Skid Resistance Strategy
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Executive Summary

The purpose of the Hertfordshire County Council (HCC) Skid Resistance Strategy (the Strategy/this Strategy) is to define how HCC manages skid resistance on the County road network. The National Guidance Document HD 28/04 describes measuring and managing skid resistance for the trunk road network. However, the Hertfordshire road network comprises many different types of roads, most of which are low speed roads with lower design standards than those used on the national trunk road network. HCC considers that strict application of HD28/04 is too stringent for a local road network because the national document does not provide suitable guidance for roads designed for lower speeds and lower traffic volumes. Hence the need for this Strategy.

The Strategy:

- Has been prepared by the HCC Infrastructure Asset Management Team in collaboration with our Road Safety Engineering specialists; and
- Is intended to assist HCC decision-makers, engineers, project managers and the highways service to implement a robust affordable skid resistance strategy for the Hertfordshire network; and
- Provides the HCC highways service with a pragmatic approach to managing skid resistance across the local road network; and
- Broadly follows the national guidelines, but addresses local road requirements; and
- Describes HCC’s requirements for measurement of skid resistance; and
- Includes a site categorisation table, which classifies different site categories dependant upon the characteristics of the road; and
- Defines the skid resistance levels at which actions, reactions and remedial works are required.

The Strategy also describes:

- Skid resistance and how it is measured on the HCC network; and
- How the highway network is segmented based on geometry and skidding risk; and
- Analysis of the skid resistance data and prioritisation of the sites for further investigation; and
- How site investigations should be undertaken and gives guidance on treatment application; and
- Early life skid resistance and notes that slippery road warning signs will not be used for new surfaces that comply with contract specifications; and
- Specific surface treatments where loose stones may result in a skid risk; and
- HFS will only be used where the benefits likely to be realised through a reduction in personal injury collisions outweigh the long term costs associated with the use of HFS. Analysis to determine the most appropriate solution(s) to address personal injury collisions will include consideration of whole of life costs and benefits.

- In particular, HFS or similar will not be used to colour part or all of a road surface in order to highlight a feature (for instance a 'SLOW' marking, central hatched area, bus cage or gateway feature). Similarly, HFS will not be used unless there is a clear case, related to personal injury collision reduction, to demonstrate that HFS is the most cost-effective (determined through whole of life cost analysis) and appropriate means of achieving the desired result. Nor will HFS or similar be used, either as a highlight or in an 'antiskid' role, to address public concerns regarding the safety of a particular site where the basis for the concerns is not adequately supported by personal injury collision data for the site. Where HFS features/highlights have been installed they will not necessarily be specifically maintained, nor will they be routinely replaced as part of maintenance of the carriageway surface. Where safety-related HFS has been installed, the need for it will be reviewed prior to resurfacing the road to see if it needs to be replaced post-resurfacing or whether an alternative approach, such as using high PSV aggregate in the new surface, will provide suitable skid resistance for the new surface.

Funding constraints dictate that not all sites can or will be investigated and/or treated, therefore, skid resistance remedial actions will be prioritised based on need.

Treatment of these sites will be the outcome of site investigations and form a planned reactive maintenance programme of works on an annual basis. This work will be completed within the existing Cat 4 maintenance and safety engineering budgets.
1 Introduction

1.1 Purpose

The purpose of the Hertfordshire County Council (HCC) Skid Resistance Strategy (the Strategy/this Strategy) is to define how HCC manages skid resistance on the County road network.

The maintenance of adequate levels of skid resistance\(^1\) on road running surfaces is an important aspect of road maintenance, and one that contributes significantly to network safety.

Hertfordshire County Council manages skid resistance in house as a task that sits between Highway Asset Management and Road Safety Engineering and requires both skill sets to implement properly. The Strategy has been prepared as a realistic approach that is intended to inform an investigation programme as well as overall treatment prioritisation.

The skid resistance strategy for a road network should be deliverable and not set the ‘bar’ too high in terms of investigations and works required to conform to the strategy. Therefore, this Strategy endeavours to be practical and affordable, while providing a safe, reliable, and sustainable network for Hertfordshire road users.

1.2 National Standard

The UK standard for the management of skid resistance is recorded in the Design Manual for Roads and Bridges (DMRB) Volume 7 Part 3 Section 1 document HD 28/04 Skid Resistance (the Standard).

The objective of HD 28/04 “… is to manage the risk of skidding [collisions] in wet conditions so that this risk is broadly equalised across the … road network. This is achieved by providing a level of skid resistance that is appropriate to the nature of the road environment at each location on the network. The appropriate level of skid resistance is determined from a network [collision] analysis plus local judgement of site specific factors.”\(^2\) “A key part of the Standard is therefore to identify locations where a greater level of friction is likely to reduce the risk of skidding [collisions]”\(^3\)

That is, the skid resistance of the road surface can be lower at those locations where the risk and/or consequences of a personal injury collision are relatively low. Conversely the skid resistance will be higher where the risk and/or consequences of a personal injury collision are higher.

The Standard requires each road section to be categorised by key parameters. This principle is a fundamental part of the Standard as the road section specific

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1 Skid resistance describes the magnitude of the frictional resistance (grip) between the tyres of a vehicle and the road surface
2 Paragraph 1.3, DMRB Volume 7 Section 3 Part 1 HD 28/04 Skid Resistance, the Highways Agency et al, 2004
3 Section 2, Interim Advice Note 98/07 Guidance for HA Service Providers on Implementing the Skid Resistance Policy (HD 28/04), Highways Agency, September 2007
categories identify locations where a greater level of friction is likely to reduce the risk of skidding that may otherwise lead to personal injury collisions⁴.

“The purpose of … [HD 28/04] is to describe how the provision of appropriate levels of skid resistance on in-service UK Trunk Roads … will be managed.” Notwithstanding that HD 28/04 was developed to describe management of skid resistance for trunk roads, the principles in the Standard are applicable to non-trunk roads. The Highways Agency (HA) network has typically been designed to geometric design standards which reduce or mitigate the potential for collisions at sites that could otherwise be considered as potential high risk sites.

Local authority road networks tend to have evolved from roads with lower geometric standards than those on the HA network and include extensive urban lengths. While HD 28/04 remains a good place to start, it does not represent the most effective and/or appropriate framework for managing skid resistance on the HCC road network.

This Strategy is designed to build on the DMRB guidance by describing specific requirements for the Hertfordshire County Council road network.

1.3 Background

There are several factors that can affect the skid resistance of a road surface. Skid resistance can fall significantly when the road is wet but is more dependant on the condition of the surface material. However, the risk of a skidding related personal injury collision occurring is greater in the wet than the dry.

