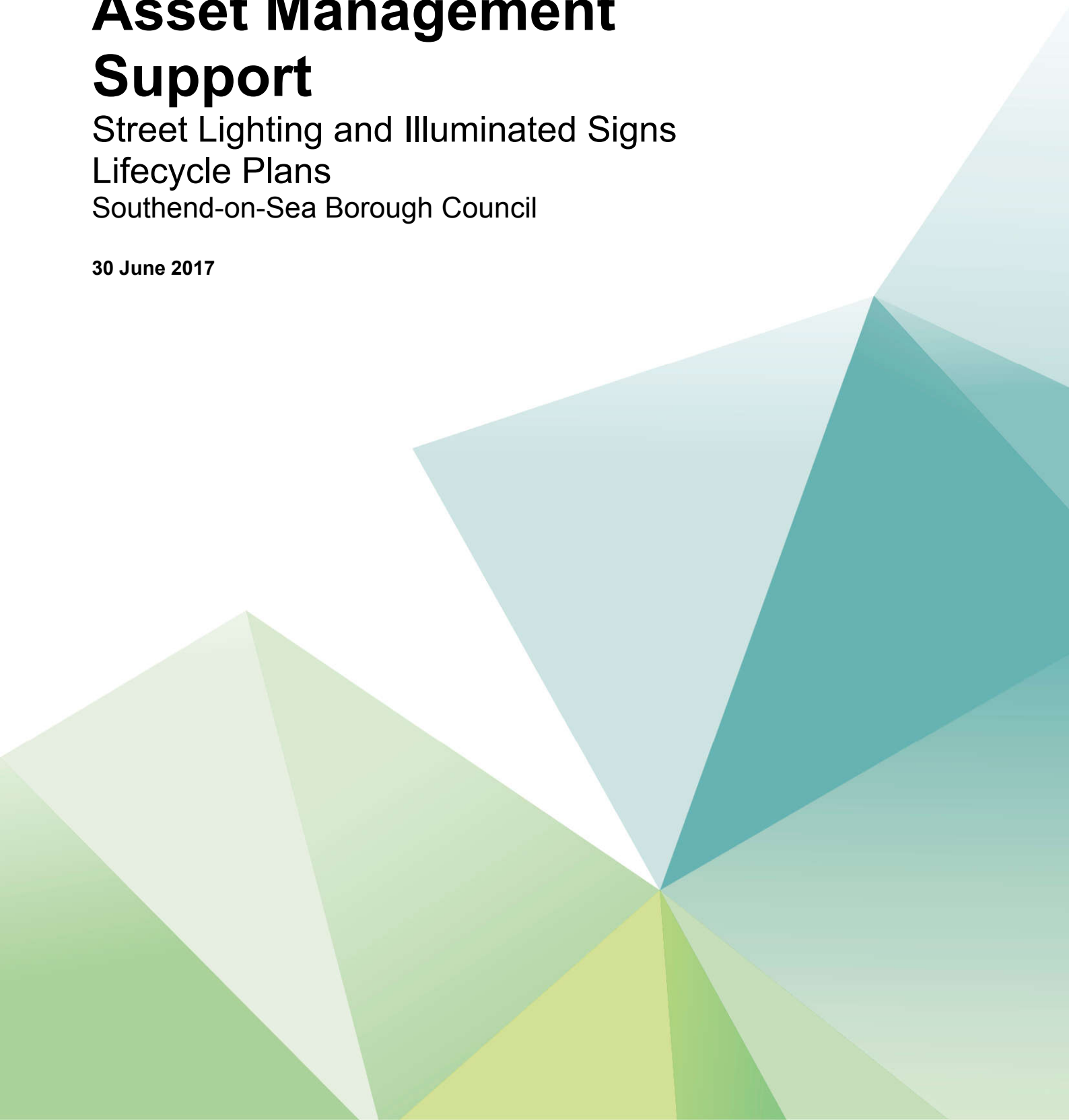


# **Southend-on-Sea Council Asset Management Support**

Street Lighting and Illuminated Signs  
Lifecycle Plans  
Southend-on-Sea Borough Council

30 June 2017



## Notice

This document and its contents have been prepared and are intended solely for Southend-on-Sea Borough Council's information and use in relation to Street Lighting and Illuminated Signs Lifecycle Planning.

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# Executive summary

Life Cycle Planning (LCP) driving planned maintenance and renewals programmes supports the effective management of highway assets, improving safety through prioritising interventions, improving serviceability through more effective and timely maintenance and reducing the whole life cost of managing the asset.

LCP is most effective when comparing several scenarios so that the approach can be optimised to the available budgets, and is supported by a value management process to ensure other network risks are adequately taken into consideration when finalising the works programme, including value engineering and delivery optimisation.

To achieve Band 3 Incentive Funding, also requires authorities to undertake LCP on all critical assets, which have been categorised as carriageways, footways & cycleways, structures, street lighting and traffic signals. Southend-on-Sea Council have been conducting LCP for carriageways and footways for several years, however it has never previously undertaken them on the Street Lighting assets.

For Street Lighting & Illuminated signs three scenarios were analysed using the HMEP Ancillary Assets Lifecycle Planning toolkit,

- Budget Constraint,
- Repair on Failure and
- Service Life;

The **Budget Constraint** scenario restricts the budget to the existing level of capital funding of £150,000 per annum;

The **Repair on failure** scenario has an unrestricted budget, but maintenance will only be undertaken on failed assets

The **Service life** scenario has an unrestricted budget and replaces the asset when the asset reaches the manufacturers design life.

Analysis indicates that for the **Budget Constraint** scenario, the present levels of funding would be insufficient to prevent the decline in the general condition of the lighting stock, which could increase the likelihood of failures, and the present budget would be insufficient to replace all failed assets from 2035/36 onwards.

The **Replace on Failure** scenario also indicates that there would be a deterioration in condition of the general lighting stock, and that an average annual budget of £144,364 would be required to replace the failed assets. Both scenarios would require Southend-on-Sea Council to implement a robust inspection/survey regime (visual inspections plus electrical & structural testing), and a risk-based/data driven approach to managing the street lighting & illuminated signs stock, as advocated by the Well Managed Highway Infrastructure Code of Practice.

