Appendix D

Street Lighting 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 street lighting. At this stage of development of the TAMP, feeder pillars, cabling etc have not been included in the life cycle plan.

2. Street lighting is divided into various categories for asset management purposes. The three main components of column, lantern and lamp have different requirements. The main consideration in terms of capital investment is column type. The following asset categories have been adopted:

   Table 1

Category	Description
Aluminium (Cast)	Refers to columns with cast aluminium base/root section.
Aluminium (Extruded)	Refers to columns manufactured from a single piece extrusion.
Aluminium (Sheet)	Refers to columns which have been fabricated from sheet aluminium.
Cast Iron	Refers to cast iron columns.
Concrete	Refers to cast concrete columns.
Galvanised steel	Refers to galvanised/galvanised and painted columns.
Painted steel	Steel columns which are painted (may be zinc/aluminium sprayed)
Pole Bracket	Fixed to third party wooden distribution poles
Subway lighting	Fixed within pedestrian subways
Wall Brackets	Fixed to buildings

Levels of Service

3. In accordance with national guidelines, West Berkshire Council carries out a comprehensive programme of visual inspections and electrical testing. In addition to these inspections, the Council formally adopted a system of structural testing on steel columns in 2008.

4. Historically, condition/asset related data was collected and used to calculate national performance indicators, however, this has developed over the last two years and the data is now used to set budgets and priorities in accordance with the principles of asset management. Over the course of this HAMP, the management of the Street Lighting asset will continue to be developed in line with the recommendations given within the Institution of Lighting Engineers Technical Report 22 – Managing a Vital Asset; Lighting Supports and Well-lit Highways - Code of Practice for Highway Lighting Management 2004.

5. The desirable levels of service for this asset category are set out in Table 2 below and the lifecycle plan, in later sections, shows how different levels of available funding may influence the level of service.

Table 2

Attribute	Desired Standard	Performance measures
Safety	Road and footways lit to the recommended standards, to reduce accidents, crime and the fear of crime Installations physically and electrically safe.	Structural test results Electrical test results ELM reports* Term Contract performance indicators.
Availability	98% of all lights working 7 day average repair time.	LI98 LI215a
Serviceability	Low levels of light pollution. Good visual appearance in high amenity areas.	ELM reports* Customer surveys**.
Condition	Consistent with achieving minimum whole-life cost, in terms of preventative maintenance and column replacement.	Condition data.

** ELM – West Berkshire Council's enquiry logging manager.*
*** National Highway and Transport (IHT) survey 2009, 2010 and Council surveys*

6. Failure to respond adequately to any of these four dimensions of level of service will produce risk to the authority. Table 3 below details the key risks and underlines the importance of responding properly to each risk.

Table 3

Risk type	Description example
Physical	Accidents caused by structural defects or failure to maintain adequate structure. Electrical risk to the public. Injury to an operative working in the highway due to incomplete records, particularly underground cable records.
Business/ Financial risk	Legal proceedings for failing in duty of care. Increase in compensation payouts due to a rising number of accidents and third party claims. Fines imposed on the authority as a result of legal proceedings. Reduction in the net book value of the asset. Higher un-metered energy charges
Corporate Image	Ineffective or defective lighting reflecting on the overall image of the Council.
Environmental	Higher energy use and light spillage from old equipment.

Asset Base and Characteristics

7. The street lighting asset group comprises street lighting, feeder pillars and cabling that is owned and maintained by West Berkshire Council. A summary of the street lighting asset is summarised in Tables 4, 5, 6 and 7 below.