A personal injury collision involving skidding⁶ is usually attributable to several factors and it is rare for a single factor to be the cause of a personal injury collision. Multiple factors need to be considered in personal injury collision investigation and the skid resistance of the road surface is just one of these. When an incident occurs due to an emergency situation that arises primarily from other factors, the skid resistance of the road surface can be brought into question. However, the causes leading to an incident can include several factors such as; environment, driver error, poor visibility, excessive speed, poor signing, etc.

In wet conditions skid resistance is reduced, which increases braking distances and reduces a driver’s ability to control their vehicle. Wet conditions can reduce the skid resistance to a level where there is insufficient friction generated to avoid skidding occurring during routine manoeuvring. Therefore, skid resistance during wet conditions needs to be considered as part of the risk management and reduction processes for a road network. Consequently measurement of skid resistance is undertaken in wet conditions.

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⁴ Skidding that leads to a personal injury collision involves a vehicle sliding, typically sideways or obliquely, followed by collision with a person, object, and/or another vehicle, and resulting in one or more people being killed or injured.

⁵ Paragraph 1.1, DMRB Volume 7 Section 3 Part 1 HD 28/04 Skid Resistance, the Highways Agency et al, 2004

⁶ A vehicle skids when one or more tyres loses normal grip on the road causing an involuntary movement of the vehicle. This happens when the grip of the tyres on the road becomes less than the forces acting on them. (Source: http://www.volvoclub.org.uk/safer-driving8.shtml)
A high skid resistance will not prevent an emergency braking situation from arising or improve driver judgment, but it can often alleviate or decrease the effects of driver error and reduce the risk of a personal injury collision occurring or at least lower the severity of a personal injury collision.
2 Measurement of Skid Resistance

2.1 Skid Resistance

Skid resistance relates to the resistive force (friction) between a vehicle tyre and the road surface. Two components of the road surface contribute to the level of available friction on a road surface; these are, macrotexture and microtexture.

- Macrotexture of the surface material induces a loss of energy through “…hysteresis (deformation and recovery of the tyre as it passes over the projections and depressions in the road surface).”

- Microtexture of the aggregate surface is the main contributor to sliding resistance between a tyre and the road surface. Microtexture is the predominant influence on tyre wear and is the major factor in determining wet surface skid resistance at low speeds. Because microtexture is the “…chemical bonding…” between the road stone and the rubber … When water is present between the road and the tyre, it prevents the chemical bonding. In wet conditions, the ability for chemical bonds to occur depends on the microtexture, i.e. the irregularities less than 0.5 mm in height which characterise the face of the stone. The greater the microtexture, the more of the surface that will protrude above the water film, and the more bonding that will take place. Adhesion in wet conditions therefore depends critically on microtexture.

![Figure 1](www.nra.co.za)

**Figure 1**: Surface Texture

Macrotexture is defined as the texture greater than 0.5 mm, which is mainly formed by the gaps between aggregate particles. Macrotexture is a function of the material components and their properties, compaction method used, and aggregate gradation. In particular it is related to the height, width and angularity of the aggregate within the surfacing material. As vehicle speeds increase, macrotexture provides an increasingly significant portion of the available skid resistance.

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7 22nd ARRB Conference – Research into Practice, Canberra Australia, 2006, Macrotexture and Crash Risk – Some Recent Findings from Australia and Their Implications, Peter Cairney, ARRB Group, Australia

8 The chemical bonding is attributable to the molecular scale interaction between the microtexture of the road stone and the tyre that provides adhesion

9 22nd ARRB Conference – Research into Practice, Canberra Australia, 2006, Macrotexture and Crash Risk – Some Recent Findings from Australia and Their Implications, Peter Cairney, ARRB Group, Australia

10 Source – www.nra.co.za
Microtexture is defined as the texture less than 0.5 mm on the surface of individual surface aggregate particles. Microtexture provides a significant portion of the available skid resistance at lower vehicle speeds and is dependent upon aggregate shape and mineralogy. “Aggregates resistance to polishing and their ability to maintain the micro-texture are measured in the laboratory by [the] polished stone value (PSV)” test procedure.\textsuperscript{11}

2.2 Measuring Skid Resistance

Skid resistance is a measure of the complex interaction between the road surface and vehicle tyres; it is dependent upon many factors including:

- Vehicle speed;
- Tyre tread depth;
- Presence of surface water on the road
- Road surface material; and
- Road surface condition.

Various test methods and survey equipment are available for measuring skid resistance. All measure the force exerted on a rubber tyre or slider as it passes over a wetted road surface; the measured force is converted to a value describing the amount of available friction. Typically this is expressed as a dimensionless coefficient of friction, which indicates the resistive force (friction) available from the road surface.

2.3 Survey Equipment

SCRIM

The Sideway-force Coefficient Routine Investigation Machine (SCRIM) was introduced in the 1970s to provide a method for measuring the skid resistance of a road network using the sideways force principle. Despite the age of the SCRIM concept, it is one of the most widely used devices for measuring skid resistance for road networks.

A freely rotating wheel fitted with a smooth rubber tyre; mounted mid-machine, in line with the nearside (left hand side in the UK) wheel track and angled at 20\degree to the direction of travel of the vehicle is applied to the road surface under a known vertical load. A controlled flow of water wets the road surface immediately in front of the test wheel so that when the vehicle moves forward, the test wheel slides in the forward direction along the surface\textsuperscript{12}. The force generated by the resistance to

\textsuperscript{11} Developing a model for estimation of polished stone value (PSV) of road surface aggregates based on petrographic parameters, Shahin Shabaniab, Mahmoud Ahmadinejad & Mahmoud Ameri International Journal of Pavement Engineering Volume 14, Issue 3, 2013, pages 242-255

\textsuperscript{12} DMRB Volume 7, Section 3, Part 1, HD 28/04, Skid Resistance
sliding is related to the wet road skid resistance of the road surface. Measurement of this sideways component allows the Sideway-force Coefficient (SFC) to be calculated.

![GripTester](image)

**Figure 3: SCRIM**

**GripTester**

The GripTester is a braked wheel, fixed slip device with drag (horizontal force) and load (vertical force) continuously measured. The quotient of drag divided by load gives the coefficient of friction.

The GripTester is a highly manoeuvrable instrument that can be used for investigating collision sites and other problem areas. It has a smaller survey length range than SCRIM and is suitable for use on very small road networks and for localised investigations.

