Good Practice – Safe Roads
Developing and operating a practical Skidding Policy

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Jacobs

ABSTRACT

Over a number of years the United Kingdom has published a series of guidance manuals and standards for Local Highway Authorities. These require Local Authorities to assess and manage the Skid resistance performance of their highway surfaces. The Road Death Investigation manual developed by the police has resulted in a new level of scrutiny of the LA's skidding policy and its implementation.

By using a series of case studies from a range of LA's this paper will outline the fundamental steps to be used in developing a practical skidding policy. This policy will be able to be managed by non-specialist engineers within the limited resources available to the LA's. A summary of the current practice by LA's on the use of warning signs is given.

The paper will consider the impact of the newly introduced SCANNER surveys and the use of technologically advanced computer systems, particularly in the areas of Global Positioning Systems, Graphical Information Systems and internet facilities. These systems combine to give fast and easy access to different data sets for efficient coordination. A demonstration of an automatic process that will give the engineer an early warning system of potential accidents at particular locations on the road network will be given.

1. Introduction

The safety of the road users depends on a number of wide ranging factors such as highway design, street furniture materials, road markings and the condition of the road surface. The use of road signs can also have an effect on safety. Too few can result in careless actions, too many could be counter productive and their impact on driver behaviour limited. This is particularly true when using slippery warning signs.

For the Highway Authority to achieve a safe road network for its users it has to balance the range of often conflicting demands within the available resources. Developing a prioritised works programme to improve safety is a very complex process involving many specialist engineers, managers and interest groups. It is therefore essential that clearly defined processes are established that produce a truly integrated works programme.

To resurface a road to restore its skid resistance properties over other safety schemes is not a straight forward decision. A systematic approach has to be developed to ensure that the processes involved are transparent and clear to all. Developing a skidding policy is an essential tool. A published skidding policy document will enable the authority to demonstrate:

- That it is cost effectively targeting high risk skid sites
- That it is giving the authority the information to challenge insurance claims
- That it is managing any potential manslaughter charges should a fatality occur and the road surface was deemed by the police to be a contributing factor.

2. Developing and operating a practical skidding policy.

The stages involved in developing an integrated works programme are shown in table 1. The complete process takes two years. For this approach to work efficiently a draft five year programme is produced ending with a two year prioritised rolling programme.

No	LOCAL AUTHORITY'S IMPROVEMENTS STRENGTHENING & RESURFACING SCHEMES TASK	CLIENT	CONSULTANT	CONTRACTOR	HIGHWAY ENGINEERS/ SAFETY INSPECTORS	COMMUNITY/ PARISHES	SAFETY TEAM	NETWORK MGMT	OTHER
1	COMMISSION CONSULTANT TO PERFORM SURVEY				■				
2	PRODUCE TREATMENT LIST		■						
3	OPS DATA				■				
4	COMMUNITY/ PARISHES INPUT					■			
5	SAFETY IMPROVEMENT SCHEMES						■		
6	EXTERNAL / SECTION 38 ETC								■
7	PRODUCE DRAFT BID LIST INCLUDING COSTINGS	■							
8	SIGN-OFF PRIORITY LIST				■				
9	PRODUCE TARGET COST			■					
10	AGREE COSTINGS	■							
11	PRESENT TO MANAGEMENT BOARD	■							
12	PRODUCE PROGRAMME			■					
13	PRE-PERMIT COORDINATION							■	
14	SCHEME DEVELOPMENT	■		C				C	
15	PROGRAMME HANDOVER			■					
16	ADD WO No	■							
17	SCHEME NOTICING	■						i	
18	APPROVE NOTICE							■	
19	NOTIFICATION	■							
20	ADVANCE WARNING SIGNS			■					
21	PUBLICITY								■
22	SITE PREPARATION			■					
23	WORKS			■					
24	COMPLETE JOB RECORD			■					
25	(RAISE COVERS AND/OR APPLY ROAD MARKINGS)			■					
26	10% CUSTOMER SATISFACTION SURVEY	■				C			
27	CLIENT SATISFACTION SURVEY	C		■					
28	REVIEW ADVERSE CLIENT FEEDBACK	C		■					
29	MONTHLY REVIEW	■		■					
30	INVOICE & ACCRUAL								■
31	CLOSING NOTICE	■							
32	H&S FILE	■		C					
33	PROGRAMME WASH-UP	■		C	C				
34	REPORTING								
35	NATIONAL AND LOCAL PERFORMANCE INDICATOR SUBMISSION								
36	PERFORMANCE MONITORING								

i INFORMATION
C CONSULT

Table 1

The two year programme is essentially stable and any changes as a result of new condition surveys and other inputs will generally only effect years 3 and 4 of a five year draft programme. Works as a result of safety inspections are not included this process as this dealt with by rapid reaction teams.

