Appendix A

Carriageway Lifecycle Plan

Introduction

1. The background to lifecycle plans and the format of each are described in Section 5 of the HAMP. This appendix provides the lifecycle plan for carriageways.

2. For management purposes, the Council's highway network has been split into discrete maintenance categories based on the recommendations given within the national Code of Practice for "Well Maintained Highways". These categories reflect the type and use of different carriageways and are summarised in Table 1 below.

Table 1

Cat.	Hierarchy	Type of Road	Detailed Description
1	Motorway*	Limited access motorway regulations apply.	Routes for fast moving long distance traffic. Fully grade separated and restrictions on use
2	Strategic* Routes	Trunk and some Principal A roads between Primary Destinations.	Routes for fast moving long distance traffic with little frontage access or pedestrian traffic. Speed limits are usually in excess of 40mph and there are few junctions. Pedestrian crossings are either segregated or controlled and parked vehicles are generally prohibited.
3a	Main Distributor	Non Principal A Roads.	Routes between strategic routes and linking urban centres to the strategic network.
3b	Secondary Distributor	Classified Roads (B and C Class) and Unclassified urban bus routes.	In rural areas, these roads link larger villages to strategic/main distributor network. In urban areas these roads usually have a 30 mph speed limit and high levels of pedestrian usage.
4a	Link Roads	Unclassified Roads linking into the main/secondary distributor network with greater local significance in rural areas.	In rural areas provide inter-village links and connect to distributor network. In urban areas residential or industrial interconnecting roads.
4b	Local Access Roads	Unclassified urban cul-de-sacs and rural, lightly trafficked roads serving small settlements and single lane roads.	In rural areas these roads serve smaller villages and provide access to individual properties and land. In urban areas they are predominately residential.

** Motorways (Category 1) and Trunk Roads (Category 2) are the responsibility of the Highways Agency.*

Levels of Service

3. Since 2002, the Highways and Transport service has been carrying out a comprehensive programme of annual testing to determine the condition of the highway network and establish the Government's defined datasets for the condition of the Principal Classified, Non-Principal Classified and Unclassified Road networks and skid resistance. For 2012/13, the national datasets are defined as follows:

    - 130 – 01 Condition of Principal Roads
    - 130 – 02 Condition of Non Principal Roads
    - 130 – 03 SCRIM (Sideway-force Coefficient Routine Investigation Machine) – classified network
    - 130 – 04 Carriageway work completed.

4. The desirable levels of service for this asset category are set out in Table 2 below. By adopting a budget optimisation and depreciation modelling approach, using the historical condition data/deterioration rates, the Council has been able to set condition based service levels for different budget scenarios.

Table 2

Attribute	Desired Standard	Performance Measure
Safety	Maintain the following level of skid resistance*: 130 – 03 to remain at 90% +/- 3%	SCRIM (Sideway-force Coefficient Routine .Investigation Machine) survey results.
Availability	All roads available for use at all times excluding periods of essential road works and street works.	Journey times. Complaints. ELM Reports.
Serviceability	Appropriate standard of ride, signing and lining.	SCANNER survey. Complaints. NHT Survey. Council surveys. ELM Reports.
Condition	Maintain the following levels of condition**: 130 - 01 (formerly NI168): 6% +/- 1% 130 - 02 (formerly NI169): 9% +/- 1% LI224b (formerly BV224b): 13% +/- 2%	Single list national dataset*** Local Indicators (LI's).

* *The percentage above the required investigatory level.*

** *The percentages represent the length of network that is in need of urgent maintenance (Condition Red).*

*** *Whilst targeting red SCANNER sites should improve the national dataset, does not necessarily promote good asset management. To maintain the asset, it is essential to target the high ambers and prevent these sites from deteriorating into the red. In providing a % range for the length requiring urgent maintenance, there should be sufficient flexibility to achieve both outcomes.*

**** *ELM – West Berkshire Council's Enquiry Logging Manager system for recording enquiries and service requests*.

5. Failure to respond adequately to any of these four attributes of level of service could produce risk to the authority. Table 3 below, which details the main risks, underlines the importance of responding properly to each.