![GripTester](image)

**Figure 4: GripTester**

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13 pavemaintenance.wikispaces.com
14 http://www.mastrad.com/griptest.htm
15 http://www.findlayirvine.com/products/grip-tester
Portable Skid Resistance Tester

The Portable Skid Resistance Tester or British Pendulum Tester was originally designed for testing slip resistance on floors in government buildings\(^{16}\). It is currently used in a road engineering context to measure the skid resistance value of aggregate samples in the Polished Stone Value (PSV) test procedure.

The British Pendulum Tester is not a suitable tool for skid resistance assessment at a network level but can be used for detailed investigation of a very localised site or area. Relative to the mobile and automated methods available (such as SCRIM and GripTester), the manual British Pendulum Tester method is time consuming and disruptive to road users, requiring the use of traffic management to protect the operator while testing of the road surface is being carried out.

![Portable Skid Resistance Tester](image)

**Figure 5: Portable Skid Resistance Tester\(^{17}\)**

2.4 HCC Survey Method

As results from the different test methods are relatable but not directly interchangeable, it is sensible to select one test method that will be used for routine monitoring of the in-service skid resistance of HCC roads.

HCC has previously used SCRIM as the routine skid resistance survey test method for the road network. The GripTester can be used on specific sites that are not included in the annual SCRIM survey run; however, the extent to which the GripTester is used should be limited because the cost per mile of road tested on a network wide basis is high when compared with SCRIM.

\(^{16}\) [www.munroinstruments.co.uk/Pendulum/contents/en-us/d23_The_Pendulum_SkidTester.html](http://www.munroinstruments.co.uk/Pendulum/contents/en-us/d23_The_Pendulum_SkidTester.html)

\(^{17}\) [www.munroinstruments.co.uk](http://www.munroinstruments.co.uk)
3 Defining Site Categories

3.1 Basis for Developing Site Categories

The principle of the DMRB standard for skid resistance (HD 28/04) is to broadly equalise the risk of collisions, where skid resistance is a factor, across the network by providing a level of (wet road) skid resistance that is appropriate to each location. Site categories allow the required level of skid resistance to be varied based on the geometric constraints of the road.

Investigatory Levels (ILs) represent a limit, above which the skid resistance is regarded as being satisfactory, but at or below which the road should be subject to a more detailed investigation of the skid resistance requirements. The IL for a road or road section is assigned based on broad features of the road type and geometry (the site category) plus specific features of the individual site\(^{18}\). ILs are banded in the table below because specific localised factors may influence the IL of the site. Factors may include personal injury collision data and site characteristics. The higher the IL for a site, the higher the level of skid resistance required for that site.

\(^{18}\)DMRB Volume 7, Section 3, Part 1, HD 28/04, Skid Resistance
Table 1 below, which is taken from HD 28/04, illustrates how investigatory levels are banded depending on specific localised factors that influence the IL of the site.

### Table 1: HD 28/04 Site Categories and Investigatory Levels

<table>
<thead>
<tr>
<th>Site category and definition</th>
<th>Investigatory level at 50 km/h</th>
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<tbody>
<tr>
<td></td>
<td>0.30</td>
</tr>
<tr>
<td>A Motorway class</td>
<td></td>
</tr>
<tr>
<td>B Dual carriageway non-event</td>
<td></td>
</tr>
<tr>
<td>C Single carriageway non-event</td>
<td></td>
</tr>
<tr>
<td>Q Approaches to and across minor and major junctions, approaches to roundabouts</td>
<td></td>
</tr>
<tr>
<td>K Approaches to pedestrian crossings and other high risk situations</td>
<td></td>
</tr>
<tr>
<td>R Roundabouts</td>
<td></td>
</tr>
<tr>
<td>G1 Gradient 5-10% longer than 50 m</td>
<td></td>
</tr>
<tr>
<td>G2 Gradient &gt;=10% longer than 50 m</td>
<td></td>
</tr>
<tr>
<td>S1 Bend radius &lt;500 m – dual carriageway</td>
<td></td>
</tr>
<tr>
<td>S2 Bend radius &lt;500 m – single carriageway.</td>
<td></td>
</tr>
</tbody>
</table>

- Left hand dark grey box to be used as default value
- Selectable if risk analysis has been carried out

The site categories in HD 28/04 have been created for the Highways Agency’s trunk road and motorway network and may not be wholly suitable for the Hertfordshire County Council road network.

Local highway authorities around the UK have used HD 28/04 as a base from which to develop additional site categories suitable for lower traffic volume/speed roads and/or for roads with difficult geometric alignments.

A recent project undertaken by LoTAG\(^19\) for all London Roads created additional site categories to cater for urban road classes.

\(^{19}\) LoTAG = Local Government Technical Advisors Group
3.2 HCC Site Categories

Hertfordshire County Council has used HD 28/04 as a starting point to customise the set of site categories and investigatory levels (ILs) for use on the HCC road network, as described in Table 2 below.

Table 2: HCC Site Categories and Investigatory Levels

<table>
<thead>
<tr>
<th>Site category and definition</th>
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<td>C Single carriageway non-event, speed limit &gt; 30 mph</td>
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</tr>
<tr>
<td>D Single carriageway non-event, speed limit ≤30 mph</td>
<td></td>
</tr>
<tr>
<td>Q Approaches to and across minor junctions</td>
<td></td>
</tr>
<tr>
<td>QL Approaches to and across major junctions</td>
<td></td>
</tr>
<tr>
<td>QM Approaches to roundabouts</td>
<td></td>
</tr>
<tr>
<td>K Approaches to pedestrian crossings and other high risk situations</td>
<td></td>
</tr>
<tr>
<td>R Roundabouts</td>
<td></td>
</tr>
<tr>
<td>G1 Gradient 5-10% longer than 50 m</td>
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</tr>
<tr>
<td>G2 Gradient ≥10% longer than 50 m</td>
<td></td>
</tr>
<tr>
<td>S1 Bend radius &lt;500 m – dual carriageway</td>
<td></td>
</tr>
<tr>
<td>S2 Bend radius ≥250 m and &lt;500 m – single carriageway</td>
<td></td>
</tr>
<tr>
<td>S3 Bend radius &lt;250 m – single carriageway</td>
<td></td>
</tr>
</tbody>
</table>

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20 A non-event site refers to any section of road where there are no junctions, roundabouts, crossings, bends or gradients.

21 A minor junction – defined in DMRB Volume 6 Section 2 Part 6 TD 42/95 Geometric Design of Major/Minor Priority Junctions, factors affecting the type of junction required are provided in DMRB Volume 6 Section 2 Part 6 TA 23/81 Junctions and Accesses: Determination of size of roundabouts and major and minor junctions.

