

# **The management of Skidding using SCRIM Investigatory levels to identify, manage and set priorities.**

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## **ABSTRACT**

This paper describes the process adopted by Cornwall County Council in assessing appropriate SCRIM investigatory levels following the publication of the Highways Agency's standard HD28/04 on 2004. In reviewing the recommendations of HD28/04, which was based on historic SCRIM and collision data on the United Kingdoms trunk road network, largely made up of motorways, dual carriageways and improved single carriageways. Cornwall County Council had concerns about adopting the recommended Investigatory levels for a largely unimproved single carriageway road network. If adopted without modification Cornwall's network would be categorised as a series of bends with an occasional non event section.

The County Council commissioned WDM Ltd. To review contemporary collision and SCRIM records. This made it possible to derive relationships between MSSC and accident risk, and in turn make data based recommendations to vary some on the investigatory levels in HD28/04 for Cornwall's unique road network.

This paper provides a link to Cornwall's local transport Plan priorities, its casualty reduction strategy and demonstrates the potential that through appropriate use of condition and accident data it is possible through prioritised investment in maintenance it is possible to contribute to casualty reduction targets.

## 1.0 INTRODUCTION: CORNWALL IN CONTEXT

Cornwall is a rural county in the South West of England. The County Council is the highway authority for the local network which comprises:

Maintenance Hierarchy	Road Classification km				Totals km
	A	B	C	Unc	
2a	223				223
2b	341				341
3a		483	218	21	721
3b		102	685	147	934
4a		0	550	95	645
4b		0	747	2606	3354
5			439	489	927
6a			1	25	27
6b			1	73	74
Total	563	585	2642	3456	7245

Table 1: Matrix of road classification and hierarchy.

The classification is largely a historic distinction, and for management purposes a maintenance hierarchy has been developed that is based on usage. Monitoring of the skidding resistance of the category 2a, 2b and 3a networks is undertaken using SCRIM.

In 2000 the County Council published its first 5 year Local Transport Plan (LTP) with objectives for highway maintenance which included reducing SCRIM deficiency as well as structural targets based on the deflectograph surveys.

During this period the SCRIM deficiency was reduced from 22% to 15% using Investigatory levels largely derived from HD28/94. In 2005 the County Council published its first casualty reduction strategy which set a target of reducing KSI's (killed/ seriously injured) numbers in the county from an average of 316 per year (2001/ 04) to 221 by 2010. The historic approach to treating accident cluster sites had brought positive benefits in reducing accidents at known 'black spots' but this approach was bearing diminishing returns, and a new route based strategy was developed, where casualty/ collision patterns along lengths of road were reviewed and programmes of treatment developed. Within this context using SCRIM data as part of the analytical process was essential. In 2005 the County Council published its second LTP (LTP2) for the period 2006 -2011. This includes targets for carriageway condition based on an indicative settlement for structural maintenance from the Department for Transport.

## 2.0 INVESTIGATORY LEVELS

The management of any skidding policy relies upon the use of investigatory levels. In the UK many highway authorities rely upon those published by the Highways

Agency, which are based on research carried out by the Transport Research Laboratory over many years

## 2.1 CORNWALL COUNTY COUNCIL'S INVESTIGATORY LEVELS

Cornwall County Council adopted the investigatory levels in HD28/94 with some local variations. These variations were not based on any analytical approach but 'intuitive' engineering judgement. Investigatory procedures were poorly documented and there was a reliance on defelctograph data as the main component of the maintenance programmes for surface treatment, with a secondary programme based on wet/dry accident rates. As the pavement management systems improved it became clear that this approach was in need of improvement.