The authority's skidding policy will identify sites that need resurfacing to improve skid resistance. These sites are fed into section 2 of the overall process as per table 1.

2.1 DEVELOPING A PRACTICAL SKID POLICY

In the UK there are a number of well researched guidance and advice notes. Generally these documents refer to heavy and high speed traffic on the motorway and trunk road networks. The issue for Local Authorities is how to transfer these standards to the lower volume and speed networks. Two documents, the Well Maintained Highways, Code of practice and the CSS Guidance note – Skidding resistance, give advice on the development of a skidding policy for local authorities.

Working with a number of local authorities in developing their skidding strategy / policy a number of essential stages have been identified.

2.1.1 Defining Site Categories

The site categories and investigatory levels from the HA Guidance advice note HD28/04 is shown in table 2.

Site category and definition		Investigatory Level at 50km/h							
		30	35	40	45	50	55	60	65
A	Motorway								
B	Dual carriageway non-event								
C	Single carriageway non-event								
Q	Approaches to and across minor and major junctions; approaches to roundabouts								
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	Bend (not Subject to 40mph or lower speed limit) Radius <250m.								
S2	Bend (not Subject to 40mph or lower speed limit) Radius <100m								

Standard risk sites
Low risk sites
Local variation to HD28/04

Table 2

In general local authorities agree with the site categories and their definitions. However the site categories S1 and S2 where the Highway Agency specifies the radius of bend at 500m are generally not appropriate for the lower speed network. For those sites where a 500m radius bend is considered to be at high risk, this can be accommodated through site category "Q".

The HA have set the minimum investigatory level of site "Q" at 45, for the low speed roads where the line of site to minor junctions is good, then an investigatory level of 40 is generally considered sufficient.

2.1.2 Defining Measurement Strategy

All local authorities should carry out an annual skid resistance survey on the high risk part of the network. Accident analysis showed that over 80% of wet skidding accidents occur on their A and B class roads. This supports the argument that a minimum network coverage for an annual skid resistance survey should cover these road classes. For the rest of the low risk network it is not practical or necessary to carry out a routine survey, however reported incidences must be investigated and site specific skid resistance tests carried out.

Most local authorities have adopted the single annual survey approach covering the complete high risk network. To reduce the effect of seasonal and yearly variations on the measurements of skid resistance some authorities use the benchmark method as defined in HD28/04 Annex 3 while others use the staggered seasonal method as defined in the LA's Code of Practice.

2.1.3 Measuring Equipment

Various types of equipment are available for measuring skid resistance. In different ways, all measure the force developed on a rubber tyre or slider passing over a wetted road surface and derive a value that is related to the coefficient of friction and the state of polish of the road surface.

Currently the results from the different devices are not directly interchangeable. For this reason, where practical, one device should be used for regularly monitoring the skid resistance of the road surface.

The definitive measurement of skid resistance in the UK is the Sideways-Force Coefficient Routine Investigation Machine, SCRIM. The HD 28/04 standard has recommended skid resistance levels that have been based on research carried out by TRL using SCRIM as the measurement of skid resistance.

For individual site investigations other equipment such as the GripTester and the Pendulum may be considered appropriate. The results from these tests can be converted to SCRIM measurements.

GripTester

Pendulum tester

The correlation between Mark 1 GripTester data and SCRIM is
SC=0.789 x GripNumber – 0.049

The correlation between Mark 2 GripTester data and SCRIM is
SC=0.85 x GripNumber

The correlation between Pendulum data and SCRIM is
SC=SRV/100 – 0.05 (SRV: Skid Resistance Value)

The correlation factors are based on specific field trials and may not be applicable to the individual sites being tested. It is the responsibility of the maintenance engineer to ensure that the conversion to SCRIM Coefficient is valid for the individual site under investigation.