22 A major junction – defined as same as minor junction where the applied factors (DMRB Volume 6 Section 2 Part 6 TA 23/81 Junctions and Accesses: Determination of size of roundabouts and major and minor junctions) determine the junction type.

23 QM = QL because it is necessary for traffic on all approaches to a roundabout to give way to other traffic flows.

24 Other high risk situations may include; poor advance visibility, high speed approaches, and high risk of head on collisions.
The philosophy of HD 28/04, which has been adopted for the HCC Skid Resistance Strategy, is to provide flexibility in the range of ILs that can be selected for each site category, as indicated by the shaded cells in the table above.

- Left hand dark grey box to be used as default value
- Selectable if risk analysis has been carried out

Depending on the risk associated with a particular site, an IL value greater than the default value can be selected.

3.3 Length of Site Categories

HD 28/04 and Interim Advice Note (IAN) 98/07 describe the process for assigning the length for a site category. Typical lengths are:

- Site category R – 10 metres;
- Site category K and Q – 50 metres; and
- Other site categories – 100 metres.

A degree of flexibility is required in determining the appropriate length for site categories as network practicalities and scheme requirements may warrant longer or shorter sections.

3.4 Reviewing Site Categories

Site categories are defined based on the road geometry and as such will remain the same until the road is physically altered in some way, for example:

- A realignment that changes a curve radius;
- Installation of a new pedestrian crossing;
- Addition of a side road;
- Alteration of a junction; and/or
- Installation of a roundabout.

As these changes are relatively infrequent, site categories will be reviewed as part of the site investigation process (Chapter 6 of this Strategy) only and will not be subject to a routine or ad hoc review.

Physical alterations to the road network will be effected by HCC highway schemes or through funding associated with Section 278, S38, S106 or S37 contributions.

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26 See http://www.sandersonassociates.co.uk/index.htm for definitions of terms
Highway works completed through any of these routes will provide the Council with a prompt to update site categorisations based upon works undertaken. All information associated with the alterations can be passed across to the HCC Data Management Team who can apply the appropriate new site category as required. This process will enable the site categorisations to be updated as works are undertaken and completed on the network.

Interim Advice Note (IAN) 98/07 provides guidance for assigning site categories and ILs and can be used as a basis for review with the limitation that only the HD 28/04 site categories are included in the IAN.
4 Assigning the Investigatory Level

4.1 Introduction

The objective of assigning an Investigatory Level (IL) is to assess the nature of the site and assign an appropriate level of skid resistance, at or below which a more detailed site investigation will be undertaken as determined from HCC’s prioritised risk management approach.

The investigatory levels described in HD 28/04 have been developed for the trunk road and motorway network and may not be wholly suitable for the Hertfordshire County Council road network due to the diverse nature of local roads; this is acknowledged in HD 28/04. Some local authorities in the UK have developed a range of suitable ILs for local authority roads; some of these have a range greater than the ranges described in HD 28/04.

4.2 Risk Based Approach

A range of possible ILs exists for most site categories. Assigning the appropriate IL for each site is important. This Strategy provides a degree of flexibility for assigning different ILs for different sites within the same category. This allows for sites, where the risk of personal injury collisions (particularly wet road personal injury collisions) is atypically high, to be addressed by assigning a higher IL within the site category band. The points below provide some detail on how different IL values can be assigned to a site based on site specific features.

- Dark grey boxes show the normal range of ILs for a particular site category;

- Light shading assigns a lower than normal value of IL. This may be used for low risk situations, for example low trafficked areas, where mitigation measures are present (e.g. signing, speed restrictions, etc) and sites demonstrating lower than typical incidence of personal injury collisions; and

- Assigning higher ILs can be justified through high personal injury collision levels and/or local risk assessments.

ILs will initially be set to the lowest ‘standard’ IL within the dark grey shaded boxes. Personal injury collision data will be used to influence the IL for a site, together with local risk assessment factors that may indicate the IL needs to be revised. If personal injury collision data and/or other local risk assessment factors indicate that a site has an associated higher than average risk then a recommendation will be put forward to increase the current IL.

4.3 Personal Injury Collision Analysis

As part of the analysis associated with the Strategy, personal injury collision data for each site will be compared with the initial SCRIM IL coefficient values. Where there
are a disproportionately high number of personal injury collisions within a site, that site will be assigned a higher IL than a different location within the same site category where there is lower risk as demonstrated by the personal injury collision history.

4.4 Review of the ILs

HD 28/04 (paragraph 4.17) states that “… a procedure shall be put in place to ensure that the Investigatory Levels are reviewed at least every three years unless agreed otherwise with the Overseeing Organisation.” HCC will apply this policy for the primary road network; therefore, based on a three year rolling programme, one third of the ILs would be reviewed every year.

For the non-primary road network a personal injury collision analysis will be undertaken on an annual basis to highlight sites that are regarded as "hazardous sites". Following preparation of the annual hazardous sites list the ILs of those locations falling within the list will be reviewed and compared with the hazardous sites list from the preceding year.

For those sites that are new to the hazardous sites list and/or remaining in the list from the preceding year, the review will consider increasing or maintaining the IL value of each site under review. For those sites dropping out from the list from the previous year, the review will consider decreasing the IL.

The review of altering the IL of a site should take account of wider network changes. Additional factors, that need to be considered when reviewing site categorisation in relation to physical alterations to the network, include changes to speed limits. The frequency of personal injury collisions and traffic flow volumes will also influence the IL level within a prescribed site category; therefore, personal injury collision records (where available) will be considered when determining the appropriate IL value within a site category.

The IL review will be undertaken by the HCC personnel holding the following positions:

- Business Manager for Contracts and Networks (or nominee);
- Head of Profession - Asset Management and Maintenance (or nominee); and
- Head of Profession - Road Safety Engineering (or nominee).
5 Skid Resistance Surveys

5.1 Introduction

The HCC road network has a wide range of traffic volumes and consequently has a variable risk of collisions occurring that are due in part to the skid resistance of the road surface. Due to the significant cumulative length of low traffic volume roads within the County, undertaking skid resistance testing on all HCC roads would not be a cost effective strategy.

5.2 Survey Regime

Skid resistance testing will be undertaken annually using a risk based approach to maximise the impact of the testing within the available budget.

For the purposes of the Skid Resistance Strategy the HCC road network has been subdivided based on accident risk, road class and traffic volumes to define the skid resistance survey regime.

