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TII Publications

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Skid Resistance Management

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AM-PAV-06046
March 2020

AM Asset Management & Maintenance

Technical

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TII Publications

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Table of Definitions

Heading	Definition
Averaging Length	A discrete portion of the road network categorised in accordance with Table 5.1 of AM-PAV-06045.
Connector Road	A collective term for slip roads, link roads, interchange links and loop roads, as defined in DN-GEO-03060.
Characteristic Skid Coefficient (CSC)	The Characteristic Skid Coefficient (CSC) is an estimate of the underlying skid resistance once the effect of seasonal variation has been taken into account.
Investigatory Level (IL)	An Investigatory Level (IL) represents a level above which the skid resistance is considered to be satisfactory and at or below which the road is judged to require a further assessment of the site specific risks in more detail.
Managing Organisation	The local authority or contracted organisation commissioned to manage part or all of the national road network by Transport Infrastructure Ireland (TII).
National Road Network	The national primary and secondary roads network in Ireland which is operated and maintained by TII and which comprises motorways and dual carriageways, including their interchanges / junctions, merge and diverge ramps, and circulatory elements of roundabouts; and national primary and national secondary single carriageway roads.
Seasonal Variation	The variation in the skid resistance measured during the course of the year due to climatic conditions, traffic, and weathering and polishing cycles.
Site	A collection of averaging lengths at or below IL which are grouped together to form an efficient basis for planning and conducting site inspections.
Site Category	One of the elements within a broad classification of the road network according to the risk of skidding.
Skid Resistance	Skid resistance is the characterisation of the friction of a road surface when measured with a specified device in accordance with a standardised method as described in AM-PAV-06045.
Skid resistance Difference (SD)	The value obtained by subtracting the Investigatory Level (IL) from the Characteristic Skid Coefficient (CSC).
Treatment	Remedial works to improve the skid resistance of a road surface.

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Table of Abbreviations

Abbreviation	Definition
CSC	Characteristic Skid Coefficient
GIS	Geographical Information System
IRI	International Roughness Index
LPV	Longitudinal Profile Variance
MPD	Mean Profile Depth
NM	Network Management
RCPRM	Roads Capital Programme and Regional Management
RibGeom	Risk Based Geometric Design
SD	Skid resistance Difference
SOP	Standard Operating Procedure
TII	Transport Infrastructure Ireland

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1. INTRODUCTION

1.1 General

1.1.1 This technical document sets out the TII policy for managing skid resistance on in-service national roads. The policy is intended to contribute to the provision, maintenance and operation of safe, efficient and sustainable networks of national roads in accordance with the TII Statement of Strategy.

1.1.2 This technical document should be read in conjunction with AM-PAV-06045, Skid Resistance Assessment, which describes how measurements of skid resistance are to be made and interpreted.

1.1.3 In this document, the term “skid resistance” refers to the characterisation of the friction of a road surface when measured using a specified device in accordance with a standardised method as outlined in AM-PAV-06045. These measurements are used to characterise the road surface and assess the need for maintenance but cannot be related directly to the friction available to a road user attempting a particular manoeuvre at a particular time.

1.1.4 The objectives of the policy are to:

a) Manage the risk of skidding collisions in wet conditions across the national road network.

b) Maintain a consistent approach to the management of skid resistance across the national road network, so that road users find consistent skid resistance characteristics when accelerating, braking and cornering.

c) Maintain a level of skid resistance appropriate to the nature of the road environment at each location. The appropriate skid resistance is determined from a combination of network-wide surveys, and consideration of collision history, friction demands by road users, geometry and local judgement of site-specific factors.

1.1.5 This policy provides a methodology to assess the requirement and priority for remedial works. Recommended remedial works are based on an engineering assessment of needs taking into consideration local and national constraints. Recommended treatments are procured in accordance with EU and National regulations and the requirements of the public spending code to promote the best use of maintenance budgets.

1.1.6 In this document, the provision of appropriate levels of skid resistance and its contribution to the provision of a safer road network is treated primarily as an asset management issue. Specifically, this document does not address the identification of locations or routes where road safety engineering measures could be beneficial to reduce collisions.

1.2 Structure

1.2.1 Chapter 2 summarises the operation of this technical document. Chapters 3 and 4 describe two of the key components of the document, namely, site scoring and prioritisation, and site inspection procedure, respectively.

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Chapters 5 and 6 describe treatment programming, and the use of slippery road warning signs, respectively.

1.2.2 These chapters are supported by Annex 1 which provides a template for the site inspection report.

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2. OPERATION

2.1 Overview

2.1.1 This Chapter summarises the operation of this technical document including the TII procedures for the identification of sites for site inspection and the prioritisation of sites for treatment, as indicated in Figure 2.1.

2.1.2 In addition, this chapter provides information on Investigatory Levels to provide an understanding of their purpose and how they relate to skid resistance. It should be read in conjunction with Chapter 5 of AM-PAV-06045, Skid Resistance Assessment.

