregated and non-segregated sections, and providing consistent accessibility standards, for example through the use of dropped kerbs on key pedestrian routes especially those used by disabled people, older people, or those using prams;

- environmental contributions can be made through verge management plans, reducing sign clutter, use of recycled products or the provision of noise-reducing surfacing.
- 8.1.10 Every aspect of highway maintenance for each element of the network has the potential to contribute to some extent to a number of the above objectives. For example, the contribution to the safety objective of the carriageway is affected by:
- the actual condition of the surface;
 - the response time for attending to inspections and user concerns;
 - the quality of management and service delivery;
 - the effectiveness of materials and treatments used.

8.2 COMPONENTS OF HIGHWAY MAINTENANCE STRATEGY

8.2.1 The foundations of a highway maintenance strategy are:

- a detailed inventory of all components to be maintained;
- a defined hierarchy for all elements of the network;
- a robust framework of levels of service linked to the core objectives of this Code.

8.2.2 These are the crucial components on which a highway maintenance strategy should be founded. Although they should each be comprehensive and robust, they should be dynamic and subject to regular review and updating in the light of changed circumstances. The network will be continually altered by new development and changes in character or use, and changes in transport or wider policies of the authority may have implications for maintenance strategy.

8.2.3 To be effective, these key components need to be supplemented by the following, which will be part of the HAMP:

- a comprehensive management system for inspecting, recording, analysing, prioritising and programming maintenance works so as to optimise their asset management contribution;
- a risk management strategy clearly identifying and evaluating the risks and consequences of investment decisions and measures to mitigate them;
- arrangements to finance, procure and deliver maintenance works, in accordance with the principles of sustainability and best value;
- arrangements to monitor, review and update as necessary, each component of the strategy and the performance of the strategy as a whole in delivering the core objectives above.

8.2.4 These arrangements should be determined locally, having regard to this Code, and the CSS Asset Management Framework, following consideration of the

relative risks and consequences relating to local circumstances, and the need to co-ordinate with other local strategies.

8.3 STRATEGY CO-ORDINATION

8.3.1 Highway maintenance management and operations contribute to the delivery of the HAMP and support and add value to local transport strategy. In this context it should, for example, have regard to strategies for the promotion of walking, cycling and public transport use and seek to add value or advance these strategies where appropriate. Strategies to provide users of motorcycles and other two wheeled vehicles and the management of heavy goods vehicles could have very particular implications for highway maintenance, as could strategies for accident reduction and prevention.

8.3.2 Co-ordination of highway management and operations is particularly relevant to the new statutory network management duty introduced by Section 18 of the Traffic Management Act 2004, which imposes a duty on authorities to coordinate street and roadworks and a duty on undertakers to co-operate in such co-ordination. Reference should be made to the Code of Practice on Coordination issued by the DfT.

8.3.3 A process of value management as discussed in Section 12 and shown in Figure 3 should be used to co-ordinate strategy. Possible examples of strategy co-ordination could include:

- moving a highway section to a higher or lower category in the hierarchy to take account of traffic characteristics and use;
- changing inspection regime to reflect actual or potential changes in accident risk;
- modifying or extending maintenance schemes to improve continuity or consistency for users and communities;
- modifying programmes to reflect broader priorities of the authority or other local authorities;
- modifying programmes to co-ordinate more effectively with works affecting the highway by utilities, developers or other local authorities.

8.3.4 It is also possible that, on occasion, particular aspects of highway maintenance strategy could potentially conflict with wider asset management or local transport strategy. For example, the need to address serious and potentially expensive carriageway defects could compromise, at least temporarily, public transport convenience and reliability. It is important that arrangements are in place to identify the potential for such conflicts at an early stage, to resolve them one way or the other, and to mitigate the effects of this as effectively as possible. This requirement will have been enhanced by the network management duty introduced in England by the Traffic Management Act 2004.

8.3.5 Another key principle is that highway maintenance should support and add value, where possible, to strategies for delivering the wider corporate objectives of the authority which may include the following, for example:

- building safer communities;
- continually improving educational achievement;
- developing and supporting the local economy;
- developing social welfare and promoting health;
- protecting and improving the environment;
- reducing inequality and poverty;
- improving accessibility of services;
- improving social inclusion.

8.3.6 Although it may be difficult to conceive areas where highway maintenance could contribute significantly to all of these objectives, there are some opportunities, which may vary between authorities. A similar approach should be adopted to that identified for transport policy co-ordination:

- identify the key areas of interaction between highway maintenance and each corporate objective;
- seek to add value where possible, by changes in scheme concept, design, scale, or priority;
- establish arrangements for resolving conflicts and mitigating their effects.

**Website Amended
27 April 2012**

8.3.7 It is also important to ensure that highway maintenance strategy is coordinated with that of neighbouring authorities for both locally and nationally maintained networks. Users will expect reasonable continuity of safety and serviceability, particularly at the higher end of the network hierarchy, but also at the lower levels where safety is a prime consideration, such as in the case of Winter Service. In such cases, serious discontinuities in service standards should be avoided through consultation and agreement. The Code of Practice on Co-ordination published to support the Traffic Management Act 2004 provides specific advice on this (<http://assets.dft.gov.uk/publications/street-works-co-ordination/cop3rdedition.pdf>).

8.3.8 Inter-authority co-ordination at both the strategic and operational level can bring other benefits, in terms of cost and resource management, levels of service and user perception. Opportunities for such co-operation include:

- integrated route management;
- optimisation of cross boundary service provision;
- optimised programming and procurement;
- shared traffic management and publicity;

- avoidance of multiple user delays;
 - research, development and innovation.
- 8.3.9 A key example of inter-authority co-operation with the potential for significant enhancement is the establishment of the Scottish Roads Maintenance Condition Survey (SRMCS) involving the agreement by all Scottish authorities to the development and implementation of a common system of automatic condition data collection and analysis. Another example is the ROADS 2000 project for London, again based on a common system of data collection and analysis providing the basis for effective resource allocation. Co-operation in procurement of services is becoming more common and collaborative purchasing of services is being further encouraged following the *Gershon* report.

**New Paragraph
Added 7 May 2010**

- 8.3.10 The Department for Transport commissioned a research project on highway service levels, focusing on getting an improved understanding, in qualitative terms, of the levels of service the public expects for the surface of carriageways, cycletracks and footways. The report is available from the following website:
- http://www.trl.co.uk/online_store/reports_publications/trl_reports/cat_highway_engineering/report_highway_service_levels.htm

8.4 DESIGNING FOR MAINTENANCE

- 8.4.1 Although much maintenance activity is undertaken on highway construction of long standing, new and improved highway schemes and facilities form an increasing proportion of the network over time. The future maintenance costs of such new infrastructure are therefore a prime consideration and DfT guidance for the second round of LTPs states that ‘authorities should consider carefully the future maintenance requirements of proposed new infrastructure before including it in their LTP. It may be that the whole life cost of a capital scheme will be such that the transport need that it is designed to address could be more efficiently met through less capital intensive or even revenue funded interventions’.

**Website Amended
24 May 2013**

- 8.4.2 This is not to say that creativity should be inhibited. High quality or relatively expensive materials may provide appropriate, low maintenance and cost effective treatments in terms of their contribution to wider regeneration objectives, for example in improving the quality of public space and streetscape. It may also be appropriate to use environmentally sensitive materials in certain locations, despite the possibility of higher future maintenance costs. A series of regional guides published by English Heritage in collaboration with DfT provide useful advice (www.english-heritage.org.uk).
- 8.4.3 There are however many cases where careful consideration of maintenance implications at the design stage would have provided an equally effective outcome, but without maintenance complications either increasing costs or introducing practical difficulties which may in fact compromise the effectiveness of the feature. Examples include:

- materials requiring a disproportionately high frequency of maintenance;
- access difficulties for routine maintenance such as drain clearance and cleansing;
- inappropriate treatments and planting on narrow verges;
- maintenance requiring disproportionate traffic management costs;
- traffic calming and safety features with high rates of deterioration.



- 8.4.4 The Value Engineering process described in Section 12 is a structured approach that may be adopted to ensure the effective outcome of designs.
- 8.4.5 Disproportionately costly, inconvenient or impossible maintenance may inhibit or prevent programmed maintenance taking place. Failure to provide the specified maintenance regime could have potentially serious consequences for potential liability of the authority and its employees. It is also important to note that authorities have only powers to improve highways for various purposes but a statutory duty to maintain them. There is no liability for failing to exercise a power but using the power, for example to erect new signing or traffic calming, creates a liability to maintain.
- 8.4.6 Given that works of highway improvement will usually be funded from capital and that subsequent maintenance works will often be funded from revenue, the potential financial 'gearing' is greater than might be perceived, and the benefits to be gained from more 'maintenance friendly' design correspondingly higher. This balance between capital and revenue expenditure could of course be modified by certain forms of public private partnership.
- 8.4.7 Co-ordination between highway maintenance and highway improvement schemes can be improved through informal liaison and co-operation between those involved. Authorities should, however, give consideration to the introduction of more formal co-ordination arrangements in conjunction with the development of their HAMPs, to ensure that the whole life costs of schemes are optimised. These could involve formal consultation, value management and/or engineering, or a system of maintainability audit for a sample of schemes in order to establish local good practice. The DfT in England will require evidence of such a system in LTP appraisals.

8.4.8 A maintainability audit could usefully be carried out by reference to a standard checklist, an example of which is given in Appendix K, which could include the following items:

- what is the estimated design life?
- is this design life compatible with the adjacent infrastructure?
- are the design and materials suitable for the predicted traffic use?
- can the materials be readily replaced throughout the design life?
- can the materials be satisfactorily re-laid after utility works?
- are the materials liable to fading or discoloration?
- can the surfaces be cleaned?
- can the infrastructure be easily accessed for maintenance purposes?
- could tree planting be redesigned to avoid future obstruction to signs or visibility and consequent maintenance requirements?

8.4.9 It would also be a useful discipline to establish arrangements to identify any unusual maintenance requirements and costs associated with schemes brought forward for approval, so that these can be taken into account at the time. This is particularly important where new highways are being assessed for adoption and should be reflected in commuted sums for any higher than usual future maintenance costs sought from developers, which can be calculated for up to 20 years.

***New Paragraph
Added 7 May 2010***

***Paragraph Amended
15 December 2010***

***Paragraph Amended
27 May 2011***

8.4.10 ADEPT has published guidance that aims to provide advice on the commuted sums mechanism, through which developers are required to contribute to future maintenance of areas adopted by local authorities. The guidance may be downloaded from the following website:

***Website Amended
27 April 2012***

<http://www.adeptnet.org.uk/assets/userfiles/documents/000296.pdf>

8.5 HIGHWAY MAINTENANCE MANAGEMENT SYSTEMS

8.5.1 A highway maintenance management system (HMMS) comprises procedures and processes to achieve certain objectives, as well as the tools (including computer software) used for putting them into practice. Computerised systems have matured in recent years, following recognition that maintenance needed more relevant management tools, and are now able to manage the large volumes of data associated with a typical road network, and to model analytically the needs, options and priorities for maintenance strategies and programmes.

8.5.2 An HMMS will typically comprise four main types of components:

- network model (against which all other data is referenced), typically represented using a sectionally labelled, digitised road centreline, and possibly also employing a GIS;
- asset database (comprising information on the location and type of every asset and information about its condition);
- data rules, defining standards and data processing parameters;
- specialist applications (providing processing algorithms suited to each technical area e.g. traffic, accidents, maintenance, lighting etc).



8.5.3 Based on this general structure, authorities will need to design an HMMS to suit particular local needs and responsibilities, procurement arrangements and other factors. It may include specialist applications indirectly related to highway maintenance, for example traffic and accident analysis.

8.5.4 Each of the main technical elements relevant to HMMS, are dealt with in detail in subsequent sections and appendices of this Code.

8.6 NETWORK INVENTORY

8.6.1 The Highways Act 1980, applying in England and Wales, requires the keeping of a register of roads that are maintainable at public expense, which is primarily used for Land Charge Searches. Similar provisions exist within Scotland. Similar records exist within Northern Ireland although there is no legislative requirement to keep a register of roads maintained at public expense.

- 8.6.2 The National Parks and Access to the Countryside Act 1949 requires the keeping of the definitive map and accompanying statement for Public Rights of Way (PROW) which forms the legal record of the position and status of PROW in England and Wales. Certain parts of the network could be recorded both on the register of roads and the definitive map, and advice on the treatment of these is provided by the PROW Good Practice Guide published jointly by the Countryside Agency, CSS and others (www.prowgpg.org.uk).
- 8.6.3 There is also a requirement under the NRSWA 1991 to maintain information for the purpose of:
- identifying streets described as traffic sensitive where work should be avoided at certain times of the day;
 - identifying structures under or over the street which need special consideration when work is planned;
 - identifying reinstatement categories used by statutory undertakers in the reinstatement of their street works.
- 8.6.4 The Code of Practice on Consultation issued by the DfT provides further information on data requirements to support the statutory network management duty introduced by the Traffic Management Act 2004. Appendix B of that Code sets out a methodology for the creation, maintenance and publication of National Street Gazetteer, Operational District Data and Additional Street Data. Information must be in a format that can be electronically accessed by all parties and facilitate electronic transfer of notices. There is a National Notification System, 'moleseye' in Scotland.
- 8.6.5 Another important reason for maintaining accurate inventory information is the requirement to submit updated information to Government each year on road lengths maintained, which is used for the calculation of Formula Funding Share and Revenue Support Grants.
- 8.6.6 Each of these requirements can however be satisfied with fairly basic information, much less detailed than would be required for highway maintenance management purposes.
- 8.6.7 A detailed highway inventory or asset register or database is an essential prerequisite of establishing a cost effective and adequate maintenance regime. It is also a vital component of the HAMP and is the starting point for valuation of the asset which is dealt with in Section 17. The inventory is the foundation on which asset management is built and when analysed in combination with other data, for example, road casualties and traffic flows, it provides crucial decision support information.



8.6.8 The first task is to reference the highway network as a basis for the inventory of information concerning all assets associated with it. This may be done in stages, according to the priority attached to different specialist applications. Before commissioning potentially expensive asset inventory surveys, consideration should be given to the use of existing data. All existing data should be reviewed to assess its currency, completeness and quality to assess the level of confidence in the data held.

8.6.9 When inventory surveys are found to be necessary, the use of appropriate technology (e.g. video or aerial survey) may be considered. Careful specification of quality and accuracy is essential. In addition, once an asset inventory database has been established, it will be essential to keep it up to date, which means establishing a cyclic updating regime, defined by hierarchy or triggered by work on the ground. No authority should commence inventory data collection until assured arrangements for updating are in place.

8.6.10 The nature and extent of highway inventory collected should be such as to provide fitness for purpose, meet business case criteria and be subjected to risk assessment. There would be no business case for collecting data, where the cost would be disproportionately high, the benefits low, and the risks of non-availability low. Conversely, where the cost of collection is relatively low, the benefits high and the risks of non-availability high the business case would be strong.

8.7 NETWORK HIERARCHY

8.7.1 A network hierarchy is the foundation of a coherent, consistent and auditable maintenance strategy. It is also crucial to asset management in establishing levels of service and to the new statutory network management role for developing co-ordination and regulating occupation.

8.7.2 It is important that the hierarchy adopted reflects the needs, priorities and actual use of each road in the network. These may be determined by importance – a route leading to a major hospital, for example. They may be determined by environment – rural, urban, busy shopping street, residential street etc. They may be determined by non-vehicular traffic factors such as pedestrian usage. Indeed, footway priorities may sometimes conflict with carriageway priorities, and hence it is necessary to define separate footway and cycle route hierarchies. Collectively, these issues may be referred to as the ‘functionality’ of the section of highway in question.

- 8.7.3 The adoption of a common hierarchy to reflect the network management duty and the requirements for maintenance management, based on highway functionality would be desirable. However, it may be difficult to achieve completely, bearing in mind the differing definitions of protected streets, traffic sensitive streets, and streets with engineering difficulties associated with the network management duty. However a high degree of compatibility between networks would seem to be essential.
- 8.7.4 Ideally, the functionality of any part of the network should be the single basis of policy priorities. It should be the hook to which standards are to be attached together with associated targets and performance objectives. In the context of this Code, hierarchy is the link between maintenance policy and implementation but it can also be a consideration when defining standards for design and new construction. At an operational level, hierarchy may be the vehicle for implementation, say, for a cycling strategy. Essex County Council has adopted a 'functional' route hierarchy for its Traffic Management Strategy.
- 8.7.5 Guidance for the second LTP issued by the DfT confirms that Rights of Way Improvement planning in England will be progressively incorporated into local transport planning and that the Rights of Way Improvement Plans (ROWIPs), the preparation of which was imposed as a duty on local highway authorities by the Countryside and Rights of Way Act 2000, will be integrated with LTPs. Authorities are required to submit a short progress report on their ROWIP with their provisional LTP in 2005, prior to full integration from 2010 onwards. Authorities should therefore give consideration to a relevant hierarchy for PROW to assist integration with existing hierarchies for walking and cycling.
- 8.7.6 In Scotland the Land Reform Act (Scotland) Act 2003 introduced a duty for the authority (not later than 3 years after the Act) to draw up a plan for a system of 'Core Paths' sufficient for the purpose of giving the public reasonable access throughout their area, and integrating with the wider transport network. There is no requirement as yet for these to be incorporated into local transport strategies.
- 8.7.7 There will also be a need to define a hierarchy for Winter Service. This should take as a starting point the hierarchy developed for general maintenance purposes but this is likely to require extensive modification to accommodate a number of local operational factors, which are detailed in Section 13 of this Code.
- 8.7.8 Hierarchies are a useful basis on which to consult users and the community. They are strategic but relatively easy to present and understand and not so detailed as to cause difficulties in interpreting the results. They can also address directly some of the wider policy issues including special needs of older and disabled people.
- 8.7.9 Guidance on the network management duty issued by the DfT suggests that, when developing strategies and processes for improving the operation of the road network, authorities should consult with the public, frontagers, representatives of road users and neighbouring authorities with an interest. The regular public consultation process carried out by the authority should be reviewed and if possible, amendments made to it so that consultation on network operation is included as part of this regular process.
- 8.7.10 It is also important that hierarchies are dynamic and regularly reviewed to reflect changes in network characteristics and functionality, so that maintenance policies, practices and standards reflect the current situation rather than the use expected

when the hierarchy was originally defined. Where major maintenance, construction or other development involves significant traffic diversion, or when congestion in one part of the network results in traffic shift to another part of the network it is important that these changes are reflected in the hierarchy and subsequently in the maintenance and network management regimes.

8.8 CARRIAGEWAY HIERARCHY

- 8.8.1 Table 1 is intended to be used as a reference point from which to develop local hierarchies. The detailed descriptions relate to the most usual circumstances encountered in the UK. There are, however, some very significant variations from the norm and in Scotland, for example, there are some instances of trunk roads of very limited width.

Table 1 – Carriageway Hierarchy			
Category	Hierarchy Description	Type of Road General Description	Description
1	Motorway	Limited access motorway regulations apply	Routes for fast moving long distance traffic. Fully grade separated and restrictions on use.
2	Strategic Route	Trunk and some Principal 'A' roads between Primary Destinations	Routes for fast moving long distance traffic with little frontage access or pedestrian traffic. Speed limits are usually in excess of 40 mph and there are few junctions. Pedestrian crossings are either segregated or controlled and parked vehicles are generally prohibited.
3a	Main Distributor	Major Urban Network and Inter-Primary Links. Short - medium distance traffic	Routes between Strategic Routes and linking urban centres to the strategic network with limited frontage access. In urban areas speed limits are usually 40 mph or less, parking is restricted at peak times and there are positive measures for pedestrian safety.
3b	Secondary Distributor	Classified Road (B and C class) and unclassified urban bus routes carrying local traffic with frontage access and frequent junctions	In rural areas these roads link the larger villages and HGV generators to the Strategic and Main Distributor Network. In built up areas these roads have 30 mph speed limits and very high levels of pedestrian activity with some crossing facilities including zebra crossings. On-street parking is generally unrestricted except for safety reasons
4a	Link Road	Roads linking between the Main and Secondary Distributor Network with frontage access and frequent junctions	In rural areas these roads link the smaller villages to the distributor roads. They are of varying width and not always capable of carrying two way traffic. In urban areas they are residential or industrial interconnecting roads with 30 mph speed limits random pedestrian movements and uncontrolled parking
4b	Local Access Road	Roads serving limited numbers of properties carrying only access traffic	In rural areas these roads serve small settlements and provide access to individual properties and land. They are often only single lane width and unsuitable for HGVs. In urban areas they are often residential loop roads or cul-de-sacs.



8.8.2 Indicative traffic flows have been therefore not been included in the table. Authorities should designate carriageway hierarchies, having regard to traffic flows but also on the basis of risk assessment and the functionality of the particular section of carriageway in the network.

8.9 FOOTWAY HIERARCHY

8.9.1 Footway hierarchy, as with the carriageway hierarchy, will not necessarily be determined by the road classification, but the functionality of the footway and scale of use. In urban areas the contribution of the footway to the quality of public space and streetscene will be particularly important. Local factors such as the age, distribution of the population, the proximity of schools or other establishments attracting higher than normal numbers of pedestrians to the area should also be taken into account. As a general guide, five broad maintenance categories are recommended for footways, as described in Table 2 below.

Table 2 – Footway Hierarchy		
Category	Category Name	Description
1(a)	Prestige Walking Zones	Very busy areas of towns and cities with high public space and streetscene contribution.
1	Primary Walking Routes	Busy urban shopping and business areas and main pedestrian routes.
2	Secondary Walking Routes	Medium usage routes through local areas feeding into primary routes, local shopping centres etc.
3	Link Footways	Linking local access footways through urban areas and busy rural footways.
4	Local Access Footways	Footways associated with low usage, short estate roads to the main routes and cul-de-sacs.

8.9.2 The assignment of a footway to a particular category within the hierarchy is a matter for local discretion. However, the following issues should be taken into consideration:

- pedestrian volume;
- current usage and proposed usage;
- accident and other risk assessment;

- age and type of footway (e.g. old flagged footways may require more frequent inspection than newly laid); and
 - character and traffic use of adjoining carriageway.
- 8.9.3 The footway hierarchy should have regard to any network of ‘housing footways’, serving housing estates or related development, which may be unadopted as public highways but maintained separately by the authority. Users will make no distinction and will consider the footway network as a whole.
- 8.9.4 Hampshire County Council has developed their footway hierarchy based on this Code as follows:
- Category 1 Primary walking - Major Town and city centres +30 number shops.
 - Category 2 Secondary Walking - Small retail shopping out lets +5 shops, large schools and Industrial outlets +500 pupils or equivalent pedestrian movements.
 - Category 3 Link Footways - Urban access, busy rural, all other schools.
 - Category 4 Local access - Rural footways, non feeder footways in housing estates.

8.10 CYCLE ROUTE HIERARCHY

- 8.10.1 The categories suggested by this Code for cycle routes are shown in Table 3 below. They are categorised not by use or functionality but by location, as the level of use is generally low and not related to maintenance need. This approach also reflects the differing risks associated with shared, partially segregated and fully segregated cycle routes. Where the level of use on particular cycle routes is significant and relevant to maintenance need, for example on commuter cycle routes, authorities may establish categories based on use.



Table 3 – Cycle Route Hierarchy	
Category	Description
A	Cycle lane forming part of the carriageway, commonly 1.5 metre strip adjacent to the nearside kerb. Cycle gaps at road closure point (no entries allowing cycle access).
B	Cycle track, a highway route for cyclists not contiguous with the public footway or carriageway. Shared cycle/pedestrian paths, either segregated by a white line or other physical segregation, or un-segregated.
C	Cycle trails, leisure routes through open spaces. These are not necessarily the responsibility of the highway authority, but may be maintained by an authority under other powers or duties.

8.11 PUBLIC RIGHTS OF WAY HIERARCHY

- 8.11.1 Authorities have not generally established a formal hierarchy for PROW, for the purpose of assigning maintenance and improvement priorities. The range of guidance on preparation of ROWIPs includes no reference to the need for hierarchy.
- 8.11.2 Some authorities have established hierarchies based on designation, for example Surrey County Council, which includes:
- Byways open to all traffic (BOAT);
 - Long Distance Trails (LDT);
 - Designated Recreational Routes (DRR);
 - Rights of Way (ROW).
- 8.11.3 Perth and Kinross use the following, which reflects the different maintenance responsibilities in Scotland:
- Strategic link path;
 - Recreational path (maintained);
 - Recreational path (non-maintained);
 - Other access rights.
- 8.11.4 The integration of ROWIPs with LTPs to ensure that PROW are recognised in LTPs as a key ingredient of an integrated transport network may make it helpful to establish some general principles of hierarchy, based on the relative contribution of particular links. Such an approach has already been adopted in Scotland through the designation of 'Core Paths' by the Land Reform (Scotland) Act 2003.
- 8.11.5 Many authorities have adopted a maintenance regime that incorporates PROW with a metalled surface, particularly those within or on the fringe of urban areas into the footway hierarchy, irrespective of their designation. This recognises users'

requirements for consistency in highway maintenance and is recommended good practice.

8.12 MAINTENANCE TYPE

8.12.1 The main types of highway maintenance are as follows:

- reactive - responding to inspections, complaints or emergencies;
- routine - regular consistent schedule, generally for patching, cleaning, grass cutting and landscape maintenance;
- programmed - flexibly planned schemes primarily of resurfacing, reconditioning or reconstruction;
- regulatory - Inspecting and regulating the activities of others. Much of this will be undertaken by the Traffic Manager under the new statutory duty for network management;
- winter Service;
- weather and other emergencies.

8.12.2 Each of these maintenance types contribute in varying degrees to the core objectives of safety, serviceability and sustainability, summarised earlier in this section of the Code. In each case therefore, standards and delivery arrangements should preferably be established having regard to these objectives focussed on outcomes, rather than on inputs mainly related to maintenance type. It is accepted that this principle may take time to establish and will be easier to pursue in conjunction with new procurement arrangements.

8.13 MAINTENANCE CATEGORY

8.13.1 Within each of the above types there are various categories of maintenance as follows, each of which should be considered in terms of their output contribution towards the core objectives of safety, serviceability and sustainability:



Reactive

- all assets -sign and make safe for safety purposes;
- all assets - provide initial temporary repair for safety purposes;
- all assets - provide permanent repair for safety purposes.

Routine

- carriageways, footways and cycle routes - minor works and patching;
- drainage Systems - cleansing and repair;
- embankments and cuttings – stability;
- landscaped areas and trees – management;
- verges – grass cutting;
- fences and barriers – tensioning and repair;
- traffic signs and bollards - cleansing and repair;
- road markings and studs – replacement;
- lighting installations -cleansing and repair;
- bridges and structures - cleansing and minor works.

Programmed

- carriageways - minor works, resurfacing or reconstruction;
- footways - minor works, resurfacing or reconstruction;
- cycle routes - minor works, resurfacing or reconstruction.

Regulatory

- maintenance of Highway Register and Definitive Map;
- co-ordination of road and street works (Traffic Manager responsibility);
- charging schemes and permits for highway occupation (Traffic Manager responsibility);
- other regulatory functions - encroachment, illegal signs, parking.

Winter Service

- pre-treatment;

- post-treatment;
- clearance of ice and snow.

Weather and other Emergencies

- flooding;
- high winds;
- high temperatures;
- other emergencies.



RECOMMENDATIONS FOR SECTION 8

R8.1 Development of Maintenance Strategy

The strategy for highway maintenance should be developed to deliver maintenance policy, to support corporate goals, local transport and network management policies. The strategy should be developed through the Highway Asset Management Plan.

R8.2 Objectives and Scope of Strategy

The objectives of the strategy related to the individual maintenance categories should be clearly defined in terms of safety, serviceability and sustainability. The strategy should incorporate all maintenance categories, and have regard to the differing requirements of the area, including rural and urban differences.

R8.3 Network Inventory

Authorities should prepare a detailed inventory or register of all highway assets requiring maintenance, together with information on the scale, nature and distribution of use. The nature and extent of highway inventory collected should be such as to provide fitness for purpose, meet business case criteria and be subjected to risk assessment.

R8.4 Storage and Updating of Inventory

The inventory should ideally be incorporated into a GIS system, together with other related information, including highway condition surveys, for ease of interpretation by non-technical stakeholders, and regular updating. No authority should commence inventory data collection until assured arrangements for updating are in place.

R8.5 Network Hierarchy

The strategy should define hierarchies for all elements of the highway network, including carriageways, footways, and cycle routes. The hierarchy should take into account current and expected traffic characteristics and use, having regard to Local Transport Plans, and Rights of Way Improvement Plans.

R8.6 Compatibility of Hierarchies

Hierarchies for maintenance and network management should ideally be common, or at least compatible with each other.

R8.7 Local Influences on Hierarchy

The hierarchy should also take account of local circumstances, for example the influence of schools and hospitals or particular concentrations of older, disabled or other potentially vulnerable users. It should also support the local accessibility strategies.

R8.8 Integrity of Facilities for Walking and Cycling

Particular account should be taken of the need for continuity in hierarchies for cycling and walking and the need for consistent maintenance standards between segregated and shared sections of routes. This principle should also apply where elements of the Public Rights of Way network form significant links within the local walking and cycling network.

R8.9 Consistency with Adjoining Authorities

The strategy should be co-ordinated with adjoining authorities, including those responsible for maintenance of the strategic network, to ensure that maintenance practice, standards and programmes meet road users' reasonable expectations for consistency, minimise disruption to users and the community and provide value for money.

R8.10 Designing for Maintenance

Authorities should establish arrangements to ensure that all highway improvement schemes including traffic management, environmental schemes and minor works are designed to facilitate future maintenance in accordance with the principles of this Code and informed by developing local experience. Consideration should be given to introducing formal maintenance audit on a selective basis to assist this process.

R8.11 Identification of Maintenance Implications

In accordance with the second round of Local Transport Plan guidance any additional maintenance costs arising from all new and improved infrastructure should be explicitly identified and taken into account in evaluating the whole life cost of the scheme. Where schemes provided in conjunction with new development are likely to involve unusual maintenance requirements and costs, consideration should be given to securing a commuted sum from the developer for such additional maintenance costs.

Section 9

Inspection Assessment and Recording

9.1 IMPORTANCE OF INSPECTION, ASSESSMENT AND RECORDING REGIME

9.1.1 The establishment of an effective regime of inspection, assessment and recording is the most crucial component of highway maintenance. The characteristics of the regime, including frequency of inspection, items to be recorded and nature of response, should be defined following an assessment of the relative risks associated with potential circumstances of network condition. These should be set in the context of the authorities' overall policy and maintenance strategy.

9.1.2 The inspection, assessment and recording regime should provide the basic information for addressing the core objectives of highway maintenance namely:

- network safety;
- network serviceability;
- network sustainability.

9.1.3 It will also provide the basic condition data for the development of programmes for maintenance as part of the Highway Asset Management Plan (HAMP).

9.1.4 All elements of the inspection and assessment regime should be applied systematically and consistently, in accordance with the principles of Quality Assurance. This is particularly important in the case of network safety, where information may be crucial in respect of legal proceedings. It is important to recognise, however, that all information recorded, even if not primarily intended for network safety purposes, may have consequential implications for safety and may therefore be relevant to legal proceedings. It is also important to recognise that, following the introduction of the Freedom of Information Act 2000, all records are potentially available for public inspection and reference.

9.2 CATEGORIES OF INSPECTION

9.2.1 Inspections and surveys can be considered in the following categories, approximately corresponding to the core objectives of highway maintenance.

Safety Inspections

9.2.2 Safety inspections are designed to identify all defects likely to create danger or serious inconvenience to users of the network or the wider community. The risk of danger is assessed on site, and the defect identified either as a Category 1 or 2, with an appropriate priority response.

Service Inspections

9.2.3 These mainly comprise more detailed inspections tailored to the requirements of particular highway elements to ensure that they meet requirements for

serviceability. The scale and scope of these inspections is optional and will be determined by an authority's approach to asset management planning. The category also includes inspections for regulatory purposes, including NRSWA, intended to maintain network availability and reliability. It also includes less frequent inspections for network integrity.

Condition Surveys

- 9.2.4 Condition surveys are primarily intended to identify deficiencies in the highway fabric which, if untreated, are likely to adversely affect its long term performance and serviceability.
- 9.2.5 Authorities in England and the Devolved Administrations are required to undertake condition surveys in order to satisfy the requirements of statutory performance indicators.
- 9.2.6 Authorities are not statutorily obliged to undertake inspections of all highway elements under all of these categories. They are, however, strongly advised to undertake safety inspections in accordance with the principles of this Code in order that, where necessary, they are able to support a defence under Section 58 of the Highways Act 1980, and equivalent legislation within the Devolved Administrations. This requires that a court shall have regard to '*whether the highway authority knew or could reasonably be expected to know, that the condition of the part of the highway to which the action relates was likely to cause danger to users of the highway*'.

General Requirements

- 9.2.7 Guidance for each category of inspection is provided in this section of the Code. This may be varied by authorities in the light of particular local circumstances, and the relative risks and consequences associated with these, but the extent of variations should be clearly identified, together with the reasons for their adoption.
- 9.2.8 The extent of detail to which the inspection regime is defined by authorities will depend upon the nature of their arrangements for procuring highway maintenance services. In the future, with certain contracts, the authority may decide to specify the outcome, leaving the contractor to determine means of delivery, which could include aspects of the inspection regime. In these circumstances, the authority will need to consider carefully the implications and the contractor should have regard to the issues identified by this Code in determining the inspection regime.

9.3 RECORDING AND MONITORING OF INFORMATION

- 9.3.1 An asset register may be used by authorities to record all inventory on their network for which they have an associated liability. This register may be in electronic or paper format but will form the basis of identifying which asset items safety and serviceability inspections should cover.
- 9.3.2 All information obtained from inspections and surveys, together with the nature of response, including nil returns, should be recorded consistently to facilitate analysis. Such analysis should enable the data from inspections to be reviewed independently, but also in conjunction with other survey information to enable a holistic view to be taken of maintenance condition and trends related to network characteristics and use.

9.3.3 The recording system should also provide for recording service requests, complaints, reports or information from users and other third parties. These may require immediate action, special inspection, or influence future inspection or monitoring arrangements. The nature of response, including nil returns, should also be recorded. All inspections should record as a matter of course: time, weather conditions, any unusual circumstances of the inspection and the person conducting the inspection

9.3.4 Arrangements should be made to review the inspection, assessment and recording regime at intervals to consider:

- changes in network characteristics and use;
- completeness and effectiveness of data collected;
- effectiveness of data analysis;
- the need for changes to the inspection regime derived from risk assessment.

9.3.5 The frequency of such reviews should be determined locally, having regard to the extent and nature of changing circumstances. The analysis will also be helpful for other purposes, however, and these might also influence the frequency of review, which should include the following:

- ensuring compliance with legal obligations;
- measuring performance of network serviceability and condition;
- establishing extent of outstanding work;
- seeking continuous improvement;
- monitoring service delivery arrangements.

9.4 SAFETY INSPECTIONS

9.4.1 Safety inspections are designed to identify all defects likely to create danger or serious inconvenience to users of the network or the wider community. Such defects should include those that will require urgent attention (within 24 hours) as well as those where the locations and sizes are such that longer periods of response would be acceptable.

9.4.2 They are normally undertaken by slow moving vehicle, at frequencies that reflect the characteristics of the particular highway and its use. In busy urban areas, particularly when inspecting footways, it may be difficult to obtain the necessary level of accuracy from vehicle-based inspections and walking should be used. It would seem logical for cycle routes to be inspected by cycle, although inspection of parts of some shared routes may be possible by vehicle.

9.4.3 Additional inspections may be necessary in response to user or community concern, as a result of incidents or extreme weather conditions, or in the light of monitoring information. These may be identified through the risk management process.

- 9.4.4 The safety inspection regime forms a key aspect of an authority's strategy for managing liabilities and risks. The report of the Roads and Highways Liability Claims Task Group, which will be published in Autumn 2005, and summarised in Appendix C, provides further advice.
- 9.4.5 The parameters which need to be specified for a safety inspection regime are:
- frequency of inspection;
 - items for inspection;
 - degree of deficiency;
 - nature of response.
- 9.4.6 The regime should be developed based on a risk assessment and provide a practical and reasonable approach to the risks and potential consequences identified. It should be considered in the same light as a Safety Audit and treated accordingly. The inspection regime should take account of potential risks to all road users, and in particular those most vulnerable.
- 9.4.7 Frequencies for safety inspections of individual network sections should be based upon consideration of:
- category within the network hierarchy;
 - traffic use, characteristics and trends;
 - incident and inspection history;
 - characteristics of adjoining network elements;
 - wider policy or operational considerations.
- 9.4.8 Although the category within the hierarchy, in combination with traffic use, will be the main determinant of inspection frequency, other factors should be taken into account in deciding whether consideration should be given to increasing or reducing the frequency. These should be taken into account, and an on-site 'reality check' undertaken where there is any uncertainty about the category to be applied. For example:
- road use might be at the margin of the category but have higher than normal levels of growth. Extensive development may be taking place or planned;
 - the section might have a higher than normal level of accidents or related incidents which would suggest unusually high levels of risk;
 - although traffic flows on the carriageway might be low, there might be high levels of pedestrians or cyclists;
 - the route might be the subject of promotion by the authority for example as a 'Safer Route to School' or access to a railway station. A cycling route may be part of the National Cycle Route Network;

- in urban areas, it may be desirable to combine footway and carriageway inspections to mitigate against problems associated with heavy traffic and parked cars;
- traffic composition might indicate unusually high proportions of particular users, for example motorcyclists or cyclists for whom surface condition is of particular importance.

9.4.9 The frequencies in Table 4 are based upon categories within the network hierarchy and are provided as a starting point, but in defining a safety inspection regime authorities should take into account all of the parameters listed.

Table 4 – Safety Inspection Frequency			
Feature	Description	Category	Frequency
Roads	Strategic Route	2	1 month
	Main Distributor	3(a)	1 month
	Secondary Distributor	3(b)	1 month
	Link Road	4(a)	3 months
	Local Access	4(b)	1 year
Footways	Prestige Area	1(a)	1 month
	Primary Walking Route	1	1 month
	Secondary Walking Route	2	3 months
	Link Footway	3	6 months
	Local Access Footway	4	1 year
Cycle Route	Part of Carriageway	A	As for Roads
	Remote from Carriageway	B	6 months
	Cycle Trails	C	1 year

9.4.10 Where carriageway and footway hierarchies intersect, for example at pelican or zebra crossings, bollards, or other defined crossing points at junctions, the footway hierarchy should always take precedence in determining of inspection frequencies, defect definition and responses. This principle should also apply to intersections between carriageways and cycle routes and between cycle routes and footways.

9.4.11 Authorities have not generally established specific systems for safety inspections for Public Rights of Way (PROW) based on hierarchy. Respective liabilities for safety are complex, and providing planned safety inspections similar to those for highway maintenance would exceed resources currently available.

9.4.12 Authorities generally provide combined inspections on PROW including safety, obstruction and all network management functions. These may be planned, for example annually, or responsive following user complaints. Many authorities have adopted an inspection regime that incorporates PROW with a metalled surface, particularly those within or on the fringe of urban areas, into the footway hierarchy, irrespective of their designation. This recognises users requirements for consistency in highway maintenance and is recommended good practice.

- 9.4.13 The Statement of Action required by Rights of Way Improvement Plans (ROWIPs) provides the opportunity for authorities to consider the relevance of a more formal system of safety inspections, for at least some parts of the network.
- 9.4.14 Although the frequencies of inspection for various features are consistent with the various categories of hierarchy, there are particular circumstances which, because of their very nature and importance, could result in increased risk of damage or injury to highway users. These should be taken into account through the risk assessment procedure and clearly identified in the risk register. These circumstances relate to special usage or vulnerable users, such as :
- access to schools, hospitals and medical centres;
 - vulnerable users or people with special needs – old people’s homes etc;
 - ceremonial routes and special events.
- 9.4.15 Where footways or cycle routes remote from carriageways form part of an integrated route or network intended to encourage walking and cycle use, or are promoted by the authority, consideration should be given to adopting a consistent safety inspection frequency, for the route or network as a whole.
- 9.4.16 An example of highway items to be included in safety and other inspections is provided in Appendix B. This is provided for guidance only and local circumstances will apply.
- 9.4.17 During safety inspections, all observed defects that provide a risk to users should be recorded and the level of response determined on the basis of risk assessment. The degree of deficiency in highway elements will be crucial in determining the nature and speed of response. Although some general guidance can be given on the likely risk associated with particular defects, on-site judgement will always need to take account of particular circumstances. For example the degree of risk from a pothole depends upon not merely its depth but also its surface area and location.
- 9.4.18 This Code defines defects in two categories, which correspond with those adopted in England by the Highways Agency (HA) in respect of motorways and trunk roads:
- Category 1 - those that require prompt attention because they represent an immediate or imminent hazard or because there is a risk of short-term structural deterioration.
 - Category 2 - all other defects.
- 9.4.19 Category 1 defects should be corrected or made safe at the time of the inspection, if reasonably practicable. In this context, making safe may constitute displaying warning notices, coning off or fencing off to protect the public from the defect. If it is not possible to correct or make safe the defect at the time of inspection, which will generally be the case, repairs of a permanent or temporary nature should be carried out as soon as possible, and in any case within a period of 24 hours. Permanent repair should be carried out within 28 days. Some authorities have formally adopted a higher level response time of 2 hours for those Category 1 defects considered to pose a particularly high risk. Others, whilst not formally

defining such a high risk category, have arrangements in place to deal with situations requiring a particularly urgent response as they arise.

- 9.4.20 Category 2 defects are those which, following a risk assessment, are deemed not to represent an immediate or imminent hazard or risk of short term structural deterioration. Such defects may have safety implications, although of a far lesser significance than Category 1 defects, but are more likely to have serviceability or sustainability implications. These defects are not required to be urgently rectified, and those for which repairs are required shall be undertaken within a planned programme of works, with the priority as determined by risk assessment. These priorities together with access requirements, other works on the road network, traffic levels, and the need to minimise traffic management, should be considered as part of the overall asset management strategy. The programmes of work for their rectification should be part of the HAMP.
- 9.4.21 Category 2 defects may be categorised according to priority, high (H) medium (M) and low (L). Authorities should adopt a range of local target response times for Category 2 defects and apply them in responding to various categories of defect, based on the risk probability and its likely impact. This should also take into account the likelihood of further deterioration before the next scheduled inspection, and where this is a high probability, the defect should either be dealt with as Category 1 or an intermediate special inspection programmed.

9.5 DEFECT RISK ASSESSMENT

- 9.5.1 The principles of a system of defect risk assessment for application to safety inspections are set out below. A number of authorities have adopted arrangements based on these principles, which are recommended as good practice. Any item with a defect level which corresponds to, or is in excess of, the stated defect investigatory level adopted by the authority, is to be assessed for likely risk. The recommended procedure for risk assessment is as follows.

Risk Identification

- 9.5.2 An inspection item for which the defect investigatory level is reached or exceeded is to be identified as a risk. The suggested inventory to be observed and examples of investigatory levels are detailed in Appendix B.

Risk Evaluation

- 9.5.3 All risks identified through this process have to be evaluated in terms of their significance, which means assessing the likely impact should the risk occur and the probability of it actually happening. A defect risk register will considerably assist the risk evaluation process. Although it may not be possible to include every conceivable risk, the register identifies a wide range of risks likely to be encountered. This enables the vast majority of all risks actually encountered through comparison, interpolation or extrapolation, to be assessed with the identified risks. The risks contained in the register are based upon the highest assumed risk attributable to the type of defect, position and assessed type of usage. Local knowledge could assess the risk differently.

Risk Impact

9.5.4 The impact of a risk occurring should be quantified on a scale of 1 to 4 assessed as follows:

- little or negligible impact;
- minor or low impact;
- noticeable impact;
- major, high or serious impact.

9.5.5 The impact is quantified by assessing the extent of damage likely to be caused should the risk become an incident. As the impact is likely to increase with increasing speed, the amount of traffic and type of road are clearly important considerations in the assessment.

Risk Probability

9.5.6 The probability of a risk occurring should also be quantified on a scale of 1 to 4 assessed as follows:

- very low probability;
- low probability;
- medium probability;
- high probability.

9.5.7 The probability is quantified by assessing the likelihood of users, passing by or over the defect, encountering the risk. As the probability is likely to increase with increasing vehicular or pedestrian flow, the network hierarchy and defect location are, consequently, important considerations in the assessment.

Risk Factor

9.5.8 The risk factor for a particular risk is the product of the risk impact and risk probability and is therefore in the range of 1 to 16. It is this factor that identifies the overall seriousness of the risk and consequently the appropriateness of the speed of response to remedy the defect. Accordingly, the priority response time for dealing with a defect can be determined by correlation with the risk factor, as shown in the Risk Matrix in Table 5 below.

Risk Management

9.5.9 Having identified a particular risk, assessed its likely impact and probability and calculated the risk factor, the category and the timescale to rectify the defect should be either defined as Category 1 response or allocated to one of the locally determined timescales for rectifying Category 2 defects as described in Section 9.4. The response category is represented by the coloured cells in Table 5 below.

Table 5 – Risk Matrix				
Probability →Impact↓	Very low (1)	Low (2)	Medium (3)	High (4)
Negligible (1)	1	2	3	4
Low (2)	2	4	6	8
Noticeable (3)	3	6	9	12
High (4)		8	1	16
Response Category	Category 2(L) response	Category 2(M) response	Category 2(H) response	Category 1 response

9.5.10 This approach is similar to that adopted by the Northern Ireland Roads Service who specify four categories of response time, relating these to specified categories of defect and the level of road hierarchy. These response time categories are:

R.1 make safe or repair within 24 hours;

R.2 make safe or repair within 5 working days;

R.3 repair within 4 weeks;

R.4 repair during the next available programme, schedule more detailed inspection, or review condition at next inspection, based on an assessment of the risk of deterioration before next visit.

9.5.11 Where defects with potentially serious consequences for network safety are made safe by means of temporary signing or repair, arrangements should be made for a special inspection regime to ensure the continued integrity of the signing or repair is maintained, until a permanent repair can be made.

***New Paragraph
Added 14 May 2009***

9.5.12 A model based on risk assessment principles has been developed to allow the calculation of the cost of claims for footways. The model is described in a report that was published in 2007. The report describes the application of risk management techniques to the management and maintenance of footways and cycle tracks, essentially to address the physical risk of accidents to pedestrians and cyclists resulting from the construction and maintenance of footway and cycle track surfaces. Detailed advice on risk management is given in relation to policy and categorisation, and on strategic, tactical and operational issues. A risk assessment model for footways is currently under development to calculate the number of accidents on a local highway networks. The model is based on deriving the probability that a person walking over a given defect will fall and be injured, and on the assumption that the number of defects on the network will be a dynamic balance between the rate at which they appear and the rate at which they

are repaired. A software tool containing this model is under development. More information may be found from the following website.

http://www.footways.org/data/uploads/PPR171_Development%20of%20a%20Risk%20Analysis%20Model%20for%20Footways%20and%20Cycle%20Tracks.PDF

9.6 SAFETY INSPECTION OF HIGHWAY TREES

- 9.6.1 Trees are important for amenity and nature conservation reasons and should be preserved but they can present risks to highway users and adjoining land users if they are allowed to become unstable. In England and Wales the highway authority is also responsible for ensuring that trees outside the highway boundary, but within falling distance, are safe. All trees within falling distance are collectively termed 'highway trees'. Section 154 of the Highways Act 1980 empowers the authority to deal, by notice, with hedges, trees and shrubs growing on adjacent land which overhang the highway, and to recover costs.
- 9.6.2 Safety inspections should incorporate highway trees, including those outside but within falling distance of the highway. Inspectors should take note of any encroachment or visibility obstruction and any obvious damage, ill health or trip hazards. A separate programme of tree inspections, however, should be undertaken by arboricultural advisors.
- 9.6.3 Authorities should include some basic arboricultural guidance in training for inspectors but it is important that arboricultural advice is obtained to advise on the appropriate frequency of inspections and works required for each individual street or mature tree, based on assessment of respective risks.
- 9.6.4 Extensive root growth from larger trees can cause significant damage to the surface of footways, particularly in urban areas. A risk assessment should therefore be undertaken with specialist arboricultural advice on the most appropriate course of action, if possible to avoid harm to the tree. In these circumstances, it may be difficult for authorities to reconcile their responsibilities for surface regularity, with wider environmental considerations and a reduced standard of regularity may be acceptable.
- 9.6.5 Overhanging branches may present a risk to buildings adjoining the highway. In such circumstances the necessary comprehensive consideration of respective risks and liabilities of the authority and landowner will require specialist technical, arboricultural and legal advice to determine the most appropriate course of action.

9.7 SAFETY INSPECTION OF ELECTRICAL INSTALLATIONS, LIGHTING, ILLUMINATED SIGNS AND SIGNALS

- 9.7.1 The presence of electrical equipment on highways relating primarily to road lighting, illuminated traffic signs and signals requires special attention to ensure the safety of users and the community. The failure of street lighting and illuminated signs and signals could have implications for the safety of users. It will therefore be necessary for authorities to establish priorities for responding to reported lamp failures, together with a regime of regular monitoring based on principles of risk assessment. Detailed advice on inspections associated with street lighting is included in the *Well-lit Highways Code of Good Practice for Road Lighting Maintenance* published November 2004.

- 9.7.2 Immediate attention should be paid to any damage or defect which could result in exposure of live cables and detailed advice on this is also provided by the Lighting Code of Practice.

9.8 SKIDDING RESISTANCE SURVEY REQUIREMENTS

**Website Amended
27 April 2012**

- 9.8.1 The HA have revised their skidding resistance standard, HD28/04, and the County Surveyors Society (CSS) has subsequently prepared guidance on how these changes should be reflected on treatment of highways, for which local authorities are responsible. This section of the Code is based on a summary of these guidelines (<http://www.adeptnet.org.uk/assets/userfiles/documents/000041.pdf>).
- 9.8.2 Advice on early life skid resistance is specifically excluded from HD28/04 but is addressed in Interim Advice Note IAN 49/03. Authorities should state in their Skid Resistance Strategies that they will follow the requirements of IAN 49/03, or produce an Early Life Skid Resistance Strategy that is based generally on the requirements of IAN 49/03.

**Paragraph Amended
Added 14 May 2009**

**Paragraph Amended
27 May 2011**

- 9.8.3 Concerns have been raised with regard to early life skid resistance and horses slipping on negatively textured new surfaces. CSS (now ADEPT) and the British Horse Society worked in partnership to produce a report that considers the use of Stone Mastic Asphalt in highway maintenance schemes and its impact on horse riders. The report recommends that a surface treatment to increase friction may be appropriate. The report may be ordered from the ADEPT web site: (Report ENG/3-05 (January 2006)).

**Website Amended
27 April 2012**

<http://www.adeptnet.org.uk/assets/userfiles/documents/000144.pdf>



- 9.8.4 The maintenance of adequate levels of skidding resistance on running surfaces is a most important aspect of highway maintenance, and one that contributes significantly to network safety, particularly for riders of motorcycles. However, whilst the frequency of accidents is expected to increase as skidding resistance falls, the effect will be more pronounced for more 'difficult' sites and there is no skidding resistance boundary at which a surfacing passes from being 'safe' to 'dangerous'. Difficult sites are those where the geometry, for example, bends, junctions, steep gradients, pedestrian crossings and traffic signals increase the risks of skidding accidents.
- 9.8.5 Authorities should appoint a member of staff to be responsible for the duties described in this section, in particular, setting investigatory levels, leading site investigations and reviewing investigatory levels. Where an authority decides to contract out this work, it is important that the authority appoints a member of staff to approve any work undertaken by other parties.
- 9.8.6 Authorities should publish their Skid Resistance Strategy as part of their HAMP. The strategy, which should be informed by risk assessment, should define:
- the network to which it applies taking account of traffic flow and characteristics and accident risk;
 - the test equipment to be used, i.e. SCRIM or Grip Tester. Authorities should state if they will use the Pendulum Skid Tester for detailed investigations;
 - the method of survey to be used to provide an estimate of the summer skid resistance, referred to as the Characteristic SCRIM Coefficient (CSC). Authorities can choose between the Single Annual Survey Method, Mean Summer SCRIM Coefficient Method, or Annual Survey with Benchmark Method;
 - Quality Assurance procedures for data collection;
 - frequency of surveys;
 - the approach to setting investigatory levels, including the range of investigatory levels which are to be used for different categories of site. This should be based on the table in HD28/04, but may have additional categories, for example for urban roads. Any deviations from the HD28/04 table must be justified;
 - frequency of re-assessment of investigatory levels;
 - list of staff authorised to set or approve investigatory levels;
 - the approach to be followed in site investigation, including prioritisation of investigations, and staff authorised to undertake site investigations. Each site investigation should be undertaken or led by personnel experienced in pavement engineering;
 - how remedial works will be prioritised in relation to available funding in the overall context of the HAMP;

- whether they will follow IAN 49/03 or produce their own strategy for dealing with early life skid resistance;
 - a realistic/achievable timetable for each part of the strategy;
 - responsibilities for delivering each part of the strategy;
 - the documentation to be retained to enable implementation of policy to be demonstrated (in court if necessary).
- 9.8.7 Authorities should note that the table in HD 28/04 is significantly different from that in HD28/94 and there is more scope for judgement in setting investigatory levels. Authorities should define the criteria used to set investigatory levels and in what circumstances these may vary from the values in HD28/04, for example in assigning a lower investigatory level to urban roads with a speed limit of 30 mph or less. This may best be achieved by the authority publishing a replacement table for its own network. Any reduction in investigatory level below that in the HD28/04 standard must be fully justified, for example by evidence from skidding accident statistics. The decisions taken when setting investigatory levels should be recorded dated and signed.
- 9.8.8 Investigatory levels should be reassessed whenever a significant change to the network is made, for example the installation of traffic lights, a pedestrian crossing, or roundabout. The investigatory levels for the full defined network should be reviewed every three years, or as a result of risk assessment.
- 9.8.9 Authorities need to decide whether to use SCRIM or Grip Tester for network testing and whether they will use Grip Tester or the Pendulum Skid Tester (recommended for localised investigations only). The Roads Board intend to undertake research into the correlation between Grip Tester and SCRIM in 2005/06, the conclusion of which will be included in an update of this Code.
- 9.8.10 Authorities have to decide between the traditional method of testing one third of the network three times each year (the Mean Summer SCRIM co-efficient (MSSC) method), the full network once a year, with benchmark sites tested three times a year (the Annual Survey with Benchmark Method), or the full network once a year (the Annual Survey method). The latter is recommended as this reduces between-year variations of skid resistance, as well as within-year variations. The characteristic SCRIM co-efficient (CSC) is derived from whichever of the above methods is used.
- 9.8.11 Authorities moving from the MSSC method to the Annual Survey method will have to establish a transitional procedure. Those authorities currently surveying one third of their network three times a year can make the transition as follows, in Table 6, where A, B and C are each one third of the network.
- 9.8.12 All sites where the skid resistance is at or below investigatory level should be investigated as soon as is practicable. The site investigations should be undertaken in a prioritised order, by personnel experienced in pavement engineering, consulting persons with relevant local knowledge, including the person responsible for accident investigation and prevention. Site investigations should also be undertaken at sites where wet or skidding accident levels have increased.

Table 6 – Transition from MSSC Method to the Annual Survey Method

	A	B	C
Year 1	Tested 3 times	Not tested	Not tested
Year 2	Test once, early season	Test 3 times	Test once, early season
Year 3	Test once mid season	Test once, mid season	Test 3 times
Year 4	Test once late season	Test once late season	Test once late season
Year 5	Test once early season	Test once early season	Test once early season

- 9.8.13 The results of the investigations, including whether further action is required, should be documented and retained, together with the identity of the assessor and other parties consulted.
- 9.8.14 Where the skid resistance is considerably below the Investigatory Level (0.10 CSC units below Investigatory Level may be an appropriate figure) slippery Road signs should be erected as a matter of urgency.
- 9.8.15 In other cases Slippery Road signs should be erected at locations where a site investigation has shown that there is a need for treatment to improve skid resistance.
- 9.8.16 Slippery Road signs should be removed as soon as they are no longer required. This should be after the remedial action has been taken and maintenance engineers are satisfied that skidding resistance levels have been returned to an appropriate level. In some cases this will not be immediately after treatment, for example at sites where surface binder has to be worn off before the skid resistance becomes adequate.
- 9.8.17 Where skidding resistance is determined as being substantially below the Investigatory Level (0.10 CSC units below Investigatory Level may be an appropriate figure) and there are clear indications that improving the condition of the surfacing is likely to significantly reduce the risk of accidents occurring then remedial treatment should be prioritised as a relatively urgent task.
- 9.8.18 Priority should then be given to the following sites:
- where the skid resistance is at least 0.05 CSC units below the investigatory level;
 - where low skid resistance is combined with low texture depth;
 - where the accident history shows there to be a clearly increased risk of wet or skidding accidents.
- 9.8.19 Where investigations show that treatment is necessary, consideration should also be given to whether other measures may be more appropriate. Surface treatment may not always be a necessary response and other measures to reduce the accident risk of the site may be both more cost effective and consistent with local transport policy.

9.9 SERVICE INSPECTIONS GENERAL REQUIREMENTS

- 9.9.1 Service inspections should be strongly focused on ensuring that the network meets the needs of users and comprise more detailed specific inspections of particular highway elements, to ensure that they meet the levels of service defined within the HAMP. These surveys are optional and are dependent upon the asset management regime adopted by the authority to determine programmes of work. Any safety defects encountered during service inspections should be assessed as being either Category 1 or Category 2 and dealt with in accordance with the requirements of the safety inspection regime. Some items identified in Appendix B of this Code may require both service and safety inspections. Where this is the case, these inspections may be combined taking due consideration for the difference in investigatory levels.
- 9.9.2 This category also includes inspections for regulatory purposes, including NRSWA, which are also primarily intended to maintain network availability and reliability. It also includes less frequent inspections for network integrity. The extent of the service inspection regime adopted by authorities is discretionary and the advice given in the following paragraphs may be subject to considerable local variation in the light of individual circumstances.
- 9.9.3 Risk assessments for service inspections are dealt with differently to safety inspections. In regard to safety related defects, risk assessments are based purely on the safety aspect and defects must be rectified in accordance with the timescales appropriate to their significance. Serviceability related defects, however, are mainly related to network reliability and integrity and the ability of the network to meet the needs of users. Risks should be assessed by reference to the HAMP by taking due consideration of standards, relative priorities and available budget.
- 9.9.4 As part of developing their asset management regime, authorities may develop individual risk assessments for each service inspection identified in this Code, following a similar procedure to that identified for safety inspections. This risk based approach to service inspections will be the basis for identifying the need, frequency and period for remedial action for each of the service inspection items.
- 9.9.5 The approach of this edition of the Code has been to adopt throughout the principles and practice of risk management. However, it is accepted that many authorities may not be sufficiently well advanced in their asset management planning to fully adopt this approach. Accordingly, in Sections 9 and 10 of the Code, where reference is made to risk assessment being used to derive inspection frequencies for service inspections, default values will also be suggested. These default values will usually be based on the current edition of the Trunk Road Maintenance Manual (TRMM).

9.10 SERVICE INSPECTIONS FOR CARRIAGEWAYS, FOOTWAYS AND CYCLE ROUTES

- 9.10.1 Service inspections for carriageways, footways and cycle routes will generally be undertaken at less frequent intervals than safety inspections. This Code makes no recommendation in respect of frequency, as this will be a matter for local determination, based on local user and community requirements for network serviceability and identified as part of the HAMP. They may be undertaken separately, or in conjunction with safety inspections and certain aspects of service

inspections can be incorporated as part of other visual inspections, such as the CVI or DVI regime for UKPMS. These surveys may be undertaken either by slow moving vehicle or on foot depending upon the circumstances.



- 9.10.2 Where footways, cycle routes or PROW remote from carriageways form part of an integrated route or network intended to encourage walking or cycle use, consideration should be given to adopting a consistent service inspection frequency for the route or network as a whole.

***New Paragraph
Added 14 May 2009***

- 9.10.3 The Footways & Cycletrack Management Group (FCMG) (Figure 1) has established a website to promote awareness of the work of the FCMG in general and through the publication of project reports and consultation papers where appropriate. More information may be found from the following website.

www.footways.org/

9.11 SERVICE INSPECTION OF HIGHWAY DRAINAGE SYSTEMS

- 9.11.1 In general inspection of drainage has proved problematic to authorities for a variety of reasons, including inaccurate records of drainage locations, uncertainty of ownership and lack of resources. In order to mitigate some of these problems, authorities should adopt a risk based approach to identifying the condition of their drainage network as described below.
- 9.11.2 A risk based approach would identify the risk associated with inadequate serviceability from, for example:
- gullies, grips and ditches, which may be obstructed by the growth of vegetation or damaged by traffic (in most cases the responsibility for maintenance of ditches will rest with the adjoining landowner);
 - culverts under roads which may be affected by blockage, subsidence or structural damage;
 - other piped drainage which may be affected by blockage or subsidence;

- sustainable urban drainage systems (SUDS), which may require special maintenance attention for maximum effectiveness;
- surface boxes and ironwork for both drainage and non-drainage applications, which may be affected by subsidence or obstructed access.



9.11.3 Authorities should identify the risks associated with these drainage elements and determine an inspection regime that would meet the expected levels of service. Where possible and in order to create greater efficiency, these inspections should be combined with safety inspections, particularly in the case of gullies and ironwork. Culverts under roads should be inspected every five years by default, and more frequently in wooded areas.

9.11.4 Fundamental in the development of this risk based approach is the identification of areas that may be particularly susceptible to risk of flooding, either from topological factors outside the highway or from frequent silting of systems. Frequency of these inspections will depend on local circumstances but again could form part of safety inspections. They should be carried out during or immediately following periods of heavy rain as opportunity allows. Further information on this is contained in Section 14 Weather and Other Emergencies.

9.12 SERVICE INSPECTION OF EMBANKMENTS AND CUTTINGS

9.12.1 Significant embankments and cuttings should be defined and an inspection regime identified based upon the geological characteristics and the potential risk of slippages or rockslides. Service inspection arrangements should be based on specialist geotechnical advice, but should usually be programmed wherever possible to follow periods of heavy rain, severe frost or prolonged dry weather. A risk based approach should be adopted to identify any issues critical to network performance, after which an enhanced service inspection regime should be adopted.

9.13 SERVICE INSPECTION OF LANDSCAPED AREAS AND TREES

9.13.1 Highway trees contribute to amenity and nature conservation and in urban areas can enhance the space between buildings, reinforcing the area's character and appeal. Close co-operation between arboriculturalists, highway engineers, landscape architects and urban designers is essential to preserve and enhance

the range and quality of street trees. Avenues, boulevards, town squares and formal spaces, and informal rural locations all require the application of different planting principles. Trees and planting should reflect the history, architecture and tradition of places. Small pockets of poor quality planting can undermine the quality of the streetscape.

- 9.13.2 Street trees and planting are not appropriate in every instance. Trees and planting should always form part of the overall urban context, and not be added or preserved without question.
- 9.13.3 Authorities should develop, with advice from arboriculturalists, landscape architects and urban designers, a policy for the installation, management, removal and replacement of highway trees and landscaping. The policy should recognise the amenity and nature conservation value of trees and also seek constructively to manage ongoing risk to the authority. The policy should include the approach to service inspections, to be undertaken by arboriculturalists, including frequency, for various types of tree.
- 9.13.4 Most trees should ideally have an arboricultural inspection every five years but this period may be reduced on the advice of an arboriculturalist. Default intervals is for arboricultural inspections at least every five years.

9.14 SERVICE INSPECTION OF FENCES AND BARRIERS

- 9.14.1 Steel and wire rope safety fences and pedestrian guard rails should be inspected at regular intervals determined through risk assessment in respect of mounting height, surface protective treatment and structural condition, to ensure that they remain fit for purpose. Tensioning bolts of tensioned safety fences should be checked and reset to correct torque at intervals determined by risk assessment, or by default every 2 years. Safety barriers adjacent to bridges should be inspected as part of the highway asset.
- 9.14.2 Inspection and testing of safety barriers with respect to mounting height and integrity should be undertaken by default no less frequently than 5 years. Sections of safety fence that are found to be mounted at heights outside the limits specified or for which structural integrity is not in doubt, should be treated as Category 2 defects.
- 9.14.3 Pedestrian safety fences and guard rails are used primarily in urban areas at busy road junctions and to encourage use of pedestrian crossings rather than other, potentially unsuitable, locations. Damaged sections should be treated as Category 1 defects and made safe within 24 hours, unless damage is clearly superficial with no loss of integrity of the fence or barrier.
- 9.14.4 Pedestrian safety fences, boundary fences and environmental barriers for which the authority is responsible, should be also inspected in respect of integrity, and where appropriate stock proof qualities, during the course of service inspections of carriageways, footways and cycle routes. A higher frequency may be necessary in some locations (e.g. in areas with known higher incidence of vandalism). Inspections of structural condition and protective treatment should be carried out at regular intervals. All inspection intervals should be determined using a risk based approach, or by default every 2 years.

Website Amended
27 April 2012

9.14.5 Safety barriers and fences adjacent to railway lines should be inspected by the highway authority irrespective of liability. Generally, inspection intervals should be determined using a risk based approach. The DfT publication *Managing the Accidental Obstruction of the Railway by Road Vehicles* provides more guidance on this (<http://www.dft.gov.uk/publications/tal-6-03/>).

9.15 SERVICE INSPECTION OF TRAFFIC SIGNS AND BOLLARDS

9.15.1 Traffic signs are the most visible elements of the highway network, highly valued by users, and contribute significantly to network serviceability through facilitating efficient and effective use of the network.

9.15.2 The primary objective is to keep all traffic signs legible, visible and effective as far as possible at all times in relation to the road use and traffic speeds. The following defects in signs and bollards should be treated as Category 1 defects. The speed of permanent repair will depend on the degree of danger but important warning and regulatory signs should be replaced as a matter of urgency:

- matters affecting the legality of important warning and regulatory signs;
- damage, deterioration, or vandalism to signs and bollards leaving either the sign or situation to which it applies in a dangerous condition;
- missing traffic cylinders across gaps in central reserve fence at emergency crossing points.

9.15.3 Vegetation potentially obscuring road signs should be recorded during safety inspections and service inspections of carriageways, footways and cycle routes, and treated accordingly. Additional inspections may be needed during periods of maximum growth (May-June).

9.15.4 Special signing schemes, for example blockwork chevron treatments at roundabouts and traffic calming schemes using special signing may deteriorate more quickly than conventional signing. They are also likely to have been installed to improve network safety. Inspection arrangements should reflect this. Blockwork chevrons are likely to need inspecting and cleaning at a frequency determined by risk assessment or by default annually.

9.15.5 The condition of non-illuminated road signs should be inspected in daylight, and also at night for degradation of colour, retro-reflectivity, deteriorating fittings, legibility distance, and average surface luminance, after cleaning. The frequency is to be determined by risk assessment or every two years by default. More frequent inspections may be necessary for strategic routes and main distributors, where more consistent high standards are desirable. Cleaning may be necessary annually, or more frequently where subject to heavy soiling.

9.15.6 Optical inspections and cleaning of illuminated signs should be carried out at regular intervals determined by risk assessment or by default every two years. A visual inspection of the sign supports should be carried out at the same time. Night-time inspections should be undertaken in conjunction with those for street lighting faults. Due to the legal requirements for the illumination of traffic signs, it is

recommended that a group lamp replacement strategy be adopted for illuminated traffic signs and bollards. The lamp replacement period will depend upon the type of lamp and its annual burning hours. Monitoring is also referred to in *Well-lit Highways – Code of Good Practice for Road Lighting Management*.

- 9.15.7 Inspections should initially be visual, and condition assessed against the criteria set out in TD 25/01. Any suspect areas identified by the visual inspection should be noted and further testing as described in TD 25/01 instigated. The coefficient of retro-reflection of sign face sheeting is a specialist site test that may require the services of a specialist organisation. TD 25/01 states that the acceptable level of retro-reflection is 80% of the 'as new' value for motorways and trunk roads, where higher performance materials are used. Authorities will obviously wish to allow for local variation, and choose sign performance levels depending on the overall risk assessment and road hierarchy, but the 80% of the 'as new' level should be applied for replacement planning purposes.
- 9.15.8 Inspection of Stop and Give Way Signs at minor roads should be included in the inspections of signs on the major road to which they control entry.
- 9.15.9 Service inspections should ideally identify signing that is inappropriate or no longer necessary and may be a distraction to users, or detrimental to the streetscene. Such signing should be noted for removal or replacement either as part of future programmed works or more urgently, if necessary.

***New Paragraph
Added 24 May 2013***

- 9.15.10 Over-provision of traffic signs can have a detrimental impact on the environment and can dilute more important messages if resulting in information overload for drivers. The Department for Transport published a Traffic Advisory Leaflet (TAL 1/13) which gives practical advice on reducing sign clutter. It emphasises that designers should use their engineering judgement and local knowledge to complement guidance to ensure signing solutions are effective. The leaflet may be downloaded from the following website:

<https://www.gov.uk/government/publications/reducing-sign-clutter>

9.16 SERVICE INSPECTION OF ROAD MARKINGS AND STUDS

- 9.16.1 Inspections in respect of wear, spread, colour, skid resistance and retro-reflectivity shall be undertaken for paint markings and for thermoplastic markings, at frequencies determined by risk assessment, or by default one year and two years respectively. Inspections for reflective conspicuity should be carried out during the hours of darkness and programmed to enable maintenance works to be completed before the onset of winter.
- 9.16.2 The standard TD 26/04 has recently been issued for the trunk and motorway network. A CSS Task Group has been appointed to review the document and produce guidelines for local roads in England. This document will be available late summer 2005.

9.17 SERVICE INSPECTION OF ROAD TRAFFIC SIGNALS AND PEDESTRIAN CROSSINGS

- 9.17.1 Service inspections of road traffic signals will not usually be necessary in relation to the functioning of the internal equipment, as this will usually be provided through remote monitoring of the installation. The remote monitoring system may also identify the need for lamp replacement, but bulk changing is likely to be preferred. Signal lenses should be cleaned at a frequency based on risk assessment or by default annually.
- 9.17.2 Service inspections of the physical condition of controller and auxiliary equipment cabinets and of other site hardware, and inspections in respect of electrical safety, should be carried out at intervals determined through risk assessment or by default annually. Guidance on aspects to be inspected and on defect criteria is given in TD 24/97. Inspections should be visual, by remote monitor or by approved test equipment as detailed in TD 24/97.
- 9.17.3 For pedestrian crossings, scouting for illumination should be undertaken in conjunction with street lighting night-time inspections, unless otherwise indicated by risk assessment. Optical cleaning should be undertaken to a frequency determined by risk assessment, or by default every two years. Electrical safety inspections should be undertaken in accordance with the advice in *Well-lit Highways – Code of Practice for Road Lighting Management*.

9.18 SERVICE INSPECTIONS FOR ROAD LIGHTING

- 9.18.1 Service inspections of road lighting are not dealt with by this Code and reference should be made to *Well-lit Highways, Code of Practice for Road Lighting Management*.

9.19 SERVICE INSPECTIONS OF BRIDGES AND STRUCTURES

- 9.19.1 Structural inspections of bridges and structures are dealt with in *Management of Highway Structures – A Code of Practice* due for publication in autumn 2005.

9.20 SERVICE INSPECTIONS FOR NETWORK INTEGRITY

- 9.20.1 Although each element of each component within each category of network hierarchy might be well maintained within the framework of an overall asset management strategy, the network might still not deliver best value, as the asset might not be performing to optimum efficiency. Operational efficiency is primarily a network management consideration but aspects of it are closely related to the maintenance function, for example:
- traffic signs or markings may be poorly sited or the legend may be either incorrect, confusing or not reflect current priorities;
 - traffic signs or markings may be redundant;
 - facilities for walking, cycling or public transport might be discontinuous or poorly defined. Opportunities for installation of dropped kerbs or textured paving should be taken;
 - opportunities might be taken to modify layout as part of future relevant maintenance schemes.

- 9.20.2 Such network deficiencies are unlikely to be noted as part of safety, or condition inspections, but are nevertheless relevant to network efficiency. It is therefore suggested that authorities undertake service inspections of network integrity at intervals determined by risk assessment, or by default three to five years, and that the outcome of such surveys be taken account of in planning of network maintenance and improvements.
- 9.20.3 Further guidance on surveys of network integrity for cycling and walking are given in IHT Guidelines on the conduct of Cycling and Walking Review.

9.21 GENERAL REQUIREMENTS OF CONDITION SURVEYS

- 9.21.1 The most significant financial investments in highway maintenance will be in repairing, reconditioning and reconstructing highway pavements, in particular those of carriageways. Condition surveys identify the current condition of the network and from this condition, both long-term and short-term maintenance funding decisions can be made. Repeatable condition surveys allow trend analysis to be used to confirm the original decisions or allow for changes as a result of the changing network condition.
- 9.21.2 As part of their HAMP, authorities will need to demonstrate value for money from investment in maintenance to meet the serviceability requirements. Authorities will therefore need to have available information on the nature and severity of deterioration, in order to determine the most appropriate maintenance treatment. There are a number of types of survey, each providing information from a differing perspective, and which in combination can provide a comprehensive picture of the condition of the asset.
- 9.21.3 These surveys may broadly be sub-divided into network level and project level. At network level surveys may include:
- SCANNER (Surface Condition Assessment of the National Network of Roads);
 - Coarse Visual Inspections (CVI);
 - skidding resistance (SCRIM or Grip Tester);
 - detailed visual surveys (DVI) for footways.
- 9.21.4 Network level surveys may be supplemented at a local or project level by further investigation. The nature of this investigation will depend on the circumstances of the case. Survey methods include:
- Deflectograph;
 - Falling Weight Deflectometer (FWD);
 - Ground Penetrating Radar (GPR).
- 9.21.5 Basic information on each of these methods is given in this Code, together with further details in Appendix E on how the information is used in developing a survey regime.

9.22 CONDITION SURVEY REQUIREMENTS

- 9.22.1 SCANNER surveys became mandatory in England in 2004/5 for reporting of BVPI 223 (previously BVPI 96), Condition of Principal Roads, and will be mandatory from 2005/6 for reporting BVPI 224a (previously BVPI 97a) Condition of Non-Principal Classified Roads. SCANNER surveys were mandatory in Scotland from 2001-02 as part of the Scottish Road Maintenance Condition Survey (SRMCS).



- 9.22.2 SCANNER surveys are traffic speed surveys that follow similar principles to the HA's TRACS surveys. These surveys collect data on transverse and longitudinal profiles, texture and cracking of pavements. These are fast surveys with real time processing of condition information, that were introduced with the aim of providing both reliable and repeatable information, for the assessment of pavement condition.
- 9.22.3 CVI will eventually be replaced as a mandatory survey for classified roads by SCANNER, for all parts of the network where its use is practically feasible. CVI is normally carried out from a slow moving vehicle, complemented in some cases with machine measured rut depth data. In the meantime however CVI remains a fast, cost-effective survey that enables authorities to cover large parts of their road network on a regular basis. Rather than recording detailed measurements of individual defects, the survey identifies and categorises lengths of features having generally consistent defectiveness.
- 9.22.4 DVI is used to report BVPI 187 for Category 1A, 1 and 2 footways. It may also be used on carriageways where more detailed information is required to support and validate treatment decisions and scheme identification (supplementing CVI data), and also on a cyclical basis for those parts of the network where a more detailed routine visual assessment is required (e.g. in urban areas). DVI can also be used for concrete carriageways. Segregated cycle routes may also be surveyed by DVI.
- 9.22.5 Network surveys such as SCANNER and CVI provide regular whole network coverage and are used to target more detailed investigations of provisional treatments, using more detailed project level surveys. These are described in more detail in Appendix E.
- 9.22.6 It is recommended that, as a minimum, surveys are carried out to support the requirements of statutory indicator reporting, and to support participation in the NRMCS and SRMCS. In addition, surveys over and above this minimum should be carried out to support local need.

- 9.22.7 Details for good practice survey regimes, to be adopted on local authority roads in England and other parts of the UK, are also summarised in Appendix E.

***New Paragraph
Added 14 May 2009***

- 9.22.8 The SCANNER User Guide was published in 2007 incorporating guidance on the use of the equipment, to support local authorities through all stages of collecting SCANNER information, from procurement of surveys to data use. The Guide includes 5 volumes.

Volume 1 – Introduction to SCANNER

Volume 2 – Advice to Local Authorities – Procuring Surveys

Volume 3 – Advice to Local Authorities – Using SCANNER Survey Results

Volume 4 – Technical Requirements – SCANNER survey data and Quality Assurance

Volume 5 – Technical Requirements – SCANNER Survey Parameters and Accreditation

- 9.22.9 The Guide may be downloaded from the following website.

***Website Amended
15 December 2010***

<http://www.pcis.org.uk/>

9.23 UKPMS REQUIREMENTS

- 9.23.1 UKPMS accommodates data provided from machine based surveys such as SCANNER and visual surveys such as CVI and DVI. The UK Roads Board are currently reviewing the strategic role of UKPMS, and its future application as described in this Code may vary as a result.
- 9.23.2 In utilising UKPMS, authorities should firstly establish their expectations in terms of benefit and value from the system. The choice of system and the data requirements will vary between an authority that is merely expecting UKPMS to provide statutory indicators, and one that is looking for UKPMS to form an integral part of their highway management arrangements. In particular, authorities should consider which of the following they are expecting UKPMS to deliver:
- production of BVPI and other statutory indicators;
 - production of data for NRMCS and SRMCS;
 - road condition information to support their LTP;
 - development of a HAMP including:
 - local identification and prioritisation of treatments;

- local budget setting and needs identification;
 - local performance indicators;
 - comparable information to benchmark with others.
- 9.23.3 UKPMS allows considerable flexibility in the types of data that are collected to support the operation of the system, and in the frequency and the level of detail at which those data are collected. A number of possible approaches are proposed below, and suggest a number of issues that influence the choice of a particular configuration.
- 9.23.4 In defining their approach, authorities may also take into account the following:
- whether to collect inventory and how much to collect;
 - what machine and visual condition surveys to collect;
 - whether to carry out surveys on a routine cyclical basis, or to target surveys (particularly more costly detailed surveys) to areas of concern or where treatments are proposed;
 - frequency of inspection;
 - whether to collect more detailed condition surveys over and above the mandatory surveys to support the detailed consideration of maintenance schemes;
 - whether to vary the approach by hierarchy or some other sub-division of the network;
 - whether the main focus of UKPMS will be as a strategic tool to support decisions based upon network condition and budget levels, or an operational tool to support engineering decisions relating to the identification and prioritisation of remedial works at the scheme level. Many users will, of course, be looking for UKPMS to fulfil both of these roles and will need to tailor their data requirements accordingly;
 - requirements for benchmarking.
- 9.23.5 There are three possible scenarios for the application of UKPMS, and associated inspection regimes, these are described below.

Scenario 1 - Full

- information used to target more detailed investigation using Deflectograph and other surveys, including DVI, to refine the provisional treatments proposed through the network level surveys;
- use of additional scheme and treatment building functionality to that provided by UKPMS may be required;
- this approach would also enable network analysis to take place;

- information used to allow future audit of treatment decisions, or to allow allocation of relative priorities on a condition or economic basis.

Scenario 2 - Enhanced

- collecting minimum data to support the requirements of the statutory indicators and to provide local information for NRMCS and SRMCS;
- consequences of historic funding and policies are monitored by tracking changes in network condition;
- treatment length costing and evaluation. Once treatments have been formulated, priorities are established on a condition (worst condition) or economic (best value) basis.

Scenario 3 - Minimum

- collecting minimum data to support the requirements of the statutory indicators and to provide local information for NRMCS and SRMCS.

9.23.6 Adoption of Scenario 1 and particularly Scenario 2 by authorities will contribute significantly toward the development of their HAMP. Further information on the use of UKPMS can be found in Appendix D. Further information on good practice for the development of pavement condition assessment regimes is provided in Appendix E.

9.24 ROAD MAINTENANCE CONDITION SURVEYS

9.24.1 The UK Roads Board, took over the responsibility for National Road Maintenance Condition Survey (NRMCS) policy following the decision to introduce automated surveys for NRMCS and best value reporting purposes. Arrangements are presently under development to change radically the way the NRMCS collects data. This is aimed at achieving more consistent survey standards locally, regionally and nationally and to ensure that data collected for NRMCS is the same as that utilised for maintenance purposes.

9.24.2 The principles underlying the new NRMCS are:

- to provide an objective measure of road condition at the national level and by type of road;
- to provide sufficient detail to permit comparisons of condition at authority and regional level;
- to permit meaningful comparisons to be made with UK and other European countries;
- to enable the calculation of outstanding maintenance work at national and regional level, in relation to targets that are consistent with maintenance minimum whole life cost;
- to avoid the necessity for authorities to carry out specific surveys for the NRMCS, but to use data collected for BVPIs and to reflect changes in the

BVPIs as they are introduced, in order to provide information that is useful to participating authorities.

- 9.24.3 The UK Roads Board have agreed an action plan to achieve this radical change, with work ongoing to move to full use of machine based SCANNER surveys. In order to demonstrate their contribution to meeting the Government targets, authorities in England should continue to adopt the different elements of the programme, as this is developed and rolled out. Authorities in other parts of the UK, although not presently subject to similar targets, are participating in the new Roads Performance Management Group developments in order to establish a more robust framework of condition information within the Devolved Administrations. CHART will remain in use until at least 2007-8.
- 9.24.4 In Scotland, where trend condition data from NRMCS was not available, all 32 authorities took the decision in 2002, to form a consortium to carry out an automated annual machine based condition survey (SRMCS) for all the road network. The information and experience gained from these surveys has been made available to the UK Roads Board and DfT. More information on SRMCS can be found in Appendix E.

9.25 DEFLECTION SURVEY REQUIREMENTS

- 9.25.1 In Wales and Northern Ireland Deflectograph surveys are still used for statutory reporting. In England SCANNER is now used for statutory reporting on the principal road network. The CSS has therefore published a guidance note on the future use of the Deflectograph in monitoring highway condition and prioritising and designing structural maintenance works. This section of the Code summarises this guidance.
- 9.25.2 The Deflectograph is a valuable tool to indicate the structural condition of the whole pavement, particularly on the vast majority of local authority roads, which are not deemed long life. (A long life pavement is defined as a pavement with over 300mm of bituminous materials and a low deflection.)
- 9.25.3 SCANNER only measures surface condition. Where defects have been identified by SCANNER, the Deflectograph may be used at project level to augment this condition information by providing the structural condition of the defective section for flexible and flexible composite pavements. This will assist in supporting treatment decisions. Where SCANNER and Deflectograph show that remedial works can be limited to the surface, no strengthening is required. However where the Deflectograph shows that the structure needs to be strengthened, the Deflectograph results provide recommendations for overlay thickness or reconstruction. At this stage, other tools such as FWD, GPR, coring and trial pitting can also be employed to provide useful data.
- 9.25.4 With SCANNER data giving a good indication of the overall condition and deterioration pattern for long life pavements, there is a potentially reduced need for Deflectograph surveys. However, for roads which are not long-life, SCANNER surveys will not take into account structural condition until it has manifested itself as rutting or cracking, therefore the need for Deflectograph surveys on a network basis on these types of highways remains valid.
- 9.25.5 The CSS guidance recommends that authorities suspend Deflectograph surveys on any lengths of highway which are known to be long life, or have more than 10

years residual life. The analysis should take into account the reduction in residual life since the survey. Authorities should bear in mind that deleting short lengths (i.e. part sections) of the network is unlikely to be economic or practical.

9.25.6 Authorities should therefore consider undertaking Deflectograph surveys as follows:

Principal Roads 1) Routine surveys of 20% of the non long life network each year;

2) Specific surveys to provide data for remedial works where routine surveys show strengthening is required.

Non-Principal Roads From 2005 authorities should consider undertaking specific Deflectograph surveys on sections highlighted by SCANNER for treatment.

9.26 INSPECTIONS FOR REGULATORY PURPOSES

9.26.1 A significant element of highway maintenance comprises regulation and enforcement of activities on or affecting the highway. The most significant of these involves responsibilities under the New Roads and Street Works Act 1991 (NRSWA). Most of these issues are now incorporated within the statutory duty for Network Management imposed by the Traffic Management Act 2004, and are the responsibility of the authority's Traffic Manager.

9.26.2 The main key regulatory activities include:

- ensuring 'expeditious movement of traffic';
- management of the Highway Register;
- management of the Definitive Map for PROW;
- dealing with encroachment on the highway;
- dealing with obstruction on highways or PROW;
- dealing with illegal and unauthorised signs;
- issuing permits for utilities, skips, hoardings, temporary closures and other authorised occupation of the highway;
- construction of vehicle crossings;
- dealing with illegal parking on verges and footways;
- adoption of new highways.

9.26.3 Although each of these are separate duties, many of them have wider implications for highway maintenance, for example:

- many of these items, for example illegal signs or encroachment, may have the potential to contribute to accidents; and the details of how the occurrence was dealt with (or not dealt with) by the authority may be a material consideration in legal proceedings;
 - illegal parking on verges and footways, especially by heavy vehicles, could cause considerable damage and where this has occurred it might be relevant to increase inspection frequency and consider new materials or prevention.
- 9.26.4 It will therefore be important to establish standards for regulatory inspection on the basis of risk assessment undertaken in conjunction with the Traffic Manager.

9.27 CO-ORDINATION OF INSPECTION REGIME

- 9.27.1 Although there is a wide range of inspections which need to be considered by authorities, it should be possible to co-ordinate these to make the best use of resources. It may also be possible to integrate inspections with other activities. For example, where 'Integrated Street Management' arrangements are adopted in town centres for cleansing and repair, it may be possible to combine safety inspections with street cleansing and other inspections undertaken by Street or Community Wardens to provide more frequent inspection at minimum cost. It may also be possible to combine DVI surveys on footways with service inspections. Many authorities will choose to combine safety and service inspections. Where combined inspections are adopted, particular care should be taken to ensure that consistent standards of recording are maintained.
- 9.27.2 A most important aspect of optimised inspections relates to NRMCS. It has been the case until now that information for NRMCS has been collected separately from data required for the authority's own purposes. Under the new strategy being developed for NRMCS outlined earlier in this section, this duplication will be avoided and one common set of data will be used for both national and local purposes. This approach is already being adopted in Scotland as part of the SRMCS surveys.