Table 3

Risk Type	Description Example
Physical	Accidents caused by asset defects.
Corporate	Legal proceedings for failure in duty of care.
Financial	Reduction in the value of the asset because of poor maintenance practice, reduced budgets and increased compensation payments following legal action.
Public Relations	Poor road condition reflects on the overall image of the Council.
Environmental	The use of premium aggregates, natural materials/resources, inappropriate materials/specifications, short lived resurfacing/overlay materials and high consumption of energy per kilometre of treated network.
Network	Disruption to road users as a result of poor coordination and unplanned maintenance following poor maintenance practice and/or reduced budget.

Asset Base and Characteristics

6. Using the national standard of road classification and maintenance category, the Council's highway network may be summarised as follows:

Table 4 - Road Class

	A Roads Lane1 kms	B Roads Lane1 kms	C Roads Lane1 kms	U Roads Lane1 kms	Total Lane 1 kms
Urban	46.7	22.3	112.5	559.5	**741.0**
Rural	158.9	125.6	731.0	740.7	**1756.2**
Total	**205.6**	**147.9**	**843.5**	**1300.2**	**2497.2**

Table 5 - Maintenance Category

Category	2	3a	3b	4a	4b	Total Lane 1 kms
Lane1 kms	104.2	101.4	1075.6	378	838	**2497.2**

Asset Condition and Assessment

7. The condition of the road network is assessed annually by SCANNER surveys. Although no longer a national indicator, 100% of the unclassified network is assessed annually to establish a local indicator (LI244b). Skid resistance is measured annually on the A, B and C roads using SCRIM. Digital video imagery is captured as part of the SCANNER surveys and is used to check condition, accessibility, serviceability and for asset inventory collection. The annual condition survey regime for West Berkshire is summarised in Table 6 below.

Table 6

	A Roads	B Roads	C Roads	U Roads
SCANNER	50% in both directions (national) Data set:130-01	100% in one direction (national) Data set:130-02	50% in one direction (national) Data set: 130-02	100% in one direction (local) LI224b
SCRIM	100% in both directions	100% in both directions	100% in one direction	Not surveyed
Digital Video Imagery	As part of SCANNER survey	As part of SCANNER survey	As part of SCANNER survey	As part of the SCANNER survey

8. In addition to condition surveys, the Council also carries out routine highway safety inspections where the frequency of inspection is based on the type of road and the amount and type of traffic using it. Adopting the guidelines given within the national Code of Practice for Maintenance Management "Well Maintained Highways" (July 2005), the standards for the frequency of safety inspections are summarised in Table 7 below.

Table 7

WBC Maintenance Group	Code of Practice Category and Description	Road Class	Frequency	Maximum Interval Between Inspections
Group 1	2, 3a and 3b	A, B and C roads. Urban bus routes on Unclassified roads	1 month (Driven)	6 weeks
Group 2	4a	U roads	3 months (Urban – Walked) (Rural – Driven)	16 weeks
Group 3	4b	U roads	12 months (Urban – Walked) (Rural – Driven)	56 weeks

9. There are national datasets for the classified road network. 130-01 and 130-02 are a direct application of the Road Condition Index (RCI) from the current UKPMS default rule set. For unclassified roads there is no longer a national indicator (previously BV224b), however the Council continues to provide a local indicator (LI224b) for these roads using the RCI methodology. A summary of road condition performance for the period 2005 to 2010 is shown in Table 8 below.