2.1.4 Identifying Skid Deficient Sites

The HA advice note HD28/04 requires that all sites that are below the investigatory level have a detailed assessment including site visits. A typical local authority will have 20 to 30% of its A and B class network below the investigatory level. With the limited resources and specialised skills available it is not practical to investigate all sites. By using GIS facilities it is now possible to locate wet skid accidents on the networks against sites below investigatory levels. A model can therefore be developed to automatically assign high risk sites for engineering assessment. This reduces the volume of sites requiring investigation. The resulting sites are referred to as Skid deficient sites.

This model can be user defined but typically a site is deemed to be deficient when:-

- The Characteristic SCRIM Coefficient (CSC), over 50 meters, is at or below the investigatory level and two or more wet road accidents have occurred at the location during the preceding three years.

- The Characteristic SCRIM Coefficient, over 50 metres, is more than 10 below the investigatory level AND one wet-road accident has occurred at the location during the preceding three years.

- The Characteristic SCRIM Coefficient, over 50 metres, is more than 20 units below the investigatory level, regardless of the past accident record.

2.1.5 Define Site Investigation Procedures

All skid deficient sites should be investigated. A list of these sites should be published for the Highway Maintenance Engineers to assess if treatment is justified. Treatment will normally be a surface treatment to improve the skid resistance. However if the site investigation identifies any characteristics that require road safety engineering measures or reapplication of road markings then this should also be reported by the engineer.

All skid deficient sites that have been confirmed by the site investigation as Event high risk should have a "Slippery Road" sign put in place until the resurfacing has been carried out.

All skid deficient sites are prioritised and the treatment list is fed into section 2 of table 1.

2.1.6 Address Early Life Skid Resistance issues

Thin Surfacing has been used as a surface course since the mid-1990's and continues to be used as the standard surfacing material. The most common used material is Stone Mastic Asphalt (SMA).

TRL has studied the range of friction generated during wet skidding at various speeds. New thin surfacing falls within the expected range of wet skid resistance obtained from Hot Rolled Asphalt (HRA) materials, but towards the lower end of the range. Older thin surfacing also falls within the expected range of wet skid resistance for HRA but towards the higher end of the range.

The TRL study has shown that the initial 'effective' dry skidding and wet skidding values as SCRIM equivalent were very close to or below the IL of 45. Therefore the sites where wet or early-life dry skidding could be a significant factor are those with an investigatory level of 45 and above.

Interim advice from Highways Agency, IAN49/03, has been to warn drivers by signing, of the possibility of a slippery road surface until monitoring shows, typically 6 months, that the skid resistance has increased as the aggregate is exposed. Some local authorities are concerned that this will generate too many signs for the road users, and as such the impact of the signs is reduced. To overcome this issue new surfaces are gritted, however the benefit of this operation is controversial.

2.1.7 Operating a Practical Skid Policy

A good Skid policy can operate within the resources available to the local authority, generate good quality records, information is shared with all teams involved in the processes as outlined in table 1.

The stages involved in identifying skid deficient sites where road resurfacing is required to restore its skid resistance properties are shown in table 3.

Task 1	Review and update target network
Task 2	Agree network to be surveyed and define early/middle/ late season and let survey contract
Task 3	Process SCRIM data
Task 4	Identify skid deficient sites and produce priority list
Task 5	Engineers to investigate skid deficient sites
Task 6	Agree / prioritise surface treatment programme
Task 7	Review slippery signs at Event high-risk sites
Task 8	Review Investigatory Levels every 3 years