9.28 RELIABILITY OF DATA AND TRAINING

- 9.28.1 Survey data to be used for determination of highway condition will have considerable influence on the development of the HAMP, in determining spending levels and priorities, to achieve the serviceability standards. It will be used to produce BVPIs through UKPMS as the basis of inter-authority comparisons, and for the assessment of national condition and maintenance need through the NRMCS and SRMCS. Data needs to be accurate, complete and repeatable, and high standards of quality management and control should therefore be applied to its specification, procurement, collection and processing.
- 9.28.2 Opportunities to ensure quality and reliability of data occur at a number of levels including:
- survey instructions and documentation;
 - selection and appointment of inspectors;
 - training;

- specification and procurement of surveys;
 - audit procedures;
 - survey procedures;
 - data capture software;
 - processing software;
 - maintenance and calibration of equipment;
 - record keeping.
- 9.28.3 All surveys should be carried out in accordance with the current documentation including, but not limited to, the latest versions of the following:
- UKPMS Visual Survey Manual and Users Manual;
 - relevant sections of the Design Manual for Roads & Bridges and TRMM.
- 9.28.4 The development of survey procedures may vary from the standard documented approach, and considerable care should be taken in the derivation of locally enhanced versions of surveys to ensure that the standard data can be extracted, without bias from the survey.
- 9.28.5 In the case of machine surveys such as SCANNER, Deflectograph, SCRIM, FWD, GPR and Grip Tester, these should be carried out only using accredited machines. Normally these machines are accredited annually.
- 9.28.6 Training is especially important in the case of inspections and surveys where the quality and treatment of data could have significant legal and financial implications.
- 9.28.7 The City and Guilds 6033 Scheme has been specifically developed to provide a range of recognised vocational qualifications, available nationally, which are gained based on the assessment of inspectors against the requirements of this Code, other related national standards, legislation, and where appropriate, locally determined highway standards and procedures.
- 9.28.8 The holding of City and Guilds Scheme 6033 unit 311 ‘Highway Safety Inspection award’ can contribute positively to risk management and the exercise of the special defence in compensation or liability cases.
- 9.28.9 The DfT has introduced inspector accreditation requirements, commencing 2004/05, for all inspectors undertaking visual surveys for BVPIs 224b and 187. Accreditation is achieved through the City and Guilds 6033 Scheme, specifically Unit 301 – Health and Safety, Unit 331 – CVI and Unit 332 – DVI.
- 9.28.10 Care should also be taken in the specification of surveys when deciding whether these are to be carried out in house or by contract, to ensure that appropriate quality provisions are included in the specification that address:
- selection and training of inspectors;

- survey procedures and documentation;
 - quality management procedures, audit and error correction.
- 9.28.11 Audit and quality control procedures are essential, and reference should be made either to the visual survey manual or model contract for UKPMS surveys.
- 9.28.12 Visual inspection survey data to be used for highway condition assessment purposes should be collected in accordance with specified requirements, in order to ensure accuracy, repeatability and comparability of BVPIs.
- 9.28.13 From 2004/05, it is a requirement that all versions of Data Capture Device (DCD) software that are used to undertake UKPMS visual surveys for BVPIs 224b and 187 have successfully passed the UKPMS DCD Software Accreditation test.

**Website Amended
27 April 2012**

- 9.28.14 Visual inspection survey data to be used for highway condition assessment purposes must be processed by a PMS fully accredited to UKPMS requirements, in accordance with the currently approved set of Rules and Parameters, to provide condition indices and hence relative maintenance priority based on condition for each network section. Further details of UKPMS are provided in Appendix D and at (<http://www.pcis.org.uk/index.php?p=25/42/0>).
- 9.28.15 The data may also be processed according to other rules at the discretion of the authority, in order to consider other options for prioritisation. Any variations from the current Rules and Parameters utilised by the authority should be recorded for LTP monitoring purposes.

RECOMMENDATIONS FOR SECTION 9

R9.1 Inspection and Survey Regime

Authorities should develop, and implement an inspection and survey regime to provide accurate, timely and relevant information on the condition of the highway network, including cycle routes and footways, as a basis for assessment of local maintenance need. The regime should include regular safety inspections and condition surveys as a minimum.

R9.2 Risk Assessment

Frequency of safety inspections, together with the nature and speed of response to identified defects, should be developed from a process of risk assessment including a risk register. Any variations in standards from this Code should be identified, approved and adopted by authorities. The approval and adoption process should involve the authority's Executive and be explicit, transparent and inclusive.

R9.3 Inspection of Highway Trees

Highway safety inspections should include highway trees, including those outside, but within falling distance of, the highway. Inspectors should take note of any encroachment or visibility obstruction and any obvious damage, ill health or trip

hazards, but a separate programme of tree inspections should be undertaken by arboricultural advisors. Authorities should include some basic arboricultural guidance in training for highway inspectors.

R9.4 Highway Tree Policy

Authorities should develop, with arboricultural advice, a policy for the installation management, removal and replacement of highway trees. The policy should recognise the amenity and nature conservation value of trees, but also seek constructively to manage ongoing risk to the authority.

R9.5 Recording of Information

Information from all inspections and surveys, together with any immediate or programmed action, including nil returns, should be accurately and promptly recorded, monitored, and utilised with other relevant information in regular reviews of maintenance strategy and practice. This is particularly relevant in the case of safety inspections.

R9.6 Highway Condition Survey Regime

The highway condition survey regime should reflect the different requirements of the network based upon the defined hierarchy, and may be based on machine collected data, coarse visual walked or driven surveys, according to particular circumstances, taking account of statutory requirements.

R9.7 Scope of Highway Condition Survey

The highway condition survey regime will need to provide as a minimum the condition information necessary to determine and monitor relevant statutory indicators. It should, however, also provide information to support more detailed assessment and monitoring of highway elements, for example surface and road edge condition, in order to establish a Highway Asset Management Plan, and to assist the programming of maintenance.

R9.8 Co-ordination with NRMCS and SRMCS

The highway condition survey strategy should be compatible with the requirements for surveys of strategic and local road condition specified through NRMCS and SRMCS and to facilitate the provision of information to national surveys, as a basis for assessment of national maintenance need, where this applies.

R9.9 Accuracy and Reliability of Data

Highway condition assessment data from SCANNER and CVIs will have considerable influence on statutory indicators, spending levels and priorities. It will need to be accurately referenced, complete and repeatable, and high standards of quality management and control should therefore be applied to its specification, procurement, collection and processing.

R9.10 Visual Survey Data Processing for Structural Condition Index

Survey data to be used for highway condition assessment purposes should be processed by a pavement management system accredited to UKPMS, in accordance with the currently approved set of Rules and Parameters, to provide condition indices and priority for network sections based on condition.

R9.11 Skidding Resistance Strategy

Authorities should publish a skid resistance strategy, as part of their HAMP. The strategy, which should be informed by risk assessment, should address all relevant issues identified by this Code, including provision of Slippery Road signing, frequency of surveys, approach to setting investigatory levels, priorities for subsequent treatment and approach to dealing with early life skid resistance.

R9.12 Developments in Survey Technology

Regular reviews of survey strategy should take account of new technologies and methods. This could include the use of in-vehicle location and communications technology to record the position of defects and to ensure that they are instantaneously recorded with the works gang.

R9.13 Training

Authorities should adopt and support relevant highway training and vocational qualifications (NVQs, SVQs and the City & Guilds 6033 Scheme) which establish the competence of all those involved in highway maintenance, having particular regard to the training and qualification of personnel engaged in highway inspection and survey tasks.

Section 10

Condition Standards and Investigatory Levels

Comment Added
Added 14 May 2009

In Section 10 various references are made to Best Value Performance Indicators (BVPIs). These have now been replaced by National Indicators (NI). Hence, when reading Section 10, BVPIs must be read as NIs.

10.1 RELEVANCE OF CONDITION STANDARDS AND INVESTIGATORY LEVELS

10.1.1 As indicated in Section 8, each aspect of the maintenance regime needs to be founded on the core objectives of:

Network Safety

- Complying with statutory obligations;
- Meeting users' needs for safety.

Network Serviceability

- Ensuring availability;
- Achieving integrity;
- Maintaining reliability;
- Enhancing condition.

Network Sustainability

- Minimising cost over time;
- Maximising value to the community;
- Maximising environmental contribution.

10.1.2 These core objectives are supplemented by a new overall objective of Customer Service developed further in Section 11. This objective will apply to the highway service as a whole, as users may not be able easily to distinguish between maintenance, network management and improvement works.

10.1.3 Every aspect of highway maintenance for each element of the network has the potential to contribute to some extent to the above objectives. For example, the contribution to the safety objective of the carriageway surface is affected by:

- the actual condition of the surface;
- the response time for attending to inspections and user concerns;
- the quality of management and service delivery;

- the effectiveness of materials and treatments used.
- 10.1.4 Authorities should therefore define standards for the condition of each element of the network, developed through risk assessment, which they consider necessary to meet the requirements for safety, serviceability and sustainability. Where these standards are not met they should set targets for attaining them and sustaining them in the long term.
- 10.1.5 Authorities should also set standards and targets for achievement in respect of response times to inspections and user concerns, based upon risk assessment. They should also work towards setting standards and targets relating to quality of management and service delivery and possible contributions from changes in materials and treatments.
- 10.1.6 In some cases these standards will relate to statutory indicators, but others may be locally determined. It is important that locally determined standards take account of the views of users and the local community, and have regard to the advice of this Code.
- 10.1.7 In the case of standards relating to network safety, it is essential that authorities take note of their statutory responsibilities as well as users' needs, and review legal interpretations in determining standards of condition and response.
- 10.1.8 Authorities should ensure that all standards are formally adopted and published as part of a Highway Asset Management Plan (HAMP). They will also need to be consistently applied and reviewed at intervals in the light of changing circumstances.
- 10.1.9 With experience over time it may be possible to develop a single outcome standard for each of the maintenance objectives as the basis for a performance based procurement regime. It will still be necessary, however, for the contracting service partner to expand these into a wider range of standards for operational purposes.

10.2 TYPES OF STANDARD OR INVESTIGATORY LEVEL

- 10.2.1 The highway maintenance regime should incorporate the following standards:
- operational;
 - management of programming and priorities;
 - materials and treatments;
 - management of procurement and service delivery;
 - management of finance.
- 10.2.2 The last four of these are dealt with in subsequent sections of this Code. Operational aspects concerning inspection frequency and response are dealt with in Section 9. This section deals with asset condition requirements for each element of the network and its contribution to safety, serviceability and sustainability.

- 10.2.3 Each element of the network could have different standards of condition, a minimum one to satisfy requirements for safety, and higher ones, designed to meet local requirements for serviceability or sustainability, as part of the asset management strategy adopted by the authority. These different higher standards have previously been given a range of names including ‘warning levels’, ‘intervention levels’ and ‘investigatory levels’. In this Code the term has been standardised as ‘investigatory levels’, as failure to reach the defined standard in most cases could give rise to a range of responses each of which needs to be further investigated, prior to action being taken. There will be certain circumstances, of course, primarily for safety reasons, where an immediate response is necessary.
- 10.2.4 The term ‘intervention level’ has been retained only for use with the automatic treatment selection criteria used in UKPMS, as the system does actually ‘intervene’ at the defined condition standard. It will, however, always be referred to as system intervention level (SIL) for the avoidance of confusion.
- 10.2.5 The following paragraphs set out the suggestions for the nature of contributions made by each element of the network towards safety, serviceability and sustainability together with, where appropriate, a suggested standard of condition. It should be stressed that these standards are suggested ones only, and presently tend to identify input rather than wider outcomes. They should be developed locally over time, in consultation with users, providers and the wider community. Assessment should be based on risk and outcome based standards, wherever possible. This process is a fundamental part of the development of the HAMP.
- 10.2.6 Each element of the network will contribute differently to the objective of customer satisfaction and possibly within different timescales. For example good surface condition or signing will have an immediately positive effect, whilst the effect of good quality drainage will probably be imperceptible for most of the time. Generally the level of customer satisfaction is more relevant when applied to the whole of the network and it is therefore not dealt with by this Code under each of the individual elements.
- 10.2.7 The approach of this edition of the Code has been to adopt throughout the principles and practice of risk management. However, it is accepted that many authorities may not be sufficiently well advanced in their asset management planning to fully adopt this approach. Accordingly, in Sections 9 and 10 of the Code, where reference is made to risk assessment being used to derive inspection frequencies for safety or service inspections, default values will also be suggested. These default values will usually be based on the current edition of the Highways Agency’s Trunk Road Maintenance Manual (TRMM).

10.3 CONDITION OF CARRIAGEWAYS

- 10.3.1 The condition of the carriageway fabric can contribute to the core objectives as follows:

- Safety**
 - Nature, extent and location of surface defects;
 - Nature and extent of edge defects;
 - Nature and extent of surface skidding resistance.
- Serviceability**
 - Nature and extent of surface defects;
 - Ride quality of the surface.
- Sustainability**
 - Surface noise attenuation characteristics;
 - Nature and extent of surface defects;
 - Nature and extent of carriageway deflection.

10.3.2 In England local road carriageway condition is identified by statutory indicators, which record the percentage of the road network where maintenance should be considered. There are separate indicators for Principal Roads (BVPI 223), Non-Principal Classified Roads (BVPI 224a), and Unclassified Roads (BVPI 224b). Further details of survey and data processing requirements, together with investigatory levels for surface and skidding resistance, commonly used by authorities to meet safety objectives, are included in Section 9. The definition of investigatory levels to meet requirements for serviceability will be a matter for local determination, preferably in consultation with users.



10.3.3 Once appropriate investigatory levels have been established to support the required standards, these may be codified as SILs within UKPMS. In this way, the use of UKPMS represents an effective means of delivering and implementing predetermined standards.

***Paragraph Amended
14 May 2009***

10.3.4 In England local road carriageway condition is identified by statutory indicators, which record the percentage of the road network where maintenance should be considered. There are separate indicators for Principal Roads (NI 168) and Non-Principal Roads (NI169). Details of these National Indicators may be found in the following website:

<http://www.communities.gov.uk/publications/localgovernment/nationalindicator>

Further details of survey and data processing requirements, together with investigatory levels for surface and skidding resistance, commonly used by authorities to meet safety objectives, are included in Section 9. The definition of investigatory levels to meet requirements for serviceability will be a matter for local determination, preferably in consultation with users.

- 10.3.5 In practice, the development of a rule set for UKPMS can be an extensive and complex exercise. For this reason, the UKPMS Rules and Parameters Project was initiated to develop a default rule set to be available for use with accredited UKPMS systems and to provide a template for local development. A key principle in the development of this default rule set, was to attempt to ensure that the treatment options produced by the automatic processing reflected the likely solution of a maintenance engineer, taking account not only of the condition of the pavement, but also maintenance policy, funding constraints and the hierarchy of the road.

**Website Amended
27 April 2012**

- 10.3.6 While treatment selection in the Automatic Pass of UKPMS involves a number of process elements, the SILs represent the final criteria, defining the relationships between condition and allocated treatment. More information on UKPMS can be found at (<http://www.pcis.org.uk/index.php?p=25/42/0>).

**New Paragraph
Added 24 May 2013**

- 10.3.7 The Highways Maintenance Efficiency Programme has developed a lifecycle planning toolkit for use by local highway authorities to provide planning level decision support, including the following:
- assessing the impact of different levels of funding on asset performance and asset maintenance needs;
 - investigating current and future levels of funding required to sustain or improve the condition or performance of the asset;
 - identifying the level of funding required to minimise whole life costs; and
 - allocating resources to assets and treatments that provide the best whole life costs.
- 10.3.8 Three different versions have been published, namely for carriageways, footpaths and ancillary assets. The carriageway model incorporates work that was carried out to develop standard deterioration models for bituminous carriageways suitable for the local road network in England. The lifecycle planning toolkit, together with a user guide and information on the carriageway deterioration models, may be downloaded from the following website:

<http://www.dft.gov.uk/hmep/efficiency/asset-management.php>

10.4 CONDITION OF FOOTWAYS

10.4.1 The condition of footways can contribute to the core objectives as follows:

- Safety**
 - Nature, extent and location of surface defects;
 - Nature and extent of kerb and edging defects.
- Serviceability**
 - Nature and extent of surface defects;
 - Extent of encroachment and weed growth;
 - The slipperiness of the surface;
 - The quality of the surface;
 - Integrity of the network.
- Sustainability**
 - Convenience and ease of use;
 - Nature extent and location of surface defects;
 - Extent of damage by over-running and parking.

***Paragraph Amended
14 May 2009***

10.4.2 In England, since 2008, there are no statutory indicators for the condition of footways. However, recognising the importance of recording and monitoring the condition of footways, many authorities are continuing to collect information to calculate the indicator that was previously defined as BVPI 187, which records the percentage of Categories 1, 1A and 2 footways where maintenance should be considered.

10.4.3 DVI surveys are undertaken on foot using staff and software accredited in accordance with the UKPMS survey manual. The resultant survey data is then processed on a compliant UKPMS system to produce BVPI 187. The output report from BVPI 187 gives a combined figure for all survey categories, as well as individual values for each of the hierarchies included in the survey.

10.4.4 In addition to providing the BVPI report, the survey data can be manipulated to produce priority listings and indicative generic footway treatments. These generic treatments are predefined within the PMS and are triggered by the level of defects recorded within a section. The trigger varies from surface to surface; therefore it is essential that inventory data is collected in tandem with the defect data, to ensure the accuracy of the treatment selection and overall BVPI. If inventory data is not available then the default feature width is used to provide the feature.

10.4.5 Securing continuous improvement in the safety and serviceability of footways, in particular network integrity, will be a necessary component for encouraging walking as an alternative to the car, particularly for journeys of up to three miles in urban areas. It will be important for maintenance strategy positively to address this.

- 10.4.6 It will also be important in determining priorities for footway maintenance to ensure that opportunities are taken to aid social inclusion, particularly improving accessibility for older and disabled people and also the use of prams and pushchairs. This should be included as part of the Value Management process described in Section 12. Proposed treatments may include the provision of dropped kerbs in suitable locations and textured paving adjacent to crossing points at marginal cost during the course of works. Since October 2004, this is of even greater importance, as there is a statutory duty on service providers under the Disability Discrimination Act 1995 to take reasonable steps to remove or alter physical features to improve access for disabled people, or provide an alternative method of making services available.
- 10.4.7 There is no doubt that the Act applies to highway authorities, in that they are providing a service to the public, and in recognition of this TfL Street Management commissioned a report to review the suitability of its network for access by people with disabilities and to consider the needs for improvements. The report identifies the specific problems related to different types of disability and identifies measures that can be applied to the design and layout of the existing highway infrastructure, to remove or mitigate these problems. Some of these measures can be applied as part of maintenance works at marginal cost. The report includes an audit checklist and its use is recommended as good practice (www.tfl.gov.uk).
- 10.4.8 Although ensuring the safety of footways for users will be a priority, in some cases the presence of roadside trees may complicate the provision of footway surface regularity. The radical treatment or complete tree removal necessary to ensure surface regularity may not be possible or desirable and reduced standards of surface regularity may be a more acceptable outcome. Further information on trees is provided in Section 15.
- 10.4.9 Where footways are remote from carriageways, safety and security of users will be an important consideration, both from the point of view of unauthorised vehicular use and quality of lighting. Maintenance strategy should pay particular attention to this.

***New Paragraph
Added 15 December 2009***

- 10.4.10 The UK Roads Board has developed and tested a new footway survey known as the Footway Network Survey (FNS). This is now available for use. Work is ongoing towards its implementation within UKPMS for April 2010. The FNS is intended to provide a cost effective, efficient and consistent approach to footway surveys, based on a linear basis. The survey is carried out by a single surveyor walking along the footway, referenced to chainage within a UKPMS section. Further details on the survey may be found on

www.footways.org.

10.5 CONDITION OF PUBLIC RIGHTS OF WAY

- 10.5.1 The condition of Public Rights of Way (PROW) can contribute to the core objectives and to the broader quality of life objectives associated with leisure and recreation.

10.5.2 In England the condition of PROW is assessed by BVPI 178 which measures the percentage of the total length of rights of way in the authority area that are easy to use by the general public. Easy to use in this context means:

- signposted where they leave the road in accordance with section 27 of the Countryside Act 1968 and to the extent necessary to allow users to follow the path;
- free from unlawful obstructions or other interference (including overhanging vegetation) to the public's right of passage;
- surface and lawful barriers (e.g. stiles, gates etc) in good repair and to a standard necessary to enable the public to use the way without undue inconvenience.

10.5.3 Condition standards for PROW will be determined as part of a Rights of Way Improvement Plan (ROWIP), in consultation with the Local Access Forum established by the Countryside and Rights of Way Act 2000.

10.6 CONDITION OF CYCLE ROUTES

10.6.1 The condition of cycle routes can contribute to the core objectives as follows:

Safety

- Nature, extent and location of surface defects;
- Nature and extent of kerb and edging defects.

Serviceability

- Nature and extent of surface defects;
- Extent of encroachment and weed growth;
- The slipperiness of the surface;
- The quality of the surface;
- Integrity of the network.

Sustainability

- Convenience and integrity of the network;
- Nature extent and location of surface defects;
- Extent of damage by over-running and parking.

10.6.2 There is presently no statutory indicator specifically identifying the condition of cycle routes, but guidance on investigatory levels for cycle routes is provided in TRL 535 and the Footway and Cycle Route Design Construction and Maintenance Guide AG26. The definition of investigatory levels for surface, and skidding resistance, commonly used by authorities to meet safety objectives is dealt with in Section 9. The definition of investigatory levels to meet requirements for serviceability will be a matter for local determination, preferably in consultation with users. SILs may, as for carriageways, be codified within a PMS, and suggested values have been established for the current UKPMS default rule set.

- 10.6.3 Securing continuous improvement in the safety and serviceability of cycle routes, in particular network integrity, will be a necessary component for encouraging cycling as an alternative to the car. It will be important for maintenance strategy positively to address this.



- 10.6.4 Network integrity is a particularly important consideration where cycle routes are segregated for part of their length, but intermittently rejoin the carriageway. In these circumstances a reasonably consistent standard of maintenance should be provided and attention paid to carriageway edge condition in the un-segregated sections. Cambridgeshire County Council specifies that:
- where carriageway cycle lanes are established particular attention will be required to ensure drainage gullies, valve covers, inspection chambers etc do not pose hazards to cyclists and that the road surface is in good repair;
 - carriageway cycle lanes necessitate the use of additional traffic signs and road markings, and coloured surfaces where appropriate;
 - where possible the quality of the road surface at the edge of carriageways, especially in urban areas, will be improved. Programmes of resurfacing and carriageway reconstruction can assist in making the existing highway network ‘cycle friendly’ and thereby assist in the implementation of the National Cycling Strategy;
 - road gully gratings shall be of the flat type and laid within 10mm of the road surface. Where other types of gratings exist, a programme of replacement will be affected;
 - when designing new cycle lanes, due regard to the road surface condition shall be taken and if the existing carriageway is poor, while the rest of the road is good, inlaying the cycle route with asphalt should be considered as part of the scheme. A check should be made on the position and condition of any ironwork within the cycle lane;

- the surface of a cycle route is crucial to its acceptability by cyclists. New surfaces should give a good ride quality, being smooth and free from bumps and depressions. Where it is possible for a paving machine and delivery lorries to gain access to a cycle route (e.g. alongside the carriageway) hot laid asphalt should be used between edging strips. Where this is not possible, textured and smooth bituminous material should be used. It is particularly important that weeds are killed before surfacing a cycle route;
- dropped kerbs across a cycle route should be flush (3mm high) with the carriageway or access particularly where cyclists will cross them obliquely;
- drainage should prevent the ponding of water or the accumulation of grit or silt on the cycle route. However this is often impossible to achieve where a converted footway runs through a wide verge at a lower level than the carriageway with little longitudinal fall;
- the authority notes that it is the responsibility of the adjacent landowner to trim hedges from the edge of the cycle route once each year. Where the natural hedge line is within half a metre of the edge of the carriageway, a second trim will be required and this cut can be allocated from the highway maintenance budget. Arrangements should be made for the District Council's contractor to sweep the cycle route after these operations (this is particularly important for thorn hedges) to a maximum of 2 sweeps. These 2 sweeps may be funded by the highway authority and may be in addition to sweeping by the District Council to keep the highway clean.
- headroom along cycle routes beneath signs and branches should be at least 2.7m.

10.7 CONDITION OF HIGHWAY DRAINAGE SYSTEMS

10.7.1 The condition of highway drainage systems can contribute to the core objectives as follows:

- | | |
|-----------------------|--|
| Safety | <ul style="list-style-type: none">• Accumulation of water on carriageways, footways and cycle routes. |
| Serviceability | <ul style="list-style-type: none">• Accumulation of water on carriageways, footways and cycle routes. |
| Sustainability | <ul style="list-style-type: none">• Polluted effluent from clearing of highway drainage should not be directed into watercourses;• Authorities have a duty to prevent nuisance to adjoining landowners by flooding and should also work with others in the wider community to minimise the future risk of flooding;• Inadequate drainage of the highway structure will reduce effective life and increase maintenance liability. |

10.7.2 Highway drainage elements fall into five main categories:

- gullies, grips and ditches, which may be obstructed by the growth of vegetation or damaged by traffic. In most cases the responsibility for maintenance of ditches will rest with the adjoining landowner;
 - culverts under roads which may be affected by blockage, subsidence or structural damage;
 - other piped drainage which may be affected by blockage or subsidence;
 - sustainable urban drainage systems, which may require special maintenance attention for maximum effectiveness;
 - surface boxes and ironwork for both drainage and non-drainage applications, which may be affected by subsidence or obstructed access.
- 10.7.3 There are no statutory or local indicators identifying the condition of highway drainage systems. Authorities should develop local standards based on fitness for purpose to provide the level of service required and assessment of the risk of this being compromised by failure of the system. The impact of drainage system failure will be greater on high speed roads, or in areas susceptible to flooding, and specified condition standards should reflect this. In such circumstances, the condition of drainage systems should require them to be free of obstructions at all times, with an appropriate inspection and cleansing regime to deliver this.
- 10.7.4 The frequency of emptying will also depend upon the location, extent of tree cover, level of rainfall, the extent of kerbing and the frequency of sweeping. The nature of local industrial and agricultural land use may also be influential. In lower risk situations, by default all gullies should be cleansed annually and arrangements made for non-functioning gullies to be recorded for more frequent or detailed attention. Schedules of gullies requiring increased frequency of emptying should be built up by experience and any known trouble spots included. Streets rather than individual gullies may be identified. Gullies should be over-filled when emptied to ensure they are clear and if not, the unit should be recorded for jetting. No more than 50mm of material should remain in the unit before it is recharged with clean water.
- 10.7.5 In lower risk areas culverts and manholes should be inspected every five years by default and cleaned where necessary, and piped drainage should be checked and flushed if necessary during regular service inspections, but by default at not more than 10 year intervals. Grips and kerb offlets should be jetted by default annually.
- 10.7.6 The frequency of cleansing of oil interceptors will depend on their design and location and will need particular consideration on a site-specific basis.
- 10.7.7 Material arising from all road drainage emptying and cleansing operations has potential implications for pollution and should be disposed of correctly in accordance with Environment Agency (EA), or equivalent authority, requirements.
- 10.7.8 Where despite effective maintenance operations, flooding of the highway occurs, with implications for safety or serviceability, relevant warning signs should be placed in position as quickly as possible and users advised through local media. The cause of the flooding should be determined and given prompt attention, in order to restore the highway to a reasonable condition. If it is subsequently determined that the flooding is attributable to deficiencies in infrastructure or the

maintenance regime, given the nature of the weather conditions under which it occurred, then action to permanently relieve the problem should be considered urgently. If the event is attributable to the actions of a third party, the matter should be taken up with them at the earliest opportunity.

10.7.9 Ironware comprising covers, gratings, frames and boxes set in carriageways, footways and cycle routes has the potential to compromise safety and serviceability, and in certain cases cause noise and disturbance to local residents. Responsibility for defective ironwork, where this is part of the apparatus installed by a utility, lies with the company. Defects identified during inspection or from users should be formally notified to the utility, with a follow up procedure to ensure that dangerous defects are remedied within a specified timescale.

10.7.10 The following default condition standards are suggested for ironware set in carriageways. Manhole covers and boxes in the carriageway should be installed to a tolerance of ± 5 mm to the surrounding level. Gully frames and gratings should be installed level, or not exceeding 10mm lower than the surrounding carriageway. When boxes, frames and covers are found to be greater than 20mm lower than the surrounding carriageway they should be re-set.

***New Paragraph
Added 13 August 2010***

10.7.11 The Highways Maintenance Efficiency Programme has produced guidance on the management of highway drainage assets that recognises that in order to maintain highway drainage systems cost effectively, local highway authorities need to have a robust management strategy. Authorities should consider this guidance when making decisions on the management of drainage assets. The guidance may be downloaded from the following website:

<http://www.dft.gov.uk/hmep/docs/asset-management/121127-guidance-on-management-of-drainage-assets.pdf>

10.8 CONDITION OF EMBANKMENTS AND CUTTINGS

10.8.1 The condition of embankments and cuttings can contribute to the core objectives as follows:

- | | |
|-----------------------|---|
| Safety | <ul style="list-style-type: none">• Risk of loose material falling to injure users or damage facility. |
| Serviceability | <ul style="list-style-type: none">• Risk of damage or service interruption. |
| Sustainability | <ul style="list-style-type: none">• Damage or loss of habitat;• Interruption or pollution of watercourse;• Extent of damage and reduced life. |

10.8.2 There are no statutory or local indicators identifying the condition of embankments or cuttings. Authorities should develop local standards based on fitness for purpose to provide the level of service required, and assessment of the risk of this being compromised by failure of the system. The probability of failure will be affected by soil conditions and drainage. The impact of embankment or cutting failure will generally be high in all situations, but particularly so on important high

speed links, or where dwellings could be affected. In such circumstances, the condition of embankments and cuttings will require a robust regime of inspection, and possibly continuous condition monitoring.

- 10.8.3 Slips and rock-falls from embankments and cuttings are relatively infrequent but the frequency and severity of such events may be affected by climatic change. Authorities should have records of relevant locations and should establish an inspection and maintenance regime based on a local risk assessment. In higher risk locations, or where ground conditions are difficult, specialist geotechnical advice should be obtained.

10.9 CONDITION OF LANDSCAPED AREAS AND TREES

- 10.9.1 The condition of landscaped areas and trees can contribute to the core objectives as follows:

Safety

- Obstruction to user visibility and legibility of traffic signs;
- Falling branches from trees;
- Leaf fall from trees causing slippery surface;
- Root growth affecting surface regularity.

Serviceability

- Potential for service interruption;
- Quality of user experience.

Sustainability

- Landscape conservation;
- Mitigation of climate change effects;
- Support for habitat and biodiversity;
- Problems of root growth for surface, structure and highway drainage.

- 10.9.2 There are no statutory indicators identifying the condition of landscaped areas and trees, but the HA includes this within its Area Performance Indicator API 4 Environmental Amenity Index. Authorities should develop local standards based on fitness for purpose to provide the level of service required and assessment of the risk of this being compromised by failure. The probability of landscaping and tree failure will generally be low but is likely to increase as a result of climate change. The impact will generally be related to safety or damage to road surfaces or property, and will increase on higher speed roads and the proximity to property. The inspection and maintenance regime should identify high risk locations, together with appropriate condition standards.

- 10.9.3 The condition of landscaped areas has major implications for all of the core objectives. The maintenance regime will therefore require particularly careful consideration to ensure that the necessary balance continues to be achieved. It is also possibly the most visible aspect of the highway, of wide interest to both public and special interest groups, and provides the opportunity to demonstrate

sensitivity and flexibility in maintenance policy. Further advice on the sustainable management of landscaped areas is given in Section 15.

- 10.9.4 The obstruction of street lighting and traffic signs can be a major safety risk to users. During routine night-time inspections any such obstruction should be recorded. Trees and other foliage should be trimmed back to allow the lighting to function and the signs to be legible, while maintaining the shape of the tree.
- 10.9.5 The National Assembly for Wales notes that highway verges should be differentiated from the 'soft estate'. Verges should be considered as part of the trafficked highway, maintained principally for the operational needs of the highway, but priorities for the wider soft estate will be different. The following definition of the soft estate is used: 'Land within the highway curtilage, which is not surfaced or constructed for use by vehicular or pedestrian traffic. It includes land that is in ownership of the NAW, having been purchased or used for the purposes of construction and the mitigation of the effects of the highway on the environment. The management of such areas will include all necessary maintenance tasks and operations set for the land by the Transport Directorate. It excludes all hard standings, lined ditches, drains, signs, and telecommunications equipment and fences. Verges and areas where grass is cut for safety and forward visibility fall within the soft estate, but are maintained to meet the overriding operational objectives but including consideration of environmental objectives or commitments.'
- 10.9.6 The soft estate includes areas of land having various functions, for example habitat, nature conservation interests, screening, planting, and wild flower diversity. The verge serves a safety and refuge function and to a lesser extent and in certain situations an amenity. The soft estate can be included in highway maintenance strategy but it requires a specialist expertise.
- 10.9.7 Dealing first with requirements for safety: vegetation either on verges, other parts of the soft estate or on private land, should not restrict visibility at junctions, access points and bends. Sight lines and minimum stopping distances should be kept clear and signs, lights, and marker posts should not be obstructed. It may also be necessary for vegetation to be cut back in order to enable inspections or surveys. Areas of highway grass that incorporate access to ducts, drainage systems etc may need to be cut about once in three years in order to maintain accessibility to these systems.
- 10.9.8 Condition standards and frequency of grass cutting on rural roads should be determined locally from risk assessment, but by default:
- embankment and cutting slopes and verges, except visibility areas, should not normally be cut;
 - on all other roads, visibility areas, and to provide a pedestrian refuge, the first swathe from the edge of the carriageway should always be kept cut. Frequency of mowing will depend on the rate of growth but will normally be twice per year. Other areas of highway grass should also be cut every three years unless a positive decision is taken to allow it to vegetate. Performance based standards can be included in maintenance contracts;

- special requirements may be necessary in Sites of Special Scientific Interest or Nature Conservation. Advice should be sought from specialist advisors or the authority's biodiversity plan.
- 10.9.9 In urban areas grass cutting practice needs to involve a different balance of highway safety, serviceability and sustainability. Using the standards for rural roads would deliver safe standards from a visibility perspective, but length of grass, possible concealed debris and the potential for grass cuttings to block gullies, suggests there is a need for a higher frequency of cutting in urban areas. The frequency of cutting needs to balance these priorities in contributing to overall townscape management, taking into account the needs of users and the community.
- 10.9.10 Authorities should also provide for flexibility in applying urban and rural standards, and these should take account of the character of the area rather than be determined solely by speed limit considerations.
- 10.9.11 Northamptonshire County Council have established a detailed grass cutting regime, as follows:
- vision splays, traffic islands, raised roundabouts and grass adjoining highways in built up areas with numerous accesses - Cut 5 times per year on strategic and main distributors, 4 times on other roads;
 - grass areas adjoining highways on all other roads - Cut 2 swathe widths 5 times per year on strategic and main distributors, 4 times on other roads;
 - grass areas adjoining footways, horse riding and cycle tracks - Cut single swathe 5 times per year on strategic main distributors, 4 times on other roads;
 - newly seeded areas - One full cut in first season;
 - three cuts of single swathe are provided for at sensitive locations and other sites adjacent to the carriageway on strategic and main roads rather than two;
 - at all lay-bys and at locations where there is restricted visibility causing an exceptional hazard to motorists or pedestrians - Full width cut 5 times per year. This is also applied to picnic sites associated with lay-bys;
 - at junctions and sharp bends where open fencing (iron hurdle) has been provided - Once per year clearance of vegetation under the fence to maintain visibility;
 - where possible, to encourage the growth of wild flowers, verges will not be cut until seeds have set.
- 10.9.12 Suffolk County Council requires all grass to be cleared around columns, safety fences, sign posts and walls, and grass which cannot be cut by machine is to be trimmed by other means. The Council also suggests that length of grass on urban verges is not expected to exceed 100mm and in a normal season, 8 cuts per year is the maximum requirement to achieve this standard. Cut grass is not removed but is swept from footways where necessary. The Council also provides local discretion to apply rural standards, where speed limits extend into an environment which is still of mainly rural character. The need to tailor maintenance practice to

suit the character of the areas, rather than to rigidly applied standards, is dealt with in Section 15.

- 10.9.13 Edge maintenance or ‘siding’ of carriageways, footways and cycle routes will occasionally be necessary to prevent encroachment of grass and reduction of width. It is often done in advance of other maintenance work, in particular surface dressing. Staffordshire County Council suggests that ‘siding’ of verges should only be carried out where the encroachment of the verge is likely to cause damage or a marked reduction in width. This work should be carried out infrequently, normally not more than once in three years. ‘Siding’ of kerbed roads should be carried out only when the encroachment of vegetation obscures the kerb. It is anticipated that, in most cases, this will be achieved by weed spraying. On unkerbed roads, ‘siding’ should only be carried out in advance of surface dressing, and only where absolutely necessary.
- 10.9.14 The growth of weeds in footways and cycle routes, hardened verges, central reserves and along kerb lines, may cause structural damage, and the general perception of such growth is that it is untidy. Indeed, in some circumstances weeds have been considered to have implications for pedestrian safety. Weed growth is also a source of significant community interest and service requests. Weed treatment should therefore be undertaken according to traffic and pedestrian usage and to a standard that takes account of local concerns. The use of weed-killers should be the minimum compatible with the required results.
- 10.9.15 It will be important to co-ordinate arrangements for weed spraying with street cleansing arrangements, which may be the responsibility of other authorities and it may be possible to facilitate co-operative arrangements.
- 10.9.16 Materials to be used for weed spraying can have serious environmental implications. Specialist advice should be taken on these and the frequency of application, in the light of developing standards. Noxious weeds should be dealt with on an ad hoc basis. All weed spraying should be carried out in accordance with the Control of Pesticides Regulations 1986. Only approved pesticides may be used, these are chemicals listed in the ‘Blue Book’ entitled *Pesticides Approved under the Control of Pesticides Regulation 1986*.
- 10.9.17 Staffordshire County Council suggests the following:
- all weed spraying operations will be carried out taking into account the Health and Safety Commission’s Approved Code of Practice: *The safe use of pesticides for non-agricultural purposes*;
 - for highway surface weed killing operations, a translocated non-residual contact herbicide should be used. Currently the only weed killer ‘available’ for use on the paved highway, which conforms with the Health and Safety Commission’s Code of Practice and with the Environment Agency’s requirements is Glyphosate;
 - for the sterilisation of surfaces prior to construction work, an approved granular residual herbicide which contains 6.75% Dichlobenil as the active ingredient shall be spread at a rate of 175 kg per ha, or as directed by the manufacturer. The use of chemicals such as Dichlobenil is approved by the Environment Agency because, provided that they are used in accordance with the

manufacturer's instructions, any subsequent run-off will not be detrimental to watercourses;

- the frequencies for the application of weed killer are specified in guidance and the presumption is that the rate of spread of the pesticide in question will be compatible with this frequency in achieving effective weed control;
 - Glyphosate has no residual qualities and will only affect plants where there is direct contact. This results in an increase in the number of applications necessary to obtain effective control. Glyphosate is only effective on actively growing plants, which restricts the time period over which the control can be achieved. New weed growth occurs in spring and autumn, so for effective weed control, there needs to be at least two applications with the possibility of a third application in mid-Summer.
- 10.9.18 The Noxious Weeds Act 1959 places a responsibility on the authorities to take action to inhibit the growth and spread of injurious weeds growing within the highway. Further advice on this is contained within Section 15 of this Code.
- 10.9.19 Safety inspections and maintenance of trees are dealt with in Section 9 of this Code. Where it is the responsibility of the authority, trimming of seasonal growth should be carried out once a year on rural roads. Where there are special requirements in visibility areas or across central reserves, cutting should be undertaken when required. Owners of private hedges should be requested to adopt similar standards.
- 10.9.20 Significant pruning or felling of trees, even for safety reasons, can be the subject of significant local concern and should only be done with specialist advice and support. The following procedure adopted by Cambridgeshire County Council illustrates these concerns:
- ‘When a request is received by Divisions to fell a tree located on the highway arboricultural advice should be taken. If the advice given is that the tree should be felled, (due to disease, unsuitability of location etc) the adjacent property owner, the Parish council and the local Member will be informed prior to the work being carried out. If the recommendation is that only trimming or no work is required the person making the initial request will be informed, giving the arboriculturalists reasons. Any tree within a Tree Preservation Order can only be felled or trimmed with the permission of the Arboricultural Officer from the District or City Council. If the tree is within a conservation area, planning permission will be required to fell the tree.’
- 10.9.21 In rural areas, work on highway trees will be mainly reactive and limited other than for safety reasons. Some routine maintenance will be necessary from time to time to maintain the condition of the tree. This should be a matter for local consideration having regard to user and community views.
- 10.9.22 In urban areas, trees have a significant impact on the local environment, but can cause damage to highways and property if not properly managed. A proactive management programme including regular inspections by qualified arboricultural officers, thinning and crown reduction, can mitigate the negative impact of trees, whilst retaining their environmental benefits.

- 10.9.23 Trimming of hedges should be infrequent, provided that visibility sight lines and road signs are not obscured, in accordance with specialist advice, and will often be the responsibility of adjoining landowners.
- 10.9.24 Any action taken must be in accordance with the requirements of the EC Nesting Birds Directive, Wildlife and Countryside Act 1981, which includes protection for birds, their nests and other relevant legislation. Significant nature conservation benefits will result from this practice. Any trimming should, as far as possible, be done in late winter, to avoid the bird-nesting season and to allow birds and mammals the maximum opportunity to take advantage of any fruits or seed present.
- 10.9.25 The requirements for tree maintenance can be greatly reduced by the careful selection of trees when planning planting or replacement operations. Pruning after planting should only be necessary where it is required to enhance or guide the shape of the tree. Trees which require pollarding should be avoided as it is costly, time consuming and unattractive. Expert advice should always be sought in the management of any tree within the highway environment, whether on highway land or not.

10.10 CONDITION OF FENCES AND BARRIERS

- 10.10.1 The condition of fences and barriers can contribute to the core objectives as follows:

- | | |
|-----------------------|--|
| Safety | <ul style="list-style-type: none">• Integrity and location of safety fencing for vehicles and pedestrians. |
| Serviceability | <ul style="list-style-type: none">• Risk of livestock disrupting traffic. |
| Sustainability | <ul style="list-style-type: none">• Appearance and condition of fencing. |

Website Amended 27 April 2012

- 10.10.2 There are no statutory or local indicators identifying the condition of fences and barriers. Authorities should develop local standards based on fitness for purpose, to provide the level of service required and assessment of the risk of this being compromised, by failure of the fence or barrier. The impact of vehicle safety on fence failure will be higher with increasing difference in level. It will be particularly so adjacent to railways and at approaches to bridges over railways. The DfT publication *Managing the Accidental Obstruction of the Railway by Road Vehicles* provides more guidance on this (<http://www.dft.gov.uk/publications/tal-6-03/>). Impact will also be higher on higher speed roads. Impact of failure to pedestrian barriers will increase with volumes of vehicles and pedestrians, especially children, and again where railways, rivers and similar high risk features are concerned.



10.10.3 All high risk situations will require a robust inspection regime with a commensurate high standard of condition. Safety fences should be maintained in a sufficiently sound structural condition to serve their function and not be dangerous to road users or pedestrians.

10.10.4 All fences and barriers, whether for safety purposes or general use, are potentially important features and their overall appearance is an environmental consideration. They should be cleaned and painted when necessary and where safety fencing is provided with chevron markings, these should be dealt with in accordance with the cleaning regime for traffic signs.

10.11 CONDITION OF TRAFFIC SIGNS AND BOLLARDS

10.11.1 The condition of signs and bollards can contribute to the core objectives as follows:

Safety

- Identification of risk to users;
- Separation of potential traffic conflicts.

Serviceability

- Contributes to ease of use;
- Contributes to network integrity.

Sustainability

- Support of sustainable transport mode;
- Contribution to local economy;
- Heavy traffic routing can optimise maintenance.

10.11.2 There are no statutory indicators identifying the condition of signs and bollards. Authorities should develop local standards based on fitness for purpose, to provide the level of service required and assessment of the risk of this being compromised by failure of the signing. The impact of failure will be greater for mandatory signs than for warning signs, the impact of which will be greater than direction signs. The probability of sign failure is generally low, higher in areas

subject to vandalism but the probability of sign illegibility, defectiveness or clutter is much higher.

- 10.11.3 Traffic signs and bollards represent a highly visible component of the highway network, highly valued by users. At best they can significantly affect both network efficiency and the convenience of users. At worst they can be intrusive, confusing and capable of detracting even more significantly from the local environment, if in poor condition.
- 10.11.4 The following standards are suggested by default for the condition of illuminated and non-illuminated signs and bollards:
- cleaning when required and at least annually;
 - brackets bolts and fittings should be tightened and adjusted at the time of service inspection;
 - painting of supports and frames when required but not exceeding 10 years interval.
- 10.11.5 The following additional standards are suggested by default for the condition of illuminated signs and bollards:
- optical inspection and cleaning together with the inspection of sign supports every 2 years;
 - lamp changing at regular intervals to coincide with service inspections and cleaning.
- 10.11.6 Many authorities have found it necessary to clean bollards and signs in heavily trafficked areas much more frequently than annually. Some have adopted standards of twice a year for signs and up to six times a year for bollards at particularly vulnerable sites. In some areas the presence of graffiti presents a significant problem and may require even more frequent attention, if the problem is to be eventually eradicated.
- 10.11.7 Many authorities have provided blockwork chevrons at roundabouts for road safety or traffic calming purposes. In order to maintain their effectiveness, they will need to be inspected annually and treated routinely for weed growth. Blocks may need to be cleaned at intervals, annually by default, to maintain a uniform appearance.
- 10.11.8 Traffic signs are probably the most important potential contributor to the maintenance of network integrity and obtaining best value from the network. At intervals of 3-5 years the overall signing regime should be reviewed, possibly in conjunction with Best Value Reviews, to ensure that integrity is maintained and that unnecessary clutter is removed.
- 10.11.9 Although in many circumstances illuminated signs are essential, the use of high-reflectivity, non-illuminated signs can bring benefits in terms of sustainability. This should be a consideration, both for new signs and on replacement, and should also be considered during the 3-5 year network integrity inspections.

10.12 CONDITION OF ROAD MARKINGS AND STUDS

10.12.1 The condition of road markings and studs can contribute to the core objectives as follows:

- | | |
|-----------------------|--|
| Safety | <ul style="list-style-type: none"> • Route delineation in darkness and poor weather; • Potential for damage and injury if loose. |
| Serviceability | <ul style="list-style-type: none"> • Ease of use in darkness and bad weather; |
| Sustainability | <ul style="list-style-type: none"> • Support of sustainable transport modes; • Edge delineation to reduce edge damage; • Movement of wheel tracking to reduce localised damage. |

10.12.2 There are no statutory or local indicators identifying the condition of road markings and bollards. Authorities should develop local standards based on fitness for purpose, to provide the level of service required and assessment of the risk of this being compromised by failure. The impact of failure will be greater for mandatory markings than others. The probability of sign failure is generally low, but the probability of marking wear is higher and increases with traffic volume.



10.12.3 Many road markings are used to give effect to regulatory provisions and it is important that their legal status is not affected by undue wear or damage. A high proportion of road markings are essential for road safety or fundamental to the implementation of integrated transport policy, for example traffic calming schemes, bus priority measures and the delineation of cycle routes. If such markings are not kept in good order, the measures may lose effectiveness and the success of transport integration compromised.

10.12.4 White line markings on Strategic and Main Distributor roads and sites of high safety risk or with a relevant accident record, should be renewed when they are no longer adequate for their intended purpose. This is generally accepted to be when more than approximately 30% of their area becomes worn away. Standards for other routes should be based on assessment of the relative risks.

10.12.5 All mandatory road markings existing before resurfacing or surface dressing should either be masked during treatment or replaced as soon as reasonably practicable after the completion of work. If it is not possible to restore immediately in permanent materials, temporary markings should be used at sites where their absence is likely to give rise to dangerous conditions. Stop and Give Way marks

should ideally be replaced permanently within 7 days, other mandatory lines within 14 days and other markings and road studs within 28 days of completion of work.

- 10.12.6 During resurfacing 'No Road Markings' boards should be displayed until all markings have been replaced.
- 10.12.7 Road studs that are either missing, or have become defective, should be replaced individually or by a bulk change, depending on the individual highway circumstances. The aim should be for a minimum 90% of the studs to be reflective prior to the winter period. Displaced road studs lying on the carriageway, hard shoulders or lay-bys, and loose studs if considered to be a hazard, should be removed immediately if reasonably practicable.

10.13 CONDITION OF TRAFFIC SIGNALS, PEDESTRIAN AND CYCLE CROSSINGS

- 10.13.1 The condition of traffic signals, pedestrian and cycle crossings can contribute to the core objectives as follows:

- Safety**
- Separation of potential traffic conflicts;
 - Key safety contributor for vulnerable road users.
- Serviceability**
- Contributes to ease of use and efficiency;
 - Contributes to network integrity.
- Sustainability**
- Support of sustainable transport modes;
 - Support for local economy.

- 10.13.2 There are no statutory indicators identifying the condition of traffic signals, pedestrian and cycle crossings, but in England BVPI 165 measures the percentage of pedestrian crossings with facilities for disabled people. Most authorities have local indicators measuring response time for traffic signal defects. Authorities should develop local standards based on fitness for purpose to provide the level of service required, and assessment of the risk of this being compromised by failure of the signal or crossing. The impact of failure will increase with traffic and pedestrian volume and the importance of the link in carriageway, cycle route or footway hierarchies.



10.13.3 Traffic signals, pedestrian and cycle crossings are the key points of interaction between vehicles and the most vulnerable road users, and are also key to the maintenance of network integrity. It is therefore crucial to the cause of transport integration that they are maintained to a high standard. Signal control also can add significantly to the efficiency of the network. In most cases an automatic fault monitoring regime, incorporated into the system, will facilitate an effective maintenance programme.

10.13.4 The primary objective is to keep traffic signals, pedestrian and cycle crossings legible, visible and effective, as far as possible at all times, in relation to the road use and traffic speeds. The following condition standards are suggested by default for signalled controlled facilities:

- defects in operation should be treated as Category 1;
- warning signs should be erected if signals are likely to be off in excess of one hour;
- at certain critical junctions, temporary traffic management measures to be installed if signals are likely to be off in excess of one day;
- urgent faults - emergency action within specified times, damage repair within 24 hours, less urgent faults to be repaired within 1 week;
- failed lamps should be replaced within 2.5 days;
- signal lenses, regulatory signs and VMS signs should be cleaned once per year;
- flashing zebra crossing beacons should be replaced within 24 hrs;
- school crossing patrol flashing lights should be repaired within 24 hrs during term times.

10.13.5 Lamp changing regimes vary at the discretion of the authority according to local circumstances. Arrangements in Cambridgeshire are as follows:

- in Cambridge City traffic signal lamps are repaired as they fail. In the rest of the County it is more economical to bulk change all signal aspect lamps at 4 monthly intervals. Push button lamps are changed at 8 months. On the 4-monthly visit the operation of all signal lamps, wait lamps, pedestrian push buttons and audible units are checked. The alignment and visibility of signal heads is also checked. Additionally, the general condition, accessibility and electrical safety of the equipment is checked annually on all installations;
- in the County the response time for replacing faulty red lamps is within one hour and for other lamps by the end of the next working day. Installations which are all out will be repaired within 24 hours, except for electric cable faults.

10.14 STANDARDS FOR REGULATORY FUNCTIONS

10.14.1 Regulatory functions can contribute to the core objectives as follows:

- Safety** • Risk to users and adjoining property.
- Serviceability** • Minimising and signing of obstruction.
- Sustainability** • Inconvenience to disabled people;
- Structural damage from parked heavy vehicles.

10.14.2 There has previously been a relatively loose framework of standards for regulatory activity, primarily related to the nature of powers and duties. In England the introduction of the statutory duty for network management introduced by the Traffic Management Act has significantly increased the emphasis on standards for regulatory activity. A range of indicators will be published to support the role. A range of Codes of Practice also provide fairly clear guidance on required standards.

10.15 STANDARDS FOR USER AND COMMUNITY RESPONSE

10.15.1 Standards of user and community response do not contribute directly to the core objectives of safety, serviceability and sustainability, but are included as part of the new objective of customer service. They can, however, make a significant indirect contribution both to safety and serviceability by ensuring that service requests and complaints are dealt with promptly and converted into actions for which direct standards will apply. Prompt provision of information will also enable users to obtain better serviceability from the network.

10.15.2 Standards for user and community response can be considered at three levels:

- user and community satisfaction with arrangements for their engagement in the policy development process;
- user and community satisfaction with the delivery of the highway maintenance service;
- authority response to user and community contact by phone, mail and email.

10.15.3 Some of these will be incorporated into general statutory indicators relating to the corporate health of the authority, and will also be relevant to the management of contracts for service delivery. This is dealt with in more detail in Section 11 of this Code.

10.16 CO-ORDINATION OF STANDARDS

10.16.1 In setting standards for all aspects of highway maintenance services, authorities should have regard to the standards of adjoining authorities and those applying to the strategic network. It will be important to deliver consistency, wherever practicable, particularly in respect of Winter Service.

***New Paragraph
Added 13 August 2010***

10.17 THE ROLE OF UKPMS

- 10.17.1 A review has been carried out to determine authorities' requirements for pavement information and decision support tools to deliver their transport objectives. The aim of the review was to establish what changes are required in the current UKPMS functional specification to meet authorities' and government's needs. The report determines the priorities and produces a rationale for the commonality of PMS functions across local authorities and systems, taking account of the increasing importance of an asset management approach. It sets out the proposed core functional specification and maps its implementation to an indicative timetable and budget, taking account of where the costs are likely to fall and the ability of the market to deliver. It identifies where there are gaps or techniques that would benefit from further research. The report may be downloaded from the following website:

http://www.trl.co.uk/online_store/reports_publications/trl_reports/cat_highway_engineering/report_review_of_ukpms_core_functionality_the_minimum_functionality_all_pms_should_embodiment_in_the_uk.htm

RECOMMENDATIONS FOR SECTION 10

R10.1 Definition of Standards or Warning Levels

Authorities should prescribe service standards for all aspects of highway maintenance, developed through risk assessment. These should define the nature and extent of works to be undertaken in particular circumstances of maintenance need, and the level of urgency that would be assigned to the response. Such standards should relate to the core objectives of safety, serviceability, sustainability and customer satisfaction.

R10.2 Consistent and Benchmarked Standards

Authorities have discretion to define and review their own standards in the light of local circumstances, but should benchmark these against the default values identified by this Code for the purpose of best value comparison, and apply them consistently.

R10.3 Application of UKPMS System Intervention Levels

The standard System Intervention Levels for application of maintenance treatments prescribed within the currently approved set of UKPMS Rules and Parameters and other DfT advice should be used for consistent calculation of condition indices and statutory indicators. Authorities may vary these at their discretion to consider other options for economic prioritisation based on condition. Any variations from the current version of UKPMS Rules and Parameters utilised by the authority should be recorded for LTP monitoring purposes, and stated within their Highway Asset Management Plan.

R10.4 Standards for Regulatory Functions and Utilities Management

Authorities should establish standards and response arrangements for the regulatory elements of highway maintenance, in conjunction with the Traffic Manager, who has a statutory responsibility for network management.

R10.5 Standards for User and Community Response

In addition to 'operational' standards, authorities should establish standards and response arrangements for providing information and responding to customer contacts, consistent with corporate standards.

Section 11

Performance Management

11.1 PERFORMANCE MANAGEMENT

**Website Amended
27 April 2012**

- 11.1.1 Performance management is a fundamental component of best value and the new Comprehensive Performance Assessment (CPA) regime, in that there is a requirement for authorities to secure continuous improvement in the way they exercise their functions, having regard to a combination of economy, efficiency and effectiveness. The new Code of Audit Practice 2005 for Local Government Bodies published by the Audit Commission includes guidance on the audit of performance management arrangements (<http://www.audit-commission.gov.uk/audit-regime/codes-of-audit-practice/Pages/codelocalgov.aspx>).
- 11.1.2 Performance management needs to take into account:
- economy – acquiring human and material resources of the appropriate quality and quantity at the lowest cost;
 - efficiency – producing the maximum output for any given set of resource inputs or using the minimum inputs for the required quantity and quality of service provided;
 - effectiveness – having the organisation meet the customers' requirements and having a programme or activity achieve its established goals or intended aims.
- 11.1.3 In order to demonstrate continuous improvement, performance has to be continually measured and this is undertaken through performance indicators, standards and targets, which can be defined as follows:
- performance indicator – the measure of performance to be used in exercising a function. Can be categorised in varying levels of importance, for example 'statutory' 'key', 'core', 'local' etc;
 - performance standard – the minimum acceptable level of performance in the exercise of a function and measured by reference to a performance indicator for that function. Failure to meet this standard will be deemed as failing the test of best value for that function;
 - performance target – the level of performance in the exercise of a function that is expected to be achieved over a minimum period of a year and measured by reference to a performance indicator for that function.
- 11.1.4 Performance can be measured in a number of ways, but in respect of best value these can best be summarised in four basic methods:

- input – the resources (human, material or financial) utilised in delivering the function or service;
- process – the methodology and procedure of committing the resources in the pursuit of fulfilling the function;
- output – the resultant effect (often numerical) of completing the process with the resource input;
- outcome – the ultimate impact on the community and the best way of measuring performance.

11.1.5 Outcome measures should be sought wherever possible and increasingly Government is seeking to prescribe these through statutory performance indicators. For some aspects of highway maintenance it may be difficult to establish directly measurable outcome links, and output measures may need to be used. Input measures should only be used as an exception, and process measures will usually be used during reviews for comparison purposes.

11.2 THE FAMILY OF PERFORMANCE INDICATORS

11.2.1 As defined by the Audit Commission, there are effectively four levels of performance indicator, otherwise known as the family of performance indicators, which are applicable to all authorities. These comprise:

- corporate health indicators - set by Government which give a view of the organisational, financial, managerial and democratic integrity of an authority;
- nationally set statutory service delivery indicators - also set by Government, which give a rounded view of service delivery covering strategic objectives, service delivery outcomes, cost/efficiency, quality and fair access. In England these will usually be BVPIs;
- other indicators - may be set by Government departments to cover areas not covered by the previous indicators, such as Core Indicators in Wales;
- locally set indicators - to be developed by individual authorities to reflect local priorities and provide key management information.

11.2.2 There is one other level of indicator of particular relevance to highway maintenance. This is contract performance indicators, sometimes called Contract KPIs, which measure the performance of the contractor in, for example, delivering projects to cost, time, and client satisfaction. These were dealt with separately in the 2001 edition of this Code, but experience with longer term partnering contracts based on shared values and objectives suggests an increasingly close alignment of contract performance indicators, with the wider family of service indicators.

11.2.3 Contracts will still need a framework of lower level indicators to monitor day to day operations, financial transactions and human relations matters, but these are not covered in detail by this Code.

11.3 PERFORMANCE ASSESSMENT

- 11.3.1 The statutory performance assessment and improvement regime for authorities has changed significantly since the 2001 edition of this Code. In England, the Best Value Inspection and Assessment process has evolved into Comprehensive Performance Assessment (CPA), which provides greater focus on corporate and cross-cutting issues, greater flexibility on areas for inspection and reduced assessment for the best performing authorities.
- 11.3.2 Furthermore, new arrangements for Public Service Agreements established for Government departments and agencies have been extended to Local Public Service Agreements (LPSA) for authorities. These enable authorities to undertake to exceed Government targets in shared priority areas in return for increased funding. These LPSAs are now evolving into area agreements.
- 11.3.3 In the Devolved Administrations the statutory performance assessment regime is generally less prescriptive, with fewer statutory indicators, and a less robust inspection regime.
- 11.3.4 The performance assessment regimes applying to highway asset management are summarised below and more detail of their application is provided in Appendix G.

11.4 INDICATORS FOR HIGHWAY ASSET MANAGEMENT

- 11.4.1 For the purpose of this Code highway maintenance is considered as a discrete service, although it influences and is influenced by, policies, priorities and programmes for wider aspects of the overall highways service. This includes highway improvement and network management.
- 11.4.2 In these circumstances it can be difficult to isolate and measure some aspects of the performance of highway maintenance, from that made by the other highway services. This is particularly the case in measuring user and community satisfaction, where they will often be unable to distinguish between maintenance and improvement works, and indeed works from others, including utilities.
- 11.4.3 Nevertheless, the emphasis on delivering user and community satisfaction has continued to increase since the 2001 edition of this Code, and this needs to be recognised more specifically in service objectives and performance management regimes. Accordingly, an overall highway service objective of customer service has been adopted to supplement the original core objectives of:
- Network Safety;
 - Network Serviceability;
 - Network Sustainability.
- 11.4.4 Table 7 attempts to define the level of contribution towards these core objectives by the respective aspects of the highways service, in order to provide some guidance as to where performance measurement is most likely to be productive. The level of contribution is defined as either:

- Prime – making a major contribution to the objective and performance management - essential;
- Main Support - making a significant contribution to the objective and performance measurement - desirable;
- Support – making a moderate contribution to the objective and performance measurement-useful; or
- Contributor – making some contribution to performance measurement unlikely to be productive.

11.4.5 The logic for selection as Prime, Main Support etc for respective components of the Local Transport Plan (LTP) or strategy, is based on assumptions as to how they will each develop. They may therefore vary slightly between authorities according to how they manage, for example, their responsibilities under the Traffic Management Act 2004, or the preparation of their HAMP. Each authority should therefore develop its own model of the table.

Table 7 – Level of Contribution			
Objectives	Highway Asset Management Plan		
	Operate Network Management Plan	Maintain Highway Maintenance Plan	Improve Highway Improvement Plan
Customer Service			
Delivering satisfaction	Prime	Main Support	Support
Providing effective consultation and information	Prime	Support	Main Support
Providing efficient enquiry and complaints management	Contributor	Prime	Support
Safety			
Complying with statutory obligations	Contributor	Prime	Main Support
Meeting users needs for safety	Contributor	Main Support	Prime
Serviceability			
Ensuring availability	Prime	Main Support	Support
Achieving integrity	Main Support	Contributor	Prime
Maintaining reliability	Prime	Main Support	Support
Enhancing condition	Contributor	Prime	Main Support
Sustainability			
Minimising costs over time	Contributor	Prime	Main Support
Maximising value to community	Contributor	Main Support	Prime
Maximising environmental contribution	Contributor	Main Support	Prime

11.4.6 It may be helpful in constructing the table to set out the assignment of key aspects of the service. In Table 8 below aspects leading to a **Prime** rating are in red, those leading to a **Main Support** rating are in Blue.

11.4.7 This suggests that highway maintenance has four Prime responsibilities and six Supporting responsibilities, and therefore makes a significant overall contribution to perceptions of overall service quality.

11.4.8 It is important that those aspects for which highway maintenance is **Prime** or **Main Support** have robust, reliable and outcome based performance indicators. Appendix F provides further details.

Table 8 – Assignment of Key Aspects			
Objectives	Highway Asset Management Plan		
	Operate Network Management Plan	Maintain Highway Maintenance Plan	Improve Highway Improvement Plan
Customer Service			
Delivering satisfaction	Minimising disruption	Quality and timeliness of work	Support
Providing effective consultation and information	Consultation on policy operational information	Support	Scheme consultation and information
Providing efficient enquiry and complaints management	Contributor	Service Requests and Complaints Management System	Support
Safety			
Complying with statutory obligations	Contributor	Inspection and response regime	Health and safety accessibility improvements
Meeting users needs for safety	Contributor	Skidding resistance strategy	Safety improvements programme
Serviceability			
Ensuring availability	Managing occupation	Programming of works	Support
Achieving integrity	Main Support	Contributor	Sustainable improvements and signing programme
Maintaining reliability	Managing network operation	Programming of works	Support
Enhancing condition	Contributor	Programmed maintenance	Main Support
			Continued

Table 8 – Assignment of Key Aspects continued			
Objectives	Highway Asset Management Plan		
	Operate Network Management Plan	Maintain Highway Maintenance Plan	Improve Highway Improvement Plan
Sustainability			
Minimising costs over time	Contributor	Managing maintenance priorities	Designing for maintenance
Maximising value to community	Contributor	Integrated townscape management	Regeneration programme
Maximising environmental contribution	Contributor	Sustainable materials and practices	Environmental schemes programme

11.4.9 This work takes into account the work by the HA following the Gershon efficiency review and the recent publication of the *Toolkit for Measuring Local Roads Efficiency Gains*. (www.rcoe.gov.uk)

11.5 STATUTORY PERFORMANCE INDICATORS

11.5.1 In England statutory performance indicators for local transport are specified as Best Value Performance Indicators (BVPI) and also as mandatory indicators in guidance for LTPs.

11.5.2 For 2005-6 there are 11 English BVPIs for local transport, the great majority of which have direct or indirect relevance to road maintenance, and these are listed below. Detailed descriptions and reporting arrangements are summarised in Appendix F.

BVPI 99 Road casualties by categories of user and injury;

BVPI 100 Temporary road closures;

BVPI 102 Passenger journeys on buses;

BVPI 103 Bus information satisfaction (reported triennially);

BVPI 104 Bus satisfaction (reported triennially);

BVPI 165 Pedestrian crossings with facilities for disabled people;

BVPI 178 Footpaths and Rights of Way easy to use by the public;

BVPI 187 Condition of surface footway;

BVPI 215 Rectification of street lighting faults;

BVPI 223 Condition of Principal Roads (previously BVPI 96);

BVPI 224 Condition of Non-Principal classified and unclassified roads (previously BVPI 97).

11.5.3 There are also 8 mandatory indicators specified for LTPs, as follows. These are less specifically directed at road maintenance, but at the wider accessibility and sustainability outcomes of the shared priorities. Road maintenance can however still make a contribution. LTP6 to LTP8 are mandatory for some authorities, but not all. Detailed descriptions and reporting arrangements can be found at (www.dft.gov.uk).

- LTP1 An accessibility target;
- LTP2 Change in area wide road traffic mileage (vehicle-km);
- LTP3 Cycling trips (annualised index);
- LTP4 Mode share of journeys to school;
- LTP5 A bus punctuality indicator (% 1min early to 5 min late);
- LTP6 Changes in peak period traffic flows to urban centres;
- LTP7 Congestion (vehicle delay);
- LTP8 An air quality target.

11.5.4 There will also be a requirement for authorities to report on progress with their Transport Asset Management Plans (TAMPs). The report should set out what has been achieved, and any remaining challenges. It should cover briefly such issues as, the ambition and realism of LTP asset management targets and the whole life maintenance resource implications of transport schemes proposed in authorities' LTPs.

11.5.5 The HA has seven high level Key Performance Indicators (KPIs) in 2005 for managing the motorway and trunk road network, of which one is directly relevant, and most indirectly relevant, to highway maintenance:

- deliver the programme of improvements to the strategic road network;
- deliver a demonstrable reduction in incident-related congestion and minimisation of road works-related congestion;
- make information available to influence travel behaviour and inform decisions;
- deliver the HA's agreed proportion of the national target to reduce by a third the number of people killed/seriously injured on trunk roads compared with the 1994-98 average;
- maintain the network in a safe and serviceable condition;
- mitigate the potentially adverse impact of strategic roads and take opportunities to enhance the environment, taking into account value for money;

- deliver a high level of road user satisfaction.
- 11.5.6 The HA also has 14 Area Performance Indicators (API) in 2005 listed below, which are used to monitor performance of the area commissions. These are reviewed from time to time and reference should be made to the HA website for the most up to date information (www.highways.gov.uk).
- API 1 response to emergency incidents;
- API 2 response to Category 1 defects;
- API 3 customer satisfaction;
- API 4 environmental amenity index (over 10 categories);
- API 5 site (workplace) safety;
- API 6 predictability of discrete schemes (time);
- API 7 predictability of discrete schemes (cost);
- API 8 predictability of resource (accruals) forecasting;
- API 9 winter Maintenance;
- API 10 defect free work;
- API 11 road traffic accidents at roadworks;
- API 12 street lighting outages;
- API 13 network availability;
- API 14 third party claims.
- 11.5.7 Scotland presently has five statutory indicators relating to road and bridge maintenance, which are set out in the Local Government Act 1992. The Publication of Information (Standards of Performance) Direction 2004 (www.audit-scotland.gov.uk) has the following indicators:
- the percentage of the road network that should be considered for maintenance treatment;
 - traffic light failure: the percentage of repairs completed within 48 hours;
 - street lights failure: the percentage of repairs completed within 7 days;
 - the proportion of street lighting columns that are over 30 years old;
 - the number of council and private bridges not meeting the European standard of 40 tonnes that have a weight or width restriction placed on them, expressed as a percentage of the total number of assessed bridges.

11.5.8 In Wales there is one statutory strategic indicator (condition of roads) and a further seven core indicators that authorities are effectively expected to report (www.cymru.gov.uk). These are:

THS001 condition of;

(a) Principal (A) roads;

(b) Non-principal classified roads;

THS002 annual highway-related insurance costs as a percentage of the annual structural maintenance expenditure;

THS003 the percentage of the annual structural maintenance expenditure that was spent on planned structural maintenance;

THS004 the percentage of the local authority maintained road network subject to precautionary salting during the year;

THS005 a) the average number of calendar days taken to repair all street lamp failures during the year;

b) the average number of calendar days taken by the authority to repair those street lamp failures for which they are responsible during the year;

THS006 the percentage increase in the total length of local authority maintained cycle routes within the local authority area during the year;

THS007 the percentage of adults aged 60+ who hold a concessionary travel pass;

THS008 the percentage of total length of footpaths and other rights of way which are easy to use by members of the public.

11.5.9 In Northern Ireland the Roads Service Business Plan sets out seven high level objectives (www.roadsni.gov.uk). For 2004-05 there are 10 Key Performance Indicators and targets reflecting these objectives and a further 29 supporting business targets. The key objectives are:

- deliver our part of the Regional Transportation Strategy for Northern Ireland 2002-2012;
- maintain the road infrastructure to keep it safe, effective and reliable and to preserve the value of the asset;
- manage and improve the road network to promote safety and efficient operation;
- improve journey times on the motorway and trunk road network;
- deliver quality services for our customers and stakeholders in a fair and equitable way;
- operate to resource limits and improve value for money;

- support and motivate all our people to achieve the Agency's objectives.

11.6 LOCAL PERFORMANCE INDICATORS

11.6.1 In addition to the nationally set indicators, authorities are encouraged to develop and use Local Performance Indicators (LPIs) relevant to their area. A good LPI should include consideration of the following criteria:

- designed as far as possible on outcomes;
- practical concise and easy to interpret;
- capable of precise definition;
- readily measurable;
- relatively inexpensive to collect in terms of supporting data;
- readily understood, meaningful and of interest to the public;
- relate to an authority's corporate or service objectives;
- performance should be entirely within the authority's control;
- clearly indicative of good or bad performance;
- balance of cost against quality should be measurable;
- where possible comparison of public and private sectors should be identifiable.

11.6.2 The following dimensions have been adopted by Government in developing the national indicators and these are also relevant in developing LPIs:

- cost and efficiency of service provision, to show that the service is being provided at a price comparable to that which other authorities are achieving;
- effectiveness of service delivery and management to show that effective systems are in place to deliver the service;
- quality of service (including user satisfaction) to show that the quality of service delivered is commensurate with the price that is paid;
- fair access to service (in terms of ease and equality of access) to show that stakeholders have easy access to the services they need regardless of gender, race etc;
- strategic objectives to show that the services provided meet the needs.



- 11.6.3 The emphasis on LPIs should be on their importance and relevance to the customer. Local service users and communities and service providers should be consulted on new performance targets set as part of Best Value Reviews.
- 11.6.4 DfT guidance suggests that, for LTPs, the optimum number of indicators, of all kinds in an effective set, appears to be between twenty and forty, partly dependent on the size and characteristics of the plan area. Authorities within a region are encouraged to adopt LPIs that are consistent in definition and methodology, and that could form the basis of improved regional monitoring.
- 11.6.5 Two indicators feature in all lists of indicators for highway maintenance, although expressed differently in each case; network condition and user satisfaction. Although the most important indicators, they are the most difficult to measure consistently and repeatedly.
- 11.6.6 Continuing changes in the methodology of measuring network condition have caused inconsistency in interpreting year on year changes, and the move to machine condition surveys in Scotland and England is intended to improve this.
- 11.6.7 Similarly, user satisfaction survey results can be significantly affected by a wide range of factors, including method of survey (face to face, telephone etc), framing of questions, opinion on other authority services and media reporting. Greater consistency is necessary in survey methodology, questions and procedure, and this is dealt with in Appendix J.
- 11.6.8 An increasing degree of uniformity with all local indicators is clearly desirable in assisting the process of comparison. The 2001 edition of this Code took into account ideas being developed throughout the UK by numerous benchmarking clubs and LTP submissions. They attempted to distil this information into meaningful indicators, upon which authorities could begin to develop their own indicators.
- 11.6.9 Since 2001, the process of LPI development has continued and this edition of the Code incorporates emerging thinking and good practice. It is clear that the practice of formulating LPIs is still developing and it is likely that there will be a need for continuing change. The suggested indicators in this Code are included as Appendix F, which will be updated from time to time. The key construction best practice indicators for the construction industry, promoted by the Egan and

subsequent reports, provide a useful basis for LPIs comprising programme, financial and operational compliance, and client and user satisfaction (www.odpm.gov.uk). These are included in Appendix G.

11.7 PERFORMANCE TARGETS

- 11.7.1 The Ten Year Plan for Transport in England included highway maintenance indicators and targets to arrest the deterioration in the condition of local roads by 2004 and to eliminate the backlog by 2010.
- 11.7.2 Current national policy *The Future for Transport* makes little explicit reference to highway maintenance, and new LTP guidance does not now expect authorities to set local targets to abolish maintenance backlogs by a particular date, where the authority would consider such a target to be unrealistic. DfT will however expect, as a minimum requirement, authorities to aim to ensure no overall deterioration in local road conditions from 2004/05 levels. DfT will expect most authorities to be more ambitious than this, and to achieve significant improvements in overall condition over the second LTP period.
- 11.7.3 The Devolved Administrations never previously had targets addressing backlog and this continues to be the present position, although Scotland has made most progress in identifying the extent of its backlog, and this is set out in Appendix I.
- 11.7.4 English authorities will need to set targets for all statutory and mandatory LTP indicators and report progress against these annually in their APR and Performance Plan. They will also need to set stretching targets for any Local PSAs.
- 11.7.5 LTP guidance requires local authorities:
- to set locally relevant targets for all outcome indicators;
 - to set targets for a minimum period of one year with an optimum period of five years;
 - for BVPIs to relate targets to the period required to achieve best quartile performance or improvement within present quartile;
 - to set trajectories for key targets to illustrate expected progress;
 - not to derive targets merely as the consequences of predetermined transport investment plans (this has particular relevance to highway maintenance);
 - to compare and benchmark targets with comparable authorities.
- 11.7.6 Scottish authorities will need to set targets for their five statutory indicators and publish progress in accordance with the annual Publication of Information (Standards of Performance) Direction. Welsh authorities will need to set targets for National Strategic Indicators, which will need to be reported in their Improvement Plans. They will also need to collect information and set targets for Core Indicators and share these nationally for comparative purposes but will be free to choose how data is used and reported, both internally and publicly.

11.7.7 Examples of established targets for the motorway and trunk road network include:

for the HA:

- for the KPI of maintaining the network in a safe and serviceable condition the 2004/5 target is to achieve a road surface condition index score of 100 ± 1 ;
- for the KPI of environmental impact the target is to achieve at least 95% across the 5 sub-targets of air quality, biodiversity, landscape, noise, and water pollution;
- for the KPI of user satisfaction the target is to achieve from the road user satisfaction survey an average annual score of at least 85% for motorways and at least 80% for trunk roads.

for the Northern Ireland Roads Service:

- to maintain the motorway network so that at least 85% is in satisfactory structural condition;
- by the end of March 2005, increase the length of the trunk road network in satisfactory structural condition to 75%;
- by the end of March 2005, increase the length of other roads receiving resurfacing treatment to 55% of that recommended in Best Practice Guidelines (the 2002 base year value was 50%).

11.8 PERFORMANCE IMPROVEMENT

11.8.1 Since the 2001 edition of this Code there has been increased focus on performance improvement. The Improvement and Development Agency (IDeA) has established a library of local indicators and best practice (www.idea-knowledge.gov.uk). The County Surveyors Society (CSS) Best Value Group and its regional subgroups have been renamed the Service Improvement Group. Wales has established a Performance Improvement Programme.

11.8.2 A wide range of incentives, tools and techniques have been developed to assist the process of performance improvement, most of which are in use somewhere within highway maintenance management. These include:

- EFQM Business Excellence Model;
- benchmarking;
- Beacon Council Scheme;
- balanced scorecard;
- Capability Assessment Toolkit;
- performance frameworks;
- Disaggregated Effectiveness Technique.

- 11.8.3 A short description of the key features and application for each of these is given below, together with web references for obtaining further information.

EFQM Business Excellence Model

- 11.8.4 This is a non-prescriptive framework which measures organisations against nine criteria of business excellence, including leadership, policy, strategy and key performance results, each weighted to take account of its relative importance in a quality organisation. The results provide a benchmark for comparison against other organisations, in order to identify best practice and highlight areas where performance can be improved. Further information on the EFQM Excellence Model can be obtained from the website (www.efqm.org).

Benchmarking

- 11.8.5 Benchmarking is a systematic process, collecting and comparing information for enabling comparisons and improving performance, both absolutely and relative to others. It provides a structure to search for better practice in other organisations that can then be integrated into an authority's own service delivery.
- 11.8.6 There are four approaches to benchmarking, each of which provides a different perspective:
- data benchmarking - which involves the use of objective data for comparing performance, very often cost or measurement related;
 - process benchmarking - which compares and measures processes, sequences or activities with those of other organisations to identify how existing methods can be improved;
 - functional benchmarking - which compares the performance and structure of an entire service area or function within an organisation;
 - strategic benchmarking - which compares outcome performance in the implementation of strategic or policy objectives across organisations.
- 11.8.7 Selection of the benchmarking network is important, as any grouping of highway maintenance service providers will provide useful information. Its significance will be improved if partners have similar characteristics. The Audit Commission 'family' groups or regional groups provide a useful starting point.
- 11.8.8 There are a number of benchmarking groups or networks in existence dealing with highway maintenance information, and co-ordination between them is improving. Some of the groups are listed below together with web contact details:

Websites Amended 27 April 2012

- The National Best Value Benchmarking Scheme (<http://www.nbvbs.co.uk/>);
- County Surveyors Society Service Improvement Group (www.cssnet.org.uk);
- TAG Performance Improvement Group (www.webtag.org.uk);

- Midland Service Improvement Group;
- Metropolitan Authorities Group;
- Welsh Authorities Service Improvement Group (www.cymru.gov.uk);
- The Celtic Benchmarking Group (<http://scots.sharepoint.apptix.net/celtic/default.aspx>);
- DLO Service Excellence Group.

Balanced Scorecard

- 11.8.9 The balanced scorecard approach enables the present performance of an organisation to be established against a range of disparate criteria such as learning, business, customers, and financial. Objectives, targets and actions are then set against each of the criteria. Subsequent performance can be similarly recorded following improvements, enabling the effect of the improvement to be identified.

Performance Frameworks

- 11.8.10 The TAG Performance Framework is a form of balanced scorecard which enables performance to be assessed for a wide range of municipal technical services, including highway maintenance.

Capability Assessment Toolkit

- 11.8.11 The Capability Assessment Toolkit is another specialist application of the balanced scorecard used as a self scoring approach. It has been adopted by the HA in its procurement strategy and is based on the EFQM model.

Disaggregated Effectiveness Technique

- 11.8.12 The Disaggregated Effectiveness Evaluation (DEE) Technique is a business analysis methodology. The technique allows the focus and impact of disparate activities at an operational level to be measured and their effect upon the achievement of corporate goals or objectives to be evaluated. DEE has been applied within the UK to support current public sector development initiatives.

RECOMMENDATIONS FOR SECTION 11

R11.1 Performance Management Regime

Authorities should establish an integrated performance management regime for highway maintenance, highway improvement and network management, to measure the contribution of each to the core objectives of customer service, safety, serviceability and sustainability.

R11.2 Performance Indicators

The regime should include relevant statutory and local indicators and preferably measure performance against outcomes or, where this is not practicable, against outputs.

R11.3 Local Performance Indicators

Authorities should adopt Local Performance Indicators that comply with this Code and are identical or similar to others so far as possible, in order to facilitate comparison and development of good practice.

R11.4 Contract Performance Indicators

Contract performance indicators for partnering contracts should so far as possible be designed to be compatible with statutory and local indicators for the service, supplemented as necessary by lower level indicators to monitor day to day operations, financial transactions and human relations matters.

R11.5 Targets and Trajectories

Realistic but challenging targets should be included to drive continuous improvement over a minimum period of one year, with an optimum period of five years. Trajectories should be developed where appropriate to track progress towards targets.

R11.6 Performance Improvement

Authorities should develop and apply a strategy for performance improvement adopting one or more of the tools identified in this Code and build this into their procurement arrangements.

R11.7 Sharing Performance Information

Authorities should, where contractually possible, arrange to share performance information in the interests of the wider continuous improvement agenda, through participation in benchmarking networks and similar arrangements.

R11.8 Use of CIPFA Code of Practice

The development of financial performance information for benchmarking purposes should for consistency be based upon the categories and definitions contained in the CIPFA Code of Practice.

Section 12

Programming and Priorities

12.1 THE IMPORTANCE OF PRIORITISING AND PROGRAMMING

12.1.1 Developing and implementing effective systems for programming and prioritising highway maintenance activity is a key requirement for the delivery of a user focused highway service, but one that presents significant challenges. This assumes, however, that the level of funding relative to the overall maintenance requirement is sufficient to provide scope for effective choices to be made. Where there are very acute levels of deficiency and a low level of funding, authorities may only be able to undertake limited works beyond their statutory and safety obligations, so that detailed arrangements to support wider choices would be less relevant. This would be especially significant in cases where claims and/or awards against the authority for alleged failure to maintain are unusually high.

12.1.2 In most cases, however, following recent increases in capital funding for highway maintenance, wider choices will be possible and authorities should establish approaches to enable these to be as informed and objective as possible. These approaches will need to form part of a wider asset management strategy, in order to support decisions on the relative allocation of priorities at different levels:

Strategic Level

- between corporate priorities and objectives;
- between areas of the authority.

Transport Level

- between Local Transport Plan (LTP) objectives and targets;
- between Best Value Performance Indicators (BVPI) and targets;
- between Public Service Agreement targets;
- between maintenance, network management and other local transport services.

Maintenance Level

- between the core objectives (customer service, safety, serviceability and sustainability);
- between maintenance service type;
- between maintenance service category;
- review against transport and strategic level priorities.

- 12.1.3 The establishment of priorities will inevitably involve an iterative process, working down through the strategic, transport and maintenance levels, then reviewing the draft programme against the higher levels and repeating the process, until a satisfactory outcome is achieved. There are well established analytical techniques that may be used to take an objective view on balancing priorities. These are discussed later in this section.

12.2 BALANCING STRATEGIC PRIORITIES

- 12.2.1 These levels are not as clear cut as, for example, the process for allocating resources between various parts of the authority, which may operate at the strategic, transport or maintenance level, or in combination according to local practice and democratic arrangements. There may be arrangements to devolve decisions on certain service priorities, including maintenance to local council or neighbourhood level, or to otherwise empower local communities. At this level it is important that the Highway Asset Management Plan (HAMP) demonstrates the importance of highway maintenance in meeting authorities' corporate objectives.
- 12.2.2 The pursuit of best value and continuous improvement requires that all services, including highway maintenance should be managed so as to optimise their contribution to the corporate objectives of the authority. This needs to be considered in three stages:
- identify the nature and extent of inter-action between the service and each of the corporate objectives;
 - where there are opportunities to add value these should be maximised;
 - where there are potential conflicts these should be resolved.
- 12.2.3 The process need not be a complex or time-consuming one and can be improved over time in the light of experience. It will be important, however, that where potential conflicts between maintenance practice and programmes are identified, a process is put in place to resolve these, either one way or the other.

12.3 BALANCING TRANSPORT PRIORITIES

- 12.3.1 The framework for local transport priorities and programmes will largely be determined by the LTP, which will have been prepared taking into account the wider corporate and strategic priorities. It will also have taken into account the outcome of consultations with users and the community. It may need to be modified, however, as a result of new information arising since the approval of the plan.
- 12.3.2 In particular a number of the issues potentially affecting the serviceability of the network may have altered, including changes in public transport routing, statutory undertakers' works, land use developments and also the nature and extent of highway deterioration. The programme for highway maintenance to meet the serviceability of the network will be included as part of the HAMP. As part of this process, authorities will be required to assess competing maintenance needs and prioritise accordingly.

12.4 BALANCING PRIORITIES BY TYPE

12.4.1 The broad priorities for the respective types of highway maintenance will largely be determined by the outcome of safety and service inspections and condition surveys, assessed against local risks and policies specified by the authority in the light of this Code. In general it will be important to establish priorities and programmes for each of the following:

- reactive maintenance - attending to Category 1 defects and other urgent safety matters arising from inspections or user information;
- routine maintenance - providing defined standards of serviceability (or level of service), including attending to Category 2 defects;
- programmed maintenance - providing co-ordinated sustainable schemes and projects to meet the serviceability requirements of the network;
- regulation - regulating occupation, interference or obstruction of the network;
- Winter Service - providing defined standards of salting and clearance of ice and snow;
- weather and other emergencies - planning for emergency response.

12.4.2 The determination of priorities and programmes for items within the categories of regulation, Winter Service and weather and other emergencies will tend not to require any special consideration and will largely arise out of the design of the services. For the other three categories it will be helpful to establish a more structured approach as outlined in the following paragraphs.

12.5 PRIORITIES FOR REACTIVE MAINTENANCE

12.5.1 Reactive maintenance involves attending to the rectification of Category 1 defects and other matters requiring urgent attention, arising either from inspections or user requests in accordance with the specified standards of response. Although all such matters will by definition have a degree of urgency, some may have potentially even more serious consequences, and priorities will usually be determined exclusively on the basis of risk assessment. This is discussed in more detail in Section 9.

12.5.2 The only other consideration is whether to:

- sign and make safe;
- provide initial temporary repair;
- provide permanent repair.

12.5.3 The option selected, together with relevant follow up, will largely be determined by operational practicalities and also whether the site is already part of a programme for more comprehensive treatment, in which case a temporary repair may be an appropriate course of action.

- 12.5.4 Many authorities use 'Highway Wardens', 'Community Wardens' or 'Care Teams' for providing an integrated service of safety inspection, signing and temporary repair. In some cases, these are also extended to provide 'Integrated Street Management' services, and teams will need clear guidance on the application of priorities.

