

Highway Asset Management Plan

Annexe 2

Skid Resistance Strategy



Knowsley Council

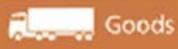


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GLOSSARY OF TERMS

Classified Roads

"A", "B" and "C" roads maintained at public expense.

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 10m SCRIM Coefficient's by the appropriate ECF

Equilibrium Correction Factor Area(ECFA)

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

Equilibrium Correction Factor (ECF)

This is the Equilibrium SCRIM Coefficient divided by the mean SCRIM Coefficient.

Equilibrium SCRIM Coefficient (ESC)

The ESC is the mean of the SC's over three years.

Investigatory Level (IL)

The level of skid resistance at or below which a site investigation is to be undertaken.

SCANNER

Surface Condition Assessment for the National Network of Roads. 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.



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SCRIM

Sideway-force Coefficient Routine Investigation Machine

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.

Skid Resistance (SR)

Refers to frictional properties of the road surface, measured using a specified device under standardised conditions. The term always refers to measurements made on wet roads, unless specifically stated otherwise.



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Executive Summary

Knowsley Council is responsible for the maintenance of over 580km of roads. Skid resistance is an important factor in the safety of highway users, particularly in damp or wet conditions. Over the course of a road's life, the surface can lose some of its skid resistance.

The objective of the Skid Resistance Strategy is to:

- formalise processes for monitoring skid resistance across the Borough's road network on an ongoing basis;
- identify roads where there may be a potential issue;
- prioritise sites for improvement works based on where the greatest risks lie, and
- ensure improvements to identified sites are incorporated into the annual highway maintenance works programme.

1. Introduction

1.1 Skid resistance measurements are used as an empirical assessment of a road surface's level of grip and as an indication of the potential need for further investigation based on known acceptable limits.

1.2 The purpose of this strategy is to outline Knowsley Council's approach to maintaining the appropriate levels of skid resistance on the adopted road network in Knowsley. It will:

- provide a step by step approach to identifying sites for investigation;
- set out a process for deciding on their subsequent treatment, and
- set out how this will be prioritised.

1.3 The procedures detailed represent a long term strategy to manage the skid resistance of the Borough's network to a consistent and safe level. The strategy complements the Council's Highway Asset Management Plan, which looks to manage assets in a strategic way.

1.4 The strategy is based on:

- Highways Agency Technical Standard HD28/04 – Skid Resistance, published in the Design Manual for Roads and Bridges (DMRB) Volume 7: Section 3;

- Interim Advice Note 98/07 – Guidance for HA Service Providers on Implementing the Skid Resistance Policy (HD 28/04), and
- CSS Guidance Note - *Skidding Resistance* (May 2005).

2. Legal Responsibilities

2.1 The Council is the highway authority for Knowsley. It therefore has a statutory duty, under Section 41 of the Highways Act 1980, to maintain highways that are maintainable at public expense. Although the formal management of highway skid resistance is not a legal requirement it is considered good practice and supports the aims and objectives set out in the Council's Highway Asset Management Strategy.

2.2 Section 58 of the Highways Act 1980 provides the ability to form a statutory defence to counter legal actions for negligence. The Council must be able to prove in a court of law that it has taken "such care as is in all the circumstances reasonably required to secure that part of the highway to which the action relates was not dangerous for traffic". When considering a third party legal action against the Council, the Court will consider such factors as:

- the character of the highway and the traffic that was reasonably to be expected to use it;
- the standard of maintenance appropriate for a highway of that character and used by such traffic;
- the state of repair in which a reasonable person would have expected to find the highway;
- whether the Council knew or could reasonably have been 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, and

- whether the Council could reasonably have been expected to repair that part of the highway before the cause of action arose.

2.3 Section 58 of The Highways Act 1980 does not stipulate the standard of maintenance applicable to the highway. It is accepted by the Courts that different standards of maintenance are applicable to different parts of the road network; this is related to vehicle and pedestrian usage as well as speeds of the vehicles using the highway. The Court therefore takes into account that it would be unrealistic for a Highway Authority to monitor and maintain high levels of skid resistance on the whole network as this would not be deemed “reasonably practicable”. The development of this Skid Resistance Strategy will ensure that a suitably structured procedure and strategy is implemented and adequate levels of skid resistance are maintained within reasonable expectations. Importantly, this strategy will provide documentary evidence of the Council’s proactive approach to skid resistance management.