Table 4 - Column Type

Column Material	Number
Aluminium (Cast)	1715
Aluminium (Extruded)	3828
Aluminium (Sheet)	122
Cast Iron	7
Concrete	818
Galvanised Steel	2755
Painted Steel	2928
Pole Bracket	95
Subway Lighting	157
Wall Brackets	67
Total	**12492**

Table 5 - Lamps

Lamp Type	Wattage	Number
CDO	50	10
	70	87
	100	38
	150	36
	250	3
Compact Fluorescent	40	41
	55	4
Cosmopolis	45	26
	60	19
Fluorescent	20	10
	40	1
	70	108
LED	21	20
	29	153
	31	6
	37	45
	42	34
	61	17

Table 5 - Lamps (continued)

Lamp Type	Wattage	Number
MBFU	80	4
SON	50	434
	70	1567
	100	1064
	150	1610
	250	452
	400	1
SOX	35	5753
	55	256
	90	435
	135	346
	180	52
Total		**12632**

Table 6 - Controls

Control Type	Number
Time switch – all night	3907
Time switch – part night	0
Photo cell – all night	8483
Photo cell – part night	38
24 hour operation	139
Dimmed equipment	0
Total	**12632**

Table 7 - Column Age

Column Material	Age (Years)	Number of Columns by Mounting Height						
		< 5m	5m	6m	8m	10m	12m	Total
Aluminium (Cast)	0 – 20		17					17
	21 - 30		843					843
	31 – 40		822	3				825
	Over 40		30					30
	Total	0	1712	3				1715
Aluminium (Extruded)	0 – 20	2	1614	432	416	497	101	3062
	21 - 30		754					754
	31 – 40		10				1	11
	Over 40		1					1
	Total	2	2379	432	416	497	102	3828

Table 7 - Column Age (continued)

Column Material	Age (Years)	Number of Columns by Mounting Height						
		< 5m	5m	6m	8m	10m	12m	Total
Aluminium (Sheet)	0 – 20							
	21 - 30					37	35	72
	31 – 40					50		50
	Over 40							
	Total					87	35	122
Cast iron	0 – 20							
	21 - 30							
	31 – 40							
	Over 40	2	5					7
	Total	2	5					7
Concrete	0 – 20		3					3
	21 – 30		50					50
	31 – 40		416					416
	Over 40		349					349
	Total		818					818
Galvanised Steel	0 – 20	23	913	111	507	164	17	1735
	21 – 30		319	59	125	21	0	524
	31 – 40		214	13	44	124	45	440
	Over 40		48		8			56
	Total	23	1494	183	684	309	62	2755
Painted Steel	0 – 20	4	135	90	306	281	72	888
	21 – 30		38	91	270	36	5	440
	31 – 40		209	39	124	351	32	755
	Over 40		716		40	72	17	845
	Total	4	1098	220	740	740	126	2928
Pole Bracket	0 – 20		9					9
	21 - 30							
	31 – 40		5					5
	Over 40		75	6				81
	Total		89	6				95
Subway lighting	0 – 20	147						147
	21 - 30							
	31 – 40	10						10
	Over 40							
	Total	157						157

Table 7 - Column Age (continued)

Column Material	Age (Years)	Number of Columns by Mounting Height						
		< 5m	5m	6m	8m	10m	12m	Total
Wall Brackets	0 – 20	7	7	1	10	10		35
	21 – 30		3			1		4
	31 – 40	1	5	2	5	1		14
	Over 40		6	5	3			14
	Total	8	21	8	18	12		67
	Total	**196**	**7616**	**852**	**1858**	**1645**	**325**	**12492**

Asset Condition and Assessment

8. To establish the condition of the street lighting assets and the extent to which the desirable levels of service are met, the routine inspections and tests detailed in Table 8 below are carried out. Whilst there are no current measures for serviceability, this dimension will be developed over the course of this HAMP.

Table 8

Inspection/Test	Frequency
Clean, inspect and change lamp	2 & 4 years dependant on lamp type
Structural test	6 years
Electrical test	6 years
Visual safety check	Every visit
Scouting to check light operational	28 day cycle

9. Whilst there are no current national indicators for street lighting, the following Best Value Indicators have been retained as local indicators for reporting performance and for setting service levels:

- BVPI215a: Average number of days to repair a street light under the control of the Local Authority.
- BVPI98: The percentage of street lights not working as planned under the control of the Local Authority.

A summary of results for the period 2006 to 2010 is shown in Table 9 below.