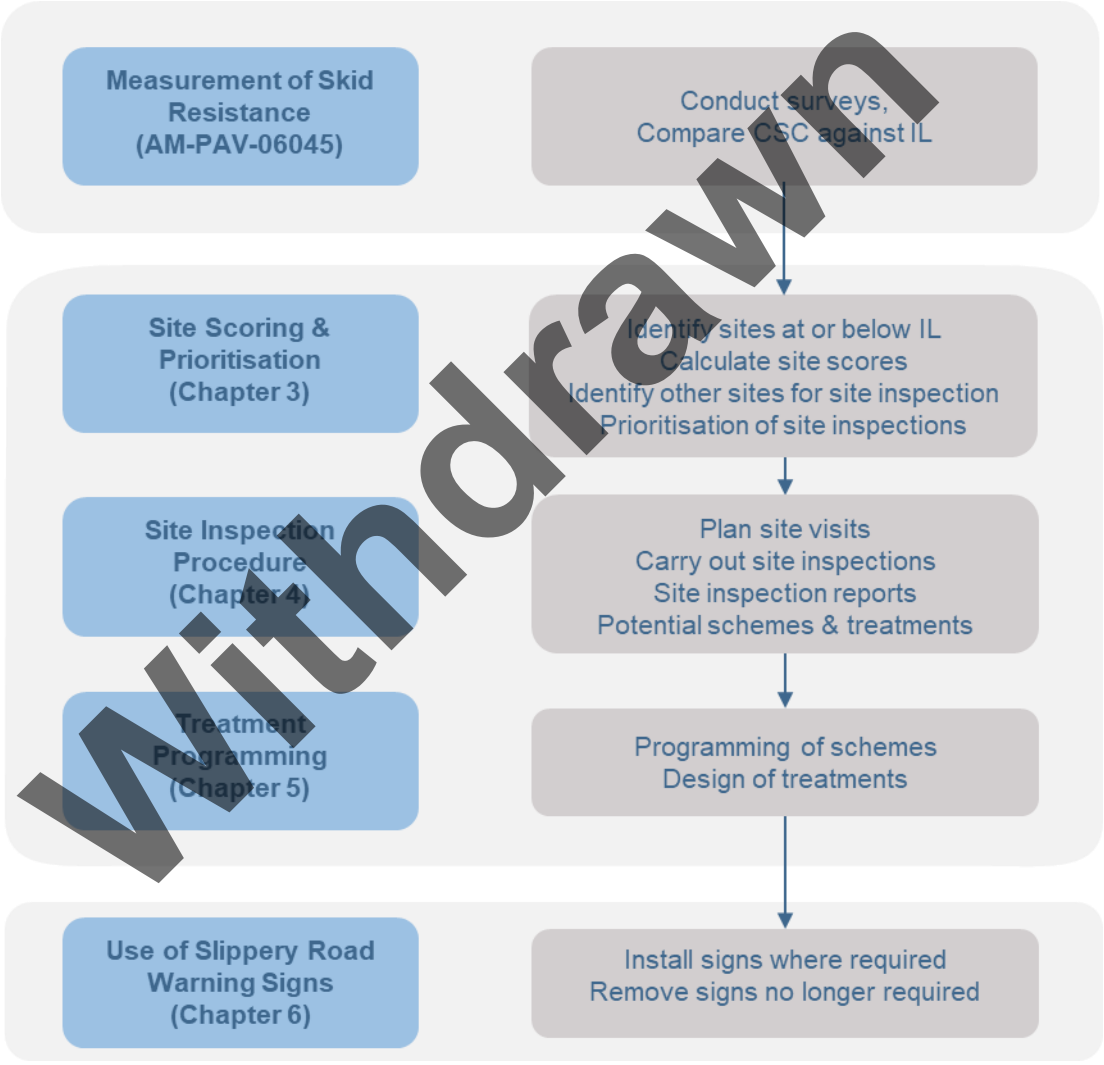

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Figure 2.1 Operation of AM-PAV-06046 Skid Resistance Management

2.1.3 TII require routine measurements of skid resistance to be carried out on the national road network using the Sideway-force Coefficient Routine Investigation Machine, as described in AM-PAV-06045, Skid Resistance Assessment. The data will be processed to derive Characteristic Skid Coefficient (CSC) values in accordance with AM-PAV-06045.

2.1.4 TII typically require the entire national road network to be tested once in each year in accordance with AM-PAV-06045, supplemented by specific instructions that may be issued by TII.

2.1.5 The process for assigning Site Categories and Investigatory Levels is described in Chapter 5 of AM-PAV-06045. The Site Categories and associated Investigatory Levels that have been developed for the national road network are defined in Table 5.1 of AM-PAV-06045.

2.2 Investigatory Levels – What They Are

2.2.1 The most frequent misconception relating to skid resistance (as defined in 1.1.3) is that Investigatory Levels are often incorrectly viewed as being a 'black and white' indicator of the safety of a road surface.

2.2.2 Skid resistance data should not be considered in isolation and it needs to be recognised that a collision is nearly always a true random, multi-factor event that is often the result of multiple interrelated factors.

2.2.3 Investigatory Levels **ARE**:

a) Values of skid resistance assigned to different road site categories (e.g. approaches to junctions or pedestrian crossings, refer to Table 5.1 of AM-PAV-06045) which are related to the friction requirements for that type of situation.

b) Values of skid resistance that represents a level above which the skid resistance is considered to be satisfactory, and at or below which the road is judged to require further assessment to evaluate the site specific risks in more detail.

c) Values of skid resistance, that when not met, are a trigger for a reasoned consideration of the need for remedial action at that site, taking into account other factors that influence safety and the competing demands within the available road maintenance budget.