12.6 PRIORITIES FOR ROUTINE MAINTENANCE

- 12.6.1 Routine maintenance is primarily for the purpose of providing defined standards of network serviceability, maximising availability, reliability, integrity and quality. The priorities and programmes will be determined largely, but not exclusively, from Category 2 defects identified during service inspections together with items from safety inspections not requiring urgent attention and user requests.
- 12.6.2 Priorities and programmes will need to be defined for all routine maintenance categories. Routine maintenance for each category may be undertaken separately, according to the frequency defined in each case, but it will usually be more efficient to combine a number of operations into a co-ordinated programme. It may also be convenient in central urban areas to consider coordination with other related street activities.
- 12.6.3 Particularly in rural areas, it will be helpful to prepare a regular programme of visits to local council areas for the purpose of undertaking the widest possible range of routine maintenance activity and to inform the local council and community in advance. Such arrangements may also be appropriate for neighbourhoods within urban areas.

12.7 PRIORITIES FOR PROGRAMMED MAINTENANCE

- 12.7.1 Programmed maintenance is undertaken primarily in the interests of providing for a sustainable outcome, seeking to minimise cost over time, to add community value to the network or to the environment. It can also be for safety purposes by, for example, improving skidding resistance or contributing to serviceability by, for example, improving ride quality.



- 12.7.2 It will be necessary to develop priorities and programmes for the structure, surface and edge of carriageways, footways and cycle routes.
- 12.7.3 Programmed maintenance schemes may be more expensive than routine or reactive treatments in initial cost, but should be designed to have a lower whole life cost, therefore providing value for money. The determination of priorities between competing schemes needs to be based more objectively, utilising processes such as Value Management, that has been successfully used by the HA.

12.7.4 One method of identifying programmed maintenance schemes for carriageways, footways and cycle routes is through UKPMS. Arrangements for undertaking surveys and the application of UKPMS are referred to in Sections 9 and 10 of this Code respectively. Further information on UKPMS is provided in Appendix D.

12.7.5 The identification of programmed maintenance schemes should be undertaken in stages:

- the information obtained from condition surveys should be processed by a UKPMS accredited system to establish a preliminary programme based on the principle of minimising whole life cost;
- the preliminary programme should then be developed into individual schemes that meet the levels of service in the HAMP. The schemes may then be prioritised using a process of Value Management (Section 12.8). Schemes should not necessarily be prioritised on the basis of 'worst first' as this may not always provide the best value for money in terms of whole life cost. In some circumstances a 'just in time' approach may provide better value.



12.7.6 There are three important new issues that should be addressed by all highway maintenance schemes, each of which present important opportunities to add value, and which should be grasped enthusiastically rather than being seen as an imposition. These are:

- the implications of the scheme on the duty, imposed by the Traffic Management Act 2004, in England, to 'secure the expeditious movement of traffic on the authority's road network'. This may require changes to design and construction arrangements in consultation with the authority's Traffic Manager;
- the requirement under the Disability Discrimination Act 1995 to make 'reasonable adjustments' to facilitate access for disabled people. The audit process developed by Transport for London Street Management demonstrates good practice in this area (www.tfl.gov.uk);
- the obligation for schemes, so far as possible, to contribute to the quality of public space. A series of regional guides published by English Heritage in collaboration with the DfT provide useful guidance (www.english-heritage.org.uk).

12.8 VALUE MANAGEMENT

- 12.8.1 Value Management is a process that may be used to prioritise the competing needs of highway schemes, identified through condition and economic prioritisation. It provides a structured, consistent and quality approach for assessing the benefits of undertaking maintenance and the associated risks of not undertaking maintenance. The outcome should be a prioritised programme of schemes that will be entered into the HAMP. This process is summarised in Figure 4.
- 12.8.2 Before an authority may establish a Value Management regime, it will need to identify the frequency of review and the overall approach to be adopted. It is important that this takes into consideration the corporate and transport priorities within the authority and the overall context of the HAMP. For example, the regime should identify:
- Value Management frequency - it is possible that some activities would be performed on a continuous basis. However, it is anticipated that a Value Management review would be held annually in order to determine the programme of works to be included in the HAMP for the following years;
 - prioritisation criteria – the criteria considered under Value Management to be used to prioritise needs. It is important that the prioritised needs should align with the levels of service and the volumes of work identified in the HAMP.
- 12.8.3 Value Management should be developed by suitably qualified and experienced staff who have a sound understanding of the organisation’s maintenance requirements and an awareness of longer-term objectives and targets, such as those identified in the HAMP. The process should be transparent and as a starting point the prioritisation criteria should align with the following four categories:
- highway improvement – criteria in this category should cover programmed maintenance schemes that are compatible with planned highway improvements. They would also include the overall safety of the network;
 - socio-economic and environmental – criteria in this category should cover the wider policy issues, including providing for disabled people, that cannot be readily quantified by automated prioritisation procedures e.g. local importance, impact on local communities and businesses, environmental impact, sustainability, considerations such as noise reducing surfacing and recycling of bituminous materials;
 - value for money – criteria in this category should consider the value of the scheme in overall terms of whole life cost. Each proposed scheme should have an associated cost estimate. The use of more durable materials and the minimisation of future routine maintenance would contribute towards a more sustainable solution;
 - network management – criteria in this category should consider the overall impact on the network of the proposed maintenance scheme in terms of the Traffic Management Act.
- 12.8.4 Each category is assigned a weighting to represent its importance in the delivery of the objectives of the authority and the context of the HAMP. While it is recognised that safety will be of primary importance, other issues should also be addressed; otherwise the process may focus solely on safety and fail to address

serviceability, sustainability and customer service. Clearly, assigning weights to the various criteria is not an easy task, particularly when it is evident that the preference on the criteria may be conflicting. A number of systems are available to establish preferences for a number of criteria, taking into account the views of interested stakeholders. One of these is the Analytic Hierarchy Process (AHP). The system should also provide robust justifiable scores.

- 12.8.5 Walsall Council have used the AHP methodology to prioritise a number of schemes identified using UKPMS and funded by Prudential Borrowing. A number of stakeholders were involved in workshops aimed at identifying the main objective of the investment 'to raise the profile of the Borough by investing the Prudential money wisely'. The use of the AHP allowed the stakeholders to balance their views, in the light of the overriding objective and through comparison of schemes and objectives to reach a priority listing that took into account the weight of all the views. The process demonstrated robust justification for the decisions made through the prioritisation.
- 12.8.6 The Value Management process is usually conducted in the form of a workshop with a number of interested parties from various departments within the authority. The process involves the assessment of the performance of each of the programmed maintenance schemes under the various criteria. The outcome of the Value Management process should be an outline programme prioritised on scores obtained from the process. The work volumes and cost estimates should align with the work volumes and the funding estimates in the HAMP. The process should also highlight the risks related to the programme.
- 12.8.7 The overall aim of the Value Management process is to ensure that maintenance schemes are assembled into programmes of work that align with the objectives of the authority and deliver value for money. Value of these schemes will be maximised by co-ordination with other highway improvement programmes and integrated transport schemes on related parts of the network, thus minimising disruption to users and maximising benefits to the community.

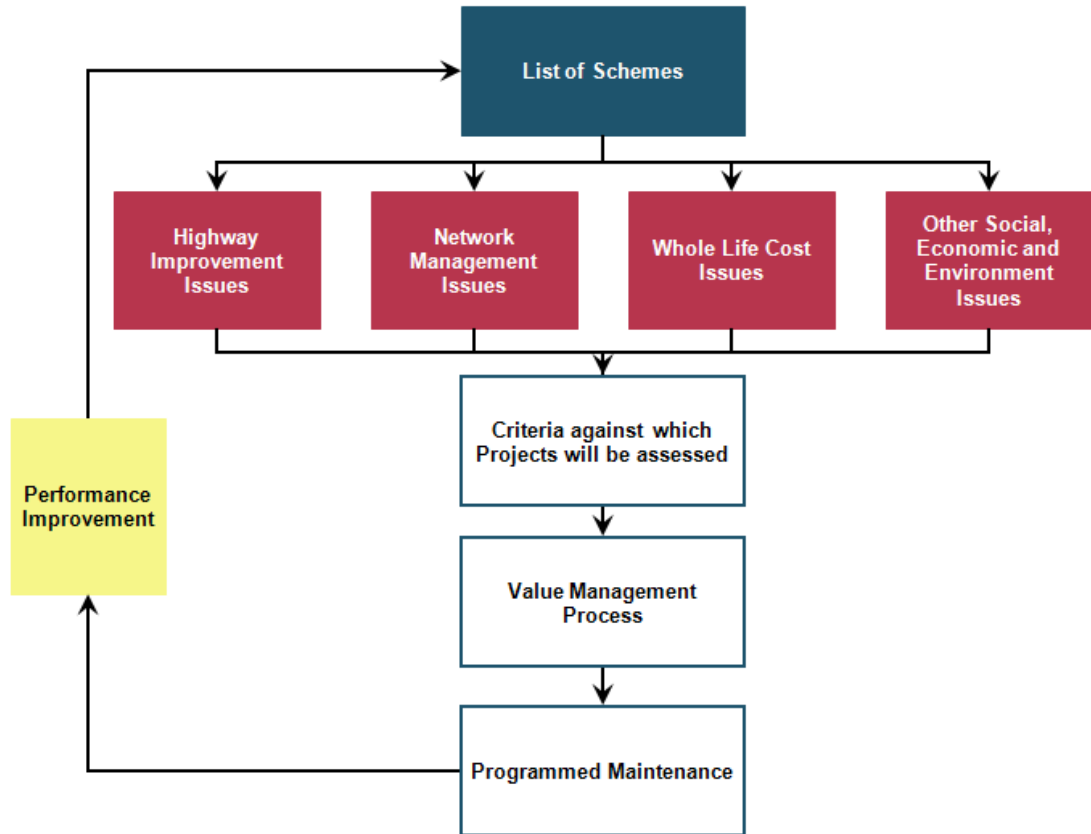


Figure 4 - The Value Management Process

12.9 VALUE ENGINEERING

12.9.1 Value Engineering is a refinement of the Value Management process. It is a second stage process that is conducted on an individual scheme, to optimise both the design and construction phases. In principle, it reduces the risk associated with unforeseen issues at the time of scheme development. Value Engineering also provides the authority with a further chance to explore potential opportunities for innovation. Key individuals from works teams and specialists from each discipline, for example pavement engineering, should be present during this process.

RECOMMENDATIONS FOR SECTION 12

R12.1 Defining Priorities

Priorities for highway maintenance activities should be based upon the objectives and outcomes for each maintenance category defined in the Highway Asset Management Plan, and in accordance with the principles of best value and the legal obligations of the authority. The process should be clear, transparent and consistently applied.

R12.2 Priorities for Programmed Maintenance

Initial priorities based on network condition for programmed maintenance should be established utilising the output of technical (and economic prioritisation)

processing from a UKPMS accredited Pavement Management System. This is provided for in UKPMS and will be enhanced to take account of ongoing research and developments.

R12.3 Value Management

Value Management should be applied to highway maintenance schemes in order to balance priorities and improve value for money. In particular it can be used to add value to Local Transport Plan priorities, making 'reasonable adjustments' to facilitate access for disabled people, required by the Disability Discrimination Act 1995, and contributing to the quality of public space.

R12.4 Programme Assembly

Maintenance schemes should be assembled into programmes of work to co-ordinate with other highway maintenance schemes, improvement schemes, and works by utilities and developers in co-operation with the authority's Traffic Manager, in order to minimise disruption to users and to meet the requirements of the Traffic Management Act 2004, where applicable.

R12.5 Extent of Programmed Maintenance

Programmes for all maintenance schemes should be an integral part of the Highway Asset Management Plan and reviewed at least yearly to ensure that they continue to meet the authority's safety, serviceability and sustainability objectives. Generally programmes should be drawn up over a rolling three year period.

R12.6 Consultation on Maintenance Programme

Consultation should be undertaken with the authority's Traffic Manager, adjoining authorities, other agencies, public transport operators and the local community on the highway maintenance programme.

Section 13

Winter Service

Section Amended
29 November 2011

Section 13 has been superseded with the revised Section below.

13.1 INTRODUCTION

Background

- 13.1.1 Although sometimes termed “Winter Maintenance”, the particular network management requirements during winter are not “maintenance”, in the traditional sense, but specialist operational services. The term “Winter Service” has been adopted by this Code.
- 13.1.2 Winter Service deals with regular, frequent and reasonably predictable occurrences like low temperatures, ice and snow, as well as with exceptional events. Whilst the effects of climate change are likely to result in an increased frequency and intensity of severe winter events, these can be taken into account in Winter Service planning. Therefore Winter Service can and should be subject to the same regime of plan, deliver, review and improve as other aspects of the highway maintenance regime.



- 13.1.3 Policies and plans developed for Winter Service are likely to have relevance in emergency planning for dealing with extreme weather conditions including flooding, high winds and high temperature, as discussed in Section 14 of this Code. The incidences of such events may be affected by climate change. They are also likely to have some relevance to the wide range of non-weather related emergencies that could affect the highway network.
- 13.1.4 Although a very specialised area, Winter Service is a significant aspect of network management both financially and in terms of its perceived importance to users. It can also have significant environmental effects. The organisation of the service is likely to

have considerable implications for the overall procurement and management of other highway maintenance services. This Section of the Code should therefore be read in conjunction with other sections dealing with these issues and Appendix H.

Objectives

13.1.5 Winter Service can contribute significantly to each of the core objectives set out in this Code as described below:

Customer

- There are, in all parts of the UK, very considerable user needs and expectations and these can be a major influence on customer satisfaction through demonstrating an efficient, effective and proportionate response to winter conditions.

Safety

- Safety is a consideration for Winter Service, even though statutory obligations and users needs vary in different parts of the UK.

Serviceability

- Maintaining availability and reliability of the highway network is a key objective for Winter Service and one where user judgements of performance will be immediate rather than longer term.

Sustainability

- Low temperatures and the formation of ice can cause serious damage to the fabric of running surfaces and accelerated damage of the network. Effective Winter Service can contribute to a reduction in whole life costs and minimise damage to the environment.

Statutory Basis

13.1.6 The statutory basis for Winter Service varies in different parts of the UK. In England and Wales Section 41 (1A) of the Highways Act 1980 was modified on 31st October 2003, by Section 111 of the Railways and Transport Act 2003. The first part of Section 41 now reads:

“a) The authority who are for the time being the highway authority for a highway maintainable at the public expense are under a duty, subject to subsections (2) and (3) below, to maintain the highway.

b) (1) In particular, a highway authority are under a duty to ensure, so far as is reasonably practicable, that safe passage along a highway is not endangered by snow or ice.”

13.1.7 This is not an absolute duty, given the qualification of “reasonable practicability” but it does effectively overturn previous legal precedence, albeit not with retrospective affect. Section 150 of the Highways Act 1980 still imposes a duty upon authorities to remove any obstruction of the highway resulting from “*accumulation of snow or from the falling down of banks on the side of the highway, or from any other cause*”.

- 13.1.8 In addition, the Traffic Management Act 2004 placed a network management duty on all local traffic authorities in England. It requires authorities to do all that is reasonably practicable to manage the network effectively to keep traffic moving. In meeting the duty, authorities should establish contingency plans for dealing promptly and effectively with unplanned events, such as unforeseen weather conditions, as far as is reasonably practicable.
- 13.1.9 Given the scale of financial and other resources involved in delivering the Winter Service it is not reasonable either to:
- provide the service on all parts of the Network;
 - ensure running surfaces are kept free of ice or snow at all times, even on the treated parts of the network.
- 13.1.10 In Scotland statutory responsibilities are defined by Section 34 of the Roads (Scotland) Act 1984 which requires that “*a road authority shall take such steps as it considers reasonable to prevent snow and ice endangering the safe passage of pedestrians and vehicles over public roads*”.
- 13.1.11 In Northern Ireland, the Roads (NI) Order 1993 SI 1993/3160 (NI 15) provides, in Article 10, a duty for the Department of Regional Development to “*remove snow, soil etc which has fallen on a road*”. Section 9 of the Order also enables the authority to “*take such action as it considers reasonable to prevent snow or ice interfering with the safe passage of persons and vehicles using the road*”. However paragraph 7 of Article 110 provides protection from liability and states that “*Nothing in this Article operates to confer on any person a right of action in tort against the Department for failing to carry out any duty imposed on it under the Article*”.

13.2 WINTER SERVICE POLICY

- 13.2.1 Authorities should formally approve and adopt policies and priorities for Winter Service, which are coherent with wider objectives for transport, integration, accessibility and network management, including strategies for public transport, walking and cycling. They should also take into account the wider strategic objectives of the authority.
(Recommendation 1)
- 13.2.2 Issues for consideration in developing policy should include:
- treatment of facilities for public transport users;
 - treatment of facilities for road users;
 - treatment of facilities for walking and cycling;
 - treatment of transport interchanges;
 - treatment of promoted facilities;
 - extent of priority for emergency services;
 - extent of priority for key public services and critical infrastructure;
 - extent of priority for vulnerable users;

- level of service resilience required;
 - other local circumstances.
- 13.2.3 Authorities should develop service standards for Winter Service which define the Overall Winter Period, the Core Winter Period, the level of resilience and treatment networks.
- 13.2.4 These policies and service standards should be developed as far as reasonably possible with users and key stakeholders and should also be based on a risk assessment to define the scope of the service. The documents should be designed and drafted to be used by staff at all levels. Authorities should utilise the time outside the winter season to put these policies and plans in place.

13.3 RESILIENCE

- 13.3.1 Better planning will result in a more resilient Winter Service and reduce the risk in the delivery of the service during normal and severe winter conditions. It also has the potential to deliver the service in a more efficient way. This includes not only the management of salt stocks, but other resources such as fuel, plant and labour.
- 13.3.2 Winter service should be regarded as part of the authority's wider resilience planning. The same disciplines, systems and processes apply, bringing a degree of rigour and challenge to the preparation of plans for winter weather.
- 13.3.3 The first step towards providing a more resilient service is consideration of the threats and vulnerabilities of the service. This can be achieved through a detailed appraisal of the current situation based on plausible but stretching 'what-if' scenarios.
- 13.3.4 By considering these scenarios, potential areas for improvement in service resilience can be identified. These should be assessed, prioritised and mitigation measures considered. It is important when considering potential mitigation to think laterally, as this may identify more cost effective solutions.
- 13.3.5 An important part of resilience planning is to include a planned escalation procedure. Engagement with the authority's emergency planning department should be considered. The Winter Service Plan should be made available to the authority's emergency planning departments such that it can be integrated with other plans such as Business Continuity Plans, Evacuation Plans and Rest Centre Establishment Plans.

Minimum Winter Networks

- 13.3.6 As part of their contingency planning, authorities should define a minimum winter network. This resilience network may be a subset of their normal treatment network and should provide a minimum essential service to the public, including links to the strategic network, access to key facilities and other transport needs. It is important that there is continuity across boundaries. It is recognised that authorities will have difficulty in treating all bus routes. However, arrangements should be made to enable bus operators to run minimum services.
- 13.3.7 Issues to consider when defining a minimum winter network are:
- What is the key infrastructure access which should be maintained? To this end, the authority's emergency planning department should be consulted. Consideration should be given to a wide range of services, including

consideration for private infrastructure. For example, water treatment works may require chemical deliveries to ensure continuity of water supply but are unlikely to be on the primary treated road network.

- How will carriageways, cycle ways and footways be prioritised across the authority's network? Issues to be considered include treatment methods, resource requirements, type of network as a whole and alternative routes or modes of transport.
 - How will the minimum winter network interface with other authorities? There is little point expending effort to keep a route open if it is snowbound in a neighbouring authority.
- 13.3.8 Treatment of the resilience network in practice should be considered, as the possibility of slower treatment speeds and potential congestion may create issues.
- 13.3.9 The trigger point and protocol for activating the minimum winter network should be agreed within the authority, documented and communicated as appropriate. In doing so agreement should be made with the emergency planning department and senior officers. The decision to activate the minimum winter network may also be made in conjunction with other authorities. The overall approach should be detailed within the Winter Service Plan.

Winter Resilience Standard

- 13.3.10 Authorities should consider, consult on and formally adopt local service standards for resilience of their winter service in terms of number of days continuous severe conditions salting on a defined Minimum Winter Network for the Overall Winter Period and for the Core Winter Period. **(Recommendation 2)**



- 13.3.11 A resilience benchmark of 12 days/48 runs should be adopted for full pre-season salt stockholding by 1 November for English local highway authorities. **(Recommendation 2a)**.
- 13.3.12 In considering how to apply the benchmark, authorities should 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.

- 13.3.13 Establishing a winter service resilience standard requires consideration of the number of days resilience to be adopted, definitions of the Overall Winter Period¹ and Core Winter Period², whether it should refer to the normally salted network or to a smaller locally determined Minimum Winter Network³.
- 13.3.14 Delivery of the Winter Service relies on suitable resources being available, including salt, fuel and trained staff and operatives. Any one resource in short supply puts additional strain on service delivery.
- 13.3.15 It is suggested that at least 6 days resilience for salt and other resources, including equipment, drivers and fuel, would represent sensible good practice for determining the number of days' resilience during the Core Winter Period. This is based on a number of days' severe conditions plus replenishment time and taking into account weekends, and combinations of public holidays and weekends such as Christmas and the New Year.
- 13.3.16 This approach based on a reasonable number of days' resilience in the ability to deliver a defined winter service should ensure that highway authorities hold or have easy guaranteed access to sufficient salt, gritters and drivers and other essential resources to deal with severe winter weather conditions.
- 13.3.17 Some highway authorities may already have a good level of resilience, but if individual authorities decide they need to increase resources, they will need to consider the practical implications and a reasonable implementation period. Implications may include any new arrangements or facilities required and cost.
- 13.3.18 In developing their local service standards based on days' resilience, authorities should assess the risks that are faced in the delivery of the Winter Service. The assessment should cover all items of policy and management including:
- network for treatment;
 - adjoining highway networks;
 - salt management policies;
 - operational resources (including equipment, salt stocks and fuel);
 - access to Winter Service depots and salt storage areas;
 - staff training;
 - availability of operational staff.

¹ Overall Winter Period – Locally defined since the winter period may vary according to climatic conditions, but usually at least the beginning of October to end of April.

² Core Winter Period – Locally defined since the winter period may vary according to climatic conditions, but usually at least December to February inclusive.

³ Minimum Winter Network – That part of the carriageway network normally treated in winter which provides a minimum essential service to the public, including strategic routes, access to key facilities and other transport needs.

- 13.3.19 An example of how authorities may express and apply their Winter Service resilience standard is included in Appendix H.
- 13.3.20 The Department for Transport has put in place a year- round salt stock monitoring system to ensure optimum resilience of salt supply, through a nationally severe winter. Authorities should provide to the Department for Transport the information required for this system in a timely manner.

13.4 CLIMATE CHANGE

- 13.4.1 It is now acknowledged that the world is experiencing a rapidly changing climate. It is generally accepted that although weather is likely to be milder and wetter in winter, there may be more occurrences of severe weather events.
- 13.4.2 The effects of climate change make it difficult for highway authorities to anticipate winter conditions from year to year. Wide variation and extreme events as a consequence of climate change needs to be taken into account in winter service planning. The events of the 2008/09 winter provide evidence of what can happen and are reviewed in detail in the UKRLG report Lessons from the Severe Weather February 2009. The report may be downloaded from the following website:

Website Amended
27 April 2012

<http://www.ukroadsliaisongroup.org/en/utilities/document-summary.cfm?docid=7E330478-F948-42A3-93F8B3A4862AA655>

- 13.4.3 In 2009/10 the UK was hit by the coldest and most extended winter for thirty years. An independent review has been carried out of the resilience of England's transport systems to severe winter weather. The final report has been published, making recommendations for improving transport systems' resilience to severe winter events. The UKRLG supports the recommendations of this report. The final report may be downloaded from the following website:

<http://transportwinterresilience.independent.gov.uk/docs/final-report/>

- 13.4.4 The Secretary of State for Transport responded to the final report. The response may be found in the following website:

Website Amended
27 April 2012

<http://www.dft.gov.uk/news/statements/hammond-20101022/>

- 13.4.5 The Transport Select Committee published a report in April 2011 entitled; Keeping the UK moving: The impact on transport of the winter weather in December 2010. The document can be downloaded from the following website:

<http://www.publications.parliament.uk/pa/cm201012/cmselect/cmtran/794/79402.htm>

- 13.4.6 Authorities should review their approach to climate change and in particular their resilience to prolonged cold weather. **(Recommendation 3)**

13.4.7 Climate change is dealt with in more detail in Section 14.1.

13.5 CO-ORDINATION AND COLLABORATION

13.5.1 Authorities should consider whether collaborative arrangements such as shared services, lead authority arrangements, collaborative service procurement, and sharing depots and salt stock, would provide an effective and value for money approach to increasing winter service resilience. **(Recommendation 4)**

13.5.2 Co-ordination and co-operation between authorities in winter service planning including defining treatment routes, response, and treatment times is of crucial importance. This should be a formal process between the adjoining local authorities and with the authority responsible for the strategic network. The intention should be to negotiate effective service integration across administrative boundaries and to enable operation of the plant and vehicles required to achieve adequate resilience.



13.5.3 In these circumstances close liaison both with public transport operators and local authority transport co-ordinators is essential, at the annual review, on an ongoing basis throughout the season and on a continual basis in severe weather conditions. This is particularly important as, although changes to public transport routes and frequencies will be made throughout the season, it will not usually be practical or desirable for consequent changes to the treated network during the season. This may influence the nature and timing of changes to public transport routes.

13.5.4 The efficient operation of many essential services may be dependent upon ice or snow removal from key areas of private land, which is fundamentally the responsibility of land owners.

13.5.5 Authorities should determine critical areas and infrastructure in conjunction with key public services and other stakeholders and seek to ensure that appropriate winter treatment has been considered by the appropriate party. **(Recommendation 5)**

13.5.6 Authorities should explore the potential for sharing depots as this may provide opportunities for efficiencies. Other areas where collaboration should be considered

include decision support services for weather particularly where authorities have similar climatic conditions.

13.6 WINTER SERVICE PLANNING

- 13.6.1 Planning and preparation is fundamental to delivering a successful Winter Service. Careful planning in advance of the winter season will greatly assist in adequate resources and contingency arrangements being put in place by authorities to improve their overall resilience.

Communication

- 13.6.2 It is good practice to communicate effectively with the public, key public services, stakeholders and other highway authorities. However, communication within the authority is also critical. Preparation and planning of communication in advance will assist in the effective delivery of the service.

Setting Expectations

- 13.6.3 It is important to ensure that the public, elected members and senior management are engaged in the Winter Service. The Department for Transport (DfT) has produced a leaflet titled “Are You Ready for Winter?” with important information for councillors and senior officers about preparation for winter. Public leaflets, websites and briefing notes all contribute to setting expectations with a low associated cost and time requirement.
- 13.6.4 Clearly setting out what will and will not be done as part of the delivery of Winter Service can reduce the number of complaints and questions raised by the public and stakeholders. Improved communication and understanding may therefore improve time available for the Winter Service delivery team to focus on delivery of the service.

Collaboration and Liaison with Stakeholders

- 13.6.5 It is important to remember that members of public will travel across boundaries of several different authorities. It is therefore important that treatment regimes align across boundaries to provide a seamless service. Simple measures such as comparing treatment routes and decision making criteria between authorities will assist with this, especially within urban areas.
- 13.6.6 Authorities should ensure that there is appropriate consultation and communication with other highway authorities, key public services and other stakeholders to ensure improved service for the public. **(Recommendation 7)**
- 13.6.7 It is important to provide information directly to key stakeholders, including adjacent highway authorities, all emergency services, public transport operators, motoring organisations, the education authority, schools, their bus operators, and key local organisations. This information could include:
- Sharing Winter Service Plans;
 - A non-technical summary of the Winter Service Plan;
 - Maps of treatment routes;
 - Operational decisions on a timely basis.

- Salt stock information via the Salt Portal
- 13.6.8 Liaison between highway authorities should be routine throughout the winter season. Communication of treatment decisions provides useful information that may inform future decision making, promotes seamless service and can potentially generate efficiency savings.
- 13.6.9 Collaboration with other authorities can be as simple as arranging an informal meeting to discuss the respective Winter Service policies and plans on an annual basis. Other topics could include resource availability, mutual aid or joint training and exercising.
- 13.6.10 It is good practice to liaise with the relevant trunk road and motorway operator (where appropriate) to confirm current route planning. This will minimise duplication of treatments where the two networks cross and avoid sections being missed at complex intersections.
- 13.6.11 There are many examples of good practice where authorities have worked together in preparation for the winter season. In London, for example, all highway authorities and other stakeholders have collaborated to produce a contingency plan, agree a resilience network, and put in place a strategic stockpile of salt.

Contact Information

- 13.6.12 Staff contact details and other stakeholders involved in the Winter Service need to be updated before the start of the winter season. A contact check is a simple and effective means of ensuring that staff can be contacted when required. The contact check also facilitates a refresh of communications with other authorities and stakeholders.

Media Information

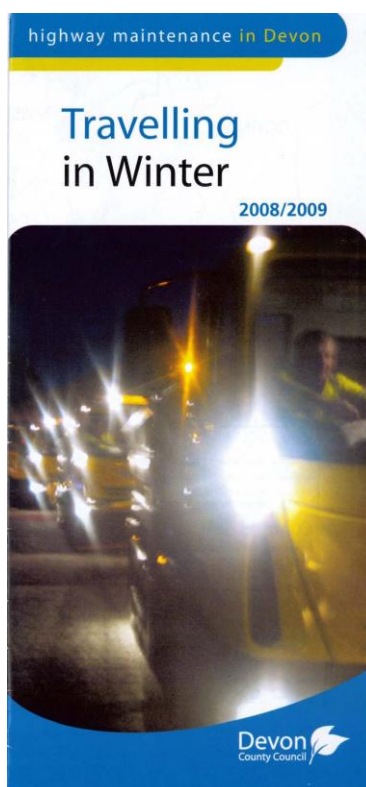
- 13.6.13 Authorities should establish effective working arrangements with local press and broadcast media. This should enable the presentation of timely and accurate information and advice on network condition and use. Information could include travel information, network availability and risk of severe conditions such as snow and black ice. These arrangements should include in-season proactive media output to engage the public with the Winter Service. This is especially important during prolonged cold weather and is likely to involve television, radio and the internet. Local radio in particular considers this to be a most important aspect of their service to the community and it therefore provides the opportunity to build good working relationships over wider issues. Many authorities have specialist press and public relations personnel and it will be important to clarify and agree respective service and specialist responsibilities.
- 13.6.14 Whilst every severe weather event poses its own unique issues, the baseline media information required remains relatively constant. Statistics such as the number of spreaders, ploughs and salt stored are popular requests. The structure of messages to be relayed is generally similar.
- 13.6.15 Robust processes should be in place to ensure a rapid and accurate issue of media information is possible. It is suggested that pre-prepared media briefs are developed in advance of the winter season for use during times of severe weather.
- 13.6.16 It is important to define and agree key contacts with press and broadcast media and also establish a clear understanding of the most effective timings for information to be provided, in order to reach necessary audiences and broadcast schedules. It may be helpful to arrange joint workshops or training sessions to build understandings and

relationships. Advance compilation of commonly requested information will reduce the media workload during a severe weather event.

- 13.6.17 There may also be a need in more widespread and extreme conditions to provide information to the public using national press and broadcast. This may be undertaken either directly or by arrangement with local media, and arrangements should be discussed with them. It may also be possible to utilise variable message signs.
- 13.6.18 Where possible authorities should use their media relations staff to prepare generic statements and press releases for rapid issue at the onset of winter conditions. These can be pre-approved for use during periods of severe conditions, when both Winter Service delivery teams and the press team will be busy. Consequently authorities may identify the need to provide media training to winter staff. This will help to ensure that the right message is put across in the correct manner at all times.
- 13.6.19 When severe weather is forecast the media rapidly start requesting information and it is important that correct and accurate information is available to them. If information is not provided by an authority the media will attempt to source it from elsewhere, which may not be accurate.
- 13.6.20 Recent experience has shown that some individuals will take heed of advice issued to the public for or avoiding travelling during severe conditions. If sufficient advanced warning is provided, drivers will be able to change their plans.

Information for the Public

- 13.6.21 Authorities should ensure effective communication of information for the public before and during both normal and severe winter conditions. **(Recommendation 6)**
- 13.6.22 Authorities should make widely available for users and the community a non-technical summary of the Winter Service Plan, including plans of the treated network, together with guidance on safe use of the network. They should also establish arrangements for local radio and web based information.
- 13.6.23 Section 6 of this Code deals with arrangements for community involvement in highway maintenance and the importance of information and publicity. This provides opportunities and challenges, which should be positively addressed by authorities and provide an important opportunity to demonstrate understanding of users' needs, and a strong service commitment.
- 13.6.24 It is of crucial importance that policies and standards of Winter Service provided by authorities are widely available and understood by users and the community. As far as possible highway users should be made familiar with treatment routes, particularly in severe weather conditions. This will help in ensuring that expectations are realistic and consistent with the resources available as well as maintaining public safety.
- 13.6.25 Many authorities provide leaflets summarising policies and service standards, including maps showing routes treated, contact information and advice on safe network use. The leaflets should be reviewed annually and made available through the internet, libraries, information centres, schools and a wide range of outlets. Further details on the content and use of leaflets are included in Appendix H.



Public Self Help

- 13.6.26 Guidance to the public has been published by DfT on how they can assist their communities in clearing snow and ice without fear of litigation.

http://www.direct.gov.uk/en/NI1/Newsroom/DG_191868

- 13.6.27 Many authorities have provided salt bins and shovels to parish councils and other stakeholders in order to help them keep local areas free of ice and snow. Ensuring suitable risk assessments and method statements are in existence will minimise the risk of accidents occurring.
- 13.6.28 Local volunteer groups may provide support to local communities and the vulnerable for clearing footways. This needs careful management to ensure the safety and welfare of all involved. This is an area that emergency planning departments are likely to have experience of, either directly or through involvement with Local Resilience Forums.
- 13.6.29 One means by which authorities can assist the local community in areas not on priority routes or at known trouble spots, including gradients and sharp bends is by the provision of public access salt bins. Where these are provided authorities should make arrangements for their replenishment as necessary and to ensure that they do not become unsightly or used for the unauthorised disposal of waste.

Winter Service Plan

- 13.6.30 It is important that the Winter Service Plan is designed to be used by staff at all levels and that those that require it have ready access to the document.
- 13.6.31 Authorities should formally approve, adopt, and publish, in consultation with users and key stakeholders, a Winter Service Plan based on the principles of this Code.
(Recommendation 8)

- 13.6.32 Once the policy and plan documents are complete, it is important that those involved in delivering the Winter Service are aware of the current approach. Ideally, a briefing should take place at the start or early in the season to disseminate this information to staff involved in the delivery of the Winter Service. The briefing should also remind staff of the critical role they play in mitigating the impact of winter weather on the road network.
- 13.6.33 The Winter Service Plan should be reviewed annually in consultation with a wide range of stakeholders.
- 13.6.34 It is good practice to monitor compliance with the Winter Service Plan throughout the season. Simple audits on decisions made and short debriefs of snow events will achieve this. These audits should be regular and clearly documented to ensure maximum benefit can be achieved.
- 13.6.35 Suggested contents of the Winter Service Plan are detailed in Appendix H. The Plan should recognise the fundamental differences between the main components of Winter Service for carriageways, cycle routes, footways and any critical areas and infrastructure as follows:
- pre-treatment - “precautionary” salting;
 - post-treatment - continuing salting following the formation of ice;
 - clearance of ice and snow;
 - dealing with continuous severe conditions.

Treatment Routes

- 13.6.36 Authorities should define treatment route plans for carriageways, cycle routes and footways for pre-treatment and snow conditions, based upon the general maintenance hierarchy, but adapted to take into account the factors identified by this Code.
(Recommendation 9)
- 13.6.37 The treatment routes for Winter Service should take as a starting point the hierarchy developed for other maintenance purposes but this is likely to require extensive modification to consider:
- wider transport and other policy priorities referred to above;
 - special requirements of carriageways, footways and cycle routes;
 - safe and reliable access to emergency facilities including Fire and Rescue, Police, Ambulance Services and hospitals;
 - other public services access needs and critical infrastructure where the maintenance of access may be critical;
 - public transport routes and access to stations, bus garages and depots;
 - safe and reliable access to main industrial and business centres of key importance to the local and regional economy;

- any significant variation between summer and winter traffic;
- accessibility dependencies of remote communities for example Scotland's island and peninsular communities;
- the special needs of disabled people or older people particularly where these can be effectively targeted;
- known problems, including significant gradients, exposed areas and other topological factors;
- climatic and thermal capacity differences within the area;
- co-ordination and co-operation with other authorities.

13.6.38 Consideration of these issues is likely to suggest differences in networks adopted for each element of Winter Service. Such decisions will usually not be clear cut. For example treatment of footways will differ from carriageways and for low traffic roads it may be difficult to justify high priority for service provision.

13.6.39 Risk assessments should be undertaken to establish which routes should be included in a programme of treatment during winter. In particular, the treatment of carriageways, footways and cycle routes must be considered taking account of risk to all highway users and consideration of the available resources.

13.6.40 Where the authority is actively promoting facilities, or there are clear trends of increasing use, a more proactive approach to Winter Service may send an important message.

13.6.41 Transport interchanges perform a key role in the delivery of integrated transport, which should be reflected in Winter Service policies and priorities. These include airports, rail and bus stations and the means of access to them whether by main routes for walking, cycling, public transport or car. Parts of the interchange may be subject to differing management regimes and it will be important to agree common standards and ensure effective co-ordination of resources.



13.6.42 It should be recognised that many authorities will have difficulty treating all bus routes as part of their precautionary salting routes. The treatment of bus routes should be

based on risk assessment of local circumstances such as service frequency and their importance to integrated transport services. It is important that treatment routes include the access roads to bus garages.

- 13.6.43 Similar considerations apply to school bus routes where, although authorities should endeavour to provide Winter Service support, there may be practical difficulties in wide spread treatment of such a diverse network.
- 13.6.44 In general salting should not be undertaken between the stop lines of level crossings, even when covered with snow. Before ploughing over a level crossing the driver must stop and telephone the signalman for permission to proceed and then inform the signalman when past the crossing. Snow blowers must not be used on level crossings.
- 13.6.45 Consideration should be given in certain circumstances for the temporary erection of snow fencing to reduce the effect of drifting snow. The legal powers to provide snow fences in England and Wales are contained in Section 102 of the Highways Act 1980. Where no agreement can be reached with the landowner, Sections 239, 240 and 250 of the Act provide for compulsory powers. The power to provide snow fences in Scotland is in Section 30 of the Roads (Scotland) Act 1984. There is no equivalent of these specific powers in Northern Ireland but Article 100 of the Roads Order, which deals with the acquisition of land, could be used in these circumstances.
- 13.6.46 In periods of especially severe weather in certain parts of the UK, temporary road closures may be necessary. Where roads are known to be particularly vulnerable consideration should be given to the installation of permanent flap down or variable message signs. These signs should be located well in advance of any anticipated obstruction and should be operated in conjunction with the Police. In determining the optimum location consideration should be given to the availability of alternative routes and, if necessary, holding areas. With manually operated signs, and in more remote areas, it is essential that the signs are easily accessible and can be quickly operated by authority or police to give timely information. Consideration should be given to the merits of remotely controlled matrix signing.

Contingency Planning

- 13.6.47 Winter Service procedures should be designed to provide a planned response during even exceptionally severe weather. Through careful planning it is possible to reduce the need for reactive response. It is important to ensure that the Winter Service Plan contains details of the escalation procedures, alternative resources and minimum winter (resilience) networks.
- 13.6.48 The delivery of a more resilient Winter Service should enable local communities, business, public transport and emergency services to function in more severe conditions prior to the need to implement contingency arrangements. Effective contingency planning is therefore a key element of delivering a more resilient service.
- 13.6.49 Authorities should prepare contingency Winter Service Plans for severe weather conditions which include possibilities such as salting a Minimum Winter Network. Authorities should seek agreement on plans in advance with other highway authorities and key public services such as hospitals and public transport providers. There should be a co-ordinated approach to implementing Minimum Winter Networks across adjacent highway authorities. **(Recommendation 10)**

- 13.6.50 When weather is sufficiently severe, a contingency plan should be activated. The success of this plan is dependent on advance planning and co-ordination, including treatment routes, resource needs, mutual aid and communications.
- 13.6.51 With improved resilience of Winter Service the normal response is likely to cope with more severe conditions before the need for escalation. Once escalated, the response will then be likely to mitigate the effects of more extreme conditions. Providing winter decision makers with well designed contingency arrangements allows them to escalate an issue before it becomes a significant threat to continuity of service and to have the tools available to best manage the situation.
- 13.6.52 When resilience measures and processes have been developed and incorporated into the Winter Service Plan, relevant staff and stakeholders will need to be trained. Resilience planning should be tested through exercises. This will resolve any potential problems in the approach prior to it being used operationally.
- 13.6.53 Local authorities, as Category 1 responders under the Civil Contingencies Act 2004, will already have emergency plans in place. Authorities should benefit from these plans in developing a more resilient approach to Winter Service. Business continuity planning with respect of severe conditions is also important to ensure that winter service can be delivered and other critical functions can be adequately supported.
- 13.6.54 As part of their contingency planning, authorities should define a Minimum Winter Network, see recommendation 2. This may be a subset of their normal treatment network and should provide a minimum essential service to the public, including links to the strategic network, access to key facilities and other transport needs. It is important that Minimum Winter Networks ensure continuity across boundaries. It is recognised that authorities will have difficulty in treating all bus routes as part of their minimum network. Minimum Winter Networks should however enable bus operators to run minimum services, as appropriate.
- 13.6.55 Resources such as salt, fuel, spreaders, depots and labour are finite. Plans therefore need to demonstrate how the service will be delivered if one or more of these resources is in short supply. Shortages of fuel, spreaders or operators may not coincide with severe weather.
- 13.6.56 Where practicable, authorities should make arrangements for obtaining reserve supplies of key resources to support their minimum resilience standard. This should include salt, fuel, power and labour.
- 13.6.57 Mutual aid is a pre-agreement between one or more organisations to assist each other, as far as practicable, to overcome disruptive challenges. Mutual aid between authorities is often used in the response to “wide” area emergencies, as the impact on the local authorities, emergency services and other resources can be overwhelmed. Sharing, e.g. depots and salt stocks, through mutual aid may be helpful. Where planning to do so authorities should make contingency arrangements in advance.

Mutual aid can be an informal or formal process having written agreements. Arrangements are usually between organisations that work closely together on a regular basis or as part of local resilience forums. Both approaches work well if they are flexible enough to change in response to the dynamics of a situation. Guidance on mutual aid may be found at:

<http://www.cabinetoffice.gov.uk/resource-library/short-guide-local-authority-mutual-aid>

13.6.58 Authorities should explore the potential for mutual aid in salt supply and other aspects of winter service and should make contingency arrangements in advance. **(Recommendation 11)**

13.6.59 During a salt shortage there may be various potential mechanisms to reduce salt consumption bearing in mind the issues discussed in Appendix H. Each has its own implications which the authority must carefully consider prior to implementation.

13.6.60 In 2009 CSS (now ADEPT) published advice for its members on how to help preserve salt stocks during periods of severe winter weather, in order to ensure that essential services can be maintained. The advice may be downloaded from the following website:

<http://www.lga.gov.uk/lga/aio/1584225>

13.6.61 During a severe weather event increased levels of communication are likely to be required. Communication during a 'crisis' is not simply about media output. Proactive internal communication and keeping the numerous stakeholders informed is also critical. It is important to ensure that good communication is achieved both with internal staff and external stakeholders. Media liaison is relatively straightforward task once suitable contacts are made. The use of authority websites is a good way to get accurate information to the public without reliance on the media.

13.7 WINTER SERVICE DELIVERY

Decisions and Management Information

13.7.1 Authorities should take full advantage of decision support systems and services to enable timely, efficient and accurate decision making. **(Recommendation 12)**

13.7.2 Decision support systems and management information are the basis of effective Winter Service delivery. More details are given in the *ICE Design and Practice Guide, Highway Winter Maintenance* published in 2000.

13.7.3 Systems will use current information and trends in conjunction with relevant software to extrapolate and display predicted conditions over a range of periods.

13.7.4 The decision support information will be used by the authority's designated Winter Service controller, or similar, together with local experience, and against the background of a range of pre-determined scenarios, in deciding the action to be taken. The decision should usually be delegated to a single person, although in larger authorities with varying climatic conditions the role may be delegated to two or more persons. Controllers will of course need to maintain close consultation with others both within and adjoining the authority and also those dealing with the strategic network.

13.7.5 Information to aid decision making is included in Appendix H.

13.7.6 The quality of decisions made by the controller will be the key factor in determining both the effectiveness of the Winter Service and also how it is perceived by users and the community. Instigating a decision check process ensures high quality decisions are acted upon and is good practice.

Information Recording and Monitoring

- 13.7.7 Authorities should continually monitor performance during service delivery and respond effectively to changing conditions or network incidents. **(Recommendation 13)**
- 13.7.8 Comprehensive and accurate records should be kept of the all Winter Service activity, including timing and nature of all decisions, the information on which they were based, and the nature and timing of all treatment. Note that time taken running dead mileage at end of salting run is not included in treatment time. It is preferable to record both the time at the end of actual salting and the time of return to depot. Where the dead mileage at the end of a salting run is significant this should be considered when planning for severe conditions as it will prevent rapid redeployment of resource.
- 13.7.9 Authorities should make use wherever possible of electronic vehicle location systems together with automatic recording of salt spreading. This will simplify and improve the accuracy of records as well as provide corroboration of service delivery in cases where failure to salt is alleged.
- 13.7.10 The condition of routes should be monitored following treatment in order to confirm that the treatment has been effective. If it has not been fully effective, contingency treatments should be considered to achieve the required condition. It should be noted that both active and passive road weather sensor systems require the presence of moisture to determine either the concentration of an anti-icing chemical on the road or the freezing point temperature of the solution present on the road sensor.

Resources

- 13.7.11 Winter Service requires numerous staff, a significant amount of plant and large volumes of consumables such as salt for de-icing and fuel. It is important that supplies and suppliers are planned and managed to ensure these resources are available when required. Sufficient trained and experienced staff are required for the delivery of an effective Winter Service. This includes winter managers, decision makers, supervisors, spreader drivers and other equipment operators.
- 13.7.12 Authorities provide Winter Service through combinations of their own resources and those of service providers contracted to them. There is a wide variety of approaches. Many highway authorities provide some of their own facilities with others provided by the private sector. In all cases, service providers' activities are governed by their contract with the highway authority.
- 13.7.13 In some authorities refuse collection, street cleansing and grounds maintenance services often provide support to the Winter Service, especially in times of prolonged ice and snow. Arrangements should be made and documented well before the commencement of the season.
- 13.7.14 Detailed route planning and for each aspect of Winter Service will need to be optimised to ensure economic, efficient and effective resource allocation. This will depend on:
- spreading vehicle characteristics and capacity;
 - depot and salt location;
 - Response times (the period between decisions being taken to begin treatment and vehicles leaving the depot. It is suggested that authorities should adopt a

target response time of no more than one hour. This should apply both within and outside normal working hours);

- Treatment times (the period between vehicles leaving the depot and the completion of treatment on all priority routes. Authorities should adopt target treatment times based on risk assessment of local circumstances that provide for the completion of pre-treatment before ice forming. They should however recognise however that treatment times might vary in different weather conditions).
 - Turnaround times (the period between a vehicle completing salting on its route and being ready to recommence salting having reloaded at the depot)
- 13.7.15 A key factor in ensuring that response and treatment times are met once a decision has been taken to treat is the availability of appropriately trained personnel. Identifying the extent of resources needed under various scenarios and the potential source of these will be an important aspect of pre-season planning. This planning should cover the whole range of requirements and conditions likely to be encountered, including:
- Pre-season preparation;
 - Precautionary treatment;
 - Footway and cycle route treatment;
 - Post treatment;
 - Snow clearance;
 - Continuous severe conditions;
 - Post snow emergencies (flooding etc).
- 13.7.16 Planning of resources should cover the entire workforce involved in the Winter Service. It is particularly important not to overlook:
- the need for staff to be available throughout defined risk periods;
 - the need for the treatment operations to be co-ordinated and supervised;
 - resources and equipment for treating carriageways, footways and cycle routes;
 - resources for dealing with vehicle breakdowns, problems with fuel supply and communications failure;
 - resources for the storage, delivery and loading of salt.
- 13.7.17 In planning resources the following issues regarding personnel also need to be addressed:
- implications of Drivers' Hours Regulations;
 - extent and nature of double manning and driver support;

- shift system arrangements;
 - provision for holidays and sickness.
- 13.7.18 It is important that a realistic assessment of the resources required has been made to ensure the continued treatment of the Minimum Winter Network during exceptional conditions. Authorities in planning their resources should ensure that they are compatible with the wider resilience standards adopted by the authority.
- 13.7.19 Authorities often place reliance in times of prolonged ice and snow on temporary contracts with contractors, farmers and others to supplement resources for snow clearing. Arrangements should be documented and it is important to ensure that the necessary insurance cover is in place.
- 13.7.20 In rural areas, authorities should examine the potential for using local council snow wardens, who may have an effective role in gathering information and providing Winter Service Managers with details of specific local problems. If snow warden schemes are adopted clear terms of reference should be established.

Training and Development

- 13.7.21 Ensuring adequately trained and experienced staff is key to successful delivery of Winter Service.
- 13.7.22 To ensure appropriate level of competence, training and development needs of all personnel should be established and reviewed annually, including health and safety and appropriate vocational qualifications. Training should then be provided where appropriate before the Winter Service season. **(Recommendation 14)**

Training

- 13.7.23 Delivery of a successful Winter Service is dependent on the individual decisions made and actions taken by all those involved. These actions and individual decisions must be supported by adequate training of the staff and operatives involved.
- 13.7.24 To ensure appropriate level of competence, the training and development needs of all personnel should be established and reviewed annually, including health and safety and appropriate vocational qualifications. Training should then be provided where appropriate before the Winter Service season.
- 13.7.25 Issues where training is required are described below. This is not an exhaustive list and will largely be based on local circumstances:
- the content and operation of the Winter Service Plan;
 - route familiarisation (as appropriate);
 - driving in difficult and hazardous road conditions including duty of care to other road users;
 - circumstances where special safety considerations apply;
 - snow ploughing, in particular around rail level crossings, tramways, partially segregated areas,

- dealing with emergencies;
 - dealing with post ice and snow emergencies especially flooding.
- 13.7.26 In addition to such specific training it will be necessary to ensure that all personnel are provided with information during operational periods on current network characteristics and constraints, including:
- nature and location of highway works, including statutory undertakers;
 - temporary and permanent barriers;
 - nature and location of any traffic diversions;
 - nature and timing of any events likely to affect network use.
- 13.7.27 Authorities should prepare specific health and safety policies, guidance, and risk assessments with their service provider. These should be issued and discussed with all personnel, including temporary contractors, and should form the basis of further training as necessary.
- 13.7.28 Training provided to service delivery personnel should also include specific reference to the health and safety needs of users, including:
- avoidance of spraying pedestrians, cyclists and vehicles where practicable with salt or slush when salting or ploughing;
 - avoidance of risks to pedestrians and cyclists when using vehicles in segregated or partially segregated areas and in treating footways;
 - ploughing and manoeuvring in restricted circumstances;
 - other road vehicles that may not be under proper control.
- 13.7.29 Authorities should consider both qualifications (e.g. City and Guilds) and practical experience training. Some authorities have found it useful for those personnel involved in Winter Service management and decisions to undertake training in familiarisation and interpretation of weather forecast information.
- 13.7.30 Authorities are encouraged to have a system to plan and record all winter service related training. This may form part of a wider training management system. This system can then be checked prior to winter to ensure any necessary refresher training is undertaken.
- 13.7.31 There are several groups of individuals that comprise an authority's resources to deliver the Winter Service. These individuals require training to fulfil their duties within an authority's Winter Service. These are listed below:
- Winter Decision Maker and Manager***
- 13.7.32 Currently there is no formal winter decision maker or winter manager qualification, however most authorities follow a similar approach. Road weather forecasting and systems training (such as for Road Weather Information Systems) are commonly used indicators of a decision maker's competence, combined with proven experience.

However, the appropriate experience required to deliver the service can only be gained 'on the job' over a number of years. Good practice suggests that novice decision makers should undergo an internal training programme. This should include briefings on the Winter Service Plan, meteorological training, experience of operational delivery and mentoring by more experienced staff. This should continue until their experience and competence is proven. It is essential that such training should be well documented to ensure that competence can be demonstrated. Weather forecast providers are able to provide training on meteorology and providers of weather sensors often provide training on how the weather affects the road surface. Exercises delivered via independent organisations can provide decision makers with experience of the management of severe conditions.

Drivers and Operators

- 13.7.33 Those operating spreading equipment are well served with vocational qualifications such as the City & Guild's 6159 modules. It is essential that any operative involved in the use or operation of any plant or machinery has received relevant formal training to do so. Where reserve drivers are available as part of an authority's contingency plans it is essential that they are trained to an equal standard of competence.

Winter Supervisors

- 13.7.34 Under City & Guilds 6159, there is a specific module for winter maintenance supervisors which ensures that the first tier of management is aware of their duties and sufficiently competent to fulfil them. It is essential that appropriate staff within an authority's organisation undergo this training.

Senior Management and other Key Stakeholders

- 13.7.35 Authorities may benefit in providing basic training to senior management and certain key stakeholders in delivery of Winter Service. This can be valuable in managing the expectations in delivering the service during both normal and severe winter conditions. A short training programme will provide a basic understanding of the Winter Service, its limitations and pressures. This may be delivered efficiently as an electronic package or briefing note to minimise staff time in the delivery of it to the multitude of stakeholders.

Training Plan and Records

- 13.7.36 Authorities are encouraged to ensure they have a system of formal training records. The purpose of the system is to record and monitor the training and competence of each individual involved in Winter Service. The system should use the data within it to help identify those people whose training requires refreshing and renewing. Where authorities contract out Winter Service they should require their suppliers to maintain similar records.
- 13.7.37 The system should comprise a development action plan for each individual and record progress in meeting that plan. This will enable training sessions to be targeted, planned and executed in a cost efficient manner.
- 13.7.38 Before commencement of the winter season training records should be checked to identify whether out of season training has occurred and individual training records have been updated. Additionally any mentoring schemes or similar experience-based learning should also be consulted to avoid any issues later in the season.

Route and Equipment Familiarisation

- 13.7.39 Relevant staff and operatives should undertake familiarisation training with winter arrangements, treatment routes and equipment. This is especially important for operational staff that may be new to the authority's Winter Service. Tool box talks and dry runs of treatment routes are useful approaches to deliver this training. Records of this training should be recorded on the training management system as described above.

Exercising

- 13.7.40 Planning and preparing for a winter season are essential activities, but often the measures implemented are only tested in a live situation. Exercising and testing aims to confirm that the plans and procedures are suitably robust to cope with conditions in a safe and non-consequence environment. It is recommended that authorities and relevant organisations should provide training and conduct periodic exercising to test plans for responding to severe weather events.
- 13.7.41 Authorities and relevant organisations should provide training and conduct periodic exercising to test plans for responding to severe weather events. **(Recommendation 15)**
- 13.7.42 The Civil Contingencies Act 2004 requires Category 1 responders to exercise their plans to validate and test them. Although winter planning does not necessarily fall into the plans that must be exercised it is clear from recent winter events that severe snowfall will result in the invoking of various other emergency plans via local and regional resilience fora.
- 13.7.43 It would be beneficial for authorities to build severe weather conditions into regional or local training exercises or to develop specific Winter Service exercises involving adjacent authorities and relevant partners. Such testing of plans and personnel associated with the Winter Service would ensure authorities are fully prepared. It would also assist with ensuring that resilience of Winter Service is addressed and communication networks developed and improved. Appendix H contains further guidance regarding the design and delivery of winter exercises.
- 13.7.44 *Case study.* The Highways Agency has been running Snow Desk adverse weather exercises for several years. The exercises are based on resilience guidelines using real networks, realistic scenarios and weather forecasts to ensure that effective and realistic assessments are achieved.

Plant and Vehicles

- 13.7.45 A range of vehicles, plant and equipment is used to deliver Winter Service. It is important that this equipment is well maintained, calibrated and reliable. This Code does not deal in detail with the equipment used for Winter Service, but refers to certain more strategic issues relating to procurement and sustainability.
- 13.7.46 In assessing the required plant and vehicles authorities should ensure that sufficient resources are available for the delivery of the Winter Service during severe and prolonged ice and snow. This should be compatible with the resilience standards adopted by the authority.
- 13.7.47 It is unlikely that, with the level of investment involved, authorities will be able to make frequent changes to the fleet, other than replacement or renewal. It is important

however, that opportunities are taken when overall service procurement changes are being contemplated to thoroughly review Winter Service and equipment procurement.

- 13.7.48 There have been significant advances in the equipment available on the market in recent years. Vehicles are now capable of delivering a range of treatment types and can have sophisticated technology. The procurement of such technology potentially allows a more targeted and effective approach to treatment of the road network and an improved audit trail of where treatments have been undertaken.
- 13.7.49 It is often extremely difficult and inefficient to remove significant depths of snow using only salt and therefore consideration should be given to the use of snow ploughs mounted on spreaders or other suitable vehicles. Snow ploughs are durable, require little maintenance and should therefore prove very cost effective. However, in urban areas there may be considerable difficulties in utilising snow ploughs and in this situation any consideration should be on a risk based approach.
- 13.7.50 It is also important to consider equipment requirements for dealing with footways and cycle routes. Specialist equipment, such as footway ploughs and footway salt spreaders may be necessary for this purpose.
- 13.7.51 The location of depots should be kept under review and specifically addressed when consideration is being given to procurement arrangements. It would be unlikely if all present depots from which authorities undertake Winter Services are ideally located, and significant financial and operational savings can often be achieved from re-location.
- 13.7.52 The environmental effects of highway maintenance depots and operations are dealt with in Section 15 of this Code, and these can be particularly significant in the case of the Winter Service, where operations will inevitably involve unusual hours of working. Every effort should be made to minimise the environmental intrusion of depots and so far as is practicable the effect of Winter Service operations.
- 13.7.53 A significant contribution to minimising environmental effects can be made by providing covered storage for all vehicles, equipment and materials, which can also reduce waste and maintenance problems.
- 13.7.54 Purchase and ownership of vehicles and equipment will also be a key issue for consideration in relation to the procurement of services. Private sector partners may be able to assist with financing arrangements and authorities will need to balance the financial advantages of this against the contractual and operational risks involved.
- 13.7.55 The need to ensure vehicles are correctly calibrated, well maintained and repaired quickly is essential to the delivery of the service. Whatever arrangements are used the response time, speed of repair, availability of spare parts, quality of repair and audit trail should be carefully established and documented.

Precautionary treatments

- 13.7.56 These are the application of de-icers to road surfaces before the onset of freezing conditions (i.e. frost, snow or freezing rain). The purpose of precautionary treatments is to prevent the formation of ice, or to weaken or prevent the bond of freezing rain or snow to road surfaces.
- 13.7.57 It is usually impractical to spread sufficient salt to melt freezing rain or more than a few millimetres of snow. Therefore, in advance of forecast snow or freezing rain, salt is spread to provide a debonding layer so that:

- snow is more readily removed by ploughing
 - compacted snow and ice are more easily dispersed by traffic
- 13.7.58 It is very difficult to remove a layer of compacted snow or ice that is bonded to the road surface, so precautionary treatments are essential before heavy snowfall.

Salt and De-icing Materials

- 13.7.59 Rock salt is the prime material for dealing with ice and snow on roads but can have environmental consequences. It can adversely affect vegetation, pollute watercourses and leave a residue on footways. It can also damage the road structure, bridges and structures, utility apparatus and vehicles. However, used responsibly it can have minimal environmental impact. In the interests of sustainability therefore authorities should ensure that only the minimum of salt is used to deal with the prevailing conditions. Suggested rates of spread are given in Appendix H.
- 13.7.60 Appendix H lists a number of alternative materials that authorities could consider using in place of rock salt in particular circumstances. The costs of some of these are extremely high and particular materials also have some environmental consequences. They may prove, however, to be cost effective in specific locations, such as the treatment of footways, where the need for additional sweeping can be avoided, and bridges, where the damage caused by the use of salt can be avoided.
- 13.7.61 As rock salt requires the passage of traffic to improve effectiveness, it may be necessary to use brine in some cases for example some cycle routes.

Salt management

- 13.7.62 Salt is a finite resource and UK suppliers are constrained by mining operations amongst other factors as to how much may be produced and supplied. Supply can therefore be outstripped by demand during severe weather. It is therefore important to make optimum use of salt for de-icing and make every effort to store and use it efficiently, regardless of the weather conditions, in order to minimise consumption. In addition there can be significant financial benefits to be gained adopting such an approach.
- 13.7.63 Salt is consumed in significant quantities during the winter season, so even small percentage savings in salt use through accurate calibration of spreaders, considered decision making and appropriate treatments is important. These measures will help to minimise the overall consumption of salt on a national basis. Appendix H contains further information regarding spreader calibration. Ultimately, authorities should consider ways of reducing overall salt consumption while maintaining agreed levels of service on their network. Considerable savings can be made in the amount of salt used to treat carriageways if the salt is maintained in good condition and spreaders are correctly calibrated.
- 13.7.64 Many authorities award salt supply contracts to a single supplier on a call-off basis. Contracts are often awarded on a balance of quality and price, with price usually being the driving consideration. This approach has resulted in a price driven market where salt supply is often treated as a commodity purchase. Authorities carry the risk of being able to obtain the salt they require when they require it. Suppliers carry the risks involved in producing and stock piling salt before sale. Commodity purchase arrangements do not necessarily embrace the service relationships between authorities and their salt suppliers which should lead to improved reliability, and knowledge and

anticipation through good communications, and which are facilitated by contemporary procurement arrangements.

- 13.7.65 Authorities and salt suppliers should treat the supply of salt as a service rather than a simple commodity purchase. **(Recommendation 16)**
- 13.7.66 Authorities should place orders for summer restocking, and make arrangements for in-season restocking. It may be beneficial to consider the option of changing de-icing material to minimise consumption and improve resilience.
- 13.7.67 It has become common to restock at intervals during the winter season using salt management systems based upon predicted use of salt and delivery times. The salt shortage in winter 2008/09 demonstrated that it is difficult for salt supply arrangements to accommodate significantly increased short term demand. Authorities should therefore ensure sufficient resilience in their salt stocks.



- 13.7.68 Authorities should develop close working relationships with salt suppliers and ensure that initial salt quantities and reorder triggers are set to achieve their local resilience standard.
- 13.7.69 It may not be easy for some authorities to achieve an appropriate level of resilience through storing salt at their own depots. Salt suppliers may be able to hold dedicated stock at locations around the UK and authorities should consider whether such an approach is possible.
- 13.7.70 Communications and relationships with salt suppliers may be improved by the development of supplier user groups and authorities should consider participation in such groups.
- 13.7.71 The salt shortages in winter 2008/09, 2009/10 and 2010/11 prompted various local, regional and national salt stockpiling arrangements. This has significantly increased salt stockholding nationally and therefore added resilience. However it is important that Authorities do not routinely rely upon these stockpiles as they are intended only for use during sustained severe winter weather. The Department for Transport Salt Portal plays a key role in managing reserve stocks as it allows early visibility of potential salt supply issues and also enables continual assessment of current stockholding across England.

Salt storage

- 13.7.72 There are two principle reasons to ensure that salt is stored carefully and in accordance with the good practice described below, namely ensure a consistent product for spreading and to reduce losses due to leaching.
- 13.7.73 Moisture content can have a significant impact on spreader calibration with over or under spreading possible. Authorities may therefore achieve more consistent spreading of salt through maintaining a constant moisture content in the salt throughout the entire season. Appendix H contains further details regarding the moisture content of salt.
- 13.7.74 As part of pre-season preparation, authorities should review how their salt is stored in order to identify how greater efficiency may be attained in its use. This may include developing the business case for salt barns or covering open storage facilities. Moisture content of salt is a critical factor in determining spreading rates and distribution.
- 13.7.75 The correct storage of salt is essential to minimise environment damage and storage in salt barns helps to prevent leaching, eases handling, helps in maintaining low salt moisture content, and is strongly recommended where additives are used. Detailed advice is available on alternative types and construction methods available. Where open stockpiles are used these should be covered with sheeting, or spraying with bituminous emulsion which provide an effective alternative.
- 13.7.76 Both permanent and temporary salt storage areas should be sited and managed in accordance with requirements of the Local Planning Authority and the Environment Agency. In particular they should not be sited where they could cause damage to landscape or nature conservation or have the potential to pollute watercourses or groundwater. Authorities should be aware of the deterioration in the quality of salt stored for long periods and the need for effective stock rotation. Appendix H contains further details regarding salt storage options.
- 13.7.77 Where grit is used for treatment, for example in the more extreme conditions applying in Scotland, storage requirements may be less stringent and local advice should be sought.
- 13.7.78 As a means of enhancing local salt storage capacity, authorities and salt suppliers should jointly consider supplier owned salt stocks held on a short or long term basis in a number of widely distributed locations around the country. A joint approach may include agreements such as purchase of some or all stock by the end of a season or provision of land. **(Recommendation 17)**

Reserve Stockpiles

- 13.7.79 In addition to operational stock, local authorities and strategic road operators have created reserve stockpiles. These stockpiles can be categorised into three different types:
- Local reserves – held by a single authority for its own use during times of limited operational salt stocks;
 - Regional reserves – held on a regional / consortium basis whereby reserve stocks have been made available for use by more than one authority;

- National reserves – stockpiles held across the UK for use by any authority during times of shortage. In England this is currently being delivered via the Highways Agency and is likely to have certain conditions of use. Transport Scotland and Transport for London have their own arrangements.
- 13.7.80 These stockpiles are not used during normal Winter Service but will be available if salt suppliers are unable to maintain operational stocks at an acceptable level. Release of salt should be subject to agreed protocols with the relevant operators. Authorities should put these arrangements in place before the start of the winter season.
- 13.7.81 Identifying the size, location and storage type of these stockpiles is important. Salt is a bulk commodity, but a reserve stockpile is still a significant investment. It should be stored in a location to allow convenient access to the area it serves and of course remain accessible during times of severe weather. The site should be secure to avoid trespass and theft of salt. Provision should be made in planning for loading facilities although there is unlikely to be a need for permanent on site plant.
- 13.7.82 Reserve stocks are unlikely to be barn stored. However they should be well covered to prevent leaching and deterioration of the salt. To avoid any gaps in planning any jointly held reserve stocks should have a salt stock management plan specific to that stockholding.

Salt Procurement

- 13.7.83 Authorities should seek a broad approach to salt supply, for example establishing framework contracts with more than one supplier. **(Recommendation 18)**
- 13.7.84 Ideally, the suppliers should be geographically separated to reduce the risk of them being impacted by the same high demand situation.
- 13.7.85 *Case Study.* Devon County Council has adopted a framework contract which specifies the supply of different types of salt, including rock and marine salt from different UK and overseas suppliers. The Council can specify the quantity of salt and has options for different salt for different purposes e.g. pre-wetting or normal salting.
- 13.7.86 Authorities should consider whether efficiency benefits can be obtained from collaborative salt procurement and should also consider ways to improve the balance of risk between salt suppliers and themselves, e.g. longer contracts, performance contracts with minimum guaranteed purchase and supply, and contracts that include supply of salt and investment in facilities. **(Recommendation 19)**
- 13.7.87 *Case study.* The Illinois Department of Transport performance contract adopts purchase arrangements based on a contracted range of supply between minimum and maximum levels. Illinois guarantees to purchase 80% of its estimated salt need and the supplier guarantees to supply up to 120% if required. This provides the State with security and the supplier with guaranteed business.

Post Snow Inspection and Maintenance

- 13.7.88 Immediately following the completion of snow clearance operations priority should be given to the clearance of gullies and offlets to ensure that melt water from snow on verges and island or central reservations can quickly drain away. However, it may be especially difficult to prevent melt water which is running across the carriageway from freezing and several applications of salt may be necessary.

- 13.7.89 It will also be necessary to inspect the network to ensure that any damage is dealt with either as a Category 1 defect or as programmed maintenance as appropriate. The inspection should be treated as a special safety inspection and deal with the items usually included. Special attention should be given to the routes treated and the following items:
- removal of accumulations of grit from running surfaces and drainage channels;
 - inspection and clearance of all bridges, culverts and drainage systems liable to flooding;
 - inspection for frost effects and any damage caused by Winter Service equipment;
 - check and replenish salt stocks in depots and grit bins;
 - inspect, clean, lubricate, check and repair all vehicles and plant.
- 13.7.90 In addition it will be important to debrief all personnel involved to ensure that their experience and observations are recorded. These should be used to inform the Annual Service Review and contribute to the process of continuous improvement. It will also be useful in a less formal way to invite observations from parish and town council snow wardens and others that may have also contributed to the operations.

13.8 REVIEW

- 13.8.1 All aspects of the Winter Service Plan, including service delivery arrangements, should be reviewed annually in consultation with key stakeholders to take account of changing circumstances. **(Recommendation 20)**
- 13.8.2 All vehicles, plant, fuel provision, equipment and maintenance arrangements should be checked annually and in accordance with manufacturers' requirements to ensure that any necessary action can be taken to ensure full operational service status prior to the Winter Service season. This should include checking the calibration of all de-icing equipment and spreaders.
- 13.8.3 Authorities should review the administrative and management arrangements for Winter Service annually. This should include the role of the private sector in delivering highway services, and the use of support services such as refuse collection, street cleansing and grounds maintenance services.
- 13.8.4 As part of the Annual Review authorities should consult with bus operators regarding changes to routes. In doing so and where practicable bus operators should be encouraged not to change routes throughout the winter season where there would be an effect on treatment routes.
- 13.8.5 The Annual Review should include an analysis on whether service delivery meets the Winter Service policy and plan. It should also include a review of the current thinking with regards to the impact of climate change. Service efficiency improvements such as route optimisation should also be considered.
- 13.8.6 Following any significant winter weather event, a formal review involving representatives from all levels of the management and delivery of Winter Service should be carried out. The review should specifically identify the successful elements of the service as well as potential improvements and actions to be taken. Where

applicable, other stakeholders should be involved. The review process should be documented to ensure all learning is captured, considered and actioned. This should feed into the Annual Review.

RECOMMENDATIONS FOR SECTION 13

- R13.1** Authorities should formally approve and adopt policies and priorities for Winter Service, which are coherent with wider objectives for transport, integration, accessibility and network management, including strategies for public transport, walking and cycling. They should also take into account the wider strategic objectives of the authority.
- R13.2** Authorities should consider, consult on and formally adopt local service standards for resilience of their winter service in terms of number of days continuous severe conditions salting on a defined Minimum Winter Network for the Overall Winter Period and for the Core Winter Period.
- R13.2a** A resilience benchmark of 12 days/48 runs should be adopted for full pre-season salt stockholding by 1 November for English local highway authorities.
- R13.3** Authorities should review their approach to climate change and in particular their resilience to prolonged cold weather.
- R13.4** Authorities should consider whether collaborative arrangements such as shared services, lead authority arrangements, collaborative service procurement, and sharing depots and salt stock, would provide an effective and value for money approach to increasing winter service resilience.
- R13.5** Authorities should determine critical areas and infrastructure in conjunction with key public services and other stakeholders and seek to ensure that appropriate winter treatment has been considered by the appropriate party.
- R13.6** Authorities should ensure effective communication of information for the public before and during both normal and severe winter conditions.
- R13.7** Authorities should ensure that there is appropriate consultation and communication with other highway authorities, key public services and other stakeholders to ensure improved service for the public.
- R13.8** Authorities should formally approve, adopt, and publish, in consultation with users and key stakeholders, a Winter Service Plan based on the principles of this Code.
- R13.9** Authorities should define treatment route plans for carriageways, cycle routes and footways for pre-treatment and snow conditions, based upon the general maintenance hierarchy, but adapted to take into account the factors identified by this Code.
- R13.10** Authorities should prepare contingency Winter Service Plans for severe weather conditions which include possibilities such as salting a Minimum Winter Network. Authorities should seek agreement on plans in advance with other highway authorities and key public services such as hospitals and public transport providers. There should be a co-ordinated approach to implementing Minimum Winter Networks across adjacent highway authorities.
- R13.11** Authorities should explore the potential for mutual aid in salt supply and other aspects of winter service and should make contingency arrangements in advance.

- R13.12** Authorities should take full advantage of decision support systems and services to enable timely, efficient and accurate decision making.
- R13.13** Authorities should continually monitor performance during service delivery and respond effectively to changing conditions or network incidents.
- R13.14** To ensure appropriate level of competence, training and development needs of all personnel should be established and reviewed annually, including health and safety and appropriate vocational qualifications. Training should then be provided where appropriate before the Winter Service season.
- R13.15** Authorities and relevant organisations should provide training and conduct periodic exercising to test plans for responding to severe weather events.
- R13.16** Authorities and salt suppliers should treat the supply of salt as a service rather than a simple commodity purchase.
- R13.17** As a means of enhancing local salt storage capacity, authorities and salt suppliers should jointly consider supplier owned salt stocks held on a short or long term basis in a number of widely distributed locations around the country. A joint approach may include agreements such as purchase of some or all stock by the end of a season or provision of land.
- R13.18** Authorities should seek a broad approach to salt supply, for example establishing framework contracts with more than one supplier.
- R13.19** Authorities should consider whether efficiency benefits can be obtained from collaborative salt procurement and should also consider ways to improve the balance of risk between salt suppliers and themselves, e.g. longer contracts, performance contracts with minimum guaranteed purchase and supply, and contracts that include supply of salt and investment in facilities.
- R13.20** All aspects of the Winter Service Plan, including service delivery arrangements, should be reviewed annually in consultation with key stakeholders to take account of changing circumstances.

Section 14

Weather and Other Emergencies

14.1 CLIMATE CHANGE

14.1.1 The report *The Changing Climate: Impact on the Department for Transport* published in 2004 confirmed that the climate of the UK is changing. The last few years have provided examples of hot dry summers and warm wet winters, with episodes of intense rain, and increased incidence of flooding.

14.1.2 The report considered scenarios for 2020, 2050 and 2080. The climate change expected for 2020 is largely fixed, as it depends on the greenhouse gases already in the atmosphere. Scenarios for 2050 and 2080 are more dependent on future emissions. The key climate changes for the UK are summarised below:

- the climate will become warmer, with annual averages up by 2°C to 3.5°C by 2080;
- hot summers will become more frequent and very cold winters increasingly rare;
- winters will become wetter and summers may become drier. Overall, soils will become drier;
- snowfall amounts will decrease;
- heavier winter rain will become more frequent, 'extreme' rainfall which is presently experienced once every 2 years, will become 5% to 20% heavier by 2080;
- relative sea level will continue to rise by between 26-86 cm in the South East by 2080;
- extreme sea levels could occur up to 10-20 times more frequently than they do now by 2080;
- the evidence for increased storminess with climate change is uncertain.

14.1.3 The key implications for highway maintenance are:

- increased risks of flooding from rivers and sea;
- increased flooding from inadequate drainage;
- deterioration and damage to highway infrastructure from subsidence, heave and high temperatures;
- damage to bridges, signs and tall structures from increased wind speeds;

- increased road safety problems from adverse driving conditions and deterioration of infrastructure;
 - effects on the management of trees, landscape and biodiversity.
- 14.1.4 During weather extremes the highway network may become restricted, with routes becoming unavailable, thus causing travel disruption. Highways also contain utility services such as water, gas, electricity, telecommunications, surface water and foul sewers, and under certain conditions the sub-soil below roads may change composition and cause movement, which is likely to damage these services. Because the loss of these services to homes and business is usually unacceptable, it may be vital that sections of the highway are shut off to allow emergency repairs, irrespective of the disruption to road traffic.
- 14.1.5 The principal recommendations of the report were:
- the Highways Agency (HA) should report to the DfT on which technical standards will need to be revised in the light of the climate change scenarios, identifying priorities for change, and setting out a 5 year programme of revisions;
 - the UK Roads Liaison Group should work with the HA to provide initial guidance to authorities identifying the main issues for local roads and to outline options for taking climate change into account in planning maintenance and improvements.

The Cambridge Experience

***Website Amended
27 April 2012***

- 14.1.6 Cambridgeshire County Council commissioned a study to assess the potential financial implications of climate change for highway maintenance. The study focused on the impact of hotter and drier summers on summer maintenance costs and the impact of milder winters on winter maintenance costs. The study was based on the UK Climate Impact Programme (UKCIP), investigating climate change scenarios for the 2020s, 2050s and 2080s, and was undertaken using the UKCIP Costing Guidelines (<http://www.ukcip.org.uk/costings/>).



- 14.1.7 The summer of 2003 was exceptionally dry, and a large number of additional structural maintenance schemes were identified as being in need of urgent

attention as a result of the drought. The roads covered by these schemes were not part of the scheduled maintenance programme and the estimated cost of them was £3.5 million. A further £1.1 million was spent on emergency repairs of the highway due to the extent of the cracking and deformation, which without attention would have left the roads in a dangerous condition.

- 14.1.8 A consequence of the predicted drier and hotter summers is a particular issue for the Fens in Cambridgeshire, which are made up of peat-containing wetland. Subsidence due to the desiccation and shrinkage of the peat deposits will become more significant, if dry periods become more frequent.
- 14.1.9 The study concluded that there are substantial costs associated with road subsidence and surface damage, which will arise from the increase in frequency of hot and dry summers under the UKCIP climate scenarios, and cost savings in the winter road maintenance service as a result of milder winters. However, the total benefits of milder winters are outweighed by the increased summer costs, by ratios of between approximately 3 to 1 and 5 to 1, depending on whether the total costs being compared are undiscounted or in net present value terms.

New Paragraph
Added 13 August 2010

The Three Counties Alliance Partnership – Climate Change Adaptation Plan

- 14.1.10 The Three Counties (Derbyshire, Leicestershire and Nottinghamshire County Councils) carried out a project to assess the effect of climate change on their highways policies and standards. The project was undertaken against climate change predictions by the UK Climate Impacts Programme 2002 (UKCIP02), which leads towards the development of an adaptation plan using a risk and probability management approach. The project has provided a comprehensive, local risk and probability based assessment of the vulnerabilities to climate change, both now and in the future, and has identified the most effective adaptation responses in order to achieve Level 2 of National Indicator 188 for Local Authorities: Adapting to Climate Change. Further, an adaptation action plan has been developed by the Three Counties Alliance Partnership to address the biggest risks posed by climate change on their highway network, thereby achieving Level 3 of NI 188. An outline timescale has been agreed for implementation of this adaptation action plan which moves the 3CAP councils towards achieving Level 4 of NI188. The report *“The Effect of Climate Change on 3CAP’s Highway Network Policies and Standards”* may be downloaded from the following website:

http://www.leics.gov.uk/climate_change_adaptations.pdf

New Paragraph
Added 13 August 2010

The Climate Change Act

- 14.1.11 The Climate Change Act 2008 empowered the government to set national targets for the year 2050 for the reduction of greenhouse gas emissions and to encourage energy users to meet the objectives of the Act, such as reducing such emissions or removing greenhouse gas from the atmosphere. The Climate Change Act may be downloaded from the following website:

http://www.opsi.gov.uk/acts/acts2008/ukpga_20080027_en_1

14.2 PLANNING FOR WEATHER EMERGENCIES

- 14.2.1 The highway maintenance industry needs to adapt to the climate change agenda. Much of this work, including the development of new and improved materials, methods of construction and procedures, will need to be done collectively, but local authorities can take some steps to prepare for increasing risk of emergencies.
- 14.2.2 Authorities should establish in consultation with others, including emergency services and relevant agencies, such as the Environment Agency (EA), operational plans and procedures to enable timely and effective action by the highway maintenance service to mitigate the effects of such weather emergencies, as they affect the highway network. There will also be other weather conditions, such as fog or heavy rain, which although possibly causing danger and operational difficulties, would not be considered as emergencies.
- 14.2.3 The content of operational plans and procedures should be based on those developed in respect of Winter Service and summarised in Appendix H, adapted to suit the particular risks and requirements for the weather situation in question. It will be essential to address specific health and safety issues relevant to each emergency.
- 14.2.4 Clearly weather forecast information is crucial and the Meteorological Office will issue severe weather warnings and flash messages to authorities, other emergency services and media. These are based on the following descriptions and conditions, other than for snow and ice. Motoring warnings will also be given when conditions are difficult but less severe than these described below.

Gales

Severe gales with gusts of 70 mph or more;

Severe gales - storms with gusts of over 80 mph.

Heavy Rain

Heavy rain expected to persist for at least 2 hours and to give at least 15 mm within a 3-hour period.

Fog

Thick Fog- visibility generally less than 200 metres; Dense Fog – visibility generally less than 40 metres.

14.3 FLOODING FROM RIVERS AND SEA

- 14.3.1 Recent experiences and consequences of flooding have increased considerably the importance placed by local communities on flood protection measures and the need for effective action by authorities in planning and responding to extreme weather conditions.

14.3.2 The EA and its equivalent within the Devolved Administrations will be the key agency in respect of flood emergencies, and authorities will need to work closely with them. The EA has established a system of flood warning procedures, together with audible warnings in certain areas:

- flood watch;
- flood warning;
- severe flood warning;
- all clear.



14.3.3 In planning for increased risk of flooding from rivers and sea, authorities should:

- undertake a risk assessment to determine vulnerable areas of the network;
- define alternative routes and progressively bring them up to necessary standards of maintenance and signing;
- install improved flood protection;
- prepare contingency plans in consultation with other authorities;
- ensure bridge openings and culverts are sufficient to deal with predicted levels of flooding.

14.3.4 The contribution of authorities in dealing with flood conditions will depend upon the circumstances but could include:

- signing and maintaining diversions;
- inspection, clearance and maintenance of drainage systems;
- provision and operation of land and water transport;
- provision and installation of sandbags and other protection;
- general support to emergency services.

14.4 FLOODING FROM INADEQUATE DRAINAGE

- 14.4.1 The Government recently concluded consultation on a new strategy for flood and coastal erosion risk management, *Making Space for Water*. The intentions include, amongst other things, the implementation of Integrated Urban Drainage Management. A range of bodies currently have responsibility for various aspects of drainage or sources of flooding, but there is currently no requirement to view the problem as a whole. Integrated urban drainage pilots are to be set up to determine the best way to tackle urban flooding in a joined-up manner.
- 14.4.2 The Government's first response to the consultation indicates that '*the role of the transport network will also be considered*', which implies that in some circumstances a broader role may be necessary. This will need to be taken into account in maintenance planning as the strategy develops (www.defra.gov.uk).
- 14.4.3 Given the relative predictability of areas susceptible to the risk of flooding, it should be possible to identify the location, scale and nature of such contributions and to include these in the operational plan. Records of drainage systems particularly susceptible to obstruction, and requiring more frequent maintenance, will also be important.
- 14.4.4 In planning for increased risk of flooding from inadequate drainage authorities should:
- undertake a risk assessment to identify sections of highway at greatest risk and/or the greatest consequences;
 - consult with local drainage authority;
 - implement targeted programme of improvement.

***New Paragraph
Added 14 May 2009***

- 14.4.5 Following flooding in June and July 2007, Sir Michael Pitt was asked by the Government to conduct an independent review of the flooding emergency that took place. The Pitt Review: Lessons Learnt from the 2007 Floods was published in June 2008 and it contains 92 recommendations, some of which are relevant to highway maintenance issues, with particular reference to a need to collate and manage the main flood risk management and drainage assets (over and underground), including a record of their ownership and condition. The report may be downloaded from the following website.

***Website Amended
27 April 2012***

<http://webarchive.nationalarchives.gov.uk/20080906001345/cabinetoffice.gov.uk/hepittreview.aspx>

***New Paragraph
Added 13 August 2010***

- 14.4.6 The Flood and Water Management Act received Royal Assent on 8th April 2010. The Act aims to improve both flood risk management and the way we manage our water resources. The Act creates clearer roles and responsibilities and instills a more risk-based approach. This includes a new lead role for local authorities in managing local flood risk (from surface water, ground water and ordinary watercourses) and a strategic overview role for all flood risk for the Environment Agency (EA). The Act may be downloaded from the following website:

**Website Amended
27 April 2012**

<http://www.legislation.gov.uk/ukpga/2010/29/contents>

14.5 SUBSIDENCE, HEAVE AND HIGH TEMPERATURES

- 14.5.1 The affect of high temperatures on running surfaces is likely to be the main consideration for the highway maintenance service and one that often needs attention. High temperatures can damage bituminous surfaces both by reducing skidding resistance and increasing susceptibility to rutting. Sanding of surfaces can mitigate the effects of the former but there is little that can be done to deal with the latter, other than in the design of the surfacing material. In very extreme conditions concrete roads can suffer acute damage as a result of expansion beyond design predictions resulting in 'pop outs' and may need complete reconstruction.



- 14.5.2 Although these issues are most effectively addressed through the design process, authorities should be aware from inventory, inspection and other information, the relative risks to parts of the network from excessive heat, and should establish priorities for treatment based on this assessment.
- 14.5.3 Increased dryness of soil is already causing problems with root growth of trees in the highway. Hammersmith and Fulham Council experienced considerable increase in subsidence claims in 2003-04 from £100,000 to £500,000. The Cambridgeshire study noted that an adaptation measure to avoid road subsidence and surface damage is tree felling. Trees remove moisture from the soil and if close to the road actually cause deformation of the road. Although this is not under consideration, it is an indication that radical measures may be necessary.

14.5.4 In planning for increased risk of damage due to subsidence, heave and high temperatures authorities should:

- undertake a risk assessment to identify potentially vulnerable sections of highway and structures, taking account of underlying soil type;
- commission a study to identify potential effects of climate change on highway maintenance budget similar to the Cambridgeshire initiative;
- change materials and methods over time to mitigate effects.

14.6 INCREASED WIND SPEEDS

14.6.1 The implications of high winds within an authority area are much less predictable, although weather information can help to assess the relative risk in parts of the UK. Authorities should, as part of highway inventory and inspection arrangements, know those parts of the network most at risk of obstruction due to fallen trees, but should identify specifically those more limited sections where any potential obstruction could have particularly serious consequences for safety or serviceability. These could include accesses to relatively isolated communities or emergency services, or heavily trafficked crucial network links.

14.6.2 This will not be a precise record providing the basis for an accurate Emergency Plan but it should enable a more efficient and timely response, than would otherwise have been the case. It may be appropriate to consider, with arboricultural advice, planned removal and more suitable replacement of trees, in some cases.

14.6.3 Weather warnings for high winds will provide the following advice on circumstances and likely damage:

50 mph gusts	Difficult driving conditions for high-sided vehicles, especially on exposed roads and bridges.
60 mph gusts	Difficult driving conditions. Unladen high-sided vehicles at risk of being overturned. Some damage to trees and falling branches.
70 mph gusts	Hazardous driving conditions. Unladen high-sided vehicles at risk of being overturned and motorists advised to drive with particular care. Damage to trees, falling branches with some being uprooted. Minor damage to some buildings, particularly to tiles, slates and chimneys.
80 mph gusts	Dangerous driving conditions. High-sided vehicles at risk of being overturned and motorists advised to avoid driving if possible. Considerable damage to trees with significant tree uprooting. Extensive minor damage, particularly to tiles, slates and chimneys, with some structural damage to chimneys.
90 mph gusts	Driving extremely dangerous. Widespread uprooting of trees. Widespread damage to buildings, with potential for severe structural damage. Public advised not to venture out of doors unless really necessary.