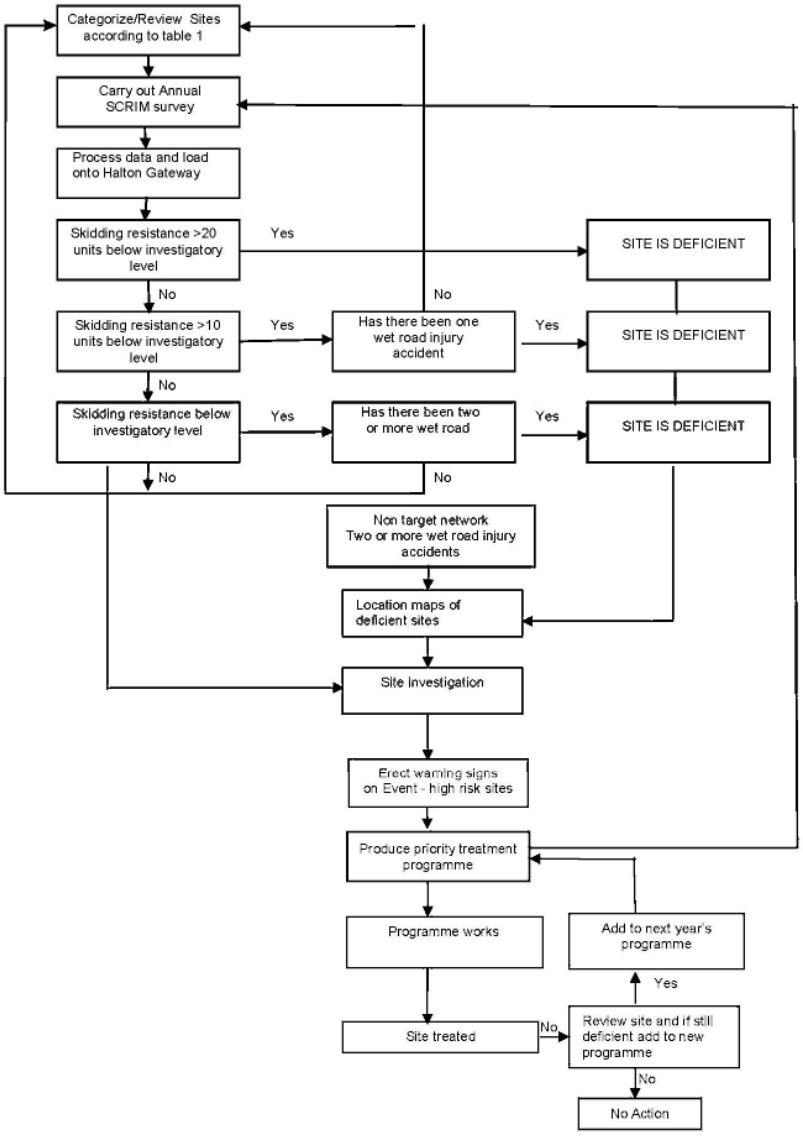
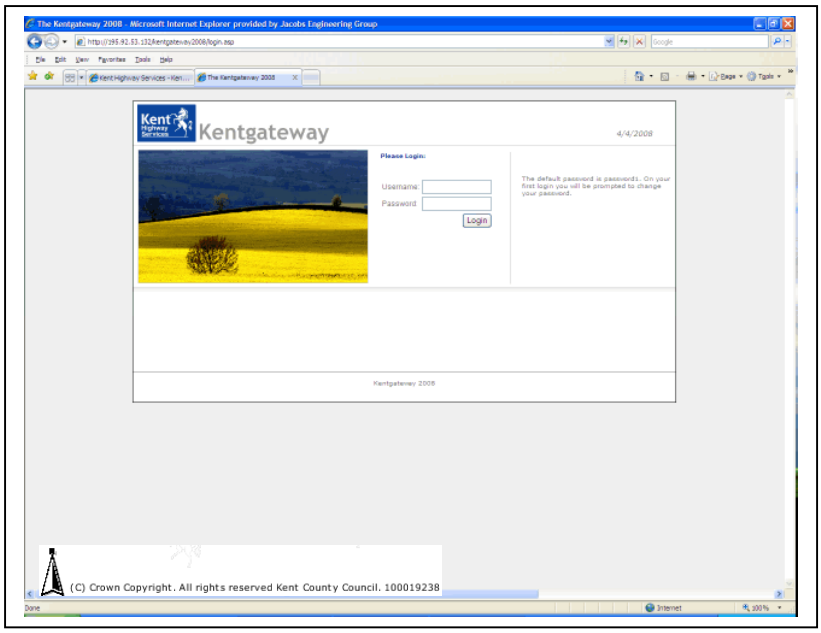