2.2.4 Investigatory Levels are set solely to trigger a further assessment of the site specific risks in more detail at the locations identified.

2.2.5 Locations with skid resistance test results that are below an Investigatory Level must not be described as "deficient", as this is misleading and must be discouraged.

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2.3 Investigatory Levels – What They Are Not

2.3.1 Investigatory Levels **ARE NOT**:

a) A mandatory requirement.

b) An indication of inadequate skid resistance

c) A minimum level of skid resistance of a particular road that must always be met.

d) A level of skid resistance that will reliably prevent skidding at that site.

e) A clear indicator that remedial action (e.g. resurfacing) is required.

f) An absolute or critical value which, if not met, will result in a high number of wet or wet skidding collisions.

2.3.2 Investigatory Levels must not be regarded as intervention levels which need to be acted upon in all circumstances. Investigatory Levels are NOT Intervention Levels, requiring immediate intervention and improvement, and there are no Intervention Levels defined under AM-PAV-06045 or this technical document.

2.3.3 As noted above, the provision of appropriate levels of skid resistance and its contribution to the provision of a safer road network is treated primarily as an asset management issue.

2.4 Procedure

2.4.1 Wherever the CSC is at or below the assigned Investigatory Level (IL), TII will carry out a site scoring procedure as described in Chapter 3 to determine whether a site inspection is required or not. A site inspection is carried out to determine whether treatment to improve the skid resistance is required or whether some other action is required.

2.4.2 A site inspection will also be carried out if, in the normal course of collision investigation processes separate from this technical document, sites are identified where increased wet skidding collisions have been notified to TII Network Management (TII NM).

2.4.3 The TII procedures for carrying out the site scoring and site inspection, including a review of localised contributory factors, are described in Chapters 3 and 4. These procedures include identification and prioritisation of sites for site inspection and carrying out the site inspection.

2.4.4 The decision of whether treatment is necessary is unlikely to be clear-cut. It will require experienced engineering judgement taking into account the nature of the site, the condition of the road surfacing, the collision history for the past three years, consideration of friction demands by road users and judgment of local site-specific factors.

2.4.5 The assessment process will result in a number of lengths being recommended for treatment to improve the skid resistance. The priority for treatment will be established taking into account the site score, the observed collision history, the need for other maintenance works in the vicinity, the cost and the budget available for the works. This process is described in Chapter 5.

2.4.6 Once a site requiring treatment to improve the skid resistance has been identified, the TII network inspector will instruct the Managing Organisation to erect slippery road warning signs, as described in Chapter 6.

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3. SITE SCORING & PRIORITISATION

3.1 Overview

3.1.1 TII undertake the further assessment of sites in two stages: an initial site scoring procedure, described in this chapter, to review the data and assess the need for a site inspection and, secondly, a site inspection to assess the justification for treatment, which is described in Chapters 4 and 5.

The site scoring procedure for identifying sites requiring site inspection is outlined in Figure 3.1