- 14.6.4 In planning for increased risk of damage from increased wind speeds local authorities should:
- undertake a risk assessment to identify structures at greatest risk and/or consequences;
 - undertake structural appraisal and consider implications for strengthening or removal.
- 14.6.5 Clearly, advice from weather warnings will need to be applied by the highway maintenance service in order to safeguard the health and safety of employees, and this may limit the extent to which any direct assistance can be provided, until conditions have eased from over 70 mph gusts. The contribution of authorities in dealing with the consequences of high winds will then depend upon the circumstances but could include:
- signing and maintaining temporary closures and diversions;
 - clearance of fallen and potentially dangerous trees;
 - clearance and removal of debris;
 - assistance with temporary support and repair of buildings;
 - general support to emergency services.

14.7 OTHER HIGHWAY EMERGENCIES

- 14.7.1 There are a number of other potential emergency situations which could affect the highway, including those resulting from subsidence, landslip or collapsed walls and oil spills. Although the risk of some such occurrences can be reduced through a considered inspection regime, there are likely to be occasional random occurrences and contingency planning should be undertaken.

14.8 CIVIL EMERGENCIES

- 14.8.1 There is also a wide range of other civil emergencies in which the highway maintenance service may need to become involved. In such cases plans, procedures, and responsibilities will be defined in the authority's Civil Emergency Plan, maintained by the authority's designated Emergency Planning Officer, and related to more specific plans maintained by the Police and other emergency services. New legislation under the Civil Contingencies Act places new requirements on authorities for emergency planning.

RECOMMENDATIONS FOR SECTION 14

R14.1 Planning for Climate Change

Authorities should research the likely effects of climate change for the delivery of highway maintenance services, taking into account their geography, topography and geology. They should identify risks particular to the authority, and plan, so far as practicable, to mitigate them.

R14.2 Severe Weather Emergencies Plan

Authorities should establish, in consultation with others, including emergency services and relevant agencies, a Severe Weather Emergencies Plan, containing operational plans and procedures, to enable timely and effective action by the highway maintenance service to mitigate the effects on the highway network.

R14.3 Content of Operational Plans

The content of operational plans and procedures should be based on those developed in respect of Winter Services and summarised in Appendix H of this Code, adapted to suit the particular risks and requirements for the situation in question. It will be essential to address specific health and safety issues relevant to each emergency.

R14.4 Planning for Civil Emergencies

Authorities should ensure that the role and responsibilities of the highway maintenance service in responding to emergencies are defined in the Civil Emergency Plan, maintained by the authority's designated Emergency Planning Officer, that these are understood by all personnel involved, and that all necessary contingency planning is in place.

Section 15

Sustainable Highway Maintenance

15.1 SUSTAINABLE DEVELOPMENT POLICY

15.1.1 The UK sustainable development strategy is described in *Securing the Future* (DEFRA, Cmd 6467, 2005), which includes priority areas for shared action as:

- sustainable consumption and production;
- climate change and energy;
- natural resource protection and environmental enhancement;
- sustainable communities.

15.1.2 Local authorities and their partners, through Local Strategic Partnerships are pivotal to delivering sustainable communities and to provide focus. The Comprehensive Performance Assessment (CPA) process will seek to recognise and reward good performance on sustainable development. Future rounds of Beacon Council themes will include aspects of sustainable development at a local level.

15.1.3 Highway maintenance has a significant role to play, and impact to make, in the achievement of sustainable development. To ensure delivery of this objective authorities should develop a 'Policy for Sustainable Development in Highway Maintenance'. This policy should form the linkage between the strategic objectives of the authority at the highest level and the materials, practices and processes used in an ongoing way on the highway network.



15.1.4 Sustainable development for highway maintenance involves living within environmental limits whilst achieving a sustainable economy and is encapsulated as:

- social progress which recognises the needs of everyone;

- effective protection of environment;
 - prudent use of natural resources;
 - maintenance of high and stable levels of economic growth and employment.
- 15.1.5 These sectors form the basis of a structure within which highway maintenance can be quantified from a sustainable viewpoint.

15.2 QUALITY OF LIFE

- 15.2.1 The third core objective set out in Section 8 of this Code is to deliver network sustainability. This is further defined to embrace the economic, social and environmental components of sustainability as:
- minimising costs over time (whole life cost);
 - maximising community value;
 - maximising environmental contribution.
- 15.2.2 The whole life cost component is self explanatory, but community value and environmental contribution need some further explanation. These are based on the principle that highway maintenance should not be just about repairing and replacing things as they were but seeking to gain value, or environmental benefit from the scheme.
- 15.2.3 These benefits could include improving the quality of public space, improving community safety or reducing fear of crime. It could improve accessibility especially for disabled people. In summary, it could make a contribution to the quality of life for all or some of the public.
- 15.2.4 Not all maintenance works will be able to make a contribution and in other cases the contribution may be small. The cumulative effect of the maintenance programme over a number of years will however be significant.
- 15.2.5 In terms of practical application a checklist for sustainability is presented in Appendix K. This checklist is based upon the themes in *Building a Better Quality of Life* (DETR, 2000) and can be augmented with local or regional issues which flow from the authority's policy for sustainable development in highway maintenance.
- 15.2.6 The embedment of checklists into everyday practice, enables a structured approach to be taken for recording consideration of sustainability issues and actions taken as a consequence on a scheme by scheme basis. An example of this approach has been adopted by Durham County Council.
- 15.2.7 Sustainability is fundamental to Best Value Reviews of highway maintenance. A sustainability appraisal of the service can provide a crucial challenge to current practice and delivery arrangements, and open up new areas for consideration of continuous improvement. It should also stimulate innovation and creativity.
- 15.2.8 This is not to undervalue technical specification and guidance, which is the crucial starting point for consideration. Indeed the National Highway Sector Schemes,

referred to later in this section, were developed with the specific purpose of supporting continuous improvement and providing a consistent and reliable base for benchmarking.

15.3 MATERIALS, PRODUCTS AND TREATMENTS

- 15.3.1 In order to meet the core objectives of customer service, safety, serviceability and sustainability, materials, products and treatments used for highway maintenance will need to meet required standards for effectiveness and durability, but should also make a positive contribution to the public realm.
- 15.3.2 There are a wide range of technical specifications for materials, products and treatments for highway works. Some of these are obligatory, but many provide for significant discretion in their application to particular circumstances. This is important, for if too high a specification is set this will not only increase cost, but may reduce the potential for sustainability, for example by precluding the use of locally sourced materials.
- 15.3.3 English Heritage, in conjunction with the Department for Transport (DfT) is publishing a series of regional guides ‘Streets for All’, which are intended to provide guidance on the management of streets and public open spaces. The appearance of this ‘public realm’ is often the product of several different agencies, each with its own priorities. A co-ordinated approach can help provide an environment that is safe, enjoyable and appropriate to its surroundings.
- 15.3.4 The guides identify some of the common problems that can diminish the quality of public areas and explains how integrated townscape management can provide answers. The underlying principles are to reduce clutter, coordinate design and to reinforce local character, whilst maintaining safety. Separate chapters address ground surfaces, street furniture, traffic management and environmental improvements. The guides apply to new design and maintenance (www.helm.org.uk).
- 15.3.5 It is important that materials and treatments for any scheme are consistent with the character of the area and, for example, do not contribute to the ‘urbanisation’ of attractive rural areas. Conversely, in heavily trafficked urban areas materials should be of sufficient durability to avoid premature deterioration and consequent poor appearance. The presence of a speed limit should not be the automatic determinant for the application of ‘urban’ standards.
- 15.3.6 In the context of best value, the right balance of materials and treatments used in particular circumstances should not merely be a technical or financial issue. It should also be one of sustainability and a major consideration. The English Heritage/ DfT guidance suggests that where possible, authorities should set up a townscape ‘Public Realm Management Team’, responsible for overseeing an integrated approach to townscape management and ensuring that policies for the public realm are included in all development frameworks.
- 15.3.7 It is also suggested that authorities should identify a hierarchy of streets and spaces in order to prioritise the use of more expensive, natural materials. Each area should have a palette of materials appropriate to its location, which allows new and old work to relate to one another. This could be a subset of the maintenance hierarchies referred to in Section 8 of this Code.

**New Paragraph
Added 14 May 2009**

- 15.3.8 In June 2006 best practice guidelines were published for Negative Texture Surfaces (NTS), providing a methodology for site evaluation and material selection, to ensure that the right material is installed in the right site, together with a structural approach to the factors which may have a bearing on distress mechanisms. The report, titled *Best Practice Guidelines for Surfacing*, may be downloaded from the following website.

**Website Amended
27 April 2012**

<http://www.ukroadsliaisongroup.org/en/utilities/document-summary.cfm?docid=5F3A1531-9879-40D0-9D699E0B0E0DC34C>

15.4 TECHNICAL SPECIFICATIONS AND GUIDANCE

- 15.4.1 This Code is not intended to provide a comprehensive record of technical standards and guidance relevant to highway maintenance, although some of the more important ones are noted. Further information can be obtained from the current edition of the HA's Trunk Road Maintenance Manual (TRMM).

15.5 QUALITY MANAGEMENT AND SECTOR SCHEMES

- 15.5.1 Quality management systems comprising Quality Assurance, Environmental Management and Investors in People are all intended to encourage consistent management and organisational process. If correctly and flexibly applied they should support a culture of competence, consistency and enable innovation to flourish.
- 15.5.2 Highway maintenance operations should be subject to a quality assurance regime to facilitate continuous improvement, preferably based on the principles of ISO 9001 2000, which integrates systems of client and service provider. Other examples of measures to support performance improvement are summarised in Section 11.
- 15.5.3 The quantity and cost of maintenance products and materials is relatively easy to determine, but quality can be very variable. Simple compliance with quality management schemes has not provided the necessary confidence of consistent quality, and the HA, CSS and TAG, with the co-operation of various trade organisations, have developed a number of National Highway Sector Schemes (NHSS). These are intended to improve the consistency of the products certified under existing schemes and ensure that they satisfy all current purchaser requirements. Sector schemes are administered by the United Kingdom Sector Service (UKAS). Schemes are continually being added and updated and current details can be found at (www.ukas.org).

**Website Amended
27 April 2012**

- 15.5.4 The Highway Authorities Product Approval Scheme (HAPAS) provides a means for manufacturers and suppliers to obtain approval for the use of innovative and proprietary products, within an agreed performance criteria. Where NHSS or a

HAPAS scheme applies, only materials, products and services complying with the schemes will be accepted for compliance with the Specification for Highway Works (SHW). Current details can be found at (<http://www.bbacerts.co.uk/hapas.aspx>).

15.6 ENVIRONMENTAL MANAGEMENT

15.6.1 In pursuing the objective of network sustainability one of the key issues will be maximising the environmental contribution made by highway maintenance policy and practice. The establishment of an Environmental Management System to ISO 14000 should be a requirement and address the range of relevant issues affecting the environment including:

- noise;
- materials utilisation;
- waste management and recycling
- pollution control;
- nature conservation and biodiversity;
- environmental intrusion.

15.6.2 This Code cannot address all of these issues in detail but is intended both to stress the very considerable contribution that maintenance can make, and to highlight a number of key areas for consideration in the following paragraphs.

15.7 MAINTAINING FOR NOISE REDUCTION

15.7.1 Road traffic noise is a major environmental consideration, both for those living close to heavily used inter-urban highways and also within urban areas. Legislation is progressively seeking to reduce road noise from vehicles but noise from running surfaces can also be intrusive.

15.7.2 Where running surfaces are renewed or resurfaced the opportunity exists to mitigate the effects of traffic noise. Whenever major maintenance schemes of this type are being planned, authorities should evaluate the option of a lower noise alternative. In areas of limited development this may not be a cost-beneficial option, but where there would be significant benefit to the local community the low noise option should be carefully considered.

15.7.3 The new statutory duty to 'secure the expeditious movement of traffic' imposed by the Traffic Management Act 2004 could place greater emphasis on night working. New developments in materials and plant could facilitate night working and provide better value for money but close consultation with residents and Environmental Health Officers, particularly in urban areas, will be required.

15.8 MATERIALS UTILISATION

15.8.1 Highway maintenance activity consumes significant quantities of materials, and policies for materials purchasing and utilisation can make a very considerable contribution to the core objective of network sustainability. There is also increasing

scope for innovation, for example the use of recycled glass as aggregate, recycled plastic for footpath signs and lower energy materials.



15.8.2 Authorities should seek wherever practicable to maximise the use of:

- local materials wherever possible in order to minimise transport costs, support the local economy, and to maintain local character. This will be of particular importance in relation to the use of visible materials in local conservation areas;
- products made from recycled materials in order to develop and support local markets for these.

15.8.3 Sustainable purchasing and materials utilisation may have cost implications, and authorities will need to balance these against the environmental benefits achieved. They should also consider carefully whether some limited reduction in material specification might be acceptable in order to achieve a more sustainable outcome, without excessive cost. Cornwall County Council, for example, has accepted a small reduction in polished stone values of surfacing materials in order to avoid the environmental consequences of very significant transport requirements.

Website Amended
27 April 2012

15.8.4 The introduction of an aggregates levy in April 2002 further supports policies for sustainable purchasing and utilisation by adjusting the financial balance. The levy, currently £1.60/tonne applies to sand, gravel and crushed rock subject to commercial exploitation in the UK, including aggregate dredged from the seabed within UK territorial waters. Recycled and secondary aggregates are not subject to the tax (www.wrap.org.uk).

15.8.5 Authorities should seek to pursue collaborative purchasing in partnership with adjoining or other authorities. This is encouraged by the Gershon report and is being facilitated by the HA.

15.9 WASTE MANAGEMENT AND RECYCLING

Website Amended
27 April 2012

15.9.1 Similarly, the introduction of, and subsequent increases in, the landfill tax have encouraged the adoption of sustainable waste management policies and practices by all authorities. The landfill tax was introduced on 1 October 1996 as a tax on

waste disposal at landfill sites. There are currently two rates of tax (<http://archive.defra.gov.uk/environment/waste/topics/index.htm>):

- £2/tonne for inactive or inert waste listed in the Landfill Tax (Qualifying Material) Order 1996. These are wastes which do not give rise to gases and have no potential for polluting groundwater;
- £15/tonne applying to all other taxable waste after April 2004. The standard rate of tax will be increased by £3 per tonne from April 2005 and by at least £3 per tonne in subsequent years to a rate of £35 per tonne.

15.9.2 In addition authorities now have rigorous statutory indicators and targets relating to waste disposal and it is important that highway maintenance provides corporate support to these so far as practicable.



15.9.3 The Waste and Resources Action Programme (WRAP) is a major Government-funded programme established to promote resource efficiency. One of the initiatives under its Aggregates Programme has been the promotion of 'Recycled Roads', through a series of roadshows held across the country. Designed to raise awareness of recycled and secondary aggregates in road construction and maintenance, these events have also provided the opportunity to inform delegates about additional information resources available from WRAP, including *The Quality Protocol for Recycled Aggregates* and the comprehensive AggRegain website (www.aggregain.org.uk).

15.9.4 Authorities should seek wherever practicable to:

- retain and re-use materials on site, in order to avoid environmental implications of transport and disposal;
- maximise the value of the re-used material rather than utilise for low grade fill;
- make use of 'recycle in place' processes in appropriate situations;
- support recycled market development through the purchase of recycled products wherever possible;
- ensure that any material that cannot be re-used or recycled is disposed of to licensed sites in accordance with statutory requirements. This will include silt and other solids arising from gully emptying and cleansing of oil interceptors. Several authorities, including Perth and Kinross Council, have a system for using reed beds to treat gully waste (www.pkc.gov.uk).

15.10 POLLUTION CONTROL

- 15.10.1 A number of maintenance operations have the potential to cause either noise, air or water pollution and will need to take particular account of statutory requirements. Advice from Environmental Health Departments and the EA should also be sought where necessary. Authorities will also wish to ensure that the wider best value principle requiring that services should be provided to ‘meet the needs of users’ and the ‘community’ is applied in such cases. This is consistent with the core objective of customer service.
- 15.10.2 In some cases, such as scarifying or major resurfacing, some environmental inconvenience to the community may be inevitable, but authorities should seek to mitigate this wherever practicable, for example by phasing and scheduling of works to avoid sensitive periods and potentially difficult weather conditions.
- 15.10.3 Storage areas for fuel and other materials, both in depots and on site, have the potential for pollution, and care should be taken in siting them. Permanent and temporary storage areas should be sited and managed in accordance with requirements of the Local Planning Authority and the EA. In particular, they should not be sited where they could cause damage to landscape or nature conservation, or have the potential to pollute watercourses or groundwater. Requirements for salt storage for Winter Service are dealt with in Section 13.
- 15.10.4 Authorities should ensure that arrangements are available on major sites having on site diesel storage to deal with diesel spills.

15.11 NATURE CONSERVATION AND BIODIVERSITY

- 15.11.1 Highway verges and the wider ‘soft estate’ both have implications for conservation and biodiversity. Specialist advice should be sought on the management of these areas, in order to achieve the correct balance between safety, amenity, nature conservation and value for money. Where landscape management plans, biodiversity action plans, or environmental databases exist they should be consulted before any work is carried out.
- 15.11.2 Certain named species and habitats are protected under UK and EC legislation and all highway maintenance works must comply with these requirements. Where designated sites are within or adjacent to the highway boundary, advice should be sought from English Nature, or equivalent bodies within the Devolved Administrations, or local wildlife trusts. Legislation requires that English Nature, or equivalent bodies within the Devolved Administrations, are informed where important habitats and species may be affected, such as the removal of trees used as bat roosts. This should be done well in advance of maintenance work to allow for seasonal factors.

Websites Amended **27 April 2012**

- 15.11.3 The HA (<http://www.highways.gov.uk/aboutus/723.aspx>), Scottish Executive (<http://www.scotland.gov.uk/Topics/Environment/Wildlife-Habitats/16118/BiodiversityStrategy>) and the Northern Ireland Roads Service (www.roadsni.gov.uk) have biodiversity action plans in place and the Transport Directorate for Wales recently published its Trunk Road Estate Biodiversity Plan

2004-14.

<http://wales.gov.uk/topics/transport/roads/environment/initiatives/trebap/?lang=en>

Website Amended
27 April 2012

15.11.4 Staffordshire County Council has established specific policies for the management of highway verges
(http://www.sstaffs.gov.uk/your_services/environmental_services/grounds_maintenance/verges.aspx) including the following:

- when undertaking any works to the highway, the likely effects on landscape and nature conservation will be taken into account. In particular, works in the vicinity of a Site of Special Scientific Interest (SSSI) and Grade 1 County Sites of Biological Importance (SBI) will be carried out in a manner that is not detrimental to the site. In all cases of doubt, the advice of the Head of Environmental Planning will be sought. Plans detailing the location of all such sites in the County are available from the Head of Environmental Planning.
- all verges will be maintained in an appropriate environmental manner, particularly in respect of nature conservation value. The maintenance approach will be based upon the following principles:
 - appropriate mowing required (depending on flora/fauna present);
 - no unnecessary inputs (herbicides etc.);
 - identified SSSIs, Grade 1 SBIs or other biologically rich verges will be managed with an appropriate regime;
- standards should be set to maintain a balance between the need to preserve road safety and the need to preserve the natural habitats which exist within roadside verges, in terms of both plant and wildlife. The need to maintain safe visibility for all categories of road user will be accorded priority where conflict arises;
- where suitable sites exist, consideration will be given to the establishment of 'roadside nature reserves';
- highway verges should be regarded as a 'Managed Habitat'. Certain lengths of verges may be set aside as conservation areas, and no routine cutting is to be carried out within these areas, which are normally defined by marker posts. Those areas of verge that are planted with bulbs, should be excluded from the first cut, in order to allow the foliage to die off completely;
- because rural verges are only cut to one swathe width, the remainder of the verge can serve as a wildlife haven. Such verges may, from time to time, need to be cut back to the full width to prevent excessive growth of brushwood or noxious weeds;
- where fine stands of wild flowers are present in the verge, the timing of cutting operations should be varied to allow the flowers to set seed. Varying the times of cutting from year to year will help nature conservation/biodiversity, since a greater number of plant species will then be given a chance to flower and seed

in at least some years. Such variations in the cutting regime *should not take place, where it would be detrimental to safety due to obstruction of visibility.*

Websites Amended
27 April 2012

- 15.11.5 West Sussex County Council have prepared a draft biodiversity action plan (www.biodiversitysussex.org/file_download/61/) for highway verges and Worcestershire County Council have some 40 roadside verge nature reserves, managed under contract by the Wildlife Trust (<http://www.worcestershire.gov.uk/cms/ecology/local-sites-partnership/roadside-verge-nature-reserve.aspx>).
- 15.11.6 In urban areas roadside trees have a particular landscape value, are often highly regarded by the community and should be carefully managed. Authorities should develop a policy for the installation, subsequent inspection and maintenance of highway trees. Care should be taken to avoid damage to trees during highway maintenance and improvement works and guidance for the planning, installing and maintenance of utility services in proximity to trees issued by NJUG should be followed (www.njug.demon.co.uk).
- 15.11.7 Care should be taken in Winter Service operations, particularly in salting footways, to avoid excessive amounts of salt being washed or swept into tree pits or piled around trees.

15.12 DEALING WITH NOXIOUS WEEDS

15.12.1 The control of injurious and noxious weeds is a statutory responsibility for authorities under the Weeds Act 1959 and the Wildlife and Countryside Act 1981. Where injurious weeds on highway land are a nuisance to adjacent landowners, it is advisable to work with the adjacent landowner to ensure that weed control measures are undertaken simultaneously to avoid recontamination across the highway boundary. The prescribed weeds are:

- ragwort;
- broad leaved dock;
- curled dock;
- creeping thistle;
- spear thistle.



- 15.12.2 Ragwort, in particular is extremely hard to eradicate and some authorities have bylaws to control it. The seed can survive 20 years in the soil before germinating and any root left behind when dug up will re-grow. It is also highly toxic to horses, cattle and sheep, causing progressive and irreversible liver damage. Although relatively unattractive to most grazing animals in its green state, it can be consumed when cut and mixed with other vegetation.
- 15.12.3 It is normally biennial and produces small rosettes in the spring and flowers in its second year from July onwards. Cutting is used by many local authorities for control to prevent the plant flowering and seeding, and two full cuts of the verge by the end of June every year for five years will inhibit seeding and spreading.
- 15.12.4 Ragwort can be only be completely eradicated by digging out before it flowers which in most cases will be impractical for authorities with large areas of verge, or by spraying an appropriate weed killer, usually in April to early June. On ungrazed land such as roadside verges, unselective weed killer use could also destroy many desirable wild species and labour intensive spot treatment may be preferable.

15.13 ENVIRONMENTAL INTRUSION

- 15.13.1 Depots and areas for materials storage will provide the most visible evidence of the extent of environmental awareness in the service. These facilities will need to meet the operational needs of the service, but every effort should be made to ensure that they are located, designed, maintained and operated to the highest practicable environmental standards.
- 15.13.2 In many cases these standards will be required as a condition of planning, but planning conditions are not able to address all operational issues and should therefore be taken as a minimum.
- 15.13.3 Poorly managed materials and temporary chipping storage areas can rapidly be adopted by others as illegal waste dumps for which authorities may become liable. In any event such poorly managed storage areas would clearly be incompatible with the core objective of sustainability.

- 15.13.4 Excessive and redundant signing ‘clutter’ can also contribute to environmental intrusion and adversely affect overall streetscape. Opportunities should be taken to remove or simplify redundant signing wherever possible in conjunction with planned maintenance works.
- 15.13.5 Guidance published by English Heritage in conjunction with DfT provides examples of authorities operating successful comprehensive programmes for removal of clutter, including Nottingham City Council whose ‘Clutterbuster’ programme seeks out and removes signs and other redundant street furniture, such as small lengths of unnecessary guardrail. Some 2,000 signs have been removed since 2003 based on clear policy guidance, including the preservation of historic street furniture. The English Heritage/DfT guidance concludes that a clutter removal programme can have fast and dramatic effects, and it is readily appreciated by the general public. It is a simple way to enhance public spaces and it can be justified financially by the consequent reduction in maintenance costs.
- 15.13.6 Similar circumstances apply in relation to street lighting and the provision of illuminated traffic signing, where considerations of possible ‘light pollution’ and energy utilisation apply. This is dealt with in detail by *Well-lit Highways – Code of Practice for Road Lighting Management*, but the availability of modern signing materials could avoid the need for illumination in some cases, and this could be addressed when maintenance or renewal is required. The Traffic Signs Regulations and General Directions 2002 removes the legal requirement for lighting of some traffic signs.

15.14 ENVIRONMENTAL CONSULTATION AND ASSESSMENT

- 15.14.1 The Government has issued guidance on Strategic Environmental Assessment for transport plans and programmes in England in accordance with the requirements of European Directive 2001/42/EC also known as the SEA Directive. The Directive was implemented in England through the *Environmental Assessment of Plans and Programmes Regulations 2004*.
- 15.14.2 The objective of the SEA Directive is ‘to provide for a high level of protection of the environment and to contribute to the integration of environmental considerations into the preparation and adoption of plans, with a view to promoting sustainable development’. This environmental commitment is broadly consistent with Government policies and is reflected in other transport planning and appraisal guidance.
- 15.14.3 The SEA Directive applies to plans and programmes, and modifications to them, whose formal preparation began after 21 July 2004. It also applies to plans and programmes whose formal preparation began before that date, if they have not been adopted (or submitted to a legislative procedure leading to adoption) by 21 July 2006. Government guidance refers only to ‘plans’, but this should be taken to include all relevant plans or programmes regardless of their formal titles.
- 15.14.4 The guidance indicates that SEA will normally be required for new transport plans including the second round of Local Transport Plans and Local (Transport) Implementation Plans, and strategic aspects of highway maintenance and asset management should be covered by this process. (www.webtag.org.uk, www.odpm.gov.uk)

- 15.14.5 Environmental issues cover a very wide range, each of which is a specialist area and on which experience and best practice is continuing to develop. In these circumstances it will be difficult for highway maintenance managers to develop and retain the necessary level of expertise in all of these areas.
- 15.14.6 In every authority area there will be a wide range of local environmental and conservation groups having specialist interests. Although engagement with such local groups will present particular challenges to highway maintenance managers, including the management of differing points of view, perseverance is likely to bring benefits both in terms of advice and environmental competence and also through greater public understanding of highway maintenance problems.
- 15.14.7 Indeed such challenges to established highway maintenance policies and practice is a fundamental requirement for Best Value Reviews. It is also suggested that environmental advisors from the authority play a strong part in this process.

***New Paragraph
Added 14 May 2009***

15.15 CLIMATE CHANGE

- 15.15.1 The Department for Transport, recognising that climate change is having a considerable impact on the UK's highway network, commissioned a research project to investigate the implications of the changing climate for highway maintenance on different types of pavement. The report produced gives recommendations on how to reduce the risks associated with climate change by ensuring good construction and maintenance practice and using adaptive maintenance techniques. The report, which was published in June 2008 and contains case studies demonstrating the impact that the weather can have on highways, can be purchased from the following website.

<http://www.tsoshop.co.uk>

***New Paragraph
Added 14 May 2009***

- 15.15.2 Following three major landslides in August 2004, the Scottish Government commissioned a study into potential trends in climate change in Scotland and how these might affect the road network. The Scottish Road Network Climate Change Study was subsequently published in June 2005 and presented a series of 28 recommendations for the design and operation of the road network. A further report, Progress On Recommendations, was published in October 2008 detailing how the recommendations made in the Climate Change Study have progressed in the intervening period. The progress report may be downloaded from:

<http://www.transportscotland.gov.uk/road/climate-change-and-the-roads>

***New Paragraph
Added 14 May 2009***

- 15.15.3 An associated study into the risk factors related to landslides and their potential effects on the trunk road network was also instigated at that time. The Scottish Road Network Landslides Study: Implementation report was published in March

2009. This is also available as a summary report. The main and summary reports can be downloaded from

<http://www.transportscotland.gov.uk/road/climate-change-and-the-roads>

***New Paragraph
Added 14 May 2009***

15.16 SUSTAINABILITY

15.16.1 It is recognised that highway maintenance and new construction has an important part to play in the sustainability debate. In response to this, the Department for Transport commissioned a research project to produce guidance for local authority highway and material engineers on the choice of sustainable materials and techniques for use in highway and footway maintenance, as well as new construction. “Sustainable Highways: A Short Guide” may be purchased from the following website.

<http://www.tsoshop.co.uk>

RECOMMENDATIONS FOR SECTION 15

R15.1 Policy for Sustainable Development

Authorities should prepare and adopt a policy for sustainable development in highway maintenance to forge the link between overarching council objectives and works undertaken on the network. This policy will provide a means of articulating in meaningful terms and applications, goals and aims of the highway maintenance service.

R15.2 Sustainable Highway Maintenance

Sustainability appraisals should be fundamental to Best Value Reviews of highway maintenance, as they can open up new ideas for continuous improvement and stimulate innovation and creativity.

R15.3 Maximising Environmental Contribution

Materials, products and treatments adopted for highway maintenance schemes should routinely be appraised for environmental contribution and for wider issues of sustainability. Authorities should consider undertaking an environmental assessment of their highway maintenance strategy and environmental audit of a sample of individual schemes in order to develop good practice.

R15.4 Application of Technical Standards

Authorities should generally apply approved technical standards for materials and processes, and ensure the provision of a quality testing, control and management regime consistent with the principles of continuous improvement. The development of the industry ‘sector’ schemes is particularly helpful in this context and these should be supported.

R15.5 Balancing Standards and Sustainability

Subject to risk assessment, authorities should encourage the relaxation of technical standards where this would bring significant benefits of sustainability.

R15.6 Consistency with Character

Authorities should ensure that materials, products and treatments for any scheme are consistent with the character of the area and, for example, do not contribute to the 'urbanisation' of attractive rural areas. Conversely, in heavily trafficked urban areas materials should be of sufficiently high quality to avoid premature deterioration and consequent poor appearance.

R15.7 Minimising Clutter

Authorities should take opportunities to remove or simplify redundant signing wherever possible in conjunction with planned maintenance works.

R15.8 Nature Conservation and Biodiversity

Highway verges, trees and landscaped areas should be managed with specialist advice, in accordance with the principles of a Biodiversity Action Plan to meet legal obligations, support conservation and add landscape value, with specialist advice where necessary.

R15.9 Depots and Materials Storage

Depots and storage areas for materials should be managed to mitigate visual intrusion and to avoid pollution, in accordance with legal and community obligations.

R15.10 Waste Management

Authorities should define and apply policies for the minimisation and sustainable management of waste arising from highway maintenance activities, including the encouragement of materials recycling.

R15.11 Purchasing

Authorities should define and apply policies for the sustainable purchasing of materials and services including encouragement to utilise products manufactured from recycled material.

Section 16

Procurement and Service Delivery

16.1 SCOPE OF PROCUREMENT AND SERVICE DELIVERY

- 16.1.1 This Code is not intended to deal with the statutory and procedural aspects of UK and European procurement legislation, and authorities will need to refer to this elsewhere. It is intended to provide general guidance on the procurement of highway maintenance services, within the context of best value and continuous improvement, and to review the developing options in this field. The Institution of Highways and Transportation (IHT) has also published a guide, developed by the Public Private Partnerships Programme (4Ps), on Procuring Local Authority Transport Schemes and Services (www.4ps.co.uk).
- 16.1.2 When pursuing innovative forms of procurement, it is particularly important to ensure that all procedures are designed and applied in accordance with the high standards of corporate governance.

16.2 PRINCIPLES OF PROCUREMENT

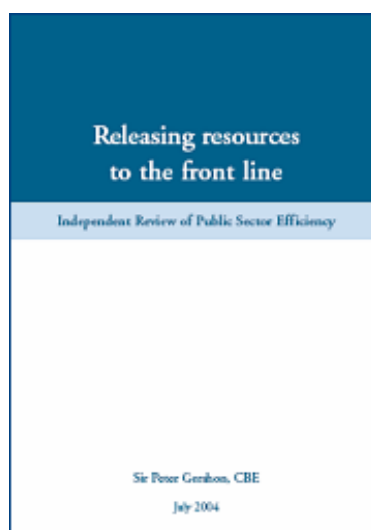
- 16.2.1 Arrangements for the procurement of highway maintenance have continued to evolve since the 2001 edition of the Code. At that time, procurement requirements were linked to the requirements of best value, in which an authority was required to *'Assess the competitiveness of its performance in exercising the function by reference to the exercise of the function, or similar functions, by other best value authorities and by commercial and other businesses, including organisations in the voluntary sector'*.
- 16.2.2 This is interpreted in DETR Circular 10/99 as the need to *'use fair and open competition wherever practicable as a means of securing efficient and effective services'*. However, the Government is committed to the delivery of high quality public services and the procurement process is an essential element in ensuring a cost effective and efficient service. It has therefore developed a policy agenda of freedoms and flexibilities as set down in the Local Government Act 2003, to encourage authorities to experiment with procurement and to take calculated risks to achieve better, more significant results, including cost savings and improved services.
- 16.2.3 As part of this policy development, initiatives such as the Strategic Partnering Taskforce, the development of the National Procurement Strategy for Local Government and the formation of Regional Centres of Procurement Excellence have been introduced to encourage authorities to look for alternative ways of delivering services that improve quality, provide better value for money and meet the needs of all local citizens.
- 16.2.4 Whatever procurement arrangements are adopted, it will be important to give careful consideration to the packaging of highway maintenance work relative to other highway and associated services, possibly in co-operation with other authorities. Best Value implies that physical or functional boundaries between authorities ought not to be a prime consideration and options could include:

- packaging highway maintenance with other network management activity and integrated transport schemes;
 - packaging highway maintenance in central urban areas with cleansing and related services to provide an integrated 'street management' regime;
 - joint contracts with adjoining authorities for specialist services, such as traffic signal maintenance or street lighting.
- 16.2.5 The provision of Winter Service and other weather and emergency response will be a key consideration in the packaging of highway maintenance work. The need to ensure provision of guaranteed levels of service in a range of conditions, to manage the consequences for other highway maintenance activity, and to ensure effective year round use of resources, will have implications for work packaging, irrespective of delivery arrangements.

16.3 EVOLVING PROCUREMENT AGENDA

- 16.3.1 The Report of the Construction Task Force *Rethinking Construction*, published in July 1998 (The Egan Report), set out a strategy for the re-invigoration of the UK construction industry incorporating a range of drivers for change and improvement, which also pointed the way to many of the subsequent best value themes:
- committed leadership;
 - focus on the customer;
 - integrated processes and teams;
 - quality driven agenda;
 - commitment to people.
 - objective measures of performance;
 - comparative performance data shared with clients and each other;
 - independently measured 'scorecards' instead of simple benchmarking.
 - annual reduction of 10% in construction cost and time;
 - annual increase of 20% in predictability of completion time and budget;
 - annual reduction of 20% in project defects on hand-over;
 - annual reduction of 20% in number of reportable accidents;
 - annual increase of 10% in value added per head;
 - annual increase of 10% in turnover and profitability.

- 16.3.2 The Egan Report principles, with their emphasis on Core Values, Quality, Performance Management and Continuous Improvement, defined the agenda for much of the subsequent procurement activity, both on new highway construction and maintenance. These were embraced strongly in new procurement arrangements for the strategic highway network, particularly in England by the Highways Agency (HA) and in Scotland, which saw the transfer of network management and maintenance from local authorities to separate private sector Managing Agents and Contractors, operating over larger geographical areas. There has recently been a further trunk road review in Wales and new arrangements will start in April 2006.
- 16.3.3 *Rethinking Construction* has been followed by *Accelerating Change*, a publication by the Strategic Forum for Construction, chaired by Sir John Egan. This document builds on and reaffirms the principles set out in *Rethinking Construction*, and seeks to tackle barriers to progress and accelerate the rate of change in the construction industry. It sets out a vision '*for the UK construction industry to realise maximum potential for all clients, end users and stakeholders through the consistent delivery of world class products and services*'. It also sets strategic targets for construction projects to be undertaken by integrated teams and supply chains, embracing the principles of *The Construction Clients Charter*.
- 16.3.4 The move towards partnership contracts has gathered pace, and a series of initiatives have taken place to support this. The Office of the Deputy Prime Minister (ODPM) established the Strategic Partnering Taskforce to support the development of Strategic Service-delivery Partnerships (SSPs). ASSP is a long term partnership between organisations that work collaboratively to achieve the authority's strategic aims for delivering services. It takes the principles embedded in the Egan Report and applies them to local authority services. Working collaboratively can assist capacity for continuous improvement and provide an additional mechanism for accountable performance. The Strategic Partnering Taskforce final report and the accompanying published guidance sets out how an SSP might be a procurement option worth considering.
- 16.3.5 *The National Procurement Strategy for Local Government*, published by the ODPM, sets out how central and local government, working together with partners from the public, private and voluntary sectors, intend to set about improving local government procurement. The most innovative authorities have found ways to deliver significantly better services at lower costs, by streamlining procurement, working in partnerships, redesigning the delivery of services, sharing office systems and pooling their buying power. The delivery of a highway maintenance service can be transformed by taking on board some of these ideas.
- 16.3.6 The Government has established nine new Regional Centres of Excellence for Procurement, that will give support and advice on procurement, and address issues such as capacity building, e-procurement, supplier management, project management and managing developing markets (www.odpm.gov.uk).
- 16.3.7 There are several emerging issues that will have an impact on procurement. The Government's Efficiency Review undertaken by Sir Peter Gershon, the new Capital Finance System incorporating prudential borrowing and resource accounting, and developments in the use of PFI, will all give opportunities for new developments in procurement. The project led by the HA, working with local authorities to improve collaborative purchasing, should also be influential. Further information on performance reporting associated with this is given in Section 11.



16.3.8 The way an authority procures its highway service delivery is also evolving, fuelled by Government encouragement, Best Value Reviews and Comprehensive Performance Assessment (CPA). New ways of working, new forms of procurement and the development of partnerships between public and private sector, are changing the face of highway maintenance service delivery. Early contractor involvement is also beneficial to improve 'buildability' and to develop cost effective solutions to highway maintenance problems.

16.3.9 There has been considerable development of the type of contract that might be used to procure highway maintenance service delivery. The New Engineering Contract has a range of options for consideration and includes Term Maintenance and Partnering options. The use of performance based end product specifications is another development, aimed at improving the quality and effectiveness of a service.

16.4 MAIN PROCUREMENT OPTIONS

16.4.1 The scope and diversity of authority arrangements for the procurement of highway maintenance services has evolved considerably over the past couple of years. There are many examples of arrangements that have been implemented to suit the needs of an authority. There is no right or wrong model and each authority will need to take account of its own specific drivers for change, as well as taking into consideration the national pressures and best practice elsewhere. It would be difficult for this Code to list them all in detail. There are, however, a number of broad categories and most involve some form of partnership:

- in-house DSO, market tested or won in competition in combination with private sector contracts for specialist work. Professional services all inhouse or with ad-hoc contract arrangement;
- all highway maintenance works contracted out. Professional services all in-house or with ad-hoc 'top-up' contract arrangement;
- all highway maintenance works contracted out and all professional services contracted out under separately contracted arrangements. With or without PFI;

- all highway maintenance works contracted out and all professional services contracted out in an integral contract with a single organisation, either through a joint venture arrangement or to one company. With or without PFI.
- 16.4.2 Bearing in mind that each of these options may also involve differing arrangements in respect of agencies or liaison with other authorities, and local circumstances for the packaging and financing of work, the scope for detailed variation is considerable. PFI has made good progress in the field of street lighting but the take up has been slower on other areas of highway maintenance. The Public Private Partnerships Programme (4Ps) has published guidance for this and other procurement options (www.4ps.co.uk).
- 16.4.3 A key issue for consideration, in relation to the procurement of highway maintenance services is the nature and scale of the 'client' role. Early models of professional services contracting out exhibited wide variations in this, with some authorities retaining a significant in-house capability and others only retaining a very low level in terms of both numbers and experience. With the newer procurement models involving more integrated and flexible partnering arrangements, this may be less of an issue, but will remain a key consideration in other cases. One significant issue to consider is transfer of risk, and determining where best a risk should lie under the new arrangements may well shape the scope and nature of a client organisation.
- 16.4.4 There are many examples of the way a highway maintenance service can be delivered, including:
- Northamptonshire County Council and recently Bedfordshire County Council - fully integrated partnership combining the traditional roles of the network manager, the consultant and the contractor in one organisation;
 - Hertfordshire County Council and Norfolk County Council - strategic partnership involving separate consultant and contractor;
 - Portsmouth City Council and Birmingham City Council - highway management PFI contract;
 - Surrey County Council – partnership contract with two contractors benchmarking their performance;
 - Nottinghamshire County Council and Leicestershire County Council - in-house service with 'top up' consultancy support.

***New Paragraph
Added 14 May 2009***

***Paragraph Amended
7 May 2010***

- 16.4.5 The Highway Efficiency Liaison Group (HELG) aims to support the whole highways industry in identifying and delivering improved and increasingly efficient highway services. In October 2009 HELG published the latest version of the Highways Efficiency Toolkit. The Toolkit describes an approach for measuring efficiencies in the delivery of the highway service and contains case studies and

examples on a number of issues, including procurement. More information on HELG and the Toolkit may be downloaded from the following website.

www.helg.org

16.5 DEVELOPMENT OF PARTNERING

16.5.1 Where Best Value Reviews, or increases in funding have indicated a need for authorities to consider private sector involvement in the delivery of highway services, there has been a tendency of authorities to pursue the newer procurement models, involving closer forms of partnership. These arrangements tend to be based on:

- commitment to shared culture, values and trust;
- joint management structures;
- shared Quality Management (QA, IIP, Environmental Management);
- performance management regime;
- agreed systems for shared risk and reward;
- flexible contract periods based on performance.
- open book accounting and financial systems integration;

16.5.2 Commitment to shared culture, values and trust is particularly important for authorities, and in order to achieve effective partnering it will be necessary for the chosen partner to:

- understand and share the beliefs and core values of the Council including their rationale and the importance of their contribution to the culture of the organisation;
- understand the nature and importance of the challenges within each of the corporate objectives, including the effects of interaction between them. Display imagination and creativity in addressing these challenges in partnership with the Council and other partners;
- understand the best value, CPA and performance improvement principles and process and assist the Council with its programme of Best Value Reviews;
- understand the importance of local democracy and actively support the Council in pursuit of its community leadership role;
- understand the particular needs of local communities, help them to articulate these and work creatively to facilitate their resolution. Appreciate that best value is founded upon services being responsive to those that use or are affected by them, rather than service providers, and provide strong employee leadership in pursuit of this aim;

- deploy high quality flexible, efficient and effective personnel and management processes in support not only of the services for which they are accountable, but also potentially to add value across a wide range of other service areas.
- 16.5.3 Such partnering arrangements should also incorporate all or some of the following:
- arrangements for private investment;
 - arrangements to encourage and reward innovation;
 - arrangements for integrated supply chain management;
 - agreement on Contract Performance Indicators (KPIs).
- 16.5.4 The development of shared culture, values and trust, together with agreement to systems and Contract Performance Indicators, is likely to be assisted by the use of partnering workshops or similar facilitated sessions, both prior to the commencement of the contract and at intervals during its term.
- 16.5.5 Contract Performance Indicators are essential parameters for the management of the partnering arrangement and it is important that agreement on these is reached at the outset. Many authorities and their service partners now have experience in the development and use of performance indicators, and the numbers used vary from approximately 10 to 70. On balance, it is suggested that a smaller number of well thought out and relevant indicators are more likely to be appropriate.
- 16.5.6 The 2001 edition of the Code included a set of 10 indicators established by the National Benchmarking Group, for information and consideration by authorities. The number of authorities participating in the Group has increased with the result that the quality and usefulness of the data has improved.

16.6 INTER-AUTHORITY COLLABORATION

- 16.6.1 It is important that Best Value Reviews include consideration of existing agency arrangements between authorities for the management and delivery of highway maintenance and related services. The circumstances in which these arrangements were established are likely to have changed since their introduction and also the relevance of the boundaries on which they are based.
- 16.6.2 Original agency arrangements are likely to have been founded on the need to sustain local DSO service delivery. With best value, the emphasis may be better placed on ensuring effective higher level co-ordination arrangements between authorities, than through conventional agency arrangements at the commissioning or service delivery level.
- 16.6.3 Where agency arrangements exist between authorities, these should be based on similar principles to those that would apply to partnering arrangements. In particular, a commitment to shared culture, values and trust, open book accounting, financial systems integration and agreed KPIs. The use of partnering workshops in achieving these is also equally relevant.
- 16.6.4 It will also be important to consider the potential for inter-authority liaison in service procurement, for example:

- sharing contract documentation and processes;
- sharing in-house resources to ease peaks and troughs;
- collaborative purchasing of goods and services;
- joint contracts with contractors or consultants.

16.6.5 The emphasis on collaboration between authorities has increased considerably since the 2001 edition of this Code. There is now a strong presumption by Government in favour of collaboration with a number of initiatives in progress. These include:

- the Regional Centres of Excellence;
- the HA project with local authorities to explore opportunities for collaborative purchasing;
- Regional Transport Partnerships in Scotland and other emerging regional arrangements elsewhere;
- the ‘Maintaining Scotland’s Roads’ report which recommends that Councils should consider whether their road maintenance service could be improved by entering into consortia arrangements to achieve economies of scale in road maintenance.

***New Paragraph
Added 24 May 2013***

16.6.6 The Highways Maintenance Efficiency Programme has produced a Local Highway Authorities Collaborative Alliance Toolkit that outlines how collaboration between authorities has achieved efficiency savings through:

- entering into contracting or professional services frameworks;
- achieving greater buying power in procurement activities for services or commodities;
- standardising within their area either for specifications or services, sharing services; and
- developing LEAN processes and the up-skilling of local authority staff.

The Toolkit may be downloaded from the following website:

<http://www.dft.gov.uk/hmep/docs/colab/120824-LHA-collaborative-alliance-toolkit-v1-full.pdf>

***New Paragraph
Added 13 August 2013***

- 16.6.7 The Highways Maintenance Efficiency Programme has developed a suite of Standard Contract Documents based on current good practice. These give practitioners advice and more flexible tools for their procurement, with a view to achieving greater standardisation. The documents provide a complete range by which to procure a term maintenance contract: These documents may be downloaded from the following website:

<http://www.dft.gov.uk/hmep/efficiency/standard-form-of-contract.php>

***New Paragraph
Added 13 August 2013***

- 16.6.8 The Highways Maintenance Efficiency Programme has published a suite of standard specifications and details which have been developed to address the areas where authorities spend most of their highway maintenance budgets. These include:

- Series 500 – Drainage & service Ducts
- Series 700 – Road Pavements – general
- Series 900 – Road pavements – Bituminous bound materials
- Series 1100 – Footways and paved areas
- Series 1300 – Road Lighting
- Series 1700 – Structural concrete
- Series 1800 – Structural steelwork
- Winter Maintenance

The documents build on the latest specifications from within the sector, including those supplied by local highway authorities that have recently tendered or are about to go to market, as well as those from existing collaborative arrangements in the Midlands Highways Alliance, South East 7 and London. Further information may be downloaded from the following website:

<http://www.dft.gov.uk/hmep/efficiency/standard-spec.php>

16.7 FOCUSING ON THE USER AND COMMUNITY

- 16.7.1 It is important that in establishing and managing all forms of procurement and service delivery arrangements a clear focus is maintained on the needs of the user. Not only will this assist the specification and definition of works, but it will also aid the resolution of differences should these occur. This approach is consistent with the core objective of customer service.
- 16.7.2 The incorporation of such measures as Charter Mark and the Considerate Contractor Scheme into contract performance regimes may help to maintain this focus.
- 16.7.3 Procuring large long term contracts can, in certain circumstances, have implications for the local economy and in such circumstances it may be appropriate to specify that the contractor should retain a percentage of local suppliers and subcontractors.

RECOMMENDATIONS FOR SECTION 16

R16.1 Best Value Procurement

Procurement of highway maintenance services should be based on the principles of best value, in accordance with standing orders of the authority, to facilitate creativity in service delivery and finance by potential service providers.

R16.2 Performance Based Contracts

Contracts for the provision of highway maintenance services should be performance based so far as practicable, and should be framed so as to facilitate continuous improvement.

R16.3 Procurement Options

Authorities should assess a range of procurement options for the delivery of highway maintenance services. The principle of continuous improvement is more likely to be achieved through longer term performance based partnerships than through relatively short term conventional contracts.

R16.4 Inclusion of Related Functions

In assessing options for the scope and content of highway maintenance contracts, authorities should consider the extent to which they should include other related highway construction and management functions.

R16.5 Contract Flexibility

In the light of the significant developments in highway management procurement currently taking place, contracts should, so far as practicable, provide for flexibility to incorporate emerging practice. Such contracts should be reviewable over perhaps a 5 year period.

R16.6 Inter-Authority Collaboration

Authorities should consider the extent of potential benefits from collaboration with other authorities.

R16.7 Agency Arrangements

Where an authority has agreed agency arrangements with other authorities to undertake aspects of highway maintenance on behalf of the authority, the strategy should set out the agreed management accountabilities and financial arrangements.

R16.8 Local Economy

Authorities should assess the implications of long term integrated contracts for the local economy, and should consider specifying a proportion of local suppliers or subcontractors where appropriate.

Section 17

Financial Management

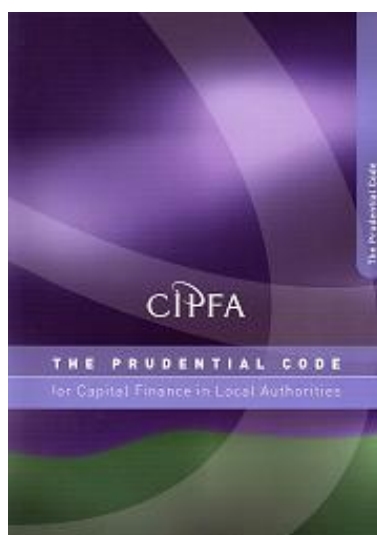
17.1 FINANCING OF HIGHWAY MAINTENANCE

17.1.1 There are significant differences in both capital and revenue funding arrangements within the UK between the various Devolved Administrations. These are not set out in detail in this Code, as they are subject to regular revision, and reference should be made to relevant Government advice.

17.1.2 There are however a number of common principles and potential sources of funding as follows:

- dedicated capital funding provided, such as the second round of Local Transport Plans (LTP) in England, either directly or indirectly by Government and delivered by means of Grants and either Basic or Special Credit Approvals;
- challenge capital funding, targeted at specified transport themes or objectives, which may have direct or indirect relevance to highway maintenance. Examples include Safer Cities Project;
- challenge capital funding for wider strategic themes or objectives, which may have direct or indirect relevance to highway maintenance. Examples include Single Regeneration Budget and Capital Challenge;
- Private Finance Initiative (PFI) credits, this is a developing area and most relevant examples have so far been based on street lighting. However, Portsmouth City Council has successfully developed and procured a highway maintenance contract based on this principle. Birmingham City Council is also pursuing a similar approach;
- capital and/or revenue funding from private sector service providers, negotiated during contract award process;
- capital and/or revenue funding from private developers, secured as a requirement for planning approval;
- capital or revenue local commercial sponsorship, the most common example of this is maintenance of landscaped areas, in particular on roundabouts;
- revenue funding from a combination of local council tax, business rate and Government revenue support. This is provided for all local services for use largely at the discretion of authorities, but with the background of Formula Spending Share (FSS) for principal services, including highway maintenance, with which authorities are expected to demonstrate reasonable levels of compliance;

- the Prudential Code provides new opportunities of capital finance for local authorities. It allows authorities to develop their own programmes for capital investment in fixed assets that are central to the delivery of
- their services, within a clear framework that ensures capital investment plans are affordable, prudent and sustainable.



- 17.1.3 The pursuit of best value requires that authorities should review all of these potential sources of finance to ensure that they are maximising the benefit of these. Although the sums involved in some cases, for example, in local sponsorship, may not be large, they can help build local pride and support for the service.
- 17.1.4 It will be particularly important to ensure that maximum benefit is obtained for highway maintenance from contributions in respect of new development. Although such contributions will be primarily to provide new or improved integrated transport infrastructure, to mitigate the effects of the development, there may be a need to modify or bring forward maintenance works, which could be incorporated into the agreement. Unusual maintenance requirements following adoption may also be reflected in commuted sums.

17.2 FINANCIAL PLANNING

- 17.2.1 The Highway Asset Management Plan (HAMP) should present the investment required in the maintenance of the highway assets to maintain the core objectives of safety, serviceability and sustainability of the asset, and the new objective of customer service. It should also align with the authority's bid for capital funds and hence provide a tool to assist in the financial planning of maintenance.
- 17.2.2 The core objective of sustainability in this Code includes, amongst other things, a requirement to minimise cost over time, focussing on whole life rather than the short term costs. This pre-supposes, of course, that authorities have sufficient financial flexibility to move beyond reactive maintenance for network safety, and clearly circumstances will vary between authorities.
- 17.2.3 Focussing on whole life costs implies the consideration of the highway network as an asset, having a defined financial value and requiring an asset management regime in order to:

- optimise use;
 - maintain value;
 - demonstrate good stewardship.
- 17.2.4 In England these principles are consistent with the requirements of value for money in the LTP, as well as the establishment of a Single Capital Pot, and unified assessment of asset investment priorities.
- 17.2.5 In England, authorities should follow two key principles of value for money when preparing and delivering their LTP:
- to provide the best possible value for money, maintenance work must be carried out in good time. It is essential that authorities do not allow the total costs of maintenance to escalate by allowing assets to deteriorate to the extent that routine maintenance is no longer possible. Similarly, authorities should aim to ensure that maintenance works are not carried out more frequently than necessary;
 - authorities should consider carefully the future maintenance requirements of proposed new infrastructure before including it in their LTP bid. It may be that the whole life cost of a capital scheme will be such that the transport need that it is designed to address could be more efficiently met through less capital intensive, or even revenue funded interventions.
- 17.2.6 Authorities may have insufficient funding to deliver proper asset management and therefore are unable to turn a reactive service into a more pre-planned proactive regime based on the principles of asset management. Some authorities have sought funding to remove maintenance backlog through the PFI credit system. In such circumstances, future maintenance of the network needs to be determined based on identified levels of service and the development of a capital programme based on whole life costs.
- 17.2.7 Funding through the Prudential Code is based on a soundly formulated capital programme that must be driven by the desire to provide high quality, value for money public services. As a consequence, the Code explicitly recognises that in making its decisions to make capital investment, the authority must have explicit regard to:
- option appraisal;
 - asset management planning;
 - strategic planning for the authority;
 - achievability of the forward plan.
- 17.2.8 It is therefore crucially important that authorities establish an asset management regime to secure different sources of capital funding. The HAMP should be produced following the development of the asset management regime. It should provide a robust justification for investment in the maintenance of assets needed, to ensure the delivery of safety, serviceability and sustainability of the network within the context of customer service. The consequences of any shortfall in

funding should be properly represented to aid decision making by the funding bodies.

17.3 WHOLE OF GOVERNMENT ACCOUNTS

- 17.3.1 Following the introduction of Resource Accounting and Budgeting (RAB) to all Government departments from 2001-02, Whole of Government Accounts (WGA) is due to cover the whole of the public sector from 2006-07. The objectives of WGA are to promote greater accountability, transparency and improved stewardship of public finance.
- 17.3.2 WGA presents a comprehensive picture of the public finances prepared on a basis comparable with that of the private sector. This will provide useful information for fiscal policy making and planning and management of public finances and services. WGA is intended to improve the Government's accountability to Parliament and taxpayers, and forms an important element of the Modernising Government agenda.
- 17.3.3 WGA builds on the Prudential System for local government finance and the Resource Accounting procedures for central government. WGA uses accruals accounting methods in line with Generally Accepted Accounting Practice (GAAP).
- 17.3.4 In order to enable the compilation of WGA, it is important that all government bodies produce the accounts on a consistent basis. It is recognised that there are some differences in the guidance currently available to authorities and central government departments for accounting, and these are likely to converge over the coming years.
- 17.3.5 It should also be recognised that highways form only part of the highway infrastructure and other services are also managed by an authority. The accounting principles and practices should be consistent across all the operations of an authority and should be agreed with its auditors.

Resource Accounting and Budgeting

- 17.3.6 The process for financial planning is critical to the management of highway maintenance, as it forms the basis for securing the necessary funds, and ensures that the available funding is appropriately targeted and effectively spent for the maintenance and upgrade of highway assets.
- 17.3.7 Resource accounts are intended to represent the full cost of ownership and use of assets in delivering transport services to the public. For this reason, the financial statements prepared should aim to provide a systematic link between services delivered and resources consumed in the accounting period. They should be prepared to incorporate:
- reliability – the information contained can be depended upon for the stated purpose; it is free from deliberate or systematic bias; it is free from material error; and it has taken a prudent approach in dealing with uncertainty;
 - comparability – the information provided can be compared with similar information about the organisation for previous accounting periods and with other similar organisations. It depends on consistency and adequate disclosure;

- materiality – all information is included that might be expected to have an influence on the purpose for which the financial statements are used.

Materiality depends on the size and nature of the item considered and should be judged on the circumstances of the case.

17.4 ASSET VALUATION

- 17.4.1 Asset valuation is the calculation of the current monetary value of an organisation's assets. The valuation of an authority's highways assets is a key requirement of WGA and an important component of public sector financial management.
- 17.4.2 The purpose of asset valuation is to produce a monetary value of the highway assets to be included in an authority's balance sheet. It also provides a measure of depreciation of the highway asset, which represents the consumption of the asset in delivering services to the public. Asset valuation is important for demonstrating stewardship of public assets.
- 17.4.3 Highways are largely publicly owned and have not been sold on the open market. These assets are not used primarily for the purpose of revenue generation. Hence, the method to be adopted for the calculation of the value of the highway asset should not be based on market value or revenue stream.
- 17.4.4 HM Treasury's *Resource Accounting Manual (RAM)* contains the requirements for valuation, which, in line with the requirements of *Financial Reporting Standard 15 Tangible Fixed Assets (FRS 15)*, recommends that highway infrastructure assets are valued on the basis of the Depreciated Replacement Cost. This is taken as the current replacement cost depreciated to reflect the overall condition of the highway network.
- 17.4.5 The procedure to be followed for the valuation of highway assets is described in detail in the CSS Guidance Document *Asset Valuation of Highway Infrastructure Assets*. A summary of this is given below.
- 17.4.6 It is important to recognise that the calculated asset value represents only the monetary value, or capital value of the assets, and not the service provided or the worth of the assets to society.
- 17.4.7 The process for the valuation of the highway assets is based in 6 main steps as described below and summarised in Figure 5:
- establish the principles, basis and rules for valuation;
 - compile an Asset Register that provides the base data required for calculating asset values for each individual asset owned by an authority;
 - produce initial values for the assets. This includes developing appropriate unit rates and calculating Gross Replacement Costs;
 - calculate the consumption of the assets. This includes calculating the depreciation of the assets and the impairment loss;
 - calculate Depreciated Replacement Cost;

- prepare the valuation report.
- 17.4.8 Impairment is defined as the unexpected deterioration in condition and/or performance, for example due to accidental damage, and is recognised as a temporary drop in asset value.
- 17.4.9 Highway assets should be subject to full revaluation once every 5 years. In between revaluations, the valuations can be adjusted using appropriate price indices.

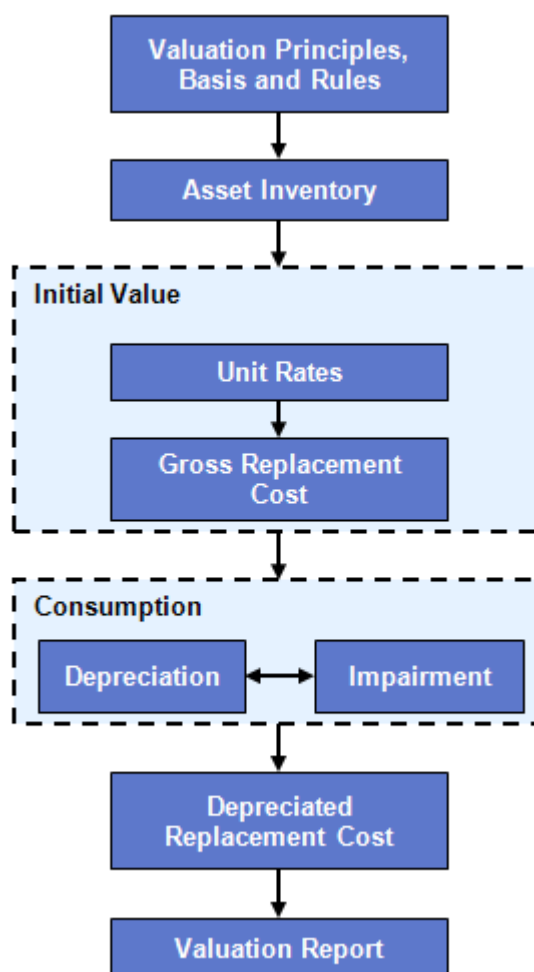


Figure 5 – Asset Valuation Steps

- 17.4.10 Renewals Accounting is the recommended approach for calculating the depreciation of the asset value. Under this approach, the level of annual expenditure, identified in the HAMP to maintain the operating capacity of the network, is treated as the depreciation for that period and is deducted from the current asset value. The actual annual expenditure is capitalised and added to the asset.
- 17.4.11 The strategic network has been valued in England by the HA and also in Scotland, Wales, and Northern Ireland by the respective authorities. In Northern Ireland the process is also carried out for local roads.

17.5 BUDGETARY CONTROL

17.5.1 Good budgetary control procedures based on high standards of corporate governance are essential to sound financial management. This section deals with the most important elements of budgetary control, and provides advice on the achievement of good financial management.

17.5.2 Major elements of budgetary control include regular reviews of the following:

- possible problems in under or overspend when comparing actual expenditure transactions to budget;
- possible need to redefine objectives against budget provision;
- possible need to delegate specific areas of larger budgets, enabling greater control;
- possible need to adjust budgets in the light of performance monitoring.

17.5.3 By acting on the following principles, a budget holder can help to ensure that activities carried out during the year are in line with agreed objectives:

- familiarisation with the relevant financial regulations and procurement standards of the authority;
- recording of commitments to ensure that an accurate picture of expenditure is available at all times. Hard commitments are defined as irreversible spending decisions, such as orders raised. Soft commitments are those that could be stopped if necessary;
- reviewing transactions to ensure that nothing has been charged that was not expected. Replacing the commitments for the preceding month with the actual expenditure and then reviewing future commitments in the light of experience;
- using financial reports and information supplied corporately by the authority to compare regularly budget allocation to actual expenditure. At the end of the month, budget holders should receive a report of the total spending against each code to date;
- identifying possible over and under spending sufficiently early to enable corrective action to be taken.

17.5.4 This corrective action could include:

- using journal transfers to move income and expenditure from incorrect budget heads where applicable;
- using virements to move a budget from one head to another, where possible overspending on one budget head might be compensated for by expected underspends on another;
- delegating budgetary responsibilities for specific budgets to personnel spending against those codes;

- ensuring budgets are re-profiled where necessary, in order to realign total budget to proposed actual spend.

17.6 BUDGETING PRINCIPLES

17.6.1 Budgeting principles for highway maintenance should provide the necessary level of flexibility in order to deliver value for money. They should be set out based on the following considerations and principles:

- that integration of scheme planning and programming, within the context of asset management, is likely to require greater flexibility than has previously been the case;
- the differing life expectancies of various treatments and the future implications of these for the balance of capital and revenue funding;
- the seasonal and weather sensitive nature of many treatments and the service as a whole;
- the uncertainties in prediction of out-turn costs for Winter Services and the need for year-end flexibility;
- the increasing trend in weather emergencies and the need to make provision for these and other emergencies.

17.6.2 The budget for highway maintenance should be drawn up over a rolling three year period and included as part of the HAMP, which should enable schemes to be developed on the basis of objective information and also to be adjusted in nature and programming, to add value to other transport and wider policy objectives.

17.6.3 Effective budget monitoring arrangements are, of course, crucial to the delivery of best value. Where services are procured through forms of Public Private Partnership, budget monitoring will form a key aspect of contract management. Many of the new forms of partnership being adopted by authorities are incorporating Open Book Accounting and also the provision of joint electronic data transfer systems for invoicing and payment. Such systems can make an important contribution to efficiency and are, of course, equally relevant to inhouse service delivery arrangements.

RECOMMENDATIONS FOR SECTION 17

R17.1 Financial Information and Planning

Strategies for highway maintenance contained in the Highway Asset Management Plan and the Local Transport Plan should be supported by clear financial planning and information management arrangements, based on high standards of corporate governance.

R17.2 Sources of Finance

Financial planning arrangements should consider the scope for introducing new sources of finance, for example through PFI, Prudential Code and developers' contributions.

R17.3 Budget Preparation

The preparation of budgets for highway maintenance should reflect the *Code of Practice on Local Authority Accounting in the UK* and be based on a rolling three year period consistent with the Highway Asset Management Plan.

R17.4 Financial Accountability

Systems for financial management should recognise the need for the delegation of financial accountability to be consistent with delivering high standards of customer responsiveness.

R17.5 Accounting Flexibility

Arrangements should be established for carry over of expenditure at year end, which recognise the sensitivity of highway maintenance works to variable weather conditions, particularly in the pre-year end period.

R17.6 Weather Sensitivity

Consideration should be given to special financial arrangements, including the use of reserves to deal with extended periods of unexpected weather, the frequency of which is expected to increase.

R17.7 Budgetary Control

Standards and procedures for budgetary control should be established, consistent with the principles of this Code. Systems should preferably enable easy and electronic data exchange between client and major service providers.

R17.8 Asset Valuation

Authorities should prepare for the introduction of Whole of Government Accounts in 2006/7. This will result in the need for valuation of highway assets. Guidance is given in the CSS document *Asset Valuation of Highway Infrastructure Assets*.

Section 18

Monitoring, Review and Reporting

18.1 IMPORTANCE OF MONITORING, REVIEW AND REPORTING

18.1.1 The establishment of regular and structured monitoring is a key requirement of any management regime and a fundamental principle of continuous improvement. It is, however, especially important in the case of highway maintenance for a number of reasons:

- the character and use of the network is subject to constant change, some of which is reasonably predictable and some of which is not;
- legal interpretations of statutory responsibilities for safety have established the presence of effective monitoring, review and reporting systems as a critical factor in determining liability;
- key policy and performance improvement processes including Comprehensive Performance Assessment (CPA), Best Value Performance Plans, and Local Transport Plans require regular monitoring and reporting, including progress on performance indicators and targets;
- technical research on processes and practices for condition assessment is rapidly evolving and advice on best practice will need to take account of this. Information from Best Value Reviews will also inform this process;
- technical research on materials and treatments, especially from the point of view of sustainability, is also rapidly evolving and will need to be taken into account;
- new forms of partnership for service delivery incorporating Contract Performance Indicators will require monitoring for contract compliance.

18.2 CATEGORIES OF REVIEW

18.2.1 Each of these requirements for monitoring, review and reporting may require a different approach and timetable and may involve:

- continuous monitoring;
- programmed reviews;
- Best Value Reviews;
- ad hoc reviews.

18.2.2 Continuous monitoring will be essential for safety and certain operational purposes, including those required by the Traffic Management Act 2004. Systems will need to provide regular updating on such matters as:

- planned (and un-planned) highway obstructions and all potential disruptions, including works by the authority and third parties;
 - results of safety and other inspections, including nature and time of planned and actual response, including no response;
 - results of service requests and complaints from users and the community, including nature and time of planned and actual response, including nil returns;
 - changes in traffic flow, composition and network distribution;
 - road traffic accidents and incidents, including damage only incidents where available, both from police records and other sources, and any damage to the highway;
 - weather information.
- 18.2.3 The regularity with which the above information is updated will largely depend on the practicalities of information collection and processing, together with the defined inspection frequencies. Authorities are encouraged to make the most effective use of ICT in establishing efficient and effective systems based on an understanding of the relative risks involved, and to apply these with absolute consistency.
- 18.2.4 Less frequent but programmed reviews will also be necessary for other purposes in order to:
- analyse trends in network character and use, and consider possible changes to hierarchy, inspection regime and standards;
 - analyse trends in network accidents, incidents, service requests and complaints, and consider possible changes to hierarchy, inspection regime and standards;
 - analyse the quality and effectiveness of continuous monitoring systems and consider how these might be improved;
 - monitor co-ordination of work programmes and priorities and consider any changes necessary to take advantage of opportunities arising;
 - review annually all relevant aspects of Winter Service and consider any changes necessary;
 - review all information relating to the delivery of statutory indicators and local PIs.
- 18.2.5 The frequency of these reviews will depend upon local circumstances, but should usually take place annually. They should also wherever possible be undertaken jointly between client and service provider, whether in-house or private sector partner. They should be separate from, but consistent with, more frequent meetings between the parties, for contract management purposes and monitoring of contract PIs.

- 18.2.6 Best Value Reviews provide the opportunity for in depth analysis of all aspects of service policy and delivery including, crucially, the extent to which these are meeting the requirements of strategic or corporate objectives and those of other stakeholders. It will be important also to ensure that opportunity is taken for highway maintenance to contribute to Best Value Reviews of other related services, both of the principal authority and others.
- 18.2.7 Ad hoc reviews will also be necessary from time to time in the light of changes in funding regimes and to take account of technical developments.

18.3 SHARED BEST PRACTICE

- 18.3.1 It is important that the outcomes of all reviews, whether continuous, programmed, best value or ad hoc, are shared with all those whom they effect, but also more widely where they have the potential to contribute to shared best practice.
- 18.3.2 Section 11 of this Code provides examples of benchmarking networks and similar groups where this is being pursued, but there is much more scope for this to be more widely effective. Since the 2001 edition of this Code there has been a considerable increase in opportunities for sharing best practice, including information from the Improvement and Development Agency (IDeA, www.idea-knowledge.gov.uk) and others.

18.4 MONITORING AND REVIEW OF CODE OF PRACTICE

- 18.4.1 All of the principles of monitoring and review outlined in this section apply to this Code. The guidance that it provides will undoubtedly be affected by current and future developments in policy and practice.
- 18.4.2 It is therefore intended to take full advantage of new technology by providing on-line updating of the Code. The structure has been designed to facilitate this and it is intended to introduce the on-line updating service during the year following the launch of the Code.

RECOMMENDATIONS FOR SECTION 18

R18.1 Risk Management Approach

Arrangements should be made for frequent and regular monitoring of overall network management performance, including effectiveness of inspection, information systems and response arrangements, and changes introduced where necessary to ensure that personal and financial risks both to users and the authority are managed effectively.

R18.2 Monitoring of Indicators, Targets and Outcomes

Arrangements should be made for monitoring of core objectives and outcomes, including statutory and other key indicators of network condition and performance, and changes introduced where necessary to ensure that progress towards targets is maintained.

R18.3 Monitoring of Procurement Regime

Arrangements should be made for monitoring the performance of procurement arrangements and the extent to which these are contributing to the pursuit of continuous improvement, and changes introduced where necessary to ensure that the necessary progress is maintained.

R18.4 Enhancing Benchmarking Information

Arrangements should be made to share ongoing monitoring and benchmarking information with others in the interests of the wider best value agenda.

R18.5 Monitoring Research and Developments

Arrangements should be made to ensure that the results of ongoing research are monitored and incorporated into highway maintenance practice, where desirable, and with respect to local circumstances.

Appendix A

Glossary of Terms

ABBREVIATIONS

AHP	Analytical Hierarchy Process
API	Area Performance Indicator
BOAT	Byway Open to All Traffic
BVPI	Best Value Performance Indicator
BVPP	Best Value Performance Plan
CAT	Capability Assessment Toolkit
CCT	Compulsory Competitive Tendering
CIPFA	Chartered Institute of Public Finance and Accountancy
CPA	Comprehensive Performance Assessment
CRM	Customer Relations Management
CSC	Characteristic SCRIM Coefficient
CSS	County Surveyors Society
CVI	Coarse Visual Inspection
DCD	Data Capture Device
DfT	Department for Transport
DRD	Department for Regional Development
DRR	Designated Recreational Routes
DRMB	Design Manual for Roads and Bridges
DSO	Direct Service Organisation (also DLO)
DVI	Detailed Visual Inspection
EA	Environment Agency
FSS	Formula Spending Share

FWD	Falling Weight Deflectometer
GAAP	Generally Accepted Accounting Practice
GPR	Ground Penetrating Radar
HA	Highways Agency
HAMP	Highway Asset Management Plan
HAPAS	Highway Authorities Product Approval Scheme
HAPMS	Highways Agency Pavement Management System
HMMS	Highway Maintenance Management System
ICE	Institution of Civil Engineers
ICT	Information Communications Technology
IDeA	Improvement and Development Agency
IHIE	Institute of Highway Incorporated Engineers
IHT	Institution of Highways and Transportation
KPI	Key Performance Indicator
LDT	Long Distance Trails
LPI	Local Performance Indicator
LPSA	Local Public Service Agreements
LTP	Local Transport Plan (Second Round)
MAC	Managing Agent Contractor
MSSC	Mean Summer SCRIM Coefficient
M4i	Movement for Innovation
NHBVBC	National Highways Best Value Benchmarking Club
NHSS	National Highways Sector Scheme
NIRS	Northern Ireland Roads Service
NRMCS	National Road Maintenance Condition Survey
NRSWA	New Roads and Street Works Act
NSG	National Street Gazetteer

NVQ	National Vocational Qualification
ODPM	Office of the Deputy Prime Minister
PFI	Private Finance Initiative
PPP	Public Private Partnership
PROW	Public Rights of Way
PSA	Public Service Agreement
RAB	Resource Accounting and Budgeting
RAUC	Roadworks and Utilities Companies
ROWIP	Right of Way Improvement Plan
RSG	Revenue Support Grant
RUPP	Road Used as Public Path
SCANNER	Surface Condition Assessment for the National Network of Roads
SCRIM	Sideway-force Coefficient Routine Investigation Machine
SE	Scottish Executive
SIL	System Intervention Level
SNVQ	Scottish National Vocational Qualification
SRMCS	Scottish Road Maintenance Condition Survey
SUD	Sustainable Urban Drainage
TAG	Technical Advisors Group
TAMP	Transport Asset Management Plan
TfL	Transport for London
TRACS	Traffic Speed Condition Survey
TRMM	Trunk Roads Maintenance Manual (also Routine and Winter Maintenance Code)
TMA	Traffic Management Act 2004
TTS	TRACS Type Survey (see SCANNER)
UKCIP	UK Climate Impact Programme
UKPMS	United Kingdom Pavement Management System

WAG	Welsh Assembly Government
WATO	Welsh Association of Technical Officers
WGA	Whole of Government Accounts
4Ps	Public Private Partnership Programme

MAIN DEFINITIONS

Asset Management	A strategic approach that identifies the optimal allocation of resources for the management, operation, preservation and enhancement of infrastructure, to meet the needs of current and future customers.
Asset Register	An inventory of the highway, including all related elements and furniture.
Authority	All forms of national and local authority having responsibility for road maintenance.
Automatic Pass	The automatic processing of data within UKPMS according to defined Rules and Parameters, without manual intervention.
Backlog	The work needed to arrest deterioration and restore the network to a pre-defined condition, which is then maintained at a steady state.
Benchmark	A parameter of data, process or function used for comparison.
Best Value	Ensuring that services are responsive to the needs of citizens, not the convenience of service providers. Securing continuous improvement having regard to a combination of economy, efficiency and effectiveness.
Carriageway	The part of the highway laid out for use by motor vehicles.
Commuted Sum	Payment made by the provider of highway infrastructure on transfer to an authority to cover future maintenance liabilities and costs.
Complaint	Communication alleging failure to respond adequately to service or information request.
Cycle Route	Collective term for all segregated facilities laid out specifically for cycles.
Footpath	Off road un-surfaced Public Right of Way for pedestrian use.
Footway	Collective term for all segregated facilities laid out for use by pedestrians.
Highway	Collective term for publicly maintained facilities laid out for all types of user, and includes for the purpose of this Code, roads and streets.

Highway Asset Management Plan	A plan for management, preservation and enhancement of the highway asset base to deliver prescribed levels of service and meet the needs of current and future customers.
Highway Improvement Plan	This plan sets out the proposed improvements to the network necessary to meet performance targets, such as safety and congestion, and is set in the overall context of local transport planning requirements.
Highway Maintenance Plan	A plan that sets out the operational requirements to maintain the network and identifies the resource requirements to deliver the maintenance service.
Highway Register	Register of public highways maintained by authorities, mainly for the purpose of Land Charge Searches.
Housing Footway	Unadopted footways, mainly serving housing development, maintained by authorities under other than highway powers.
Investigatory Level	The standard of asset condition below which the need for treatment should be considered.
Maintenance Type	The nature of planned maintenance response, for example reactive, routine or programmed.
Maintenance Category	The nature of maintenance work undertaken, for example, cleansing, patching, resurfacing etc.
Network Management Plan	A plan that sets out how the network should be managed to meet the requirements of the Traffic Management Act and improve co-ordination between stakeholders in delivering works programmes.
Performance Indicator	The measure of performance to be used in exercising a function. Can be categorised in varying levels of importance, for example 'statutory' 'key', 'core', 'local' etc.
Pavement	Collective term for all running surfaces.
Resource Accounting and Budgeting	An accounting procedure adopted by central government in 2001 that aims to provide a systematic link between an organisation's objectives, resources consumed and outcomes delivered.

Public Right of Way	A way over which the public have a right to pass and re-pass. By convention excludes roads normally used by motor vehicles.
Road	See highway.
Rules and Parameters	Common standards applied by UKPMS to derive condition indices and treatments.
Running Surface	Collective term for all hardened surfaces within the highway.
Safety Inspection	Inspections to identify all defects likely to create danger or serious inconvenience to users or the wider community.
Service Inspection	Inspections to identify all defects likely to compromise serviceability.
Service Request	Communication seeking information, inspection or maintenance activity.
Single Capital Pot	Amalgamation of capital funding for authority services, and removal of ring-fencing.
Soft Estate	Highway land, usually behind the verge not surfaced or maintained for use or convenience of vehicular traffic.
Structural Condition Index	A number in the range 0 to 100 which defines the relative condition of the highway. Higher numbers reflect increasing deterioration.
System Intervention Level	The standard of asset condition at which UKPMS automatically applies a treatment.
Transport Asset Management Plan	A plan that is referenced in the second round of Local Transport Plans (see also Highway Asset Management Plan).
Value Management	Management of highway schemes and programmes to optimise added value to the community and ensure value for money is delivered.
Value Engineering	Management of highway schemes and programmes to optimise engineering cost-benefit.
Whole of Government Accounting	A central government initiative to produce a comprehensive set of accounts from 2006/2007 for the whole of the public sector, covering central government and local government

departments.

Winter Service

Collective term for all specialist winter operations. Also called Winter Maintenance.

Appendix B

Parameters for Defect Definitions

B1 POTENTIALLY DANGEROUS DEFICIENCY

- B1.1 Section 9 of this Code defines the purpose of safety inspections as being designed to identify those defects likely to create danger or serious inconvenience to users of the network or the wider community, and therefore requiring immediate or urgent attention.
- B1.2 Category 1 defects are defined as those that require prompt attention because they represent an immediate or imminent hazard or because there is a risk of short-term structural deterioration.
- B1.3 In England the original BVPI 105 required authorities to record and monitor the *‘Total number of reported incidents of dangerous damage to roads and pavements repaired or made safe within 24 hours from the time that the authority first became aware of the damage, as a percentage of such incidents’*. This indicator is now discontinued as a statutory indicator, but it is recommended that authorities continue to monitor performance of response to Category 1 defects as a local performance indicator. Appendix F includes this referenced as SA2.
- B1.4 Also in England one of the Highways Agency’s (HA) fourteen Area Performance Indicators, API 2, requires the reporting of response to Category 1 defects. The Northern Ireland Roads Service also has a business target of repairing serious surface defects in roads and footways.
- B1.5 It will still be necessary however for those undertaking inspections, or responding to reported incidents to judge whether any individual observed or reported defect should be recorded as Category 1 and the consequent urgent action put in hand. Each and every such decision could be critical to the safety of users and may also potentially be subject to legal scrutiny in the event of an accident occurring at or near to the site, and complete and accurate records will be essential.
- B1.6 Each authority should therefore provide clear guidance and training to employees in the conduct of safety inspections. This should include a check list of items to be inspected, recognition of the degree of deficiency defining Category 1 defects, and the application of risk management in determining the speed and nature of response appropriate to the site in question. An example of the recommended risk management approach is given in Section 9 of this Code. The use of photographs, both for training and on-site comparison is encouraged.

B2 SUGGESTED ITEMS FOR INSPECTION

- B2.1 This following section is a suggested schedule of deficiencies to be identified during safety inspections. It is not exhaustive and is provided as a check list only. It should be modified to suit local circumstances. The term running surface applies to carriageway, footway or cycle route. The schedule is as follows:

- debris, spillage or contamination on running surface or hard shoulder;
- displaced road studs lying on running surface; • overhead wires damaged or unstable;
- damaged and exposed electrical wiring;
- embankments and cuttings apparently unstable;
- trees with loose branches or apparently unstable;
- signs, signals or lighting damaged, defective, missing or unstable;
- road markings and studs missing, misleading or badly worn;
- signs, signals or lighting dirty or obscured;
- sight-lines obscured by trees, unauthorised signs and other obstructions;
- safety fencing, parapet fencing, handrail, and other barriers missing or defective;
- abrupt level differences in the running surface;
- potholes, cracks or gaps in the running surface;
- crowning, depression and rutting in the running surface;
- edge deterioration of the running surface;
- kerbing, edging or channel defects;
- rocking or otherwise unstable footpath or cycleway surfaces;
- apparently slippery running surface;
- ironwork (gully lids, manholes etc) broken or missing;
- gullies, drains or grips blocked or defective;
- standing water, water discharging onto or overflowing across the running surface.

B3 DEFICIENCY AND RISK

B3.1 Whether these defects should be treated as Category 1 in particular circumstances and the nature and speed of response will depend, amongst other things, upon the assessed risk posed by:

- the depth, surface area or other degree of deficiency of the defect or obstruction;
- the volume, characteristics and speed of traffic;

- the location of the defect relative to highway features such as junctions and bends;
- the location of the defect relative to the positioning of users, especially vulnerable users, such as in traffic lanes or wheel tracks;
- the nature of interaction with other defects;
- forecast weather conditions, especially potential for freezing of surface water.

B3.2 The weight given to each of these parameters should be based on risk assessment and should be informed by a risk register. Authorities should develop a risk register for highway safety inspections, generally following a common set of principles, adjusted for local circumstances. The proposed approach is described in Section 9. A similar approach has been adopted by Westminster Council.

B3.3 Some examples of the comprehensive list of investigatory levels for safety defects adopted by Westminster Council are set out in Table B1 below. Where these investigatory levels are not met, the nature and response time of any action is determined by the risk assessment process described in Section 9.

Table B1 – Examples of Defects		
Item	Defect	Investigatory Level
Carriageway	pothole/spalling crowning depression rutting gap/crack sunken ironwork	20mm depth 50mm (area as NRSWA Code of Practice) 50mm (area 2m ²) 20mm 20mm depth (20mm wide) 20mm level difference
Pedestrian Crossing	trip/pothole	15mm depth
Footway	trip/pothole rocking slab/block open joint tree root damage sunken ironwork defective coal plates/ basement lights etc	15mm depth 15mm vertical movement 20mm width x 200mm length (min depth 20mm) 15mm trip 15mm level difference 15mm trip
Kerbing	dislodged loose/rocking missing	50mm horizontally 15mm vertically yes/no
Ironwork	level difference within framework	15mm

B3.4 An example of the risk levels, default standards and responses adopted by Perth and Kinross Council is provided below:

Defects presenting an immediate and critical hazard to road users. Immediate make safe or repair. Such defects will include:

- major debris or spillage;
- critically unstable wires, trees or structures;
- exposed live electrical wiring;
- carriageway collapse or comparable severe surface defect with very high probability of loss of control;
- isolated standing water of a depth and location with very high probability of loss of control;
- missing or seriously defective ironwork with very high probability of injury to user;
- footway or cycleway collapse or comparable severe surface defect with very high probability of injury to user.

Defects presenting an urgent or imminent hazard or risk of rapid structural deterioration. Make safe or repair within 24 hrs. This will be interpreted as the same working day for defects notified before noon and the end of the following working day for later notifications. Such defects will include:

- rapid deterioration in unstable wires, trees and structures;
- seriously damaged or defective traffic signals;
- missing, dirty or obscured Stop or Give Way signs;
- missing, dirty or obscured Stop and Give Way markings;
- missing, dirty, obscured or 'red light out' traffic signals;
- missing or seriously defective ironwork;
- missing or seriously damaged safety or pedestrian fencing;
- pothole, trench or other abrupt carriageway level difference exceeding 40mm in all road categories of a size and location likely to cause loss of control;
- edge deterioration with abrupt level difference at carriageway edge exceeding 100mm in all road categories, of a size and location likely to cause loss of control;
- pothole, trench or other abrupt level difference exceeding 20mm in cycleway categories A and B, of a size and location likely to cause injury to users;

- trip or other abrupt level difference in footway or kerb exceeding 20mm in all footway categories, of a size and location likely to cause injury to users, but excluding such level differences between adjoining kerbs;
- gap wider and deeper than 15 mm in all footway categories of a size and location likely to cause injury to users.

Defects presenting a moderate level of hazard or risk of structural deterioration. Repair within 7 days. Such defects will include:

- missing, dirty or obscured warning signs;
- isolated standing water;
- pothole, trench or other abrupt carriageway level difference exceeding 40mm in all road categories in any location;
- edge deterioration with abrupt level difference at carriageway edge exceeding 100mm in all road categories in any location;
- pothole, trench or other abrupt level difference exceeding 20mm in cycleway categories A and B in any location;
- trip or other abrupt level difference in footway or kerb exceeding 20mm in all footway categories in any location, but excluding such level differences between adjoining kerbs;
- gap wider and deeper than 15mm in all footway categories in any location.

B3.5 The Northern Ireland Roads Service has adopted business plan targets for 2004/05:

- to repair or make safe, by the end of the day following the day of detection, at least 90% of serious road surface defects:
 - 50-100 mm deep on heavily trafficked urban roads and footways;
 - over 100 mm deep on all roads and footways (except lightly trafficked rural roads);
- to repair or make safe within 5 working days of detection, at least 90% of defects:
 - between 20 and 50 mm deep on heavily trafficked roads and footways;
 - between 50 and 100 mm deep on all roads and footways except heavily trafficked urban roads and footways and lightly trafficked rural roads;
 - over 100 mm deep on lightly trafficked rural roads.