**It must also be considered that the Replace on Failure scenario implicitly increases the stock on the network that is likely to rapidly fail and the Authority's reputational and third party liability risks should be very carefully considered. There will also be increased operational costs from this approach which requires an ad-hoc replacement of assets across the network.**

The **Service Life** scenario indicates that an initial investment of approximately £2 million would be required to replace the remaining 4,000 concrete columns, which are now well passed their original 30-year design life, and would require roughly £170,000/year budget to maintain the service level of lighting columns and lanterns over 30 and 15 years respectively. There may however be operational delivery efficiencies that can be derived from this approach through the planned replacement of adjacent assets along the network.

Based on the data available, Southend-on-Sea Council have the following available options:

1. Manage the decline in condition of the street lighting & illuminated signs stock, through use of regular inspections/surveys (visual assessments and electrical & structural testing) and a well-documented risk assessments based on the data driven approach advocated by Well Managed

Highway Infrastructure Code of Practice. As the budget, constrained scenario demonstrates, this approach becomes unsustainable after 2035/36.

2. Review annual highway infrastructure asset funding based on LCP across all asset groups to determine the optimum levels based on LCP and network needs (Highway Infrastructure Asset Management Guidance Document recommendation 6 and Well Managed Highways Infrastructure Code of Practice recommendation 29 & 30).
3. Increase Street Lighting & Illuminated signs budget or investigate other options to identify further investments, such as Department for Transport Challenge Fund, Prudential Borrowing or other funding streams.

It should be noted that the budgets and costs have not been inflated or discounted as part of this analysis, and therefore are based on individual asset costs which would benefit from further reviews of overall operational costs.

# 1. Introduction

Southend on Sea Council (SC) have an aspiration to improve the management of their highway infrastructure assets and become a Band 3 incentive fund authority, as determined by the annual self-assessment questionnaire submission required by the Department for Transport (DfT) each autumn.

To reach the aspired Band 3 funding levels, areas for improvement were investigated and it was identified that SC already conducted Lifecycle Planning (LCP) across some of the critical assets, such as carriageways, however it was identified that expanding LCP across all critical assets would assist SC achieve Band 3 funding levels.

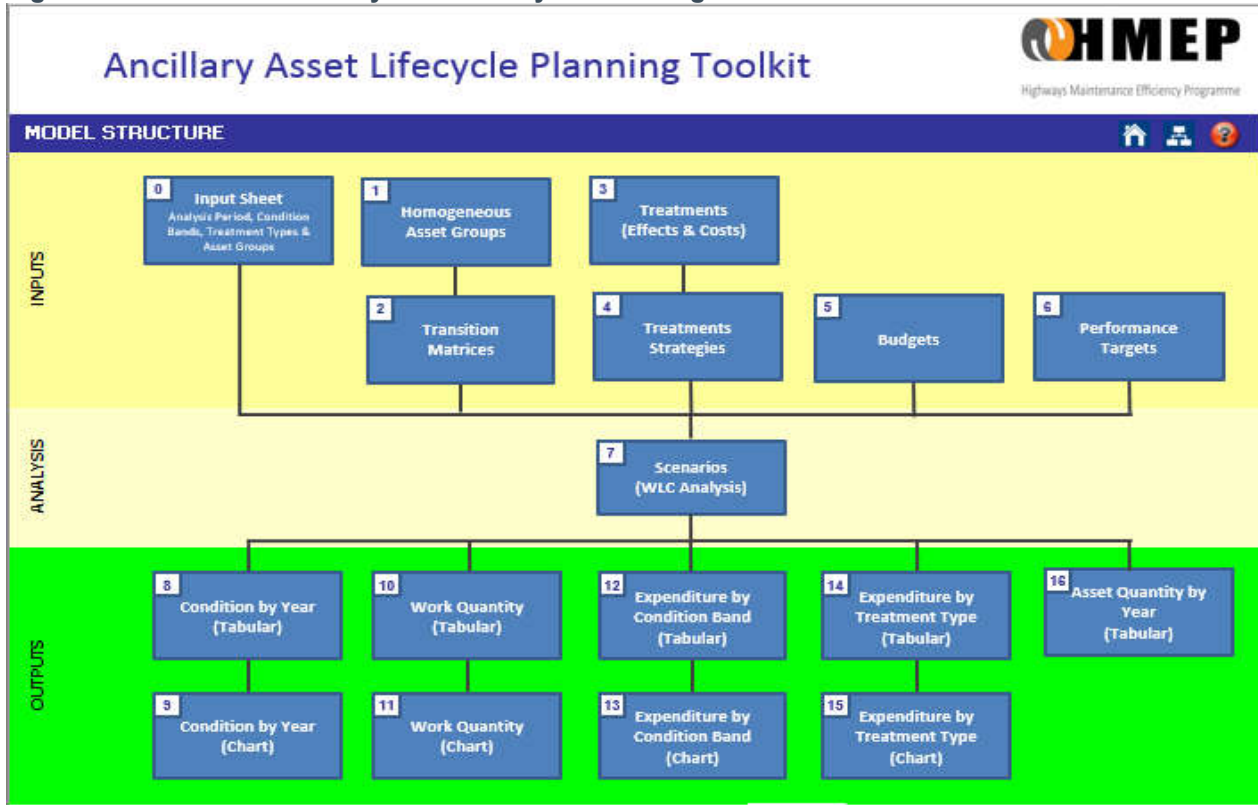
Atkins has been supporting SC, as a critical friend, in developing their asset management service and were commissioned to support SC with developing the LCP for Street Lighting and Illuminated Signs.

# 2. Methodology

The street lighting and illuminated signs LCP has been conducted utilising the HMEP Ancillary Asset LCP Toolkit. This Toolkit is a high-level network tool which provides an overview of the impact of different scenarios across the network and asset type.

Figure 2-1 provides an overview of the HMEP Ancillary Asset Lifecycle Planning toolkit model structure:

Figure 2-1 HMEP Ancillary Asset Lifecycle Planning Toolkit Model Structure



## 2.1. Data

SC has provided Atkins with asset data (excel file format) containing the following information:

1. Street Lighting and Illuminated Sign asset inventory
2. Street Lighting Schedule of rates for maintenance

Appendix A includes an overview of the information received from SC.