3. Principles of the Strategy

3.1 In 2004 the Highways Agency published a comprehensive methodology for managing carriageway skid resistance on motorways and trunk roads; this is set out in their design bulletin, HD 28/04. Whilst the methodology in HD 28/04 was used as a template for this Skid Resistance Strategy, it has been adapted to reflect the CSS Guidance Note *Skidding Resistance* (May 2005), Interim Advice Note (IAN) 98/07 and local needs and resource constraints.

3.2 The broad principles of HD 28/04 and therefore the Council's strategy are as follows:

- skid resistance surveys will be undertaken annually on the Motorway and all classified roads;
- the network will be assigned "investigatory levels" depending on a range of factors. The investigatory levels are detailed in Appendix 1;
- skid resistance data obtained from the surveys and the investigatory levels will be properly recorded, managed and stored;
- skid resistance data for a particular section of road will be scrutinised and compared against its investigatory level;

- sites where skid resistance is at or below the investigatory level will be identified for investigation, and
- where remedial treatment is deemed to be of benefit, sites will be prioritised using a risk assessment approach and inserted into the planned work programme for action.

3.3 These principles will be applied on an ongoing basis so that skid resistance across the highway network is monitored systematically and managed appropriately.

4. Roles and Responsibilities

4.1 The annual skid resistance survey programme is procured through a specialist contractor who can demonstrate adherence to the appropriate British Standard (HD28/04-HD36 DMRB 7.5.1) for making skid resistance measurement.

4.2 The Council's Highways & Transportation service will be responsible for the following:

- management, development, implementation and regular review (every three years) of Knowsley Council's Skid Resistance Strategy;
- the procurement and subsequent management of skid resistance surveys with contractors;
- assignment of site categories and investigatory levels;
- processing, analysis and review of skid resistance data received from survey contractor;
- review of the site categories and investigatory levels for the road network subject to skid resistance surveys. This review will be carried out every three years;

- maintaining the appropriate records of site visits and associated documents. This is detailed further in the “Records” section of this strategy, and
- providing a prioritised list of sites that would benefit from improvement works and making informed decisions about how these are integrated into the annual highways planned programme.

4.3 The Highways & Transportation service will ensure that the most appropriate remedial action is taken at sites that have been identified as being at or below the investigatory level. Some examples of the options available are:

- temporary erection of warning signs;
- retexturing of the road surface;
- resurfacing of the carriageway with appropriate material.

5. Method of Surveying

5.1 Knowsley Council currently makes use of SCRIM testing. 100% of the classified network is tested each year, alternately between early, mid and late parts of the testing season (see table below). This method will produce - over 3 years - the average Characteristic SCRIM Coefficient (CSC) value for roads across the Borough and will take into consideration the effects of seasonal variation.

Year	Survey Period	Start and end dates
1	Early	1st May – 20 June
2	Middle	21 June – 10 August
3	Late	11 August – 30 September

5.3 Skid resistance is not a constant; it is influenced by various factors such as test speed, temperature, weather conditions and also longer term effects such as seasonal weather variations or change of traffic flows. With this in mind the following controls will be applied;

- measurements of road skid resistance shall be carried out annually between the dates of 1st May- 30th September;
- standard testing speed of 50km/h will be applied (where this is not achievable a correction factor will be applied);
- an up to date network plan will be provided for the survey contractor to use.

- 5.4 The method of survey used will be the single annual survey method, with a Local Equilibrium Correction Factor applied, as described in HD 28/04. This will produce a Characteristic SCRIM Coefficient (CSC) for each 10m sub-section of the surveyed roads.
- 5.5 All roads under investigation shall form part of the annual survey programme. This information shall be maintained within an asset management programme and both directions of each carriageway shall be surveyed. SCANNER data will also be available from within the same programme.
- 5.6 Collision data will be provided on a yearly basis on request from the road safety team.
- 5.7 Where fatal or serious collisions occur and it is determined through the STATS19 statistics that the skid properties of the road surface may be a contributory factor, the surface condition and historical SCRIM data will be assessed. In cases where the Council is approached by the police to investigate, for example following a road traffic collision, the Highways and Transportation service shall endeavour to undertake its investigations within 30 days.

6. Processing and Analysis of Skid Resistance Data

- 6.1 The survey company will be provided with an electronic up to date copy of the road network. Once the survey has been completed, the data collected will be validated and processed by the survey company. The survey company shall then also calculate the CSC.
- 6.2 Once data has been validated and processed, it will be returned to the Council for uploading onto its system. The Highway Asset Management Team shall use this data as the first step in the identification of sites. All sites initially identified shall be further investigated to determine if the investigatory level is correct or if an alternative action is necessary, such as reducing the investigatory level.