Appendix C

Highway Risk and Liability Claims Summary of Task Group Report

Addition to Appendix
15 December 2009

Website Amended
27 April 2012

An update to the Highway Risk and Liability Claims was published in June 2009 and can be downloaded from:

<http://www.ukroadsliaisongroup.org/en/utilities/document-summary.cfm?docid=3A9E12B3-EC43-4A5C-B7FCF77E38E6DB72>

Comment Added
27 May 2011

Section 4.3 of the 2009 version of the Highways Risk and Liability Claims has been updated. The updated Section may be downloaded from:

Website Amended
27 April 2012

<http://theihe.org/knowledge-network/uploads/HighwayRiskandLiabilityGuide4.3HighwayInspectorTrainingUpdate%20Feb2011.pdf>

C1 INTRODUCTION

C1.1 This appendix is a short summary of a more comprehensive report by the Roads and Highways Liability Claims Task Group to be published in Autumn 2005. The report, which is backed by extensive web based information and references, is based on the Kindred Associations Guidance on Highway Liability Claims, first published in 1995 and revised in 1998.

Purpose of the Report

C1.2 The report aims to provide local authority engineers, transport planners, landscape architects, elected Members, insurers, risk managers and anyone else with responsibility for providing and maintaining the roads infrastructure, an overview of the current position on highways liability arising from maintenance, including latest philosophy and views on best practice and legislation.

C1.3 The report sets out the ground rules for good practice and prepares the foundation for a national claims trend and performance indicator database. Sharing highway

related claims information will help participating authorities to monitor their performance against others and national trends.

- C1.4 All UK highway authorities are encouraged to support the national highways claims initiative which is commended as good practice by this Code.

Using the Report

- C1.5 Although the task group has taken every care in the preparation of the report, neither the authors nor their organisations can accept any legal liability for its contents, which do not necessarily reflect the views of the sponsoring organisations. Where possible, this document refers to legislative practice in England, Wales, Scotland and Northern Ireland. Where specific reference is made to case law the implications of the legislation in force must be checked. The information is provided in good faith and on the condition that users will employ their own judgement in implementing any of the examples or suggestions contained in the guide.

Who Produced the Guide?

- C1.6 In November 2003 the UK Roads Board formed a sub-group whose task was to provide a best practice document for authorities to assist in their handling of highway liability claims. In parallel, the Institution of Civil Engineers (ICE) tasked a working party of their Municipal Group to investigate similar issues to update earlier work on highways liability undertaken jointly between the CSS and TAG. To avoid duplication of effort and to provide a common approach a decision was made for the two groups to work together. It was also decided that those involved in similar initiatives, the Association of Public Services Excellence (APSE), the Association of British Insurers (ABI) and the Association of Local Authority Risk Managers (ALARM) should also be invited onto the group.
- C1.7 Members of the Task Group are recorded in the Acknowledgements at the end of this Code.

C2 BACKGROUND TO HIGHWAY CLAIMS

- C2.1 There are around 5 million incidents on the highway each year. Research suggests that around 75% of accidents are caused solely by driver error. The condition of the road is a contributory factor in less than a fifth of accidents. Of these, only a fraction lead to a claim against the highway authority. Around 95% of these claims are thought to be due to maintenance defects, and around 5% due to design defects.
- C2.2 Over the past 15 years, highways liability claims have become a major concern. The number of claims received annually by authorities has nearly doubled over the past 10 years, and public liability insurance increased by 40% in just one year 2003/2004. Authorities are thought to spend between £100-£500 million in managing highway liability claims or potentially up to 20% of the total funds spent on local authority highway maintenance. These funds would be better spent on providing a public service.
- C2.3 Factors that are increasing claims and the cost of claims include:

- media coverage – e.g. TV documentaries;
- high profile advertising, featuring media personalities;
- growth of no-win-no-fee companies;
- conditional fee arrangements (legal aid resources have not been transferred);
- open government and the Freedom of Information Act;
- new types of claim being made – e.g. loss of face;
- maintenance backlog on local roads and footways leading to more successful claims being made;
- changing public expectation on the level of awards being made;
- fraudulent claims;
- court costs in general have increased far more rapidly than the general rate of inflation.

C3 AN INTRODUCTION TO THE LAW ON HIGHWAY LIABILITY

Duties, Powers and Responsibilities

C3.1 The law on highways has its roots in the Saxon era and possibly earlier. A substantial body of common law has built up over this period. One High Court judge was moved to remark that ‘Highways Law is a complex and artificial body of knowledge through which commonsense is not always a sure guide.’

Statutory Duties

C3.2 The highway authority is under a duty to:

- maintain the highway - the courts have interpreted ‘maintain’ as ‘repair’, and the ‘highway’ as the ‘fabric of the highway’;
- remove snow and ice and also ‘to ensure, so far as is reasonably practicable, that safe passage along a highway is not endangered by snow and ice’ (Railways and Transport Safety Act 2003);
- secure the ‘expeditious’ movement of traffic (in England);
- improve road safety – this is a general duty and cannot be used in a private action by an individual.

These duties are balanced by responsibilities of road users to take the road as they find it.

Statutory Powers

C3.3 An authority may be liable for the consequences of exercising a statutory power,

but it is rare that any liability will arise from a decision not to exercise a statutory power.

Other Areas of Relevant Law and Potential Liability

C3.4 Other areas of relevant law and potential liability include:

- Common Law Duty of Care (www.swarb.co.uk) - a duty of care may exceptionally be established where a local authority has failed to exercise a statutory power (see *Stovin v Wise*);
- occupier's liability - on sites where a contractor has exclusive possession, lane rental, or where a contractor closes off a footway, there is potential for occupiers' liability;
- corporate manslaughter (www.cps.gov.uk) - may be proven where 'a corporation, through the controlling mind of one of its agents, commits an act which fulfils the prerequisites of the crime of manslaughter'. Currently a single individual has to be identified as the controlling mind for a charge of corporate killing to be brought. In consequence, larger organisations have been virtually immune from prosecution. However, this situation is liable to change. The Government is committed to widen liability for corporate manslaughter, and are committed to bringing forward legislation.

Website Amended 27 April 2012

- Article 8 Human Rights Act 1998 (<http://www.legislation.gov.uk>) – right to respect for private and family life. This is a new area where there has been little litigation on which to draw conclusions.

Proving Reasonableness

C3.5 The authority or its agent will need to demonstrate that its actions or decisions were reasonable. Examples include:

- inspection or repair policies were in accordance with national guidelines, or were based on rational consideration of local circumstances;
- judgement was made by an adequately trained and qualified individual.

C3.6 There will need to be robust evidence, or an audit trail that can convince a court that a decision or an action took place at the time and in the manner in which the authority claim. Examples include:

- minutes of policy decisions, and the steps by which the decision was taken, and the reasons;
- records of condition e.g. the state of the highway, trees, furniture;
- records of decisions not to act over a marginal defect – these can be important if a claimant subsequently makes a claim;

- records of actions – when the repair took place etc.

If an authority is unable to provide sufficiently strong evidence, its defence will be impaired.

Statute of Limitations

C3.7 A claimant must make the claim:

- in the case of injuries – within three years from the date of the accident, from being first aware of the injury, from reaching the age of 18, or the date of competency;
- in the case of damage - within six years.

Statutory Defence – Condition of the Highway

C3.8 By virtue of Section 58 of the Highways Act 1980 (England and Wales) or Section 1 of the Roads Scotland Act 1984, if an authority can prove that it had in place adequate policies and procedures to maintain the highway, and the policies and procedures were being performed, and there was no prior knowledge of ‘the defect’ before the incident date, a claim can be repudiated.

C3.9 In defending an action, the authority will need to establish that it has acted reasonably, by the production of adequate documentation and evidence:

- policies and standards: conformity with standards recommended by this Code of Practice and other national standards can be used as evidence of reasonable actions. Local authorities which wish to depart from the Code should formally record the deliberation process over the departure. Authorities should publish the standards they are working to (see above);
- a robust inspection and recording system to demonstrate that the policies have been carried out will require a robust system, operated by appropriately trained and qualified inspectors.

Examples of Main Causes of Highway Liability Claims

C3.10 This section is based on current case law. It lists potential outcomes. For definitive information, readers should consult the source judgements, and where appropriate take legal advice. The authority must cater for the ‘normal run of drivers’ (Rider v Rider). Drivers have responsibilities also. The ‘overriding imperative is that those who drive on the public highways do so in a manner and at a speed which is safe having regard to such matters as the nature of the road, the weather conditions and the traffic conditions. Drivers are first and foremost themselves responsible for their own safety’ (Lord Scott at paragraph 76, (Gorrington v Calderdale).

Table C1 – Main Causes of Claims		
Cause	Potential Consequences	How an authority could become liable
Trips/Rocking Slabs	Damage to clothing, sprained ankles, broken wrists, arms. In rare cases death can result. In an elderly person complications can be serious.	Inadequate frequency of inspection. Inappropriate intervention level bearing in mind potential danger. Inaction.
Potholes	Damage to tyres, wheels, tracking, suspension. Rarely loss of control, and serious or fatal injury. Risk to cyclists or motorcyclists is potentially higher than to vehicle users.	Risk also applies to pedestrians walking in or crossing the road. Inadequate frequency of inspection. Inappropriate intervention level bearing in mind potential danger and use. Inaction.
Poor surface friction	Skidding, serious injuries or fatalities owing to extreme deceleration from high speeds or crushing owing to sideways impact.	Failure to act in the face of history of accidents. Inadequate frequency of inspection. Inappropriate intervention level.
Aquaplaning	Aquaplaning occurs at speeds above 40 mph. Serious injuries or fatalities owing to extreme deceleration from high speeds or crushing owing to sideways impact.	Failure to act in the face of knowledge about drainage problems. Responsibility will be apportioned by courts – e.g. motorist going too fast for conditions, or having worn tyres.

Table C2 – Less Frequent Causes of Highway Liability Claims		
Cause	Potential Consequences	How an authority could become liable
Unsigned sharp bend	Skidding off bend. Serious injuries or fatalities owing to high speeds, potential for crush injuries owing to sideways impact, e.g. with tree or street furniture.	Vast majority of bends are obvious. Driver holds responsibility.
Unexpected hazard in a road, e.g. debris, plant materials		Liability depends on frequency of inspection, and promptness of action once danger reported. Motorist shares responsibility for keeping lookout for obstructions.
Obliterated markings at road junction	Serious injuries or fatalities owing to high speeds, potential for crush injuries owing to sideways impact.	Potential for motorist to be entrapped into danger which could lead to the authority being held partly responsible.
Worn out sign warning of obvious hazard		Gorringe ruling – implies authority is not liable where the danger is obvious.
Defect in design – motorist entrapped into danger		Motorist bears responsibility for own safety. Courts will apportion responsibility. Claimant will have to establish that they were entrapped into danger.

Liability Claims Associated with Highway Trees

- C3.11 There are three issues of liability associated with highway trees:
- damage to buildings arising from subsidence linked to trees and tree-roots;
 - damage or injury caused by falling trees and branches;
 - damage or injury caused by tree root damage to highway surfaces.
- C3.12 This report does not seek to provide guidance on either of these areas. Extensive information on the management of risk of damage to structures from highway trees was contained in 'Highways Liability Claims – The Issues' first published in 1997. The focus was on damage to property from tree roots. This information is available on the web but has not been updated. The report did not cover risks imposed to people or property from falling trees or branches, though this is recognised as an issue of some concern.
- C3.13 Risks from falling trees and branches is a difficult and uncharted area. Trees are obviously of considerable value to both urban and rural environments. A risk avoidance strategy of felling any tree in the vicinity of a highway or Public Right of Way would be a nonsense. Issues that authorities need to be aware of include:
- potential liability from damage caused by dangerous trees on private land next to the highway, and whether highways tree inspections should attempt to identify such trees and then notify the owners;
 - stress placed on trees by drought, tree-root damage from cable laying or new diseases such as 'Sudden Oak Death'.
- C3.14 Further information on management of the risks associated with trees within and adjoining the highway is provided in Sections 9 and 10 of this Code.

C4 CLAIMS MANAGEMENT RECOMMENDATIONS FOR HIGHWAYS RISK AND AUTHORITIES

Linking with Wider Policies

- C4.1 The primary responsibilities of an authority include:
- to provide a public service;
 - to protect the individual citizen; and in so doing
 - to use the authority's resources efficiently, guarding against fraudulent and unreasonable claims.
- C4.2 The highways service should be considered in the wider context, including the objectives identified in the Local Community Plan, and the power to promote or improve economic, social or environmental well-being. It would be counter productive if the authority introduced policies or practices which, while minimising

claims payments, led to a worsening of the overall service it provided to the community.

- C4.3 If an authority has established and followed reasonable policies for highway maintenance and management, then it can expect to be able to defend itself against actions for highways liability claims, as well as being satisfied that it is serving the wider interests of its community. Following such policies may in the longer term provide a defence against claims of corporate manslaughter.

Establishing Reasonable Policies, Practices and Expenditure Levels

- C4.4 Authorities should aim to maximise the value to society of public expenditure on highways in terms of cost, social welfare and sustainability:

- establish highways maintenance policies, processes and funding levels that maximise value of the highways asset to society;
- use a risk assessment and management approach in establishing the policies and expenditure priorities;
- identify areas offering greatest return;
- allocate expenditure accordingly.

- C4.5 Issues to consider in establishing reasonableness include:

- best practice guidance – including this report;
- inter-generational equity – authorities should not permit their network to deteriorate and in so doing transfer maintenance costs on to future generations or administrations. Over recent decades there has been a systematic under-spend on road maintenance which has resulted in the present generation inheriting a highways maintenance backlog measured in £billions;
- comparable marginal social rate of return on public expenditure – the authority should spend a sufficient amount on highways maintenance such that the community obtains a return that compares with other areas of authority expenditure. This may include equivalence in predicted rates of risk to the public. The advent of corporate manslaughter legislation may make this an important consideration: it might be difficult to defend a case where an authority decided to under-fund highways maintenance, in the face of evidence that higher levels of funding were fully justified and represented a beneficial use of public funds in comparison with other areas of expenditure;
- basis of decisions on principle, rather than short term or local political expediency;
- Resource Accounting and Budgeting;
- Whole Government Accounting;
- extent of public consultation undertaken in determining policies;

- public expectations and information provided to the public about the safe use of the highway.

Protecting the Authority against Fraud and Exaggerated Claims

C4.6 Fraud arises by individuals or companies making claims that are:

- exaggerated;
- not in the circumstances alleged;
- fictitious.

Surveys suggest that 1 in 7 individuals have no qualms about making fraudulent insurance claims, and that 55% of claims are opportunistic and exaggerated. Authorities owe a duty to the community to protect public funds from fraudulent claimants, and should establish systems that can identify and resist fraudulent claims.

Managing Fraudulent Claims

C4.7 Authorities should ensure there are robust systems to establish statutory defence (inspection, recording, training etc).

C4.8 Authorities should provide public information on:

- how to report defects;
- how to report fraudulent claimants;
- successful convictions of fraudulent claimants, publicising this through the local media.

C4.9 Authorities should encourage pro-active claims handling by interviewing claimants, preferably at the accident location, and reviewing contemporary records and reports.

C4.10 Authorities should share data to enable cross referencing of claims and claimants. For highway trip claims the availability of good computer records allows cross-referencing by claimants and witnesses to see if there is any common feature that might cause a suspicion of fraud. In the past it has often been too easy for a claimant to find a pavement defect and then construct a highways liability claim around it.

C4.11 Authorities should share information outside the authority to enable cross referencing:

- with other authorities;
- with other insurance organisations.

Policies on Inspection, Repair and Maintenance

C4.12 Authorities should adopt policies on inspection, frequencies, intervention levels and response times that are consistent with:

- this Code;
- a rational consideration of local needs and circumstances;
- a risk management approach.

C4.13 Policies should be decided on using the authority's standard decision making processes, and be openly adopted.

Inspection and Maintenance Systems

C4.14 Authorities should introduce an auditable highway inspection and maintenance system that:

- meets criteria of reasonableness (refer to this Code);
- comprehensively identifies risk on the highway and utilises all publicly available information on highways risk;
- includes reports from the public;
- reports on accidents e.g. from police, and potentially hospitals, and insurance companies;
- records claims;
- provides robust evidence for use in court;
- presents management information in a form that can be used to improve the management of the highways network, identifying areas in need of action, and assisting in prioritisation of expenditure.

Claims Recording Systems

C4.15 Authorities should adopt an auditable, standardised claims processing and recording system which:

- guards against fraud;
- provides robust evidence for use in court;
- allows monitoring and analysis of claims patterns and trends.

Active Analysis and Use of Information

C4.16 Authorities should ensure the system is capable of being analysed and can produce useful information to help management of the highway. The system should be able to provide answers to the following questions:

- what are the current trends in claims numbers?
 - what are the trends in payments?
 - what are the most common types of incident?
 - are there hot spots or clusters where incidents keep occurring?
 - is there any link with the condition of the road or a type of surfacing or a highways feature?
 - has a claimant made a previous claim?
 - easy breakdown of data by the cause of the claim, the size of claim, the site of claim.
- C4.17 Authorities should link to the national highways liability claims survey and record information in a way that is compatible with the recommended system. This will help to provide robust data against which an individual authority may compare their local claims rates with national trends and identify problems or areas for improvement.
- C4.18 Authorities should act on the information contained in the system and:
- target high claims areas for maintenance and increased inspection frequencies, and if necessary, maintenance;
 - once a decision is taken to carry out works, do so expeditiously;
 - share the information with others – see below;
 - failure to act may expose the local authority to liability.

Highway Incident and Claims Recording

- C4.19 Authorities should adopt policies and systems for handling claims that:
- institute a quick and efficient system for handling complaints and providing appropriate redress, without recourse to law;
 - authorities should offer an alternative dispute resolution procedure as standard, to individuals wishing to pursue highway liability claims;
 - ensure an audit trail is kept, including notes of telephone conversations, with corroborative evidence;
 - arrange a site visit with every claimant if possible;
 - allow authority staff to negotiate the settlement of claims below £500 in value. Small claims can be expensive to administer;
 - identify potentially large claims which should be reported to senior staff at the earliest opportunity.

Local and National Information Sharing

- C4.20 Authorities should adopt a standardised claim form and computer based format for recording the minimum claims data requirements, to establish a national highway claims survey and monitoring system.
- C4.21 Authorities should share information with other authorities, to enable comparison and assessment of risks.
- C4.22 In the longer term, authorities' systems should link to police accident reporting systems, hospital accident records and insurance company accident records to establish full picture of risk on the network.

Training

- C4.23 Authorities should ensure staff are adequately trained and appropriately qualified to perform their tasks, sufficient to satisfy a court of law. For example, all staff carrying out safety inspections or processing claims should undergo training, such as the City and Guilds, NVQ or other recognised in-house or commercially available scheme. Appropriate examples can be provided by ICE, APSE or one of the other organisations which contributed to the Task Group report.

Keeping Records

- C4.24 Authorities should ensure that regularly updated printouts of computer based records are kept in the office. It is suggested that these are kept for at least 6 years.

Public Information

- C4.25 Authorities should publicise successful prosecutions against fraudulent claimants. They should consider producing a leaflet setting out people's rights in terms of the use of the highway and a leaflet for claimants setting out highway related claims procedures, a highway authority's statutory duties, standard defence and explanation of the claims process.

Longer-Term Recommendations

- C4.26 The following actions are recommended for the longer term:
- a national database should be established for highway incidents, and to obtain data on non-injury accidents to enable identification of problem sites and sections of highways;
 - authorities should offer an alternative dispute resolution procedure as standard, to individuals wishing to pursue highway liability claims;
 - authorities should standardise their recording and reporting arrangements. The system used in Wales could be considered;
 - a national database on highways claims should be considered;

- continuing research should be undertaken into the causes of highway incidents, and how to avoid them. The research should be used to provide evidence based standards and practices that are regularly updated as technologies and patterns of highway use change.

Appendix D

United Kingdom Pavement Management System

D1 WHAT IS UKPMS?

D1.1 The United Kingdom Pavement Management System (UKPMS) is the national standard for management systems for the assessment of local road network conditions and for the planning of investment and maintenance on paved areas of roads, kerbs, footways and cycle routes on local roads within the UK. Systems that have been fully accredited to the UKPMS standard have successfully demonstrated a wide range of highway maintenance management functionality, including:

- location and referencing of highways, including footways and cycle routes;
- recording of an inventory of maintainable assets within the highway;
- recording of condition data collected from various visual and machine surveys and allowing different survey types to be processed together;
- projection of future condition based on historic deterioration, and on engineering models of deterioration for given construction types and pavement life profiles;
- selection of options and requirements for remedial works;
- costing of potential works;
- management of budgets;
- analysis of budgetary and maintenance needs for highway networks;
- prioritisation of potential works on a condition basis;
- prioritisation of potential schemes of work using econometric principles.

D1.2 As of April 2005, the following five commercially available pavement management systems are fully UKPMS accredited.

Table D1 – Accredited UKPMS Systems	
Developer	System
Exor	Highways
FaberMaunsell	MARCHpms
Southbank Systems	Confirm
Symology	Insight
WDM	WDMpms

Website Amended

27 April 2012

- D1.3 More detail about UKPMS can be found on the UKPMS website at (<http://www.pcis.org.uk/index.php?p=25/42/0>).
- D1.4 In addition to the core UKPMS-functionality described above, each of the five UKPMS accredited pavement management systems offers additional functionality or is designed to meet the particular needs of a specific type of user. Authorities are therefore recommended to select a system that closest matches their own particular needs. The UKPMS approach gives users confidence by guaranteeing that whichever system is chosen will fully meet the core UKPMS functionality.
- D1.5 The primary use of UKPMS is to assist authorities in the planning of structural maintenance on the local road network through the systematic collection and analysis of condition data. This is recommended as good practice and is a vital component of an effective asset management regime. UKPMS supports local authorities' current asset management objectives by providing facilities to:
- identify lengths of paved asset in need of maintenance, including treatment options and costs;
 - prioritise maintenance schemes to give best value for money;
 - identify network trends;
 - appraise options at a scheme and budget level;
 - process data over nominated scheme lengths;
 - develop forward work programmes;
 - predicting future budget need;
 - define local indicators related to condition and performance of roads and footways.
- D1.6 There are many examples of authorities that make full use of UKPMS to support the management of their highway assets. Specific examples of current best practice can be found from the UKPMS Support Contractor by e-mailing

(support@ukpms.com).

- D1.7 The other area where UKPMS plays a vital part is in supporting the best value regime. Because the UKPMS approach ensures consistency between the different pavement management systems operated by different local authorities, the DfT made it a requirement for UKPMS to be used for the production of Best Value Performance Indicators relating to the condition of local roads and footways.

Current UKPMS Developments

- D1.8 In addition to providing general support to UKPMS users and developers, the UKPMS Support Contractor is currently undertaking a programme of development tasks to enhance both the functionality and management of UKPMS. This includes:

- developing functionality related to condition projection and economic prioritisation to ensure that UKPMS is able to support asset management;
- producing a new definitive UKPMS User Manual to provide users with a single reference document and to enable them to get full value from their pavement management systems;
- an Annual Health Check to ensure ongoing comparability of UKPMS accredited systems. The Annual Health Check provides ongoing routine assurance that UKPMS systems continue to meet UKPMS requirements including the current rule set and BVPI definitions and will supplement rather than replace the UKPMS Comparability Tests;
- ensuring that UKPMS is ready to load and process data collected by the new SCANNER surveys;
- ensuring that UKPMS can provide information about asset condition to support Asset Valuation.

- D1.9 The ongoing development programme is under the auspices of the UK Roads Board and overseen by the UKPMS Steering Group which represents the interests of local authority users, system suppliers, survey contractors and the DfT.

D2 STRATEGY FOR THE FUTURE OF UKPMS

- D2.1 The specification for UKPMS dates back to the early 1990s. It is timely to review the role of UKPMS and the strategic direction that future development and implementation should take. A UKPMS Strategic Development Study has just been completed, its objectives were to recommend:

- the approach, procedures and systems by which paved areas of highways should be managed nationally and by local authorities in the year 2010 and beyond;
- the steps required, and by whom they should be undertaken to move from the present position of managing paved areas to that recommended;
- the likely cost of moving towards the recommended approach.

- D2.2 The study investigated the ways in which the current approach to managing pavements using UKPMS could be improved to obtain the benefits for which UKPMS was originally developed, to improve the quality of decision-making, and to provide systems that are more robust, easy-to-use and which enable change to be managed easily and in a controlled way. Operations at both the national and local levels were investigated and, in particular, the following options considered:
- UKPMS to continue to be a tool used primarily at local level for the following purposes:
 - producing performance indicators and other statistics to be used nationally for monitoring, budget award, or other purposes;
 - assisting with the local management of paved areas, including assistance with treatment selection, prioritisation, production of trend information, and to support the move towards asset management and asset valuation;
 - pavement management systems to be used separately at national and local level:
 - a 'national' system would be run centrally, using high-level input data provided locally, to produce performance indicators and other national statistics for monitoring, budget award, or other purposes;
 - local authorities would use systems to meet more closely their own defined purposes, which could be existing UKPMS systems or other suppliers' systems with similar aims, including carrying out pavement management as part of a broader approach to highway asset management.
- D2.3 The study investigated the ways in which the current approach to managing pavements using UKPMS could be improved to obtain the benefits for which UKPMS was originally developed, to improve the quality of decision-making, and to provide systems that are more robust, easy-to-use and which enable change to be managed.
- D2.4 Recognising that the basic system design of UKPMS was produced over ten years ago, the study team also reviewed whether a fundamental update of the system is necessary to reflect more closely present needs and technology.
- D2.5 The study team also identified the steps required to move from the current position to that recommended. Risks were identified, and the steps designed to minimise these. Responsibilities for action were also identified.
- D2.6 The study team also provided cost estimates for each of the options and identified, as far as practicable, the likely financial benefits and implications for each. Other benefits and implications of the options were also identified.
- D2.7 The findings have been documented in a report to be presented to the UK Roads Board and the UK Roads Liaison Group. A final decision on the chosen strategy as of July 2005 is in the process of evaluation with a final decision expected in September 2005.

Appendix E

Pavement Condition Assessment Regimes

E1 PRACTICE IN PAVEMENT CONDITION ASSESSMENT

- E1.1 Since the last edition of the Code, there have been considerable developments in the type, cost and availability of the surveys and techniques available to authorities for the assessment of pavement condition. This appendix outlines a framework within which a highway authority can apply assessment techniques to meet particular local needs and capabilities. Three examples of optional assessment regimes are then given to illustrate the application of the framework.
- E1.2 The UK Roads Board has instituted a process of developing automated road condition surveys to replace visual surveys, initially for the purposes of reporting BVPI, with the intention of replacing visual surveys in NRMCS and of supporting local maintenance management strategies. As part of this development the UK Roads Board has instituted an extensive programme of research and development to extend the capabilities of automated road conditions surveys and to make them more relevant on minor local roads.
- E1.3 In Scotland, where trend condition data from NRMCS was not available, all 32 authorities took the decision in 2002, to form a consortium to carry out an automated annual machine based condition survey (SRMCS) of all of the road network, in the belief that this offered significant long term benefits of objectivity and reproducibility compared with CVI and other visual surveys. The information and experience gained from these surveys has been made available to the UK Roads Board and DfT, with the aim of developing a standard survey methodology and condition index which will be applicable throughout the UK.
- E1.4 In specifying a condition assessment regime, and in making a case for instituting a particular survey or assessment, it is important to note that data are not usually collected only to support a single information need. Opportunities should be taken to gain maximum value from the data by utilising it in a number of ways.
- E1.5 The new automated road condition surveys have been developed from the Highways Agency's TRAffic-speed Condition Surveys (TRACS), initially under the name TRACS Type Surveys (TTS) and from April 2005 as SCANNER (Surface Condition Assessment for the National NEtwork of Roads) Surveys. TTS was the only acceptable method for reporting BVPI 96, the condition of principal roads in 2004/05. SCANNER will be the only acceptable method for reporting BVPI 223, the condition of principal roads, and BVPI 224a, the condition of other classified roads in 2005/06. It is intended that SCANNER will become the only acceptable method for reporting BVPI 224b, the condition of unclassified roads in 2007/08. The extent of surveys required for BVPI purposes will be specified and may change from year to year.

- E1.6 In Scotland, the TTS surveys, which were introduced on principal roads in 2002/03 together with sample surveys on other roads, were extended from 2003/04 to cover all categories on an annual basis. The information collected has been used to compute a road condition performance indicator for each road class and for the network as a whole. This reflects the proportion of the network which requires further investigation in terms of maintenance need, having breached the investigatory threshold of at least one of the defined parameters. At present these include rutting, texture depth and longitudinal profile. While cracking information is collected, this is not yet included within the statutory PI.
- E1.7 In order to facilitate the interpretation of the results, the information has also been represented graphically using a 'traffic light system' of red, amber and green. Red being the areas where maintenance was most likely to be required, having breached the threshold at the upper level, amber where the investigatory levels had been breached at the lower level and green where the condition was deemed to be satisfactory.
- E1.8 The SRMCS data has also been used by local authorities to prioritise maintenance need and to allocate budgets. This use of the survey information was endorsed by Audit Scotland in their report on highway maintenance in 2004, as a means of developing a more systematic approach to road maintenance, linked to the implementation of highway asset management plans.
- E1.9 In Northern Ireland Deflectograph and SCRIM remain the primary tools for identifying pavement condition at the network level on motorway, trunk and non-trunk 'A' class roads. Other roads are surveyed using a CVI. Condition information from Deflectograph and CVI is used to determine depreciation of the network as part of the calculation of the asset value. Roads Service plans to introduce SCANNER type surveys on its principal and sub-principal road network at the earliest opportunity.
- E1.10 In Wales Deflectograph is used for principal roads to determine the Programme for Improvement PIs. CVIs are still used for the non-principal network. It is the intention to introduce SCANNER surveys in Wales as soon as practical.
- E1.11 Condition assessment can support, but need not be limited to, the following activities:

At Scheme or Project Level:

- to inform decisions on what, where and how to treat defects;
- to develop options for scheme designs and subsequent detailed designs;
- to provide an audit on the decisions taken by maintenance engineers in the choice, timing and priority of treatments;
- to target more detailed assessments;
- to determine whether treatments and reinstatements have been carried out to an appropriate standard;

- to identify locations where functional or safety-related pavement characteristics do not meet a defined local or national standard (such as skid resistance, ride quality).

At Authority Network Level:

- to provide a network level performance indicator such as BVPI in England;
- to determine an appropriate level of budget for maintenance within an authority to meet the levels of service as part of the HAMP;
- to determine physical characteristics of road pavements;
- to develop and monitor local performance indicators as part of the HAMP;
- to support the production of forward programmes of work as part of the HAMP;
- to enable sub-authority benchmarking (e.g. between agents or areas).

At Regional, National and International Level

- to monitor condition of the national road network such as SRMCS/NRMCS;
- to assess maintenance need at the national level such as determination of backlog;
- to assess functional performance of the national road network;
- to support inter-authority comparison;
- to determine funding at national level;
- to support international benchmarking;
- to support highway condition and maintenance-related research and development.

E1.12 The first step in determining the data requirements and the associated survey requirements is to review the information needs for each part of the network, in particular to determine how they vary by feature (carriageway, footway and cycle route etc) by environment and by road class, or by levels within the hierarchy.

E1.13 In practice, however, a number of additional considerations come into play when determining the regime:

- availability of funding within the authority for assessment purposes;
- physical constraints (for example, the geometry on parts of the road network, particularly the unclassified network may make the use of certain machine surveys impractical);
- pavement construction (for example, Deflectograph surveys are of very limited value on rigid construction pavements);

- availability of resources and machinery, at the appropriate time to undertake surveys and to process data.
- E1.14 The timing of surveys and techniques may be constrained by weather and seasonal factors. SCRIM surveys are generally intended to be carried out between May and September. Outside these months the results may not be representative.
- E1.15 Deflectograph surveys are limited by temperature and usually operate between March – mid June and mid September – end November for Category 1 surveys.
- E1.16 SCANNER surveys have no temperature limits but are restricted by wet road surfaces and therefore lower productivity should be assumed in the winter months.
- E1.17 When the information needs have been established for each part of the network under consideration, and constraints on the application of surveys identified, then the required assessment regime can be defined.
- E1.18 With the introduction of SCANNER surveys, authorities should give consideration to maximising the potential of the range of data that will be generated from these surveys, which may be used in combination with tools such as GIS to provide detailed information related to the serviceability of the pavement.
- E1.19 In Scotland, pavement condition has been assessed against a set of investigatory levels developed for SRMCS but based on those in the DMRB.

Table E1 –SRMCS Investigatory levels			
Parameter	Amber Threshold	Red Threshold	Applicable Road Class
Rut Depth	11mm	20mm	All roads
Longitudinal profile 3m Variance	4mm	10mm	'A' and 'B' roads
	7mm	17mm	Urban 'C' and U/c roads
	15mm	25mm	Rural 'C' and U/c roads
Texture	0.6mm		
Cracking	0.5%	2%	All roads

Note: cracking information not yet incorporated within the reported statutory performance indicator in Scotland.

- E1.20 While the appropriateness of the above investigatory levels to the Scottish network was verified by site inspections undertaken on sample sections of road, it is recognised that these will require to be reviewed in the light of experience. However, one of the criteria established at the outset of the SRMCS was that the data should be backward compatible, allowing the PI to be recalculated should the component parts or the threshold values be altered over time.

E2 MINIMUM SURVEY REGIME

- E2.1 The minimum survey regime may vary between England and the Devolved Administrations.
- E2.2 In England it is suggested that the starting point should be the 'minimum' regime that will support requirements for BVPI and provide for participation in the NRMCS. The following should be noted in preparation of the minimum survey regime:
- the requirements for BVPI reporting are likely to change from year to year;
 - inventory data is not required;
 - full cross-section position recording is only for SCANNER, to record rut, transverse and longitudinal profile, texture and cracking;
 - DVI surveys required for Category 1(a), 1 and 2 footways at a level of 50% per year.
- E2.3 In Scotland under SRMCS, the initial annual survey objectives are set as:
- 100% of A roads (in one direction);
 - 50% of B & C roads;
 - 25% of unclassified roads.
- E2.4 In practice however, owing to the low levels of productivity achieved on unclassified roads, particularly urban residential cul-de-sacs, the proportion of the unclassified network surveyed was closer to 15% in 03/04 and 04/05. This is however in excess of the sample size currently used for NRMCS, and while not strictly a random sample, was considered to provide reliable statistical information on the condition of both the urban and rural unclassified networks within each authority.
- E2.5 CVI will gradually be replaced by SCANNER as machine surveys are rolled out across the whole network. The intention is that:
- principal roads will be surveyed 100% in both directions over a two-year period;
 - B roads will be surveyed 100% in one direction each year giving data in both directions no more than two years old;
 - C roads will be surveyed at 50% in one direction each year giving 100% coverage in one direction with data no more than two years old;
 - for 2005/6 the C roads will be limited to 10% or 50kms whichever is the greater. This is to both obtain a statistical sample and assist the survey contractors;
 - unclassified roads, present indications are that machine surveys will commence in 2007/8.

E3 ENHANCED SURVEY REGIME

E3.1 Authorities, including those of the Devolved Administrations, may establish data requirements, over and above this minimum regime to support their own maintenance and management of the local road network. At this stage, the focus is on network level functionality consistent with surveys that are supported by UKPMS. Use of the variety of survey techniques supported by UKPMS will enable a fuller assessment of the pavement condition to be made. This will enable budgetary need and preliminary treatment options to be prepared for more detailed consideration by maintenance engineers. It will also be the first step to preparing a programme of maintenance needs as part of the HAMP.

E3.2 The following should be noted in preparation of the enhanced survey regime:

- the requirements for BVPI reporting are likely to change from year to year;
- inventory data is collected to provide more accurate calculation of areas, rating of defects and derivation of cost estimates;
- CVI surveys or other visual surveys may be chosen to provide additional information on the local road network. In the case of principal road carriageways, this is in addition to the TTS survey. Authorities may choose to do this as a means of maintaining consistency with the view to developing deterioration relationships;
- guidelines for SCRIM surveys are now complicated with the introduction of the single annual survey. Reference should be made to Section 9.

E3.3 This enhanced regime better supports the following activities at a local level:

- consequences of historic funding and policies are monitored by tracking changes in network condition;
- once treatments have been formulated, priorities are established on a condition and economic basis, after which the value management process may be used to rank schemes for the purpose of prioritisation;
- maintenance management plans aimed at reducing accidents.

E4 FURTHER ENHANCED SURVEY REGIME TO SUPPORT SCHEME LEVEL

E4.1 An enhanced survey regime may be adopted at a scheme or project level to determine more accurately the cause of deterioration. Funds invested in the enhanced regime may provide a more accurate assessment of the pavement for determining options for treatment, thus potentially providing value for money, when compared to the previous two regimes. Such a regime would also provide more support towards a HAMP. Authorities must consider the potential benefits of this enhanced regime on a scheme-by-scheme basis.

- E4.2 Although not mandatory in England, Deflectograph surveys to assess the structural condition of the highway are still recommended by CSS for the principal road network and specific roads highlighted by SCANNER. The reasoning for the surveys is outlined in Section 9, together with the need for other survey tools, FWD, GPR, coring and trial pitting to provide useful data to refine the design.
- E4.3 Note that scheme level surveys only collect data required over and above the network level data previously collected.
- E4.4 This regime is designed to support the detailed assessment of treatment options at a scheme level. Condition data together with economic projection may be used as part of a value management process to justify programmes included in the HAMP, which will ultimately substantiate bids for funding of maintenance schemes. It will also allow future audit of treatment decisions.

Appendix F

A Framework for Performance Indicators

F1 INTRODUCTION

- F1.1 This appendix sets out recommended performance indicators for local authority highway maintenance services. It combines relevant statutory indicators, supplemented by suggested local indicators, to provide a recommended minimum framework of measures, against which the performance of the service should be judged.
- F1.2 The suggested framework takes into account work by CSS on performance improvement, together with experience of the various benchmarking groups in England, Scotland, Wales and Northern Ireland. The statutory indicators quoted are for England, as these provide a wider base on which to build supplementary local indicators, but the framework should be relatively easy to transpose for all parts of the UK.
- F1.3 The recommended performance indicators, other than the statutory indicators, are not mandatory on authorities. Local circumstances may require authorities to adopt modified or new indicators. Some consistency is however important for continuously improving comparison.
- F1.4 Some of the original indicators from the 2001 edition of the Code have been retained, possibly with a change of reference number and a number of new ones added in the light of experience.

F2 INDICATORS FOR ASSET MANAGEMENT

- F2.1 Section 11 describes how performance measures for highway maintenance should integrate with a wider performance framework for asset management, including the operational and improvement aspects. It redefined the core objectives, including a new objective of customer service as:
- customer service;
 - network safety;
 - network serviceability;
 - network sustainability.
- F2.2 Table 7 in Section 11 defines the contribution of the different service aspects as:
- Prime – making a major contribution to the objective and performance management-essential;

- Main Support - making a significant contribution to the objective and performance measurement-desirable;
- Support – making a moderate contribution to the objective and performance measurement-useful;
- Contributor – making some contribution but performance measurement-unlikely to be productive.

F2.3 Table F1 is taken as the starting point for the performance indicator framework for highway maintenance. Where highway maintenance is a ‘prime’ contributor to an objective, it is crucial to provide an indicator of performance. Conversely, where highway maintenance is merely a ‘contributor’, a performance indicator is of limited use.

F3 INDICATORS FOR HIGHWAY MAINTENANCE

F3.1 Table F1 sets out a recommended framework of indicators relevant to each of the core objectives. For convenience, the colour coding is the same as that used for the tables in Section 11. Where the highway maintenance contribution is **prime** the indicator is in red, where highway maintenance is a **main support function** the indicator is in blue. The support and contributor categories are in black.

Table F1 – Performance Indicators			
OBJECTIVE	Ref.	PERFORMANCE MEASURE Short Description	COMMENT
Customer Service			
Delivering satisfaction	CS1	• % net satisfaction with service	Recommended local indicator
Providing effective consultation and information	CS2	• % net satisfaction with consultation and information	Recommended local indicator
Providing efficient enquiry and complaints management	CS3	• % service requests, complaints and claims ‘closed out’ within policy timescales	Recommended local indicator
Safety			
Complying with statutory obligations	SA1	• % safety inspections completed on time	Recommended local indicator
	SA2	• % Category 1 defects repaired on time	Recommended local indicator
Meeting users needs for safety	SA3	• % principal roads SCRIM surveyed in current year at or below investigatory level	Recommended local indicator
	SA4	• % third party claims repudiation rate over three years	Recommended local indicator
			Continued

Table F1 – Performance Indicators continued			
OBJECTIVE	Ref.	PERFORMANCE MEASURE Short Description	COMMENT
Serviceability			
Ensuring availability	SE1	<ul style="list-style-type: none"> No. of days temporary traffic control or road closures on traffic sensitive streets caused by local authority roadworks 	BVPI 100. (May need revision in the light of TMA 2004)
	SE2	<ul style="list-style-type: none"> % occasions precautionary salting routes completed before formation of ice 	Recommended local indicator
	SE3	<ul style="list-style-type: none"> % of total length of public rights of way that are easy to use 	BVPI 178
Achieving integrity	SE4	<ul style="list-style-type: none"> % pedestrian crossings equipped with facilities for disabled people 	BVPI 165
Maintaining reliability	SE5	<ul style="list-style-type: none"> % of schemes value managed 	Recommended local indicator
	SE6	<ul style="list-style-type: none"> % works completed within published dates 	Recommended local indicator
Enhancing condition	SE7	<ul style="list-style-type: none"> % of principal road network where maintenance should be considered 	BVPI 223
	SE8	<ul style="list-style-type: none"> % of non principal classified network where maintenance should be considered 	BVPI 224a
	SE9	<ul style="list-style-type: none"> % of non principal unclassified network where maintenance should be considered 	BVPI 224b
	SE10	<ul style="list-style-type: none"> % of the Category 1,1a and 2 footway network where maintenance should be considered 	BVPI 187
	SE11	<ul style="list-style-type: none"> % of the Category A and B cycle route network where maintenance should be considered 	Optional local indicator
			Continued

Table F1 – Performance Indicators continued			
OBJECTIVE	Ref.	PERFORMANCE MEASURE Short Description	COMMENT
Sustainability			
Minimising costs over time	SU1	<ul style="list-style-type: none"> % Asset preservation 	Recommended local indicator
	SU2	<ul style="list-style-type: none"> Annual reactive maintenance expenditure as % planned maintenance 	Recommended local indicator
	SU3	<ul style="list-style-type: none"> Annual highway related claim costs as % planned maintenance 	Recommended local indicator
	SU4	<ul style="list-style-type: none"> % programmed schemes subject to maintainability audit 	Recommended local indicator
Maximising value to community	SU5	<ul style="list-style-type: none"> % programmed schemes subject to sustainability audit 	Recommended local indicator
Maximising environmental contribution	SU6	<ul style="list-style-type: none"> % highway works by tonnage undertaken with recycled and secondary aggregates 	Recommended local indicator
	SU7	<ul style="list-style-type: none"> Average % score across all amenity categories 	Optional local indicator. Based on Highways Agency Area Performance Indicator (API 4)

F4 FURTHER DETAILS OF THE INDICATORS

F4.1 The following section provides further information and rationale for each of the recommended local indicators. For statutory indicators, full details are available from (www.odpm.gov.uk). Where aspects of the performance measures are described as ‘to be determined locally’ it would be good practice to consult users and communities about these.

F4.2 Where required, performance targets should be set for statutory indicators. It is good practice to set targets for local indicators provided that sufficient comparative data is available.

Customer Service

CS1 % Net satisfaction with service (previously SE4)

- Based on the results of local public opinion surveys;
- net satisfaction is the difference between those who are satisfied (very or fairly) and those who are dissatisfied (very or fairly);
- professional advice recommended on survey method, sample size, and frequency;
- difficult for respondents to distinguish between highway maintenance and other works including those by other service providers and it may be necessary to include whole highway service;

- alternatively sample ‘post-completion’ surveys of highway maintenance works will provide a very specific relevant measure of customer perceptions.
- CS2 *% Net satisfaction with consultation and Information*
- Based on results of local public opinion surveys;
 - net satisfaction is the difference between those who are satisfied (very or fairly) and those who are dissatisfied (very or fairly);
 - professional advice recommended on survey method, sample size, and frequency;
 - may be related to consultation on highway maintenance policy overall but more likely related to sample of highway maintenance schemes.
- CS3 *% Service requests and complaints ‘closed out’ within policy timescales*
- Timescales to be locally defined but responses to routine correspondence good practice is usually 10 working days;
 - separate indicators should be identified for service requests and complaints;
 - indicators need to be consistent with authority corporate requirements;
 - indicator to be calculated annually.

Network Safety

- SA1 *%Safety inspections completed on time (previously SA1)*
- Inspection frequencies to be based on the recommendations of this Code or local frequencies determined by risk assessment;
 - extent of any flexibility for ‘on time’ to be specified locally and to be ‘caught’ up within one cycle;
 - needs to be supplemented by inspection ‘quality’ training and monitoring;
 - indicator to be calculated annually.
- SA2 *%Category 1 Defects repaired on time*
- Repair times should be based on the recommendations of this Code or local times determined by risk assessment. Category 1 defects should be corrected or made safe at the time of the inspection, if reasonably practicable. If it is not possible to correct or make safe the defect at the time of inspection, repairs of a permanent or temporary nature should be carried out as soon as possible and in any case within a period of 24 hours. Permanent repair should be carried out within 28 days.
 - separate indicators may be defined for making safe, temporary repair and permanent repair;

- indicator to be calculated annually.

SA3 % Principal roads SCRIM surveyed in current year at or below Investigatory Level (previously SA2)

- Method and programme of testing to be determined locally taking account of advice from this Code;
- investigatory levels to be set locally but in accordance with HD 28/04. They should be reviewed every three years or as a result of risk assessment;
- changes in investigatory levels and consequential changes in the indicator should be reported to assist comparison.

SA4 % Third party claims repudiation rate over three years (previously SA5)

- Details to be checked and completed;
- procedure for dealing with claims needs to be clearly defined;
- provisional three-year figure estimates may be required as some claims can take many years to resolve;
- actual repudiation rates should be calculated when the figures are available for earlier year;
- information to be recorded and compared based on financial year.

Network Serviceability

SE1 Number of days temporary traffic control or road closures on traffic sensitive streets caused by local authority roadworks

- Methodology in accordance with BVPI 100;
- may be updated to accord with indicators for Traffic Management Act 2004.

SE2 % Occasions precautionary salting routes completed before formation of ice (previously SE5)

- The percentage is calculated from the total number of precautionary salting treatments over the winter period;
- the winter period may vary according to climatic conditions and from year to year;
- if icy conditions apply after failure to salt this should be included in the calculation;
- separate indicators may be defined for carriageways, cycle routes and footways.

- SE3 % Total length of public Rights of Way that are easy to use*
- Methodology in accordance with BVPI 178.
- SE4 % Pedestrian crossings equipped with facilities for disabled people*
- Methodology in accordance with BVPI 165.
- SE5 % Schemes value managed*
- The percentage is calculated from the number of maintenance schemes that have been value managed out of the total number of maintenance schemes delivered by the authority.
- SE6 % Works completed within published dates*
- Scale and nature of schemes monitored to be determined locally but should be based on those schemes for which a programme is published;
 - the number of schemes included should be quoted in reporting to assist comparison;
 - definition of 'completed' to be determined locally;
 - extent of flexibility to be determined locally.
- SE7 % of Principal road network where maintenance should be considered*
- Methodology in accordance with BVPI 223.
- SE8 % of Non-Principal classified road network where maintenance should be considered*
- Methodology in accordance with BVPI 224a.
- SE9 % of Non-Principal unclassified road network where maintenance should be considered*
- Methodology in accordance with BVPI 224b.
- SE10 % of the Category 1, 1a and 2 footway network where maintenance should be considered*
- Methodology in accordance with BVPI 187.
- SE11 % of the category A and B cycle route network where maintenance should be considered*
- Optional indicator for those authorities with relatively long lengths of cycle route;
 - methodology to be developed locally, based on BVPI 187 at present but may be adopted BVPI at some stage in the future.

Network Sustainability

SU1 % Asset preservation

- This measure comprises the following three sub-measures:
 - accumulated asset consumption – measures the proportion of the gross asset value that has been consumed to date;
 - In-year asset consumption – measures the proportion of the asset value consumed during the accounting period;
 - In-year asset renewal – measures the proportion of asset value restored/renewed during the accounting period;
- further details of these measures are given in the Guidance Document for Highway Infrastructure Valuation.

SU2 Annual reactive maintenance expenditure as % planned maintenance

- Common definitions of reactive and planned maintenance are necessary to assist comparison and should be based on this Code;
- reactive maintenance comprises the repair of Category 1 defects and non-safety actionable Category 2 defects executed under a planned programme;
- planned maintenance incorporates resurfacing, reconditioning and surface dressing schemes undertaken under annually approved programmes. Surface dressing costs should include associated pre-patching.

SU3 Annual highway-related claim costs as % planned maintenance

- Indicator devised by Roads and Highway Liability Claims Task Group in association with the Welsh Association of Technical Officers (WATO);
- common definitions of planned structural maintenance are necessary to assist comparison;
- planned structural maintenance incorporates resurfacing, reconditioning and surface dressing schemes undertaken under annually approved programmes. Surface dressing costs should include associated pre-patching.

SU4 % Programmed schemes subject to maintainability audit

- Number and scale of significant schemes to be determined locally. The criteria for selection and base number should be reported to assist comparison;
- items in maintainability audit to be determined locally taking into account this Code.

SU5 % Programmed schemes subject to sustainability audit

- Number and scale of significant schemes to be determined locally. The criteria for selection and base number should be reported to assist comparison;
- items in sustainability audit to be determined locally taking into account this Code.

SU6 % Highway works by tonnage undertaken with recycled and secondary aggregates

- Base tonnage of highway works to be determined locally, but criteria for inclusion should be reported to assist comparison.

SU7 Average % score across all amenity categories

- May be used as contract management indicator;
- methodology based on HA Area Performance Indicator API 4;
- scope of indicator and sample size to be determined locally;
- amenity categories to be determined locally but should preferably be based on the 10 specified categories:
 - litter and debris (shared function in two tier authorities);
 - grass cutting swath and visibility splays;
 - grass cutting at obstructions;
 - weed growth in verges and reservations;
 - weed growth in gullies and drains;
 - visibility of signs;
 - cleanliness of signs;
 - sweeping of channels (shared function in two tier authorities);
 - encroachment of vegetation;
 - illegal signs and obstruction.

Appendix G

Contract Performance Indicators for Maintenance Procurement

G1 INTRODUCTION

- G1.1 The 2001 edition of the Code included an appendix of suggested contract performance indicators based on those adopted by the then recently formed 'Five Counties Initiative'. This has since become well established as the National Highways Best Value Benchmarking Club (NHBVBC), with many more members. This appendix provides a summary of the indicators used by the benchmarking club.
- G1.2 Partnering contracts in their various forms have continued to evolve and, as the partnerships have developed, the indicators used to manage the contract and manage the service have moved closer together. This appendix also provides examples of contract performance indicators from Northamptonshire County Council's partnership contract.

G2 THE NATIONAL HIGHWAYS BEST VALUE BENCHMARKING CLUB

- G2.1 The NHBVBC comprises local authorities, DSOs and private sector contractors and provides a medium for exchanging performance data within the highway maintenance sector. It has established a set of Key Performance Indicators (KPIs) to measure term contracts, monitoring both the client and the contractor.
- G2.2 The club incorporates the Highway Design and Highway Works Best Value Benchmarking Clubs and has over 75 members covering the whole of the UK. The Highway Works Club was initiated by the authorities of Dorset, Hampshire, Oxfordshire, Wiltshire and Gloucestershire and subsequently endorsed by the Movement for Innovation and DfT. Further information about the NHBVBC is available from the 'Constructing Excellence' website (www.constructingexcellence.org.uk)
- G2.3 The NHBVBC maintains ten indicators relevant to highway maintenance contracts together with the local indicators for highway maintenance safety serviceability and sustainability suggested in the 2001 edition of this Code. Each member receives a copy of the graphs and radar charts for each indicator, showing the industry benchmark score together with the score of their organisation. For local authority DSOs it provides the opportunity to compare performance with private sector providers on a common basis and could assist in meeting the requirements of Best Value Reviews.
- G2.4 The suggested KPIs are as follows:
- Indicator 1: Commissioner Satisfaction – Product

Indicator 2:	Commissioner Satisfaction – Service
Indicator 3:	Contractor Satisfaction – Service
Indicator 4:	Defects
Indicator 5:	Predictability – Cost
Indicator 6:	Predictability – Time
Indicator 7:	Profitability
Indicator 8:	Productivity
Indicator 9:	Safety
Indicator 10:	Payment for Works

G3 FURTHER DETAILS OF EACH INDICATOR

G3.1 Indicator 1: Commissioner Satisfaction – Product

- Measures how satisfied the commissioner was with the finished product or facility, using a 1 to 10 scale;
- separate indicators for routine and structural maintenance.

G3.2 Indicator 2: Commissioner Satisfaction – Service

- Measures overall level of commissioner satisfaction with the service of contractor, using a 1 to 10 scale;
- separate indicators for routine and structural maintenance.

G3.3 Indicator 3: Contractor Satisfaction – Service

- Measures the overall level of contractor satisfaction with the service of the commissioner and consultants on a 1 to 10 scale;
- separate indicators for routine and structural maintenance.

G3.4 Indicator 4: Defects

- Measures the impact on the client of any defects at the point of handover on a scale of 1 to 10, 10 being defect free;
- separate indicators for routine and structural maintenance;
- for routine maintenance based on monthly analysis of monitoring officers' sample of completed orders;
- for structural maintenance analysis is based on individual schemes.

G3.5 Indicator 5: Predictability – Cost

- Measures the reliability of cost estimates for both design and construction;
- separate indicators for design and construction and for routine and structural maintenance;
- design indicator is based on comparison of the estimated (A) and actual scheme design costs (C), expressed as a % of (A);
- construction indicator is based on comparison of committed (A) and actual (C) works orders costs, as held by maintenance manager, expressed as a % of (A).

G3.6 Indicator 6: Predictability – Time

- Measures the reliability of time estimates for both design and construction;
- separate indicators for design and construction and for routine and structural maintenance and for:
 - routine maintenance design - indicator is based on comparison of the actual time taken to issue works orders within the target time;
 - routine maintenance construction - indicator is based on comparison of the actual time taken to execute works orders within the target time;
 - structural maintenance design - indicator is based on a comparison of the actual duration to design a scheme with the agreed duration;
 - structural maintenance construction - indicator is based on a comparison of the actual duration to construct a scheme with the agreed duration.

G3.7 Indicator 7: Profitability

- Measures the profitability of a construction company before tax and interest;
- for DSOs indicator is based on the excess rate of return on capital employed expressed as a percentage of the annual turnover.

G3.8 Indicator 8: Productivity

- Measures the value added per employee of a construction company;
- indicator is based on the value of sales less the value of goods and services subcontracted to or supplied to other parties, divided by the number of FTEs.

G3.9 Indicator 9: Safety

- Measures safety in terms of the number of reportable accidents per 100,000 employed (the accident incidence rate).

G3.10 Indicator 10: Payment for Works

- Measures performance in paying contractor's valuations;
- indicator is based on the % of contractor's valuations that are paid within the agreed timescales.

G4 NORTHAMPTONSHIRE COUNTY COUNCIL

- G4.1 Northamptonshire County Council (NCC) secured the delivery of its highways services and works through the award of an innovative integrated white and blue collar highways partnership contract. This new contract commenced in October 2001. A number of other authorities have subsequently procured integrated service contracts, including Bedfordshire and Gloucestershire.
- G4.2 The need to promote continuous improvement in all aspects of service delivery generated an evolving range of jointly agreed partnership indicators which enable this process to be monitored and managed for this integrated highways contract. Soon after the commencement of the contract, a joint Partnership Performance Group was established and met on a regular basis. Various performance indicators were identified against the following four headings:
- National and Best Value Indicators where NCC is required to report figures to central government on an annual basis;
 - specific higher level (business) indicators which demonstrate the business health of the partnership;
 - specific lower level (operational) indicators which demonstrate the highways maintenance and scheme delivery on site;
 - the contractor's own organisational indicators.
- G4.3 As the contract evolved and the new partnership arrangement became established, the Partnership Performance Group considered that indicators within the above categories could be best monitored by grouping them under the following headings for ease of reporting quarterly to the Partnership Board:
- satisfaction;
 - budget and programme;
 - network management;
 - health and safety;
 - sustainability.
- G4.4 Details of the specific higher and lower level indicators used by the contract are summarised below. National and Best Value indicators are dealt with in Appendix F.

Higher Level Indicators (Contract Specific)

Satisfaction

- Annual partner survey with NCC;
- complaints received by NCC;
- complaints received by contractor;
- monthly site audit reports;
- compliments received;
- % sites audited without information boards.

Budget and Programme

- Actual spend against forecast spend;
- predictability of target cost schemes against actual cost;
- predictability of target cost schemes progress;
- predictability of target cost schemes construction time.

Network Management

- See lower level indicator lists.

Health and Safety

- Monthly accident records (split into office based, office visiting site and site based);
- reportable;
- non-reportable;
- near misses;
- utility damage by contractor;
- % of sites complying with Section 8 requirements.

Sustainability

- Innovations register;
- recycled office materials.

Lower Level Indicators (Contract Specific)

Satisfaction

- CLARENCE (fault reporting system records);
- monthly community surveys;
- annual parish surveys;
- claims by third parties.

Budget and Programme

- Prediction of Schedule of Rates works cost to actual costs;
- prediction of works time to actual works time.

Network Management

- Category 1 safety inspections;
- Category 1 public reports;
- average response times;
- % of emergencies dealt with in target time;
- % routes salted on time;
- % of fleet serviced and calibrated;
- % of occasions routes salted before ice;
- % of snow clearing requests within target time.

Health and Safety

- As above;
- % of sites complying with Section 8 requirements.

Sustainability

- Recycled asset equipment;
- street lighting lamps;
- street lighting columns;
- % excavated recycled or reused;
- % imported recycled material;

- % imported non-recycled material;
- % material recycled on site;
- % excavated material not going to licensed landfill.

Appendix H

Winter Service Practical Guidance

Appendix Amended
18 September 2013

Appendix H has been superseded with the revised Appendix below.

This latest revision of Appendix H has been carried out under the direction of the NWSRG on behalf of the UKRLG and UKRB using information from the NWSRG Practical Guide for Winter Service (Practical Guide) and NWSRG member organisations, as well as other recent winter service research and information.

The guidance and recommendations contained within Appendix H relate to national Best Practice and it is recognised that local circumstances, including financial and other resource constraints, as well as political influences etc. can vary widely across the country. Authorities and operators will need to take all of these factors fully into account, when devising and revising their Winter Service policies and plans. Some of the recommendations and practices will, if adopted, also take a number of years to implement. For example, it is recognised that, in certain cases it could potentially take up to around 10 years or so for a major programme of change to be fully implemented.

The NWSRG Practical Guide is updated regularly with the latest research and information and on a different timeline to Well-maintained Highways. Therefore, differences may exist between this document and the NWSRG Practical Guide.

H1 GENERAL

- H1.1 Following on from Chapter 13, which provides the background and policy aspects of winter service, this section provides guidance on the delivery aspects of the service.
- H1.2 Additional information and further detailed practical guidance on Winter Service delivery is provided in the NWSRG Practical Guide for Winter Service.
- H1.3 This section refers generally to salt, i.e. sodium chloride (NaCl) and its use. However, alternative de-icers to salt are also discussed. The information relating to salt use, storage and salt condition etc generally applies to other de-icers, except where specifically stated otherwise.
- H1.4 For ease of use, the tables and flowcharts required for the Decision making process have been repeated at the end of this appendix along with some notes. It is strongly recommended that these are not used in isolation by decision makers until they have a thorough understanding of the contents of the whole of this appendix.
- H1.5 It is suggested that authorities and other winter service providers review their policies and practices against the content of this document with a view to identifying and explaining any significant variance and, where appropriate, develop time tabled implementation plans for the adoption of the detailed national best

practice guidance and recommendations.

H2 WINTER SERVICE PLAN

H2.1 This section provides guidance in what is considered to be the desirable content for an Authority's Winter Service Plan. The Winter Service Plan should be a "Controlled Document" within the Quality Management Regime.

Statement of Policies and Responsibilities

- Policies and objectives;
- Client and Service Provider risks and responsibilities;
- Partnership or shared risks and responsibilities;
- Decision making process and responsibilities;
- Liaison and communication arrangements with other authorities and other public services;
- Winter risk period;
- Resilience standard;
- Legislative background.

Route Planning for Carriageways, Footways and Cycle Routes

- Carriageway routes by risk level;
- Response and treatment times for all carriageway treatments;
- Routes for footbridges, subways and other high risk pedestrian areas;
- Response and treatment times for footway and cycle route treatments;
- Routes for other footway and cycle route treatment by risk level;
- Allocation of plant, vehicles, equipment and materials to routes;
- Location and maintenance of salt bins and grit heaps;
- Special sites or features (e.g. near railways or traffic calming).

Weather Prediction and Information

- The decision making process;
- Road weather information bureau service;
- Road weather stations;

- Timing and circulation of information;
- Road weather forecast;
- Reporting procedure;
- Thermal mapping;
- Maintenance of ice detection equipment;
- Information to be provided.

Organisational Arrangements and Personnel

- Command, control and operational organisation;
- Arrangements with other authorities;
- Arrangements with other public services;
- Decision making;
- Operational record keeping and reporting;
- Plant and vehicle manning arrangements, including management of drivers' hours regulations;
- Materials management;
- Training and development arrangements;
- Schedules of Contract and Voluntary Personnel (CVP);
- Employee roles and responsibilities;
- Contact and commissioning arrangements for CVP;
- Employee duty schedules, rotas and standby arrangements;
- Winter Service exercising arrangements;
- Standard operating procedures ;
- Escalation and emergency operating procedures;
- Operational monitoring;
- Health and safety procedures;
- Contingency arrangements.

Facilities, Plant, Vehicles and Equipment

- Winter Service compounds and facilities;
- Calibration procedures;
- Fleet inventory including licence requirements and capacity;
- Fuel stocks and locations;
- Location of plant, vehicles, snow-blowers and other equipment;
- Contingency arrangements;
- Garaging, servicing and maintenance arrangements;
- Contact and hire arrangements for contract plant.

Salt and Other De-Icing Materials

- Location and capacity of stocks for salt and other materials;
- Contacts and purchasing arrangements for supplies;
- Minimum pre-season and in-season stock levels;
- In season re-stocking arrangements;
- Testing arrangements;
- Stock level monitoring and forecasting procedures;
- Loading arrangements;
- Treatment requirements including spread rates.

Operational Communications

- Technical systems information;
- Reporting arrangements and protocols;
- Inventory and allocation, including back up.

Contingency Plan

- Contingency arrangements for Winter Service delivery such as salt supply, drivers, fuel vehicles etc.;
- Arrangements for implementing minimum winter networks;
- Mutual Aid e.g. resources available from adjacent authorities;

- Liaison with Category 1 and Category 2 responders (reference Civil Contingencies Act 2004).

Information and Publicity

- Local press and broadcast contact information;
- Public information leaflets;
- Other key local and national contact information;
- Thermal mapping;
- Responsibilities and guidance for providing information;
- The decision making process;
- Road weather stations;
- Information to be provided;
- Road weather information bureau service;
- Timing and circulation of information;
- Road weather forecast;
- Notification arrangements for failure to maintain the published network;
- Reporting procedure;
- Maintenance of ice detection equipment.

Quality Management

- Quality management regime including regular service audits;
- Document control procedures;
- Distribution of documents;
- Information recording and analysis;
- Arrangements for performance monitoring, audit and updating;
- Procedure for deviation from the Winter Service Plan;
- Service review following significant events and at the end of season.

H3 SERVICE RESILIENCE

Expressing the Winter Service Standard

H3.1 An example is provided below on how authorities could express and apply their Winter Service resilience standard.

Overall Winter Period	1st October to 30th April
Core Winter Period	1st November to 1st March
Days Resilience (Overall Winter Period)	3 days
Days Resilience (Core Winter Period)	6 days

Determination of minimum salt stocks by depot

H3.2 For the purpose of this example it has been assumed that in heavy snow conditions there would be 6 successive treatments at 20g/m² each day.

Table H1 – Minimum Salt Stocks					
Routes	Normal Salting Network (tonnes/run)	Minimum Winter Network (tonnes/run)	Minimum Stock		
			Full Pre-season stock (12 days/48 runs)	Core Winter Period Minimum Network (6 days/36 runs)	Overall Winter Period Minimum Network (3 days/18 runs)
Carriageways	200	120	9600	4320	2160
Footways, cycle routes & salt bins (1 per day)	16	16	192	96	48
Total			9792	4416	2208

The minimum salt stock rounded up to the nearest 5 tonnes is therefore:

1 October to 30 October	= 2210 tonnes (at all times)
1 November	= 9790 tonnes
1 November to 1 March	= 4420 tonnes (at all times)
1 March to 30 April	= 2210 tonnes (at all times)

Notes.

1. The minimum in season stocks are the minimum to which stocks should be allowed to fall, i.e. restocking should take place well before the minimum is likely to be reached.

2. The early season and end of season minimum resilience stock should not be confused with the stocks likely to be required to ensure full pre-season stocks are achieved for the current or for the subsequent winter season.

Other Arrangements

H3.3 Minimum numbers of staff should be established for each of the roles identified for delivery of the service. Section 13 advises that all resources should be subject to a minimum resilience standard. When establishing shift patterns for all staff it is important to consider building in resilience for staff absence in addition to the requirements of the working time directive and drivers' hours regulations.

The drivers' hours regulations are in place to contribute to road safety. Pushing drivers to the limit, in difficult driving conditions, should be avoided wherever possible. VOSA has produced guidance on drivers' hours, 'Rules on Drivers' Hours and Tachographs' which can be found at the below web link:

<http://assets.dft.gov.uk/publications/drivers-hours-passenger-vehicles/report.pdf>

H3.4 Reserve drivers can be sourced from any pool of HGV qualified drivers, although they should be trained to the relevant Winter Service modules. Some authorities have written the requirement to supply reserve spreader drivers into other, non-winter contracts. For example, domestic refuse collection drivers would be suitable candidates for training as reserve spreader drivers.

H3.5 Through multi-skilling other operators, it is possible to provide sufficient resilience for activities such as loading. Reserve driver's mates for snow ploughing, where used, can be sourced through similar multi-skilling of other operatives.

H3.6 Winter decision makers, supervisors and managers have specific tasks to complete during both normal and severe conditions. As with spreader drivers, it is important to ensure that, when combined with other daily duties, the hours worked by individuals remain acceptable.

H3.7 Trained decision makers should be available to support contingency arrangements. Training additional reserve staff should be considered. It is important that these reserve staff are routinely exposed to operational decision making to ensure their knowledge is current and they have sufficient experience to meet the requirements of the winter plan.

H3.8 Where practicable, authorities should make arrangements for obtaining reserve supplies of key resources to support their minimum resilience standard. This should include salt, fuel, power and labour.

H3.9 Authorities should ensure that they have sufficient fuel to meet the resilience standard. This should be either bunkered in the depot or guaranteed from other easily accessible sources.

H3.10 Fuel supply has not historically been a widespread threat to the delivery of the Winter Service. However, lessons must be learnt from the recent shortages of salt. At a local level, there have been cases of localised fuel contamination and even a simple pump failure at a depot is sufficient to put strain on the service. Meeting the resilience standard for fuel stocks locally will lessen the impact of fuel

supply interruptions at a national or regional level.

- H3.11 Additional reserve stocks of fuel and salt can be obtained to give surety of supply. Recent winters have shown that supply guarantees need to be well defined and enforceable within contracts, if they are to be effective.
- H3.12 A relatively low cost way of increasing the number of vehicles available for snow clearance is to consider fitting snow plough mounts to appropriate non-winter vehicles and procuring additional ploughs to suit. This allows, in authorities where ploughing is appropriate, for two way ploughing whilst maintaining salting in a single pass. (For further details on ploughs and ploughing see Section H11)
- H3.13 Depots can be unavailable for a range of reasons but the most common reason is closure of the access road or loss of power. Both can be mitigated against at minimal cost. If feasible, each depot should have more than one entry/exit point onto different routes. Secondary entrances/exits would only be used when necessary but would enable access to and egress from the depot even if one route was impassable. Power supply issues can be mitigated against by the provision of backup generators. However, it is important to assess the requirements for mains electrical power and the required backup generation capacity. Lighting of depot yards can be achieved with temporary lighting towers, and heating for the depot staff can be achieved with portable gas appliances. Not having full IT systems for operational and decision making purposes may or may not be an issue for a short term power outage and a business impact analysis would determine this. Communication links are a potential issue, although mobile phones are a good backup to landlines, as long as they are kept charged.

Crisis Communications

- H3.14 Consideration could be given to providing information on appropriate websites during a snow event to direct traffic to the treated and passable sections of the network. It is important to keep information up to date in order not to exacerbate problems or cause the drivers to distrust the information being output. Some local authorities already utilise mapping on their websites to inform the public regarding available routes during major flooding events, and such methods could potentially be utilised for other weather related incidents such as widespread severe snowfalls. Social media is also increasingly used by authorities to keep road users informed of current road conditions and incidents.
- H3.15 Other departments within an authority may benefit from accurate updates on the condition of the network and likely future conditions. If, for example, the winter service team realise that safe access to a school cannot be maintained, then those responsible for the school need to be made aware as early as possible, so that arrangements for closing the school can be made in a planned manner.
- H3.16 All staff attempting to get into work may benefit from advance information and reminders to allow longer for their journeys to work. Text messages to staff phones or 'telephone trees' are effective ways to deliver the message. These types of arrangements may already exist in the Authority's Business Continuity Plan.
- H3.17 The provision of information is particularly important for those front-line staff engaged in delivering the Winter Service. It will reduce the risk of drivers /

operators arriving late and disrupting the treatment effort. However, many drivers / operators may sleep in the depots to eliminate the risk entirely.

H4 DE-ICING MATERIALS

General

- H4.1 Salt and salting are commonly used terms in relation to UK winter service. In the context of this guidance 'salt' refers to sodium chloride (NaCl) and 'de-icer' refers to salt and other chemical de-icers.
- H4.2 Chemical de-icers prevent ice formation or melt ice and snow by suppressing the freezing point of water to below 0°C when a solution is formed. Solid chemical de-icers are not effective until they have dissolved and formed this solution. This requires water, either from the moisture present on the road surface, in the air, or added during spreading.
- H4.3 De-icers are not effective unless they remain in the target area. To maximise the amount of de-icer within the target area, it is essential to carry out checks on the performance of the spreader.
- H4.4 Rock salt is the most commonly used material for de-icing in the UK. Rock salt is an indigenous product and normally readily available at reasonable cost. A number of other types of salt and chemical de-icers are also available which may be considered for particular circumstances. Cost, effectiveness and environmental impact characteristics differ widely, these should be considered and compared before adoption.
- H4.5 Alternatives to sodium chloride are appropriate when:
- Very low temperatures are expected
 - Corrosion damage to infrastructure by sodium chloride is unacceptable
 - There are concerns about the impact on the environment
- H4.6 Alternatives to sodium chloride used in the UK include:
- Magnesium Chloride
 - Calcium Chloride
 - Sodium chloride brine mixed with ABP
 - ABP Liquid (solutions)
 - Potassium Acetate
 - Calcium Magnesium Acetate
 - Ethylene Glycol
 - Propylene Glycol
- H4.7 When considering alternative de-icers for extreme cold or any other conditions the

effectiveness of different types and mixtures should be carefully evaluated to ensure they can be spread sufficiently accurately and in sufficient quantities with the equipment available (or by any new equipment specifically obtained for this purpose) and that they will deliver the service levels required at overall minimum cost.

Salt

- H4.8 While rock salt is the most commonly used salt; marine salt, vacuum and PAD salt are also available. All rock salt and salt used for road de-icing should comply with BS3247:2011.
- H4.9 In its dry condition, salt has a natural moisture content of between about 2% and 4%. The practical effective temperature of sodium chloride when used for winter maintenance on roads is at or above -5°C at the time of spreading in low humidity conditions (below 80% relative humidity) and at or above -7°C in normal UK winter humidity conditions (at or above 80% relative humidity)
- H4.10 The rate of dissolution becomes slower as the effective temperature is approached, although finer gradings will dissolve more quickly than coarser at the same temperature. The rate of dissolution will also depend on the salting technology. Although ice may be melted below the effective temperature, this is at a very low rate which is unlikely to be practical for precautionary or post treatments. Furthermore, the amount of salt needed increases to become economically and environmentally undesirable.
- H4.11 If solid (dry or pre-wetted salting) sodium chloride is spread at temperatures near or lower than -7°C , it will not dissolve quickly enough to become effective until the road surface temperature has risen above the effective temperature (-7°C).
- H4.12 In theory, once sodium chloride has dissolved it can prevent freezing of a saturated solution down to -21°C . In practice a saturated solution will not be formed on the road surface. Therefore, for winter service purposes, it is considered that sodium chloride can only suppress the freezing point to a minimum of -15°C .

Types of salt available

- H4.13 The types of salt that are normally used to treat highways are:
- Rock salt
 - Marine salt
- H4.14 Most of the rock salt supplied to the UK is mined at Winsford Mine in Cheshire, Boulby Mine in Cleveland and Kilroot Mine in Carrickfergus, Northern Ireland.
- H4.15 Finely graded marine salt is most commonly used for pre-wetted salting, both to manufacture brine and for the dry salt component.
- H4.16 Since 2009, marine and rock salt have been supplied from overseas to meet the increased demand due to severe weather and to restock for the future. (Some marine salt was supplied to the UK before 2009).

Salt composition

H4.17 Different types of salt vary slightly in the amount of sodium chloride and insolubles (e.g. marl) in the material. It is the sodium chloride content that provides the de-icing potential of the material and therefore de-icing performance is better, the higher the purity. Salt may also have chemicals added such as de-caking agents or treatment agents such as those manufactured from Agricultural By-Products (ABPs). These additives are not included in the recommendations below for soluble chloride purity

H4.18 Key recommendations – salt composition:

- The soluble chloride content of rock salt, expressed as sodium chloride, should not be less than 90%
- The purity of marine salt should not be less than 99%.
- The soluble sulphate compounds expressed as calcium sulphate, should not be more than 2.5%.
- The insoluble content should not be more than 7.5%.
- High purity salts such as marine salt and vacuum or PAD salt should be used to manufacture brine (except in saturators specifically designed for rock salt).
- The sodium chloride content and percentage of impurities in a salt need to be considered when purchasing and when determining appropriate spread rates.

(Recommendation RH.3)***Salt grading***

H4.19 Grading refers to the distribution of particle sizes in the salt, and the proportion by weight of the different particle sizes. When referring to common types of salt used in the UK, e.g. 10mm salt, the '10mm' relates to what should be the largest particles found within the salt.

H4.20 Key recommendations - salt grading:

- The grading of salts, including imported salts should comply with BS 3247 which specifies the range of acceptable particle sizes for salt used in the UK.
- The grading of some types of salt can vary significantly from one delivery to another and therefore it is important to check the grading regularly, and particularly when salt is obtained from a new source or supplier. Spreaders should always be calibrated for the salt being used.
- Pressure dried vacuum salt and PAD or vacuum road salt can be used alone or mixed with other salts, but only if the mixture complies with BS 3247.

(Recommendation RH.4)

H4.21 UK rock salt is graded so that the particle size distribution is fairly well centred within the limits in BS 3247. Marine salt is normally de-dusted so the number of finer particles is much less in marine salt than in UK rock salt.

H4.22 Generally, the higher the moisture content of the salt, the lower the percentage of

fine particles because these tend to be dissolved by the water in the salt.

- H4.23 Domestic producers can provide both 6mm (actual maximum particle size is 6.3mm) and 10mm graded rock salt to BS 3247:2011. The larger particle size requires less processing and can therefore be produced faster. Thus significantly more 10mm salt than 6mm salt can be produced in the same period of time. If more orders are placed for 10mm than 6mm then the pressure on UK production has the potential to be lessened. However, smaller particles go into solution much more rapidly than larger particles; particularly in situations of low humidity. A 6mm particle size is suggested for precautionary salting, giving a faster reaction time and better opportunities for salt rate reduction, whereas 10mm is more effective for ice and hard-packed snow. Spreaders should always be calibrated for the salt being used.
- H4.24 The size of a particle affects the distance it travels after leaving the distribution system of a spreader. Larger particles generally travel further than smaller particles and it is difficult to control their movement because they tend to bounce more on the road surface than smaller particles. It is important for Authorities to note that a move from 6mm salt to 10mm salt will require different spreader calibration settings to deliver satisfactory spread coverage. 10mm salt tends to spread less evenly than 6mm salt and this can result in more salt being put on the carriageway to achieve the minimum spread rate across the spread width. Use of 10mm salt has also been linked to claims for damage to vehicles, especially vehicle windscreens.
- H4.25 Smaller particles will dissolve more rapidly than larger particles given the same conditions. However, smaller particles are more likely to be affected by the wind or spreader induced turbulence during spreading. For dry salting operations, after spreading and in the period before they dissolve, finer particles are more likely to be affected by wind and traffic induced turbulence. Wind/turbulence can affect particles of all sizes but the effects are likely to be small for any particles larger than about 3mm. Particles less than 0.6mm in size are particularly prone to displacement.
- H4.26 It should be possible to achieve more effectively distributed salt (assuming the spreader is capable) at lower spread rates the more finely graded the salt, and with pre-wetted salt rather than dry salt. 1mm salt is used in some countries for pre-wetted salting, but such a finely graded salt is impractical for dry salting.
- H4.27 For post-treatment on layers of snow and ice, larger particles are more effective because they better penetrate the snow/ice than smaller particles. 10mm salt is therefore more effective on snow than 6mm salt. This is particularly relevant when it is not possible to plough to the road surface,
- H4.28 Like for like, the more finely graded a salt, the more rapidly it is likely to deteriorate when stored unless conditions are controlled.

Types of salting technology

- H4.29 The main salting technologies (methods) in the UK are:
- Dry salting
 - Pre-wetted salting
 - Treated salting

- Liquid spreading, e.g. sodium chloride brine, etc.

Dry salting

H4.30 Dry salting' is the spreading of salt at or close to its natural moisture content, in which condition it has a dry appearance. Much of the salting in the UK is dry salting, but it is not the optimum technology for many treatments. The moisture content of the salt is critical to effective spreading (more so than pre-wet salting) and should be in the range of 2% to 3.5% for dry salting operations. See Table H2.

Pre-wetted salting

H4.31 Pre-wetted salting is where dry salt is pre-wetted with brine just before spreading. The brine holds the finer particles of salt in suspension and so the amount of salt lost during and after spreading is lower than for dry salting. The brine dissolves some of the salt but only a small amount because the brine is nearly saturated. Salt can be pre-wetted with alternative liquid de-icers for use in colder temperatures.

H4.32 Pre-wetted salting has been shown to be more effective than dry-salting in most conditions, as salt distribution during the spreading process tends to be more uniform when using pre-wetted when compared to that when using dry salt. The finer particles in dry salt are also more likely to be dispersed by the wind and traffic during and after spreading, whereas those in pre-wetted salt tend to be retained on the road surface.

H4.33 It provides the ability to use less salt but involves investment in spreading equipment and the additional plant required. Consequently, this option cannot be considered for quick and low-cost implementation although it will have long term benefits in cost, resilience and environmental impact. To prevent an unnecessary reduction in the amount of salt spread, the brine concentration should not be less than 20%.

H4.34 The dry salt:brine mix proportions can be varied but are typically 70:30 by weight. Therefore, 10g of pre-wetted salt contains 7g of dry salt plus 0.66g of (pure) salt in the brine if the brine concentration is 22%.

H4.35 Production and/or storage facilities are required for the pre-wetting agent.

H4.36 Warning – Pre-wetted salting

- If the brine concentration exceeds 23%, there is a risk of salt re-crystallising within the pumps, pipes and nozzles of the spreader, particularly at very low temperatures.

(Warning 1)

Treated salting

H4.37 Salt coated with proprietary Agricultural By-Products (ABPs) and/or other additives is used by some Authorities. This may improve the effectiveness of treatments by reducing the loss of fines during spreading and may help retain the salt on the road surface after spreading. The treatment matrices show some reduction in the amount of salt required for some treatments when using treated salt.

H4.38 Conventional spreading machinery will need calibration for the ABP treated salt.

Where both treated and untreated salt is used at the same depot care must be taken that spreaders are calibrated and set for the salt used.

- H4.39 Authorities using ABP treated salt have reported savings in salt usage, with experienced users claiming greater savings. This anecdotal evidence suggests benefits may come from prolonged retention of residual salt on the carriageway in some weather conditions.
- H4.40 All major suppliers of UK salt can supply treated salt and a choice of treatment is available. The treatment process does not add any significant delay to the production and distribution process in normal circumstances.
- H4.41 Authorities should draw on the experience of current users if considering a change of de-icing material.
- H4.38 The Environment Agency has asked potential users to notify them before using treated salt due to concerns on the BOD (Biological Oxygen Demand) impact of ABP to sensitive receiving waters. Additives other than ABP (which may be included in ABP treatments) may also have environment impact consequences.

Brine

- H4.43 Brine solution only (with no dry salt being spread) is effective in some conditions. For example, in situations where the volume and weight of traffic may be insufficient to promote dissolution (activate) dry salt in time.
- H4.44 Spreading brine solution can be carried out with specialist equipment or existing equipment can be modified.
- H4.45 Brine only spreading requires more equipment or more runs to treat the same area due to the ratio of water to salt delivered even in a fully saturated brine solution.

Abrasives (Salt/Sand mix)

- H4.46 Sand for use as an abrasive in mixtures is ideally a single sized particle size 5-6mm and angular in shape suitable to create an abrasive surface. Abrasives between 1-5mm can still reasonably be used although may not be as effective. The sand can be added to salt at a ratio of 1:1 by weight.
- H4.47 Where hard-packed snow and ice have formed and cannot be removed by ploughing, a salt/abrasive mixture can be used in successive treatments at a spread rate of 20 to 40 g/m². This aids vehicular traction and helps act to break up the snow and ice. However, there are issues such as costs of clearing the abrasives from surfaces and drainage infrastructure.
- H4.48 Salt and abrasive should be pre-mixed before loading onto the spreader (see below). The mix proportions should be approximately 50:50 by weight (or 50:50 by volume will suffice – i.e. one loader bucket full of salt to one loader bucket of abrasive).
- H4.49 Care is needed when salt is mixed with abrasives with a high moisture content. Checks should be made that the mixture remains free flowing, does not clump and can be spread effectively.

H4.50 If Authorities use abrasives then, after snow melt, they should ensure that drains are checked and cleaned as necessary. Recovered material, (from roads, drains, etc.) which may be contaminated with oil and other pollutants, must be disposed of safely

H4.51 A salt/abrasive mix can be used as an alternative to salt for filling grit bins. Whilst grit bins are often provided for footways, such mixes can, in some cases, also be applied on minor roads.

Magnesium or Calcium Chloride

H4.52 Magnesium Chloride and Calcium Chloride are effective at lower temperatures than sodium chloride but are more expensive. They can be spread as a liquid brine or a solid. In solid form, these materials absorb moisture freely and special requirements are needed for storage. Their use in the UK is considered likely to remain generally as pre-wetting agents or by blending with salt.

Urea

H4.53 Urea has no more corrosive effect on steel than water alone but is a less effective de-icer than salt (for equivalent weight) and ceases to be effective at about -6°C. It is considerably more expensive than salt. Urea is normally used only in certain specialist locations because of its less corrosive effect. Supplied in pellets it needs special attention in storage and conventional spreading equipment requires modification to obtain satisfactory results.

Glycol

H4.54 Glycol is supplied as a liquid, either in bulk or in drums, and is considerably more expensive than salt. It is most often used on airfields and other specific locations. It may have an adverse effect on skidding resistance, when compared to an otherwise dry or wet road surface.

Calcium Magnesium Acetate

H4.55 Calcium Magnesium Acetate is supplied in the form of spherical pellets. It does not corrode bare steel but may be comparable to salt in the corrosion of reinforcement bars in concrete. It is considerably more expensive than salt.

Potassium or Sodium Acetate (Liquid Acetate)

H4.56 Potassium or Sodium Acetate liquid is supplied in bulk or in drums. It is fast acting and used on some airfields. There is some laboratory evidence that acetates may adversely affect the durability of concrete that has not been air entrained but the significance of this has not yet been proven. It is considerably more expensive than salt.

H5 EFFECTIVE MANAGEMENT OF SALT FOR WINTER SERVICE

Reducing Waste

- H5.1 Spreading salt with well calibrated vehicles capable of accurate distribution and ensuring the salt has a moisture content within the target range (for dry salting) will allow reduced spread rates and therefore minimise salt usage.
- H5.2 It may help to emphasise to spreader drivers and loader operators, how to minimise salt wastage when loading, off-loading, washing spreaders and when carrying out treatments.
- H5.3 Some Authorities have found on-board weighing or vehicle tracking systems useful tools to secure salt savings by ensuring that excess salt is not spun off inappropriately. Authorities should determine whether these systems offer benefits to their own service. The practice of ‘spinning-off’ surplus salt on the way back to the depot should be eliminated as this is a wasteful practice. It also makes proving full network treatment difficult.
- H5.4 At extremely low temperatures salt becomes very much less effective and is required at uneconomical and impractical doses. Alternative de-icers can be used to reduce the amount of salt (and overall chloride content) being spread onto the network. The practicalities of calibrating spreaders for these alternative de-icers and other issues in using them need careful consideration. Use of abrasive mixes can assist with traction using less salt in extreme circumstances. During periods of extreme cold it is likely that atmospheric humidity will also be low, which again reduces the effectiveness of salt, as it inhibits dissolution.
- H5.5 The use of suitably screened, salt contaminated wash-down water and rainwater for the production of brine can be considered.

H6 SALT STORAGE

General

- H6.1 Good storage is crucial to maintaining salt in good condition and should be addressed before considering other investment. If salt is not maintained in good condition, target spread rates and adequate distribution across the carriageway are unlikely to be achieved, particularly for dry salting, regardless of spreader quality. If salt is in poor condition both under-spreading and over-spreading are possible.
- H6.2 Keeping the salt in good condition and monitoring the condition is essential to allow spreading at lower rates, and crucial if spreading at less than 10g/m².
- H6.3 The condition of the salt must be maintained for consistent spreader performance during the season.