## 2.2. Data Review

The data received from SC was reviewed to identify any gaps in the data, from which an exception report was produced and issued. Upon receipt of the exception report, SC provided additional information regarding the data gaps, with clarification of the projected annual budget and the expected service life of each asset type. All information received from SC has been utilised in the development of the lifecycle plans.

## 2.3. HMEP Ancillary Asset Lifecycle Planning Toolkit

The HMEP Ancillary LCP Toolkit has been used to undertake the LCP analysis; the default toolkit is empty of data, therefore it had to be setup and calibrated using our experience and the information received from SC.

The following sub-sections describe the parameters and settings employed in the HMEP Ancillary LCP Toolkit based on experience and the information received.

### 2.3.1. Asset Groups

Asset Groups are an important part of the HMEP Ancillary LCP Toolkit; the asset groups are the foundation of the LCP, allowing asset groups properties to be differ, such as replacement costs, deterioration rates and treatment regime.

Based on the information provided by SC, 22 unique asset groups have been generated, of which 18 relate to the street lighting columns based on material and height. The remaining four are the wall mounted street lighting, pole mounted street lighting, street lighting lanterns, and illuminated sign lanterns; all have a differing lifecycles and costs.

A full list of the asset groups is contained in Append B.

### 2.3.2. Condition Data

In the absence of detailed installation dates, SC provided Atkins with age ranges of the installation of the street lighting and illuminated signs, based on type and material. The HMEP Ancillary Lifecycle Planning Toolkit allows a maximum of ten condition bands; condition bands were determined by evenly distributing the bands along the installation and expected design life age range for each asset type, plus including two additional bands for “Beyond Expected Life” (BEL) and “Failure”. Assets are not expected to fail once they surpass their design life, in many cases assets can be in service long time after; therefore, the BEL band is used for these assets. However further development of BEL band is required to establish an industry standard empirical BEL factor that can be applied to the Manufacturers service life. The “Failure” band is used for assets which require replacement after inspection or in the rare instances of failure.

SC has an on-going LED replacement programme on all Street Lighting and as part of this programme, it is anticipated that all cast iron columns will be replaced with equivalent galvanised steel columns, and approximately 10% of the concrete column stock will also be replaced by the end



of 2017/18 financial year. However, for concrete columns, other mitigations should be considered such as steel casing of key elements/joints to maintain the safety of the ageing lighting columns.

Additionally, as part of the LED replacement programme, SC are reviewing the illumination of signs against the latest illuminated sign requirements with the aim of reducing the number of illuminated signs; therefore, if illumination of a sign is no longer necessary, the lighting will be removed. If requirements specify the sign should remain illuminated, the existing lighting will be upgraded to LED; SC has assumed that only 10% of the existing illuminated signs will remain as illuminated after the review.

Appendix B provides the distribution of condition across each asset group and Appendix C contains additional information regarding the Condition Bands.

### 2.3.3. Treatments, Effects and Costs

The desired treatment is to replace concrete and cast iron columns with galvanised steel tubular columns at the same height and lamp, with the equivalent LED solution; replacement costs have been derived from the schedule of rates supplied by SC. Therefore, the effects of the works would replace the asset and reset the condition to an “as new” condition.

Appendix D provides information regarding the treatments and costs for each asset group.

#### 2.3.3.1. Inflation

It should be noted that the HMEP Ancillary Lifecycle Planning Toolkit does not take into consideration inflation or Net Present Value; therefore, all treatment costs have not been inflated or discounted over the 25-year analysis period.

### 2.3.4. Transition Matrix

The HMEP Ancillary Lifecycle Planning Toolkit utilises a transition to model the deterioration of the carriageway condition. Transition matrix deteriorates the data by transferring a percentage of one condition band into one or more condition bands. For example, assume that 5% of ‘Very Good’ will deteriorate into ‘Good’ each year, therefore if there are 100 galvanised steel columns of ‘Very Good’ condition carriageway in year 0, assuming no deterioration of the Good condition band, then:

**Table 2-1 Transition Example**

Year	Very Good Condition Area	Good Condition Area
0	100	-
1	95	5
2	90.25	9.75
3	85.74	14.26

Appendix E contains a copy of the transition matrix utilised for the analysis.

### 2.3.5. Scenarios

The two scenarios “budget constraint” and “Replace on Failure” taken from the “Life Cycle Planning for Critical Assets and Highway Infrastructure Asset Management Plan” proposal have been analysed. Also, an additional “Service Life” scenario has been analysed. Table 2-2 below provides a description of each scenario and the treatment strategy utilised:



**Table 2-2 Scenario Descriptions**

Scenario Name	Scenario Description	Treatment Strategy
Budget Constraint	Analysis is constrained to a budget; the budget agreed was based on existing levels of funding of £150,000 (± £5,000) capital maintenance per annum.	<ol style="list-style-type: none"> <li>1. Replace structurally failed Street Lighting columns</li> <li>2. Replace failed Lanterns</li> <li>3. Replace Concrete Columns</li> </ol>
Replace on failure	Analysis is unrestrained, but will only replace assets when they are deemed to have failed.	<ol style="list-style-type: none"> <li>1. Replace structurally failed Street Lighting columns</li> </ol>
Service Life	Analysis is unrestrained, but will only replace assets when the asset has reached its design/service life.	<ol style="list-style-type: none"> <li>1. Replace Street Lighting columns that have reached or surpassed Service Life.</li> </ol>