Table 3

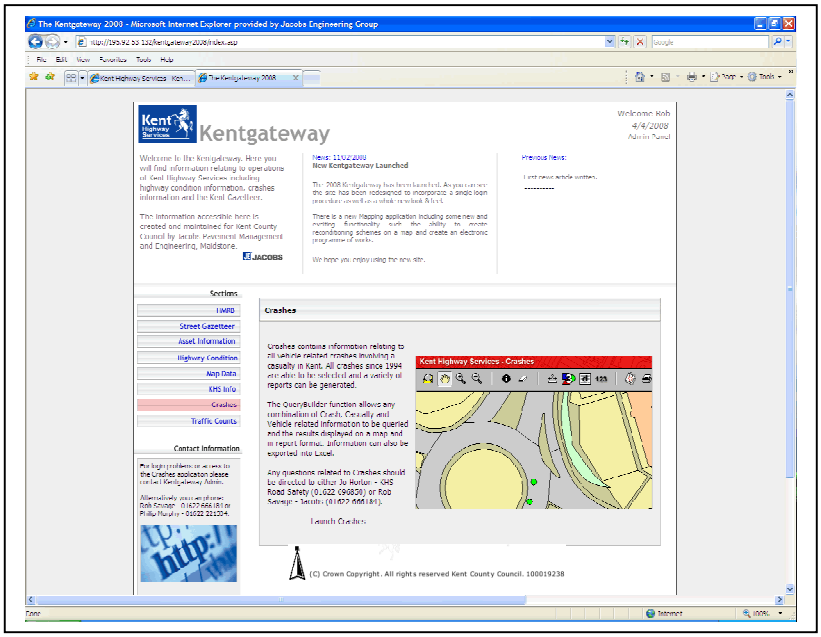
By using Web based GIS technology, once survey data has been loaded onto the web, the system will allow the engineer to identify all skid deficient sites within a few days.

An example of this automatic process is shown.

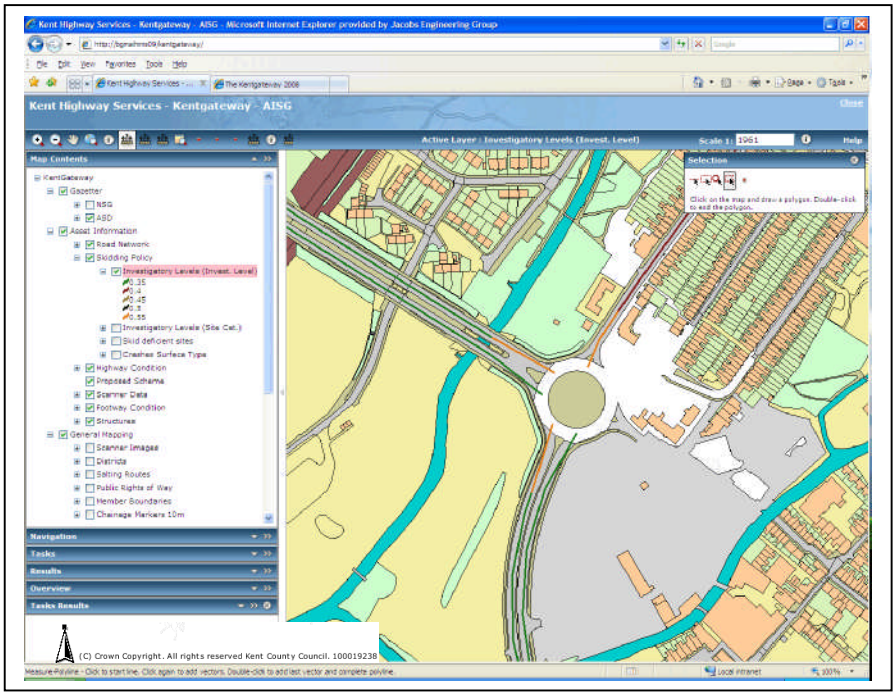
1. The Kent gateway – information portal accessible by all involved in process outlined in table 1.