An annual SCRIM survey will be undertaken where possible within the annual budget constraints on the portions of the HCC road network in following priority order:

1. Personal injury collision sites or routes (identified from the hazardous sites or routes lists), at which the HCC Head of Profession - Road Safety Engineering considers there may be a skid resistance related issue. The suitability of SCRIM skid resistance data for analysis associated with hazardous sites will depend on whether the timing of the SCRIM surveys allows the data to be collected in a timely manner27; and

2. Principal Classified Road Network – A Roads;

3. Non Principal Classified Road Network with greater than 10,000 vehicles per day – that is, B and C Roads with an annual average daily traffic (AADT) volume greater than 10,000 vehicles per day (vpd);

4. Test sites (for example, new materials, degradation of specific test sites, etc) identified by the HCC Head of Profession - Asset Management and Maintenance.

Where constraints (for example, budgetary, timing, network availability) require that the scale of the annual SCRIM survey needs to be amended, a prioritised list of the sections of road to be surveyed will be produced by the HCC personnel holding the following positions:

- Business Manager for Contracts and Networks (or nominee);

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27 Refer also to Section Error! Reference source not found. of this document
5.3 Survey Calculation Method

The skid resistance of road surfaces can fluctuate during the year and between successive years, while maintaining a similar general level of skid resistance over a long period of time. Skid resistance for the HCC network will be assessed on the basis of the overall (summer) level of skid resistance, rather than the actual measurement recorded at the time of the survey.

The method to be used by HCC to provide an estimate of the summer skid resistance is the Single Annual Survey Method, as defined by HD 28/04. The Mean Summer SCRIM Coefficient (MSSC) uses the average SCRIM coefficient results based upon readings taken at different times within the surveying season.

The survey programme is planned so that the effects of seasonal variation, both within a single season and/or between successive years, can be taken into account to determine the Characteristic SCRIM Coefficient (CSC) for any particular length of road.

“This approach is based upon a single annual survey of the network. The method uses measurements from the preceding 3 years to characterise the long-term skid resistance of the network. This value is used with the mean network skid resistance in the current year, to calculate a correction factor, which is applied to the current year’s data to make current values consistent with the long-term average.”

Further information on this process can be found in HD 28/04.

5.4 Quality Assurance

SCRIM vehicles used on the HCC network will have passed the annual correlation trials implemented by the Highways Agency. The trials ensure consistency of results across the nationwide fleet of SCRIM vehicles by undertaking surveys on a number of sites with varying levels of skid resistance. The trials confirm the equipment can measure the data elements to the required accuracy and the data is compared to identify anomalies in measurement.

The SCRIM survey contractor will not begin the annual survey until all calibration and validation requirements have been met. The formal process of accreditation and correlation for the SCRIM vehicle will be confirmed in accordance with HD 28/04.

Benchmark Monitoring Sites
Benchmark monitoring sites serve as long term performance monitoring sections to calibrate the carriageway deterioration models. These sites are surveyed annually at the same time each year to monitor deterioration.

Seasonal correction factors are applied to SCRIM data to allow for the influence of varying climatic conditions. The sites identified for determining the seasonal correction factors will be assessed as required to ensure they are giving accurate results.

Data Quality

Data quality assurance is the process of profiling data to identify inconsistencies and anomalies in the data, and performing data cleansing activities to improve the data quality. Data quality will be checked at all stages of the data collection and processing process.

The video of the HCC road network captured during the Surface Condition Assessment of the National Network of Roads (SCANNER) road condition assessment will be used during the data quality assurance process to visually assess the validity of the SCRIM data values.

5.5 Ad Hoc Skid Resistance Testing

As noted in Section Error! Reference source not found., SCRIM is suitable for road network skid resistance testing. However, occasions often arise where ad hoc skid resistance tests are required so that the skid resistance of the road surface can be identified at isolated locations such as:

- Hazardous sites;
- Locations at which HCC asset management and/or road safety engineering staff and/or the Police have identified potential concerns in relation to skid resistance as evidenced through loss of control collisions; and
- Other locations at which ad hoc surveys are required.

The results of ad hoc skid resistance testing will often be required before the information would be available through the programmed completion of SCRIM surveys. Due to the relatively high cost of using SCRIM to obtain skid resistance data for isolated locations on an ad hoc basis, it is more appropriate to obtain such skid resistance data using a device designed for smaller survey lengths (for example the GripTester). Therefore, where ad hoc surveys are required for sections of road where the skid resistance data cannot be readily obtained in a timely manner using SCRIM, the data will be obtained using a device such as the GripTester.
6 Site Investigations

6.1 Purpose and Objectives of Site Investigation

The purpose and function of the site investigation process is to consider each site at which the SCRIM survey results indicate investigation is required and to provide consistency in prioritisation and programming.

Site investigations will be carried out annually by a team of HCC officers with experience in pavement engineering, personal injury collision investigation and prevention, and with relevant local knowledge. As such a risk based prioritisation process will be used to rank sites for investigation. The number of sites to be investigated annually will be limited by the available resource.

The objectives of a site investigation are to determine:

- Whether the IL and site category are appropriate;
- Whether the IL is appropriate. If the IL appears to be inappropriate, consideration will be given to changing it. The guidance in Section 5 of HD 28/04 will be followed and the justification for any proposed change will be recorded;
- The correlation between the SCRIM test result and the appearance of the surface at that location;
- Pavement defects contributing to the skid resistance deficiency;
- Whether a surface treatment is justified to reduce the risk of personal injury collisions, specifically personal injury collisions in wet conditions and/or involving skidding;
- Whether some other form of action is required in relation to the pavement or street furniture; and
- Whether treatment will be deferred in the interim and the site kept under review.

All investigations and site notes, including the personal injury collision analysis, will be stored for future reference.

6.2 Identifying and prioritising sites for investigation

Sites will be prioritised for investigation based on:

- Skid deficiency – where skid resistance is at or below the required IL;
- Site category;
- Personal injury collision history;
- Road hierarchy – road class A, B, C or U; and
• Speed limit – or operating speed where available

The quantity of sites that can be investigated each year will be determined by the resources available in the County to undertake the site investigations. The list of sites identified as having a skid resistance deficiency will be ranked and prioritised with the highest priority sites selected for investigation.

Consideration will be given to lower priority sites that are close\(^{29}\) to high priority sites to maximise the value of time spent on site. This process will be used to provide a value for money service while benefiting road users in a cost effective way.