Moisture Content for Salt

- H6.4 The moisture content of salt is given as a percentage value. This is the weight of water in the salt expressed as a percentage of the dry weight of salt. The higher the percentage value the wetter the salt.

H6.5 During spreading, the rate at which salt is discharged from a spreader and its distribution on the road surface is critically dependent on the moisture content of the salt and the salt grading. This is particularly critical for dry salting but pre-wet salting may also be affected by tunnelling in the spreader where salt has a moisture content over 4.5%.

H6.6 The optimum moisture content for spreading salt depends on the type of salt and the spreading technology.

H6.7 Key recommendations – moisture content for salt:

- Salt should be stored such that its moisture content is maintained within an optimum range for the spreading technology used.
- The salt moisture content should be kept at a consistent level and should not differ from that used for spreader calibration by more than 1.5% or be outside the range shown in Table H2.
- Where salt moisture content is outside the optimum range consider remedial action as discussed in H6.70

(Recommendation RH.5)

H6.8 Good storage practices will help keep the salt moisture and grading within the optimum ranges. The optimum range for the moisture content of salt is dependent on the type of salt used, such as UK rock salt, imported rock salt, marine salt and whether salt is pre-treated and is shown in Table H2.

Table H2 – Optimum salt moisture content		
Salt type	Technology	Optimum range
UK rock salt	Dry salting	2 to 3.5%
UK rock salt	Pre-wetted	Less than 3.5%
UK rock salt	Treated	2 to 3.5%
Marine salt* ¹	Dry salting	1.5 to 4%
High purity imported rock	Dry salting	2 to 3.5%

*¹ Includes Vacuum and PAD salt.

H6.9 The effects of salt being too wet can include:

- Tunnelling in the spreader hopper
- Caking of salt stockpiles
- Leaching from salt stockpiles
- Poor salt distribution - areas of carriageway under or over salted

- H6.10 The effects of salt being too dry can include:
- Finer particles may be lost due to wind and vehicle draughts during and after spreading (particularly when the moisture content is less than 1% and especially when treating a dry road)
 - For pre-wetted salt low moisture is not considered significant
- H6.11 BS 3247:2011 is the British Standard for salt used for highway winter maintenance. This gives information on the acceptable condition of the salt and also how to test its condition. This standard specifies the range of acceptable particle sizes and also maximum moisture content on delivery of 4%.
- H6.12 Salt can be used with moisture contents higher than the optimum range recommended in this guidance. However the best spreading performance (and possible reduction in spread rates as a result) will be obtained if kept within the recommended optimum ranges as shown in Table H2.
- H6.13 Where salt with a moisture content higher than 4.5% is used, checks must be carried out before and during spreading that the salt is reaching the spreading mechanism and being distributed onto the road.
- H6.14 For pre-wetted salting with rock salt graded to be compliant with BS 3247:2011, the upper limits for dry salting apply. However, the moisture content can be less than 2% because the pre-wetting agent helps to prevent the loss of the finer particles during and after spreading.
- H6.15 For treated rock salt, the upper limits for dry salt apply. The minimum moisture content of coated rock salt is typically 2% or greater; the additive helps to prevent loss of the finer particles during and after spreading.
- H6.16 Marine salt tends to have a lower fines content than UK rock salt and hence a lower optimum moisture content than rock salt is provided for within Table H2.
- H6.17 Moisture content can be tested by a UKAS accredited laboratory. However a simple test can be undertaken using a standard oven and a suitable set of weighing scales. See H6.69.
- H6.18 **Warning – Salt moisture content:**
- Whatever type of salt is being used, tunnelling (the formation of large voids resulting in salt not falling onto the distribution mechanism) can occur in the spreader hopper if the moisture content of the salt is too high. Tunnelling must be avoided because it can result in uneven spreading or large areas of the road being left untreated.

(Warning 2)

Salt Storage Options

- H6.19 Key recommendations – salt storage:
- Storing salt in a salt barn or dome will help to maintain the salt in optimum

condition

- Fabric covered structures can be considered as an economical option for salt storage. Consideration should be given to them as they may offer similar protection to the salt and control of its condition as barns or domes
- When it is necessary to store salt outside, stockpiles should be covered by waterproof sheeting or a suitable weather proofing system
- The key areas of good practice (covered in this guidance) should be followed whatever storage method is used
- The requirements of the relevant environmental agency and environmental legislation for the area where the salt is stored should be noted and followed

(Recommendation RH.6)

H6.20 There are a number of storage options available for salt. The factors to consider when deciding on storage options are shown in the table below:

Table H3 – Salt storage options				
Storage method	Factors to consider			
	Relative cost of construction	Maintenance requirements	Control of salt Condition	Effect on spread rates
Salt barn/dome	High	Low	Excellent	Generally Lower spread rates possible (<10g/m ²)
Fabric covered structure	Medium	Medium	Good to excellent depending on configuration	Generally Lower spread rates possible (<10g/m ²)
Outside under cover	Low	Covering must be installed and regularly inspected	Reasonable – but only when good storage practices are used and maintained	Lower spread rates will not normally be achievable unless the covers are very well maintained and the area is properly drained. Even under covers the moisture content may not be maintained within optimum or acceptable ranges over time.

Outside unprotected^{*2}	Low	Medium to Low ^{*1}	Poor	Lower spread rates are not achievable (i.e. not less than 15-20g/m ²)
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^{*1}Environmental and drainage aspects such as contaminated runoff must be managed in consultation with the local agency responsible for the environment

^{*2}EA recommendations are for salt stores to be roofed or, if this isn't practicable, covered with an impermeable membrane. EA also require all salt to be stored on an impermeable base and untreated runoff must not enter groundwater, surface water drainage or watercourses.

Preparing storage areas

H6.21 The most important practical considerations when providing for salt storage are:

- The required storage space.
- Planning permissions and restrictions.
- Construction requirements.
- Position/orientation of salt barns/domes/fabric covered structures.
- Drainage and environmental requirements

H6.22 Key recommendations – Storage space:

Storage space:

- The storage area must be large enough to contain the salt stockpile and provide room for vehicles to safely manoeuvre when unloading/loading and maintaining the stockpile
- If changing to a different salt type, the effect on the storage area requirements or amount of salt that can be stored should be reviewed
- Different types of salt should be properly and clearly segregated in storage to prevent contamination or loading of the wrong type of salt

(Recommendation RH.7)

H6.23 Key recommendations – Safety:

Safety:

- Salt stockpiles can become dangerous if the salt is piled too high. Vertical or very steep faces also present a danger due to the risk of collapse. The risk will increase dependent on the quality of the material and storage method i.e. barns or domes generally present a lower risk than open storage.

- The maximum stockpile height should not exceed the ability of the loader to push up salt from solid ground
- All faces should be sloped to the natural angle of repose to reduce the risk of collapse
- Salt should be handled by machine including when taking samples
- Stockpiles must not be walked on without adequate precautions and equipment for health and safety reasons and lone working should be prohibited when working manually at stockpiles. Proper procedures with risk assessments should be put in place.
- Operators of machines involved in handling salt, spreader drivers, etc., should not leave the vehicle to carry out any manual operation on the stockpile without a proper procedure and risk assessment having been put in place. Such procedures should not permit lone working.

(Recommendation RH.8)

H6.24 Key recommendations – Construction:

Construction:

- All buildings and storage structures must meet UK building design codes and be constructed of materials not subject to corrosion e.g. timber, high grade concrete(C50).
- All of the walls within a barn or dome must be designed to withstand the maximum possible loads caused from salt stored against them and the dynamic forces from loading the salt
- Salt stockpiles should be kept on a concrete (preferred) or a bituminous base sloped to allow water to drain away, prevent ingress of water from the ground, contamination and facilitate loading.
- Stockpile bases should be designed to prevent salt contaminated water flowing from the stockpile directly into the ground or any untreated drainage system. They should also prevent ingress of water flowing into the stockpile.
- For salt stored outside (covered or uncovered), the hard standing should have a slight cross-fall and drainage to disperse precipitation quickly and prevent water accumulation at the base of the stockpile.
- An impervious base must be provide to meet environmental requirements
- Adequate drainage must be provided which meets environmental requirements/agreements

(Recommendation RH.9)

H6.25 Key recommendations – Position/orientation of salt barns and domes

Position/orientation of salt barns and domes:

- Doors will assist in maintaining the salt condition, in particular where openings face the prevailing weather
- To minimise weather ingress and where practical, openings should face away from the prevailing wind and weather

(Recommendation RH.10)

H6.26 Key recommendations - Drainage and environmental requirements:

Drainage and environmental requirements:

- The requirements of the relevant Environmental Agency for the area where the salt is stored should be noted and followed
- Where pre-wetted salt is used, there may be a business case for the recycling of drainage water from stockpiles and the washing down of spreading equipment, as well as the collection of rainwater for brine production (brown water recycling)

EA recommendations are that:

- Salt stores should be roofed or covered with an impermeable membrane
- Salt stores should be sited on an impervious base and sited at least 10m away from the nearest watercourse or drain inlet/access
- Drainage from salt storage areas, loading areas or areas where extraneous salt is deposited by spreaders leaving the depot, should pass to a suitable system or a sealed tank – not to a watercourse or soakaway
- If the above drainage requirements cannot be met, consent from the appropriate agency will be needed which may contain strict quality conditions
- Salt from stores should not encroach onto the open yard

(Recommendation RH.11)

Storage capacity requirements

H6.27 The Final Report of the Review of the Resilience of England's Transport Systems to Severe Winter Weather made the recommendation that Authorities should have sufficient pre-season stocks of salt for 12 days/48 runs (assuming each run at 20g/m²)

It was further recommended that:

- Local Highway Authorities 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;

- Local Highway Authorities 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.
- H6.28 If too much salt is stored in an area it can be difficult to manage the salt stocks using the methods recommended in Section H6.
- H6.29 The amount of salt that can be stored in a given area will depend upon:
- the steepness of the stockpile slope determined by the salt's angle of repose.
 - the maximum safe and workable height of the salt stockpile.
 - the shape of the stockpile.
 - the space required for vehicle manoeuvring in barns and domes.
 - access and egress for vehicles when delivering and loading salt.
- H6.30 Salt poured from a low height will form a cone with sides that slope at the 'angle of repose' of the salt; that is the angle the surface of the pile naturally makes with a horizontal surface. This storage method is not typical in the UK, where salt is usually pushed up into stockpiles. The range of angles of repose discussed in this section allows for these different storage methods. The angle of repose is determined by the shape and size of the particles and will therefore vary from one type of salt to another. The higher the angle of repose, the steeper the safe slope of the stockpile and the greater the amount of salt that can be stored in a given area.
- H6.31 The angles of repose for commonly used salts are given below:

Table H4 – Angles of repose for common salt types		
Salt type	Angle of repose (degrees)	Approximate height/width ratio of stockpile (h/w)
UK Rock Salt	40-44	0.90
Treated UK Rock Salt	36-40	0.78
Marine Salt	35-40	0.78

Types of storage

Salt Barn and Domes

- H6.32 The condition of salt in a salt barn or dome should remain fairly constant, although the stockpile may increase in moisture content if there is ingress of precipitation, increase or decrease in sustained high or low humidity, or decrease in sun and wind, particularly near an open door or for a barn or dome without covered

openings.

Fabric Covered Structure

H6.33 A well specified, constructed and maintained fabric covered structure should provide the same degree of protection as a salt barn or dome and the notes as above apply. If the fabric covered structure does not meet these conditions then the degree of protection should be considered as equal to “Outside Protected” as below.

Outside Protected

H6.34 Whenever possible, outdoor stockpiles should be protected by waterproof sheeting or suitable alternatives such as a spray on waterproofing system. This is an EA recommendation. The system should prevent (or at an absolute minimum severely limit) the ingress of water and prevent erosion due to the wind. Covers should be positioned to prevent precipitation from reaching any part of the stockpile, including the base.

H6.35 Where circumstances allow, outside stockpiles should ideally take the form of an extended pyramid with the working face at one end. It is likely to be impractical to cover the working face of a stockpile during frequent use, hence the need to reduce the size of the working face which is exposed to the elements.

H6.36 Covers should be handled carefully and inspected on a regular basis for damage, especially after high winds, heavy rainfall and heavy snow. Covers may be prone to deterioration by ultra-violet radiation and this should be considered at the point of purchase. Damage should be repaired promptly to prevent the ingress of water. Water ingress may be significant and ‘swallow holes’ may form.

H6.37 The turning and agitation of protected stockpiles is not recommended as this may damage the protection and allow the ingress of water. The condition of the salt at different parts of the stockpile should be checked regularly. If it is found that the moisture content is close to the limit of the optimum range, the affected salt should be used as soon as practicable to prevent its moisture content moving outside the target range. Alternatively, mixing with salt, with that of different moisture content could be considered.

H6.38 **Warning – Outside protected salt:**

- If water enters a stockpile, a cover may prevent subsequent drying in fine weather. If this happens the condition of the stockpile will deteriorate rapidly and the stockpile should be considered effectively uncovered. Water must be prevented from entering a covered stockpile.
- Walking on covers must not be allowed without adequate precautions and equipment for health and safety reasons. Apart from the potential for slips and falls, a ‘swallow-hole’ in the stockpile may entrap anyone walking on the cover. A full risk assessment must be carried out and a proper process put in place.

(Warning 3)

Outside Unprotected

H6.39 Key Recommendations – Outside unprotected storage:

- EA recommendations are that salt stores are roofed or, if this isn't practicable, covered with an impermeable membrane
- The stockpile should be left undisturbed to keep the thatch intact, apart from the working face
- The thatch on rock salt should not be used
- The thatch on a stockpile of marine or pad salt with high purity can be used if it is regraded
- The stockpile should be profiled such that water runs off and does not pool on the surface
- The base to the stockpile should be impervious and designed to prevent water running into the base of the stockpile

(Recommendation RH.12)

- H6.40 Pre-treatment spread rates will be higher for salt stored outside and unprotected compared to salt stored under cover. Unprotected stockpiles should also be avoided where possible because salt and anti-caking agents are lost through leaching, and the moisture content of the salt cannot be maintained at optimum levels. Results from a test programme in the 1960s suggest that losses of salt of the order of 0.01%/mm of rainfall can be expected from an undisturbed stockpile of UK rock salt that is not treated, i.e. 60 tonnes from a 1,000 tonne stockpile with annual rainfall of 600mm. (Average rainfall in the UK is generally higher than 600mm and most of the country has an average rainfall of 800mm or more)
- H6.41 UK rock salt contains insolubles that range from about 2.5 to 5.5% by weight. The insolubles are mostly marl. When stored outside a thatch or crust is formed on the surface of the stockpile from the marl and recrystallised salt as the sodium chloride at the surface is dissolved by precipitation. The thatch helps to prevent large amounts of water from entering the stockpile. This indicates that salt under the thatch will be less affected by precipitation the deeper the salt is in the stockpile. However, testing must be carried out to determine that the salt used lies within the acceptable range and that the correct spread matrix is chosen for the salt condition.
- H6.42 Other rock salts and marine salts can have a very low insoluble content. When stored outside, thatch is formed as the salt on the surface of the stockpile dissolves and recrystallises. The potential for water ingress is greater with purer salts because the thatch can take longer to form.
- H6.43 The advantages of using some types of treated salt may be compromised if it is stored in unprotected stockpiles and exposed to the elements. It is suggested that before storing any salt and particularly treated salt unprotected, Authorities should satisfy themselves as to the suitability and/or cost effectiveness of this storage method.

- H6.44 Outside stockpiles should take the form of an extended pyramid with the working face at one end in order to limit the ingress of water to the stockpile. The opportunity should be taken to check the condition of the salt at different parts of the stockpile when this can be done safely.
- H6.45 Once thatch has formed, the stockpile should be disturbed as little as possible. If the thatch is broken up, the ingress of water will increase until new thatch has formed.
- H6.46 The thatch on UK rock salt should be not used because it has a very low sodium chloride content. The thatch on a stockpile of salt with high purity can be used if it is thoroughly broken up. If large particles from the thatch are spread, the discharge rate of the salt from spreader may be affected, wastage may increase, and target spread rates may not be achieved. Also, there is an increased risk of damage to car windscreens, etc.

Drainage and Environmental Considerations

- H6.47 Following the guidance in this document and from the relevant agencies will enable Authorities to reduce the risk of serious environmental impacts from spreading de-icers, by using proper storage facilities and spreading in the most efficient manner.
- H6.48 Environmental and regulatory agencies have concerns over the environmental impacts of spreading all de-icers. Authorities should be aware that any de-icer, including salt, will have an environmental impact and should take all necessary precautions, as far as practically possible, to reduce the amount of de-icer entering the environment. Authorities need to comply with all relevant legislation and guidance. Therefore close liaison with the relevant environmental agencies is recommended at the earliest stage.
- H6.49 Before, during and after spreading, de-icers will reach the environment in a number of ways:
- Leakages and spills during storage.
 - Directly from the back of the spreader to the verge during spreading.
 - Spray of the de-icer solution from the road surface by traffic and wind.
 - Run off of the de-icer from the road surface into the surrounding environment e.g. surface water, ground waters, soil and sensitive habitats.
- H6.50 The Environment Agency for England and Wales (EA), Scottish Environment Protection Agency (SEPA), and the Northern Ireland Environment Agency (NIEA) have jointly produced a range of guidance documents for storage of industrial liquids, based on relevant legislation and current good practice which should be consulted, including:
- Guidance on industrial and commercial pollution prevention: ‘Pollution Prevention Pays’, available from the EA website
<http://www.environment-agency.gov.uk/business/topics/pollution/36641.aspx>
 - Pollution Prevention Technical Information note: ‘Safe storage and use of de-icing products’, available from the EA website.
http://www.environment-agency.gov.uk/static/documents/Business/PPTI_De_Icer.pdf
- H6.51 A section of the Environment Agency’s website deals directly with pollution prevention guidance, and can be found at:
<http://www.environment-agency.gov.uk/business/topics/pollution/39083.aspx>.
- Contact details for the Environment Agency (EA), Scottish Environment Protection Agency (SEPA) and Northern Ireland Environment Agency (NIEA) are provided below.
- The UK-wide incident and pollution hotline is available on 0800 80 70 60 and can

be reached 24 hours a day.

Environment Agency

Website: www.environment-agency.co.uk

Email address: pollution.prevention@environment-agency.gov.uk

Telephone: 0117 934 4001

Head Office: Horizon House, Deanery Road, Bristol. BS1 5AH

Scottish Environment Protection Agency (SEPA)

Website: www.sepa.org.uk

Email address: netregs@sepa.org.uk

Telephone: 01786 457 700

Head Office: Erskine Court, The Castle Business Park, Stirling. FK9 4TR

Northern Ireland Environment Agency (NIEA)

Website: www.ni-environment.gov.uk

Email address: NIEAPollutionPrevention@doeni.gov.uk

Telephone: 0845 302 0008

Head Office: Klondyke Building, Cromac Avenue, Gasworks Business Park, Lower Ormeau Road, Belfast. BT7 2JA

Salt stockpile maintenance

H6.52 Key factors in maintaining salt condition following delivery to the storage area include:

- Stock rotation.
- Method of working of the stockpile.
- Turning /agitation of stockpiles (to be avoided if possible).
- Monitoring of salt condition.

It is also crucial that the stockpile is maintained in a safe condition at all times.

Stockpile Rotation

H6.53 Key recommendations – Stockpile rotation:

- Salt should be stored such that its condition is maintained throughout the season
- Where practical, the priority should be to use any externally stored unprotected salt first, and then externally stored covered salt before salt stored in barns and domes
- Salt should be used in order of delivery (oldest first)
- Salt should not be externally stored unprotected for more than one winter season
- Salt should not be externally stored undercover for more than three years unless it can be confirmed that the salt remains in good condition
- Handling of salt for dry salting should be kept to a minimum

(Recommendation RH.13)

H6.54 A stockpile rotation plan should be developed by Authorities to ensure that the salt being used is in good condition, the salt in storage is not deteriorating and no salt deteriorates so much that it cannot be used. For each type of storage, there should be a principle of first in first out. Stocking to meet the resilience standard may leave surplus salt in store at the end of a mild winter. Reserve stockpiles, once established, should be part of the rotation plan.

H6.55 As a general rule, salt should not be stored outside unprotected for more than one season. Where salt is protected it should not be stored for more than three years unless it can be confirmed that the salt is in good condition. Based on current information, it may be necessary for Authorities to consider replacing strategic stocks on a rotating basis every three years.

H6.56 Old salt stocks left in a barn or dome should remain in good condition for a number of seasons. However, they should be moved forward and used before they can deteriorate beyond the required condition.

Method of working of the stockpile.

H6.57 Key recommendation – Method of working stockpiles:

- Salt should only be removed from a single working face at any one time
- Where practical, the stockpile should be worked fully to the back of the pile before moving the working face
- External stockpiles should take the form of an extended pyramid or trapezoid
- The size of the working face should be kept to a minimum, for example by making the working face the short side of the pile

When there is insufficient covered storage capacity for all salt stocks, the priority for storing under cover should be as follows:

- Highest priority: High purity/low insoluble content salt e.g. Marine salt
- Lowest priority: UK rock salt

(Recommendation RH.14)

Monitoring of salt condition.

H6.58 Key recommendations – Monitoring of salt condition:

- Authorities should regularly check the salt condition, by testing samples taken from existing stockpiles as well as new deliveries
- A regime of testing should be developed in consultation with the salt supplier
- Salt samples can be sent to a UKAS accredited laboratory and analysed.
- Simple checks on moisture content can be carried out locally at reduced cost but should be supplemented and verified by UKAS accredited laboratory tests
- Independent testing should be compared with certificates provided by suppliers

(Recommendation RH.15)

H6.59 Testing of salt moisture content, grading and certain chemical properties can be carried out by UKAS accredited laboratories. There are also other, simpler methods that can be used to measure salt moisture content. These tests can be used for comparative purposes to check how the moisture content is changing throughout a season. If the simple checks indicate a change in salt moisture, it is recommended that samples are then sent for testing by an accredited laboratory for confirmation.

H6.60 Checks should be made on new deliveries of salt. A testing regime should be developed in consultation with the supplier, based on the consistency of the salt being supplied. e.g. a level of testing of one sample every 10 lorry loads might be recommended.

H6.61 Checks should also be carried out regularly on the condition of salt in stockpiles. Suggested frequencies of sampling for different storage options are shown in the table below:

Table H5 – Salt testing frequency	
Storage type	Frequency of testing (per month)
Outside unprotected	2
Outside covered * ¹	1
Barn or dome * ¹	1

*¹ Use appropriate level for Fabric covered structures depending on specification

H6.62 If incorporated as a routine procedure, sampling and testing the salt condition will be a quick and easy process and will provide useful long term information.

Procedure for taking salt samples:

H6.63 For safety reasons, the sample should not be taken by hand from the stockpile. It should be taken using equipment normally used to load spreaders.

H6.64 It is recommended that two bucket loads are first removed from the same location and height. A third bucket load should then be removed and a sample (of about 2kg) taken from this bucket. In this way the sample will be representative of salt that would be loaded into a spreader.

H6.65 When sampling from stockpiles in barns or domes, it is recommended that samples are taken from the working face and other areas of the stockpile. For external stockpiles, salt should only be taken from the working face to avoid disturbing the cover or thatch.

H6.66 For each sample:

1. Assign a unique reference number
2. Note on a plan of the stockpile where each sample was taken
3. If sending for laboratory analysis, the samples should be placed in an airtight container labelled with the sample reference number and sent for analysis, preferably at a UKAS accredited laboratory.

Simple procedure for testing salt moisture content:

H6.67 Although the preferred method for measuring the moisture content is by laboratory analysis, a reasonable estimate for continual monitoring can be obtained by the following method:

1. Samples should be taken from the stockpile in the same way as outlined above
2. Weighing a sample of salt (before drying)
3. Drying the sample in a fan oven at 70°C

4. Weighing the dry sample
5. Calculating the difference in weight

The moisture content (%) can be obtained using:

$$100 \times (\text{wet weight} - \text{dry weight}) \div (\text{dry weight})$$

Example

If a sample weighs 500g (wet) and 478.5g (dry) the moisture content would be $100 \times (500 - 478.5) \div 478.5 = 4.5\%$

Action when salt moisture content is outside the optimum range

H6.68 Key recommendations – Actions when salt moisture content is outside the optimum range:

- Review spread rates when salt is not in the optimum moisture content range
- Recalibrate spreaders where moisture content varies significantly from that at previous calibration

(Recommendation RH.16)

H6.69 When salt is too wet it can be removed from the stockpile and allowed to dry and/or be mixed with drier salt to reduce the moisture content in an appropriate area. Some of the potential actions that can be taken are summarised below:

H6.70 Actions for wet salt (>4.5% moisture):

- All wet salt should be moved away from the stockpile and left to dry (in a suitably contained area to minimise environmental impact)
- When the moisture content reaches the optimum range, the salt can be mixed with drier salt in the stockpile or from new deliveries
- Samples should be checked after mixing to confirm that the moisture content is in the optimum range

H6.71 Actions for wet salt (<4.5% moisture):

- Salt should be mixed with drier salt in the stockpile or from new deliveries
- Samples should be checked after mixing to confirm that the moisture content is in the optimum range
- If spreading when wet, assume poor distribution when deciding the spread rate

H6.72 Actions for dry salt:

- For dry salting, assume high losses after spreading

- Consider mixing with salt of higher moisture content in the stockpile or from new deliveries

Storage of strategic stocks

H6.73 Key recommendations – Storage of strategic stocks:

- Recommendations for preparing and maintaining stockpiles given in this section apply equally to strategic stockpiles
- Salt should not be stored outside undercover for more than three years unless it can be confirmed that the salt is in good condition
- Consider replacing strategic stocks of salt on a rotating basis every three years.
- Strategic stocks of salt should be inspected regularly and samples taken to monitor the salt condition. More frequent checks should be made for stockpiles over three years old

(Recommendation RH.17)

H6.74 Information from salt suppliers suggests that, if stored correctly, UK indigenous rock salt can be stored outside under waterproof covers and remain in good condition without turning or agitation for up to three years. However, it should not be assumed that salt stored outside under cover will remain in good condition indefinitely. Salt should not be stored outside undercover for more than three years unless it can be confirmed that the salt is in good condition.

H6.75 Based on current information, it may be necessary to consider replacing strategic stocks on a rotating basis every three years.

H6.76 There is insufficient experience of the covered storage of other types of salt in UK conditions to provide guidance on this issue at this time. The guidance provided for preparing a stockpile will apply equally to strategic stockpiles of salt.

Loading spreaders

H6.77 It is important that spreaders are loaded in such a way that maintains the salt condition resulting from good storage.

Key recommendations:

- Do not load thatch or large aggregations ('lumps') of salt
- Care should be taken to avoid contamination of the salt with detritus when removing from the base level of the stockpile
- Salt spreaders should be sheeted during spreading. This will protect the salt from snow and rain and prevent it being lost from the hopper during spreading

(Recommendation RH.18)

H7 CALIBRATION OF SALT SPREADERS

General

H7.1 Key recommendations – Calibration of salt spreaders:

- Spreaders should be calibrated for each type of salt they are to spread using salt in the expected condition for normal operations
- Any variation in the condition of the salt from the condition at calibration must be minimised if re-calibration is to be avoided
- The performance of spreaders should be routinely monitored after calibration and checked if necessary
- Significant changes in performance, salt type or salt condition should trigger re-calibration or at least a review of the need for re-calibration
- Spreaders should be calibrated regularly and following any maintenance or incident that has the potential to affect spreader performance
- Calibration records should be retained in accordance with the Authority's policies regarding the retention of other important documents

(Recommendation RH.19)

H7.2 The purpose of calibration is to ensure that each spreader in a fleet is spreading the salt uniformly over the target area, at the correct rate of application and with as little wastage as possible.

H7.3 Salt spreaders require calibration and set-up for the specific salt type, grading and moisture content being used. Even though salts may be compliant with BS 3247: 2011, the spreader settings for salt from one source are unlikely to be the optimum settings for salt from another source. The amount of salt discharged could vary from the expected amount by as much as $\pm 50\%$.

H7.4 Calibration should always involve a direct measurement of the salt being discharged and where it is being spread. An indirect check of the spreader settings, such as the belt speed, gate height and spinner speed is not sufficient. Before any calibration is carried out, the salts, spread widths and spread rates for which calibration is required must be clearly identified.

H7.5 Every spreader should be calibrated before each winter, however undertaking and additional mid-winter calibration is also good practice. Calibration should be carried out whenever required throughout the season, for example following a change of salt or monitoring highlighting a potential issue. The objective is to ensure that the intended spread rates are achieved.

H7.6 It cannot be relied upon that the spreader performance will remain unchanged after calibration. There are numerous variables that impact on calibration. Performance needs to be monitored and recorded so that recalibration of

spreaders can be carried out where necessary. Monitoring of the salt tonnage used provides a quick and easy method of checking the spreader performance in terms of discharge rate.

H7.7 Driver training is important in monitoring the performance, as any non-routine actions (such as operating the spreader in burst mode) should be recorded and allowed for. Driver training is discussed in Section 13

H7.8 **Warning – Calibration of spreaders:**

- There is a risk of under or over spreading if the spreader is not calibrated for the salt being spread.
- The potential consequences of under spreading are higher when the spread rate is low.

(Warning 4)

H7.9 An extensive record of spreader performance testing has been built up over the last 10 years, through spreader trials carried out on behalf of the NWSRG (formerly NSSRG) and the Highways Agency. The results of these trials demonstrated that the amount of salt discharged could vary from the expected amount by as much as $\pm 50\%$. Important reasons for this large amount of variation were identified as insufficiently rigorous calibration procedures and/or variations in salt condition after calibration and/or spreader performance capabilities.

H7.10 Calibration can be carried out in-house or under contract but always by trained and competent persons. Before any calibration is carried out:

- The level of service to be provided and the roles and responsibilities of all parties must be agreed.
- The de-icers, spread widths and spread rates for which calibration is required must be clearly identified.
- This should be fully documented and form part of any contractual agreement.

Calibration procedure

H7.11 Key recommendations – Calibration procedure:

- Calibration should be carried out for every spreader in a fleet and should check:
 1. That the total amount of salt being discharged is within acceptable tolerances
 2. That the salt is being spread to the target area
- Calibration should always involve a direct measurement of the amount of salt being discharged and where it is being spread

- Calibration must be carried out by a competent and trained person

(Recommendation RH.20)

H7.12 Warning – Calibration procedure:

- Carrying out an indirect check of the spreader settings, the belt speed, gate height and spinner speed is not sufficient.
- The amount of salt being discharged must be measured.

(Warning 5)

H7.13 The key element of calibration is to check that the amount of de-icer discharged corresponds to the particular target spread rates required to be delivered by that spreader and that the salt distribution profile meets the specification across the whole of the road.

H7.14 An effective calibration procedure will involve carrying out checks in the following order:

A. Pre-calibration Checks

H7.15 Key recommendations – Pre-calibration checks:

- Check and record the salt moisture content ensuring that it is in an acceptable range
- Check the condition of the spreader, particularly the hopper, chute and salt distribution mechanism and controls.

(Recommendation RH.21)

H7.16 Calibration will not be effective unless the spreader is well maintained, in a good serviceable condition and the salt(s) used (for calibration) are both typical of the salt stored and ideally within the optimum moisture range.

H7.17 The salt moisture should be within the optimum range. However, the vehicle should be calibrated for the actual salt that it will be using, no matter the state of the salt.

H7.18 Calibration should only be carried out with salt outside the optimum moisture content range when there is no alternative salt in good condition available. Spreaders must be re-calibrated as soon as salt in good condition and within the optimum moisture content range is available.

B. Discharge Tests

- The discharge test should check that the spreader is discharging salt (and brine for pre-wetted salting) at the correct rate. The target amount (g) = spread width (m) x spread rate (g/m²) x spread length (m).
- The salt discharge rate can be measured most accurately by completing a trial

spreading run. This will require the use of a weighbridge, an accurate on-board weighing system or weigh pads to measure the amount of salt and brine discharged during the run.

- Weighbridges and weigh pads should be calibrated and the resolution (the smallest increment in weight) should be considered. For example, if the weighbridge measures to the nearest 10kg, and the amount of salt discharged is 100kg, there would be a potential error of 10%. For accuracy, sufficient salt should be discharged such that the resolution does not result in a measurement error greater than 3%.
- If using the spreader's on board weighing system, the spreader should be on a flat area of ground to give an accurate measurement. The spreader should be parked in the same position to measure the weight before and after a spreading run
- If using weighbridges or weigh pads and the spreader has completed a full treatment run then it is important to ensure the fuel tank is full during weighing both before and after treatment.
- The discharge rate may vary with the hopper load, with experience indicating that a full hopper is more likely to result in a reduced rate of spread. This is considered more of an issue for older spreaders as more modern equipment may be able to continuously adjust the output (once calibrated) through closed loop control.
- Alternatively, for some spreaders it is possible to carry out a discharge test with the spreader stationary, simulating spreading at the normal spreading speed. The salt (and brine when spreading pre-wetted salt), can be collected in a bag or bucket and weighed using scales. This method will be less accurate than a trial spreading run because less salt is discharged.
- Checks should be made that the calibration is valid at two significantly different spread rates using a typical spread width on the routes treated by that spreader.
- The amount of salt (and brine where applicable) discharged should be adjusted in accordance with the spreader manufacturer's recommendations so they are within $\pm 10\%$ of the target.
- For more modern spreaders, with closed loop control of the amount discharged, more stringent limits of $\pm 6\%$ should apply.
- The dry salt to brine mix proportions for pre-wetted salting should be within the range 64:36% to 76:24%.

Procedure for discharge test

H7.19 Following completion of pre-calibration checks, the discharge test should be carried out as follows:

1. The spreader should be refuelled to the same level before and after any spreading run, so the weight of fuel used does not affect the measurement

2. Load salt into the spreader hopper (the hopper should be between 10% and fully loaded and all spreaders within a fleet should be loaded to a consistent level)
3. Weigh the spreader or hopper load before spreading
4. Calculate the target amount from the spread rate setting
5. Carry out the discharge run or static discharge
6. Weigh spreader or hopper/discharged load after discharging
7. Calculate the difference in weight before and after spreading to determine the amount of salt (and brine where applicable) discharged
8. To measure the amount of brine discharged during a static test it can be collected separately to the salt. Alternatively, the spreader can be weighed with no salt loaded before and after the test (fuelled to the same level). The difference in weight will be the amount of brine discharged
9. Compare this to the target amount. If the amount of salt discharged is not within $\pm 10\%$ of the target, make adjustments in accordance with the spreader manufacturer's recommendations
10. Repeat until two consecutive measurements are made within $\pm 10\%$ of the target. (For more modern vehicles, with closed loop control of the amount discharged, more stringent limits of $\pm 6\%$ should apply)
11. When pre-wetted salting at target mix proportions of 70% dry salt and 30% brine, the measured proportions should be within the range 64:36 to 76:24
12. Checks should be made at two significantly different spread rates using a typical spread width for the routes treated by that spreader

C. *Distribution Check*

- A visual check of the salt distribution should be made to check the salt is being spread to the target area. This should be carried out by an experienced person who has the competence to relate the visual check to actual performance.
- For some spreaders the check can be carried out with the spreader stationary and operated for a few seconds to simulate spreading at normal speed. The bounce of salt across the road surface will be affected by accumulations of salt, so the salt should be cleared as necessary. Cones can be placed as markers to define the correct spread width.
- Alternatively, the salt distribution may be observed from a vehicle following the spreader while performing a trial spreading run. While this will demonstrate the distribution at speed, with the extra bouncing of the salt particles due to their forward momentum and the snaking caused by turbulence generated by the spreader, it is harder to assess the uniformity of the distribution and the wastage than from a static assessment.
- The spread pattern should be observed and, if necessary, the spinner speed and symmetry should be adjusted to optimise the salt distribution profile and reduce wastage.

- The distribution should be checked at the typical spread rate and also at the lowest rate that may be used by that spreader.
- An assessment of the uniformity of the salt distribution as **Good/Fair/Poor** should be made during calibration and this will depend on the salt type (see Table H6 and H7)
- The assessment is made when the amount of salt being discharged is within 10% of the target amount (as checked during the discharge test)

Procedure for stationary distribution check

H7.20 Following completion of discharge checks, the distribution check should be carried out as follows:

1. The spreader should be positioned on a level surface with a normal road surface or at least one that is similar
2. Cones can be placed as markers to define the correct spread width, e.g. from 1.75m to the left of the spinner to 5.25m to the right for a 7m asymmetric spread
3. Operate the spreader for a few seconds simulating spreading at normal speed
4. The bounce of salt across the road surface will be affected by accumulations of salt, so the salt should be cleared as necessary to prevent any accumulations
5. The spread pattern should be observed and, if necessary, the spinner speed and symmetry should be adjusted to optimise the salt distribution profile and reduce wastage to less than 10% of the target amount

H7.21 For each salt type, the uniformity of distribution is defined by the minimum spread rate achieved in any lane as follows:

Table H6 – Assessment of Uniformity of Salt distribution from stationary test		
Salt type	Uniformity	Minimum spread rate in a lane (% of the target amount)
Treated and pre-wetted	Good	90
	Fair	70
	Poor	60
Dry	Good	80
	Fair	60
	Poor	50

H7.22 The following guidelines are given, to help assess the level of uniformity based on a simple visual assessment of the relative amounts of de-icer in each lane based on an observed spreader run.

Table H7 – Assessment of Uniformity of Salt distribution from observed run		
Salt type	Uniformity	Observation of distribution to two lanes
Treated and pre-wetted	Good	Distribution appears uniform between the lanes Wastage assessed to be less than 5%
	Fair	Up to 50% more salt assessed to be in one lane than the other Wastage assessed to be less than 10%
	Poor	Up to 75% more salt assessed to be in one lane than the other Wastage assessed to be less than 15%
Dry	Good	Up to 20% more salt assessed to be in one lane than the other Wastage assessed to be less than 10%
	Fair	Up to 75% more salt assessed to be in one lane than the other Wastage assessed to be less than 15%
	Poor	Up to 90% more salt assessed to be in one lane than the other Wastage assessed to be less than 20%

H7.23 An example of a fair dry salt distribution is given below:

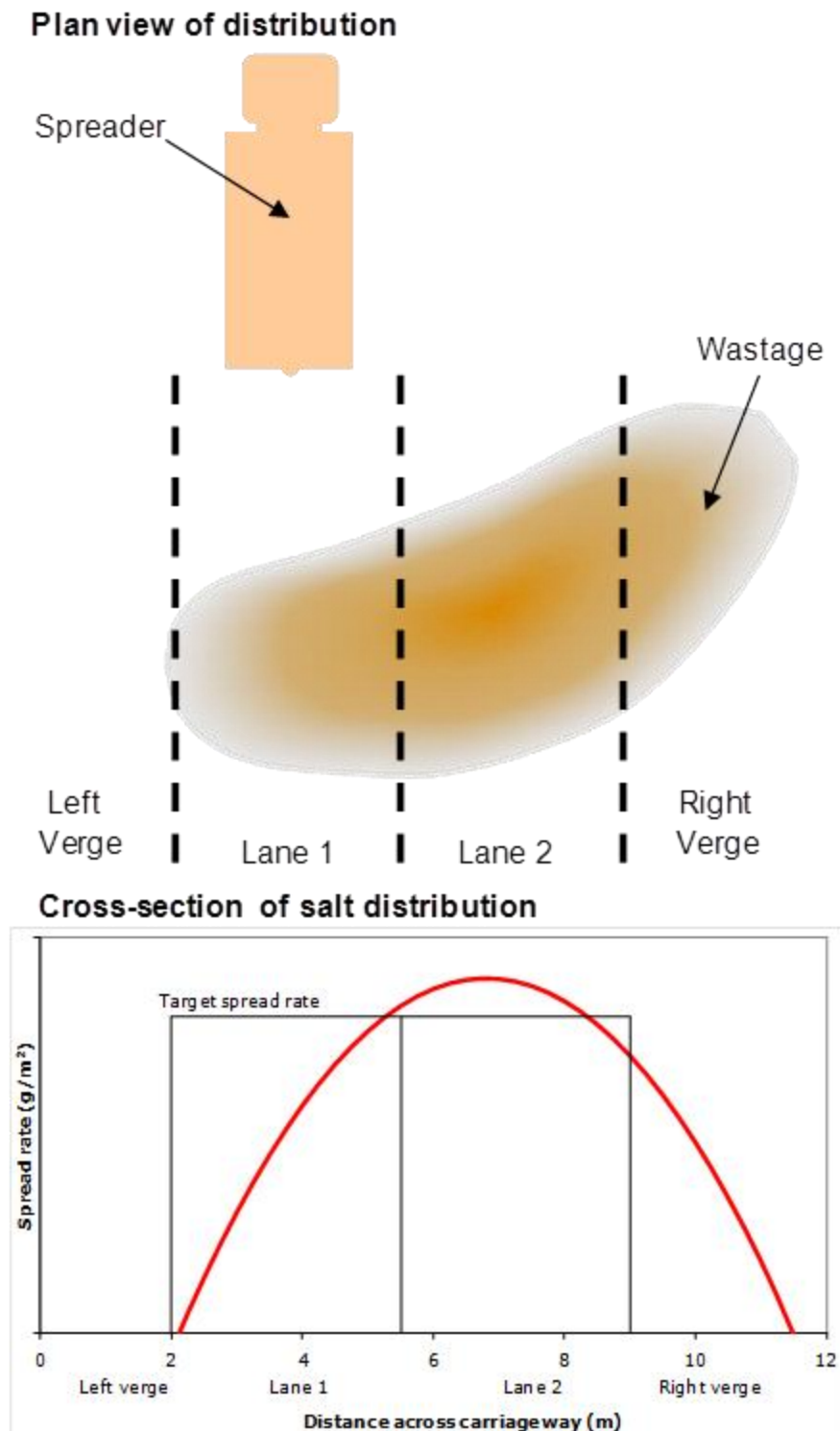


Figure H1 – Dry Salt Distribution Diagram

D. Certification

Following successful completion of the discharge tests and distribution check, a calibration certificate should be issued by the tester who should be an appropriately trained and experienced person. The calibration certificate should give details of the:

- spreader being tested;
- type and moisture content of the salt;
- amount of de-icer discharged at each spread setting;
- spread settings at which the salt distribution profile was assessed;
- approximate hopper load.

Timing of calibration

H7.24 Key recommendations – Timing of calibration:

- Spreaders should be calibrated:
 - Just before the start of the season
 - Mid-season
 - Whenever significant changes in performance are noted
 - Whenever significant changes are made to the spreader (maintenance, repair, etc.)
 - When salt type or condition changes

(Recommendation RH.22)

H7.25 Every spreader should be calibrated before each winter season commences. The end of September is recommended as a suitable time for carrying out pre-season calibration and this can also be incorporated into any training or route familiarisation for new drivers. A mid-winter calibration is also recommended.

H7.26 Calibration should also be carried out when

- A different type of salt is to be spread
- The moisture content of the salt to be spread differs by more than 1.5% from that used in the original calibration
- Changes have been made to the spreader that would affect salt delivery e.g. after servicing, repair, replacement of key parts, etc.

- Monitoring of spreader performance has indicated a potential problem (see H7.24)
- If and when any concern is raised by the salting vehicle driver or other winter service personnel regarding spread rate and/or distribution
- If a vehicle collision or a series of less severe incidents occur on a treated route where icy/frosty/snowy conditions have been reported (attributable to road surface conditions) and there are concerns/allegations regarding the salt spread rate and/or distribution

Monitoring spreader performance after calibration

H7.27 Key recommendations – Monitoring spreader performance after calibration:

- Spreader performance should be routinely monitored throughout the season
- Spreaders should then be recalibrated when any significant change in the spreaders performance is noted
- Regular spreader checks should form part of the Winter Service plan
- Recalibration should always be instigated where the performance checks show this is required

(Recommendation RH.23)

H7.28 Once calibrated, spreader performance may change as a result of many factors. As well as physical changes to the spreaders, there may be variations in the condition of the salt, which will impact on the amount spread and its distribution. For example, during a severe winter, supplies of UK indigenous rock salt may be delivered straight from the mines and are likely to be drier than any weathered supplies obtained previously. Furthermore, salt supplies obtained from other depots or strategic stockpiles are likely to differ from the salt utilised during calibration. Therefore, spreader performance needs to be monitored and recorded so that re-calibration of spreaders can be carried out where necessary.

H7.29 After calibration, the amount of de-icer being spread on each route should be monitored continuously through a defined and robust process. Where incorporated as a routine procedure, this provides a quick and easy method of checking the spreader performance in terms of discharge rate (although not the distribution).

H7.30 There should be a target amount for each route and each spread rate used. The amount spread during each treatment should be continuously monitored throughout the winter season against the target amount for that route and spread rate.

H7.31 A suggested method of monitoring performance is as follows: For each treatment, the spreader should be weighed before and after spreading to measure the amount of salt (and brine for pre-wetted salt) discharged (the amount of fuel used will need to be factored in to the target amount or fuel topped up before weighing). For spreaders with onboard weighing, the difference in weight before and after

should be logged. Weighing should be carried out with the spreader stationary and on level ground. (Clearly weighing needs to be done before unloading any surplus/excess salt).

H7.32 Acceptable upper and lower limits for the amount of salt being spread should be agreed e.g. $\pm 10\%$ of the target amount. A procedure should be in place to investigate spreaders when their performance falls outside the acceptable range. This should include:

- Confirming that the correct spread rate, spread width and treatment length was used for any treatment where there was a discrepancy
- Confirming that no unaccounted for additional spreading was undertaken, e.g. spot treatments, etc.
- Confirming that the spreader is in working order – i.e. the spreading mechanism is not damaged or contaminated
- Confirming that there has been no tunnelling
- Confirming that the equipment was operated to instruction by a trained operative

If these checks cannot explain any discrepancies, re-calibration is required. An example process to follow is given below

H7.33 Carry out checks in the following order, look for the simplest answer first. If the answer to any of the questions below is “no” carry out remedial action and consider if recalibration is required where appropriate:

1. Check the spread settings:
 - Incorrect spread rate and spread width?
 - Correct setting for the salt type being spread?
 - Confirm with driver correct operation of vehicle?
2. Issues during the spread run:
 - Spreading was over correct length?
 - Spreader was not continually operated in burst mode?
 - Salt was not spun off before returning to depot?
 - No reported tunnelling during spread run?
3. Check spreader operation:
 - Damage to the hopper or spreading mechanism?
 - Contamination of the hopper or spreading mechanism?

- Obstruction of the hopper or spreading mechanism?

H8 CONSIDERATIONS FOR PRECAUTIONARY TREATMENTS

Salt type, grading and condition

- H8.1 Guidance on salt type, quality, grading and condition are provided within previous sections of Appendix H.

Salt spreaders

- H8.2 The amount of salt spread and the uniformity of the salt distribution (also considering any wastage) are dependent on the performance of the spreader. High performing spreaders achieve spread rates and distributions close to the target amount but less accurate spreaders need to spread more salt to ensure that the target area receives the correct amount of salt. Less salt is needed to ensure target spread rates are achieved for spreaders that deliver salt accurately than those that spread unevenly and/or with high wastage. If spread rates are accurate and salt remains on the surface through the period required, relatively little salt is needed for precautionary treatments in marginal conditions. Even if the performance of the spreader does not meet a good standard, it may be possible to reduce spread rates in marginal conditions provided minimum target rates are achieved. However, it is essential that the guidance given in this section is followed closely and risk properly managed.

Salting technology

- H8.3 Guidance is provided within previous sections of Appendix H on considerations for dry, treated and pre-wetted spreading.

Weather and road surface conditions

- H8.4 Key recommendations – Weather and road surface conditions:
- Accurate forecasting of road and weather conditions will allow spread rates to be optimised and give decision makers confidence in selecting the lowest spread rates for those forecast conditions
 - Information should be obtained concerning predicted precipitation type, intensity and timing, as well as the predicted road surface temperature in order that the timing of treatments and spread rates can be optimised
 - Weather stations and live data should be used when possible
 - Forecasts and treatments based on climatic domains (where practical) may enable more efficient and economic spreading
 - When the weather and road surface conditions are suitable, consideration should be given to treating only the known wet and cold spots, rather than full routes. However, when undertaking 'spot' treatments such as these, good records need to be kept regarding which locations were treated, when they

were treated, why they were treated and the spread rate used. These records should be used to aid future decision making in similar conditions

- Highway drainage systems need to be adequately maintained to prevent water ponding or flowing on to the road. Information concerning locations where water is flowing onto the highway or failing to flow away from it should be reported to the appropriate maintenance team for remedial action and/or the erection of temporary warning signs
- Higher spread rates should be used in high wind (greater than 20mph average wind speed) if wind compensation of the spreader settings is not possible

(Recommendation RH.24)

H8.5 The amount of salt required to prevent ice formation is dependent on the amount of water present at the road surface as well as road surface temperature. Good drainage of roads is therefore important to reduce the amount of salt needed to be spread. Provided there is effective drainage, the amount of water at the road surface decreases rapidly after rainfall and the action of traffic also assists in this process. If a road surface is well drained and has been trafficked for several hours after rainfall, relatively little water will be present at the road surface.

H8.6 **Warning - Weather and road surface conditions:**

- A very significant quantity of salt is required to prevent freezing if water has ponded on or is flowing across a road surface. Spreaders can be operated in blast mode, but this is often insufficient to prevent freezing. N.B. Approx. 100g/m² of rock salt is required to prevent the freezing of water of depth 2.5mm (or 1kg/m² for 25mm of ponded water) at road surface temperatures down to only -2°C. Where water is flowing onto the carriageway (or up through porous surfacing, cracks, etc.) it will remove the salt solution. Thus spreading at high rates or in blast mode may be ineffective no matter how much salt is spread.

(Warning 6)

Effect of types of surfacings

H8.7 Different surface course types may affect the level of treatment required and may present problems with drainage of water either to or from the road surface

H8.8 Some surfacing materials, including porous asphalt, “negative texture” thin surfacings, multiple surface dressings and micro surfacings, exhibit different texture, drainage and thermal characteristics from conventional positively textured surfacings such as Hot Rolled Asphalt.

H8.9 Thin surfacings are a textured surface course generally less than 40mm in thickness (as defined in HD 37/99).

H8.10 Porous asphalt surfacings have a higher permeability and allow increased flow of water through the surface.

- H8.11 The air voids content of these surfacings are such that drainage may occur within them. Water may flow through these voids carrying away salt solution. Water may also appear at the surface where there is a barrier to flow such as a joint, this may create areas of particular difficulty in preventing ice formation.
- H8.12 Evidence has shown that the effect of residual salt on the carriageway is reduced for such surfacings, particularly in areas of low traffic and therefore should not be relied upon. Higher spread rates and more frequent treatments may be required than on positively textured dense surfacings such as hot rolled asphalt or some surface dressings.

Porous asphalt

- H8.13 Key recommendations – Porous Asphalt:

- Porous asphalt surfacings require particular attention
- Precautionary treatment rates at least 25% higher should be considered for porous asphalt
- Since porous asphalt cools more rapidly than denser surfaces, treatments should be made in good time to avoid ice forming, These treatments must also remain effective for longer as porous asphalt is slower to warm
- Spread rates should be increased for a distance of at least 100m before a change from dense surfacing to porous asphalt and, after a contiguous section of porous asphalt, the spread rate should remain at the elevated level for at least 1km after the surface change. ; The distance can be shorter than 1km with a low level of traffic. This is due to a reduction in the amount of salt carried forward by traffic from the porous asphalt to the dense surfacing

(Recommendation RH.25)

- H8.14 In winter conditions, porous asphalt can reach temperatures up to 2°C lower than denser surfaces. In areas that cannot drain freely, porous asphalt stays wetter for longer than positively textured dense surfacings (such as hot rolled asphalt). This increases the risk of ice formation and consequently more salt is needed to keep porous asphalt free from ice.
- H8.15 Water may drain through the surface and rise to surface level at joints, discontinuities or low spots creating ponding. Such areas require particular attention (see Warning 6)
- H8.16 Salt in solution may flow away from the road through the surface requiring consideration of additional treatments where this is known to occur.
- H8.17 Water, salt solution and salt grains will enter the voids. Salt in solution will drain towards the lower parts of the carriageway, but some salt, water and brine may be retained in the voids. Salt in solution may be 'pumped' back to the surface by the action of traffic, but this effect cannot be relied upon because of the uncertainties involved. When water or weak brine solution are 'pumped' back to the surface it has the potential to freeze; also ice 'mushrooms' may form in the pore structure when insufficient salt is present.

H8.18 Salt can be transported for over one kilometre along a dense surfacing due to the action of traffic, but this action does not occur to the same extent on porous asphalt because de-icers are largely retained in the voids of the porous surface. Thus there is a tendency for sections of dense surfacings following sections of porous asphalt to lose de-icer over time (due to the action of traffic) which is not replenished because of the absence of the tracking effect from the porous asphalt.

Negatively textured thin surfacing other than porous asphalt

H8.19 Key recommendations – Negatively textured thin surfacings:

- The spread rate for negatively textured thin surfacing (other than porous asphalt) should remain as for hot rolled asphalt (see Treatment Matrices A to C)
- Winter service practitioners should aim to apply treatment as close as possible to the forecast time of freezing, within the limits of practicality
- The common practice of applying treatment during the early evening to protect against a forecast of ice forming in the early hours of the following morning may not be economical or effective. Where this practice is employed, accurate historical records of the decision making process are important to provide confidence that appropriate levels of service are met. These records should be used to aid future decision making in similar conditions.

(Recommendation RH.26)

H8.20 Negatively textured thin surfacings generally exhibit thermal characteristics between those for positively textured surfacing and porous asphalt. It is unlikely that most thin surfacings will cool as quickly to as low temperatures as porous asphalt.

H8.21 As with porous asphalt, salt tends to become trapped in the surface voids. For the trapped salt to become effective, it must be dissolved and be drawn to the surface by the action of tyres. For heavily trafficked roads, an amount of residual salt may remain on the surface to combat ice formation. On lightly trafficked roads, salt is more likely to be retained in the surface voids and thus not be effective.

H8.22 Significant amounts of water can be retained in some thin surfacings. This is more likely to constitute a problem where the carriageway:

- has limited crossfall
- is on a shallow incline
- is wide, with multiple traffic lanes

In particular, water can pond where there is inadequate drainage, and where the flow of water through the surfacing is impeded by surfacing of lower porosity or joints. There is an increased likelihood of a layer of ice forming on the surface where water has ponded; a significant amount of salt may be needed to form a salt solution of sufficient concentration to prevent freezing. (see Warning 6)

- H8.23 As for porous asphalt, when water retained in thin surfacings is ‘pumped’ back to the surface it has the potential to freeze. Also, ice ‘mushrooms’ may form in the pore structure when insufficient salt is present.

Concrete road construction

- H8.24 Care is needed for concrete carriageways. Concrete roads will tend to retain heat in their core for longer than HRA roads due to their dense construction and at times this can lead to slightly warmer road surface temperatures than bituminous constructions in the same conditions. However, after a prolonged cold spell they also tend to be slower to warm and can be colder than other bituminous construction roads in the same weather conditions.

Residual salt

- H8.25 Key recommendations – Residual salt:

- Before reducing treatment because of the amount of salt already present on the network, Authorities must satisfy themselves that residual salt levels are adequate and it is crucial that the information utilised regarding this issue is accurate.
- Residual salt levels should only be taken into account for routes where good information is available, conditions are favourable and historical evidence has been gathered to support decision making. It is important that the possible variation of residual salt levels over the whole length of treatment routes is considered
- Reliance should not be placed on residual salt levels on negatively textured thin surfacing
- Less reliance should be placed on residual salt levels as lower spread rates are introduced
- Whilst normally providing useful information regarding conditions, residual salt measurements from roadside weather stations should be treated with caution
- For decision making purposes, residual salt readings (or calculated ‘Freezing Temperatures’) from individual sensors should not be solely relied upon, and other information such as knowledge of previous salting operations, actual weather and road conditions during the intervening period etc. should also be utilised. Furthermore, it is recommended that this information is supplemented by visual inspection.
- It is important that good records are kept on the decision making process involved in determining the effect of residual salt on spreading operation and rates.

(Recommendation RH.27)

- H8.26 Residual salt may build up on road surfaces if there are treatments on successive days without precipitation in the intervening period and traffic levels are not high. To reduce the number of treatments and minimise spread rates, residual salt

levels should be considered when possible

- H8.27 If residual salt levels are high, consideration should be given to either reducing the spread rate for the next treatment or not making a treatment. Accurate measurement and assessment of the overall residual salt level and a careful risk assessment are required.
- H8.28 The potential to either reduce spread rates or not make a treatment is greatest on marginal nights. This decision depends on the spread rates for the previous treatments and the weather and road surface conditions. Primarily, it is dependent on the accurate assessment of overall residual salt, good knowledge of the routes in question to understand where the minimum residual levels may be and the experience of the decision maker in this area.
- H8.29 Residual salt sensors are only effective when water is present on the sensors and road surface. Some Authorities have correlated a measured reading with the protection to a specific temperature in order to assess top-up rates.
- H8.30 Accurate records of the decision making process are always important and particularly when residual salt is taken into account. They provide essential evidence in defending claims where an incident has occurred.

Traffic levels

- H8.31 Key recommendations – Traffic levels:
- Actual traffic levels should be used
 - Where actual traffic levels are not known the decision making process should consider both the low/medium and high traffic levels, then take the highest spreading rate applicable for the known conditions
 - Spreading in heavy traffic should be avoided where possible as conditions for spreading will be less than optimal
 - Spreading carried out at a time of lower traffic will help reduce losses before the salt has dissolved
 - Ideally, there should be reasonable trafficking after spreading to facilitate dissolution, especially when spreading dry salt and even more so for dry 10mm salt
 - Treatments after rainfall should be delayed to allow traffic to disperse as much water as possible, when operational considerations and the weather allows
 - Treatments on roads with low traffic may need to be increased or carried out earlier to allow sufficient time for dissolution to take place before the forecast conditions.

(Recommendation RH.28)

- H8.32 The effects of traffic on precautionary salting are significant and therefore must be considered carefully in the decision making process.

- H8.33 Actual traffic levels should be used in the decision making process and these may vary between “Before Spreading”, “At Spreading”, “Immediately after Spreading” and during “Forecast Conditions”. (N.B. At times one or more of the latter 3 may be part of the same time period). Where actual traffic counts are not available figures may be based on route and time specific estimates.
- H8.34 For purposes of simplification and the issues involved in accurately estimating traffic across any part of the network and at any time, this guidance considers only two levels of traffic:
- Heavy - 250 vehicles per hour per lane or more
 - Low/Medium – up to 250 vehicles per hour per lane
- H8.35 The two levels of trafficking have been based on loss of de-icers observed in trials. Thus heavily trafficked roads and medium/light trafficked roads, in terms of de-icer spreading, bear no relation to the actual or theoretical traffic capacities of the roads. Research shows that de-icer losses do not increase significantly for traffic levels beyond 250 vehicles per lane per hour.
- H8.36 Average Daily Traffic levels (ADT), or similar categorisation must not be used. Also traffic levels associated with Road Hierarchy, Road Category, etc. must not be used.
- H8.37 See Table H8 for a summary of the effects attributable to differing traffic levels before, during and after salting.
- H8.38 Salt may be deflected by vehicles or vehicle draughts and not reach all of the target area when spreading in heavy traffic.
- H8.39 Salt may be removed from the road by the action of tyres and vehicle drafts (drafts are more of an issue for dry salting or pre-wet salting in dry and windy conditions)
- H8.40 Whereas trafficking can help to redistribute salt from the well-salted to the under-salted areas, the redistribution may be insufficient and should not be relied upon, especially when spread rates are low. Trafficking may also remove salt from an under salted area exacerbating the situation.
- H8.41 Where practical, when frost and ice weather conditions are forecast and humidity conditions are beneficial to dissolution, spreading is preferable at a time when the amount of traffic within the first hour after spreading is lower. (This is because the rate of loss of salt from the target area through trafficking is likely to be higher before the salt has dissolved, particularly for dry salting).
- H8.42 In heavy traffic conditions spreading may be compromised by de-icer being deflected by vehicles or moved by vehicle drafts. In slow moving and stop/start conditions spreading is unlikely to be optimal.
- H8.43 When spreading in heavy traffic, losses due to trafficking will tend to be higher when dry salting and particularly if the road is not sufficiently damp to retain the smaller salt particles or hasten the dissolution of the salt.
- H8.44 The precautionary spreading of salt during peak traffic flow periods should be

avoided whenever possible. In emergency or snow conditions (forecast and actual), appropriate salting should be arranged to be carried out outside of peak flow periods however, there will be times where this is unavoidable due to weather and/or network conditions. If precautionary treatment in heavy traffic is unavoidable it may be necessary to implement additional measures to aid the passage of spreaders and/or to consider treatment in two runs to ensure proper distribution of the de-icers.

- H8.45 Trafficking breaks up the salt particles and aids their dissolution provided there is sufficient moisture present.
- H8.46 Trafficking displaces water from the road surface. Treatments after rainfall should be delayed as long as possible to enable the amount of water present to reduce so less salt is needed to prevent ice formation.
- H8.47 It may be necessary to undertake treatments when roads are dry and atmospheric humidity is low. Dissolution in these conditions will be slow, particularly when dry salting and traffic flow is light after salting. Although the rate of loss may be lower under these circumstances. Such conditions require consideration of increasing the amount of salt spread and/or earlier treatment, in order to allow the salt more time to enter solution.

Table H8 – Effect of trafficking (read in conjunction with notes above for details)		
Traffic Level & Timing	Pros	Cons
Before treatment High	Removes water from wet road surfaces Reduces water film thickness on damp roads	None
Before Treatment Low/Medium	None	Little water removed from a wet road surface Higher water film thickness for damp and wet roads
At Treatment High	None	May deflect salt from target areas, vehicle draughts may remove salt from road, particularly in dry conditions. Operation of spreader may be less than optimal in slow moving or stop/start conditions
At Treatment Low/Medium	Little loss due to traffic Salt spreading unhindered by vehicles adjacent to spreader	None
Shortly After Treatment High	Will help dissolution by crushing salt grains and reduce loss due to wind	Much salt may be removed from road by tyres and vehicle draughts before it enters solution
Shortly After Treatment Low/Medium	Less losses due to traffic	Dissolution may be slow particularly for dry roads and low humidity conditions. Some salt will be removed from the road before dissolution takes place.

H9 DECISION MAKING

General

- H9.1 Appropriate spread rates and treatment times can only be determined with accurate forecasting of road and weather conditions. Timing of treatments and spread rates will be dependent on predicted precipitation type, intensity and timing, as well as the predicted road surface temperature.
- H9.2 Many Authorities operate over a network that covers more than one climatic domain. By using domain-based forecasting, consideration can be given to using different spread rates in different domains or partial network treatment to provide a more economical service where practical. Route-based forecasting can also help assist in the route design and decision making for such an approach. Such an approach may assist in reducing the amount of salt used by the Authority.
- H9.3 When the actual and predicted weather and road surface conditions are suitable, consideration can be given to treating only the known wet and cold spots, rather than full routes. Route assessment with drivers, highway maintenance records and third party reports can all assist in identifying sections of road where the carriageway suffers from run-off from beyond the highway boundary. Such causes can include changes in agricultural practice. Problematic locations can be identified and further actions such as mitigation or enforcement to resolve the underlying issues should be considered. However, when undertaking 'spot' treatments, good records must be kept regarding which locations were treated, when they were treated, why they were treated and the spread rate used.
- H9.4 Use should be made of all available sensor and camera information.
- H9.5 Patrols to inform treatment decisions could be introduced. These can aid decisions on focused treatments and help in making the best use of salt stocks by providing information to decision makers of problem sites, visual assessment of road wetness and residual salt levels etc. Trained and experienced patrols and/or scouts can provide useful information that significantly assists the decision making process. However, they are usually not in possession of all of the information available to the nominated decision maker regarding predicted conditions and/or the conditions being experienced and the actions being taken across the wider road network. Therefore, it is important that patrols and/or scouts are only used carefully to supplement the decision making process, rather than to replace it.
- H9.6 In conducting the annual review recommended in Section 13 it can be useful to investigate individual "marginal" forecasts experienced during previous seasons and to consider whether decision making and the data provided for that decision making could be improved in the future. This process can provide information to aid decision making in future "marginal" situations and can provide economies if future unnecessary treatments are avoided.
- H9.7 A suggested decision making process, taking into account various operational scenarios, is provided in this section. This may be modified as necessary to suit local circumstances within the bounds of legislative requirements and delivering an effective service.

H9.8 Decision makers should be suitably trained and experienced and fully competent to make the winter service decision across the full range of conditions that may be met in a winter season.

- They should have a thorough understanding of the local network and any temporary or permanent conditions that may require particular consideration in delivering the service.
- They should have a sufficient understanding of the technical process to determine how changes in de-icer, de-icer condition, spreading capability and late changes to weather, road or traffic conditions may impact the level of service delivered.
- They should undertake appropriate training and certification where this is available.

Precautionary Treatment Decision Matrix

H9.9 A suggested decision matrix for precautionary treatments based on road surface conditions and predicted weather conditions is given in Table H9.

Table H9 – Sample Precautionary Treatment Decision Guide				
Road Surface Temperature	Precipitation	Predicted Road Conditions		
		Wet	Wet Patches	Dry
May fall below 1°C	<u>No</u> rain <u>No</u> hoar frost <u>No</u> fog	Salt before frost	Salt before frost (see note a)	No action likely, monitor weather (see note a)
Expected to fall below 1°C	<u>No</u> rain <u>No</u> hoar frost <u>No</u> fog			
	<u>Expected</u> hoar frost <u>Expected</u> fog	Salt before frost (see note b)		
	<u>Expected</u> rain BEFORE freezing	Salt after rain stops (see note c)		
	<u>Expected</u> rain DURING freezing	Salt before frost, as required during rain and after rain stops (see note d and H11.35)		
	<u>Possible</u> rain <u>Possible</u> hoar frost <u>Possible</u> fog	Salt before frost		Monitor weather conditions
<u>Expected</u> snow (See H11.35)		Salt before snow fall		
<p>The decision to undertake precautionary treatments should be, if appropriate, adjusted to take account of residual salt.</p> <p>All decisions should be evidence based, recorded and require continuous monitoring and review.</p> <p>Decision on treatment timing should account for traffic and road surface wetness at time of treatment and after, as well as forecast conditions.</p>				

Notes:

- (a) Particular attention should be given to the possibility of water running across or ponding on carriageways and other running surfaces e.g. off adjacent fields after heavy rains, washing off or diluting salt previously deposited. Such locations should be closely monitored and may require treating in the evening and morning and possible other occasions. See Warning 6.
- (b) When a weather warning contains reference to expected hoarfrost, considerable deposits of frost may occur. Hoarfrost usually occurs in the early morning and is

difficult to cater for because of the probability that any salt deposited on a dry road too soon before its onset, may be dispersed before it can become effective. Close monitoring is required under this forecast condition which should ideally be treated just as the hoarfrost is forming. Such action is usually not practicable and salt may have to be deposited on a dry road prior to and as close as possible to the expected time of the condition. Hoarfrost may be forecast at other times in which case the timing of salting operations should be adjusted accordingly.

- (c) If, under these conditions, rain has not ceased by early morning, crews should be called out and action initiated as rain ceases.
- (d) Under these circumstances rain will freeze on contact with running surfaces and full pre-treatment should be provided even on dry roads. This is a most serious condition and should be monitored closely and continuously throughout the danger period. Authorities should be aware of the health safety implications of ice forming during freezing rain events, both to the travelling public and winter maintenance personnel carrying out treatments. They should be prepared to make follow up treatments on any ice that has formed or to take suitable actions such as road closures.
- (e) By using domain-based forecasting, consideration can be given to differing actions from each depot.
- (f) Where there is any hint of moisture being present, a pessimistic view of the forecast should be taken when considering treatment to negatively textured surfaces. See Warning 6
- (g) Spreading salt alone at temperatures below about -7°C (the lower of air or road surface at time of spreading) or below about -5°C in low humidity conditions (relative humidity less than 80%) may not be practically effective. High spread rates will be required and even then salt may not enter solution quickly enough to prevent freezing or be able to melt ice or compacted snow. Consideration should be given to spreading at least 2 hours before the temperature reaches these values to allow salt to enter solution, or the use of alternative de-icers. See Section H12.

Road Surface Wetness

- H9.10 For the purpose of allocating treatments a distinction is made between dry, damp and wet road surfaces. Definitions for use when making treatment decisions are given in Table H10. These may be used in conjunction with direct measurements of water film thickness and data from weather forecasts to determine when a road is damp or wet.

Table H10 – Road Surface Wetness		
Definition	Description	Water film thickness (mm)
Dry road	A road that shows no signs of water or dampness at the surface but may be just detectably darker (however it may have moisture contained in pores below the surface that is not 'pumped' to the surface by traffic)	0 to 0.03mm
Damp road	A road which is clearly dark but traffic does not generate any spray. This would be typical of a well-drained road when there has been no rainfall after 6 hours before the treatment time.	0.03 to 0.05mm
Wet road	A road on which traffic produces spray but not small water droplets. This would be typical of a well-drained road when there has been rainfall up to 3 hours before the treatment time.	0.05 to 0.1mm

H10 TARGET SPREAD RATES OF SALT FOR PRECAUTIONARY TREATMENT

General

H10.1 Key recommendations – Target spread rates for precautionary treatment:

- When precautionary treatments are carried out, sufficient salt should be spread, based on the forecast conditions, to prevent frost and ice formation and/or to prevent ice or snow from bonding to the carriageway
- Spread rates should be kept as low as possible for the forecast conditions, routes and road surfaces considered. This is in order to optimise salt usage, improve stock resilience, and reduce the impact of salt on vehicles, infrastructure and the environment
- **(Recommendation RH.29)**

H10.2 The majority of winter service treatments in the UK are precautionary in nature and in response to predicted frost and ice conditions.

H10.3 Those conditions where expected road surface temperatures are close to zero (just above or below) are termed marginal. In these situations significant salt savings can be achieved using the rates given in this guidance when:

- Spreader performance is good and in-calibration
- Salt is in good condition

- The type of salt is the same and salt moisture content is within 1.5% of that when the spreader was calibrated, and when this is also within the optimum range, see H7.23
 - Salt distribution in the target area is within acceptable defined limits, see H7.18
 - Losses during spreading and wastage are within acceptable defined limits
- H10.4 Spread rates for precautionary treatments are given in this section for dry, pre-wetted and treated salting for a range of weather and road surface conditions.
- H10.5 The use of pre-wetted or treated salt can provide salt savings compared to dry salting. Thus providing service efficiencies and increased resilience, whilst having less detrimental impact on the environment, vehicles and infrastructure.
- H10.6 There are a number of key factors which determine appropriate treatment spread rates. This section provides guidance on how to consider each factor when deciding which spread rate to use. The key factors which determine the appropriate spread rate are:
- The type, grading and moisture content of the salt
 - Whether the spreader is accurately calibrated for the salt being used
 - The performance and serviceability of the spreader
 - The type of salt and salting technology (e.g. dry, pre-wetted, treated salting)
 - The weather forecast and forecast road surface conditions
 - The weather and road surface conditions during and after spreading
 - The residual salt levels on the highway
 - The level of trafficking before, during and after spreading
 - The type of surfacing
 - Other factors associated with the nature of the local road network, such as the presence of slopes, and highway drainage provision, etc.

Spread rate decision making

- H10.7 Recommended spread rates for dry, pre-wetted and treated precautionary treatments are provided in Treatment Matrices A to C. Authorities should select the appropriate Matrix column for each route based on an assessment of the following 3 factors as shown in Table H12:

- Salt distribution **Good/Fair/Poor**
- Traffic level **Low/Medium or High**
- Salt loss immediately after spreading **Normal or High**

H10.8 The determination of these factors may vary for a number of factors, these include:

- different climatic domains,
- different routes,
- different spreaders,
- accuracy of calibration or time since last calibration,
- different salt types,
- different salt condition,
- different stocks/deliveries of the same salt type,
- time of spreading,
- traffic levels at time of spreading,
- traffic levels after spreading,
- road surface types.

Therefore a one size fits all approach will not provide the benefits outlined above.

H10.9 The final decision on the correct matrix column will be dependent on the factors above and others that must be confirmed, either as continuing from previous assessments or newly assessed, each time a new treatment is required. Prior to commencement of the winter season, assessment can be made of the spreader performance following calibration.

H10.10 The decision maker should recognise that circumstances or conditions may change following the original treatment decision for a single or multiple treatments and the decision making process should be revisited when necessary.

The Treatment Decision Making process

H10.11 The following checklists are designed as a quick reference for the delivery of the Treatment Decision. They should be read and used in conjunction with the detailed guidance and information given in this Appendix.

H10.12 Decision Making Checklist H1 “In advance of forecast” can be used to prepare for the winter season as well as be used in season to confirm that the data has not changed and take action where necessary outside of the individual treatment decision making process required for a weather event.

- H10.13 Using this process, when the treatment decision is made it is only necessary to confirm that the base data/parameters, that may not change at each treatment decision (such as spreaders being in calibration and salt condition remains unchanged), need be confirmed.
- H10.14 Furthermore, the number of treatment matrices and columns used within the matrix needed for a particular route can be identified possibly reducing to just one or two for most decisions.
- H10.15 Decision Making Checklist H2 “At forecast” is the part of the decision making process which is reliant on the forecast and other current conditions such as traffic level, road wetness at time of spreading and wind.

Decision Making Checklist H1 – In advance of forecast of frost		
Item	Parameters	Action
The following conditions and parameters may be assessed/determined in advance of the treatment decision but must be confirmed within the treatment decision process for each forecast		
Spreader is allocated to route	Yes/No	Check spreader is able to spread de-icer allocated for the route – if not do not use or treat as poor spreading capability and increase spread rate to next largest rate in appropriate matrix. Monitor route during and after spreading
Spreader is in Calibration	Yes/No	Use Poor Spreading capability if No providing spreader is capable of spreading de-icer to the minimum level required * ¹ .
Is the same spreading technology used as when calibrated?	Yes/No	If No confirm spreader is capable of spreading de-icer to the minimum level required * ¹ . Use spread rate matrix consistent with the actual technology to be used.
Is de-icer the same type and grading as calibration (Normal and/or extreme cold alternatives need to be considered)	Yes/No	Is spreader capable and calibrated for de-icer if Yes OK – if No do not use or treat as poor spreading capability (poor coverage) and increase spread rate to next larger rate in appropriate matrix. Monitor route after during and spreading
Has de-icer been tested within allowable period (Table H5)	Yes/No	If No reduce spreading capability (coverage) to next lesser level of capability if above Poor Capability. Take remedial action where salt exceeds maximum allowable moisture content
Is de-icer within 1.5% of calibrated m/c and not above maximum allowable m/c	Yes/No	If No reduce spreading capability (coverage) to next lesser level of capability if above Poor Capability. Take remedial action where salt exceeds maximum allowable moisture content

*¹ Note the minimum requirements for spreading capability when using the spreading matrices in this guidance must be met at all times for the rates to be valid.

Decision Making Checklist H2 – At forecast of frost or ice		
Item	Parameters	Action
The following conditions and parameters are assessed/determined when the treatment decision is being made for the forecast conditions		
Obtain forecast conditions (from forecast provider)	Temperature and precipitation	Use values to determine road surface wetness and appropriate row in spread rate matrix for salting technology for wetness and RST ^{*1}
Assess salt distribution	Good/Fair/Poor	Use results of distribution assessment if known and spreader is in calibration. Otherwise use Poor – See Flowchart H1
Assess traffic level	High/Medium	Use known traffic levels at time of/immediately after spreading. If traffic levels are not known carry out the full decision making process for both High and Medium/Low traffic levels and take higher spread rate. See Table H11
Assess road surface wetness at time of spreading	Dry/Damp/Wet Or Very Wet	See Table H10 and use appropriate value to determine both losses and spread rate for combined RST and wetness in appropriate decision matrix for salting technology used. For a very wet road (in excess of Wet as defined in Table H10 refer to Table H13 for appropriate action
Assess loss after spreading	High/Normal	Use Flowchart H2
Assess road surface wetness at forecast point	Dry/Damp/Medium	Assess from forecast of precipitation See Table H10
Assess road surface temperature	°C (from forecast) ^{*1}	Use along with road surface wetness to determine appropriate row in spread rate matrix.
Determine spread rate from appropriate spread rate matrix for technology and de-icer used	Using information assessed above	Use Table H12 to identify appropriate Matrix column. For normal or extreme cold conditions.
Check special conditions which may require increase in treatment rate, etc.	Surfacing, wind, traffic.	See Table H13
Record of decision process		Record all information and communicate to appropriate parties for service delivery, management and audit of the service.

*1 – Forecast conditions may be modified by additional historical data, thermal mapping information, sensor information and other sources of local knowledge where these are available. This should only be done where well defined processes aligned with the Treatment Decision and understanding of the information along with its impact on the decision and associated risks are understood and risks mitigated.

H10.16 Guidance is given in the following sections on how to assess all the factors required in the decision making process:

- Salt distribution (see Flowchart H1)
- Traffic level (see Table H11)
- Salt loss immediately after spreading (see Flowchart H2)

Guidance on assessing salt distribution

H10.17 For precautionary treatments, the spread rates that can be used depend upon how accurately the spreaders can distribute the salt. A simple assessment of the salt distribution as **Good/Fair/Poor** should be made during calibration

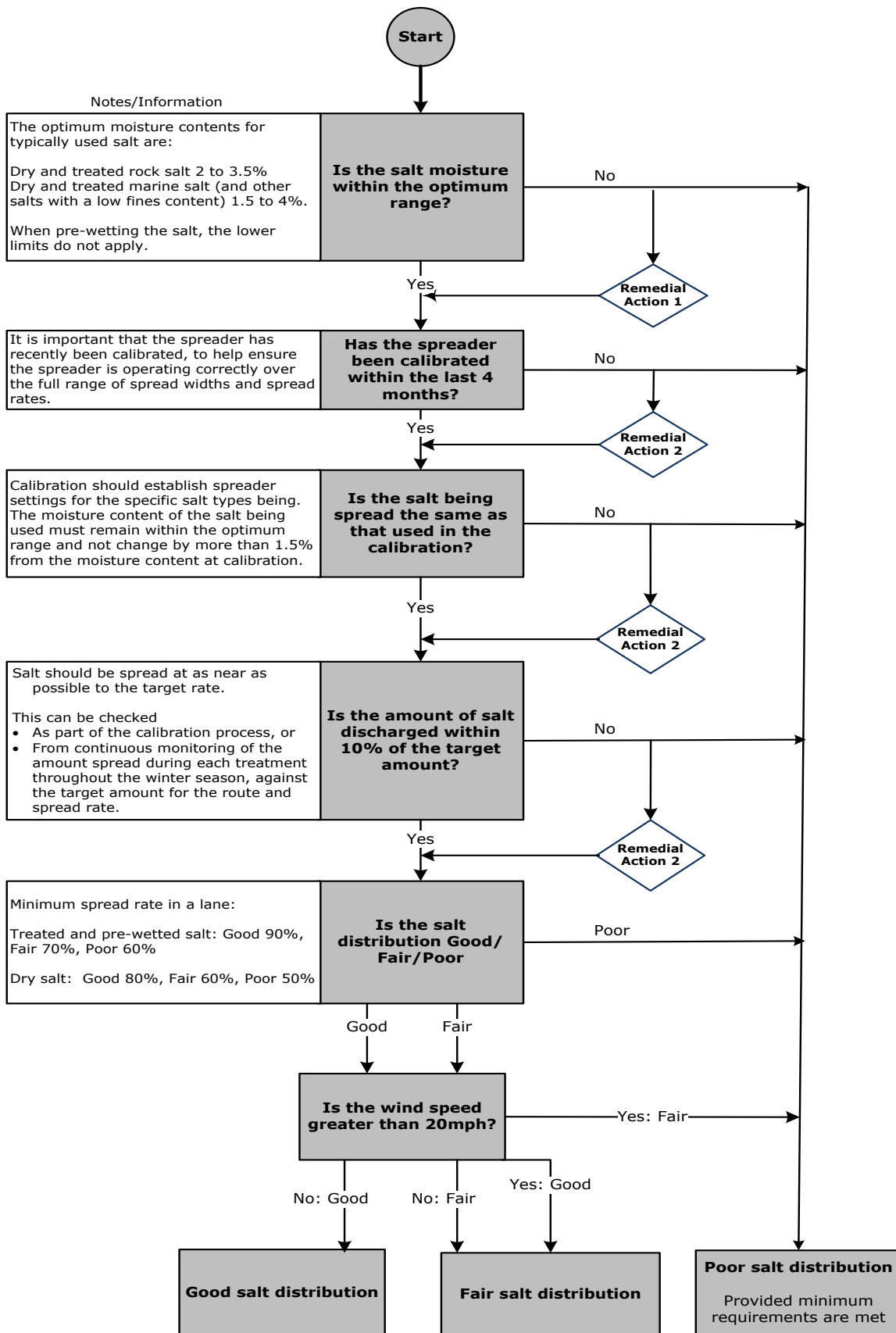
H10.18 The decision on the salt distribution is based on the condition of the salt and the spreader performance, as well as the calibration of the spreader. The flow chart H1 below provides guidance on determining whether the spreading capability can be considered as Good, Fair or Poor. It asks a number of questions relating to the condition of the salt and the calibration and performance of the spreader.

H10.19 The coverage should be reduced from 'Good' to 'Fair' or 'Fair' to 'Poor' when the wind speed is greater than 20mph and the spreader is not operated with wind compensation. In winds greater than 30mph, additional treatments may be necessary which may include continuous spreading. It is recommended that an assessment is made based on the spreader characteristics (e.g. susceptibility to poor distribution in winds or wind compensation providing ability to be set for effective asymmetrical spreading in windy conditions for the road layout and topography), road surface wetness (e.g. if the road is drying in the wind and further precipitation is not forecast, or the road is wet and the salt is less likely to be blown off the road) or the road surface is highly exposed to the wind. This assessment should firstly consider whether de-icer spreading is practical in the conditions and then consider whether an increased spread rate or continuous spreading is the appropriate decision when all circumstances are taken into account

H10.20 It is considered that 'Good coverage' will apply only to spreaders capable of high spreading accuracy and in good condition, that are correctly calibrated and whose performance is monitored regularly.

H10.21 Ideally, a Service Provider would utilise the same spreaders on the same routes. It is acknowledged that this may not be practically achievable in all circumstances. However Authorities should as far as possible use spreaders with the same performance on each route. Where spreaders are allocated to a different route than the normal, one or backup spreaders are used they must be calibrated for the salt being used or allowances made for increasing the spread rate during the

decision making process.



Note:- For wind speeds of 30mph or more refer to Section H10.19

Flowchart H1 – Salt Distribution Flowchart

H10.22 An Authority can improve its spreading capability by considering the remedial actions below.

Action 1

Mix the salt with drier or wetter salt (as appropriate to decrease or increase the moisture content). Use salt from the stockpile or from new deliveries.

A simple test for moisture is outlined in H6.69

Action 2

Calibrate the spreader using the salt being spread.

Guidance on assessing traffic levels

H10.23 Traffic levels are an important part of the treatment decision. Details are given in Section H8 and Table H11

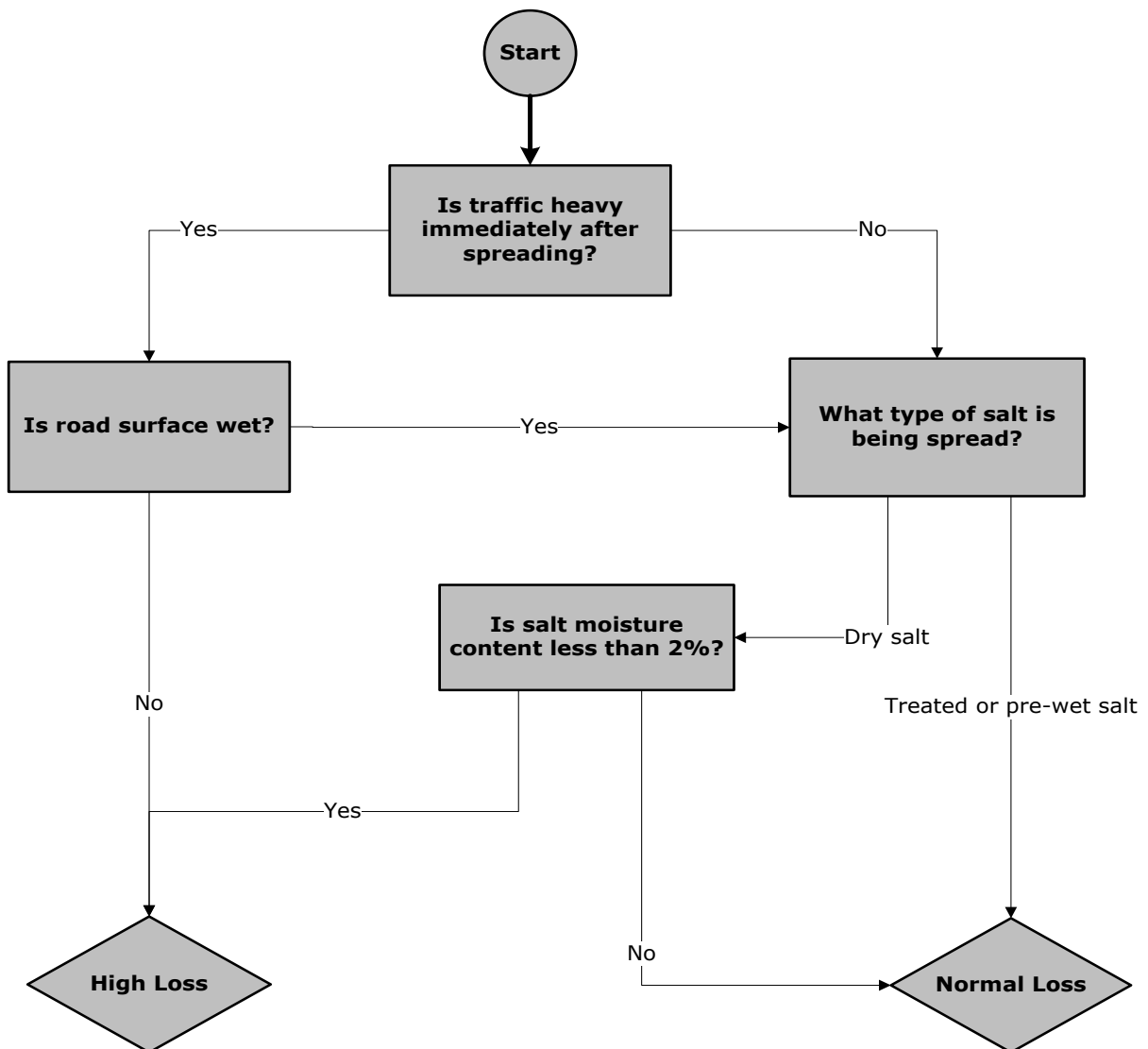
Table H11 – Traffic Level	
Level	Vehicles/hour/carriageway
Heavy	250 or more
Low/Medium	Less than 250

Guidance on assessing salt loss immediately after spreading

The salt loss immediately after spreading should be assessed as normal or high loss:

- Normal loss
Road surface is wet, or traffic is not heavy immediately after spreading
- High loss
Traffic heavy immediately after spreading and road surface dry or damp, or
If the moisture content of dry salt is less than 2% when dry salting

The flow chart H2 provides guidance on the decision making process to determine whether the salt loss immediately after spreading will be normal or high.