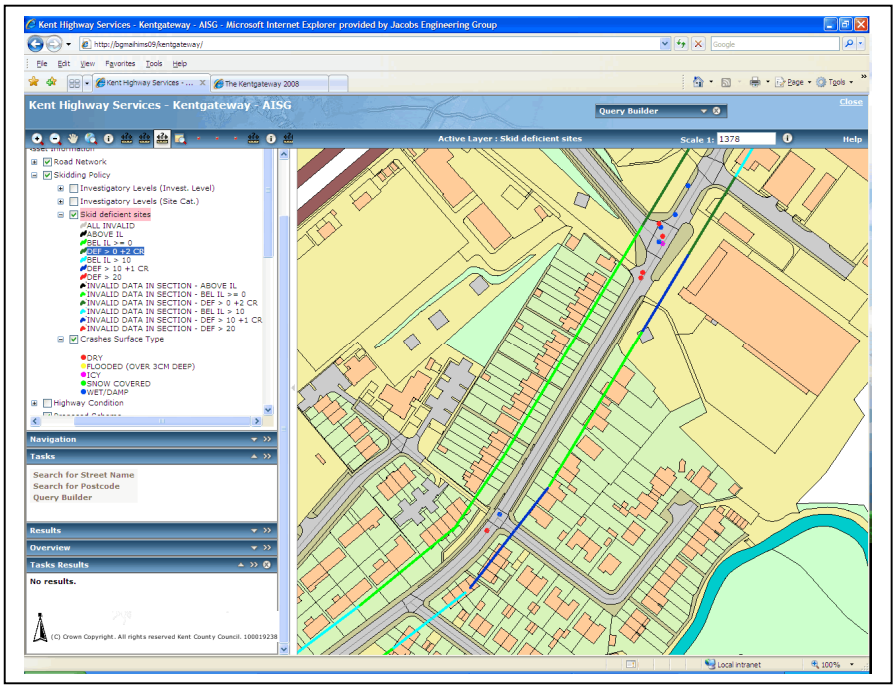
2. Kent Gateway – compiling information on wet accidents for the previous 3 years.



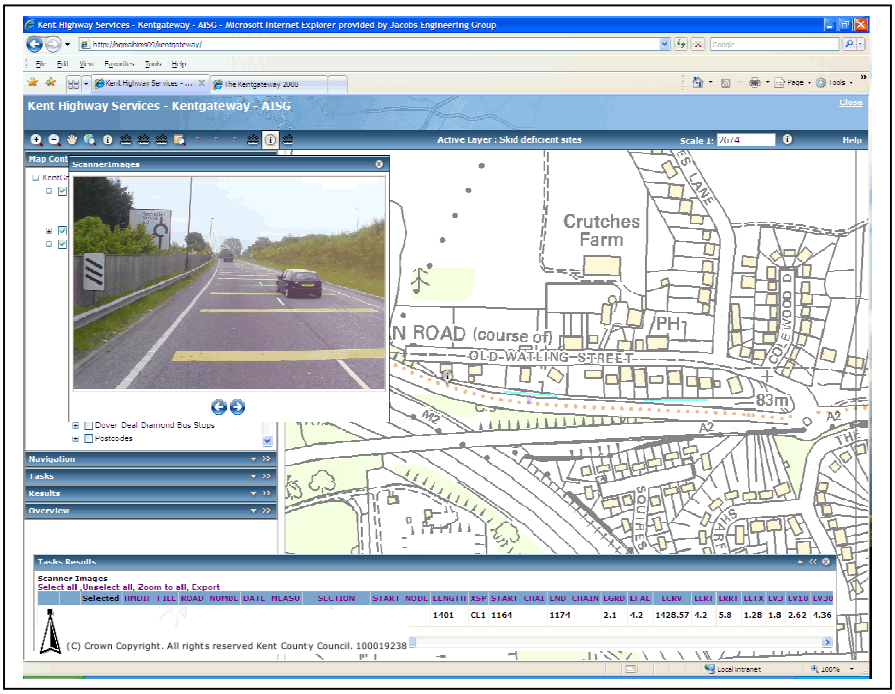
3. Kent Gateway – identifying site categories and investigatory level values