Table 8

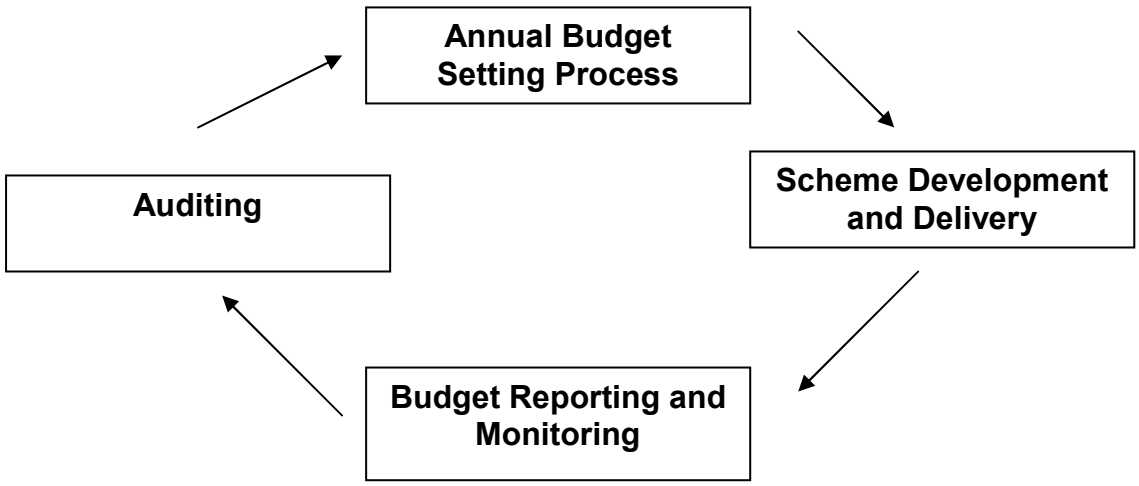
Indicator/Year	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
A Roads	BV 223	BV 223	NI 168	NI 168	NI 168	NI 168
	5%	7%	5%	6%	5%	5%
B & C Roads	BV224a	BV224a	NI 169	NI 169	NI 169	NI 169
	11%	9%	7%	9%	9%	9%
U Roads	BV224b	BV224b	LI224b	LI224b	LI224b	LI224b
	26%	20%	14%	21% *	12% *	11% *

** Based on 100% network coverage.*

Financial Management, Investment and Programming.

10. The Council's constitution provides a flexible mechanism for ensuring effective and fully accountable financial management of the Council's transport budgets, both capital and revenue.

    The framework within which operational budgets are managed is as follows:



11. Day to day budget control is the responsibility of the budget manager, a senior officer reporting directly to the Head of Service. The Head of Service has overall responsibility for the department's financial situation, working very closely with the Directorate Group Accountant, who is a key member of the Directorate Management Team. Service budgets are monitored at Directorate Management Team level and a formal budget report presented monthly to Corporate Board.

12. To ensure compliance with the constitution, regular independent audits are undertaken particularly in areas of high cash turnover such as car parks and concessionary fares.

13. The process for managing capital expenditure is very similar but the Council's Capital Strategy Group plays a key role in monitoring scheme progress and cost. Whilst an overview is taken by the Directorate Management Team, the details are closely monitored by Capital Strategy Group using detailed monthly reports. This group is a good example of cross service corporate working as it comprises representatives of all Council Services with a capital expenditure programme. A holistic view of the Council's overall position regarding capital can therefore be taken.

14. To ensure that value for money is being achieved across the entire range of transport related budgets, the Council undertook a complete Zero Based Budget Review in October and November 2005. A series of subsequent value for money audits as well as reviews by the Council's Transformation and Efficiency Board (TEB) will continue to ensure that the Council's resources are used to the best effect by directing funds to the most needed area.

Budget Optimisation and Depreciation Modelling

15. To carry out budget optimisation and depreciation modelling on the classified network, the Council applies a financial model that is able to predict the level of investment required to deliver any predefined level of service as measured by road condition surveys. The model is also used to assess the effect of treatments and budget strategies on the 130-01 and 130-02 data sets and the Depreciated Asset Value over selected time periods.

16. For the unclassified road network, a separate model was used to predict budgets required to achieve selected LV224b values using the results from past CVI surveys. However, from 2011, the mini-SCANNER was introduced to assess the unclassified network and this data has now been combined as part of the classified road network model.

17. The model is populated using the latest SCANNER and SCRIM survey data from the Principal, Non Principal Classified and the Unclassified road networks and a treatment decision matrix that links the individual condition parameters (rutting, longitudinal profile, cracking and texture etc) to specific maintenance treatments (reconstruction, resurfacing, surface dressing etc) is used to formalise treatments.

18. The model uses a deterioration rate to predict the future condition. The SCANNER road condition indicator (RCI) has been linked to a residual life which enables the life of the road to be determined from the condition data.