## 2.2 PUBLICATION OF HD28/04

The Highways Agency published HD28/04 in August 2004. Initial review of the document suggested that it would form a robust basis for setting Investigatory Levels in Cornwall, and work commenced on a bulk corrections with validation of specific sites. In carrying out this work it became apparent that there was a significant change in some of the site categories on the principal (A road), with in effect the amount of network classified as bends increasing from 12 to 39%, and 'non event' reducing from 49 to 27%. This change resulted in an increase in the length of the principal road network with an investigatory level greater than 0.50 from 24 to 42%

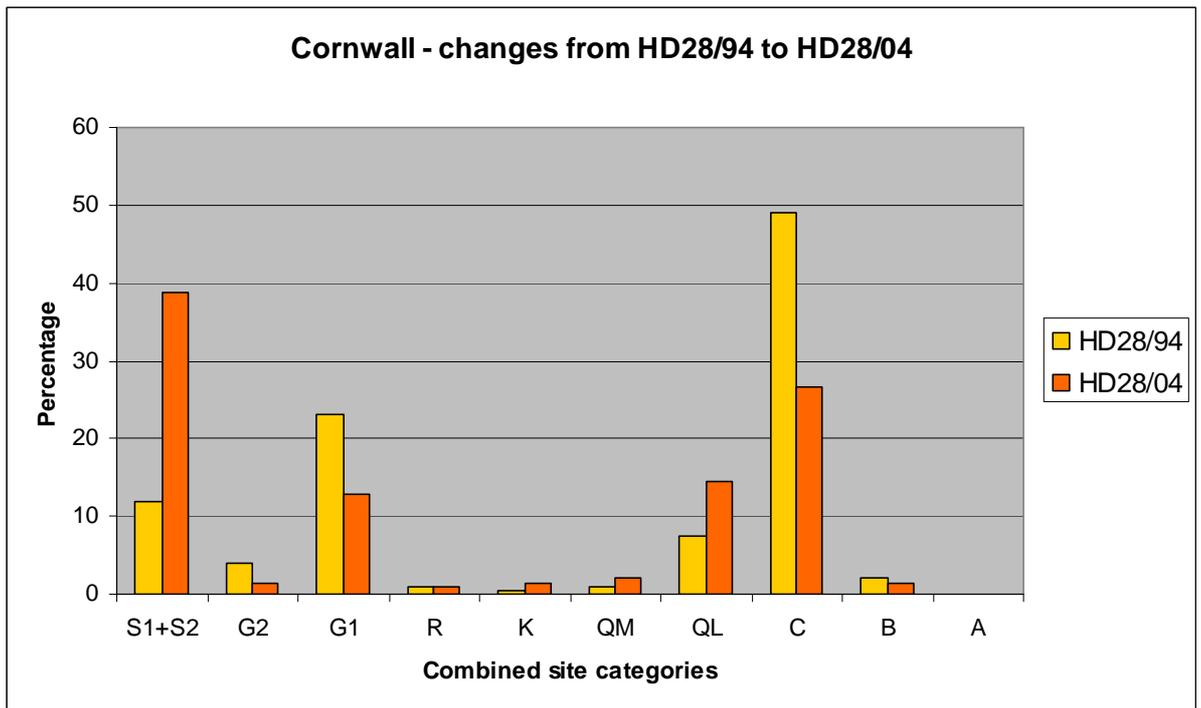


Figure 1: Summary of changes in investigatory level following publication of HD28/04.

## 2.3 CSS GUIDANCE NOTE

In May 2005, the County Surveyors Society (CSS) through the Highway Condition Assessment Group published advice to local authorities on developing their own skidding policies. It recommended 'Any reduction in Investigatory Level below that in

the Highways Agency standard must be fully justified, for example by evidence from skidding accident statistics.'

It is generally accepted in the UK that the Highways Agency standards are used as a default if a local highway authority has not developed its own standards in any court proceedings.

## **2.4 REVIEW OF TRL 622**

In order to update their standards the Highways Agency used research carried out by the TRL and published in 2005 as TRL622. This involved a detailed network accident and condition assessment data. Due to the nature of the trunk road network in the UK there was little urban (speed limit < 40mph) and a much smaller proportion of event sections than represented in Cornwall's network. The report established the basis for setting investigatory levels, and a more robust process for making decisions on prioritising maintenance work.