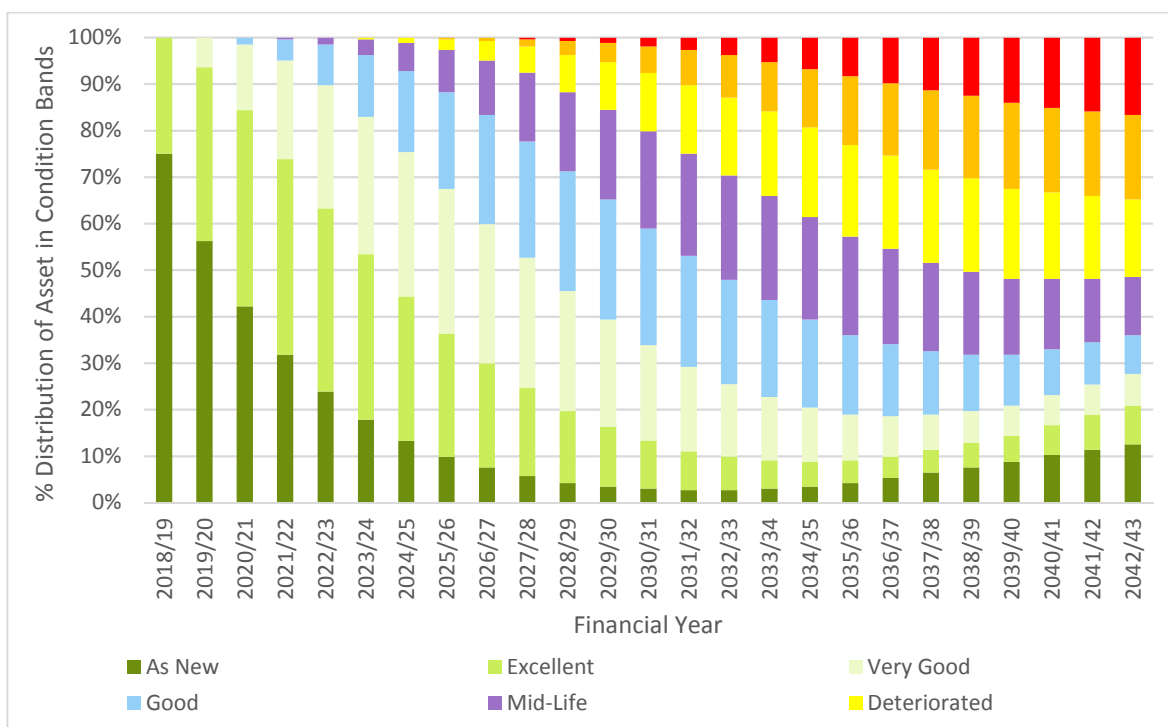
### 3. Outputs

The HMEP Ancillary Lifecycle Planning toolkit provides information regarding the expenditure and the projected asset condition profiles over the 25 years’ analysis period. This section reports the outputs from the HMEP Ancillary Asset Lifecycle Planning toolkit for the two scenarios “Budget Constraint” and “Replace on failure” highlighted in section 2.3.5. All analysis has been completed utilising the parameters specified in Section 2 of this report and no inflation or discounts have been applied to the costs.

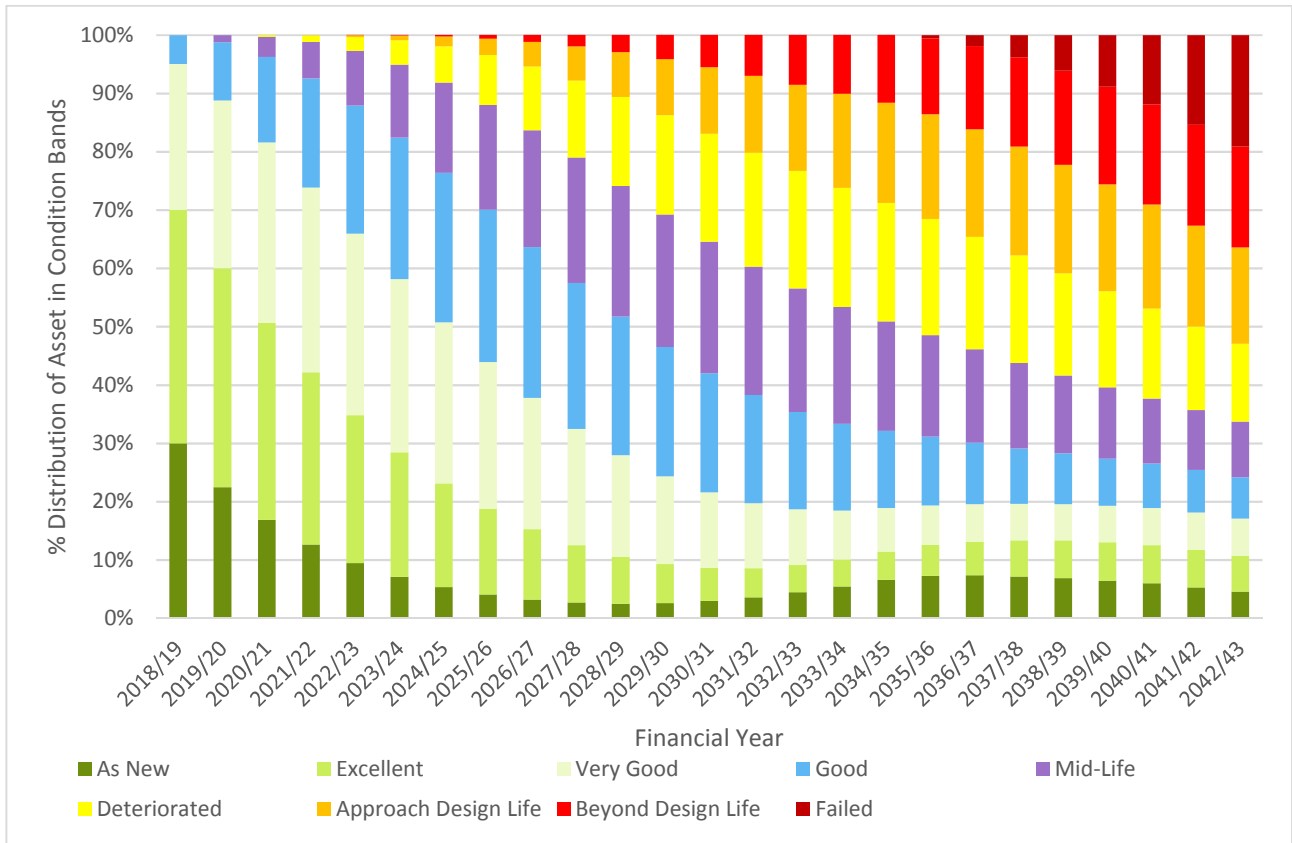
#### 3.1. “Budget Constraint” Scenario

Figures 3-1 to 3-4, below, provide the Condition Band profiles for the Street Lighting Columns, Street Lighting Lanterns, Illuminated Signs and Wall & Post bracket mounted lighting.