Table 9

Indicator/Year	2006/07	2007/08	2008/09	2009/10	2010/11
LI215a (formally BV215a)	4.24	5.90	3.87	3.75	6.22
L98 (formally BV98)	0.89	1.01	1.01	1.04	1.17

Structural Testing and Inspection

10. Analysis has shown that different types of lighting columns have different structural problems. All street lighting columns are regularly inspected and specific structural testing has been undertaken on steel lighting columns. Visual inspections of concrete and aluminium columns are carried out at every visit as are brackets mounted on Electricity Board wooden poles, bridges and other buildings and structures not owned by the Council. Maintenance of the structure itself is the responsibility of others.

11. Steel street lighting columns over 12 years of age are tested every 6 years. Eddy current material thickness testing is used along with ultra sonic testing for the swage joint.

12. From the data obtained from these tests, colour based condition indicators are applied to the data to highlight the severity of each defect as detailed in Table 10 below.

Table 10

Colour Code	Loss of Thickness	Visual Inspection	Outcome
Red	> 50 %		Immediate replacement of column
High Amber	11 – 50 %	Damage assessed visually	Next test and visual inspection set for 3 years
Low Amber	0 – 10%	Damage assessed visually	
Green	0 – 10 %		Next inspection set for 6 years

13. The results of recent testing are summarised in Table 11 below:

Table 11

Date	Total	Red		High Amber		Low Amber		Green	
		Units	%	Units	%	Units	%	Units	%
2008/09	2029	14	0.69	59	6.60	1182	58.26	774	38.15
2009/10	133	2	1.50	30	22.56	14	10.53	87	65.41
2010/11	2500	86	3.44	123	4.92	610	24.4	1681	67.24
Totals	4662	102	2.19	212	30.57	1806	38.74	2542	54.53

14 From the available asset data, it has been established that steel columns have the highest percentage failure rate where the primary cause of failure is through a loss of wall thickness to the root section up to ground level as a result of corrosion.

15 In adopting the principles of asset management, initial consideration would be given to the high ambers in order to prevent these assets from deteriorating further and entering the red. However, because of the high safety risk associated with column failure, it is the Council's current policy to tackle the reds before the high ambers and budgets are set accordingly. From Table 10 above, the current replacement rate for red columns lies between 0.69% to 3.44%. (testing period 2008/9 to 2010/11).

16. It has been established that concrete lighting columns vary in structural condition according to manufacturer and this is taken into account when the routine visual inspections are carried out. Because of the destructive and disruptive nature of the standard load test, visual inspections are the preferred method of identifying column condition using the green/amber/red condition criteria.

17. Aluminium columns also vary in structural condition according to the type of construction, for example, columns with a cast aluminium base suffer from corrosion of the underground base section and cracking of the casting. Columns of a fabricated sheet construction suffer from corrosion of the underground base section and columns of an extruded construction have to date shown no significant structural defects. With this knowledge, it has been possible to apply the concrete column approach to assess condition.

18. A visual assessment of the structural condition of each lighting column is carried out on every visit. Lighting columns thought to be structurally unsound are further assessed and may be subject to an emergency "make safe" or are replaced. The visual inspection process will continue to be developed in accordance with recommendations given within TR22 Managing a Vital Asset: Lighting Supports over the course of this HAMP.