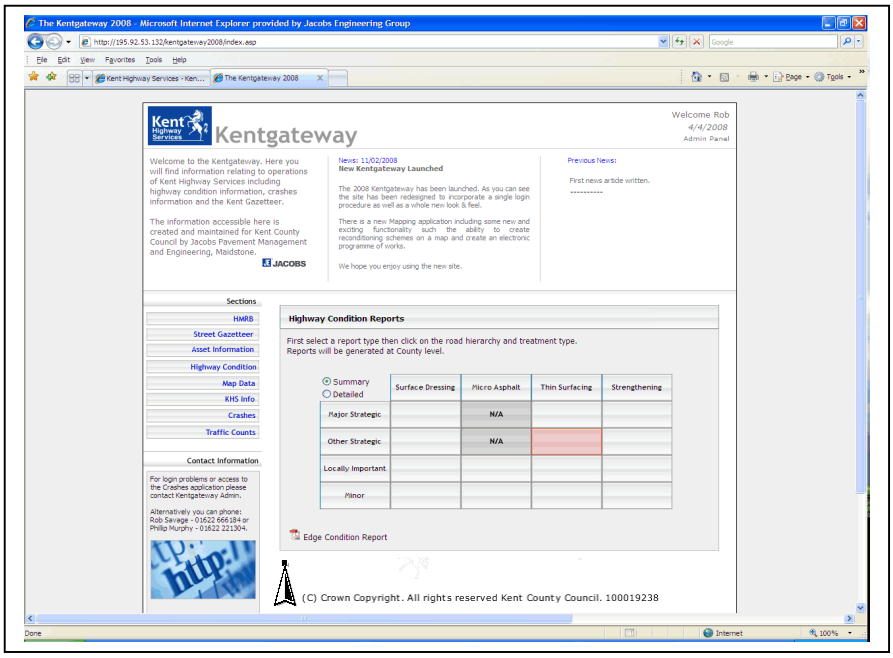
4. Kent Gateway – running model to identify skid deficient sites



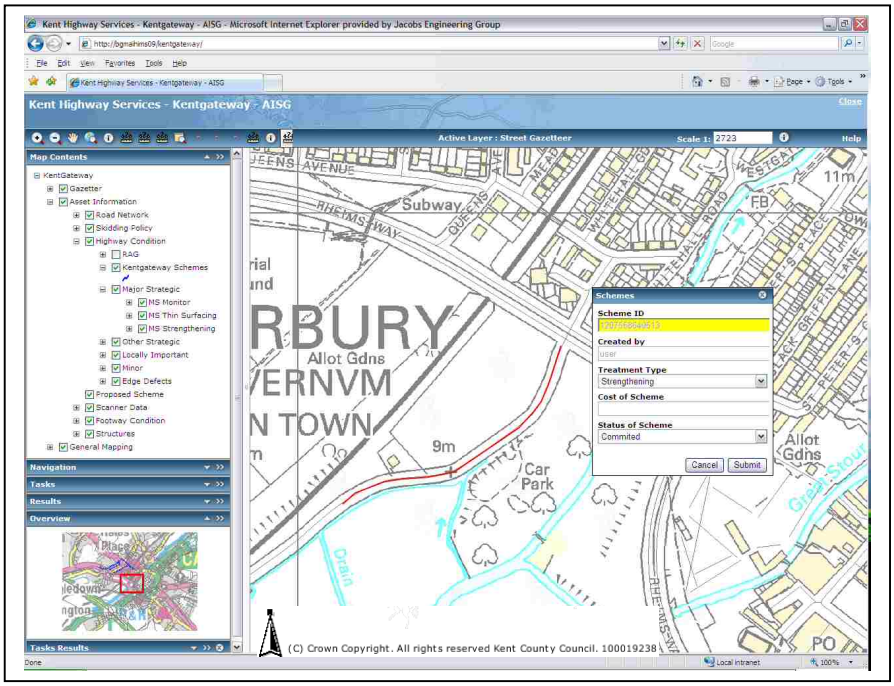
5. Kent Gateway – using video information to reduce site visits