Flowchart H2 – Salt Loss Flowchart**Spread rate matrices**

H10.24 Authorities should select the correct Treatment Matrix and matrix column from Table H12.

Table H12 - Treatment matrix & column for different non-forecast conditions			
Spreading Technology		Treatment Matrix	
Dry Salting		Treatment Matrix A	
Pre-wet Salt Spreading		Treatment Matrix B	
Treated Salt Spreading		Treatment Matrix C	
Salt distribution	Traffic level	Losses	Treatment matrix column
Poor	High	Normal	A
Poor	High	High	B
Poor	Medium/Light	Normal	C
Poor	Medium/Light	High	D
Fair	High	Normal	E
Fair	High	High	F
Fair	Medium/Light	Normal	G
Fair	Medium/Light	High	H
Good	High	Normal	I
Good	High	High	J
Good	Medium/Light	Normal	K
Good	Medium/Light	High	L

- H10.25 The following points must be considered when using the spread rate matrices for normal conditions. If the minimum requirements set out below are not met then the service provider must take remedial action to ensure that the total amount of salt being spread is at least 90% of the target amount and wastage of salt spread outside the lanes is assessed to be less than 20% of the target amount.
1. The service provider must make adequate checks to ensure salt distribution is within 60 % of target for treated and pre-wet spreading and 50% for dry salt, for each lane for the spread rate used and that there will be no tunnelling in the spreader preventing salt reaching the discharge mechanism.
 2. The Matrices only relate to properly calibrated spreaders as outlined in Section H7.
 3. Spread rates given in the Matrices are only appropriate when spreading takes place at temperatures that ensure the salt is fully dissolved before lower temperatures are reached. Generally this is at temperatures above -5°C in low humidity conditions (below 80%) and above -7°C in normal UK winter humidity conditions (80% and above). Temperatures below these have been defined as “Extreme Cold” in this guidance. While salt **already** in solution on the road can be effective at temperatures significantly below these values it is essential that spreading operations are undertaken before temperatures fall to these levels. The absolute value considered effective for sodium chloride brine solutions is -15°C .
 4. In Extreme Cold conditions spreading should be completed at least 2 hours before the threshold temperatures of -7°C or -5°C are reached to enable the salt to enter solution provided conditions of road wetness and/or humidity are sufficient at the time of spreading to provide sufficient water. Roads should be closely monitored and consideration given to increasing the spread rate, making successive treatments or both.
 5. In Extreme Cold conditions, where spreading cannot be completed in the above time-frame or in conditions when dissolution will not occur alternative de-icers should be considered. Also, where forecast temperatures will be below -15°C , alternative de-ices should be used. (See Section H12). Where alternative de-icers are not available consideration must be given to providing clear and frequent warnings to drivers of icy conditions or roads should be closed.
 6. The spread rates are for sections of well drained roads without ponding or runoff from adjacent areas. Spread rates must be adjusted accordingly or other measures taken where appropriate
 7. The rates may be adjusted to take account of variations occurring along routes such as temperature, surface moisture, road alignment and traffic density. When single spread rates are used for each route/network (which is currently typical practice) the rates should reflect the expected conditions on all sections of that route/network.

8. The rates may be adjusted to take account of residual salt levels. However, it should be noted that residual salt levels will tend to be lower if lower spread rates are introduced. Residual salt levels are most likely to be significant on marginal nights after treatments on two or three successive days without precipitation in the intervening period.
9. On porous asphalt and on dense surfacing for 1km after a change from porous asphalt, spread rates should be increased by 50% on roads with medium traffic levels and by 25% on heavily trafficked roads.
10. Spread rates should be increased to a rate appropriate for the particular situation where negatively textured thin surfacings are poorly drained such that water can accumulate within the surface texture.
11. When the rates in the selected Matrices are significantly lower than those used previously, it is recommended that the reduction should be introduced in stages with the performance of spreaders and route condition monitored. In particular, checks should be made that the amount of salt discharged is within 10% of the target and that treatments are effective.
12. All decisions should be evidence based, recorded and require appropriate monitoring and review.
13. Where Authorities are confident of significant levels of residual salt, spread rates may be reduced by an appropriate amount based on local knowledge and experience. Care must be taken to identify any areas on a route where residual salt may not be present.

Important notes

- The spread rates for pre-wetted salt are for the total de-icer, i.e. the dry salt and the brine components.
- Matrices A to C provide the spread rates for UK Indigenous Rock Salt. Spread rates can be reduced by 5% for salts with a sodium chloride content of 99% or more such as marine salt when using spread rates of 20g/m² or above.
- It has been assumed that two treatments are required to achieve spread rates greater than 30g/m². It may be necessary and preferable to make two treatments to achieve spread rates greater than 20g/m².
- Spread rates should be increased from those given in the Matrices under the conditions shown in Table H13 below:

Table H13 - Change in spread rates	
Condition	Increase in spread rate or action
Spreading when there is no or very little traffic	25%
Porous asphalt	25%
Dense surfacing after change from porous asphalt	25% for 1km
Areas prone to surface water	See Warning 6
Spreading in very heavy traffic (e.g. peak traffic times) if unavoidable	Consider treatment in 2 runs
Spreading in high winds (greater than 20 mph)	Increase the spread rate or consider continuous spreading as detailed in Section H10.19 and Flowchart H1
Concrete roads after prolonged cold spell	25%
Spreading in low humidity (less than 80%)	Consider an additional precautionary treatment earlier in the day ^{*1}
Spreading in dry conditions in advance of heavy hoar frost	Consider an additional precautionary treatment earlier in the day ^{*1}

^{*1} The treatment should be timed to allow the maximum time for dissolution taking into account the likely losses due to traffic especially when using dry salt only.

TREATMENT MATRIX A													
DRY SALTING (De-icer spread rates in g/m²)													
Frost or forecast frost Road Surface Temperature (RST) and Road Surface Wetness	Column Cvrg Traffic Loss	A PC HT NL	B PC HT HL	C PC MT NL	D PC MT HL	E FC HT NL	F FC HT HL	G FC MT NL	H FC MT HL	I GC HT NL	J GC HT HL	K GC MT NL	L GC MT HL
RST at or above -2°C and dry or damp road conditions		8	8	8	8	8	8	8	8	8	8	8	8
RST at or above -2°C and wet road conditions		10	13	13	16	8	11	11	13	8	8	8	10
RST below -2°C and above -5°C and dry or damp road conditions		15	20	17	20	13	17	14	17	10	13	11	13
RST below -2°C and above -5°C and wet road conditions		25	2 x 17	2 x 17	2 x 20	21	28	28	2 x 17	16	21	21	25
RST at or below -5°C and above -10°C ^{*1} and dry or damp road conditions		29	2 x 19	2 x 16	2 x 19	24	32	27	2 x 16	18	24	20	24
RST at or below -5°C and above -10°C ^{*1} and wet road conditions°		2 x 24	2 x 32	2 x 32	2 x 39	2 x 20	2 x 27	2 x 27	2 x 32	30	2 x 20	2 x 20	2 x 24
Please see Table H13 for variations to the rates given above													

Key:

Cvrg: PC = Poor coverage, FC = Fair coverage, GC = Good coverage

Traffic: HT = High level, MT = Medium Level

Loss: NL = Normal loss, HL = High loss

^{*1} Refer to Section H10.21 Notes 3, 4 & 5 when spreading at temperatures at or below -5°C

TREATMENT MATRIX B													
PRE-WETTED SALTING (De-icer spread rates in g/m²)													
Frost or forecast frost Road Surface Temperature (RST) and Road Surface Wetness	Column Cvrg Traffic Loss	A PC HT NL	B PC HT HL	C PC MT NL	D PC MT HL	E FC HT NL	F FC HT HL	G FC MT NL	H FC MT HL	I GC HT NL	J GC HT HL	K GC MT NL	L GC MT HL
RST at or above -2°C and dry or damp road conditions		8	8	8	8	8	8	8	8	8	8	8	8
RST at or above -2°C and wet road conditions		8	10	12	14	8	9	10	12	8	8	8	9
RST below -2°C and above -5°C and dry or damp road conditions		13	16	16	18	11	14	14	16	9	11	11	12
RST below -2°C and above -5°C and wet road conditions		21	26	2 x 16	2 x 18	18	22	27	31	14	17	21	24
RST at or below -5°C and above -10°C ^{*1} and dry or damp road conditions		26	2 x 16	2 x 16	2 x 18	22	27	27	31	17	21	21	24
RST at or below -5°C and above -10°C ^{*1} and wet road conditions		2 x 21	2 x 26	2 x 31	2 x 36	2 x 18	2 x 22	2 x 27	2 x 31	28	2 x 17	2 x 21	2 x 24
Please see Table H13 for variations to the rates given above													

Key:

Cvrg: PC = Poor coverage, FC = Fair coverage, GC = Good coverage

Traffic: HT = High level, MT = Medium Level

Loss: NL = Normal loss, HL = High loss

^{*1} Refer to Section H10.21 Notes 3, 4 & 5 when spreading at temperatures at or below -5°C

TREATMENT MATRIX C													
TREATED SALTING (De-icer spread rates in g/m²)													
Frost or forecast frost Road Surface Temperature (RST) and Road Surface Wetness	Column Cvrg Traffic Loss	A PC HT NL	B PC HT HL	C PC MT NL	D PC MT HL	E FC HT NL	F FC HT HL	G FC MT NL	H FC MT HL	I GC HT NL	J GC HT HL	K GC MT NL	L GC MT HL
RST at or above -2°C and dry or damp road conditions		7	7	7	7	7	7	7	7	7	7	7	7
RST at or above -2°C and wet road conditions		7	8	10	11	7	7	8	10	7	7	7	7
RST below -2°C and above -5°C and dry or damp road conditions		10	13	12	14	9	11	11	12	7	9	8	10
RST below -2°C and above -5°C and wet road conditions		17	21	24	28	15	18	21	24	11	14	16	19
RST at or below -5°C and above -10°C ^{*1} and dry or damp road conditions		19	24	23	27	17	21	20	23	13	16	15	18
RST at or below -5°C and above -10°C ^{*1} and wet road conditions		2 x 16	2 x 20	2 x 23	2 x 27	2 x 14	2 x 17	2 x 20	2 x 23	22	27	30	2 x 18
Please see Table H13 for variations to the rates given above													

Key:

Cvrg: PC = Poor coverage, FC = Fair coverage, GC = Good coverage

Traffic: HT = High level, MT = Medium Level

Loss: NL = Normal loss, HL = High loss

^{*1} Refer to Section H10.21 Notes 3, 4 & 5 when spreading at temperatures at or below -5°C

H11 TREATMENTS FOR SNOW, ICE AND FREEZING RAIN

General

- H11.1 It is impractical to spread sufficient salt to melt more than very thin layers of snow and ice. Ploughing is the only economical, efficient, effective and environmentally acceptable way to deal with all but light snow.
- H11.2 Drainage should not be obstructed when ploughing snow. Windrows or piles of snow should be positioned to allow drainage system to function or be removed. Where necessary snow should be removed to prevent melt water overloading of drainage systems or running back into the carriageway.
- H11.3 The salt distribution profile determined during calibration is most relevant to precautionary treatments when salt can bounce across the road surface. When slush, snow or ice is present, unless the spread width setting is increased, salt distribution will tend to be restricted to a narrower width as a result of the salt not 'bouncing' across the road surface. Therefore, when spreading on snow or slush, the spreader settings should be adjusted to achieve the required spread width.
- H11.4 Providing space for ploughing of further snowfalls is important and may require windrows to be removed or ploughed further off the carriageway.
- H11.5 Freezing rain occurs when droplets of water freeze upon contact with the ground and freeze instantaneously into ice, often forming 'black' ice. Freezing rain is difficult to forecast and can cause ice to build up very quickly on the road surface.

Preparation before ice, snow and freezing rain

- H11.6 Key recommendations – Preparation before ice, snow and freezing rain:
- Forecasting and timing are critical to the efficient treatment of snow and freezing rain conditions. Decisions should be based on the best available forecast information and treatments carried out as close to the optimum time as is practicable

(Recommendation RH.30)

- H11.7 When snow is forecast ploughs and snow blowers should be prepared and positioned in order that snow clearance can start without delay as and when required.
- H11.8 To facilitate the breakup and dispersal of ice and snow by trafficking, treatments must be made before snowfall or freezing rain. This ensures that there is de-icer present on the surface to provide a debonding layer.
- H11.9 Although it will increase salt usage, before snowfall and where practicable, consideration should be given to spreading salt on as much of the network as possible (i.e. beyond the normal precautionary salting network). This will provide a debonding layer and facilitate the breakup and dispersal of snow by traffic where subsequent treatments will not take place for a considerable time or at all.

H11.10 Spreading salt before freezing rain is necessary to provide a de-bonding layer but freezing of the liquid brine may occur on top of the salt. Authorities should be aware of this limitation and the health safety implications of this frozen layer during freezing rain events. They should be prepared to make follow up treatments on any ice that has formed or to take suitable actions such as road closures. Research into more effective treatments before, during and after freezing rain is currently on going and guidance will be updated to reflect the findings.

Depths of snow (light, moderate to heavy snow)

H11.11 This guidance defines two main snowfall categories – light snow and moderate/heavy snow. The differentiation is based on the amount of snow that a 40g/m² treatment of dry salt would adequately treat at freezing down to -2 °C. This relates to dilution amongst other factors and it is suggested that light snow relates to a snow depth with an equivalent depth of water of 1mm. Depending on the type of snow (dry (powdery), normal and wet) the depth varies. The forecaster should forecast the snow “wetness” factor. Figure H2 defines light and moderate/heavy snow

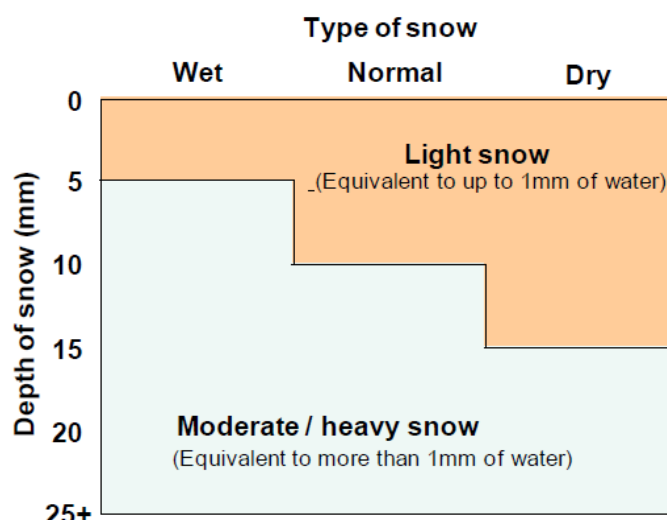


Figure H2 – Snow definitions

Timing of different treatment types

H11.12 Whenever possible, treatments should be made:

- Before snowfall and freezing rain (to provide a debonding layer and melt small amounts of snow).
- Depending on the prevailing conditions, subsequent treatments should be carried out as shown below:

Table H14 – Timing of treatments for snow and freezing rain	
Timing of treatment	Treatment type
Before snowfall and freezing rain	<ul style="list-style-type: none"> • Salt spreading
During freezing rain, or where there are minor accumulations of ice	<ul style="list-style-type: none"> • Salt spreading
During snowfall	<ul style="list-style-type: none"> • Ploughing • Salt spreading
After snowfall <ul style="list-style-type: none"> • When there is slush on the road 	<ul style="list-style-type: none"> • Ploughing • Salt spreading
After snowfall <ul style="list-style-type: none"> • When there is compacted snow or ice on the road 	<ul style="list-style-type: none"> • Ploughing • Salt spreading • Salt and abrasive mixtures • Abrasives only

Effect of trafficking on roads affected by snow

H11.13 Key recommendations – Effect of trafficking on roads affected by snow:

- The effect of trafficking should be considered when planning treatments relating to snowfall events as, depending on the prevailing conditions, it can be beneficial in aiding the melting or dispersing of snow or have the dis-benefit of compacting existing layers of snow making them harder to remove
- For the above reasons careful consideration needs to be given to the closing of roads in snow conditions or the timing of closing and opening
- If trafficking is not able to be accounted for, treatment rates should be those provided for light traffic conditions
- When traffic levels are light, and where practicable, the number of trafficked lanes should be reduced, as this concentrates the traffic and helps to disperse the snow more rapidly

(Recommendation RH.31)

H11.14 Traffic helps to melt and disperse snow, particularly at air and road surface temperatures at around 0°C or higher, and may be sufficient on its own to melt and disperse light snow. However, when snow is likely to settle (because the road and/or air temperatures are below zero) traffic will be more effective in dispersing

snow when salt has been spread on the road beforehand.

- H11.15 Where snow has settled on a road surface, traffic may compact the snow when air or road surface temperatures are below 0°C. However, when precautionary treatment has established a debonding layer, trafficking may help to break up compacted snow and ice. Increased trafficking also tends to disperse the debonding layer at the road surface more rapidly which may dictate further treatment is necessary where conditions require.

Ploughing

- H11.16 Key recommendations - Ploughing:

- When snow is forecast, ploughs and snow blowers should be made ready to allow snow clearance to commence without delay as and when required.
- Drivers and staff required to carry out ploughing should be ready to start operations when needed and not be delayed due to travelling to depots etc. when snow has started to settle.
- When carrying out treatments after snowfall, as much snow and slush as possible should be removed from the road surface by ploughing, before the application of de-icer and/or abrasives
- During and after snowfall, for efficiency and environmental reasons it is best that only the ploughed lane is treated if other lanes have still to be ploughed. The spread width settings may be adjusted accordingly to maximise effectiveness
- Actions to remove snow should be taken as early as practicable to prevent compaction by traffic
- Subsequent ploughing can be carried out when necessary to prevent a build-up of snow (this may require continuous ploughing in certain conditions)
- Ploughing is most effective when down to the road surface
- Ploughs are best operated at a steady speed which is effective for the plough and conditions
- Ploughing should be with a loaded vehicle, to aid traction and allow a steady ploughing speed to be maintained
- When fitted, a plough blade float mechanism should always be used
- If available, snow blowers can be used for particularly deep snow or where there is insufficient width at the side of the road to store the ploughed snow
- Snow ploughs should always be operated in accordance with the manufacturer's instructions

(Recommendation RH.32)

H11.17 The purpose of ploughing is to move as much snow as possible away from the road surface. More than a few millimetres of snow cannot be treated with salt. Effective ploughing will:

- Remove as much snow as is practical for the given conditions, preferably down to the road surface.
- Reduce the likelihood of snow becoming compacted and bonded to the road surface.
- Reduce the amount of de-icer needed for subsequent treatments (these treatments may not be effective if much snow has fallen and not been removed by ploughing)

H11.18 Ploughing down to (or very close to) the road surface is very important as it improves efficiency and reduces salt usage. However, snow ploughs should be adjusted and/or operated to avoid risk of damage to the plough, the road surface, street furniture and level crossings.

H11.19 Ploughing with a loaded vehicle is recommended to improve traction and provide greater momentum. For this reason consideration must be given to the effect on traction and ability to plough deeper snow towards the middle and end of a route when ploughing and spreading at the same time.

H11.20 **Warning - Ploughing:**

- Records of raised manholes, traffic calming measures, and level crossings that may be damaged, or damage the plough, should be taken into account when ploughing.

(Warning 7)

Types of plough

H11.21 Key recommendations – Types of plough:

- Plough blades should be designed to minimise distortion during ploughing. They should have special wearing edges to prevent damage and ensure low friction
- In addition to the spreader fleet, consideration should be given to the fitting of ploughs to other suitable vehicles
- Authorities should consult manufacturers, to ensure that ploughs are suited to the operational conditions and requirements

(Recommendation RH.33)

H11.22 A wide range of snow plough types are available, including those for mounting on spreading vehicles and other maintenance vehicles. It is recommended that ploughing should be carried out down to the road surface and snow ploughs are available that can allow this to be achieved without causing damage to the road surface.

H11.23 Important aspects to consider on a plough are:

- The material used for the wearing edge of the plough blade
- The construction of the plough
- The ease of mounting and removal (where applicable)

H11.24 Plough blades are available with different types of wearing edge material, including rubber, polyurethane, metal and composite materials. Rubber wearing edges can offer an effective 'squeegee' action that removes soft snow and slush. However rubber wearing edges are likely to be less effective than harder wearing edges at removing hard packed snow and ice. Ploughs specifically designed for removing compacted snow or ice will have metal cutting edges. Weak materials should not be used as wearing edges.

H11.25 The type of ploughs used on the highway network are typically straight bladed, and it is often possible to change the angle at which the blade is oriented to the left or right and the angle of the plough blade to the road surface.

H11.26 Steerable snow ploughs, in which the blade orientation can be changed automatically during clearing operations, provide even greater operational flexibility. For example, when clearing snow to the roadside with an angled plough, there may be occasions when it is necessary to alter the angle of the blade, for example to move snow along a road when there is insufficient room to the side, or there is a need to avoid blocking certain areas.

H11.27 The correct plough orientation should be used for the intended purpose:

- Straight blade angled to the road alignment - for displacing snow/slush to the roadside
- Straight blade perpendicular to the road alignment - for moving snow along a road
- V shaped – typically for displacing deep snow to both sides of the vehicle. Blades can be formed from several sections, mounted side by side, with each section able to move independently. This allows the blades to better adapt to the shape of the road surface. Some types of plough are constructed with a single section blade and these may be less effective in certain circumstances than multiple section blades.

H11.28 Ploughs should have effective systems to avoid damage to the machine, the road surface and the blade - for example spring mounted wearing edges which can deflect when an obstacle is encountered. A float mechanism enables the plough blade to automatically follow the changing longitudinal profile of the road, preventing the whole weight of the vehicle being applied to the plough and reducing wear to the plough blade.

H11.29 In addition to the spreading fleet, consideration should be given to fitting ploughs to other vehicles including those belonging to contractors or farmers. This will increase the capacity for ploughing on a Authority's network and potentially free up salting vehicles to spread de-icer and/or abrasives to assist in providing a faster

and more effective service in snow conditions.

- H11.30 For demountable ploughs the plough should be easily mountable, to minimise the time and manpower required to mobilise the plough, potentially shortening response times.

Good ploughing practices

- H11.31 Key recommendations – Good ploughing practices:

- Plans should be drawn up for each ploughing route to inform drivers where ploughed snow can and cannot be moved to
- Snow should be ploughed to the low side of carriageways and the build-up of snow in the centre of a single carriageway should be avoided. This is to avoid the later run-off from windrows or piles of snow from entering the traffic lanes, where it may dilute treatments and/or refreeze
- Drainage should be kept clear, and windrows or piles of snow should be removed or be positioned to allow melt water to reach the drains
- Piles of snow should be removed, where possible, so that melt water does not overload drainage systems or run back onto the road
- Windrows must be avoided at level crossings. Before ploughing commences on roads that include level crossings, contact should be made with Network Rail.
- Windrows should be removed or ploughed back when further periods of heavy snow are anticipated. This will provide space to plough the further snowfalls
- Accumulations of snow at central reserves, especially those with vertical concrete barriers, should be cleared where they create a hazard or impede drainage
- Where possible, multi-lane dual carriageways should be ploughed in one pass, either by:
 - Ploughing just one lane
 - Ploughing all lanes using ploughs working in echelon formation
 - Appropriate traffic management should be considered

(Recommendation RH.34)

- H11.32 **Warning - Good ploughing practices:**

- Run-off from windrows and piles of snow may enter the carriageways and refreeze to form sheet ice, particularly where drainage is blocked or piles of snow are to the high side of the road.

(Warning 8)

Precautionary treatments before snow or freezing rain

H11.33 Key recommendations – Precautionary treatments before snow or freezing rain:

- If light snow is forecast that will be of insufficient depth to require ploughing, then sufficient salt should be spread to melt the snow aided by the action of traffic
- If moderate or heavy snow is forecast, sufficient salt should be spread to provide a debonding layer

(Recommendation RH.35)

H11.34 Trafficking is important in the process of breaking up and removing ice and snow. When it snows, the temperature can hover around 0°C and rarely falls below -3°C. Calculations show that even when spread rates of 40g/m² are used the freezing point of water is only suppressed by a small amount (and rarely below -1.5°C) because of the diluting effect of the moisture provided by snow.

H11.35 Spread rates for precautionary treatments before snow or freezing rain are given in Treatment Matrix D

H11.36 The traffic levels are as assigned in Table H11 according to the vehicles/hour/carriageway

TREATMENT MATRIX D – Precautionary Treatments Before Snow Or Freezing Rain		
Weather conditions	Light or medium traffic	Heavy traffic
Light snow forecast	Spread: <ul style="list-style-type: none"> • 40g/m² of dry salt, or • 40g/m² of pre-wetted salt, or • 30g/m² of treated salt 	Spread: <ul style="list-style-type: none"> • 20g/m² of dry salt, or • 20g/m² of pre-wetted salt, or • 15g/m² of treated salt
Moderate/Heavy snow forecast	Spread: <ul style="list-style-type: none"> • 20-40g/m² of dry salt • 20-40g/m² of pre-wetted salt • 15-30g/m² of treated salt (see Note 1) 	Spread: <ul style="list-style-type: none"> • 40g/m² of dry salt, or • 40g/m² of pre-wetted salt, or • 30g/m² of treated salt
Freezing rain forecast	<ul style="list-style-type: none"> • 40 or 2x20g/m² of dry salt, or • 40 or 2x20g/m² of pre-wetted salt, or • 30 or 2x15g/m² of treated salt 	
<p>Note 1: The lower rates (e.g. 20g/m² for dry salt) can be used if the snow is likely to settle quickly, e.g. when the road surface temperature is below zero, the road surface is not wet and the snow is not wet, and/or there is little traffic after snowfall begins and settles.</p> <p>Note 2: Spreading salt before freezing rain can have a limited benefit and Authorities should be prepared to make follow up treatments on any ice that has formed.</p>		

Treatments during snowfall

H11.37 Key recommendations – Treatments during snowfall:

- Ploughing is most effective when started as soon as possible for the conditions and, where required, is continuous or sufficient to prevent a build-up of snow
- Salt spreading should be considered after ploughing to provide a new debonding layer to facilitate further ploughing of fresh snow and the break up and dispersal of compacted snow
- On heavily trafficked roads it is preferable (where practicable) to prevent a build-up of more than 10mm depth of snow. The build-up should be no more than 50mm in depth where there is a risk of compaction by traffic

(Recommendation RH.36)

H11.38 Ploughing and salt spreading are undertaken during snowfall to:

- Limit the accumulation of snow on the road surface, thereby reducing the amount of salt required for subsequent treatments
- Help the dispersal/clearing of the snow by traffic

- Prevent snow from being compacted

H11.39 Warning – Treatments during snowfall:

- Applying salt alone to compacted snow and ice can produce more dangerously slippery conditions if a weak brine film is formed on top of the ice/snow layer.
- De-icer should not be spread alone without abrasives to anything other than a thin layer of ice or compacted snow when snowfall has ceased or future snowfall will be less than 10mm.

(Warning 9)

H11.40 Treatment Matrix E provides guidance on how to treat during snowfall.

TREATMENT MATRIX E – Treatments During Snowfall		
Plough to remove as much material as possible (e.g. slush, snow, compacted snow) Ploughing is most effective when as near as possible to the level of the road surface		
No ice or compacted snow on surface	Ice or compacted snow on surface (see Note 2)	
To provide a debonding layer, spread: <ul style="list-style-type: none"> • 20g/m² of dry salt, or • 18g/m² of treated salt or • 24g/m² of pre-wetted salt (See Note 1)	Is traffic likely to compact subsequent snowfall before further ploughing is possible?	
	YES	NO
	To provide a debonding layer, spread: <ul style="list-style-type: none"> • 20g/m² of dry salt, or • 18g/m² of treated salt, or • 24g/m² of pre-wetted salt (See Note 1)	No de-icer should be spread
Note 1: During and after snowfall, it is best that only the ploughed lane be treated if other lanes have still to be ploughed. The spread width settings may be adjusted accordingly. Note 2: A de-icer should not be spread alone without abrasives to anything other than a thin layer of ice or compacted snow when snowfall has ceased or future snowfall will be less than 10mm. Applying salt alone to compacted snow and ice can produce more dangerously slippery conditions if a weak brine film is formed on top of the ice/snow layer.		

Treatment of slush on the carriageway

H11.41 Key recommendations – Treatment of slush on the carriageway:

- If freezing conditions are expected, it is important to remove as much slush as possible by ploughing to reduce the amount of material available to form ice when temperatures drop, as well as to reduce the amount of salt required for subsequent treatments
- If freezing conditions are not expected and the slush will melt and be dispersed under the action of traffic, no action is required

(Recommendation RH.37)

H11.42 Treatment Matrix F provides guidance on how to treat slush.

TREATMENT MATRIX F – Treatment For Slush When Freezing Conditions Are Forecast
Plough to remove as much slush as possible (ploughing is best when as near as possible to the level of the road surface).
After removing slush, spread: <ul style="list-style-type: none"> • 40g/m² of dry salt, or • 36g/m² of treated salt, or • 48g/m² of pre-wetted salt (See Note 1)
Note 1: After snowfall, and when there will be no further ploughing but some slush remains on the road surface, it may be necessary to change the settings normally used for precautionary treatment to ensure a satisfactory distribution is achieved over the target spread width.

Treatment of thin layers of ice (up to approximately 1mm)

H11.43 **Warning - Treatment of thin layers of ice:**

- Care is needed when salt is mixed with abrasives. Checks should be made that the mixture is free flowing, does not clump and can be spread effectively.

(Warning 10)

H11.44 Where a thin layer of ice forms, including after an instance of freezing rain, Treatment Matrix G provides guidance on how to treat thin layers of ice.

TREATMENT MATRIX G – Treatment For Thin Layers Of Ice (Less Than 1mm Thick)		
Forecast weather and road surface conditions	Medium/Light Traffic	Heavy traffic
Lower of air or road surface temperature higher than -5°C	Spread: <ul style="list-style-type: none"> • 40g/m² of dry salt, or • 36g/m² of treated salt or • 48g/m² of pre-wetted salt • 40g/m² of salt/abrasive mix (see Notes 1 and 2) 	Spread: <ul style="list-style-type: none"> • 20g/m² of dry salt, or • 18g/m² of treated salt or • 24g/m² of pre-wetted salt
Lower of air or road surface temperature less than -5°C	Spread: <ul style="list-style-type: none"> • 40g/m² of salt/abrasive mix (50:50) (see Notes 1 and 2) 	Spread: <ul style="list-style-type: none"> • 40g/m² of salt/abrasive mix (50:50) (see Notes 1 and 2)
<p>Note 1: Abrasives are ideally of 5-6mm and angular particles, but gradings down to 1-5mm may be reasonably effective. After abrasives have been used, drainage systems should be checked and cleared where necessary. Recovered material, which may be contaminated, must be disposed of safely.</p> <p>Note 2: Care is needed when salt is mixed with abrasives with a high moisture content. Checks should be made that the mixture remains free flowing, does not clump and can be spread effectively.</p>		

Treatments of medium or thick ice and compacted snow

H11.45 Key recommendations – Treatments of medium or thick ice and compacted snow:

- For high thicknesses of compacted snow and ice (i.e. greater than 5mm), treatments should be with salt and abrasive mixture or abrasive only. Treatments with a significant amount of salt should not be considered because they may leave the surface uneven. Any brine formed on the surface may collect in hollows and deepen them further, which can lead to a very uneven surface
- When using abrasives alone, sufficient salt should be added to the abrasive to prevent freezing of the water within it. If the moisture content of the abrasive is 7%, 25kg of salt per tonne of abrasive is sufficient to prevent freezing if thoroughly mixed

(Recommendation RH.38)

- H11.46 For compacted snow, when no further snow is expected, salt and abrasive mixtures or abrasives alone can be applied to assist the action of traffic in breaking the layer.
- H11.47 For compacted snow, when further snow is expected, salt and abrasive mixtures may be applied to provide grip as well as a debonding layer between the existing layer and any future snow to assist future ploughing operations. Salt should not be applied on its own as it may eventually form a weak brine solution which may re-freeze to form an ice or ice/brine layer.

H11.48 **Warning - Treatments of medium or thick ice and compacted snow:**

Applying salt alone to compacted snow and ice can produce more dangerously slippery conditions if a weak brine film is formed on top of the ice/snow layer.

(Warning 11)

- H11.49 Where medium or thick (greater than 1mm thickness) has formed or snow has compacted to form ice the treatments suggested in Treatment Matrix H should be considered.

TREATMENT MATRIX H – Treatment For Layers Of Compacted Snow And Ice	
Plough to remove as much material (e.g. slush, snow, compacted snow) as possible from the top of the compacted layer	
Medium Layer Thickness (1 to 5 mm)	High Layer Thickness (greater than 5mm)
<p>For initial treatment, spread:</p> <ul style="list-style-type: none"> • 40g/m² of salt/abrasive mix (50:50) (see Notes 1, 3, 4 and 5) <p>For successive treatments, spread:</p> <ul style="list-style-type: none"> • 20g/m² of salt/abrasive mix (50:50) (see Notes 1, 3, 4 and 5) 	<p>For initial treatment, spread:</p> <ul style="list-style-type: none"> • 40g/m² of abrasives only (see Notes 2, 3, 5 and 6) <p>For successive treatments, spread:</p> <ul style="list-style-type: none"> • 20g/m² of abrasives only (see Notes 2, 3, 5 and 6) <p>After traffic has started breaking up the layer, spread:</p> <ul style="list-style-type: none"> • 20g/m² of salt/abrasive mix (50:50) so salt can penetrate the layer and reach the road surface (see Notes 1, 3, 4 and 5)
<p>Note 1: For medium thicknesses of compacted snow and ice, treatments without abrasives should only be used when earlier precautionary treatments have successfully established a debonding layer, and there is sufficient traffic to break up the layer of ice quickly.</p> <p>Note 2: For high thickness of compacted snow and ice (greater than 5mm), treatments with a significant amount of salt should not be considered because they may leave the surface uneven. Any brine formed on the surface may collect in hollows and deepen them further, which can lead to a very uneven surface.</p> <p>Note 3: Abrasives should ideally be of 5-6mm and angular particles, but gradings down to 1-5mm should be effective. After abrasives have been used, drainage systems should be checked and cleared if necessary. Recovered material, which will be contaminated with road oil, must be disposed of safely.</p> <p>Note 4: Care is needed when salt is mixed with abrasives with a high moisture content. Checks should be made that the mixture remains free flowing, does not clump and can be spread effectively.</p> <p>Note 5: When there are layers of snow, compacted snow, or ice of medium or high thickness on the road surface, it may be necessary to change the settings normally used for precautionary treatment to ensure a satisfactory distribution is achieved over the target spread width.</p> <p>Note 6: Salt should be added to the abrasive to prevent freezing of the water within it. If the moisture content of the abrasive is 7%, 25g of salt per tonne of abrasive is sufficient to prevent freezing if thoroughly mixed.</p>	

H12 TREATMENTS FOR EXTREME COLD

General

- H12.1 Spreading sodium chloride alone in extreme cold conditions may not be practically effective or economical. High spread rates will be required and even then salt may not enter solution quickly enough to prevent freezing or be able to melt ice or compacted snow.
- H12.2 Extreme cold conditions for the spreading of salt (sodium chloride) without suitable additives are considered to be at or below -5°C at the time of spreading in low humidity conditions (below 80% relative humidity) and at or below -7°C in normal UK winter humidity conditions (at or above 80% relative humidity).
- H12.3 When utilised without additives specifically designed for extreme cold conditions, sodium chloride should be spread at least two hours before temperatures reach -5°C to -7°C to allow the salt to enter solution and become effective as a de-icer.
- H12.4 Salt already in solution before extreme cold temperatures are reached is considered to be effective down to -15°C for a fully saturated brine solution. Care must be taken where spreading is carried out before extreme cold temperatures are reached that the brine solution is not weakened by the ice and snow melted to a point where it is not effective in preventing freezing at the temperatures encountered.
- H12.5 Alternative de-icers (to sodium chloride) can provide more effective and economical treatments than salt alone when spreading has to be carried out in extreme cold conditions. Some alternatives can be spread in conjunction with salt to make the salt more effective. Other alternatives can be used on their own without salt to melt ice and/or compacted snow. The ability to spread an alternative de-icer gives an option to Authorities for handling prolonged extreme cold conditions.
- H12.6 While these de-icers provide benefits over sodium chloride in terms of effective operating temperature, they also may have disadvantages in terms of cost, corrosion, environmental impact and smell.
- H12.7 Environmental impact may also be reduced by the use of some alternative de-icers either on their own or added to salt. This is because they may be less damaging than salt in the quantities used and may reduce the amount of salt that would be needed on its own.

Mutual aid and resource sharing

- H12.8 Due to the cost of providing suitable facilities and equipment for the use of alternative de-icers as well as the cost of the de-icers themselves, consideration may be given to mutual aid and resource sharing within the winter plans of Authorities. However, plans need to be considered very carefully to ensure that an effective, timely service can be delivered in the likely operating conditions and demands on resource which will be present during extreme cold conditions.

Types of alternative de-icers suitable for extreme cold

H12.9 Alternative de-icers that can be used in extreme cold are include in Section H4 and typical compositions are shown in Table H15 below:

Table H15 – Types of de-icer	
De-icer	Composition
Magnesium chloride brine	32% concentration magnesium chloride brine
Calcium chloride brine	28% concentration calcium chloride brine
Brine with ABP - Sodium chloride brine with ABP	A blend of 23% concentration sodium chloride brine and ABP <i>20% sodium chloride, 10% ABP, 70% water</i>
Brine with ABP - Sodium chloride and calcium chloride brine with ABP	A blend of 23% concentration sodium chloride brine, 28% concentration calcium chloride brine and ABP <i>20% sodium chloride, 1.5% calcium chloride, 10% ABP, 68.5% water</i>
ABP Liquid	A blend of 32% concentration magnesium chloride brine and ABP <i>26% magnesium chloride, 13% ABP, 61% water</i>
Brine with ABP - Sodium chloride brine with ABP Liquid	A blend of sodium chloride brine (23% concentration) and ABP Liquid <i>16% sodium chloride, 8% magnesium chloride, 4% ABP, 72% water</i>
Sodium chloride brine	20% – 23% concentration sodium chloride brine, used in pre-wetted salting. Use is not recommended in extreme cold temperatures (see below)
Dry rock salt	High spread rates are required and use is not recommended in extreme cold temperatures (see below)

- H12.10 The alternative de-icers listed above provide benefits in two ways:
- They can lower the freezing point of water further than salt, melt more ice than salt and melt ice more rapidly than salt
 - When used with salt, hygroscopic de-icers (e.g. magnesium and calcium chloride) attract moisture and can facilitate the dissolution of salt. This is particularly helpful for precautionary treatments, but this also helps the salt dissolve more quickly when treatments are made to remove existing ice and compacted snow.
- H12.11 When applied in longitudinal lines along a road, alternative de-icers in liquid form are better able to penetrate existing ice and compacted snow, and provide a debonding layer, than salt. When used in this way, the liquid should have sufficient viscosity to minimise flowing out over the surface after spreading. If the liquid simply melts the surface of a layer of ice or compacted snow (rather than penetrates it), this can potentially create a more dangerous slippery surface that is also liable to refreeze, depending on the weather conditions.

Environmental considerations

- H12.12 Key recommendations – Environmental considerations:
- Authorities should obtain a full specification and Material Safety Data Sheet (MSDS) detailing the types and amounts of chemicals contained in any de-icer used. Authorities should carry out an impact assessment for the specific products used
 - Authorities should follow the guidance in this document to reduce the risk of any significant environmental impacts from storage and spreading of alternative de-icers. When proposing to use any de-icer other than rock salt, authorities should contact the relevant national environmental agency to agree their use, including advice on special restrictions due to potential impacts on environmentally sensitive locations

(Recommendation RH.39)

- H12.13 In assessing the environmental impact of using alternative de-icers, consideration should be given to the amount being spread, the level of available dilution and the potential receptor e.g. surface water, ground water, soil or sensitive habitats.
- H12.14 All of the chloride-based de-icers being recommended in this guidance (sodium chloride, calcium chloride and magnesium chloride) will have the potential to increase the salinity of adjacent land and watercourses. Using the alternative de-icers as recommended in this guidance will enable lower spread rates in comparison to standard treatments with sodium chloride. For example, spread rates for pre-wetted precautionary treatments using alternative de-icers are less than 80% of spread rates for standard treatments with salt pre-wetted with sodium chloride brine. This will result in a reduction of the concentration of chlorides entering the environment when carrying out treatment in these conditions.
- H12.15 Environmental agencies have concerns over increases in Biological Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) in water courses receiving

drainage from road surfaces after treatments with de-icers containing ABPs (and glycols and acetates although these are not recommended here). BOD is the amount of oxygen used by microorganisms (e.g. bacteria) when breaking down organic matter, such as ABPs, in the water. COD is a measure of the total amount of oxygen required for the chemical oxidation or decomposition of compounds in water. These can deplete the oxygen levels in the water and kill or harm fish and other aquatic organisms.

- H12.16 For treatments made using salt pre-wetted with alternative de-icers, as recommended in this guidance, the proportion of ABP contained in the de-icer will be the same as standard treatments made using ABP treated salt. i.e. the ABPs make up around 3% by weight of the de-icer. Therefore, treatments recommended in this guidance should not have significant additional impacts compared to standard treatments with sodium chloride or ABP treated salt. When making remedial treatments by spreading liquid de-icers that contain ABPs on compacted ice and snow, larger amounts of ABP will be spread as opposed to precautionary treatments using mixtures of the de-icer with salt. Therefore, it should be stressed that this should only be carried out as a last resort in extreme conditions, which in themselves occur very rarely. The de-icers will also be highly diluted by the water from melted ice and snow.
- H12.17 It is important that Authorities have full information regarding the composition of de-icers that are spread to the road network and consequently entering the environment. A specification should be available for the de-icers supplied providing details of the chemicals contained in the product and in what amounts, including the amount of ABPs.
- H12.18 Pollution Prevention Guidelines (PPGs) available from the Environment Agency website, containing guidance directly applicable to the storage of liquid de-icers include:
- PPG1: General Guide to Pollution Prevention
 - PPG21: Incident Response Planning
 - PPG22: Dealing with Spills
 - PPG26: Storage and handling of drums and intermediate bulk containers
 - PPG2: Above Ground Oil Storage Tanks

Storage of alternative de-icers

- H12.19 Alternative liquid de-icers must be stored and handled correctly to:
- Maintain their condition and effectiveness
 - Prevent damage to infrastructure
 - Prevent impacts to the environment from leaks and spillages
 - Minimise the risks to personnel handling them.

H12.20 Important considerations when storing alternative liquid de-icers are:

- Deciding on the type of container and storage capacity required
- Requirements for storage containers, including materials that are resistant to corrosion by the de-icer
- Requirements for the storage area, e.g. containment measures to prevent leaks and spillages entering the environment and drainage requirements
- Monitoring and maintaining de-icer condition
- Handling and special health and safety requirements
- Additional equipment requirements to enable loading and unloading of liquids from spreaders
- Storage and disposal techniques for unused liquids

Storage capacity requirements

H12.21 Key recommendations – Storage capacity requirements:

- A severe weather plan (winter service plan) should be produced that identifies the network to be treated using the alternative de-icers in extreme cold conditions
- Authorities should plan to provide sufficient de-icers to give the necessary resilience. However, the likelihood of extreme events occurring in their particular geographic areas should be considered
- Authorities should calculate the amount of de-icer required to be stored, based on the route length to be treated, the spread rates required under different weather conditions and the number of treatments for which a reserve is considered necessary

(Recommendation RH.40)

H12.22 To determine the storage capacity required, Authorities need to consider the length of network to be treated using the alternative de-icers. For example, Authorities should consider whether or not the alternative treatments will be utilised in extreme conditions:

- on the entire precautionary treatment network
- on the strategic network alone
- on critical network links
- at identified cold spots
- on critical infrastructure

- at vulnerable locations
- at major transport hubs

Types of storage container

H12.23 Key recommendations – Types of storage container:

- When choosing the type of container the following factors need to be considered:
 - Total storage capacity
 - Requirements for storage container construction
 - Requirements for preparing the storage area
- Materials must be capable of withstanding corrosion from stored chemicals and resistant to degradation from external factors. Recommended materials for storage container construction are polypropylene, polyethylene, glass reinforced plastic (GRP) or stainless steel
- Container walls must be thick enough and plastics be of a suitable grade to withstand the weight of dense de-icing liquids.
- Storage containers should have the facility to prevent the build-up of pressure within the container

(Recommendation RH.41)

H12.24 A range of storage tank types and capacities are available. Examples that are suitable for the storage of liquid de-icers include:

- Intermediate Bulk Containers (IBCs). De-icers can be delivered and then stored in this type of container. These containers typically have a capacity of around 1000 litres, have an external metal reinforcing cage and can be easily refilled from subsequent deliveries made by tanker.
- Tank Containers or Vertical or Horizontal Storage tanks. These tanks will allow a larger storage capacity in a single tank up to around 50,000 litres.

Storage area

H12.25 Key recommendations – Storage area:

- Storage areas for liquid de-icers should be bunded or storage tanks have a secondary containment system to contain any leaks and spills and to aid any clean up
- The containment capacity of the bund should be large enough to hold at least 110% of the capacity of the largest tank or 25% of the total storage capacity if in multiple tanks, whichever is the greater

- Storage should be sited on an impermeable surface, to prevent any leakage soaking into the ground
- Drainage from the store or loading area must not be allowed to soak away and must not pass into the surface water system or to soakaways. Foul drainage cannot be used without the prior permission of the drainage service provider. Discharge to a sealed tank equipped with a level alarm could also be considered
- Liquids should not be stored where spillage could enter adjacent surface water or foul water drainage and the bunded area should not have any drains within it that lead to these systems unless prior permission of the drainage service provider has been granted
- Where practical, preference should be given to indoor and/or covered storage of liquids. This will assist in preventing rainwater from building up in any bunded area, reduce bunding requirements, offer greater protection to the storage containers and associated equipment and fittings and also shading from direct sunlight
- Indoor storage areas should be well ventilated
- Ensure all local and national environmental requirements are met

(Recommendation RH.42)

H12.26 Information on constructing good quality bunds is contained within:

- The Construction Industry Research and Information Association (CIRIA) Report 163, on the construction of bunds for oil storage tanks.

H12.27 Storage in multiple containers, e.g. 1000 litre IBCs, will reduce requirement for substantial bunding and may be a convenient method for storing alternative liquid de-icers. If the bunded area is uncovered, the volume of rainwater/precipitation must be considered which could cause the bunded area to overflow.

H12.28 Alternatives to building a bunded area include:

- Secondary containment provided by storage tanks with secondary linings or integrated sumps.
- Storage units for holding multiple containers, which are vented and have an integrated sump for containing leaks and spills.

Monitoring de-icer condition in storage

H12.29 Key recommendations – Monitoring de-icer condition in storage:

- Procedures should be put in place to properly maintain and monitor the de-icer condition, and to ensure the de-icers remain effective after storage i.e. that they remain adequately mixed and that solid particles do not settle out

- A reference measurement should be made of the de-icer condition for each new delivery and recorded for future monitoring
- De-icers should be regularly stirred or agitated and immediately before each use to reduce any settlement or crystallisation and ensure the liquid does not separate out into layers of different concentrations
- When not in regular use, de-icers should be stirred or agitated at least once every 3 months to help maintain the condition of the de-icer

(Recommendation RH.43)

Procedure for testing liquid condition – checking the liquid is thoroughly mixed:

1. The liquid should first be stirred/agitated in the storage tank before sampling
2. Ideally the sample should be taken directly from the storage tank and not from the delivery hose
3. If taking the sample from the hose, enough de-icer should first be discharged to ensure the sample is from the de-icer within the tank and not from residual liquid within the hose
4. The sample size should be at least 10 litres
5. A suitable hydrometer or refractometer can be used to measure the liquid density
6. A reference measurement should be taken and recorded for each new delivery of de-icer, for comparison with subsequent measurements. Each subsequent sample reading should be within 5% of the reference value
7. If the reading is outside the 5% limit, the liquid should be restirred/agitated and resampled
8. If still outside the 5% limit, further investigation should be made of causes of the difference

Handling liquid de-icers – equipment and health and safety requirements

H12.30 Key recommendations – Handling liquid de-icers:

- The Material Safety Data Sheet (MSDS) should be consulted for necessary health and safety information. Authorities should carry out a COSHH assessment for the specific products used
- In order to reduce the risk of leaks escaping, as far as issues of practicality allow, all pipes and hoses used for transferring de-icers to the storage tanks and from storage tanks to spreaders should be contained within the bunded area or secondary containment system
- Loading and dispensing areas should not connect to any surface water sewer or soakaway. Foul drainage cannot be used without prior permission of the sewer provider. A sealed tank with level alarm could also be considered.

- All connections and fittings must be constructed of materials resistant to corrosion by the de-icer i.e. polypropylene, polyethylene, GRP, PVC or stainless steel
- All pipes, hoses and connections should be regularly checked for leaks and tight fitting
- In order to load and unload spreaders quickly, a pump of sufficient capacity will be needed to transfer liquid de-icer between the spreader and storage container. In determining the required pump capacity, consideration should be given to the number of spreaders that are to be loaded, the spreader capacity and the number of pumps available
- It is recommended that all wetted parts of the pump should be stainless steel or other suitable materials to provide resistance to corrosion by the de-icers

(Recommendation RH.44)

Spreading equipment

Pre-wetted salt with alternative liquid wetting agent

H12.31 Key recommendations – Pre-wetted spreading equipment:

- Authorities should ensure that spreaders:
 - Should not be adversely affected by the de-icer
 - Can be set up and calibrated to accurately deliver the proposed spread rates to the defined target areas at the operating temperatures
 - Have the capability to be set up for different salt types and pre-wetting agents
- Drivers (including reserves) should be fully competent in the use and operation of the spreaders
- Regular checks should be made when using the alternative de-icers to ensure they have no additional (as compared to salt) detrimental effect on the following equipment:
 - Spreader body, chassis, electrics and spinner
 - Brine tanks on spreader
 - Spreader brine pumps
 - Spray nozzles on spreader
 - Pumps and other equipment for transferring de-icers to spreaders from storage tank

(Recommendation RH.45)

- H12.32 Standard pre-wetted salt spreaders are suitable for the application of salt pre-wetted with the alternative liquid de-icers. The liquid de-icers can be loaded into the spreader saddle tanks to pre-wet the salt using the same mechanism as when pre-wetting salt with sodium chloride brine.
- H12.33 All spreaders should be individually calibrated and set up for the de-icer being spread. The purpose of calibration is to ensure that each spreader in a fleet is spreading the de-icer uniformly over the target area, at the correct rate of application and with as little wastage as possible.
- H12.34 Guidance on calibration of spreaders for dry and pre-wetted spreading is contained within previous sections of Appendix H. The assessment of the distribution profile from spreaders distributing salt mixed with alternative de-icers should follow the same procedures previously outlined.
- H12.35 Driver training is important to ensure all drivers are fully competent in the use and operation of the spreaders with the alternative de-icers. Where reserve drivers are available as part of an Authorities's contingency plans, it is essential that they are trained to an equal standard of competence.
- H12.36 If the concentration of some alternative de-icers is too high or some alternative de-icers are mixed together or with salt brine, recrystallisation may occur that may affect the pumps and nozzles of the spreader. If the liquid discharge rate falls more than 10% below the target, or if irregular discharge is suspected, the operation of the nozzles and pumps should be checked.
- H12.37 The guidance in this document has been based on the information available. However, due to the limited operational experience with these alternative materials in the UK, it is recommended that Authorities make regular checks to ensure there are no detrimental effects to their spreaders.

Liquid only spreading

- H12.38 Key recommendations – Liquid only spreading equipment:
- Liquids should be spread using dedicated liquid spreaders or combination spreaders where available
 - If Authorities do not have liquid spreaders, modifications to spreaders or other maintenance vehicles, potentially including equipment for weed control or plant watering, should be investigated to provide an adequate and calibrated liquid spreading capability (N.B. de-icers should not be sprayed onto compacted snow or ice)
 - Liquid spreading equipment that can apply de-icer liquid in longitudinal lines no greater than approximately 100mm apart for treatments on ice and snow should be used

(Recommendation RH.46)

- H12.39 Precautionary treatments using only liquids in extreme cold conditions are not generally recommended because very high spread rates are required. However,

spreading for localised priority treatments may be acceptable on occasion.

H12.40 For post treatments, on anything other than very thin uncompacted snow (less than 10mm thick) or thin ice and compacted snow (less than 1mm thick), it is recommended that application of the liquid should be in longitudinal lines (not more than 100mm apart) along the carriageway rather than as a uniform distribution. This should allow optimum penetration and undercutting of ice and snow.

H12.41 In order to provide an effective and safe treatment, the liquid should have sufficient viscosity to limit flowing out over the surface of existing ice or compacted snow after spreading. If the liquid just melts the surface (rather than penetrates into a layer of ice or compacted snow), this can leave a more dangerous slippery surface that is also potentially liable to refreeze, depending on the weather conditions.

H12.42 **Warning - Liquid only spreading equipment:**

- Liquid de-icers should not be spread uniformly onto an existing layer of ice or compacted snow without penetrating into it. If they melt the surface and form a liquid film on top of the layer of ice or compacted snow this may well result in more dangerously slippery conditions.

(Warning 12)

H12.43 Possible options for providing a liquid spreading capability include the modification of existing pre-wet spreaders with the addition of a spray/dribble bar and associated pipe work. When liquid only application is required, liquid can be diverted to the bar. Spray bars are available with interchangeable nozzles, for application of a fan spray or application of liquid in lines. Other practical options will include the modification of maintenance vehicles by the addition of a storage tank, pumps and dribble bars.

Spreading without pre-wet or liquid spreaders

H12.44 Key recommendations – Spreading without pre-wet or liquid spreaders:

- When using the alternative de-icers discussed in this guidance, it is strongly recommended that pre-wet or liquid spreaders are utilised. This section is presented to give guidance to Authorities without these capabilities regarding spreading in extreme cold conditions. However, the treatments are likely to be both less economical and less effective than with pre-wetted or liquid spreading capability
- The options presented in this section should only be considered as a last resort and not as an alternative option to using the preferred spreading methods previously described
- Salt wetted with alternative de-icer liquids before loading onto spreaders can be considered but strictly in accordance with the guidelines given below:
 - Increase the spread rate. This may help in some conditions when no other alternatives are available (see salt spread rates included in the

treatment matrices below) but Authorities should consider the probable limited effectiveness, cost, salt stock resilience and environmental implications

- In extreme cold or low humidity conditions, even at high spread rates salt may not be effective. Authorities must assess the risk and act appropriately. For example consider road closures or clearly warning drivers of unsafe conditions
- The local winter plan should include additional measures for extreme cold conditions beyond treatments. These should include:
 - Provision of timely information and warnings to the public
 - Liaison with the police and other emergency services
 - Additional monitoring of route condition after treatment

(Recommendation RH.47)

H12.45 It is not considered practical to spread solid alternative de-icers on their own or mixed with salt (except in very limited amounts for highly localised priority treatments) because of the onerous requirements for storing and spreading of the solid de-icers. The hygroscopic nature of the recommended alternative de-icing materials mean they readily absorb water and must be kept dry, i.e. stored in sealed bags or containers. De-icers would need to be properly mixed with salt immediately before spreading, (and not sooner) in sufficient quantities for spreading. Any materials remaining after spreading would need to be disposed of.

H12.46 In the USA, salt is sometimes wetted with alternative liquid materials, typically calcium chloride, before loading into spreaders. This can be achieved by:

- Wetting of dry salt with alternative de-icers during loading. Salt can be sprayed with the liquid as it is loaded into the hoppers of spreading vehicles e.g. each loader bucket of salt could be sprayed before loading. This is not recommended but is considered to be a potentially practicable alternative of last resort.
- Wetting of dry salt stockpiles with alternative de-icers: This is a practice that is not recommended or considered at all desirable for use in the UK.

H12.47 As noted above, the wetting of dry salt in stockpiles is not considered at all desirable for use in the UK and the wetting of otherwise dry salt during loading is not recommended. If either of these methods is employed, the resultant salt distribution on the road will be poorer than when spreading using a purpose built pre-wet spreader. These methods also increase the risk of 'tunnelling' within vehicle hoppers. Spreaders are unlikely to have been appropriately calibrated for otherwise dry salt that has been wetted with alternative de-icers.

H12.48 During extreme conditions, when the use of dry salt would be relatively ineffective, salt wetted during loading with alternative de-icer can be considered as a potentially practicable emergency option of last resort, rather than to continue

using dry salt alone. The need to make dry salt applications more effective in these conditions is considered likely to override concerns regarding the uniformity of the resultant spread distribution, and the impact of the lack of uniformity may be overcome with repeat treatments. However, it is strongly recommended that, where these treatments are utilised, the treated routes are closely monitored to determine the effectiveness of the treatments. Suitable warnings should be issued to the public regarding potentially dangerous driving conditions, because the de-icers may not be fully effective.

H12.49 Warning - Spreading without pre-wet or liquid spreaders:

- Dry salt that has been wetted with alternative de-icer during loading into spreading vehicles will demonstrate a potentially poorer spread distribution, and spread rates may be inaccurate. The salt may suffer from tunnelling within the vehicle hoppers, which could potentially result in sections of road not being treated.
- Routes treated in this manner should be monitored after treatment and suitable warnings issued to drivers regarding potentially unsafe driving conditions.

(Warning 13)

Maintenance of spreading equipment

H12.50 Key recommendations – Maintenance of spreading equipment:

- Spreaders should be washed down after use, using high volumes of water with low pressure, taking care that washdown water is handled properly to prevent environmental impacts. Wash bay areas should not be connected to any surface water sewer or soakaway. Refer to the Environment Agency's Pollution Prevention Guideline PPG13 Vehicle Washing and Cleaning for further guidance
- Spreader tanks, pumps and hoses should be rinsed with water before changing the liquid. After rinsing, the brine pump should be operated for a short time to put the new de-icing liquid through the whole system and prevent freezing
- Spreader manufacturers should be consulted to confirm spreaders have adequate protection for mechanical and electrical components:
 - Paint work and protective systems should be of an appropriate standard
 - Additional protection measures such as wax based coats, plastic chassis canopies and gear box covers should be considered

(Recommendation RH.48)

H12.51 The alternative liquid de-icers and sodium chloride brine can result in greater corrosion of spreading vehicles when compared to spreading dry salt only. The viscous nature of some alternative liquid de-icers and the hygroscopic nature of

some of the chemicals can also increase the retention of corrosive liquid de-icers on metal components and keep metal components wetter for longer.

Precautionary treatments for extreme cold

H12.52 Key recommendations – Precautionary treatments for extreme cold:

- As per other winter conditions, the most cost effective way to treat roads in extreme cold conditions is to undertake precautionary treatments before snow or ice are present.
- The guidance given in H9 should be followed for treatments when the salt can enter solution before the minimum of the air or road surface temperatures are at or below -7°C (or -5°C in low humidity conditions). This is typically when treatments can be made earlier in the day and completed at least 2 hours before the temperatures reach this threshold
- For practical and effective winter service, alternative de-icers should be considered for precautionary treatments when spreading at:
 - Temperatures at or below -7°C or
 - Temperatures at or below -5°C in low humidity conditions
- In order to improve stock resilience and reduce the impact of salt and alternative de-icers on vehicles, infrastructure and the environment, spread rates used should not exceed those recommended

(Recommendation RH.49)

H12.53 Spread rates are given for 'Good' spreading capability (Treatment Matrix I), 'Fair' spreading capability (Treatment Matrix J) and 'Poor' spreading capability (Treatment Matrix K). See section H7 on Spreader Calibration for how to assess the spreading capability. Spread rate before snow and freezing rain are given in Treatment Matrix L.

H12.54 Spread rates are given for:

- Dry rock salt pre-wetted with alternative liquid de-icers,
- Standard pre-wetted precautionary treatments with sodium chloride brine
- Rock salt wetted with alternative liquid de-icers before loading and spread from dry salt spreader
- Dry rock salt

H12.55 Liquid only precautionary treatments in extreme cold require very high spread rates, which are uneconomical and potentially more environmentally damaging for spreading over large areas of the network.

H12.56 Spread rates in the tables can be high (greater than 40 g/m^2) and may require more than one pass to achieve. Authorities should take account of this with regard

to treatment response times.

- H12.57 Guidance has been included for the equivalent amounts of salt needed (dry or pre-wetted with sodium chloride brine) under the same extreme cold temperature conditions as the alternative de-icers where appropriate, however their use is not recommended. as although salt does not become completely ineffective at extreme cold temperatures (down to -15°C or so,) for practical purposes its effectiveness is reduced at these very cold temperatures, even if high spread rates are utilised. Therefore, as temperatures fall below the thresholds for 'extreme cold' conditions, the use of salt alone becomes progressively less economical and practical, as well as leading to increased environmental impacts.

TREATMENT MATRIX I						
FROST or FORECAST FROST DURING EXTREME COLD						
PRECAUTIONARY SPREAD RATES FOR GOOD SPREADING CAPABILITY (in g/m ²)						
(See Notes 1 to 6)						
Dry salt component (% by weight of de-icer)	Rock salt (70%)	Rock salt (70%)	Rock salt (70%)	Rock salt (70%)	Rock Salt (96%)	Rock Salt (100%)
Brine component (% by weight of de-icer)	Magnesium chloride brine (30%)	Calcium chloride brine (30%)	Brine with ABP (30%)	Sodium chloride brine (30%) See Note 1	4% liquid de-icer added before loading	No pre-wetting See Note 1
Road Surface Temperature (RST), Road Surface Conditions.						
RST at or below -5°C above -7°C, and dry or damp road conditions NOTE: Only for low relative humidity <80%	11	11	10	13	14	14
RST at or below -5°C above -7°C, and wet road conditions NOTE: Only for low relative humidity <80%	18	19	17	21	22	22
RST at or below -7°C and above -10°C and dry or damp road conditions	16	17	16	21	20	22
RST at or below -7°C and above -10°C and wet road conditions	27	28	26	35	34	37
RST at or below -10°C and above -12°C and dry or damp road conditions	21	22	20	29	26	30
RST at or below -10°C and above -12°C and wet road conditions	35	36	34	49	43	50
RST at or below -12°C and dry or damp road conditions	27	29	27	41	33	41
RST at or below -12°C and wet road conditions	46	48	45	68	56	68

Notes:

1. Spread rates have been included in red for dry salt (e.g. 28) and salt pre-wetted with sodium chloride brine, however their use is not recommended because they may not become effective in the required time scales
2. Dry salt:brine should be in the ratio 70:30 by weight for pre-wetting
3. Spread rates for pre-wetted salting are the weight of dry salt and brine combined as shown in headings.
4. A follow-up treatment of 50% of the recommended spread rate should be considered in lightly trafficked areas at the lower end of temperature bands indicated.
5. To take account of residual salt during periods of sustained extreme cold temperatures, where temperatures do not rise above extreme cold over 12 hours or more, rates of spread for successive treatments, carried out within 6 hours of completing previous treatments using alternative de-icers, may be 50% of the rates in the table. Higher spread rates may require more than one pass to achieve, and Authorities should take account of this with regard to treatment response times.

TREATMENT MATRIX J						
FROST or FORECAST FROST DURING EXTREME COLD						
PRECAUTIONARY SPREAD RATES FOR FAIR SPREADING CAPABILITY (in g/m²)						
(See Notes 1 to 6)						
Dry salt component (% by weight of de-icer)	Rock salt (70%)	Rock salt (70%)	Rock salt (70%)	Rock salt (70%)	Rock Salt (96%)	Rock Salt (100%)
Brine component (% by weight of de-icer)	Magnesium chloride brine (30%)	Calcium chloride brine (30%)	Brine with ABP (30%)	Sodium chloride brine (30%) See Note 1	4% liquid de-icer added before loading	No pre-wetting See Note 1
Road Surface Temperature (RST), Road Surface Conditions.						
RST at or below -5°C above -7°C, and dry or damp road conditions NOTE: Only for low relative humidity <80%	14	14	13	16	18	18
RST at or below -5°C above -7°C, and wet road conditions NOTE: Only for low relative humidity <80%	23	24	22	27	30	30
RST at or below -7°C and above -10°C and dry or damp road conditions	21	22	20	27	27	29
RST at or below -7°C and above -10°C and wet road conditions	35	37	34	45	45	49
RST at or below -10°C and above -12°C and dry or damp road conditions	27	28	26	37	35	40
RST at or below -10°C and above -12°C and wet road conditions	45	47	44	62	58	67
RST at or below -12°C and dry or damp road conditions	35	38	35	53	45	55
RST at or below -12°C and wet road conditions	59	62	58	88	75	91

Notes:

1. Spread rates have been included in red for dry salt (e.g. 28) and salt pre-wetted with sodium chloride brine, however their use is not recommended because they may not become effective in the required time scales
2. Dry salt:brine should be in the ratio 70:30 by weight for pre-wetting
3. Spread rates for pre-wetted salting are the weight of dry salt and brine combined as shown in headings.
4. A follow-up treatment of 50% of the recommended spread rate should be considered in lightly trafficked areas at the lower end of temperature bands indicated.
5. To take account of residual salt during periods of sustained extreme cold temperatures, where temperatures do not rise above extreme cold over 12 hours or more, rates of spread for successive treatments, carried out within 6 hours of completing previous treatments using alternative de-icers, may be 50% of the rates in the table.
6. Higher spread rates may require more than one pass to achieve, and Authorities should take account of this with regard to treatment response times.

TREATMENT MATRIX K						
FROST or FORECAST FROST DURING EXTREME COLD						
PRECAUTIONARY SPREAD RATES FOR POOR SPREADING CAPABILITY (in g/m²)						
(See Notes 1 to 6)						
Dry salt component (% by weight of de-icer)	Rock salt (70%)	Rock salt (70%)	Rock salt (70%)	Rock salt (70%)	Rock Salt (96%)	Rock Salt (100%)
Brine component (% by weight of de-icer)	Magnesium chloride brine (30%)	Calcium chloride brine (30%)	Brine with ABP (30%)	Sodium chloride brine (30%) See Note 1	4% liquid de-icer added before loading	No pre-wetting See Note 1
Road Surface Temperature (RST), Road Surface Conditions.						
RST at or below -5°C above -7°C, and dry or damp road conditions NOTE: Only for low relative humidity <80%	16	17	15	19	22	22
RST at or below -5°C above -7°C, and wet road conditions NOTE: Only for low relative humidity <80%	27	28	26	32	36	36
RST at or below -7°C and above -10°C and dry or damp road conditions	25	26	24	32	33	35
RST at or below -7°C and above -10°C and wet road conditions	41	43	40	53	54	59
RST at or below -10°C and above -12°C and dry or damp road conditions	31	33	31	43	42	48
RST at or below -10°C and above -12°C and wet road conditions	52	55	51	73	69	80
RST at or below -12°C and dry or damp road conditions	41	44	41	61	54	66
RST at or below -12°C and wet road conditions	69	73	68	102	90	110

Notes:

1. Spread rates have been included in red for dry salt (e.g. 28) and salt pre-wetted with sodium chloride brine, however their use is not recommended because they may not become effective in the required time scales
2. Dry salt:brine should be in the ratio 70:30 by weight for pre-wetting
3. Spread rates for pre-wetted salting are the weight of dry salt and brine combined as shown in headings.
4. A follow-up treatment of 50% of the recommended spread rate should be considered in lightly trafficked areas at the lower end of temperature bands indicated.
5. To take account of residual salt during periods of sustained extreme cold temperatures, where temperatures do not rise above extreme cold over 12 hours or more, rates of spread for successive treatments, carried out within 6 hours of completing previous treatments using alternative de-icers, may be 50% of the rates in the table.
6. Higher spread rates may require more than one pass to achieve, and Authorities should take account of this with regard to treatment response times.

TREATMENT MATRIX L						
SNOW or FREEZING RAIN DURING EXTREME COLD						
PRECAUTIONARY SPREAD RATES (in g/m²)				(See Notes 1 to 4)		
Dry salt component (% by weight of de-icer)	Rock salt (70%)	Rock salt (70%)	Rock salt (70%)	Rock salt (70%)	Rock Salt (96%)	Rock Salt (100%)
Brine component (% by weight of de-icer)	Magnesium chloride brine (30%)	Calcium chloride brine (30%)	Brine with ABP (30%)	Sodium chloride brine (30%) See Note 1	4% liquid de-icer added before loading	No pre-wetting See Note 1
Weather conditions & Road Surface Temperature						
Snow forecast (RST at or below -5°C and above -7°C)	23	24	22	28	28	28
Snow forecast (RST at or below -7°C and above -10°C)	33	35	32	40	40	43
Snow forecast (RST at or below -10°C and above -12°C)	39	41	38	47	47	52
Snow forecast (RST at or below -12°C)	47	50	47	58	58	70
Notes:						
<ol style="list-style-type: none"> 1. Spread rates have been included in red for dry salt (e.g. 28) and salt pre-wetted with sodium chloride brine, however their use is not recommended because they may not become effective in the required time scales 2. Dry salt:brine should be in the ratio 70:30 by weight for pre-wetting 3. Treatments for moderate/heavy snow are as for light snow, plus a follow-up treatment at half the recommended spread rate when no treatments in previous six hours 4. Higher spread rates may require more than one pass to achieve, and Authorities should take account of this with regard to treatment response times. 						

De-icer treatments during snowfall

H12.58 Combination of ploughing and de-icer treatments during snowfall are given in Matrix M. See Section H11 for guidance on effective ploughing.

TREATMENT MATRIX M TREATMENTS DURING SNOWFALL		
Plough to remove as much slush, snow and compacted snow as possible		
No ice or compacted snow on surface	Ice or compacted snow on surface	
To provide a debonding layer, spread (see Note 1): Use the treatments given in Matrix L	Is traffic likely to compact subsequent snowfall before further ploughing is possible?	
	YES	NO
	To provide a debonding layer, spread (see Note 1): Use the treatments given in Matrix N	No de-icer should be spread
Notes:		
1. During and after snowfall, only the ploughed lane(s) should be treated if other lanes have still to be ploughed		

De-icer treatments on snow and ice

H12.59 Key recommendations – de-icer treatments on snow and ice:

- Where spread rates are given for the application of liquid, this is on the basis that application is only from a dribble bar forming discrete longitudinal lines of de-icer no more than approximately 100mm apart across the carriageway
- Application of liquids in lines can also be in conjunction with dry salt spreading and can be carried out immediately before, after or at the same time as the dry salt application
- Solid de-icer with larger particle sizes will be more effective than a finely graded material, as the larger particles can penetrate further and more quickly into the layer before dissolving to reach the road surface and debond the layer

- The road condition should be monitored on all treated routes when ice, snow or compacted snow are present and abrasives should be applied at a rate of 20 to 40g/m², as outlined in Matrix D, if more dangerously slippery conditions occur

(Recommendation RH.50)

- H12.60 Combination of ploughing and de-icer treatments are given in Matrix W
- H12.61 Ideally, de-icers should penetrate and bore into ice and compacted snow in order to reach the road surface and debond the layer. The performance will be optimised if de-icers are concentrated (e.g. larger particle size or liquids applied in lines) so, when they have penetrated the layer down to the road surface, there is sufficient ice melting capability to spread out and debond the layer from the road surface.
- H12.62 Liquid de-icers should not be spread 'uniformly' to a layer of ice or compacted snow. If they melt the surface to form a liquid film on the layer of ice this may result in more dangerously slippery conditions. Also, there is a risk of refreezing when the concentration of the solution formed falls such that the air/road surface temperature is below its freezing point temperature. Small particles of solid de-icer may have a similar effect as uniformly spread liquid de-icers by only melting the surface. When using solid de-icers they should have a low fines content whenever possible, i.e. with less than 20% by weight passing a 1mm sieve, and less than 10% passing a 600µm sieve.
- H12.63 The treatments in Matrix N are designed to facilitate the dispersal of ice, snow and compacted snow without the need to use abrasive. However, the road condition should be monitored on all treated routes when ice, snow or compacted snow are present and abrasives should be applied at a rate of 20 to 40g/m², as outlined in Matrix D, if more dangerously slippery conditions occur.

TREATMENT MATRIX N							
SPREAD RATES ON SNOW AND ICE (in g/m²) (See Notes 1 to 13)							
Dry salt component (% by weight of de-icer)		Rock salt (70%)	Rock salt (70%)	Rock salt (70%)	Rock salt (70%)	Rock Salt (96%)	Rock salt (100%)
Brine component (% by weight of de-icer)	ABP Liquid	Magne sium Chlori de brine (30%)	Calcium chloride brine (30%)	Brine with ABP (30%)	Sodium chlorid e brine (30%)	4% liquid added before loading	No pre- wetting
Lower of air or road surface temperature:							
At or below -5°C and above -7°C	24	28	29	27	34	28	28
At or below -7°C and above -10°C	24	40	42	38	48	40	43
At or below -10°C and above -12°C	30	46	49	46	56	47	52
Less than -12°C	36	56	61	56	76	58	70

Notes:

General

1. Spread rates have been included for dry salt and salt pre-wetted with sodium chloride brine, however their use is not recommended because they may not become effective in the required time scales
2. Dry salt:brine should be in the ratio 70:30 by weight for pre-wetting
3. Operators should consider carrying out patrols in extreme cold to determine the effectiveness of treatments and when further follow up treatments are required.
4. If the surface melts and becomes slippery, an initial treatment of abrasives should be applied at a rate of 40g/m² and successive treatments at 20g/m² until an acceptable level of friction is restored. Care should be taken to make further applications where ice or snow melts again and refreezes later leaving abrasives beneath the ice surface and therefore ineffective.
5. Abrasives should ideally be of 5-6mm and angular particles, but gradings down to 1-5mm should be effective. After abrasives have been used, drainage systems should be checked and cleared if necessary. Recovered material, which will be contaminated with road oil, must be disposed of safely.
6. A small amount of salt should be added to the abrasive to prevent freezing of the water within it. If the moisture content of the abrasive is 7%, 50kg of salt per tonne of abrasive is sufficient to prevent freezing if thoroughly mixed.
7. At temperatures below -7°C, treatments with dry salt or salt pre-wetted with only sodium

chloride brine are likely to melt ice at a slower rate than salt pre-wetted with the alternative de-icers. To increase the rate of ice melting with dry salt or salt pre-wetted with only sodium chloride brine the recommended spread rates can be increased.

8. Higher spread rates may require more than one pass to achieve, and Authorities should take account of this with regard to treatment response times.

For treatment of thin layers of ice (not exceeding 1mm thick):

9. Consider follow-up treatments at 50% in light traffic when there are few vehicles to assist the dissolution of the salt e.g. certain slip roads

For treatment of layers of compacted snow and ice more than 1mm thick:

10. Plough to remove as much material (e.g. slush, snow, compacted snow) as possible from the top of the compacted layer before applying de-icer
11. When using solid de-icers they should have a low fines content whenever possible, i.e. with less than 20% by weight passing a 1mm sieve, and less than 10% passing a 600µm sieve.
12. If ice or compacted snow is thicker than about 10mm, it may not be possible to penetrate the layer, undercut it and debond it from the road surface. The critical thickness is dependent on the road surface temperature and de-icer concentration and particle size.
13. When it is not possible to remove compacted snow and ice because of their thickness, or de-icers are ineffective, abrasives should be used as follows until the conditions are more favourable for de-icing:

For initial treatment, spread:

- 40g/m² of abrasives only

For successive treatments, spread:

- 20g/m² of abrasives only

H13 EXERCISES

Purpose and Types of Exercise

H13.1 Exercises should be carried out in advance of the winter season. Exercises vary in scale and complexity but fundamentally serve to test arrangements in an environment where lessons can be safely identified and subsequent improvements made. A Winter Service exercise aims to achieve confidence that processes and equipment will meet the requirements for service delivery set out in the Winter Plan.

H13.2 When developing an exercise programme Authorities should aim to target at all levels of the Winter Service from senior management and decision makers through to operatives delivering the service. It is vitally important to regularly test the decision making and escalation approach, particularly given that this is a subjective matter and that there is no formal qualification for decision makers. It is good practice to carry out some form of exercise in advance of each winter season. The structure of these exercises can vary significantly and the delivery of these need not be costly.

H13.3 The Cabinet Office's 'The Exercise Planners Guide' provides further information regarding the types of exercises and their respective merits.

<http://www.cabinetoffice.gov.uk/ukresilience/preparedness/exercises/plannersguide.aspx>

H13.4 The guidance identifies four types of exercise and these can be applied to Winter Service as follows:

- Table-top Exercise
 - This is generally the most cost effective method of delivering an exercise and can be delivered to a small number of staff (5-10) in the Authority's own premises. These can be run to a larger number of participants, particularly where multiple authorities are participating.
 - The approach is generally to lead participants through a developing scenario over a period of time with added complications developing throughout the event.
- Seminar
 - A seminar exercise tends to be less realistic than other types of exercise. However, it promotes liaison with a range of stakeholders and organisations. The costs of running a seminar exercise will depend heavily on the number of people attending and the venue used. Significant planning can be required as the number of attendees at events like this can be in excess of 100 with wider stakeholders such as Police and Emergency Planning Teams included.
 - The scenario for an event like this will generally be delivered in a smaller number of elements and is aimed to promote discussion rather than detailed operational planning. An event like this can be particularly

useful in the development of a multi-agency response to severe weather conditions.

- Control Post
 - A control post exercise is much the same as a table-top exercise, but with staff undertaking the role in their normal place of work. In Winter Service delivery this approach may not offer any significant benefit over a table-top exercise, however it will require a significant amount of prior planning, can be disruptive to other operations and will often cost significantly more to run.
- Live
 - A live exercise in Winter Service terms would generally be much the same as a control post, but extended to include operations on the road network. This would be an expensive event to undertake in its entirety with little benefit, however two cost effective live tests can be employed:

H13.5 A phone contact check is a good and cost effective approach to ensure that contact can be made with staff on duty out of hours and is a very basic form of live exercise. This approach could be expanded to involve a multitude of stakeholders and test relationships, communication and technical knowledge.

H13.6 A more comprehensive operational, live exercise is to undertake a dry treatment run during the early part of the season. This can be used to check the communication, routes undertaken, information recorded and actions undertaken in the event of a failure such as a spreader breakdown.

Delivery of Exercises

H13.7 Delivering exercises need not necessarily be a costly task. The Cabinet Office guidance provides useful information regarding the development and delivery of exercises. It is designed to allow exercises of any scale to be delivered, so it would not be wholly applicable for a small scale operational test.

H13.8 The Cabinet Office guidance advises that those involved in planning the exercise should not participate directly. Some smaller organisations may seek help from external organisations in running the exercise. In addition, advice on the delivery of the exercise can be sought from organisations such as forecast suppliers, contractors, neighbouring authorities and the emergency services.

H13.9 Exercise development should always start with the agreement of the aim and objectives. These will shape the scenario and delivery method to be employed. An example could be to satisfy the aim of “confirming communication links are functional”. The exercise could be developed to make check calls to various staff / stakeholders to confirm the arrangements in place are adequate.

H13.10 A structured approach to any exercise should be adopted to lead staff through a realistic, but challenging, scenario that tests as many elements of the Winter Service as possible. This should include decision making, communication and delivery of the service during difficult conditions. Factors to consider should extend beyond the weather itself to include scenarios that impact on operation of

the road network such as congestion and traffic incidents.

- H13.11 To develop a complete test of arrangements, the planning process is more involved. It is important to consider scenarios to test specific elements of the plan whilst attempting to keep the situation plausible and realistic. Keeping the scenario aligned to events that have happened in the past will assist in retaining realism.
- H13.12 Recent experience suggests that delivery of a simple table-top exercise based around discussion will deliver a holistic test of a plan. If a specific element requires testing, then a concentrated test to mimic a live event will push staff members to perform as they would in a real situation.
- H13.13 To minimise costs and also to increase the opportunity for learning, authorities could consider collaborating to deliver joint exercises. The scenario should then be written to test cross boundary issues in addition to the standard response within each respective Authority's boundary.
- H13.14 Collaborative approaches will also increase the credibility of the exercise through increased independence. If planning an exercise "in house" it is important that the participants do not have sight of the scenario before the event. This will ensure that the test is realistic and delivers accurate learning points. Two authorities could write scenarios for each other to show independence or a third party organisation could be employed.
- H13.15 It is essential that the resulting learning and good practice is recorded, acted upon and disseminated. Following an exercise it is important that a report is written and is circulated to attendees.
- H13.16 Staff training should also be considered by Authorities for testing through exercising. Once staff training has been delivered, this should be tested to ensure it is adequate and that any shortcomings or good practice influences future winter and training plans.

H1 PUBLIC INFORMATION LEAFLETS

- H14.1 Public information leaflets provide a useful means of providing information to drivers on travelling in winter conditions and roles and responsibilities of an authority in delivering Winter Service. Authorities should consider emphasising key messages in their leaflets. Typical contents of such a leaflet could include the following:
- H14.2 Winter travelling advice to address issues, such as:
- The need to travel;
 - Using public transport;
 - Drivers should never assume a road has been salted;
 - Adding extra time to journeys;
 - Reducing speed;

- Hazards of black ice;
- Using lights in poor visibility;
- Extra care for cyclists pedestrians and horse riders;
- Giving snow ploughs and gritters plenty of room;
- Parking where it may block a salting route;
- Skidding and stopping distances;
- Condition of vehicle and appropriate personal provisions and equipment.

H14.3 Information on network treatments, such as:

- Map of normal treatment network;
- Map of Minimum Winter Network;
- When salting takes place;
- Showers or rain may wash salt off roads;
- Salting will not stop ice forming in very cold weather;
- Times to treat the network;
- Snow clearance;
- Salt bins.

H14.4 Further advice and contacts

- Telephone and email and website details.

H14.5 Authorities should consider as wide a distribution of the leaflets as possible through public and private outlets such as council offices, shops, petrol stations and service areas. Leaflets should also be available from authorities' websites.

Warnings

Warning 1

Pre-wetted salting

- If the brine concentration exceeds 23%, there is a risk of salt re-crystallising within the pumps, pipes and nozzles of the spreader, particularly at very low temperatures.

Warning 2

Salt moisture content:

- Whatever type of salt is being used, tunnelling (the formation of large voids resulting in salt not falling onto the distribution mechanism) can occur in the spreader hopper if the moisture content of the salt is too high. Tunnelling must be avoided because it can result in uneven spreading or large areas of the road being left untreated.

Warning 3

Outside protected salt:

- If water enters a stockpile, a cover may prevent subsequent drying in fine weather. If this happens the condition of the stockpile will deteriorate rapidly and the stockpile should be considered effectively uncovered. Water must be prevented from entering a covered stockpile.
- Walking on covers must never be allowed without adequate precautions and equipment for health and safety reasons. Apart from the potential for slips and falls, a 'swallow-hole' in the stockpile may entrap anyone walking on the cover. A full risk assessment must be carried out and a proper process put in place.

Warning 4

Calibration of spreaders:

- There is a risk of under or over spreading if the spreader is not calibrated for the salt being spread.
- The potential consequences of under spreading are higher when the spread rate is low.

Warning 5

Calibration procedure:

- Carrying out an indirect check of the spreader settings, the belt speed, gate height and spinner speed is not sufficient.

- The amount of salt being discharged must be measured.

Warning 6

Weather and road surface conditions:

- A very significant quantity of salt is required to prevent freezing if water has ponded on or is flowing across a road surface. Spreaders can be operated in blast mode, but this is often insufficient to prevent freezing. N.B. Approx. 100g/m² of rock salt is required to prevent the freezing of water of depth 2.5mm (or 1kg/m² for 25mm of ponded water) at road surface temperatures down to only -2°C. Where water is flowing onto the carriageway (or up through porous surfacing, cracks, etc.) it will remove the salt solution. Thus spreading at high rates or in blast mode may be ineffective no matter how much salt is spread.

Warning 7

Ploughing:

- Records of raised manholes, traffic calming measures, and level crossings that may be damaged, or damage the plough, should be taken into account when ploughing.

Warning 8

Good ploughing practices:

- Run-off from windrows and piles of snow may enter the carriageways and refreeze to form sheet ice, particularly where drainage is blocked or piles of snow are to the high side of the road.

Warning 9

Treatments during snowfall:

- Applying salt alone to compacted snow and ice can produce dangerously slippery conditions if a weak brine film is formed on top of the ice/snow layer.
- De-icer should not be spread alone without abrasives to anything other than a thin layer of ice or compacted snow when snowfall has ceased or future snowfall will be less than 10mm.

Warning 10

Treatment of thin layers of ice:

- Care is needed when salt is mixed with abrasives. Checks should be made that the mixture is free flowing, does not clump and can be spread effectively.

Warning 11

Treatments of medium or thick ice and compacted snow:

- Applying salt alone to compacted snow and ice can produce more dangerously slippery conditions if a weak brine film is formed on top of the ice/snow layer.

Warning 12

Liquid only spreading equipment:

- Liquid de-icers should not be spread „uniformly“ onto an existing layer of ice or compacted snow without penetrating into it. If they melt the surface and form a liquid film on top of the layer of ice or compacted snow this may well result in more dangerously slippery conditions.

Warning 13

Spreading without pre-wet or liquid spreaders:

- Dry salt that has been wetted with alternative de-icer during loading into spreading vehicles will demonstrate a potentially poorer spread distribution, and spread rates may be inaccurate. The salt may suffer from tunnelling within the vehicle hoppers, which could potentially result in sections of road not being treated.
- Routes treated in this manner should be monitored after treatment and suitable warnings issued to drivers regarding potentially unsafe driving conditions.

Recommendations

RH.1

Minimum Winter Networks:

- As part of their contingency planning, authorities should define a minimum winter network

RH.2

Winter Resilience Standard:

- Authorities should consider, consult on and formally adopt local service standards for resilience of their winter service in terms of number of days continuous severe conditions salting on a defined Minimum Winter Network for the Overall Winter Period and for the Core Winter Period.
- A resilience benchmark of 12 days/48 runs should be adopted for full pre-season salt stockholding by 1 November for English local highway authorities.

RH.3

Salt composition:

- The soluble chloride content of rock salt, expressed as sodium chloride, should not be less than 90%

- The purity of marine salt should not be less than 99%.
- The soluble sulphate compounds expressed as calcium sulphate, should not be more than 2.5%.
- The insoluble content should not be more than 7.5%.
- High purity salts such as marine salt and vacuum or PAD salt should be used to manufacture brine (except in saturators specifically designed for rock salt).
- The sodium chloride content and percentage of impurities in a salt need to be considered when purchasing and when determining appropriate spread rates.