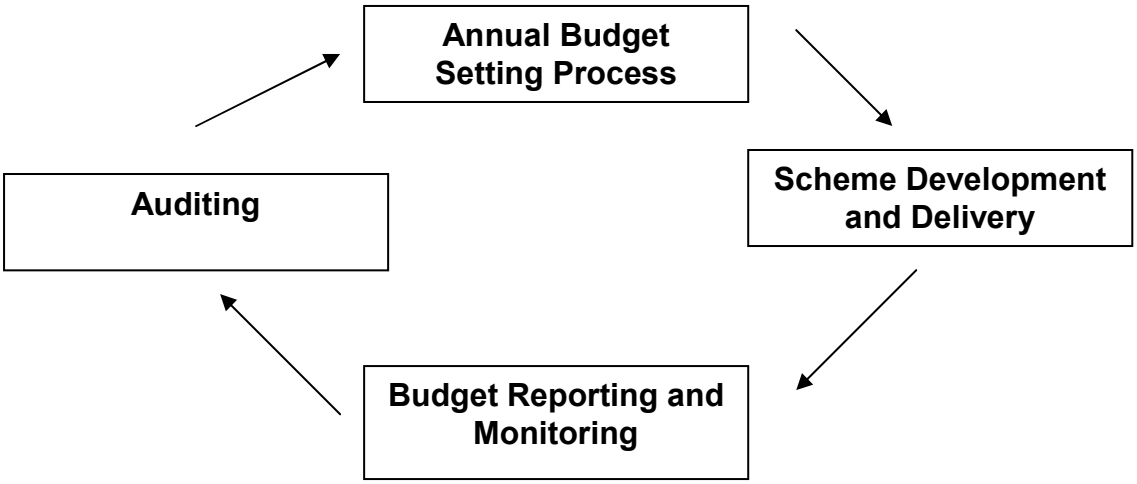
Electrical Testing

19. Electrical testing of each lighting column, feeder pillar and council-owned cable network is carried out every six years in accordance with the IEE regulations. By applying the red/amber/green condition methodology, the test results are prioritised in order of importance and programmed accordingly subject to the nature and severity of the defect and the inherent level of risk.

Financial Management, Investment and Programming.

20. 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.

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



22. 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.

23. 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.

24. 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 the 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.

25. 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. This review 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.

26. From the asset data, it has been possible to identify the level of funding required to meet the set service levels and this will be developed and refined in accordance with the recommendations of TR22 Managing a Vital Asset: Lighting Supports and Well-lit Roads – Code of Practice for Highway Lighting Management 2004.

27. Gross replacement cost and the depreciation cost have been calculated using the Code of Practice on Transport and Infrastructure Assets 2010 calculation template and standard rates and this will be developed in line with the Code of Practice recommendations over the course of this HAMP.

Maintenance Options

28. The limited number of types of lighting installation and ways in which they deteriorate, lead to a relatively short list of maintenance treatments. The key assets are summarised in Table 12 below. Short-term treatments are dictated by safety and serviceability requirements. Decisions on when to intervene with medium and long-term treatments are determined in accordance with the asset management strategy.

Table 12

Asset Type	Material	Treatment Type	Service Life Years	Height m	Unit Cost £
Columns	Steel**	Painting	7	All	50
		Replacement	40	5.0	750*
				6.0	800*
				8.0	1050*
				10.0	1350*
				12.0	1450*
	Concrete**	Replacement	40	5.0	750*
	Aluminium**	Replacement	40 +	5.0	750*
				6.0	800*
				8.0	1050*
				10.0	1350*
				12.0	1450*
Lamps****	SOX	Replacement	4		16.62
	SON	Replacement	4		5.60
	CDO	Replacement	3		22.62
	COSMO	Replacement	3		22.62
	Fluorescent	Replacement	2		2.09

Table 12 (continued)

Asset Type	Material	Treatment Type	Service Life Years	Height m	Unit Cost £
Lanterns***	LED	Replacement	25		500.00
	SOX	Replacement	25		250.00
	SON	Replacement	25		250.00
	CDO	Replacement	25		250.00
	COSMO	Replacement	25		250.00
Electrical components	Under the present contract, electrical components are replaced as part of an annual maintenance lump sum. In addition, the lanterns include for all the main components apart from the isolator and photocell. Compared to the key assets, their replacement cost is small and therefore have been included within the replacement cost of a column.				

* *including DNO service transfer cost*

* *concrete columns are replaced with extruded aluminium where design parameters allow.*

*** *lanterns are replaced with LED equivalents where designs parameter allow. Where it is not possible to fit an LED equivalent, the lantern will be replaced on a like for like basis. All replacement lanterns include lamps.*

**** *To cover the various wattages, an average cost of a lamp has been calculated for valuation/assessment purposes.*

Column Painting

29. In 2002, the Council introduced a standard where extruded aluminium columns would be used for new installations and to replace existing columns. The benefits of using aluminium columns are:

- To reduce routine maintenance costs
- To reduce the whole life cost of the asset
- To improve passive safety

30. Over time, aluminium columns will replace the current stock of steel columns, however, in managing the current stocks, unless painting is required for aesthetic reasons, the Council has adopted a non painting policy for the following reason. Whilst painting will arrest external corrosion, there is sufficient evidence to indicate that internal corrosion affects structural integrity and therefore painting of the exterior will not guarantee an extension to the service life of a column.