### 6.3 Conducting site investigations

A site investigation procedure is defined in IAN 98 and in Annex 4 of HD 28/04, which involves collating various sources of information to assist an analyst to reach a decision about the appropriate course of action. This procedure involves:

• Reviewing the IL;
• Collating various sources of; pavement, line marking and sign condition data;
• Assessing visibility along the section;
• Obtaining personal injury collision data;
• Assessing the positions of personal injury collisions relative to the areas with low skid resistance;
• Assessing the collision risk – personal and collective;
• Determining whether a surface treatment or other action is required; and
• Determining if the site requires monitoring only or if no action is required.

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\(^{29}\) Proximity of sites will be determined on a site by site basis based upon treatment selection, traffic management requirements and ease of inclusion.
7 Remedial Works

The outcome of the site investigation process will be a schedule of sites to be programmed for the recommended remedial works. Remedial works may include improving the skid resistance of the road surface and/or influencing driver behaviour by altering the road environment in the vicinity of the affected road surface.

For those locations with a history of personal injury collisions, a multi-dimensional approach may be needed where improving the skid resistance of the surfacing material alone is unlikely to significantly reduce personal injury collision rates.

Road environment improvements to be considered in conjunction with skid resistance remedial works, can include, but will not be limited to:

- Removing hazards;
- Amending junction geometry;
- Adjusting vehicle speeds;
- Improving road geometry;
- Improving the surface profile;
- Remediing drainage issues;
- Improving visibility;
- Repositioning or removing street furniture;
- Signage and/or lining improvements; and/or
- Other safety features.

7.1 Programming Remedial Works

Remedial work may have associated adverse effects including traffic disruption, monetary cost and environmental impact; all of which need to be considered when determining whether treatment is justified, so that treatments are targeted at locations where the most benefit will be gained.

A risk based process will be followed to provide a prioritised ranking of remedial works based on the outcomes of the site investigations.

Remedial works will be prioritised based on the following:

- Where the skid resistance is at least 0.05 CSC units below the IL;
• Where low skid resistance\(^{30}\) is combined with low texture depth\(^{31}\);

• Where the personal injury collision history shows there have been wet and/or skidding collisions; and

• Where a scheme already exists on the Forward Works Programme.

HCC maintains a Forward Works Programme (FWP), which is a multi-year plan of future works, and an Integrated Works Programme (IWP) which is a two year coordinated programme of future works.

Sites identified as requiring skid resistance remedial works may already be on the FWP or included in the IWP for action in the next two years. Therefore, consideration will be given as to whether the skid resistance remedial works:

• Are already included in the current IWP and can wait until the works are carried out;

• Could be added to the current IWP as an extension of planned works; and/or

• Could be added to and/or accelerated through the planned programme.

HCC anticipate that each year at least some of the skid resistance remedial works will require prompt intervention and a reactive programme of works will need to be prepared and undertaken.

On a prioritised basis, all sites for which skid resistance treatment is justified will be considered as part of planning the IWP programme to influence the timing of future projects.

7.2 Treatment Selection

The choice of surfacing material plays a vital role in providing roads that meet the friction demands of road users. The Polished Stone Value (PSV) is the key parameter of the surfacing material to achieve this.

Table 3.1 of HD 36/06 Surfacing Materials for New and Maintenance Construction specifies the minimum PSV required based on the site category, IL and traffic volume.

HD 36/06 is designed for trunk road and motorway applications and will be used as a basis for PSV selection for HCC roads where no other information exists. In accordance with HD 36/06 the minimum values of PSV described in Table 3.1 of that document will be used for this Strategy if no other more suitable information is available.

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\(^{30}\) Low skid resistance is where the SCRIM reading is at least 0.05 CSC units below the IL

\(^{31}\) Low texture depth is defined as texture depth below 0.4 mm
However, where local evidence clearly indicates that a particular aggregate or source provides an appropriately high level of in service skid resistance, despite the PSV being potentially lower than might otherwise be required, this information can be used to influence aggregate selection in preference to aggregate selection being based solely on the values in Table 3.1 of HD 36/06.

Treatment selection should also consider non motorised users that could be affected by the potential low early life skid resistance of newly resurfaced roads. Equestrian traffic could pose one user group that could potentially be affected by initial low skid resistance associated with particular surfacing types. The guidance note published by the County Surveyors Society, horses and highway surfacing should be considered by designers when a new surfacing is constructed across areas of known equestrian movement.

7.3 Life Cycle Cost Considerations

Surface treatments can include high friction surfacing, surface dressing, retexturing, and gritting during construction. All have life cycle cost considerations which will be taken into account for when selecting the appropriate surface.

Surfaces with a high PSV are comparatively expensive to construct and maintain, and typically have relatively short life spans. The cost over the life cycle of the road section will be carefully considered before these materials are proposed for use.

Further detail of the use of high friction surfacing can be found in Appendix A.
8 Early Life Skid Resistance

Some surfacing treatments require a period of time to develop their full skid resistance potential, for example where surface binder has to be worn off the aggregate. However, for these surfacings, the criteria described in Interim Advice Note (IAN) 49/13 - Use of Warning Signs for New Asphalt Road Surfaces will be followed. In particular, IAN 49/13 states (paragraph 3.1) that “Slippery Road Warning signs … should not be erected at any newly resurfaced sites where the surfacing laid complies with the contract specification”[emphasis added].

The IAN 49/13 approach is in line with the HCC guidance on the use of slippery road surface signs, as described in Chapter 9 of this Strategy, which specifically seeks to eliminate the over usage of Slippery Road Warning signs.

8.1 Gritting of New Surfaces

Where an early life skid resistance deficiency is known to occur on a surfacing material, gritting the surface immediately after construction is a method that can be employed to mitigate the risks that may be associated with the reduced skid resistance that can exist for the period following construction until the surface binder material has worn off.

8.2 Surface Dressing

Surface dressing is a fast, effective and economical way to rejuvenate the road surface and/or to preserve and protect the underlying pavement.. It can be used to improve skid resistance and fill small imperfections on the road surface. However, part of the process of constructing a surface dressing involves spreading a surplus of chippings over the road surface, which are embedded through trafficking. Remaining surplus chippings are swept and removed from site within 7 days.

Drivers need to be made aware of the risk of skidding on a newly surface dressed site through temporary signage (TSRGD 7009 together with a supplementary plate 513.2; as illustrated below). The recommended maximum speed limit for carriageways with loose chippings is 20 mph.
7009
Loose chippings on road ahead

513.2
Maximum speed in miles per hour advised at bend or other hazard
9 Use of Slippery Road Signs

Slippery road signs can be used to warn drivers that the upcoming section of carriageway (as defined by the supplementary plate, which is supplementary to the slippery road sign) may have lower than expected skid resistance. Frequent use of these signs has contributed to sign clutter across the network. More importantly, clutter has reduced the impact of these signs, which are intended to positively alter driver behaviour at specific locations on the network where there is an increased risk of skidding.