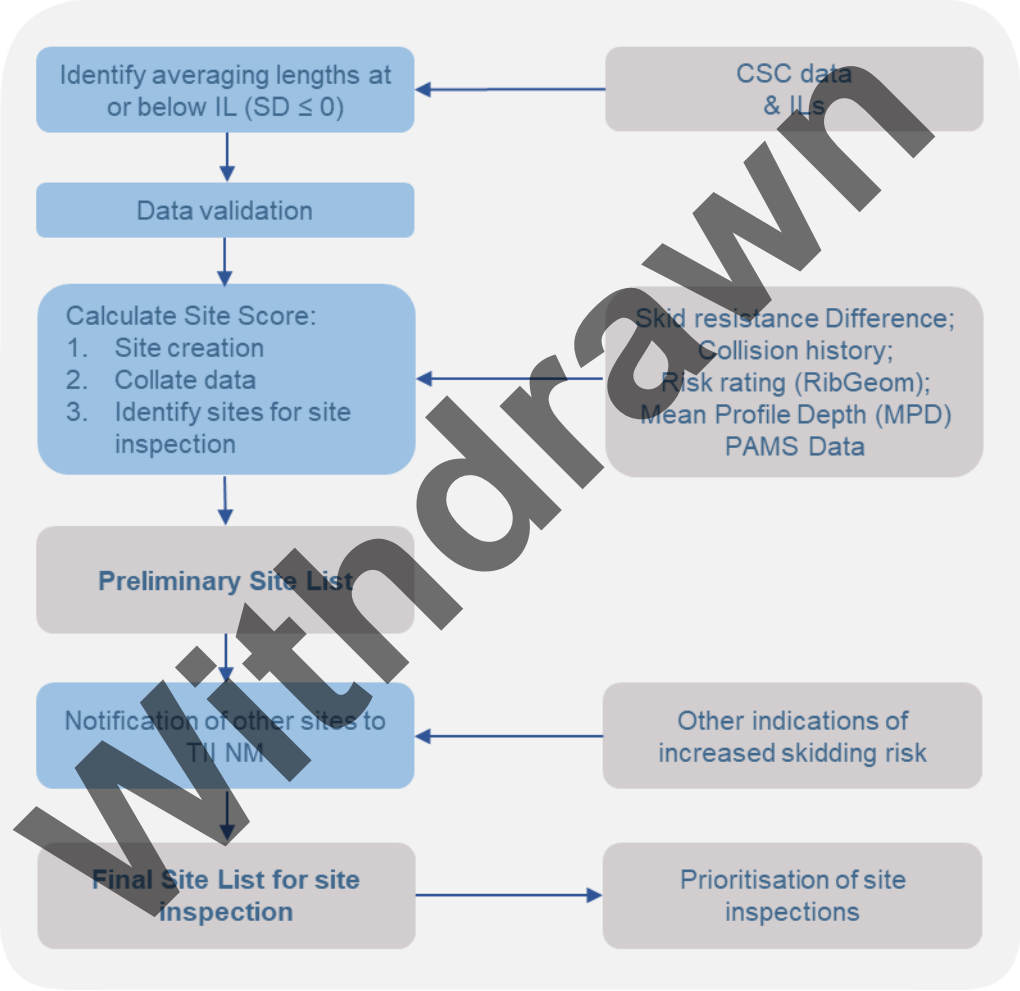

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Figure 3.1 Procedure for identifying sites requiring site inspection

3.2 Identify averaging lengths at or below the IL

3.2.1 The processed CSC survey data for the appropriate averaging length are compared with the predetermined ILs to identify lengths of road where the skid resistance is at or below the IL. The appropriate averaging length for the various site categories is set out in Chapter 5 of AM-PAV-06045, Skid Resistance Assessment.

3.3 Data validation

3.3.1 Basic data validation checks in accordance with AM-PAV-06045 will be conducted for averaging lengths that have been identified as at or below the IL. This will include confirming that the IL has been assigned correctly in accordance with AM-PAV-06045.

3.3.2 If the IL is incorrect then it will be updated and recorded together with the date of the change. If the skid resistance is above the revised IL, then further assessment is unnecessary, and the change of IL should be recorded as the outcome of the assessment.

3.3.3 In addition, details of any recent construction or changes in layout or alignment since the time of survey, or any planned schemes that will materially change the pavement surface shall be collated so that averaging lengths within the bounds of these schemes can be identified and excluded from further assessment, where appropriate.

3.4 Site creation

3.4.1 Mainline sites are created using basic proximity rules. Averaging lengths at or below the IL that lie along the same route and are within close proximity (typically 30m) may be combined into a single site. These longer lengths may be more robust for collision analysis and also more suitable from a treatment efficiency perspective. However, subsequent site inspection may show that only part of this length may require treatment.

3.4.2 Each individual connector road that forms part of a network interchange (e.g. slip road, link road, interchange link, loop road etc.) is a self-contained site. Where a connector road contains an averaging length at or below IL, then the whole connector road will be identified as a site.

3.4.3 Roundabouts are treated similarly to connector roads. Each roundabout is treated as a self-contained site with an associated list of 10m averaging lengths at or below the IL. As per AM-PAV-06045, further assessment is required where 50% or more of the 10m averaging lengths on the roundabout are at or below the IL.

3.5 Collate data

3.5.1 As a minimum, the data collated for each site will include skid resistance, texture depth, overall RibGeom risk rating (where available, refer to RE-GEO-01108, Risk-Based Geometric Design for Road Improvements), the most recent 3 years of collision data available.

3.5.2 For recent construction or changes in layout or alignment, three years of relevant collision data are not likely to be available. In cases where three years of collision data are not available, data since the date of construction or change in layout/alignment should be used.

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3.5.3 Skid resistance data (CSC) at 10m intervals is obtained so that short lengths with low skid resistance are not disguised by being averaged over a longer length.

3.5.4 All relevant survey data stored within the TII pavement asset management system (PAMS) will be available. This information will normally include the following road condition parameters:

a) International Roughness Index (IRI)

b) Rut Depth

c) Longitudinal Profile Variance (LPV)

d) Surface Texture (Mean Profile Depth, MPD)

3.5.5 Gradient, crossfall and curvature data are obtained if they are relevant, e.g. if the site has poor transverse or longitudinal evenness, or bends or gradients. Information on the date of last surface treatment may also be relevant to the further site assessment and the interpretation of collision data.

3.5.6 For each site, the relevant data will be collated to show the location of lengths with poor surface condition relative to the location of previous collisions and features such as bends, junctions, etc. This data could be collated as GIS mapping or spreadsheets.

3.6 Identify sites for site inspection

3.6.1 TII have implemented a scoring model for identifying and prioritising sites for site inspection. The model considers Skid resistance Difference, collision history, surface texture and overall RibGeom risk rating, as outlined in Table 3.1.

3.6.2 Skid resistance Difference (SD): SD is the value obtained by subtracting the Investigatory Level (IL) from the Characteristic Skid Coefficient (CSC).

3.6.3 Number of collisions for the latest three years where SD ≤ 0: This refers to the total number of reported injury collisions and reported material damage only collisions. Wet and wet skid collisions are not considered separately here.

3.6.4 Surface texture (MPD) where SD ≤ 0: The combination of low texture depth and low skid resistance has been shown to be associated with an increased collision risk. Texture depths less than or equal to 0.8mm MPD are considered to be low.