7. Site Categorisation and Setting the Investigatory Level

7.1 The investigatory level (IL) for a particular length of road is the level at which a further investigation should be considered if a survey shows that the CSC is at or below the IL set for that section of road. The methodology for prescribing investigatory levels is based on HD 28/04 and subsequent guidance contained in the CSS Guidance Note (May 2005) and Interim Advice Note 98/07. The investigatory levels are set out in Table 4.1 – Site Categories and Investigatory Levels of HD28/04 (see Appendix 1).

7.2 The investigatory levels shall be reviewed every 3 years or when a significant change to the network is made e.g. new roundabout construction. Any changes to the IL will be documented (see Chapter 9).

7.3 The investigatory levels may be revised if:

- the site IL has been incorrectly assigned (See Appendix 1);
- changes to the network are made e.g. reclassification, increased usage, change of alignment etc;
- after a 3-year review the site IL it is deemed appropriate by a qualified person (Principal Engineer, Traffic Officer, Traffic Manager), and
- there is an increase in the level of wet skid related collisions.

8. Investigation & Prioritising

- 8.1 Investigations are important in the process of identifying the sites most in need of remedial work or other measures. Where remedial works are identified following skid resistance investigations a system of works prioritisation will be adopted.
- 8.2 The Council shall however, erect temporary slippery road warning signs (Diagram 557 to The Traffic Signs Regulations and General Directions) at sites where the need for treatment to improve skid resistance to reduce collisions or the potential for collisions has been identified following a site investigation.

Investigation

- 8.3 Sites where the CSC is at or below the defined IL will be considered within 6 months from the date of identification. Such sites will be designated as being an "Amber" priority and will be subject to an initial investigation.
- 8.4 Sites where the CSC is down to -0.1 of the IL will be designated as a "Red" priority and an initial investigation considered as soon as practicable, and in any case not more than 3 months after identification. An initial investigation will determine the need for a site investigation.

8.5 The initial investigation should determine:

- if the collision history shows there to be an increased risk of wet or skidding accidents, and
- if the skid resistance is combined with low texture depth (SCANNER analysis).

Prioritisation

8.6 Generally, site investigations will be prioritised, with the biggest gap from the IL being considered first. The site investigation will establish whether the IL is correct and if so, whether surface treatment or other measures are necessary. Site visits will be documented using a Site Investigation Form (Appendix 2).

8.7 Some form of treatment or intervention will be considered where:

- based on an casualty analysis over a three year period, the number of casualties observed is higher than mean average for the type of site being considered (i.e. compared to other sites within the Borough);
- based on an casualty analysis over a three year period, the site has a higher than average proportion of accidents in wet conditions or involving skidding for the type of site being considered;

- the nature of the individual site and the demands of road users mean that a higher accident risk (compared with other sites in the same category) might be expected with the skid resistance at its current value or if it were to fall further before the next measurement. In this case, preventive treatment is justified to pre-empt a potential increase in accident risk.
- the reduced skid resistance value is exacerbated by low texture depth.

8.8 The most appropriate form of treatment will be identified for each site that is found to require remedial works to restore an adequate level of skid resistance. This could be a surface treatment, a surface replacement or re-texturing of the surface.

8.9 Where the site is not affected by the criteria above, it will be kept under review. If skid resistance and collision patterns remain stable for more than 3 years, then a lowering of the Investigatory Level will be considered; this will be documented.

8.10 Should site investigations identify different defects or an issue with the behaviour of road users that an engineering measure may not be able to resolve, the relevant team within Highways and Transportation will be notified.

9. Records

9.1 All verbal and written enquiries regarding skidding matters on the surveyed network will be registered on the Council's customer management system. The standard target response period will be 10 working days for correspondence.

9.2 When an enquiry is received an initial investigation will be carried out to determine the nature of the problem.

9.3 Details of the actions proposed will be recorded and held on the system.

9.4 The following records shall be maintained to demonstrate the ongoing operation of this strategy:

- IL's for the surveyed road network, including justification for any deviation from the recommendations of this strategy;
- skid testing results and data analysis;
- site investigation findings for sites assessed;
- KSI casualties citing skid or loss of control due to road surface condition (not weather-related);
- a record of sites where and when slippery road warning signs have been erected showing subsequent removal dates where appropriate;

- priority lists of sites for remedial treatment to restore an adequate level of skid resistance;
- details of completed works programmes, relating to remedial treatment for substandard skid resistance, and
- a register of enquiries regarding skidding matters and actions taken.