Over usage of slippery road signs has led to the following criteria being developed to define limitations as to where such signs should be used. HCC is endeavouring to improve the impact of these signs and their ability to encourage drivers to positively alter their behaviour and adjust to the prevailing road conditions.

Slippery road signs (illustrated below) will only be considered where a site investigation has been conducted (refer to Chapter 6 of this Strategy) and the analyst has determined that such signage is required. Slippery road signs (TSRGD 557), where installed, will be paired with an appropriate supplementary plate sign (TSRGD 570).

557 Slippery road ahead

570 Distance over which hazard or prohibition extends

Signage needs to comply with the Traffic Signs Regulations and General Directions 2002 (TSRGD)\(^{33}\).

Slippery road signs must be erected as soon as practicable after site investigation has been completed:

- Where the skid resistance is substantially below the IL (0.10 CSC units or below), and the treatment deemed appropriate for the site cannot be immediately applied; and/or

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- At sites which have been resurfaced and are awaiting the application of an HFS.

Slippery road signs will be removed after the programmed remedial action has been completed and HCC highway maintenance engineers are satisfied that skid resistance levels are adequate. 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.
Glossary

Terms and abbreviations used within this document are defined below.

AADT - Annual average daily traffic

Carriageway – means a way constituting or comprised in a highway, being a way (other than a cycle track) over which the public have a right of way for the passage of vehicles;

Characteristic SCRIM Coefficient (CSC) - The skid resistance value that has been corrected for within year, and between year, seasonal variations and is obtained by multiplying the 10 m SC’s by the appropriate ECF.

Dense Bitumen Macadam (DBM) - Bitumen macadam in which the aggregates and filler are so graded as to form a close textured mixture, of low permeability, when spread and compacted.

Equilibrium Correction Factor (ECF) - The ECF is the ESC divided by the mean SC for an ECF area.

Equilibrium Correction Factor Area - A group of road sections within a locality used to provide the Equilibrium Correction Factor.

Equilibrium SCRIM Coefficient (ESC) - The ESC is the mean of the SCs for each site over three years.

Highway –Section 328 of the Highways Act 1980 states ““highway” means the whole or a part of a highway other than a ferry or waterway.”. For the purposes of this Strategy, “highway” means the area of publicly owned land, from boundary to boundary, within which a road is located.

Hot Rolled Asphalt (HRA) - Is a bitumen rich gap-graded blend of mineral aggregate (stone), sand, filler and bitumen, which is used extensively for surfacing roads.

Investigatory Level (IL) - The level of skid resistance at or below which a site investigation is to be undertaken.

Mean Summer SCRIM Coefficient (MSSC) - The mean of three SCs measured for the same length of road at reasonably well spaced intervals during the full summer testing.

Non-Principal Roads - Local authority maintained ‘B’, ‘C’ and unclassified roads.

Principal Roads - Local authority maintained ‘A’ roads. In general they carry less traffic than all purpose trunk roads which are ‘A’ roads owned and maintained by Highways Agency.
Road - Means a way constituting or comprised in a highway, being a way (other than a cycle track, footway, footpath, bridleway, path and/or byway) over which the public have a right of way for the passage of vehicles;

**SCRIM Coefficient (SC)** - A SCRIM reading that has been corrected for all factors except seasonal effects.

**Seasonal Adjustment Factor (SAF)** - The SAF is equivalent to the ECF except that it is obtained from the Seasonal Control sites rather than from the main run.

**Section** – Refers to an area of carriageway as recorded within the inventory system. The carriageway network comprises thousands of connected sections. Example of section is illustrated as the blue boxes in the diagram below the definition of “site”.

**Sideway-force Coefficient (SFC)** - The coefficient of the sideways force applied to the test wheel of a SCRIM truck as the vehicle moves forward on a wet road surface and the freely rotating test wheel, which is set at an angle of 20° to the direction of travel, slides in a forward direction on the wet road surface.

**Sideway-force Coefficient Routine Investigation Machine (SCRIM)** - A lorry based machine that measures the resistance to skidding of wet pavement surfaces.

**Site** – Refers to a designated area of carriageway to which an IL event category is applied or across which a collision area extends. A site (illustrated below as a red box) can extend across several road sections (illustrated below as blue boxes).

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**Surface Condition Assessment of the National Network of Roads (SCANNER)** - SCANNER surveys use automated road condition survey machines to measure a range of road condition parameters including ride quality, rut depth, intensity of cracking, texture depth and edge condition.
References

Documents to which reference is made in this Strategy include:


- COUNTY SURVEYORS SOCIETY (2006) *British Horse Society ENG 03/05 - Horse and highway surfacing, A guidance note for highway authorities:* CSS


- RSTA ADEEPT (2011) *Code of Practise for High Friction Surfacing:* RSTA


- THE HIGHWAYS AGENCY (2013) Interim Advice Note 49/13; Use of Warning Signs for New Asphalt Road Surfaces: The Highways Agency


Appendix A – High Friction Surfacing (HFS)

High Friction Surfacing (HFS), often referred to as ‘antiskid’, has been widely used in Hertfordshire to improve the friction properties of sites at which skid resistance has been identified as a possible factor contributing to the incidence of personal injury collisions. HFS provides a relatively simple solution for sites at which an increase in skid resistance is likely to reduce collisions. However, over the long term, there are often issues associated with adequately maintaining the surface and the whole of life cost for this treatment may not always have been taken into account when HFS was selected as a treatment.

Because HFS is a relatively expensive treatment, when considered on a construction and maintenance life cycle cost basis, which sometimes/often does not provide a long term solution for the friction issues associated with its original selection, it will in future be used sparingly as a treatment solution.

HFS will only be used where substantial personal injury collision reduction is anticipated and the benefit of installing the surfacing outweighs the increased costs associated with its use. It will not be used in lieu of long-term solutions that address geometric deficiencies, however, whole of life costs and benefits need to be taken into account.

When HFS is warranted, maximising the longevity of HFS is key to achieving a value for money solution. There are things that can be done to assist the longevity of HFS; these include:

- Only place HFS on a structurally sound surface that is unlikely to require maintenance in the short to medium term;
- Ensure the contractor is well versed in the construction of HFS; and
- Ensure that construction takes place during the correct season and within the appropriate temperature constraints.

Where HFS is deemed the appropriate treatment on site the designer should refer to the code of practise for high friction surfacing34. This guidance should be consulted by designers for suitability of site, preparation and application of treatment but does not have to be rigidly followed.