3.6.5 RibGeom risk rating: TII have developed a Risk-Based Geometric Design (RibGeom) methodology for minor road improvement schemes, as outlined in RE-GEO-01108, Risk-Based Geometric Design for Road Improvements. As part of the RibGeom project, a geometric risk analysis model was developed that enables a multi-criteria assessment of collision risk based on seven controlling factors in the context of vehicle stability, namely:

a) horizontal curvature;

b) vertical alignment;

c) forward visibility;

d) road cross-fall and surface friction;

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e) driver workload (alertness and degree of active engagement) and,

f) vehicle speed

The RibGeom project has developed an integrated suite of algorithms in a single model that combines the multiple factors and provides a single risk rating result. This allows the locations of abnormal risks to be identified along a section of road so that interventions to reduce collision risk may be developed.

RibGeom risk rating applies to rural single-carriageway roads only. In the case of urban roads and motorway/dual carriageways an overall RibGeom risk rating of ≤ 0.9 can be assumed.

3.6.6 The criteria and scores for each of the input parameters described in Section 3.6.2 to 3.6.5 are shown in Table 3.1 below.

Table 3.1 Scoring model for identification and prioritisation of sites for site inspection

Input Parameter	**Criteria and Scores**						
Skid resistance Difference *(SD)*	0	-0.01 to -0.03	-0.04 to -0.06	-0.07 to -0.09	-0.10 to -0.12	-0.13 to -0.15	< -0.15
Score	**0**	**2**	**4**	**6**	**8**	**10**	**12**
Number of collisions for the latest three years where SD ≤ 0	0	1	2		3		4+
Score	**0**	**3**	**6**		**9**		**12**
Surface texture *(MPD)* where SD ≤ 0	> 0.8mm		0.6mm to 0.8mm		< 0.6mm		
Score	**0**		**1**		**3**		
Risk rating (*RibGeom*)	≤ 0.9		> 0.9 and ≤ 0.995		> 0.995		
Score	**0**		**1**		**3**		

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3.7 Preliminary Site List

3.7.1 Based on the scoring model in Section 3.6, all sites with a score greater than or equal to 6 will be included in the Preliminary Site List for site inspection.

3.7.2 The site score is the maximum of the individual averaging length scores within a site.

3.7.3 The individual averaging length scores within a site are obtained by summing up the scores from the criteria in Table 3.1. If any averaging length within the site has a score greater than or equal to 6 then the whole site will be included in the Preliminary Site List for site inspection.

3.8 Notification of other sites to TII NM

3.8.1 As a result of processes separate from this technical document, other sites notified to TII NM, where increased levels of wet or wet skid collisions have been observed, will be included in the Preliminary Site List.

3.9 Final Site List

3.9.1 The Final Site List is obtained from the Preliminary Site List in Section 3.7 and other sites notified to TII NM in Section 3.8.

3.10 Prioritisation of site inspections

3.10.1 TII have established five priority levels for site inspections based on the site score and the likelihood that the site will require remedial action to reduce the risk of wet and wet skid collisions. The final action decision will be determined based on the subsequent site inspection process described in Chapter 4.

3.10.2 The site scores are relatable to the action likelihood, as shown in Table 3.2 below.

Table 3.2 Site Inspection Prioritisation Based on Site Score and Treatment Likelihood

Priority	Site Score	Site Inspection Required?	Treatment Likelihood
1	18 to 30	Yes	High
2	15 to 17	Yes	Medium/High
3	12 to 14	Yes	Medium
4	9 to 11	As resources allow	Medium/Low
5	6 to 8	As resources allow	Low

3.10.3 Sites with a score of 12 and above (Priority 1, 2 and 3) will undergo a site inspection.

3.10.4 Sites with a score of between 6 and 11 (Priority 4 and 5) will undergo a site inspection as resources allow, subject to review by TII NM.

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4. SITE INSPECTION PROCEDURE

4.1 Overview

4.1.1 This Chapter describes the TII process of site inspection and should be read in conjunction with Chapter 3 – Site Scoring & Prioritisation, and Annex 1 – Site Inspection Report Template.

4.1.2 A site inspection is carried out to assess the information available for each site in order to reach a decision about the best course of action. These site inspections are carried out on sites included on the Final Site List identified from the process described in Chapter 3.

4.1.3 The objective of the site inspection is to determine whether treatment to improve the skid resistance is justified to reduce the risk of wet skid collisions, whether some other form of action is required, whether the site should be kept under review, or whether no action is currently required. If no action is required, sites will automatically be reviewed again following the next skid resistance measurement if they remain at or below the IL.