19. Using the financial model a number of scenarios can be run to enable West Berkshire Council to evaluate the effect of different budget allocations on the network condition and the resulting effect on the value of the asset.

20. The Council has developed a financial model that uses the latest road condition data and a deterioration model to help predict budget requirements to achieve target condition service levels over different timescales and future condition of the road network should investment levels change.

21. The financial model has also been used to target budget allocations to specific road hierarchies. Based on current model simulations using condition data and deterioration parameters, Table 9 below shows the average cost to achieve a "steady state" scenario, namely, the budget amounts required to deliver the set service levels over the next 25 years:

Table 9

Road Class	Average Annual Cost (25 Years)	Total Network Cost	% of the Total Cost
A Classified Rural	£389,759	£9,743,982	11%
A Classified Urban	£141,918	£3,547,950	4%
B Classified Rural	£227,180	£5,679,505	6%
B Classified Urban	£54,423	£1,360,571	1%
C Classified Rural	£1,060,637	£26,515,933	29%
C Classified Urban	£229,979	£5,749,471	6%
U Unclassified Urban and Rural	£1,546,038	£38,650,961	43%
TOTAL	**£3,649,934**	**£91,248,373**	**100%**

The above figures are based on the condition data and unit costs up to and including 2010

22. The above table has also been used to establish a budget allocation between the classified (60% of the budget) and non-classified networks (40% of the budget), enabling a more targeted maintenance regime based on existing network condition.

Condition Threshold Values and Availability of Condition Data

23. Condition threshold values represent the condition beyond which the road would be classified as in need of investigation and possible treatment. The condition is defined from SCANNER surveys, which now provide very high levels of network coverage.

24. Threshold levels from SCANNER surveys are defined in terms of a Road Condition Indicator (RCI), which combines defects together into a composite measure for every 10 metre subsection of road, and can range from 0 to 315 for the classified network and from 0 to 246 for the unclassified network. An RCI ≥ 100 indicates the section is in 'need of maintenance' and is classified as red for national indicator reporting. Amber is used to describe roads with an RCI > 40 and < 100.

25. However, in order to manage a network not only are the lengths of road with an RCI ≥ 100 considered for treatment but some of the roads with RCI values of between 80 and 100 are also considered because these are approaching a critical condition and early treatment is more cost effective as it is usually less extensive at this stage in the life cycle. The model therefore, takes into account treatments that have been applied to the road in a "high" amber and red condition.

26. Tables 10, 11, 12 and 13 below highlight the parameters, thresholds, weightings and the subsequent "points" score used to calculate the RCI for A, B, C and U roads using condition data collected from SCANNER surveys. Each 10-metre section of surveyed road is allocated a condition ranking shown as green, amber, high amber or red depending on the value of the "points" scored. The total length of the red sections is reported as a percentage of the total network coverage to establish the national datasets 130-01 and 130-02 and the local indicator LI224b.

Table 10

Condition of Principal Roads (A Roads: Data set 130 - 01)					
Parameter (defect)	**Units**	**Lower Threshold**	**Upper Threshold**	**Weighting (Importance x Reliability)**	**Maximum Score (Points)**
Rut depth (larger of LLRT or LRRT)	mm	10	20	1.0	100
3m profile Variance (LV3)	mm2	4	10	0.8	80*
10m profile Variance (LV10)	mm2	21	56	0.6	60*
Whole c/w cracking (LTRC)	% area	0.15	2.0	0.6	60
Texture depth (Urban roads) (LLTX)	mm	0.6	0.3	0.5	50
Texture depth (Rural roads) (LLTX)	mm	0.7	0.4	0.75	75
Maximum Scores (RCI)			**Urban Roads**		**290**
			Rural Roads		**315**

** Only the higher score from the two measures of longitudinal profile (3m and 10m profile variance) is counted in the overall score*

Glossary of Terms

LLRT Left wheel path rut depth
LRRT Right wheel path rut depth
LV3 3m moving average longitudinal profile variance
LV10 10m moving average longitudinal profile variance
LTRC Whole carriageway cracking
LLTX Left wheel path average texture depth