## **3.0 UNDERTAKING A REVIEW FOR CORNWALL**

On the basis of the factors laid out above Cornwall County Council decided to undertake its own review to establish Investigatory Levels suitable for its network. WDM Ltd were commissioned to undertake this review using contemporary accidents data and MSSC data for the survey network. WDM were specifically asked to:

- Consider whether bends should be categorised into bands by radius
- Whether there was a basis for setting different Investigatory levels in rural and urban areas.
- Whether there was a basis for setting different Investigatory levels for different parts of the hierarchy.

## **3.1 DATA SOURCES**

Cornwall County Council has access to historic collision data and condition data for its network.

### **3.1.1 Scrim data**

The SCRIM data was trended to 31<sup>st</sup> March 2006 and summary lengths set at 100m. The SCRIM survey years used for the analysis were all version 1 summary results from 2004 and 2005. To use survey data from before these dates presented difficulty in identifying the type of event/ non event section due to the changes from HD28/94 to HD28/04.

The data was checked to ensure that:

- The only cross sectional position was either CL1 or CR1
- Every section had either a Rural or Urban Classification
- Summary Dates were between 03/06/04 to 21/06/05

### **3.1.2 Site Categories**

The lengths of each site category on the different road hierarchies covered by the latest SCRIM surveys are shown in Table 2.

As can be seen the single bends <500m provide the largest length of site category for the 2b and 3a road hierarchies and a significant proportion for the 2a roads. Under HD28/96, the criterion for this site category was < 250m radius, but with a largely unimproved rural road network a significant length of road exists with bends of radius between 250 and 500m.

Site Category	2a (km)	2b (km)	3a (km)
Bend Dual <500m	2.76	1.38	0.26
Bend Single <500m	113.60	290.83	354.84
Crossings Etc Approach	5.52	9.05	6.33
Gradient >10%	5.05	7.50	10.65
Gradient 5-10%	58.93	67.42	69.07
Junction Approach	61.36	93.46	88.03
Non-Event Dual	5.31	2.71	0.41
Non-Event Single	130.04	156.35	182.14
Roundabout	4.31	1.54	0.02
Roundabout Approach	10.40	10.65	5.41

Table 2: SCRIM site categories by road hierarchy

### 3.1.3 Collision data

The PMS collision database currently holds 4160 individual collision details for the Cornwall 2a, 2b, and 3a road network that occurred under wet or damp road surface conditions from 01/01/1995 to 31/12/2004. After the MSSC and category assignment procedures were carried out 3588 collisions out of the 4160 remained with a valid SCRIM reading and assigned cross sectional position. Each collision was linked to a current SCRIM MSSC from the SCRIM summary table, both for the CL1 and CR1 cross sectional positions.

To ensure that the SCRIM readings were related to the equilibrium skid resistance at the accident sites, only collisions that occurred at least one year after surfacing were included. Collisions were also excluded from the analysis if the site was surveyed less than 365 days from any maintenance. There were 3158 valid records after the removal due to maintenance.

Each row of data in the SCRIM Summary table was populated with an Annual Average Daily Flow, AADF. The MSSC for each site category was represented in summary bands of 0.05 sfc. The wet road accident rate was reported for each summary band in each site category, in terms of accidents per 100 million vehicle km using data from the traffic flow and total length in each category. The kilometres in each summary band for each site category were then listed and divided into the number of accidents to give accidents per kilometre or accident densities.

## 3.2 ANALYSIS

The data was grouped together into SCRIM Site categories and accident rates were plotted against the MSSC bands. Certain MSSC bands only contained a short length of a particular site category and inclusion of such data can lead to anomalous values. To avoid this, the length of the data for any one MSSC band for a site category had to be at least 1km or the length for the band needed to be at least 1% of the total length for the particular site category, whichever is longer.

It was found that on occasions there were sites with high MSSC's that also had high accident rates. It is considered that these are sites that have been previously treated with antiskid/ high PSV surfacing however there remains a significant accident problem. Typically these sites will form part of the County Council's other accident remedial programme, and in some cases may represent sites where previous treatment may have reduced accident rates from Very High to Moderately High and

all that can be reasonable achieved with surface treatment has been realised. Results were plotted as a series of graphs by site category, and if appropriate road hierarchy.