4.1.4 The procedure for site inspection is outlined in Figure 4.1.

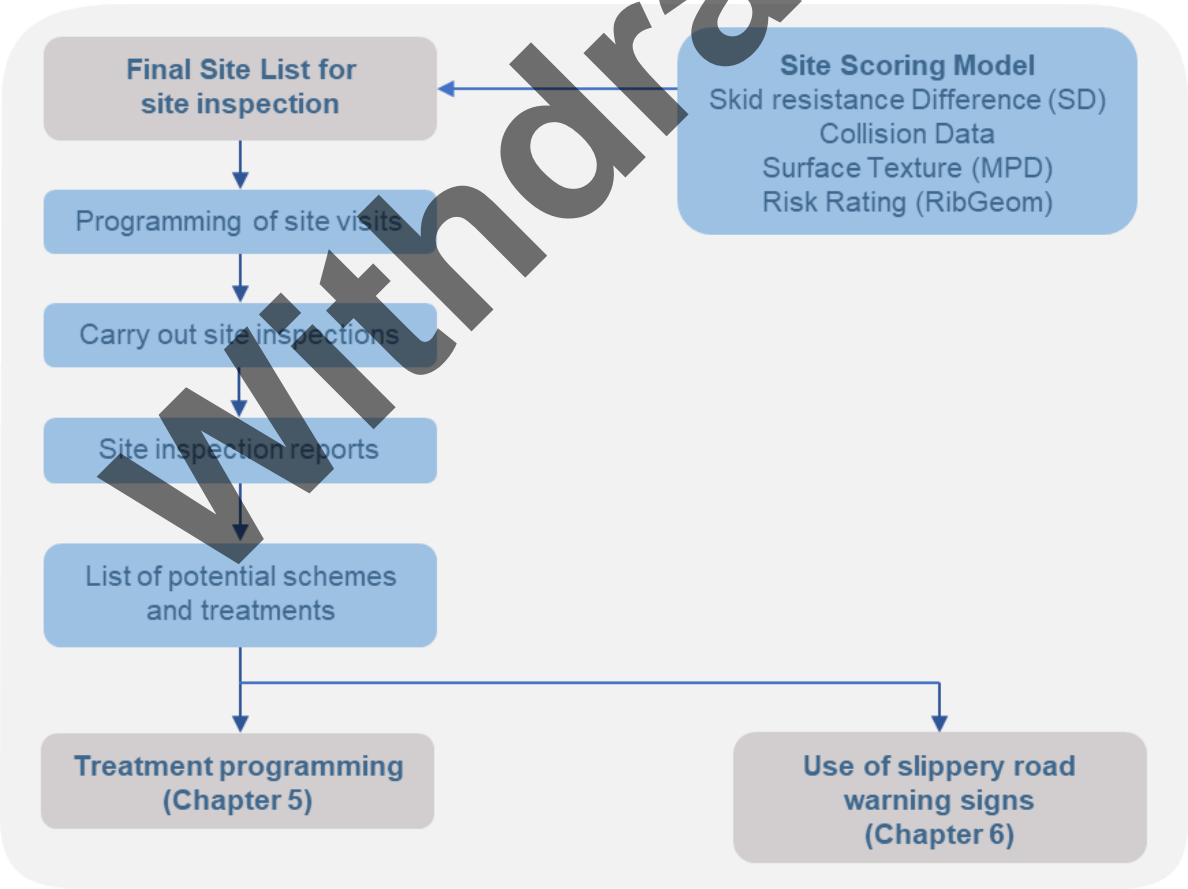

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Figure 4.1 Site Inspection Procedure

4.2 Plan site visits

4.2.1 Site visits will be planned primarily to maximise efficiency. However, greater priority will be given to sites with higher site scores based on the site scoring and prioritisation procedure described in Chapter 3.

4.2.2 Site inspections will be carried out by suitably experienced engineers.

4.2.3 Persons with relevant local experience may be consulted if deemed necessary during the site inspection process.

4.2.4 Reviewing the nature of the site and condition of the surfacing is an important component of the site inspection. This can be achieved through a combination of the following methods:

- on foot (this allows the condition of the road to be observed in detail)
- from a parked or moving vehicle (this allows the pattern of traffic movement and speed to be observed during the visit)
- video records and maps may be helpful but should not be used in isolation as they do not show obstructions to visibility, drainage issues, field accesses, hidden dips etc.

4.2.5 The health and safety of personnel conducting site inspections, maintenance operatives and other road users is paramount. As such, site inspections will be undertaken in accordance with relevant TII Standard Operating Procedures (SOPs) and in a manner that minimises risk to these groups.

4.3 Carry out site inspections

4.3.1 The site inspection report template is set out in Annex 1. The inspector will select a response for each predefined question based on the visual assessment of site characteristics, taking into account relevant factors from the items listed plus any other relevant points. Reference to supporting documents or data should be made as appropriate.

4.3.2 The full carriageway width should be included in the site inspection, e.g. all lanes of a dual carriageway and both directions of a single carriageway. In addition, all junction approaches should also be inspected to determine whether the advance signing/lining etc. is adequate or could be improved.

4.3.3 When carrying out the visual assessment it should be borne in mind that skid resistance and texture depth are generally measured in the nearside wheel track in lane one. The visual assessment should determine if the rest of the area of the maintained pavement is visually consistent with the measured path, or if there are any localised conditions likely to give rise to uneven skid resistance, such as:

- areas of fattening up/bleeding or chip-loss/ravelling
- areas of low texture depth
- patched areas, trench reinstatements etc.
- debris and other sources of surface contamination

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- ponding or inadequate drainage of water from the carriageway
- structural pavement defects such as rutting, potholes and cracking

4.3.4 If, during the site inspection, the rest of the pavement is not visually consistent then it is possible that the skid resistance of the rest of the lane or other lanes could be lower than the line tested. This could occur, e.g. if the surface in other lanes (including the hard shoulder) is different to the lane tested, and these lanes carry a similar volume of heavy commercial vehicles to the lane tested. In these cases, it may be necessary to carry out additional surveys to investigate this.