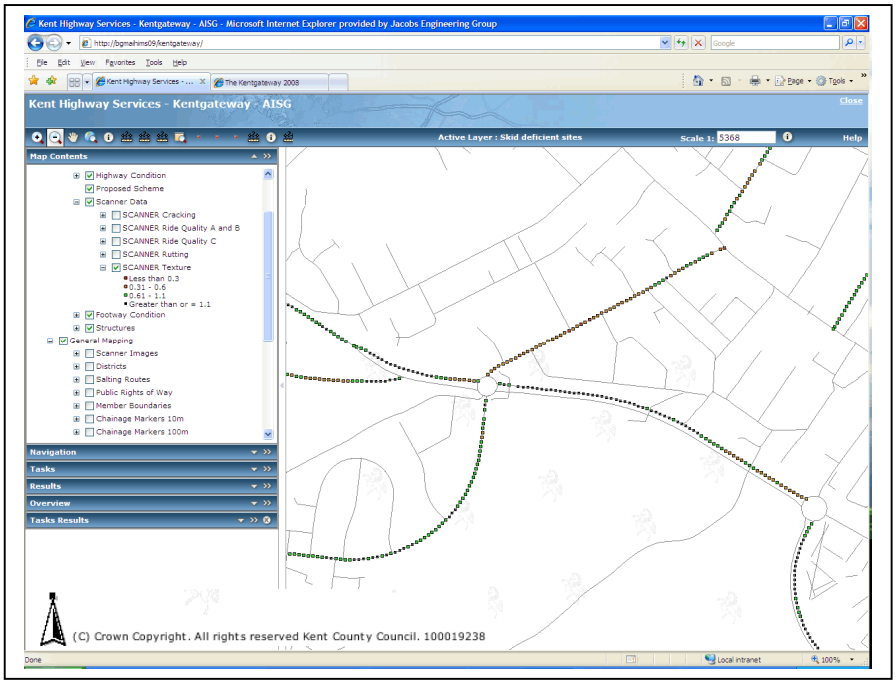
6. Kent Gateway – 2 year rolling programme



7. Kent Gateway – highway schemes tracking system



8. Kent Gateway – Surface texture measured by SCANNER



4. FUTURE DEVELOPMENTS

SCANNER
(Surface Condition Assessment for the National NEtwork of Roads)
In the UK the newly introduced SCANNER survey will have a significant impact on the engineering processes that identify road maintenance requirements.

SCANNER is a mandatory survey for all classified roads in England and the national performance indicators are based on the data collected by the survey.

Jacobs are developing a carriageway asset management system (J-CAM), that uses SCANNER data to select maintenance schemes, recommends treatment and forms programmes according to various strategies selected, e.g. worst condition highest priority, or per economic ranking. The system will also assess the funding requirements for each strategy selected.

Global Positioning Systems
Significant savings can be achieved in surveys and processing by replacing linear referencing systems with Global Positioning Data. It has been demonstrated that matching survey data to a linear reference can seriously distort the location of the data.

5. REFERENCES

Design Manual for Roads and Bridges – HD28/04 Skid resistance, HA
CSS Guidance Note – Skidding resistance, May 2005, CSS
Interim Advice Note IAN 49/03, Use of warning signs for new asphalt road surfaces, HA.
Interim Advice Note IAN 98/07, Guidance on implementing HA Skidding policy
CSS, Horses and Highway surfacing ENG 03/05, A guidance note for highway authorities.
Well-maintained highways: code of practice for highway maintenance management, 2005, Roads Liaison Group
TRL report PPR060, The Early Life Skid Resistance of Asphalt Surfaces.
TRL report PPR 205, Early Life Skid Resistance – an assessment of accident risk.
London wide Asphalt specification – produced by Ian Walsh (Jacobs)
KCC Gateway – Developed by Kent County Council

Presenter Information

Ed Lawrence – Pavement Engineering Consultant

Ed has 30 years experience relating to pavement and asset management activities. He developed and implemented major pavement management systems prior to UKPMS and promoted strategic planning concepts to highway maintenance. He is a member and past chairman of the UKPMS Steering group. As part of the CSS team and other related groups involved in the introduction of CHART, deflectograph, SCRIM and SCANNER surveys on local authority roads. Ed was also involved in implementing for Kent County Council the RMMS. He introduced RST to KCC in 1989 and developed treatment maintenance models using the then RST and later SCANNER data as well as developing a GIS system for analysing wet skid accidents with SCRIM results and producing a Skidding policy for KCC. As past chairman of the NRMCS, Ed introduced the deflectograph structural assessment into the NRMCS design and is a member of the CSS Highway Condition Assessment Group.

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