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Appendix 1: Investigatory Level



Site category and definition		Investigatory Level at 50km/h							
		0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65
A	Motorway								
B	Dual carriageway								
C	Single carriageway								
Q1	Approaches to and across minor junctions								
Q2	Approaches to and across major junctions								
Q3	Approaches to roundabouts								
K	Approaches to pedestrian crossings and other high risk situations								
R	Roundabout								
G1	Gradient 5% to <10% - longer than 50m								
G2	Gradient >=10% - longer than 50m								
S1	Bend radius <500m – dual carriageway. Speed limit >40mph								
S2	Bend radius <500m – single carriageway. Speed limit >40mph								

Investigatory Levels are for the mean skidding resistance within the appropriate averaging length. Investigatory Levels for site categories A, B and C are based on 100m lengths or the length of the feature if shorter. Investigatory Levels and averaging lengths for site category Q1, Q2 and K are based on 50m approach to the feature but shall be extended when justified by local site characteristics. Investigatory Levels for site category R are based on 10m lengths. Categories G1 and G2 not to be applied to uphill gradient on all roads. Categories S1 and S2 not to be applied to bends with a speed limit at or below 40mph. As part of the site investigation individual values within each averaging length should be examined and the significance of any values that are substantially lower than the mean value assessed.

Key:

Lowest IL threshold (based on risk assessment)	
Default IL	
Upper IL threshold (based on risk assessment)	

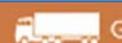
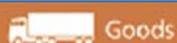
The decision to assign a site an IL other than the default would be made following the guiding principles in HD28/04 based on the knowledge of each site. Examples of factors to consider are whether the traffic flow is particularly low or high and whether the skid related accident history is low or high.

Appendix 2: Site Investigation

1. GENERAL	
Investigating Officer:	
Date of site visit:	
General weather at time of visit:	
Reason for site visit:	Low SCRIM result
	Routine review
	Accident report
	Third party report
Dates of any previous site visits:	

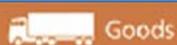
2. SITE DETAILS					
Road classification (A, B, C and Unclassified)					
Road Name					
UKPMS Section label					
Carriageway / Lane tested (CL/CR)					
Investigatory Level					
Site category and definition (straight, bend, gradient, junction, roundabout, pedestrian crossing)					
Have any substantial changes been made to the site or road usage since Investigatory Level was assigned. Is the above Site Category correct?.	Yes/No				
Signed Speed	30	40	50	60	70

3. SUMMARY OF ACCIDENT HISTORY		
	Number	%
Number of accidents in the last 3 years:		n/a
Number and % of wet weather accidents:		
Types of accidents:		
• Fatal		
• Seriously injuries		
• Slight injuries		



4. CONDITION DATA		
Average CSC over site		
Average deficiency		
Site efficiency		
Stripping of surface course/high friction present	YES	NO
Fatting/polishing of surface course	YES	NO
Cracking within surface course	YES	NO
Good condition	YES	NO
Standing water	YES	NO
Gully cleansing required	YES	NO
Does the site have shared use i.e. bus/cycle lane	YES	NO
Trees/vegetation overhanging/Shaded?	YES	NO
Poor advance visibility	YES	NO
Road markings clearly defined/visible	YES	NO
Road signs clearly defined and visible	YES	NO
Majority surface type	HRA, TSCS, SD, MICRO-ASPHALT, ANTISKID?	
Are there any features at the site which would require users to stop suddenly?	YES	NO
Does the traffic joining the site create issues?	YES	NO

Ensure that record photographs are taken at the time of inspection and attached to the final report.



5. RESULTS AND ACTIONS CHECK LIST		
Engineers recommendation (after site visit)	No Further Action	
	Change IL	
	Recommend Treatment	
	Other maintenance works	
	Other	
If treatment then what has been recommended for this site?	Surface dressing	
	Resurface	
	Re- texture surface	
	High friction surfacing	
	Other	
Any maintenance recommendations?	No further action required	
	Road markings	
	Redesign of junction/ carriageway	
	Sweeping of road	
	Emptying of gullies	
	Signs: replacement or additional	
Should consideration be given to raising or lowering the Investigatory Level?	YES (Give reason)	NO (Give reason)
Notify traffic and road safety team to design and erect appropriate signage.	Person notified:	
Map and site description sent to contractor?	YES	NO
Confirm contractor has erected signs.	Date erected, & Notified by, checked by:	
Surface treatment works completed and date:	YES	NO
Testing and date of testing of new surface?	PASS	
	FAIL	
Name of investigating officer:	Print name:	
	Signature	
Date:		
Approved and checked by:	Print name:	
	Signature:	
Date:		

Ensure that this document is converted to PDF with photographs attached and saved to the appropriate data repository



Document Change Control Table

Page	Paragraph	Amendment	Date