4.3.5 As part of the site inspection, any characteristics that may have an adverse effect on road user behaviour, or indications that there may be a higher than expected braking demand on the site will be identified, including:

- locations where road users have a specific need to stop or manoeuvre
- visible signs of recent collisions or road users failing to negotiate site successfully, e.g. debris, tyre tracks, damaged crash barrier, roadside fencing or roadside furniture etc
- poor sight lines at and through junctions and from minor roads or other accesses
- unusual or confusing road layout
- inadequate provision for vulnerable road users (pedestrians, cyclists, motorcyclists, equestrians, bus, tram users, etc), where appropriate.

4.4 Site inspection reports

4.4.1 As a result of the site inspection, a clear recommendation will be recorded of the actions to be taken (including if no immediate action is required).

4.4.2 Treatment will normally be a surface treatment to improve the skid resistance. However, if the site inspection identifies any characteristic of the site or road user behaviour that suggests other engineering or routine maintenance measures could be warranted, then the relevant people will be notified.

4.4.3 If there is no justification for treatment then no further action will be required other than to review the site after the next annual survey.

4.4.4 The results of the site inspection, including whether further action is required, will be documented and retained together with the identity of the assessor and other parties consulted.

4.5 List of potential schemes & treatments

4.5.1 The results of site inspection reports will be compiled into a final list of potential schemes along with recommended surface treatments, and any other recommended actions including additional routine maintenance, where required. These recommendations will then be distributed to the relevant Managing Organisations to be implemented. Table 4.1 contains the various action types and treatment options that may be recommended.

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4.5.2 The programming of treatments is described in Chapter 5 of this technical document.

Table 4.1 Typical Site Inspection Recommendations

Category	Action/Treatment Options
Surface Treatment	Resurface Resurface and Repair Retexture – Mechanical Abrasion Retexture – Water Jetting Strengthening
Routine Maintenance	Repair/replace lines and markings Repair/replace warning/directional signs Maintain drainage outlets Maintain landscaping/vegetation Localised pavement repairs
Slippery Road Warning Signs	Erect slippery road warning signs where a treatment has been recommended to improve the skid resistance (refer to Chapter 6)
Review	Review the site after the next annual survey if it remains at or below IL
Do Nothing	No action required

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5. TREATMENT PROGRAMMING

5.1 Overview

5.1.1 The site inspection process will result in a number of lengths being recommended for treatment to improve the skid resistance. The programming of treatments will take into account the need for other maintenance works in the vicinity, the cost and the budget available for the works. If other actions are identified as a result of the site inspection, then these will be programmed as appropriate.

5.1.2 Budgeting and programming issues will influence when the treatments are carried out and this process should be managed through TII Network Management.

5.2 Notification of schemes and treatments

5.2.1 TII Network Management will allocate funding and issue the final list of potential schemes and recommended treatments to TII Roads Capital Programme and Regional Management (RCPRM). TII RCPRM will then notify the relevant Managing Organisations of the schemes and oversee the delivery of the works.

5.3 Design of treatments

5.3.1 The design of treatments is the responsibility of the relevant Managing Organisation and will be carried out in accordance with current TII standards.

5.3.2 The following TII Publications (Standards) give advice on surfacing types, techniques and material properties required to provide the appropriate level of skid resistance.

- DN-PAV-03023, Surfacing Materials for New and Maintenance Construction, for Use in Ireland
- DN-PAV-03024, Bituminous Mixtures, Surface Treatments, and Miscellaneous Products and Processes
- DN-PAV-03074, Design of Bituminous Mixtures, Surface Treatments, and Miscellaneous Products and Processes

Other aspects of pavement condition must also be taken into account in designing the treatment.

Withdrawn

6. USE OF SLIPPERY ROAD WARNING SIGNS

6.1 Overview

6.1.1 The use of slippery road warning signs are installed where required or removed where signs are no longer required.

6.1.2 Slippery road warning signs will be erected where, after a site inspection, a treatment has been recommended to improve the skid resistance.

6.1.3 As outlined in the Traffic Signs Manual, a slippery road warning sign is used to warn the road user that the danger of vehicles skidding is greater than normal.

6.1.4 The process for erecting and managing slippery road warning signs as part of this document is split into the following two steps:

1. Determine locations requiring warning signs
2. Install/remove signs as necessary

These steps are detailed in turn below.

6.2 Determine locations requiring warning signs

6.2.1 Sites which have been identified and notified to the Managing Organisation following a site inspection as requiring treatment to improve the skid resistance will have slippery road warning signs erected. This strategy provides a targeted use of signs and is designed to avoid a proliferation of signs that would undermine their effectiveness and would not make best use of resources.

6.2.2 It is particularly important to complete site inspections in a prioritised order and within a reasonable time period, so that warning signs can be placed where they are needed without undue delay.

6.2.3 Once the location of sites requiring warning signs has been identified a schedule for warning signs.

6.2.4 For the purpose of legal proceedings, it is essential that records of the erection and removal of slippery road warning signs will be kept by the Managing Organisation.

6.3 Install/remove signs as necessary

6.3.1 Warning signs will be installed as soon as practicable after the need for treatment has been identified and notified to the Managing Organisation. They will then be removed as soon as practicable after treatment has been applied.

6.3.2 The slippery roads warning sign shown in Figures 6.1 (Sign W 134) and the length supplementary sign shown in Figure 6.2 (Sign P 002) will be used in accordance with the Traffic Signs Manual.

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6.3.3 Short individual lengths requiring warning signs should be merged if they are separated by less than 1km.

6.3.4 A visual inspection of the site should be made after the signs are erected to confirm that they have been erected and correctly placed. A record of this observation should be made and retained by the Managing Organisation.