Table 11

Condition of Classified Roads (B Roads: Data set 130 - 02)					
Parameter (defect)	**Units**	**Lower Threshold**	**Upper Threshold**	**Weighting (Importance x Reliability)**	**Maximum Score (Points)**
Rut depth (larger of LLRT or LRRT)	mm	10	20	1.0	100
3m profile Variance (LV3)	mm2	5	13	0.8	80*
10m profile Variance (LV10)	mm2	27	71	0.6	60*
Whole c/w cracking (LTRC)	% area	0.15	2.0	0.6	60
Texture depth (Urban roads) (LLTX)	mm	0.6	0.3	0.5	50
Texture depth (Rural roads) (LLTX)	mm	0.6	0.3	0.75	75
Maximum Scores (RCI)			**Urban Roads**		**290**
			Rural Roads		**315**

** Only the higher score from the two measures of longitudinal profile (3m and 10m profile variance) is counted in the overall score*

Table 12

Condition of Classified Roads (C Roads: Data set 130 - 02)					
Parameter (defect)	**Units**	**Lower Threshold**	**Upper Threshold**	**Weighting (Importance x Reliability)**	**Maximum Score (Points)**
Rut depth (larger of LLRT or LRRT)	mm	10	20	1.0	100
3m profile Variance (LV3)	mm2	7	17	0.8	80*
10m profile Variance (LV10)	mm2	35	93	0.6	60*
Whole c/w cracking (LTRC)	% area	0.15	2.0	0.6	60
Texture depth (Urban roads) (LLTX)	mm	0.6	0.3	0.3	30
Texture depth (Rural roads) (LLTX)	mm	0.6	0.3	0.5	50
Maximum Scores (RCI)			**Urban Roads**		**270**
			Rural Roads		**290**

** Only the higher score from the two measures of longitudinal profile (3m and 10m profile variance) is counted in the overall score*

Table 13

Condition of Classified Roads (U Roads: Local Indicator LI224b)					
Parameter (defect)	**Units**	**Lower Threshold**	**Upper Threshold**	**Weighting (Importance x Reliability)**	**Maximum Score (Points)**
Rut depth (larger of LLRT or LRRT)	mm	10	20	1.0	100
3m profile Variance (LV3)	mm2	10	20	0.6	60*
10m profile Variance (LV10)	mm2	50	95	0.5	50*
Whole c/w cracking (LTRC)	% area	0.15	2.0	0.36	36
Texture depth (Urban roads) (LLTX)	mm	0.6	0.3	0.3	30
Texture depth (Rural roads) (LLTX)	mm	0.6	0.3	0.5	50
Maximum Scores (RCI)			**Urban Roads**		**226**
			Rural Roads		**246**

** Only the higher score from the two measures of longitudinal profile (3m and 10m profile variance) is counted in the overall score*

27. The total number of points attributed to each 10 metre section of road is calculated based on the above tables. The Road Condition Indicator (RCI) is assigned a "condition" colour based on the RCI value as detailed in Table 14 below.

Table 14

RCI Range	Condition Colour
0 to 39	Green
40 to 79	Amber
80 to 99 (locally created range)	High Amber
greater than or equal to 100	Red

28. The nationally recognised definitions for the colour groupings shown above are as follows:

- GREEN – Lengths where the carriageway is generally in a good state of repair.
- AMBER – Lengths where some deterioration is apparent which should be investigated to determine the optimum time for planned maintenance treatment.

- HIGH AMBER – (Locally created range) Lengths where the carriageway is in need of planned maintenance as soon as possible to justify carrying out a lesser maintenance treatment rather than a more extensive treatment later, in order to minimise whole life costs.

- RED – Lengths in poor overall condition which are likely to require planned maintenance soon (i.e. within a year or so) on a "worst first" basis. (Although there may be justification for postponing major repairs, and only carrying out minor repairs to keep the road safe and serviceable, in order to minimise whole life costs i.e. "economic prioritisation").

Maintenance Treatments

29. Road surfaces can be renewed, repaired, protected or retextured.

- Renewal involves replacing some or all of the structural layers and in some cases the sub-base layer in order to restore strength and life expectancy.

- Repairs include patching, permanent pothole repairs, crack sealing and resetting of ironwork.