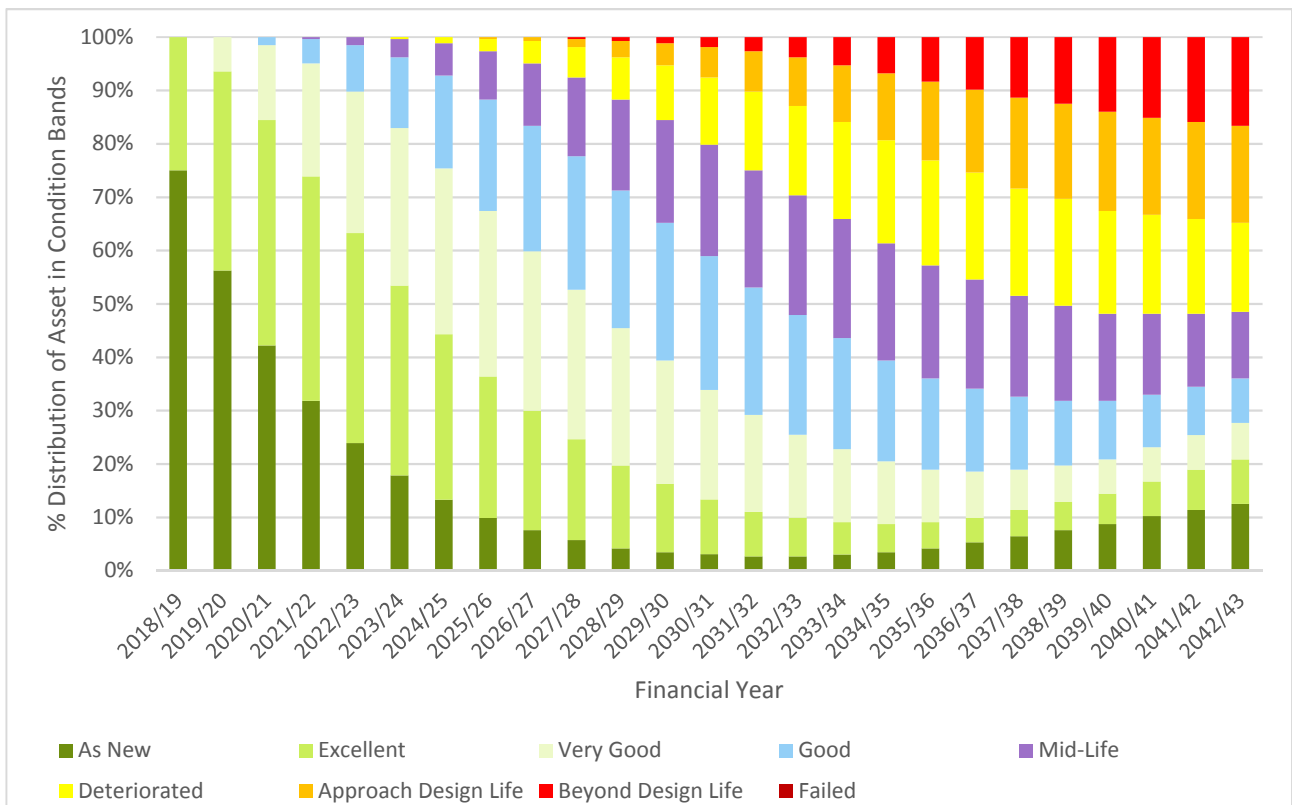
**Figure 3-1 % Distribution of Assets in Condition Bands – Street Lighting Columns**