Figure 6.1 Slippery Road Warning Sign (W 134)

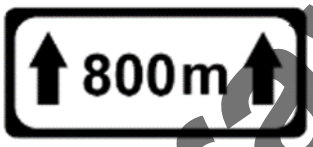

Figure 6.2 Example of Length Supplementary Sign (P 002)

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7. REFERENCES

7.1 TII Publications (Standards)

AM-PAV-06045 Skid Resistance Assessment.

AM-PAV-06050 Pavement Assessment, Repair and Renewal Principles.

DN-PAV-03023 Surfacing Materials for New and Maintenance Construction.

DN-PAV-03024 Bituminous Surfacing Materials and Techniques Mixtures, Surface Treatments, and Miscellaneous Products and Processes.

DN-PAV-03074 Design of Bituminous Mixtures, Surface Treatments, and Miscellaneous Products and Processes.

DN-PAV-03075 Approval of Specific Products

CC-SPW-00900 Specification for Road Works Series 900 - Road Pavements - Bituminous Materials.

7.2 TII Publications (Technical)

RE-GEO-01108 Risk-Based Geometric Design for Road Improvements.

7.3 Other Publications

CS 228 Skidding resistance Revision 0 (formerly HD 28/15), Highways England, 2019.

AP-G83/05 Guidelines for the Management of Road Surface Skid Resistance, Austroads, 2005.

S.R. CEN/TS 15901-6: 2009, Road and airfield surface characteristics - Part 6: Procedure for determining the skid resistance of a pavement surface by measurement of the sideway force coefficient (SFCS): Sideway-force Coefficient Routine Investigation Machine, NSAI.

TII Statement of Strategy 2019 to 2023.

Traffic Signs Manual, Department of Transport, 2019.

Withdrawn

Appendix A:

Site Inspection Report Template

Withdrawn

A1 SITE INSPECTION REPORT TEMPLATE

AM-PAV-06046 SITE INSPECTION REPORT TEMPLATE					
Site Inspection Details					
Site Number:	*Prepopulated*	**Site Score:**	*Prepopulated*	**Priority:**	*Prepopulated*
Route Number:	*Prepopulated*	**Location (lane/dir.):**	*Prepopulated*	**Chainage (m):**	*Prepopulated*
Inspector Name:	*Select*	**Date/Time:**	*Select*	**Weather Conditions:**	*Select*

Visual Assessment			
Are there areas of **fattening up/bleeding** or **chip loss/ ravelling**?	None	Some	Significant
Are there areas of **low texture depth**?	None	Some	Significant
Are there areas of **patching** or areas otherwise likely to give rise to uneven skid resistance?	None	Some	Significant
Is there **debris** or other **surface contamination** present?	None	Some	Significant
Is there evidence of **ponding** or **inadequate drainage** of water from the carriageway?	None	Some	Significant
Are there any **structural pavement defects** visible such as rutting, potholes and cracking etc.?	None	Some	Significant

Inspector Comments: *(Free text)*

Is the surface condition visually consistent with the available skid resistance and road condition survey data?

Road Users & Braking Demand	**Yes/No**
Are there locations where road users have a **specific need to stop or manoeuvre**?	*Select*
Is the **lowest skid resistance** in locations where road users have a specific need to stop or manoeuvre?	*Select*
Are there any **visible signs of recent collisions** or road users failing to negotiate site successfully, (e.g. debris, tyre tracks, damaged crash barrier, roadside fencing or roadside furniture etc.)?	*Select*
Is the **road layout** unusual or likely to be confusing to road users?	*Select*
Do **sight lines** appear to be adequate at and through junctions and from minor roads or other accesses?	*Select*
Is the road layout appropriate for the number and type of **vulnerable road users** (pedestrians, cyclists, motorcyclists, equestrians, bus, tram users, etc)?	*Select*

Inspector Comments: *(Free text)*

Description of issues affecting road users resulting in an increased braking demand.

Primary Treatment Actions

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Surface Treatment	◯ *Resurface*	◯ *Resurface and Repair*	◯ *Strengthening*	
	◯ *Retexture – Mechanical Abrasion*	◯ *Retexture – Water Jetting*		
Other	◯ *Erect Slippery Road Warning Signs*	◯ *Review*	◯ *No Action*	
Inspector Comments: *(Free text)* *State what surface treatment and other actions should be considered to mitigate the existing risk, and why?*				
Routine Maintenance Actions				
Localised pavement repairs	◯ *Repair surface defects*		◯ *Repair structural defects*	
Pavement markings	◯ *Repair/Replace markings*		◯ *Remove old markings*	
Warning and direction signs	◯ *Repair/Replace signs*		◯ *Remove redundant signs*	
Landscaping/vegetation	◯ *Maintain landscaping*		◯ *Clear vegetation*	
Drainage outlets	◯ *Clear Verges*	◯ *Clear Gullies*	◯ *Clear French Drains*	◯ *Other (Specify)*
Referral to other TII section and/or relevant Managing Organisation?			*Select*	
Inspector Comments: *(Free text)* *Details of issues identified that require referral to other TII section or relevant Managing Organisation, and recommended remedial action(s), if applicable.*				
Approval				
Print Name	**Signature**		**Date:**	

Withdrawn

Withdrawn

Withdrawn

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