### 3.2.1 Results of analysis

Plots for all the site categories were developed. Figure 2 shows the plot for non event single carriageway sections which demonstrate a good relationship, but also the different influence of MSSC on accident rate on the different roads. This plot has also been used to determine a background accident rate that is used in site investigations into deficient sites. The analysis for bends on the category 2a roads is shown in figure 3, which demonstrates the basis for varying investigatory levels with different radius bends.

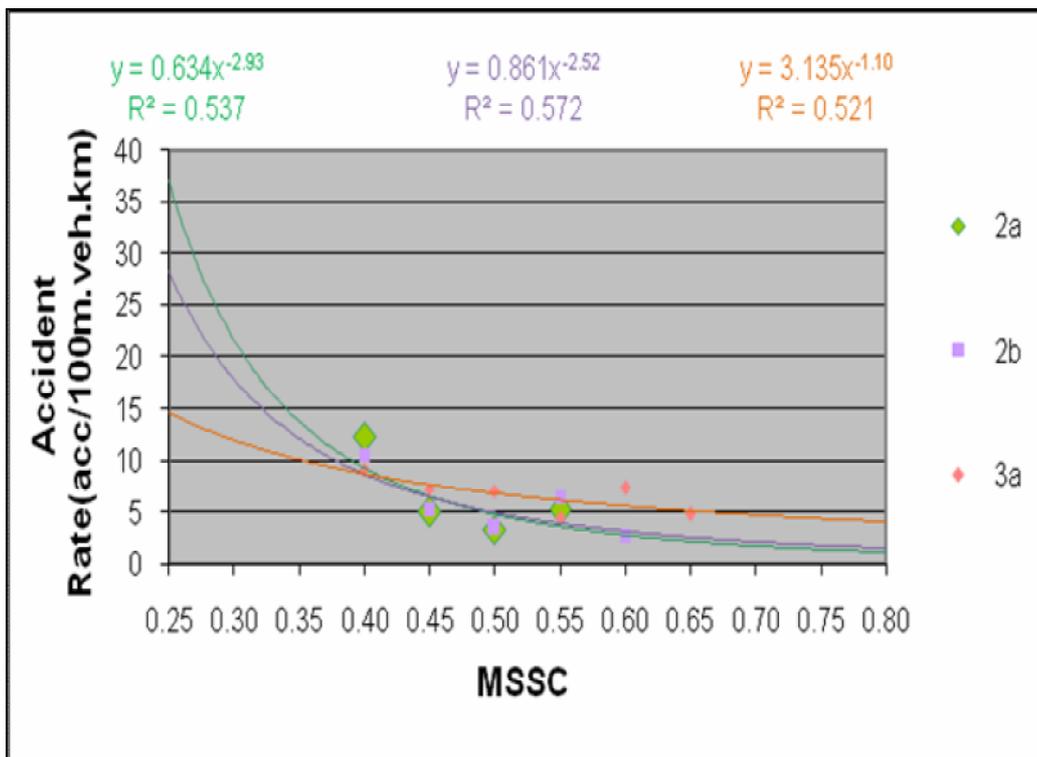


Figure 2: Analysis of single carriageway, non event sections.



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
K	Approaches to pedestrian crossings and other high risk situations								
R	Roundabout								
G1	Gradient 5-10% longer than 50m								
G2	Gradient >=10% longer than 50m								
S1	Dual carriageway bend radius < 500m								
S2<100	Single carriageway bend radius <100m								
S2>100<250.	Single carriageway bend radius >100m <250m								
S2>250<500.	Single carriageway bend radius >250m <500m								

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

**Table 3: adopted investigatory levels**

## 5.0 Conclusion

This study was undertaken to determine how a rural road authority should approach setting investigatory levels in a manner consistent with best practice in the United Kingdom. Whilst the findings are unique to Cornwall the methodology adopted could be used by other highway authorities.

The findings are now being used in determining investment priorities for Cornwall County Council for the remainder of the LTP2 period and beyond, but also to test various scenarios for the development of an asset management based approach to highway maintenance in the county.