Sites at which HFS is presently installed will be reviewed subject to a skid resistance deficiency. Each site will be re-assessed with reference to its site category and the PSV requirements described in Table 3.1 of HD 36/06 (as per Chapter 7.2 of this Strategy). Where conventional surfacing materials can provide an adequate level of skid resistance, HFS will not be re-laid unless the site is high risk as categorised through an increased IL value and the required skid resistance cannot be achieved by more cost-effective means. Each site will be considered

34 RSTA ADEEPT, Code of Practise for High Friction Surfacing
individually as site conditions, local factors and personal injury collision data will vary from site to site.
Appendix B – SCRIM Calibration sites

Test site locations used for SCRIM calibration purposes.

<table>
<thead>
<tr>
<th>Site Location</th>
<th>Date of Survey</th>
<th>SCRIM Result</th>
</tr>
</thead>
<tbody>
<tr>
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</table>
## Appendix C – Site Investigation Report

### SCRIM Site Investigation Report - Desk top study

<table>
<thead>
<tr>
<th>Road Section ID</th>
<th>Road Name</th>
<th>Road Name and Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit ID</td>
<td>A41</td>
<td>Section(s) / chainage</td>
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</table>

<table>
<thead>
<tr>
<th>Road Class</th>
<th>Site Category</th>
<th>Current IL</th>
<th>SCRIM Value</th>
<th>Difference</th>
<th>Site ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>A, B, C or U/C</td>
<td>B, C, Q, ...</td>
<td>0.30 - 0.60</td>
<td>0.00 - 0.60</td>
<td>IL - SCRIM</td>
<td>Ref Number</td>
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</table>

<table>
<thead>
<tr>
<th>Reason for Site Investigation</th>
<th>AADT</th>
<th>HGV %</th>
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</thead>
<tbody>
<tr>
<td>SCRIM Failure</td>
<td>High Collision</td>
<td>3rd Party Claim</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>OS Grid Reference</th>
<th>Date of previous site investigation</th>
<th>Date of last surface treatment</th>
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<tbody>
<tr>
<td></td>
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</tbody>
</table>

### Site location and use

#### Location and Nature of the Site
- State signed speed limit
- List hazards e.g. junctions, lay-bys, pedestrian crossings, bends, gradients

### Current Site Category and IL
- Are these values in line with the current site
- State lowest SCRIM reading and provide detail of results

### Pavement Condition Information
- Review SCRIM data for site survey and comment on location of low skid resistance i.e. located at a section where drivers would manoeuvre

### Additional pavement condition information
- Review scanner data and state other defects present that could contribute to a low SCRIM result - Longitudinal profile, rutting ...

### Current and proposed works over the past and next 12 months
- State any CAT1, 2 works undertaken over the past 12 months and consideration of CAT 4 works programme for the following 12 months

### Drainage
- State if there is drainage and the date of last cleanse

### Personal Injury Collision Data - Last 3 years

<table>
<thead>
<tr>
<th>Period</th>
<th>Number of Personal Injury Collisions</th>
<th>Analysis Length</th>
</tr>
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<tbody>
<tr>
<td>From</td>
<td>To</td>
<td>Total</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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</table>

### Other collision information - Last 3 years

<table>
<thead>
<tr>
<th>Collision Type</th>
<th>Number of Collisions</th>
<th>Analysis Length</th>
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</thead>
<tbody>
<tr>
<td>Total</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wet Skid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length (m)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Traffic (AADT)</td>
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</table>
## Site Investigation Report - Onsite inspection of SCRIM failure

<table>
<thead>
<tr>
<th>Site ID</th>
<th>Road Name</th>
<th>Survey Date</th>
<th>Reference Number</th>
<th>Inspectors</th>
<th>Weather</th>
<th>SCRIM Value</th>
<th>Site Category</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>A41</td>
<td></td>
<td></td>
<td>0.00 - 0.60</td>
<td>B, C, Q …</td>
</tr>
</tbody>
</table>

### Visual Assessment of carriageway section where SCRIM failure has been identified

<table>
<thead>
<tr>
<th>Type of carriageway surface material</th>
<th>Consideration to variance, e.g. HRA, concrete, SD …</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does the SCRIM value correlate to surface coarse</td>
<td>Comment relating to correlation of reported SCRIM failure</td>
</tr>
<tr>
<td>Debris or other contaminants on carriageway</td>
<td>Line of travel for all road users should be considered - mud, contaminants …</td>
</tr>
<tr>
<td>Carriageway condition</td>
<td>General condition - cracks, rutting, potholes …</td>
</tr>
<tr>
<td>Specific defect(s) contributing to low SCRIM</td>
<td>Polishing, low texture depth, fatting up</td>
</tr>
<tr>
<td>Drainage</td>
<td>Is the current drainage adequate and functional - blocked gullies/outfalls …</td>
</tr>
</tbody>
</table>

### Road Users

- Volume and type of traffic: Assess HGV usage and vulnerable users
- Traffic speeds in relation to layout and limit: General traffic speeds seen during investigation
- Possible causes of collisions: State observed collision damage, skid marks, damaged street furniture
- Pedestrians at location affecting event site: Comment on location of pedestrian at location
- Location of personal Injury collisions in relation to SCRIM failure: Comment on location of SCRIM failure and correlation of PI collisions

### General site observations

- Any distinguishing features that could contribute to a collision: Alignment, layout, signing, bend, right turn …
- Carriageway signing, lining and markings: Present what condition are the signs, lines and markings
- Is there street lighting onsite: If present, condition and times of operation
- Are there traffic control systems onsite: Pedestrian, signals - condition and function
- Are potential hazards protected: Unprotected trees, lamp columns, structures …
- Visibility to event site: State observed visibility issues onsite, sign visibility, vegetation overgrowth
- Current low skid resistant mitigations onsite: Signage, markings, HFS
- Additional Comments

### Recommendation

- Is there an immediate requirement: What is required on site - visibility cut, lining, drainage, closure … ?
- Is a surface treatment required: Why is a surface treatment justified
- Proposed surface treatment: Type of surface treatment
- Maintenance work requirements: State location for proposed sign(s) together with base plate distance
- Is a slippery road sign required: State why the site needs monitoring and frequency of review
- Is the site to be monitored: State proposed IL
- Change IL: State proposed new category
- Change Site Category: State proposed new category
- Other actions required: State proposed actions e.g. enhanced signing, realignment, drainage works

### Approval

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<tr>
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Site location - Detail of SCRIM failure provided as highlighted on the map.
Chainage of SCRIM values site provided for guidance
Appendix D – IL Review