- Protection treatments restore the skid resistance and seal the surface of the road which prevents moisture and water ingress getting into the surface and oxidation of the binder. Treatments include surface dressing, micro-asphalts and slurry seals.

- Retexturing increases the serviceable life of the surface course by removing excess binder and "roughing up" the polished aggregate, improving both macro and micro texture to increase skidding resistance in wet conditions and reduce aqua-planing.

30. A set of maintenance treatments for various defect conditions have been established along with unit costs and typical design lives for each road class. For the classified and unclassified networks, the treatment cost/life expectancy matrix is detailed in Table 15 below.

Table 15

Treatment	Design Life (Years)	Unit Cost (£/m2)			
		A Roads	B Roads	C Roads	D & U Roads
Reconstruction (450-525mm)	50	70.00	67.00	45.00	45.00
Thick Overlay (150mm)	50	25.00	25.00	21.00	21.00
Moderate Overlay (100mm)	40	22.00	22.00	19.00	19.00
Thin Overlay (40-60mm)	20	18.00	17.00	16.00	16.00
Thin Inlay (40mm)	15	20.00	19.00	17.00	17.00
Moderate Inlay (90-110mm)	20	24.00	24.00	22.00	22.00
Surface Dress/Micro (10-25mm)	10	5.00	5.00	5.00	5.00
Retexturing	10	15.50	15.50	15.50	15.50

Linking Condition with Treatment

31. Using the latest national rules and parameters (RP 10.01), the parameters and thresholds tabulated in Section 26 are used to calculate national datasets 130-01 and 130-02. For local indicator (LI224b), local parameters have been established for the unclassified network based on engineering judgement, knowledge of network performance and the locally set thresholds as detailed in Table 13 of this appendix.

32. The four main defect mechanisms used to identify treatments are rut depth, texture depth, whole carriageway cracking and variance (ride quality). These are all recorded by the SCANNER surveys and are also used to establish the RCI and national datasets. There is a fifth defect mechanism which is the skidding resistance of the road surface as measured by SCRIM. Within the analysis, this data is combined with wet injury accidents and given the highest weighting when compared against the other four defect mechanisms.

33. When a scheme has been identified as in need of maintenance, the five defects will be analysed on an individual basis to establish the main defect mechanism causing the deterioration and the most suitable and cost effective treatment will be recommended. For example, a scheme that has a deep wheel track rutting problem would most likely require an inlay or thicker overlay of new material to remove the rutting. Surface dressing or a thin inlay/overlay would not eradicate the problem. If a scheme is deficient in texture depth and areas of cracking are evident, a surface dressing maybe the most cost effective treatment to improve texture, skidding resistance and seal the cracks to prevent water ingress.

Effectiveness of Treatment

34. By the very nature of the work, maintenance schemes will contain ‘non-defective’ sections and therefore treatments will be applied where they do not produce the full benefit of the treatment. The amount of non effective maintenance is defined as the effectiveness factor for the treatment and is a variable within the model. The distribution of RCI on the length where ‘non-effective’ maintenance is applied is based on the network distribution as a best estimate for forward projection of condition. An effectiveness factor of 50% has been assumed within the financial model.

Timing of Treatment

35. If defects are treated before they reach an RCI of 100, the cost of repair will tend to be less expensive than if they are left untreated and allowed to deteriorate into the “red”, resulting in the reduction of the whole life cost of the pavement. It is often not possible to treat all defects as they occur and, therefore, it is necessary to allow for the additional cost of repairs. Factors can be applied to increase treatment unit costs as the RCI increases beyond 100.

Scenario's

36. When the need arises, financial models can be run on all classes of road. The following scenarios were run for the period 2009/10 to establish base levels of spend in order to set realistic service levels.

- Headline backlog – the cost to remove all defects within 1 year (£31.4m)
- Current budget – condition projections for 10 years using current budgets
- Budget required meeting defined service level over 10 years
- Budget required achieving steady state over 10 years.

Scheme Identification and Prioritisation Framework

37. Schemes are identified in a number of ways and originate from a number of sources. Once a scheme has been identified as having a possible maintenance need, it is then analysed along with all the other schemes to establish a priority.