RH.4

Salt grading:

- The grading of salts, including imported salts should comply with BS 3247 which specifies the range of acceptable particle sizes for salt used in the UK.
- The grading of some types of salt can vary significantly from one delivery to another and therefore it is important to check the grading regularly, and particularly when salt is obtained from a new source or supplier. Spreaders should always be calibrated for the salt being used.
- Pressure dried vacuum salt and PAD or vacuum road salt can be used alone or mixed with other salts, but only if the mixture complies with BS 3247.

RH.5

Moisture content for salt:

- Salt should be stored such that its moisture content is maintained within an optimum range for the spreading technology used.
- The salt moisture content should be kept at a consistent level and should not differ from that used for spreader calibration by more than 1.5% or be outside the range shown in Table H2.
- Where salt moisture content is outside the optimum range consider remedial action as discussed in H6.70

RH.6

Salt storage:

- Storing salt in a salt barn or dome will help to maintain the salt in optimum condition
- Fabric covered structures can be considered as an economical option for salt storage. Consideration should be given to them as they may offer similar protection to the salt and control of its condition as barns or domes

- When it is necessary to store salt outside, stockpiles should be covered by waterproof sheeting or a suitable weather proofing system
- The key areas of good practice (covered in this guidance) should be followed whatever storage method is used
- The requirements of the relevant environmental agency and environmental legislation for the area where the salt is stored should be noted and followed

RH.7

Storage space:

- The storage area must be large enough to contain the salt stockpile and provide room for vehicles to safely manoeuvre when unloading/loading and maintaining the stockpile
- If changing to a different salt type, the effect on the storage area requirements or amount of salt that can be stored should be reviewed
- Different types of salt should be properly and clearly segregated in storage to prevent contamination or loading of the wrong type of salt

RH.8

Safety:

- Salt stockpiles can become dangerous if the salt is piled too high. Vertical or very steep faces also present a danger due to the risk of collapse. The risk will increase dependent on the quality of the material and storage method i.e. barns or domes generally present a lower risk than open storage.
- The maximum stockpile height should not exceed the ability of the loader to push up salt from solid ground
- All faces should be sloped to the natural angle of repose to reduce the risk of collapse
- Salt should be handled by machine including when taking samples
- Stockpiles must not be walked on without adequate precautions and equipment for health and safety reasons and lone working should be prohibited when working manually at stockpiles. Proper procedures with risk assessments should be put in place.
- Operators of machines involved in handling salt, spreader drivers, etc., should not leave the vehicle to carry out any manual operation on the stockpile without a proper procedure and risk assessment having been put in place. Such procedures should not permit lone working.

RH.9

Construction:

- All buildings and storage structures must meet UK building design codes and be constructed of materials not subject to corrosion e.g. timber, high grade concrete(C50).
- All of the walls within a barn or dome must be designed to withstand the maximum possible loads caused from salt stored against them and the dynamic forces from loading the salt
- Salt stockpiles should be kept on a concrete (preferred) or a bituminous base sloped to allow water to drain away, prevent ingress of water from the ground, contamination and facilitate loading.
- Stockpile bases should be designed to prevent salt contaminated water flowing from the stockpile directly into the ground or any untreated drainage system. They should also prevent ingress of water flowing into the stockpile.
- For salt stored outside (covered or uncovered), the hard standing should have a slight cross-fall and drainage to disperse precipitation quickly and prevent water accumulation at the base of the stockpile.
- An impervious base must be provide to meet environmental requirements
- Adequate drainage must be provided which meets environmental requirements/agreements

RH.10

Position/orientation of salt barns and domes

- Doors will assist in maintaining the salt condition, in particular where openings face the prevailing weather
- To minimise weather ingress and where practical, openings should face away from the prevailing wind and weather where practical

RH.11

Drainage and environmental requirements:

- The requirements of the relevant Environmental Agency for the area where the salt is stored should be noted and followed
- Where pre-wetted salt is used, there may be a business case for the recycling of drainage water from stockpiles and the washing down of spreading equipment, as well as the collection of rainwater for brine production (brown water recycling)

EA recommendations are that:

- Salt stores should be roofed or covered with an impermeable membrane
- Salt stores should be sited on an impervious base and sited at least 10m away from the nearest watercourse or drain inlet/access
- Drainage from stores and loading areas should pass to a suitable system or a sealed tank – not to a watercourse or soakaway
- If the above drainage requirements cannot be met, consent from the appropriate agency will be needed which may contain strict quality conditions
- Salt from stores should not encroach onto the open yard

RH.12

Outside unprotected storage:

- EA recommendations are that salt stores are roofed or, if this isn't practicable, covered with an impermeable membrane
- The stockpile should be left undisturbed to keep the thatch intact, apart from the working face
- The thatch on rock salt should not be used
- The thatch on a stockpile of marine or pad salt with high purity can be used if it is regraded
- The stockpile should be profiled such that water runs off and does not pool on the surface
- The base to the stockpile should be impervious and designed to prevent water running into the base of the stockpile

RH.13

Stockpile rotation

- Salt should be stored such that its condition is maintained throughout the season
- Where practical, the priority should be to use any externally stored unprotected salt first, and then externally stored covered salt before salt stored in barns and domes
- Salt should be used in order of delivery (oldest first)
- Salt should not be externally stored unprotected for more than one winter season
- Salt should not be externally stored undercover for more than three years unless it can be confirmed that the salt remains in good condition

- Handling of salt for dry salting should be kept to a minimum

RH.14

Method of working stockpiles:

- Salt should only be removed from a single working face at any one time
- Where practical, the stockpile should be worked fully to the back of the pile before moving the working face
- External stockpiles should take the form of an extended pyramid or trapezoid
- The size of the working face should be kept to a minimum, for example by making the working face the short side of the pile

When there is insufficient covered storage capacity for all salt stocks, the priority for storing under cover should be as follows:

- Highest priority: High purity/low insoluble content salt e.g. Marine salt
- Lowest priority: UK rock salt

RH.15

Monitoring of salt condition:

- Authorities should regularly check the salt condition, by testing samples taken from existing stockpiles as well as new deliveries
- A regime of testing should be developed in consultation with the salt supplier
- Salt samples can be sent to a UKAS accredited laboratory and analysed.
- Simple checks on moisture content can be carried out locally at reduced cost but should be supplemented and verified by UKAS accredited laboratory tests
- Independent testing should be compared with certificates provided by suppliers

RH.16

Actions when salt moisture content is outside the optimum range:

- Review spread rates when salt is not in the optimum moisture content range
- Recalibrate spreaders where moisture content varies significantly from that at previous calibration

RH.17

Storage of strategic stocks:

- Recommendations for preparing and maintaining stockpiles given in this section apply equally to strategic stockpiles
- Salt should not be stored outside undercover for more than three years unless it can be confirmed that the salt is in good condition
- Consider replacing strategic stocks of salt on a rotating basis every three years.
- Strategic stocks of salt should be inspected regularly and samples taken to monitor the salt condition. More frequent checks should be made for stockpiles over three years old

RH.18

Loading spreaders:

- Do not load thatch or large aggregations ('lumps') of salt
- Care should be taken to avoid contamination of the salt with detritus when removing from the base level of the stockpile
- Salt spreaders should be sheeted during spreading. This will protect the salt from snow and rain and prevent it being lost from the hopper during spreading

RH.19

Calibration of salt spreaders:

- Spreaders should be calibrated for each type of salt they are to spread using salt in the expected condition for normal operations
- Any variation in the condition of the salt from the condition at calibration must be minimised if re-calibration is to be avoided
- The performance of spreaders should be routinely monitored after calibration and checked if necessary
- Significant changes in performance, salt type or salt condition should trigger re-calibration or at least a review of the need for re-calibration
- Spreaders should be calibrated regularly and following any maintenance or incident that has the potential to affect spreader performance
- Calibration records should be retained in accordance with the Authority's policies regarding the retention of other important documents

RH.20

Calibration procedure:

- Calibration should be carried out for every spreader in a fleet and should check:
 3. That the total amount of salt being discharged is within acceptable tolerances
 4. That the salt is being spread to the target area
- Calibration should always involve a direct measurement of the amount of salt being discharged and where it is being spread
- Calibration must be carried out by a competent and trained person

RH.21

Pre-calibration checks:

- Check and record the salt moisture content ensuring that it is in an acceptable range*
- Check the condition of the spreader, particularly the hopper, chute and salt distribution mechanism and controls.

* The salt moisture should be within the optimum range. However, the vehicle should be calibrated for the actual salt that it will be using, no matter the state of the salt.

RH.22

Timing of calibration:

- Spreaders should be calibrated:
 - Just before the start of the season
 - Mid-season
 - Whenever significant changes in performance are noted
 - Whenever significant changes are made to the spreader (maintenance, repair, etc.)
 - When salt type or condition changes

RH.23

Monitoring spreader performance after calibration:

- Spreader performance should be routinely monitored throughout the season

- Spreaders should then be recalibrated when any significant change in the spreaders performance is noted
- Regular spreader checks should form part of the Winter Service plan
- Recalibration should always be instigated where the performance checks show this is required

RH.24

Weather and road surface conditions:

- Accurate forecasting of road and weather conditions will allow spread rates to be optimised and give decision makers confidence in selecting the lowest spread rates for those forecast conditions
- Information should be obtained concerning predicted precipitation type, intensity and timing, as well as the predicted road surface temperature in order that the timing of treatments and spread rates can be optimised
- Weather stations and live data should be used when possible
- Forecasts and treatments based on climatic domains (where practical) may enable more efficient and economic spreading
- When the weather and road surface conditions are suitable, consideration should be given to treating only the known wet and cold spots, rather than full routes. However, when undertaking 'spot' treatments such as these, good records need to be kept regarding which locations were treated, when they were treated, why they were treated and the spread rate used. These records should be used to aid future decision making in similar conditions
- Highway drainage systems need to be adequately maintained to prevent water ponding or flowing on to the road. Information concerning locations where water is flowing onto the highway or failing to flow away from it should be reported to the appropriate maintenance team for remedial action and/or the erection of temporary warning signs
- Higher spread rates should be used in high wind (greater than 20mph average wind speed) if wind compensation of the spreader settings is not possible

RH.25

Porous Asphalt:

- Porous asphalt surfacings require particular attention
- Precautionary treatment rates at least 25% higher should be considered for porous asphalt
- Since porous asphalt cools more rapidly than denser surfaces, treatments should be made in good time to avoid ice forming, These treatments must also remain effective for longer as porous asphalt is slower to warm

- Spread rates should be increased for a distance of at least 100m before a change from dense surfacing to porous asphalt and, after a contiguous section of porous asphalt, the spread rate should remain at the elevated level for at least 1km after the surface change. ; The distance can be shorter than 1km with a low level of traffic. This is due to a reduction in the amount of salt carried forward by traffic from the porous asphalt to the dense surfacing

RH.26

Negatively textured thin surfacings :

- The spread rate for negatively textured thin surfacing (other than porous asphalt) should remain as for hot rolled asphalt (see Treatment Matrices A to C)
- Winter service practitioners should aim to apply treatment as close as possible to the forecast time of freezing, within the limits of practicality
- The common practice of applying treatment during the early evening to protect against a forecast of ice forming in the early hours of the following morning may not be economical or effective. Where this practice is employed, accurate historical records of the decision making process are important to provide confidence that appropriate levels of service are met. These records should be used to aid future decision making in similar conditions.

RH.27

Residual salt:

- To reduce the number of treatments and minimise spread rates, residual salt levels may be considered when possible
- However, residual salt levels should only be taken into account for routes where good information is available, conditions are favourable and historical evidence has been gathered to support decision making (see below). It is important that the possible variation of residual salt levels over the whole length of treatment routes is considered
- Reliance should not be placed on residual salt levels on negatively textured thin surfacing
- Less reliance should be placed on residual salt levels as lower spread rates are introduced
- If a salting operation is not instructed or if a salt spread rate is reduced on the basis of the residual salt level, it is crucial that the information utilised regarding this issue is accurate. Whilst normally providing useful information on conditions, residual salt measurements from roadside weather stations should be treated with some caution
- For decision making purposes, residual salt readings (or calculated 'Freezing Temperatures') from individual sensors should not be solely relied upon, and other information such as knowledge of previous salting operations, actual weather and road conditions during the intervening period etc. should also be

utilised. Furthermore, it is recommended that this information is supplemented by visual inspection.

- It is important that good records are kept on the decision making process involved in determining the effect of residual salt on spreading operation and rates.

RH.28

Traffic levels:

- Actual traffic levels should be used
- Where actual traffic levels are not known the decision making process should consider both the low/medium and high traffic levels, then take the highest spreading rate applicable for the known conditions
- Spreading in heavy traffic should be avoided where possible as conditions for spreading will be less than optimal
- Spreading carried out at a time of lower traffic will help reduce losses before the salt has dissolved
- Ideally, there should be reasonable trafficking after spreading to facilitate dissolution, especially when spreading dry salt and even more so for dry 10mm salt
- Treatments after rainfall should be delayed to allow traffic to disperse as much water as possible, when operational considerations and the weather allows
- Treatments on roads with low traffic may need to be increased or carried out earlier to allow sufficient time for dissolution to take place before the forecast conditions.

RH.29

Target spread rates for precautionary treatment:

- When precautionary treatments are carried out, sufficient salt should be spread, based on the forecast conditions, to prevent frost and ice formation and/or to prevent ice or snow from bonding to the carriageway
- Spread rates should be kept as low as possible for the forecast conditions, routes and road surfaces considered. This is in order to optimise salt usage, improve stock resilience, and reduce the impact of salt on vehicles, infrastructure and the environment

RH.30

Preparation before ice, snow and freezing rain:

- Forecasting and timing are critical to the efficient treatment of snow and freezing rain conditions. Decisions should be based on the best available

forecast information and treatments carried out as close to the optimum time as is practicable

RH.31

Effect of trafficking:

- The effect of trafficking should be considered when planning treatments relating to snowfall events as, depending on the prevailing conditions, it can be beneficial in aiding the melting or dispersing of snow or have the dis-benefit of compacting existing layers of snow making them harder to remove
- For the above reasons careful consideration needs to be given to the closing of roads in snow conditions or the timing of closing and opening
- If trafficking is not able to be accounted for, treatment rates should be those provided for light traffic conditions
- When traffic levels are light, and where practicable, the number of trafficked lanes should be reduced, as this concentrates the traffic and helps to disperse the snow more rapidly

RH.32

Ploughing:

- When snow is forecast, ploughs and snow blowers should be made ready to allow snow clearance to commence without delay as and when required.
- Drivers and staff required to carry out ploughing should be ready to start operations when needed and not be delayed due to travelling to depots etc. when snow has started to settle.
- When carrying out treatments after snowfall, as much snow and slush as possible should be removed from the road surface by ploughing, before the application of de-icer and/or abrasives
- During and after snowfall, for efficiency and environmental reasons it is best that only the ploughed lane is treated if other lanes have still to be ploughed. The spread width settings may be adjusted accordingly to maximise effectiveness
- Actions to remove snow should be taken as early as practicable to prevent compaction by traffic
- Subsequent ploughing can be carried out when necessary to prevent a build-up of snow (this may require continuous ploughing in certain conditions)
- Ploughing is most effective when down to the road surface
- Ploughs are best operated at a steady speed which is effective for the plough and conditions

- Ploughing should be with a loaded vehicle, to aid traction and allow a steady ploughing speed to be maintained
- When fitted, a plough blade float mechanism should always be used
- If available, snow blowers can be used for particularly deep snow or where there is insufficient width at the side of the road to store the ploughed snow
- Snow ploughs should always be operated in accordance with the manufacturer's instructions

RH.33

Types of plough:

- Plough blades should be designed to minimise distortion during ploughing. They should have special wearing edges to prevent damage and ensure low friction
- In addition to the spreader fleet, consideration should be given to the fitting of ploughs to other suitable vehicles
- Authorities should consult manufacturers, to ensure that ploughs are suited to the operational conditions and requirements

RH.34

Good ploughing practices:

- Plans should be drawn up for each ploughing route to inform drivers where ploughed snow can and cannot be moved to
- Snow should be ploughed to the low side of carriageways and the build-up of snow in the centre of a single carriageway should be avoided. This is to avoid the later run-off from windrows or piles of snow from entering the traffic lanes, where it may dilute treatments and/or refreeze
- Drainage should be kept clear, and windrows or piles of snow should be removed or be positioned to allow melt water to reach the drains
- Piles of snow should be removed, where possible, so that melt water does not overload drainage systems or run back onto the road
- Windrows must be avoided at level crossings. Before ploughing commences on roads that include level crossings, contact should be made with Network Rail.
- Windrows should be removed or ploughed back when further periods of heavy snow are anticipated. This will provide space to plough the further snowfalls
- Accumulations of snow at central reserves, especially those with vertical concrete barriers, should be cleared where they create a hazard or impede drainage

- Where possible, multi-lane dual carriageways should be ploughed in one pass, either by:
- Ploughing just one lane
- Ploughing all lanes using ploughs working in echelon formation
- Appropriate traffic management should be considered

RH.35

Precautionary treatments before snow or freezing rain:

- If light snow is forecast that will be of insufficient depth to require ploughing, then sufficient salt should be spread to melt the snow aided by the action of traffic
- If moderate or heavy snow is forecast, sufficient salt should be spread to provide a debonding layer

RH.36

Treatments during snowfall

- Ploughing is most effective when started as soon as possible for the conditions and, where required, is continuous or sufficient to prevent a build-up of snow
- Salt spreading should be considered after ploughing to provide a new debonding layer to facilitate further ploughing of fresh snow and the break up and dispersal of compacted snow
- On heavily trafficked roads it is preferable (where practicable) to prevent a build-up of more than 10mm depth of snow. The build-up should be no more than 50mm in depth where there is a risk of compaction by traffic

RH.37

Treatment of slush on the carriageway:

- If freezing conditions are expected, it is important to remove as much slush as possible by ploughing to reduce the amount of material available to form ice when temperatures drop, as well as to reduce the amount of salt required for subsequent treatments
- If freezing conditions are not expected and the slush will melt and be dispersed under the action of traffic, no action is required

RH.38

Treatments of medium or thick ice and compacted snow:

- For high thicknesses of compacted snow and ice (i.e. greater than 5mm), treatments should be with salt and abrasive mixture or abrasive only.

Treatments with a significant amount of salt should not be considered because they may leave the surface uneven. Any brine formed on the surface may collect in hollows and deepen them further, which can lead to a very uneven surface

- When using abrasives alone, sufficient salt should be added to the abrasive to prevent freezing of the water within it. If the moisture content of the abrasive is 7%, 25kg of salt per tonne of abrasive is sufficient to prevent freezing if thoroughly mixed

RH.39

Use of alternative de-icers - Environmental considerations:

- Authorities should obtain a full specification and Material Safety Data Sheet (MSDS) detailing the types and amounts of chemicals contained in any de-icer used. Authorities should carry out an impact assessment for the specific products used
- Authorities should follow the guidance in this document to reduce the risk of any significant environmental impacts from storage and spreading of alternative de-icers. When proposing to use any de-icer other than rock salt, authorities should contact the relevant national environmental agency to agree their use, including advice on special restrictions due to potential impacts on environmentally sensitive locations

RH.40

Use of alternative de-icers - Storage capacity requirements:

- A severe weather plan (winter service plan) should be produced that identifies the network to be treated using the alternative de-icers in extreme cold conditions
- Authorities should plan to provide sufficient de-icers to give the necessary resilience. However, the likelihood of extreme events occurring in their particular geographic areas should be considered
- Authorities should calculate the amount of de-icer required to be stored, based on the route length to be treated, the spread rates required under different weather conditions and the number of treatments for which a reserve is considered necessary

RH.41

Use of alternative de-icers - Types of storage container:

- When choosing the type of container the following factors need to be considered:
 - Total storage capacity
 - Requirements for storage container construction

- Requirements for preparing the storage area
- Materials must be capable of withstanding corrosion from stored chemicals and resistant to degradation from external factors. Recommended materials for storage container construction are polypropylene, polyethylene, glass reinforced plastic (GRP) or stainless steel
- Container walls must be thick enough and plastics be of a suitable grade to withstand the weight of dense de-icing liquids.
- Storage containers should have the facility to prevent the build-up of pressure within the container

RH.42

Use of alternative de-icers - Storage area:

- Storage areas for liquid de-icers should be bunded or storage tanks have a secondary containment system to contain any leaks and spills and to aid any clean up
- The containment capacity of the bund should be large enough to hold at least 110% of the capacity of the largest tank or 25% of the total storage capacity if in multiple tanks, whichever is the greater
- Storage should be sited on an impermeable surface, to prevent any leakage soaking into the ground
- Drainage from the store or loading area must not be allowed to soak away and must not pass into the surface water system or to soakaways. Foul drainage cannot be used without the prior permission of the drainage service provider. Discharge to a sealed tank equipped with a level alarm could also be considered
- Liquids should not be stored where spillage could enter adjacent surface water or foul water drainage and the bunded area should not have any drains within it that lead to these systems unless prior permission of the drainage service provider has been granted
- Where practical, preference should be given to indoor and/or covered storage of liquids. This will assist in preventing rainwater from building up in any bunded area, reduce bunding requirements, offer greater protection to the storage containers and associated equipment and fittings and also shading from direct sunlight
- Indoor storage areas should be well ventilated
- Ensure all local and national environmental requirements are met

RH.43

Use of alternative de-icers - Monitoring de-icer condition in storage:

- Procedures should be put in place to properly maintain and monitor the de-icer condition, and to ensure the de-icers remain effective after storage i.e. that they remain adequately mixed and that solid particles do not settle out
- A reference measurement should be made of the de-icer condition for each new delivery and recorded for future monitoring
- De-icers should be regularly stirred or agitated and immediately before each use to reduce any settlement or crystallisation and ensure the liquid does not separate out into layers of different concentrations
- When not in regular use, de-icers should be stirred or agitated at least once every 3 months to help maintain the condition of the de-icer

RH.44

Use of alternative de-icers - Handling liquid de-icers:

- The Material Safety Data Sheet (MSDS) should be consulted for necessary health and safety information. Authorities should carry out a COSHH assessment for the specific products used
- In order to reduce the risk of leaks escaping, as far as issues of practicality allow, all pipes and hoses used for transferring de-icers to the storage tanks and from storage tanks to spreaders should be contained within the bunded area or secondary containment system
- Loading and dispensing areas should not connect to any surface water sewer or soakaway. Foul drainage cannot be used without prior permission of the sewer provider. A sealed tank with level alarm could also be considered.
- All connections and fittings must be constructed of materials resistant to corrosion by the de-icer i.e. polypropylene, polyethylene, GRP, PVC or stainless steel
- All pipes, hoses and connections should be regularly checked for leaks and tight fitting
- In order to load and unload spreaders quickly, a pump of sufficient capacity will be needed to transfer liquid de-icer between the spreader and storage container. In determining the required pump capacity, consideration should be given to the number of spreaders that are to be loaded, the spreader capacity and the number of pumps available
- It is recommended that all wetted parts of the pump should be stainless steel or other suitable materials to provide resistance to corrosion by the de-icers

RH.45

Use of alternative de-icers - Pre-wetted spreading equipment:

- Authorities should ensure that spreaders:
 - Should not be adversely affected by the de-icer
 - Can be set up and calibrated to accurately deliver the proposed spread rates to the defined target areas at the operating temperatures
 - Have the capability to be set up for different salt types and pre-wetting agents
- Drivers (including reserves) should be fully competent in the use and operation of the spreaders
- Regular checks should be made when using the alternative de-icers to ensure they have no additional (as compared to salt) detrimental effect on the following equipment:
 - Spreader body, chassis, electrics and spinner
 - Brine tanks on spreader
 - Spreader brine pumps
 - Spray nozzles on spreader
 - Pumps and other equipment for transferring de-icers to spreaders from storage tank

RH.46

Use of alternative de-icers - Liquid only spreading equipment:

- Liquids should be spread using dedicated liquid spreaders or combination spreaders where available
- If Authorities do not have liquid spreaders, modifications to spreaders or other maintenance vehicles, potentially including equipment for weed control or plant watering, should be investigated to provide an adequate and calibrated liquid spreading capability (N.B. de-icers should not be sprayed onto compacted snow or ice)
- Liquid spreading equipment that can apply de-icer liquid in longitudinal lines no greater than approximately 100mm apart for treatments on ice and snow should be used

RH.47

Use of alternative de-icers - Spreading without pre-wet or liquid spreaders:

- When using the alternative de-icers discussed in this guidance, it is strongly recommended that pre-wet or liquid spreaders are utilised. This section is presented to give guidance to Authorities without these capabilities regarding spreading in extreme cold conditions. However, the treatments are likely to be both less economical and less effective than with pre-wetted or liquid spreading capability
- The options presented in this section should only be considered as a last resort and not as an alternative option to using the preferred spreading methods previously described
- Salt wetted with alternative de-icer liquids before loading onto spreaders can be considered but strictly in accordance with the guidelines given below:
 - Increase the spread rate. This may help in some conditions when no other alternatives are available (see salt spread rates included in the treatment matrices below) but Authorities should consider the probable limited effectiveness, cost, salt stock resilience and environmental implications
 - In extreme cold or low humidity conditions, even at high spread rates salt may not be effective. Authorities must assess the risk and act appropriately. For example consider road closures or clearly warning drivers of unsafe conditions
- The local winter plan should include additional measures for extreme cold conditions beyond treatments. These should include:
 - Provision of timely information and warnings to the public
 - Liaison with the police and other emergency services
 - Additional monitoring of route condition after treatment

RH.48

Use of alternative de-icers - Maintenance of spreading equipment:

- Spreaders should be washed down after use, using high volumes of water with low pressure, taking care that washdown water is handled properly to prevent environmental impacts. Wash bay areas should not be connected to any surface water sewer or soakaway. Refer to the Environment Agency's Pollution Prevention Guideline PPG13 Vehicle Washing and Cleaning for further guidance
- Spreader tanks, pumps and hoses should be rinsed with water before changing the liquid. After rinsing, the brine pump should be operated for a short time to put the new de-icing liquid through the whole system and prevent freezing
- Spreader manufacturers should be consulted to confirm spreaders have adequate protection for mechanical and electrical components:

- Paint work and protective systems should be of an appropriate standard
- Additional protection measures such as wax based coats, plastic chassis canopies and gear box covers should be considered

RH.49

Use of alternative de-icers - Precautionary treatments for extreme cold:

- The guidance given in H9 should be followed for treatments when the salt can enter solution before the minimum of the air or road surface temperatures are at or below -7°C or -5°C in low humidity conditions. This is typically when treatments can be made earlier in the day and completed at least 2 hours before the temperatures falls below -7°C (or -5°C in low humidity conditions)
- In order to improve stock resilience and reduce the impact of salt and alternative de-icers on vehicles, infrastructure and the environment, spread rates used should not exceed those recommended

RH.50

Use of alternative de-icers - De-icer treatments on snow and ice:

- Where spread rates are given for the application of liquid, this is on the basis that application is only from a dribble bar forming discrete longitudinal lines of de-icer no more than approximately 100mm apart across the carriageway
- Application of liquids in lines can also be in conjunction with dry salt spreading and can be carried out immediately before, after or at the same time as the dry salt application
- Solid de-icer with larger particle sizes will be more effective than a finely graded material, as the larger particles can penetrate further and more quickly into the layer before dissolving to reach the road surface and debond the layer

The road condition should be monitored on all treated routes when ice, snow or compacted snow are present and abrasives should be applied at a rate of 20 to 40g/m², as outlined in Matrix D, if more dangerously slippery conditions occur

QUICK REFERENCE FOR PRECAUTIONARY TREATMENT DECISION MAKING

Decision making procedure preparation

The following checklists are designed as a quick reference for the delivery of the Treatment Decision. Decision Making Checklist H1 “In advance of forecast” can be used to prepare for the winter season as well as be used in season to confirm that the data has not changed and take action where necessary outside of the individual treatment decision making process required for a weather event.

When this process is used and the results properly documented, when the treatment decision is made it is only necessary to confirm that certain parameters (the base data that may not change at each treatment decision) such as spreaders being in calibration and salt condition (is unchanged), need be confirmed. Furthermore, the number of treatment matrices and columns used within the matrix needed for a particular route can be identified possibly reducing to just one or two for most decisions (provided this base data has not changed).

Decision Making Checklist H2 “At forecast” is the part of the decision making process which is reliant on the forecast and other current conditions such as traffic level, road wetness at time of spreading and wind.

Decision Making Checklist H1 – In advance of forecast of frost		
Item	Parameters	Action
The following conditions and parameters may be assessed/determined in advance of the treatment decision but must be confirmed within the treatment decision process for each forecast		
Spreader is allocated to route	Yes/No	Check spreader is able to spread de-icer allocated for the route – if not do not use or treat as poor spreading capability and increase spread rate to next largest rate in appropriate matrix. Monitor route during and after spreading – See Section H7.24
Spreader is in Calibration	Yes/No	Use Poor Spreading capability if No providing spreader is capable of spreading de-icer to the minimum level required ^{*1} . See Section H7.18
Is the same spreading technology used as when calibrated?	Yes/No	If No confirm spreader is capable of spreading de-icer to the minimum level required ^{*1} . Use spread rate matrix consistent with the actual technology to be used. See Section H10.22
Is de-icer the same type and grading as calibration (Normal and/or extreme cold alternatives need to be considered)	Yes/No	Is spreader capable and calibrated for de-icer if Yes OK – if No do not use or treat as poor spreading capability (poor coverage) and increase spread rate to next larger rate in appropriate matrix. Monitor route after during and spreading – See Section H7.24
Has de-icer been tested within allowable period (Table H5)	Yes/No	If No reduce spreading capability (coverage) to next lesser level of capability if above Poor Capability. Take remedial action (See H6.70) where salt exceeds maximum allowable m/c – See Section H6.8
Is de-icer within 1.5% of calibrated m/c and not above maximum allowable m/c	Yes/No	If No reduce spreading capability (coverage) to next lesser level of capability if above Poor Capability. Take remedial action (See H6.70) where salt exceeds maximum allowable m/c – See Section H6.8

^{*1} Note the minimum requirements for spreading capability when using the spreading matrices in this guidance are set out in Section H10.22. These must be met at all times for the rates to be valid.

Decision Making Checklist H2 – At forecast of frost or ice		
Item	Parameters	Action
The following conditions and parameters are assessed/determined when the treatment decision is being made for the forecast conditions		
Obtain forecast conditions (from forecast provider)	Temperature and precipitation	Use values to determine road surface wetness and appropriate row in spread rate matrix for salting technology for wetness and RST ^{*1}
Assess salt distribution	Good/Fair/Poor	Use results of distribution assessment if known and spreader is in calibration. Otherwise use Poor – See Flowchart H1
Assess traffic level	High/Medium	Use known traffic levels at time of/immediately after spreading. If traffic levels are not known carry out the full decision making process for both High and Medium/Low traffic levels and take higher spread rate. See Table H11
Assess road surface wetness at time of spreading	Dry/Damp/Wet Or Very Wet	See Table H10 and use appropriate value to determine both losses and spread rate for combined RST and wetness in appropriate decision matrix for salting technology used. For a very wet road (in excess of Wet as defined in Table H10 refer to Table H13 for appropriate action
Assess loss after spreading	High/Normal	Use Flowchart H2
Assess road surface wetness at forecast point	Dry/Damp/Medium	Assess from forecast of precipitation See Table H10
Assess road surface temperature	°C (from forecast) ^{*1}	Use along with road surface wetness to determine appropriate row in spread rate matrix.
Determine spread rate from appropriate spread rate matrix for technology and de-icer used	Using information assessed above	Use Table H12 to identify appropriate Matrix column. For normal or extreme cold conditions.
Check special conditions which may require increase in treatment rate, etc.	Surfacing, wind, traffic.	See Table H13
Record of decision process		Record all information and communicate to appropriate parties for service delivery, management and audit of the service.

*¹ – Forecast conditions may be modified by additional historical data, thermal mapping information, sensor information and other sources of local knowledge where these are available. This should only be done where well defined processes aligned with the Treatment Decision and understanding of the information along with its impact on the decision and associated risks are understood and risks mitigated.

Table H2 – Optimum salt moisture content		
Salt type	Technology	Optimum range
UK rock salt	Dry salting	2 to 3.5%
UK rock salt	Pre-wetted	Less than 3.5%
UK rock salt	Treated	2 to 3.5%
Marine salt* ¹	Dry salting	1.5 to 4%
High purity imported rock	Dry salting	2 to 3.5%

*¹ Includes Vacuum and PAD salt.

Table H5 – Salt testing frequency	
Storage type	Frequency of testing (per month)
Outside unprotected	2
Outside covered * ¹	1
Barn or dome * ¹	1

*¹ Use appropriate level for Fabric covered structures depending on specification

Table H6 – Assessment of Uniformity of Salt distribution from stationary test		
Salt type	Uniformity	Minimum spread rate in a lane (% of the target amount)
Treated and pre-wetted	Good	90
	Fair	70
	Poor	60
Dry	Good	80
	Fair	60
	Poor	50

Table H7 – Assessment of Uniformity of Salt distribution from observed run		
Salt type	Uniformity	Observation of distribution to two lanes
Treated and pre-wetted	Good	Distribution appears uniform between the lanes Wastage assessed to be less than 5%
	Fair	Up to 50% more salt assessed to be in one lane than the other Wastage assessed to be less than 10%
	Poor	Up to 75% more salt assessed to be in one lane than the other Wastage assessed to be less than 15%
Dry	Good	Up to 20% more salt assessed to be in one lane than the other Wastage assessed to be less than 10%
	Fair	Up to 75% more salt assessed to be in one lane than the other Wastage assessed to be less than 15%
	Poor	Up to 90% more salt assessed to be in one lane than the other Wastage assessed to be less than 20%

Table H9 – Sample Precautionary Treatment Decision Guide				
Road Surface Temperature	Precipitation	Predicted Road Conditions		
		Wet	Wet Patches	Dry
May fall below 1°C	<u>No</u> rain <u>No</u> hoar frost <u>No</u> fog	Salt before frost	Salt before frost (see note a)	No action likely, monitor weather (see note a)
Expected to fall below 1°C	<u>No</u> rain <u>No</u> hoar frost <u>No</u> fog			
	<u>Expected</u> hoar frost <u>Expected</u> fog	Salt before frost (see note b)		
	<u>Expected</u> rain BEFORE freezing	Salt after rain stops (see note c)		
	<u>Expected</u> rain DURING freezing	Salt before frost, as required during rain and after rain stops (see note d and H11.35)		
	<u>Possible</u> rain <u>Possible</u> hoar frost <u>Possible</u> fog	Salt before frost		Monitor weather conditions
	<u>Expected</u> snow (See H11.35)		Salt before snow fall	
<p>The decision to undertake precautionary treatments should be, if appropriate, adjusted to take account of residual salt.</p> <p>All decisions should be evidence based, recorded and require continuous monitoring and review.</p> <p>Decision on treatment timing should account for traffic and road surface wetness at time of treatment and after, as well as forecast conditions.</p>				

Notes:

- (h) Particular attention should be given to the possibility of water running across or ponding on carriageways and other running surfaces e.g. off adjacent fields after heavy rains, washing off or diluting salt previously deposited. Such locations should be closely monitored and may require treating in the evening and morning and possible other occasions. See Warning 6.
- (i) When a weather warning contains reference to expected hoarfrost, considerable deposits of frost may occur. Hoarfrost usually occurs in the early morning and is difficult to cater for because of the probability that any salt deposited on a dry road too soon before its onset, may be dispersed before it can become effective. Close monitoring is required under this forecast condition which should ideally be treated just as the hoarfrost is forming. Such action is usually not practicable and salt may have to be deposited on a dry road prior to and as close as possible to the

expected time of the condition. Hoarfrost may be forecast at other times in which case the timing of salting operations should be adjusted accordingly.

- (j) If, under these conditions, rain has not ceased by early morning, crews should be called out and action initiated as rain ceases.
- (k) Under these circumstances rain will freeze on contact with running surfaces and full pre-treatment should be provided even on dry roads. This is a most serious condition and should be monitored closely and continuously throughout the danger period. Service Providers should be aware of the health safety implications of ice forming during freezing rain events, both to the travelling public and winter maintenance personnel carrying out treatments. They should be prepared to make follow up treatments on any ice that has formed or to take suitable actions such as road closures.
- (l) By using domain-based forecasting, consideration can be given to differing actions from each depot.
- (m) Where there is any hint of moisture being present, a pessimistic view of the forecast should be taken when considering treatment to negatively textured surfaces. See Warning 6
- (n) Spreading salt alone at temperatures below about -7°C (the lower of air or road surface at time of spreading) or below about -5°C in low humidity conditions (relative humidity less than 80%) may not be practically effective. High spread rates will be required and even then salt may not enter solution quickly enough to prevent freezing or be able to melt ice or compacted snow. Consideration should be given to spreading at least 2 hours before the temperature reaches these values to allow salt to enter solution, or the use of alternative de-icers. See Section H12.

Table H10 – Road Surface Wetness		
Definition	Description	Water film thickness (mm)
Dry road	A road that shows no signs of water or dampness at the surface but may be just detectably darker (however it may have moisture contained in pores below the surface that is not 'pumped' to the surface by traffic)	0 to 0.03mm
Damp road	A road which is clearly dark but traffic does not generate any spray. This would be typical of a well-drained road when there has been no rainfall after 6 hours before the treatment time.	0.03 to 0.05mm
Wet road	A road on which traffic produces spray but not small water droplets. This would be typical of a well-drained road when there has been rainfall up to 3 hours before the treatment time.	0.05 to 0.1mm

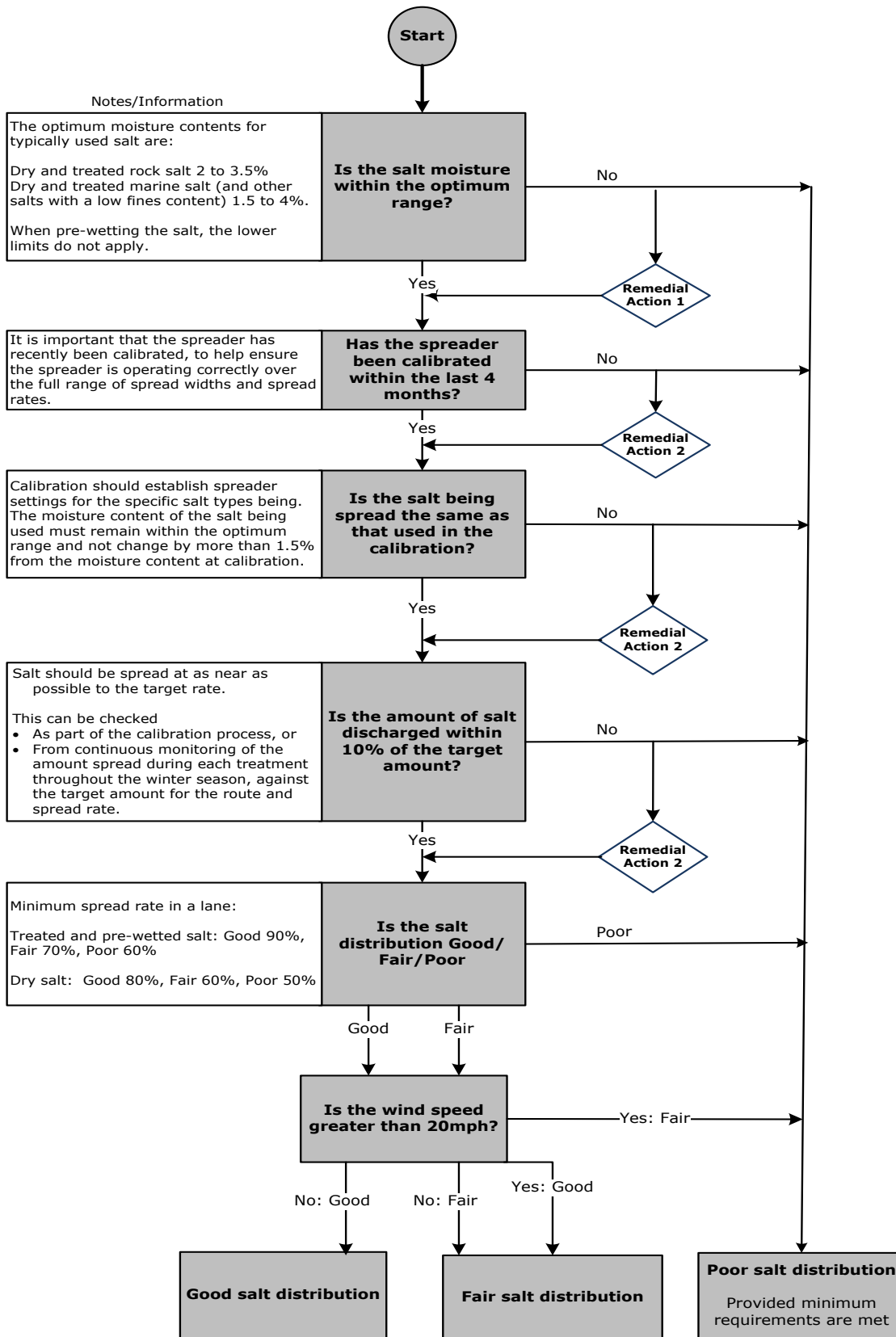
Treatment decision making procedure

Table H12 - Treatment matrix & column for different non-forecast conditions			
Spreading Technology		Treatment Matrix	
Dry Salting		Treatment Matrix A	
Pre-wet Salt Spreading		Treatment Matrix B	
Treated Salt Spreading		Treatment Matrix C	
Salt distribution	Traffic level	Losses	Treatment matrix column
Poor	High	Normal	A
Poor	High	High	B
Poor	Medium/Light	Normal	C
Poor	Medium/Light	High	D
Fair	High	Normal	E
Fair	High	High	F
Fair	Medium/Light	Normal	G
Fair	Medium/Light	High	H
Good	High	Normal	I
Good	High	High	J
Good	Medium/Light	Normal	K
Good	Medium/Light	High	L

Table H13 - Change in spread rates	
Condition	Increase in spread rate or action
Spreading when there is no or very little traffic	25%
Porous asphalt	25%
Dense surfacing after change from porous asphalt	25% for 1km
Areas prone to surface water	See Warning 6
Spreading in very heavy traffic (e.g. peak traffic times) if unavoidable	Consider treatment in 2 runs
Spreading in high winds (greater than 20 mph)	Consider continuous spreading or second treatment where spreader can be set (effectively) asymmetrically into the wind
Concrete roads after prolonged cold spell	25%
Spreading in low humidity (less than 80%)	Consider an additional precautionary treatment earlier in the day ^{*1}
Spreading in dry conditions in advance of heavy hoar frost	Consider an additional precautionary treatment earlier in the day ^{*1}

^{*1} The treatment should be timed to allow the maximum time for dissolution taking into account the likely losses due to traffic especially when using dry salt only.

Assessing salt distribution



Flowchart H1 – Salt Distribution Flowchart

A Service Provider can improve its spreading capability by considering the remedial actions below.

Action1

Mix the salt with drier or wetter salt (as appropriate to decrease or increase the moisture content). Use salt from the stockpile or from new deliveries.

A simple test for moisture is outlined in H6.69

Action 2

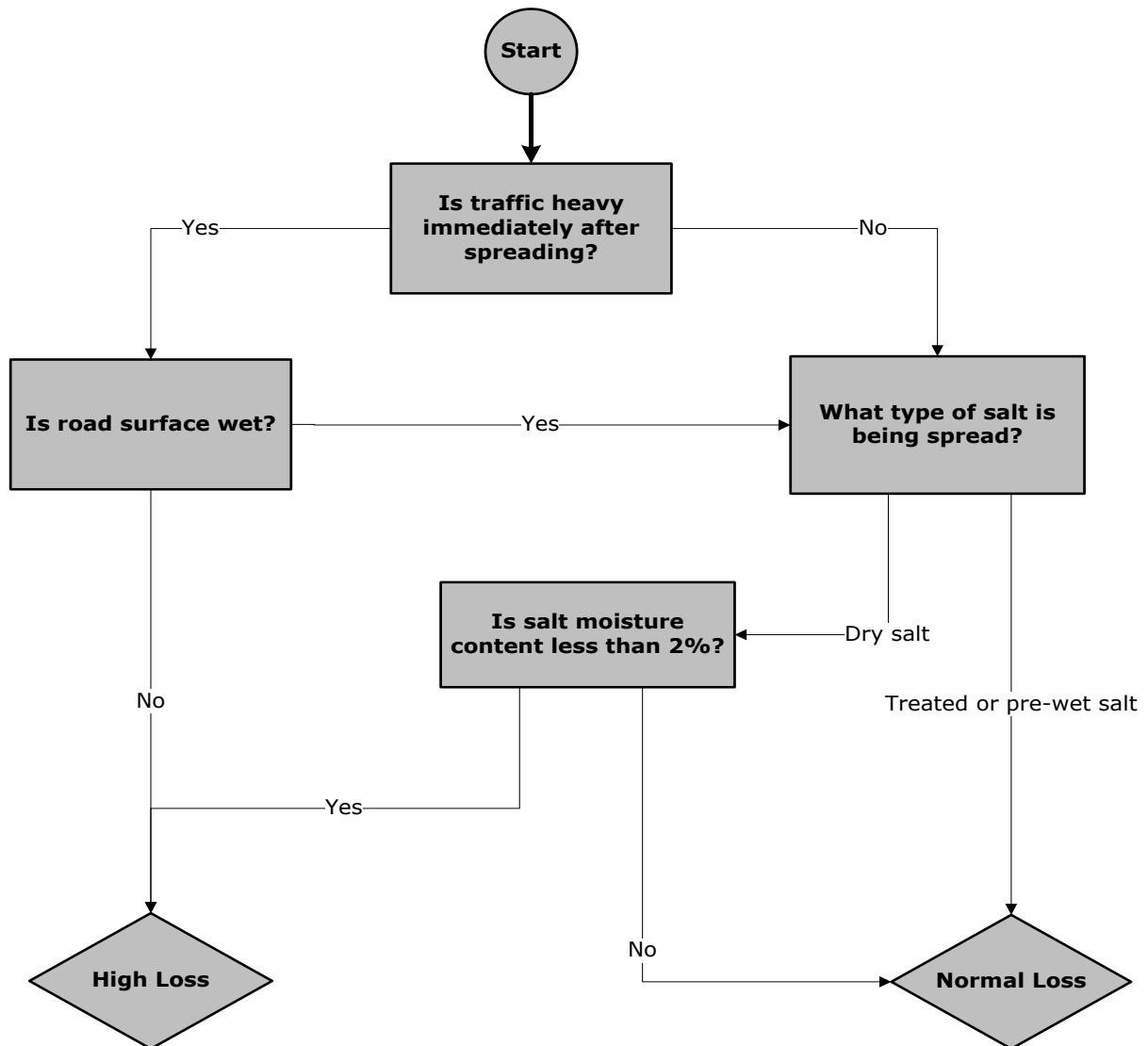
Calibrate the spreader using the salt being spread.

Assessing traffic level

Table H11 – Traffic Level	
Level	Vehicles/hour/carriageway
Heavy	250 or more
Low/Medium	Less than 250

Table H8 – Effect of trafficking		
Traffic Level & Timing	Pros	Cons
Before treatment High	Removes water from wet road surfaces Reduces water film thickness on damp roads	None
Before Treatment Low/Medium	None	Little water removed from a wet road surface Higher water film thickness for damp and wet roads
At Treatment High	None	May deflect salt from target areas, vehicle draughts may remove salt from road, particularly in dry conditions. Operation of spreader may be less than optimal in slow moving or stop/start conditions
At Treatment Low/Medium	Little loss due to traffic Salt spreading unhindered by vehicles adjacent to spreader	None
Shortly After Treatment High	Will help dissolution by crushing salt grains and reduce loss due to wind	Much salt may be removed from road by tyres and vehicle draughts before it enters solution
Shortly After Treatment Low/Medium	Less losses due to traffic	Dissolution may be slow particularly for dry roads and low humidity conditions. Some salt will be removed from the road before dissolution takes place.

Assessing salt loss immediately after spreading



Flowchart H2 – Salt Loss Flowchart

TREATMENT MATRIX A													
DRY SALTING (De-icer spread rates in g/m²)													
Frost or forecast frost Road Surface Temperature (RST) and Road Surface Wetness	Column Cvrg Traffic Loss	A PC HT NL	B PC HT HL	C PC MT NL	D PC MT HL	E FC HT NL	F FC HT HL	G FC MT NL	H FC MT HL	I GC HT NL	J GC HT HL	K GC MT NL	L GC MT HL
RST at or above -2°C and dry or damp road conditions		8	8	8	8	8	8	8	8	8	8	8	8
RST at or above -2°C and wet road conditions		10	13	13	16	8	11	11	13	8	8	8	10
RST below -2°C and above -5°C and dry or damp road conditions		15	20	17	20	13	17	14	17	10	13	11	13
RST below -2°C and above -5°C and wet road conditions		25	2 x 17	2 x 17	2 x 20	21	28	28	2 x 17	16	21	21	25
RST at or below -5°C and above -10°C ^{*1} and dry or damp road conditions		29	2 x 19	2 x 16	2 x 19	24	32	27	2 x 16	18	24	20	24
RST at or below -5°C and above -10°C ^{*1} and wet road conditions ^o		2 x 24	2 x 32	2 x 32	2 x 39	2 x 20	2 x 27	2 x 27	2 x 32	30	2 x 20	2 x 20	2 x 24
Please see Table H13 for variations to the rates given above													

Key:**Cvrg:** PC = Poor coverage, FC = Fair coverage, GC = Good coverage**Traffic:** HT = High level, MT = Medium Level**Loss:** NL = Normal loss, HL = High loss^{*1} Refer to Section H10.21 Notes 3, 4 & 5 when spreading at temperatures at or below -5°C

TREATMENT MATRIX B													
PRE-WETTED SALTING (De-icer spread rates in g/m²)													
Frost or forecast frost Road Surface Temperature (RST) and Road Surface Wetness	Column Cvrg Traffic Loss	A PC HT NL	B PC HT HL	C PC MT NL	D PC MT HL	E FC HT NL	F FC HT HL	G FC MT NL	H FC MT HL	I GC HT NL	J GC HT HL	K GC MT NL	L GC MT HL
RST at or above -2°C and dry or damp road conditions		8	8	8	8	8	8	8	8	8	8	8	8
RST at or above -2°C and wet road conditions		8	10	12	14	8	9	10	12	8	8	8	9
RST below -2°C and above -5°C and dry or damp road conditions		13	16	16	18	11	14	14	16	9	11	11	12
RST below -2°C and above -5°C and wet road conditions		21	26	2 x 16	2 x 18	18	22	27	31	14	17	21	24
RST at or below -5°C and above -10°C ^{*1} and dry or damp road conditions		26	2 x 16	2 x 16	2 x 18	22	27	27	31	17	21	21	24
RST at or below -5°C and above -10°C ^{*1} and wet road conditions		2 x 21	2 x 26	2 x 31	2 x 36	2 x 18	2 x 22	2 x 27	2 x 31	28	2 x 17	2 x 21	2 x 24
Please see Table H13 for variations to the rates given above													

Key:

Cvrg: PC = Poor coverage, FC = Fair coverage, GC = Good coverage

Traffic: HT = High level, MT = Medium Level

Loss: NL = Normal loss, HL = High loss

^{*1} Refer to Section H10.21 Notes 3, 4 & 5 when spreading at temperatures at or below -5°C

TREATMENT MATRIX C													
TREATED SALTING (De-icer spread rates in g/m²)													
Frost or forecast frost Road Surface Temperature (RST) and Road Surface Wetness	Column Cvrg Traffic Loss	A PC HT NL	B PC HT HL	C PC MT NL	D PC MT HL	E FC HT NL	F FC HT HL	G FC MT NL	H FC MT HL	I GC HT NL	J GC HT HL	K GC MT NL	L GC MT HL
RST at or above -2°C and dry or damp road conditions		7	7	7	7	7	7	7	7	7	7	7	7
RST at or above -2°C and wet road conditions		7	8	10	11	7	7	8	10	7	7	7	7
RST below -2°C and above -5°C and dry or damp road conditions		10	13	12	14	9	11	11	12	7	9	8	10
RST below -2°C and above -5°C and wet road conditions		17	21	24	28	15	18	21	24	11	14	16	19
RST at or below -5°C and above -10°C ^{*1} and dry or damp road conditions		19	24	23	27	17	21	20	23	13	16	15	18
RST at or below -5°C and above -10°C ^{*1} and wet road conditions ^o		2 x 16	2 x 20	2 x 23	2 x 27	2 x 14	2 x 17	2 x 20	2 x 23	22	27	30	2 x 18
Please see Table H13 for variations to the rates given above													

Key:**Cvrg:** PC = Poor coverage, FC = Fair coverage, GC = Good coverage**Traffic:** HT = High level, MT = Medium Level**Loss:** NL = Normal loss, HL = High loss^{*1} Refer to Section H10.21 Notes 3, 4 & 5 when spreading at temperatures at or below -5°C

TREATMENT MATRIX D – Precautionary Treatments Before Snow Or Freezing Rain		
Weather conditions	Light or medium traffic	Heavy traffic
Light snow forecast	Spread: <ul style="list-style-type: none"> • 40g/m² of dry salt, or • 40g/m² of pre-wetted salt, or • 30g/m² of treated salt 	Spread: <ul style="list-style-type: none"> • 20g/m² of dry salt, or • 20g/m² of pre-wetted salt, or • 15g/m² of treated salt
Moderate/Heavy snow forecast	Spread: <ul style="list-style-type: none"> • 20-40g/m² of dry salt • 20-40g/m² of pre-wetted salt • 15-30g/m² of treated salt (see Note 1) 	Spread: <ul style="list-style-type: none"> • 40g/m² of dry salt, or • 40g/m² of pre-wetted salt, or • 30g/m² of treated salt
Freezing rain forecast	<ul style="list-style-type: none"> • 40 or 2x20g/m² of dry salt, or • 40 or 2x20g/m² of pre-wetted salt, or • 30 or 2x15g/m² of treated salt 	
<p>Note 1: The lower rates (e.g. 20g/m² for dry salt) can be used if the snow is likely to settle quickly, e.g. when the road surface temperature is below zero, the road surface is not wet and the snow is not wet, and/or there is little traffic after snowfall begins and settles.</p> <p>Note 2: Spreading salt before freezing rain can have a limited benefit and Service Providers should be prepared to make follow up treatments on any ice that has formed.</p>		

Appendix I

Backlog Calculation

I1 INTRODUCTION

- I1.1 The 10 Year Plan set targets to arrest deterioration of the local road network by 2004. The NRMCS report published in 2004 indicates that these targets have largely been met.
- I1.2 The Roads Board is developing a methodology to use road condition data to calculate the road maintenance backlog for the UK as a whole, which it hopes will be adopted across the whole of the UK.
- I1.3 *Maintaining Scotland's Roads* produced by Audit Scotland describes the approach adopted in Scotland to the calculation of the maintenance backlog. The following section, including the recommendations, is an extract from this report.

I2 SCOTTISH ROAD MAINTENANCE BACKLOG

- I2.1 The cost of bringing the road network up to standard has been estimated at £1.7 billion, but further work is needed to improve the accuracy of the estimate.
- I2.2 Several different methods have been used to calculate the size of the road maintenance backlog. These include:
- the cost of improving the condition of the roads network to a 'steady state' where a fixed percentage of the network (around 8%) requires maintenance each year;
 - applying an average unit cost to the length of the road network needing repair;
 - the expenditure required to bring the network to a condition where the maintenance cost can then be minimised over the long term;
 - the cost of bringing the network to the standard expected by road users.
- I2.3 The maintenance backlog also includes items other than the road itself, including: footways, street lighting, drainage, bridges and traffic signals. The simplest method of taking into account these items is by multiplying the road maintenance backlog by a factor representing the relative weight of these items compared to that of the road pavement.
- I2.4 Different methods of calculating the backlog can lead to widely differing results. This means it is important that the methodology adopted is widely accepted and provides a consistent measure of the backlog. Using the 'steady state' method outlined above, SCOTS provided evidence to the Scottish Parliament's Local Government and Transport Committee that the first estimate of the backlog of structural maintenance emerging from SCRMS information was a requirement for repair work of £1.5 billion, including £900 million for road repairs. The Executive,

using more detailed information than that available from the SRMCS, has calculated that the structural maintenance backlog for trunk roads is around £100 million, with a further £72 million required for routine repairs and £60 million for bridges.

- 12.5 The structural maintenance backlog is less of a problem in some areas than in others. For the trunk roads managed by the Scottish Executive and for roads maintained by five councils (Aberdeenshire, Angus, Eilean Siar, Orkney Islands and West Lothian), the proportion of the road network requiring repair appears to fall below the 8% threshold. The majority of the maintenance backlog is therefore likely to be found mainly in the remaining 27 councils.
- 12.6 The methodology used to produce the estimate is still a matter of debate among roads engineers, and SCOTS is actively pursuing a more robust basis for assessing the cost. The UK Roads Board is developing a methodology to use road condition data to calculate the road maintenance backlog for the UK as a whole, which it hopes will be adopted across the whole of the UK.
- 12.7 The results of the improved methodology will also benefit from the additional information available from progress with the SRMCS, both in terms of greater coverage of the road network and developments in the technology, for example, to allow it to measure edge deterioration in rural roads.

I3 RECOMMENDATIONS

- 13.1 Councils should use the information from the SCRMS to calculate the size of the structural maintenance backlog in their area using a common accepted methodology.
- 13.2 Councils and the Scottish Executive should monitor and report publicly on the condition of their road network and their road maintenance backlog on an annual basis.

I4 METHODOLOGY

- 14.1 The Audit Scotland Report was based on a methodology developed by a SCOTS working group. This methodology is described in detail in the following section.

What is the Overall Asset?

- 14.2 During the course of the assessment a lot of consideration was given to what the asset is. The previous study in 1997 compared the funding awarded to local authorities and considered this against the whole life cost for road infrastructure. However, the working group considered there was a need to extend the scope of the previous work to include parts of the asset that were coming under greater scrutiny, e.g. drainage, bridging, footways. For this reason a catalogue of elements was developed. This included the immediately identifiable parts of the infrastructure, as the public would recognise it, i.e. carriageway, footway, street lighting, and the unseen or minor elements which as a result of increased spending over the past 10 years through central government targeted expenditure, have become more apparent i.e. road related structures, drainage, intelligent traffic systems, and public realm.

Quantification of Available Information

- 14.3 It was immediately appreciated by the working group that not all authorities would have information on the condition of the entire infrastructure within their responsibility. This may seem rather odd given that in most cases it will have been the authority or its predecessors who would have built or managed the network over many years. However, while there were some who had detailed knowledge of what existed and what condition it was in, the majority were not in this position, with some having very little detailed condition information preferring to spend their increasingly limited resources 'on the ground' rather than on management systems.
- 14.4 In order to ascertain the situation across Scotland, a short questionnaire was sent to all authorities seeking information on the data held and the quality of the data i.e. desktop assessment, visual surveys, detailed surveys along with any estimated costs for repairs. The majority of authorities provided feedback to the survey. As each authority had agreed to contribute to the gathering of machine based condition information for carriageways this was omitted from the questionnaire.
- 14.5 Three elements were to be established by other means. The backlog of carriageway repairs was to be developed through the use of the results from the Scottish Road Maintenance Condition Survey (SRMCS), to which all councils and agreed to participate. However, there would be a need to establish the costs of different treatments to allow the overall backlog to be calculated.
- 14.6 The condition of road structures is updated on a regular basis by the bridges working group of SCOTS. The intention therefore was to use the most up to date figure from their work and to modify it to reflect any major works that had been completed or had commenced since its calculation.
- 14.7 The final element in this category was street lighting. At a national level the backlog of street lighting was being established by the UK Lighting Board, a group created to consider issues relating to street lighting across the UK. Since this work would produce an overall figure for the UK, and a methodology for its calculation, it was agreed that this would be adopted for the SCOTS calculation.

Establishing Family Groupings

- 14.8 While the survey had revealed that there was information available, how to use the available data was a key issue, especially where information was available for differing authorities. The group agreed that in order to make best use of the information, authorities had to be grouped on a like for like basis. This led to five groups being established: Cities; Urban; Semi-Urban; Rural and Islands. The definition of each group is given in Table I1 below.

Table I1 – Groups	
Group	Definition
Cities	The four historic cities in Scotland
Urban	An authority with >70% of its roads being classed as urban
Semi-Urban	An authority with >70% but >30 of its roads being classed as urban
Rural	An authority with 30% of its roads being classed as urban
Islands	The three island authorities, with possible input from the Highland Council and Argyll and Bute Council as they had islands within their area of responsibility

I4.9 The groupings established had similarities with work undertaken by Audit Scotland in relation to refuse collection based on six groupings and population dispersal, and were therefore felt to be on a sound footing.

I4.10 The groupings had many benefits to the calculation of an overall backlog. They allowed direct comparisons to be made between authorities in the group, especially where the backlog on a particular piece of the infrastructure differed markedly between Councils. It also allowed comparisons to be made between groups e.g. rural and semi-rural for not just the quantity of repairs required but also the costs.

Role of the Groups

I4.11 The groups were established to perform two key functions:

- to identify the costs of defined repairs to the different elements of the infrastructure e.g. carriageway treatments, footways etc.
- to compare the estimated backlog per authority in the group and then to develop an estimate for any Council who did not have such information.

I4.12 This process was important as it ensured that abnormal quantity or costs of outstanding defects could be challenged and amended to reflect the results from other group members.

I4.13 An initial list of items was developed and each group tasked with collating and developing an initial backlog calculation. During the development of this exercise it became clear that some of these elements should not be collected, e.g. items relating to car parking as these would tend to be addressed through the wider corporate property portfolio or would be funded through other budgets other than those specifically related to roads infrastructure.

I4.14 Some of the items were, even with a description of the method or item coverage, difficult to assess and ultimately to compare across groups. One area was in regard to drainage. This is a vast area where most authorities had little detailed knowledge of the condition of the infrastructure. In an urban context the most obvious backlog is to deal with defective gullies. However, in a rural situation the method of dealing with a drainage problem could vary from location to location and it was therefore difficult to identify backlog and costs.

- 14.15 Throughout the process the one defining issue was ‘what constituted a backlog?’. There has been an inclination in the past to look at the life expectancy of a piece of the infrastructure and to assume that there was a backlog if it was not replaced at the end of the specified time. Clearly, while this may be appropriate if considerably larger sums of funding are available for replacement, in a situation where there is limited funding, there is a need to prioritise replacement. It is therefore not uncommon to have parts of the infrastructure lasting well beyond its theoretical replacement date. So for some elements the backlog would be based on known construction date, or in others, where no date was available, a ‘gut feel.’ Items such as retaining walls tend to have sudden failure and while it was appreciated that this was not allowing whole life solution, it was based on a reasoned way forward in line with how Councils were operating in stringent funding situations.

FINDINGS

The Backlog Calculation

- 14.16 This part of the study utilised the information that had been collated in the family groups and through other sources identified earlier in this report. For this reason, this part of the report is split into two distinct sections, carriageway backlog, and other associated infrastructure.

The Carriageway Backlog

- 14.17 Having gathered costs for various treatments of the carriageway, the results from the SRMCS were used to calculate the carriageway backlog.

The Associated Infrastructure

- 14.18 Having gathered information from each of the groups on the quantity of defective infrastructure in each category and the average costs of repairs, it was possible to develop a preliminary backlog figure for each group. At this point, it was evident how important the family groupings had become. Not only did it give a comparison between authorities in each group, but it also allowed comparisons to be made across each of the groups. A quick comparison between the groups, excluding the islands, reveals that while there are considerably different overall road lengths, there are roughly the same quantities of urban roads in each of the four groups (see table I2 below).

Group	Total Road Length (km)	Total Urban Road Length (km)
Cities	4,632	4,335
Urban	4,369	3,940
Semi-urban	10,304	5,407
Rural	21,341	4,257

- 14.19 So while there was little comparison between the groups for some areas e.g. Intelligent Transport Systems, there were opportunities to compare estimates for other items e.g. street lighting.
- 14.20 The methodology adopted has scope for incremental improvement which will increase the accuracy of the estimates.

Appendix J

Customer Relationships

J1 INTRODUCTION

- J1.1 Customer Relationship Management (CRM) is a business strategy aimed at understanding and anticipating the needs of an organisation's current and potential customers. It is about maintaining a complete and single view of the relationship between council and customer, available to all appropriate authority staff. CRM systems enable councils to use core data to support service delivery across multiple channels, and to create the single view of customer relationships. Successful implementations of CRM systems help councils to improve customer service and service efficiency. Further information on the measurement of customer service is given in Section 11 and Appendix F of this Code respectively.
- J1.2 Customers of most local authority services, and the highways service in particular, are not customers in the traditional sense of paying for services at the point of delivery. Their payment tends not to be optional and often made well in advance of the point of delivery. They may not even receive a service in the traditional sense, but be affected by the delivery of the service to others as, for example in the case of residents affected by a new road scheme.
- J1.3 As a result they are often referred to as service 'users' and communities (who may be users but also may be affected by use). These groups, together with the wider representative groups serving special interests, are often collectively referred to as stakeholders.
- J1.4 This Code generally refers to 'users and communities' but considers both of these as customers. They each are affected by the actions (or inactions) of the authority and need to be engaged with the authority in precisely the same way as if they were a 'paying' customer. They need consultation on things that affect them, information to enable them to accommodate changes in levels of service, and effective means of complaint and redress when things go wrong.
- J1.5 Establishing a strong customer focus and putting customers first is the foundation of business success, a crucial driver for continuous improvement and the core requirement of Best Value.
- J1.6 This appendix sets out information and good practice on the three main aspects of customer care:
- consulting customers;
 - responding to customers;
 - informing customers.

J1.7 Delivering good practice on each of these three aspects is a key requirement for success in achieving a Charter Mark Award. Information on authorities who have received awards is available at the (www.chartermark.gov.uk) together with information on expected standards.

J2 CONSULTING CUSTOMERS

J2.1 This section of the appendix provides advice on consultation methods and indicates those particularly relevant to highway maintenance. The Improvement and Development Agency (IDeA) is a useful source of advice on consultation methods. The publication 'Feeling the Pulse II' prepared by MORI on behalf of the IDeA published in July 2003 is available as a free download (www.idea-knowledge.gov.uk).

J2.2 This new version of the guide is divided into three parts, each covering a particular theme:

- reviewing your consultation – the 'scrutiny and scoping phase', revisiting the aims and objectives, looking at how the work has been carried out, and thinking about how the findings can be used;
- analysing the findings – ensuring that appropriate techniques are being adopted to help identify what the results mean, and how priorities for the future can be established;
- communicating the implications – developing steps to ensure that the findings and implications are reaching those people with responsibility for the service or issue in question.

Quantitative and Qualitative Consultation

J2.3 There are two types of consultation process, quantitative and qualitative:

- quantitative consultation is designed to produce data of how many people do or think something. It is intended to be statistically reliable and something that can be extrapolated from;
- qualitative consultation is not intended to be statistically reliable, but instead provides an in-depth understanding of why people hold particular views, and how they make judgements. Some types of qualitative consultation (for example citizens juries) attempt not just to understand, but also to inform participants views by supplying them with information to enable them to form a more considered view.

J2.4 Both these types of consultation are relevant to highway maintenance. It is important to find out what people know about the service and how satisfied they are with it through qualitative consultation. Many aspects of highway maintenance policy and practice however, for example the selection of schemes to optimise whole life cost, or the benefits of surface dressing are relatively complex and not well understood by customers. Qualitative consultation including provision of information in these cases, should result in a more considered view.

Quantitative Consultation

J2.5 This type of survey is usually used by authorities to evaluate the performance of services and/or the authority as a whole. To provide results which are statistically reliable a reasonably large and representative sample is required. There are three main types of quantitative consultation:

- face to face or telephone surveys;
- self-completed postal questionnaires;
- citizens' panels whose members take part in regular surveys to provide tracking or benchmark data.

J2.6 The accuracy of such surveys depends on a range of factors, including the overall sample size and percentage result being considered.

Table J1 – Sampling Tolerances			
Sample Size	Sampling tolerances applicable to results at or near percentages (based on 95% confidence level)		
	10/90%	30/70%	50%
	±%	±%	±%
100	6	9	10
300	3	5	6
600	2	4	4
1000	2	3	3
1500	2	3	3
2000	1	2	2

J2.7 Table J1 shows, for example, that if the results of a representative sample of 1,000 customers shows that 50% are satisfied with a particular service, the range within which the true figure would lie would be ± 3 points 95 times out of 100.

J2.8 Questions for qualitative surveys need to be carefully drafted, preferably with professional assistance to provide the necessary detail but to avoid too long an interview period. It is difficult to maintain concentration from respondents in telephone interviews of over 10 minutes and cost is also an important consideration. A 10 minute interview would provide for approximately 20-30 questions, a 15 minute one 30-35.

J2.9 The cost of surveys depends on the eventual length of the interviews based on the approved questionnaire, but the following fully inclusive quotations are indicative of the cost range for 500 interviews:

- for a 10 minute telephone interview including survey design, all data processing and analysis about £15,000 (+VAT);

- for a 15 minute telephone interview including survey design, all data processing and analysis about (+ £20,000 +VAT).
- J2.10 For surveys relating to highways and highway maintenance it is useful to group the questions into the following categories:
- getting around the area;
 - importance of particular aspects of service
 - satisfaction with these aspects
 - looking after the highway network;
 - importance of particular aspects of highway maintenance
 - satisfaction with these aspects
 - getting things done;
 - information about roadworks
 - planning and co-ordination of works
 - speed and efficiency of completion
 - quality of temporary signing
 - getting in touch;
 - how well informed about roadworks
 - speed of response to enquiries or complaints
 - quality and helpfulness of response
 - space for freeform comments.

J2.11 A number of authorities can provide further advice on the detailed wording of questions, including Leicestershire, Hampshire, Suffolk and Shropshire.

Telephone and Face to Face Surveys

- J2.12 Telephone or face-to-face surveys have been used extensively in Best Value Reviews of highway maintenance. Their strengths are:
- they are statistically reliable if properly conducted;
 - can compare views by any sub group or area (may be useful for highway maintenance);
 - findings are relatively easy to communicate;

- they allow for comparison with surveys conducted elsewhere (may be useful for Best Value Reviews), previous findings (useful for monitoring improvements in service), and targets.

J2.13 The weakness of telephone and face-to-face surveys are:

- responses to telephone surveys and face-to-face surveys are not comparable;
- if not combined with some qualitative work, you may not ask all the relevant questions;
- little time for respondents to consider responses and may not get a considered response;
- respondents attention may decline during later questions and questions will need to be rotated to compensate for this.

Citizens' Panel Surveys

J2.14 Results from Citizens' Panel surveys are also regularly used to inform Best Value reviews of highway maintenance. Their strengths are:

- once set up it provides cost-effective resource for all types of consultation;
- panel members may become advocates for the authority;
- a tangible resource to work with;
- able to track individual views.

J2.15 The weaknesses of Citizens' Panel surveys are:

- panel members become atypical so tracking is not advisable over a long period;
- panel members may be self-selecting and unrepresentative without careful checking and weighting of results;
- attrition can mean ad hoc research is less costly than maintaining a representative panel.

Self Completion Questionnaire Surveys

J2.16 Self completion questionnaires are relatively inexpensive and have been used by some authorities in connection with highway maintenance. Their strengths are:

- they are relatively inexpensive to conduct and analyse;
- they are 'visible' and enable the authority to be 'seen' to consult large numbers of people.

J2.17 The weaknesses of self completion questionnaire surveys are:

- they can often be unrepresentative. Respondents are self-selecting and may be atypical of the wider population. They are particularly likely to under-represent the views of young people, ethnic minorities, those on low incomes and those who do not have strong views on an issue;
- often suffer from poor response rates;
- no control over who completes questionnaire or over the order in which questions are answered;
- get little supplementary information.

Qualitative Consultation

J2.18 There are four main types of qualitative consultation:

- depth interviews and Focus Groups - Depth interviews involve one-to-one contact with respondents for about 45-60 minutes providing more scope and flexibility for the interviewer. Focus groups typically involve 6-10 people for a period of 1-2 hours;
- Citizens Juries - which involve a larger number of people, typically 12-20, take place over a considerably longer period of time (between 2-4 days) and discuss issues in far greater detail. They receive information from 'expert witnesses who can be cross examined and a formal report is written which feeds directly into the authority's decision making process;
- Citizens Workshops - which provide a less expensive way of involving local people. They involve about 20-30 people usually for a single day on a specific issue;
- Stakeholders 'Visioning' Workshops - These involve large groups of stakeholders coming together 'en masse' to discuss a big policy or strategic issues. Involves the use of smaller 'break out' groups and needs high quality facilitation.

Depth Interviews and Focus Groups

J2.19 Depth interviews are not regularly used in connection with highway maintenance but one-to-one depth interviews can be useful in dealing with specialist areas, for example environmental issues. Focus groups are used more often and the strengths are:

- enables people to express 'why' not just 'what';
- in groups respondents can use each other as springboards to generate new ideas;
- useful for evaluating communications materials;
- useful for in depth analysis of how users make judgements about standard of service;

- helpful in exploring priorities for improvement.

J2.20 Weaknesses of Qualitative 'Depth' and Focus Groups are:

- cannot be used to extrapolate results to population as a whole;
- not statistically reliable;
- usually meet for about two hours which is not enough for complex issues.

Citizens Juries

J2.21 Citizens Juries are a useful method of addressing major areas of policy and are ideally suited to looking into the whole area of highway maintenance funding. Strengths of Citizens Juries are:

- enables participants to make an informed judgement;
- empowers, involves and informs participants;
- dynamic interactive process (valuable for officers and politicians);
- formula could be adapted for working with Member Groups.

J2.22 Weaknesses of Citizens Juries are:

- small numbers of participants are involved;
- can be difficult to get truly representative group;
- long period of 2-4 days may inhibit participation;
- participants views may become unrepresentative as a result of information provided;
- participants may feel constrained in what they say in order to reach consensus;
- recommendations may not be higher quality than those elected members would make with the same information.

Citizens Workshops

J2.23 Citizens Workshops are particularly useful in developing individual schemes in partnership with the local community. This is more usually adopted for highway improvement schemes but can also be used for more complex highway maintenance schemes. The strengths of Citizens Workshops are:

- cross section of public or stakeholders work together for one day;
- participants develop stronger more relaxed working relationships than in a focus group;

- helpful means of getting service managers to meet the public or stakeholders in a relaxed setting. Can clear out the usual ‘negatives’ and focus on the key issues.

J2.24 Weaknesses of Qualitative Citizens Workshops are:

- relatively small numbers are involved;
- participants’ views become unrepresentative as a result of being provided with information.

J2.25 Stakeholder ‘Visioning’ Workshops are mainly used to address ‘big picture’ issues and are particularly relevant to the development of the Local Transport or Development Plan. They are less used in connection with highway maintenance but could be useful for example in the development of new long term procurement arrangements including PFI. The strengths are:

- officers and politicians actively involved;
- free-ranging discussion;
- allows two way interchange of views;
- lack of structure can allow new ideas to emerge.

J2.26 Weaknesses of Qualitative Stakeholder ‘Visioning’ Workshops are:

- not representative or statistically reliable;
- activists get over represented because they are more organised than less vocal groups and are easier to speak to;
- needs careful facilitation.

Consultation with Members and Employees

J2.27 Members and employees of authorities are also users of the highway network and can provide a useful source of information, relatively easy and inexpensive to access. For employees self completion questionnaires are particularly appropriate as for this group many of the weaknesses can be relatively easily overcome. The questionnaire can be e-mailed to employees or placed on intranet bulletin boards and completed on line so that the response rate is higher than the wider population. Any questions from respondents can be emailed to the survey organiser and dealt with immediately.

J2.28 Similar arrangements can be adopted for Members, with questionnaires being dealt with either electronically or by post.

J3 RESPONDING TO CUSTOMERS

J3.1 There is extensive evidence from all industrial sectors that the speed and efficiency with which organisations respond to enquiries and complaints from customers significantly influences their opinion of, and commitment to, that

organisation.

- J3.2 Section 6 of this Code stresses the importance of authorities adopting systems to ensure that all customer compliments, service requests, complaints, or claims are recorded, together with any action taken, including nil returns. This will enable the regular review of all customer contacts as a driver for continuous improvement.
- J3.3 Good practice in this area is continuing to evolve and six authorities were awarded Beacon Council Status in 2003 for Street and Highway Works. This theme had a particular emphasis on good practice, in responding to and informing customers. The authorities have undertaken to provide information and assistance to others as part of the Beacon Council award. These authorities are:
- Barnsley;
 - Birmingham;
 - Cornwall;
 - Corporation of London;
 - Hammersmith and Fulham;
 - Kirklees.
- J3.4 Some authorities including a number of the above have adopted ‘Contact Centres’ for the management of all service requests and complaints for the authority as a whole. In these circumstances it is important that all personnel involved, where not experienced in highway maintenance have immediate access to advice and support to assess and rectify potential Category 1 defects.

J4 INFORMING CUSTOMERS

- J4.1 The new responsibilities to ‘secure the expeditious movement of traffic’ under the Traffic Management Act 2004 has placed new emphasis on the need not only to minimise disruption but to provide effective information to customers to enable them to adjust their arrangement where necessary.
- J4.2 Guidance issued by DfT on the Network Management Duty states that authorities should give consideration to the methods of sharing the information with road users. As well as being well received, timely and readily accessible information can result in better use of the network through influencing journey choice. In the case of organisations such as the emergency services and public transport operators, adequate notice of activities that can affect their operations is vital.
- J4.3 The guidance indicates that authorities should establish the needs of different user groups and consider how best to disseminate information available to them, to deliver improved management of the network. Processes should be put in place to deliver this.
- J4.4 Information on roadworks and streetworks combined with accurate and timely information about events and incidents on the network, provide a good source of travel information. This can be transmitted to the public by the use of variable

message signs, radio and television travel reports, travel information providers and the internet. Authorities should work with a variety of media providers to provide such services, which may allow road users to choose a different route or mode of travel or to delay or defer their proposed journey.

- J4.5 Many authorities have developed or are developing comprehensive customer information arrangements. Cornwall County Council has introduced special arrangements for managing seasonal traffic flows and providing information to customers on holiday routes.

Appendix K

Maintainability and Sustainability

K1 MAINTAINABILITY CHECKLIST

K1.1 The following checklist is provided to assist designers in giving adequate consideration to future maintenance requirements of schemes during the design process. The check list is not exhaustive but includes most of the key issues that need to be addressed. Authorities are encouraged either to adopt this checklist or to develop their own local version and apply it as a matter of routine to a sample of highway schemes.

Table K1 – Maintenance Checklist			
Ref	DESIGN CHECKLIST FOR FUTURE MAINTENANCE		
	Issue	Check	Action
1	Scope and Scale		
1a	Intended life of scheme	Is the scheme long life or 'temporary' and likely to be affected by future redevelopment?	Choose materials and products relevant to the life of scheme.
1b	Nature of scheme	Is the scheme a 'unique' prestige project or a 'routine' standard one?	Choose materials and products relevant to the type of scheme.
1c	Scope of scheme	Has the scheme been 'value-managed' to take in all possible marginal benefits?	All 'significant' schemes should be value managed.
1d	Use of scheme	Is the scheme likely to be subjected to particularly 'heavy duty' traffic use with high rates of wear?	Select design and materials to mitigate these affects so far as possible.
1e	Cost of scheme	Have the costs of future maintenance been calculated and included in future budgets?	Identify any extraordinary maintenance costs and report these alongside construction costs.
			Continued

Table K1 – Maintenance Checklist continued			
Ref	DESIGN CHECKLIST FOR FUTURE MAINTENANCE		
	Issue	Check	Action
2	Design Aspects		
2a	Pedestrians and cyclists	Do footways and cycle routes fit the actual paths used?	Redesign to reflect actual paths to avoid erosion and later replacement.
2b	Heavy goods vehicles	Is footway paving likely to be over-ridden by HGV or other parked vehicles?	Where necessary use heavy duty paving or prevent over-riding to avoid frequent costly replacement.
2c	Grassed and planted areas	Are grassed and planted areas of a size and position to be effectively maintained?	Redesign or remove where necessary to avoid future poor appearance and later resign.
2d	Trees	Have trees been selected and positioned to avoid future problems with roots, obstruction or leaf fall?	Reselect or reposition where necessary to avoid potentially expensive future problems.
2e	Traffic signs	Do traffic signs need to be illuminated or can they be reflectorised?	Maximise use of reflective signs to reduce energy costs.
3	Maintenance Operations		
3a	Maintenance regime	Does the scheme require specialist maintenance regime?	Identify cost of specialist regime and where appropriate consider cheaper alternatives.
3b	Cleansing	Does the scheme require specialist cleansing regime?	Identify cost of specialist regime and where appropriate consider cheaper alternatives.
3c	Traffic management	Will maintenance require special traffic management?	Identify traffic management costs and minimise wherever possible, possible through co-ordination with other works.
3d	Maintenance access	Is there safe and convenient access for plant and personnel?	Redesign scheme to provide safe and convenient access.
Continued			

Table K1 – Maintenance Checklist continued			
Ref	DESIGN CHECKLIST FOR FUTURE MAINTENANCE		
	Issue	Check	Action
4	Materials and products		
4a	Specialist materials	Are the materials used for the scheme of standard or specialist nature?	If specialist materials used ensure availability of future replacements.
4b	Durability of materials	Does the durability of the materials provide substandard, oblique, sufficient or excessive life?	Select materials relevant to the intended life and nature of the scheme.
4c	Failure mechanism	How will material/product approach the failure condition – slowly/quickly?	Programme safety and service inspections on basis of risk assessment.
4d	Life extension	Are there any processes which could be used to extend useful service life at economic cost?	Investigate cost benefit of using life extension products.
4e	Replacement practicability	Are there likely to be any difficulties in replacing failed sections?	Undertake risk assessment and plan for the likely difficulties.
4f	Replacement cost	Is the cost of replacement likely to be disproportionately high?	Consider alternative materials or products.
5	Reuse and Recycling		
5a	Practicability of reuse	If the schemes is a short life scheme what is the scope reusing materials and products?	Choose re-useable materials and products wherever possible.
5b	Practicability of recycling	What is the scope for recycling materials and products?	Where re-useable materials and products are not appropriate, use recyclable wherever possible.

K2 SUSTAINABILITY CHECKLIST

K2.1 The following checklist is provided to assist maintenance engineers and practitioners in undertaking a sustainability appraisal either of individual maintenance schemes or of the maintenance service as a whole. In this case the actions to be taken to address each of the issues is not specified but should be determined locally taking into account local priorities and constraints. The check list is not exhaustive or too detailed but includes all of the key issues that need to be addressed. Authorities are encouraged either to adopt this check list or to develop their own local version and to apply this routinely to a sample of local schemes. Durham County Council is actively involved in such a process and has developed check lists for various stages of the design process.

K2.2 The adoption of Environmental Management Systems such as ISO 14001 and the Eco-Management and Audit Scheme (EMAS) will assist in the development and operation of sustainability appraisal. It will be important to involve all employees and provide training to meet requirements of management systems.

K2.3 Table K2 includes a column to record whether the issue applies to the particular service or scheme (yes/no) and also whether the affect is considered to be positive or negative (+or -). Depending on the nature and reliability of information these basic criteria can be extended or subdivided. Where an issue is identified as having a negative affect, appropriate actions to mitigate the affect should be considered locally.

Table K2 – Sustainability Checklist				
Ref	Issue	Check	Affect yes/no +/-	Action (determine locally)
1 Local Economy				
1a	Viability and vitality	Does the service or scheme affect the vitality and viability of the local community?		
1b	Local employment	What contribution is made to local employment by the service or scheme?		
1c	Local materials	Does the service or scheme fully make use of opportunities to use local materials?		
2 Community Value				
2a	Community engagement	Does the service engage well with all sections of the local community?		
2b	Meeting community needs	Does the service or scheme meet the needs of all sections of the local community?		
2c	Quality of public space	Does the scheme make an effective contribution to the quality of public space?		
				Continued

Table K2 – Sustainability Checklist continued				
Ref	Issue	Check	Affect yes/no +/-	Action (determine locally)
3 Noise Pollution				
3a	Offices and depots	Are all opportunities realised to minimise noise pollution at offices and depots?		
3b	Works sites	Are all opportunities realised to minimise noise from vehicles and plant at works sites?		
3c	Traffic	Are locations of high traffic noise identified and mitigation measures included in schemes where appropriate?		
4 Air Pollution				
4a	Vehicles	Is there a policy and programme for vehicle replacement and modification to minimise air pollution (with targets)?		
4b	Plant and machinery	Is there a policy and programme for plant replacement and modification to minimise air pollution (with targets)?		
5 Water Management				
5a	Offices and depots	Are there arrangements in all offices and depots to minimise water use (with targets)?		
5b	Works sites	Are there arrangements in all works sites to avoid water wastage (with targets)?		
5c	Pollution control	Are there policies and procedures in place at all depots and works sites (with targets) to avoid water pollution especially from oil spills and salt leachate?		
5d	Flood management	Are locations of high flood risk identified and mitigation measures included in schemes where appropriate?		
				Continued

Table K2 – Sustainability Checklist continued				
Ref	Issue	Check	Affect yes/no +/-	Action (determine locally)
6 Visual Intrusion				
6a	Depots	Are all depots located and designed to minimise visual intrusion?		
6b	Works sites	Are all works sites located to minimise visual intrusion?		
7 Materials Utilisation				
7a	Location	Does the materials selection criteria give priority to local sources?		
7b	Design	Does the design process include consideration of minimum materials?		
7c	Performance	Do the design criteria allow for reduced specification in order to mitigate environmental affects?		
8 Waste Management				
8a	Minimisation	Do the design process and criteria facilitate the designing out of waste?		
8b	Reuse	Does the design process encourage the use of re-used materials as the first option?		
8c	Recycling	Does the design process encourage the use of recycled materials as the second option?		
				Continued

Table K2 – Sustainability Checklist continued				
Ref	Issue	Check	Affect yes/no +/-	Action (determine locally)
9 Energy Management				
9a	Offices and depots	Are there policies and procedures in place at all offices and depots (with targets) to minimise energy usage?		
9b	Works sites	Are there policies and procedures in place at all offices and depots (with targets) to minimise energy usage?		
9c	Schemes	Do all works and schemes maximise the use of cold rather than hot technology?		
10 Biodiversity				
10a	Policies	Has the service adopted biodiversity policies and procedures?		
10b	Trees and landscaping	Are all policies and practices for maintenance of trees and landscaping designed to maximise nature conservation value?		
10c	Works programmes	Are works programmes adjusted to assist biodiversity requirements?		

Appendix L

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Disclaimer

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