**Figure 3-2 % Distribution of Assets in Condition Bands – Street Lighting Lanterns**



**Figure 3-3 % Distribution of Assets in Condition Bands – Illuminated Signs**



**Figure 3-4 % Distribution of Assets in Condition Bands – Wall & Post Bracket Replacement**

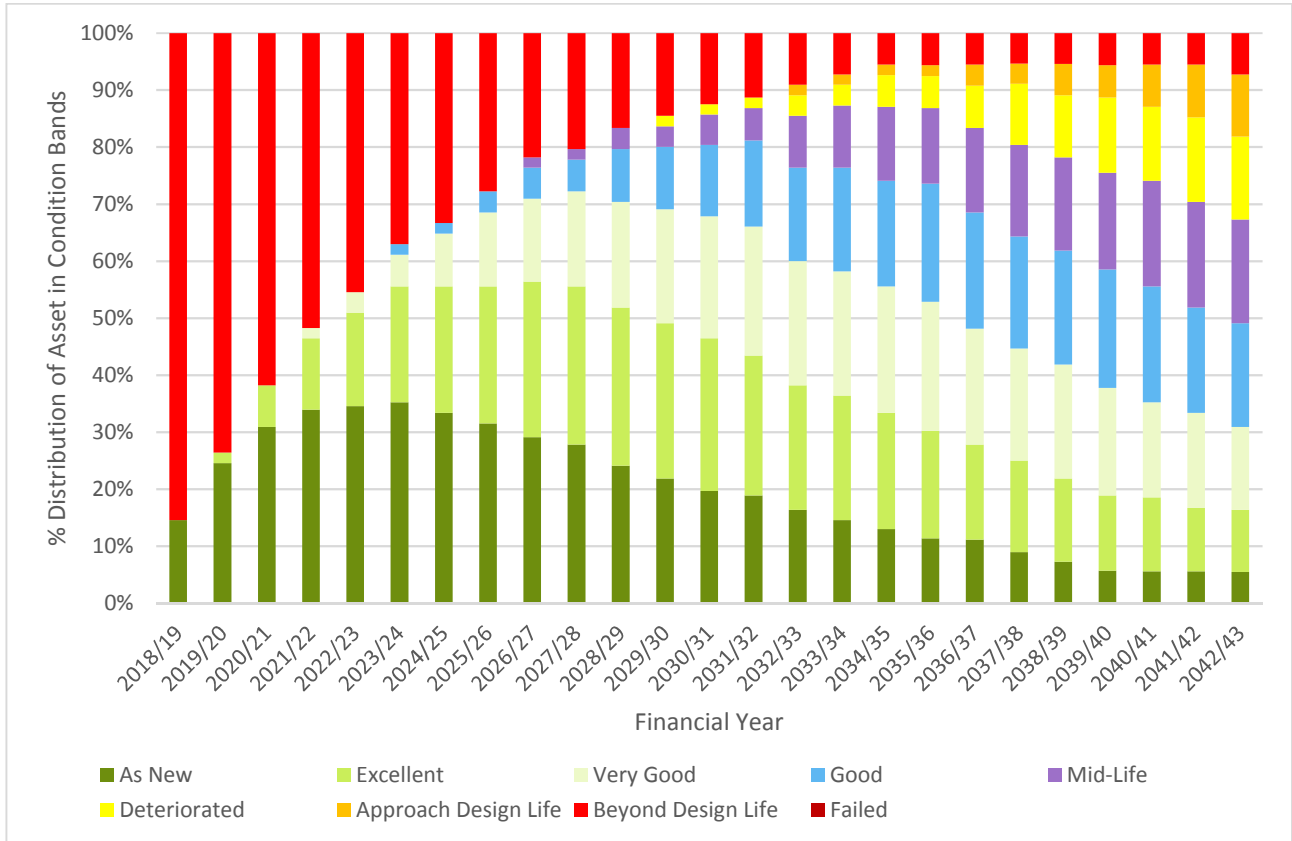
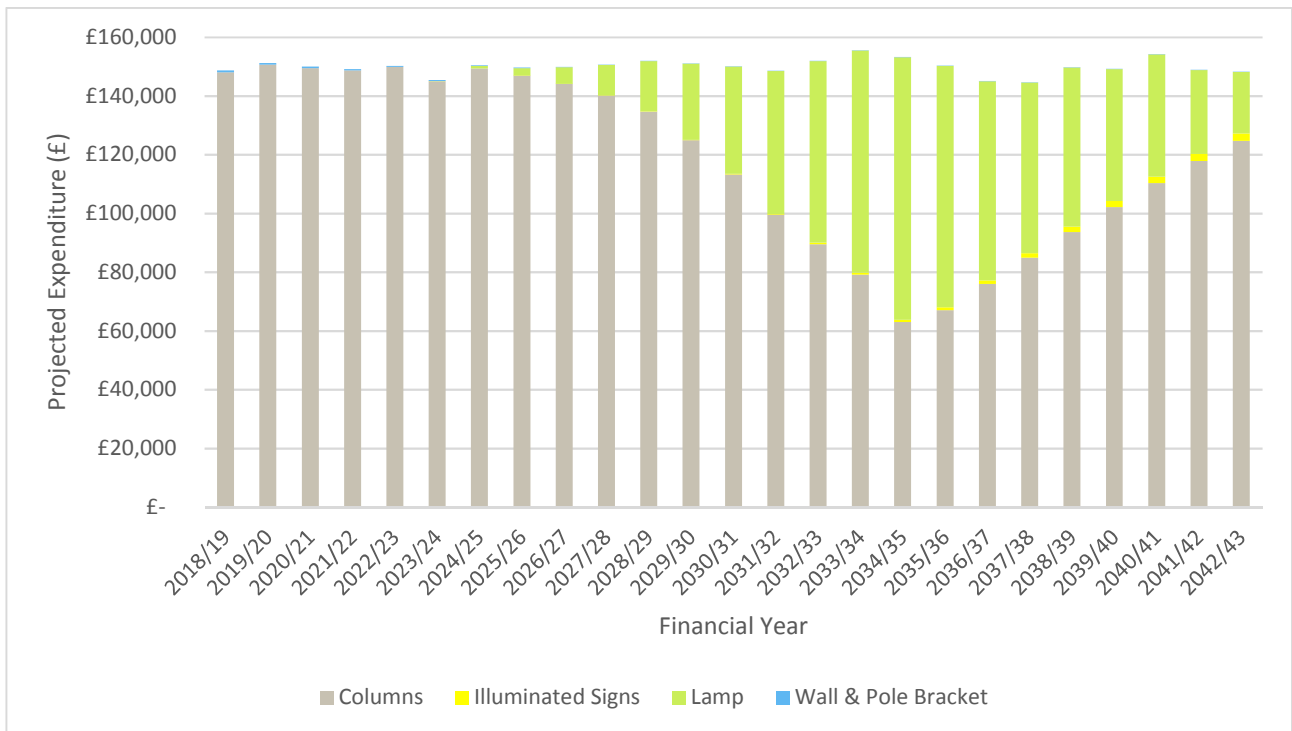


Figure 3-5, below, provides the expenditure profile for the “Budget Constraint” scenario; the average annual expenditure is £149,913 over the 25-year analysis period.

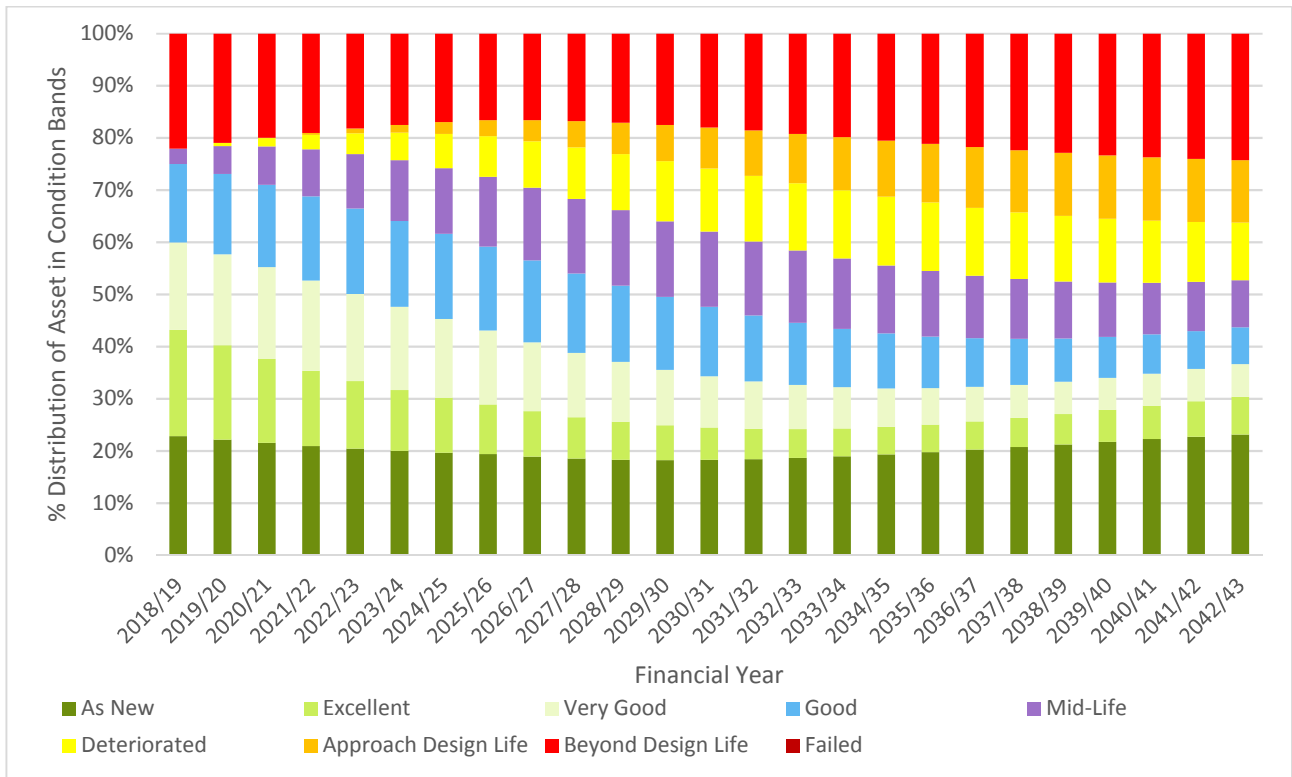
**Figure 3-5 All Asset Projected Expenditure Profile – “Budget Constraint” scenario**