38. Initial scheme identification will normally come from one or more of the following sources:

Objective sources:

- SCANNER data – identified from sections with a high concentration of "Red" or "High Amber" RCI values.
- SCRIM data – sections of carriageway which are both deficient in skidding resistance and have had an occurrence of wet injury accidents.

Subjective sources:

:

- Visual condition reports in addition to the routine safety inspections from the Council's inspectors who are on the network daily.
- Members of the public/Council Members/Parish Councils – Concern raised regarding poor condition of surfaces.
- Safety Inspections – Analysis of surface defect repairs where clusters and/or repeat reactive maintenance is occurring.

39. For each identified scheme, the available machine based condition data is analysed to establish its priority rating using the following criteria:

- Skidding Resistance and Wet Accidents
- Road Condition
- Deterioration Trends
- Road Classification

40. Table 16 below shows how the points are allocated across each defect type. For any particular defect, the maximum possible priority rating is 620. This table is based on the format for RCI calculations shown in Tables 10, 11, 12 and 13.

Table 16

Defect Type	Units	Lower Threshold	Upper Threshold	Weighting (Importance /Reliability)	Max Score (Points)
Wet Injury Accidents in the past 3 years	Number	1	3	3.0	300
SCRIM (Worst 100m Average)	I.L minus MSSC	0	0.2	1.0	100
SCANNER RCI	Factor of RCI%	50	300	1.0	100
Trend Analysis	% change in RCI	10	17	0.8	80
Road Classification	Class	D&U	A	0.4	40
Maximum Score					**620**

Glossary of Terms:

I.L Investigatory Level
MSSC Mean Summer SCRIM Coefficient
RCI Road Condition Index

Wet Injury Accidents

41. Wet accident score is only triggered if SCRIM shows the surface to be deficient. If the skidding resistance of the road surface is above the recommended investigatory level for that particular site, then no points for wet accidents will be added. Skidding resistance is combined with wet injury accidents to assign points based on the level of deficiency and the number of accidents which have occurred in the past 3 years. Points are allocated based on a sliding scale of skid deficiency i.e. the greater the deficiency the more the points gained, up to a maximum of 100. For each wet injury accident where the road surface has been identified as deficient within a scheme, 100 points are awarded up to a maximum of 3 wet accidents. This gives a possible maximum score of 300.

SCRIM

42. A SCRIM score is calculated using the Mean Summer SCRIM Coefficient (MSSC) and the Investigatory Level (IL). For any given scheme, the worst 100 metre section is taken and a value of deficiency is calculated by subtracting the MSSC from the IL. If the result is equal to or above zero, the surface is not deficient in skid resistance and as a consequence no points are added to the overall score.
If the result is equal to or less than zero, points are added depending on the degree of deficiency.

Example:

43. A 100 metre length of A Class road has a MSSC of 0.27 and an investigatory level of 0.4, the value of deficiency would be -0.13. Applying this value to Table 17 below, the point score for the scheme would be 65.

Table 17

Deficiency	0 to -0.1	-0.11	-0.12	-0.13	-0.14	-0.15	-0.16	-0.17	-0.18	-0.19	>=0.20
Point Score	50	55	60	**65**	70	75	80	85	90	95	100

44 The above calculation is added to the scores from wet injury accidents, SCANNER, trend analysis and road classification to determine the overall score for the scheme. With this overall score, it is possible to compare schemes and set priorities in an objective manner.

SCANNER

45. A SCANNER RCI score is calculated based on the percentage of green, amber, high amber and red values there are for each individual scheme. These percentages are multiplied by the factors detailed in Table 18 to establish an overall rating where the weighting is biased towards high amber and red.

Table 18

Condition Colour	Multiplier
Green	0
Amber	1
High Amber	6
Red	5

This rating, between 50 and 300 is then converted into a points score up to a maximum score of 100.

Example

A section of urban A class road has the following condition data over a 10 metre section:

Defect Type	Units	Condition Data	RCI Score *
Rut Depth	mm	20	100
Profile variance**	mm2	10	80
Cracking	% area	0.175	30***
Texture Depth	mm	0.8	0
		Total RCI Score	**210**

* *The RCI scores have been calculated using the figures in Table 10*
** *The profile variance is the average of the 3m and 10m profile variance results*
*** *Calculated on a pro-rata basis using the figures in Table 10*

From paragraph 29, a score of 210 will place this 10 metre section into category RED as it is greater than 100. This calculation is then repeated for the whole length of the proposed scheme giving a consolidated set of results as tabled below.