Lamp Replacement

31. Most lamp types have an expected service life between 2 and 4 years. In order to meet the set service levels, it is deemed more economical to replace lamps at the recommended intervals in order to minimise expensive reactive replacements, for example, control gear and lamp failure.

Strategy for Minimising Whole Life Cost

32. An asset's whole life cost includes the direct costs of works, design, supervision, testing and inspections. The main factors which will affect the whole life cost of an individual installation are:

- Specification and quality of materials and equipment.
- Degree and type of damage and degradation.
- Age of components.
- Speed and quality of response to damage and degradation.
- Timing of intervention and quality of medium and long term treatments.

33. The Council's strategy for maintaining street lighting maybe summarised as follows:

- To deliver a high standard of initial installation.
- To specify high quality materials and equipment.
- To carry out routine electrical and structural testing.
- To inspect lighting systems on a regular basis such that defects are identified within a reasonable period.
- To 'scout' for out of service lighting.
- To undertake reactive maintenance works expeditiously to prevent short term deterioration and keep in a safe condition.
- To maintain an up-to-date inventory of lighting stock to facilitate asset management and enable competitive purchase of energy.
- To bulk-change lamps to maintain light output at satisfactory levels.
- To replace end of service life columns.

34. The above strategy is based on good practice and will continue be developed over the course of this HAMP in accordance with national guidelines. In carrying out routine inspections, the Council is able to monitor the condition and the rate of degradation of the key components and as a consequence, deliver timely and cost effective treatments.

Options and Targets Within The Management Strategy

35. In managing the street lighting asset, the Council's policy is to first address columns that have been classified as being red followed by those that have been classified as high amber.

36. Under the current strategy, columns that have either failed a structural test, or have failed a visual inspection (condition RED) are replaced immediately and budgets have been set accordingly. Columns that have been deemed as being close to failing the structural test (deemed as HIGH AMBER) are then programmed for replacement in order of severity on a rolling three year programme as summarised in Table 13 below.

Table 13

	2010/11*	2011/12	2012/13	2013/14**	2014/15	2015/16
RED 5 and 6m Steel	**X**	**-**	**-**	**-**	**-**	**-**
HIGH AMBER 5 and 6m Steel	**X**	**X**	**X**	**-**	**-**	**-**
RED 8, 10 and 12m Steel	**-**	**-**	**-**	**X**	**-**	**-**
HIGH AMBER 8, 10 and 12m Steel	**-**	**-**	**-**	**X**	**X**	**X**
RED Aluminium (Visual Inspection)	**X**	**X**	**X**	**X**	**X**	**X**
RED Concrete (Visual Inspection)	**X**	**X**	**X**	**X**	**X**	**X**
RED Other (Visual Inspection)	**X**	**X**	**X**	**X**	**X**	**X**

* *Following the testing of the 5m and 6m steel columns*
** *Following the testing of the 8m, 10m and 12m steel columns*

37. As previously stated, the current column condition indicator calculation will be refined over the course of the HAMP using the Council's WDM asset management system and the guidance given within TR22.

38. To reduce the Council's carbon footprint and reduce energy and maintenance costs, focus is given to the replacement of aged and inefficient lanterns, lamps and control gear. Inefficient lanterns are being replaced with energy efficient LED luminaires on the existing column where residual service life of the column allows. LED luminaires provide improved quality 'white' light and have an expected useful life of 25 years. Currently 70w SON lanterns are being targeted for replacement as this gives the greatest energy saving.

Risks

39. 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 14 and 15 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 HAMP document.

Table 14

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 15

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