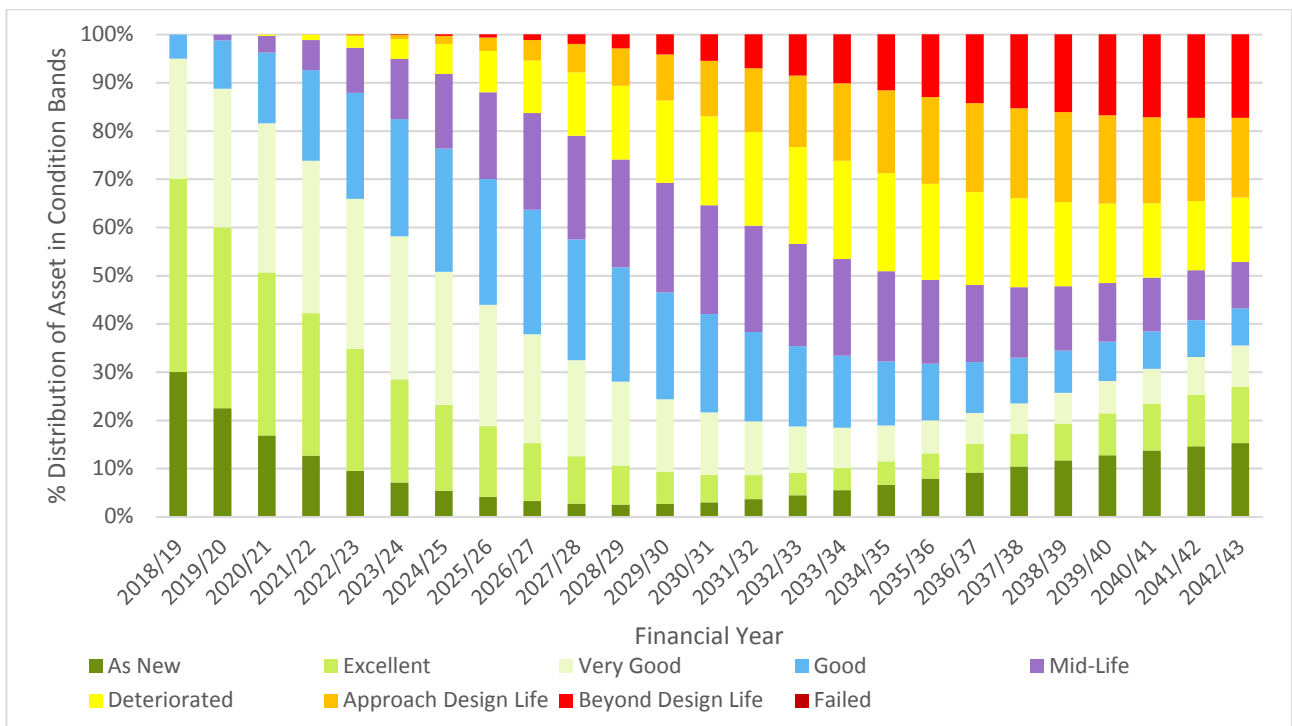
### 3.2. “Replace on failure” Scenario

Figures 3-6 to 3-10 below provide the Condition Band profiles for the Street Lighting Columns, Street Lighting Lanterns, Illuminated Signs and Wall & Post bracket mounted lighting.