Table 19

	% RCI GREEN	% RCI AMBER	% RCI HIGH AMBER	% RCI RED	
Consolidated RCI score % for scheme	14	42	18	26	
Multiplier*	0	1	6	5	
Overall Rating	0	42	108	130	**Total 280**

Using the overall rating total above and Table 20 below, the points score for the scheme is 95.

Table 20

Rating	<=50	51-75	76-100	101-125	126-150	151-175	176-200	201-225	226-250	251-275	276-300	>300
Point Score	0	50	55	60	65	70	75	80	85	90	**95**	100

Trending Analysis

46. Trending analysis is also carried out to establish how the road pavement within an identified scheme has performed over a period of time. Deterioration modelling can be unpredictable due to the high number of variables that have an effect on a road pavements residual life, for example, extreme weather, traffic levels, drainage, location etc. However, analysis of past RCI values and the changes that may have occurred over time, can give a good indication of the rapid onset of failure. It can also identify road pavements that may have reached the high end of their RCI value (high amber), and have stabilised, indicating a slowing down of deterioration. This may offer the opportunity to delay maintenance for a year or two, enabling resources to be redirected to other schemes.

47. Trend analysis is carried out on each scheme by calculating the percentage change of high amber and red RCI values over the past 2 surveys. For example, an A class road is surveyed once every two years. Being a designed pavement, expected serviceable life is 20 years, therefore the predicted rate of deterioration would be 5% per annum. Over the two year period, the predicted rate of deterioration would be 10% and this represents the lower threshold used for assigning points. For any value above this percentage (up to an assumed maximum of 17%), points are assigned linearly to a maximum value of 80 similar to using the calculation method described above for SCRIM and SCANNER.

48. The final item contributing towards the priority points total is the road classification. A small number of points are awarded based on the usage of the road and environment it is situated in. Table 21 below highlights the allocation of points.

Table 21

Road Classification	Environment	
	Urban Points	**Rural Points**
Principal Roads (A Road)	40	30
Classified Roads (B Road)	30	25
Classified Roads (C Road)	20	15
Unclassified Roads (U Road)	10	0

Scheme Prioritisation

49. By adding the point scores for each of the defect type shown above for each scheme, it is possible to compare schemes and set priorities in an objective manner. From this analysis, the Council is able to prepare it's budget based Three Year Highway Improvement Programme.

Risks

50. The risks involved in implementing the lifecycle action plan have been assessed against the Council's standard grid of likelihood versus impact and are detailed in Tables 22 and 23 below, with an outline of the mitigation to be planned. The 'red' risks from each lifecycle plan are listed in Section 7 of the main TAMP document.

Table 22

Impact				
	Extreme Impact - Rarely 4	**Extreme Impact - Moderate** 8	**Extreme Impact - Likely** 12	**Extreme Impact - Almost certain** 16
	High Impact - Rarely 3	**High Impact - Moderate** 6	**High Impact - Likely** 9	**High Impact - Almost certain** 12
	Medium Impact - Rarely 2	**Medium Impact - Moderate** 4	**Medium Impact - Likely** 6	**Medium Impact - Almost certain** 8
	Low Impact - Rarely 1	**Low Impact - Moderate** 2	**Low Impact - Likely** 3	**Low Impact - Almost certain** 4

Likelihood

Table 23

Risk	Level	Mitigation	Responsible
1. Insufficient staff resources.	6	Highlight in Service Plan Present Business Case for additional support	Head of Highways and Transport Highways Manager
2. Insufficient national guidance and support	6		
4. Materials/ labour/ plant/ staff costs	6	Ensure value for money is being achieved	Project Managers Contractors
5. Reduced capital funding	12	Prioritise key assets to minimise overall deterioration whilst maintaining safety	Council Officers
6. Reduced revenue funding	12	Prioritise key assets to minimise overall deterioration whilst maintaining safety	Council Officers