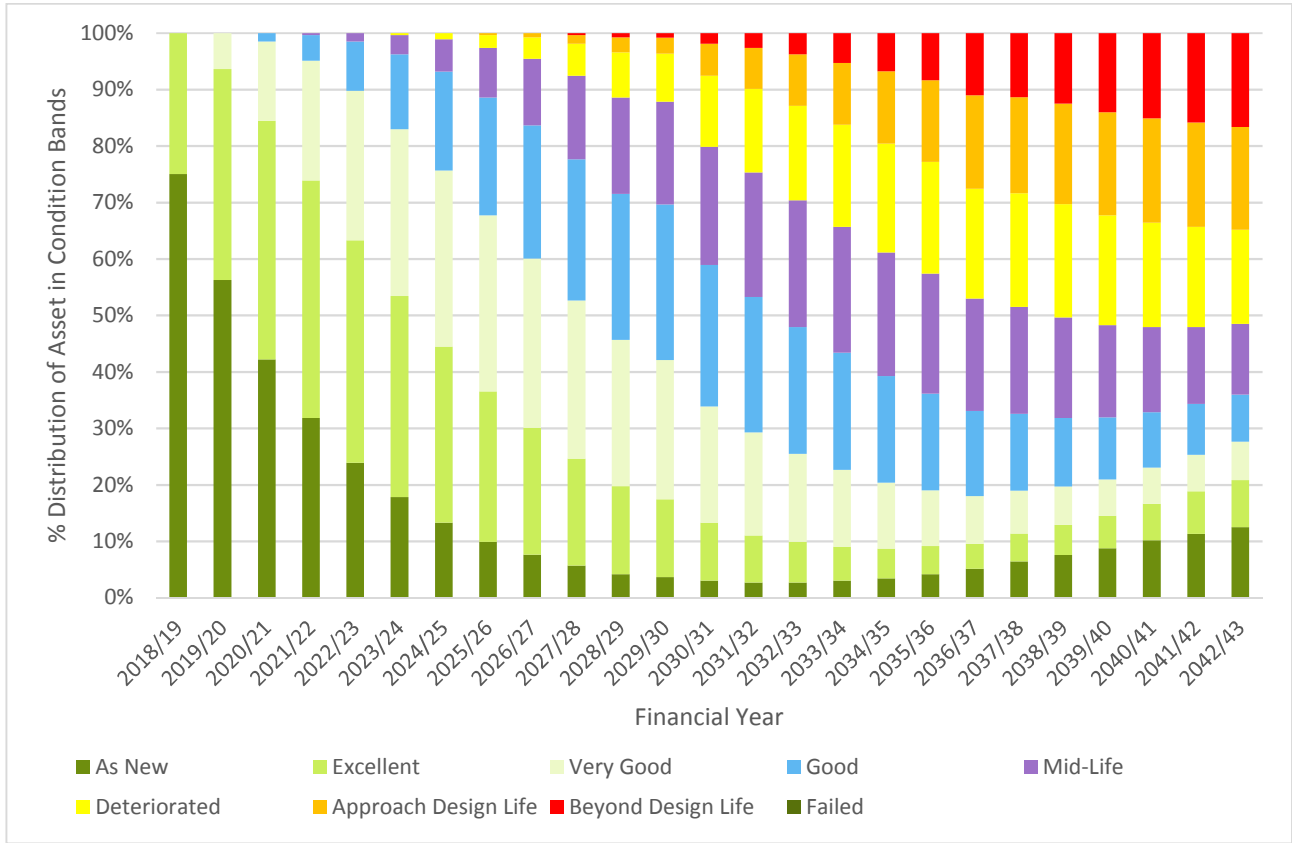
**Figure 3-6 % Distribution of Assets in Condition Bands – Street Lighting Columns**



**Figure 3-7 % Distribution of Assets in Condition Bands – Street Lighting Lanterns**



**Figure 3-8 % Distribution of Assets in Condition Bands – Illuminated Signs**



**Figure 3-9 % Distribution of Assets in Condition Bands – Wall & Post Bracket Replacement**

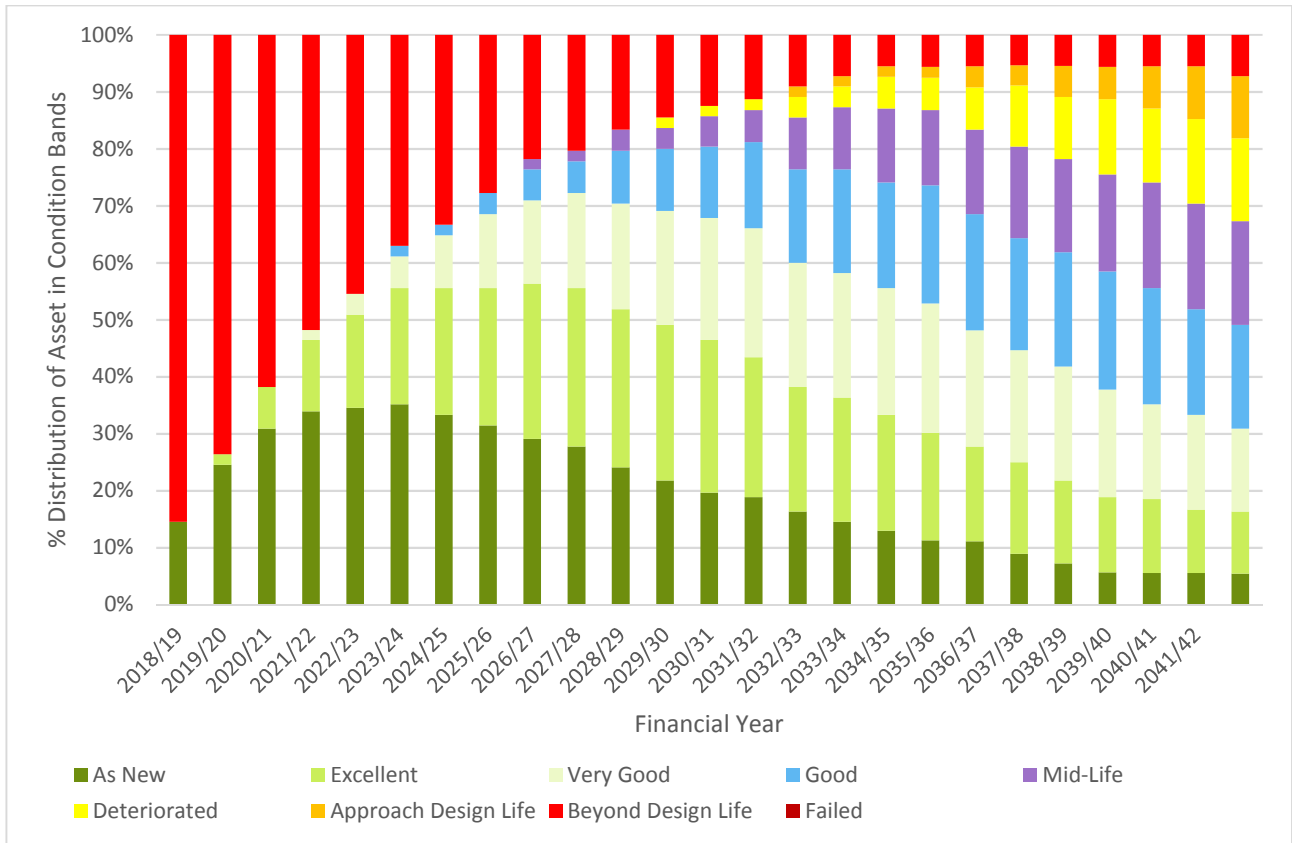
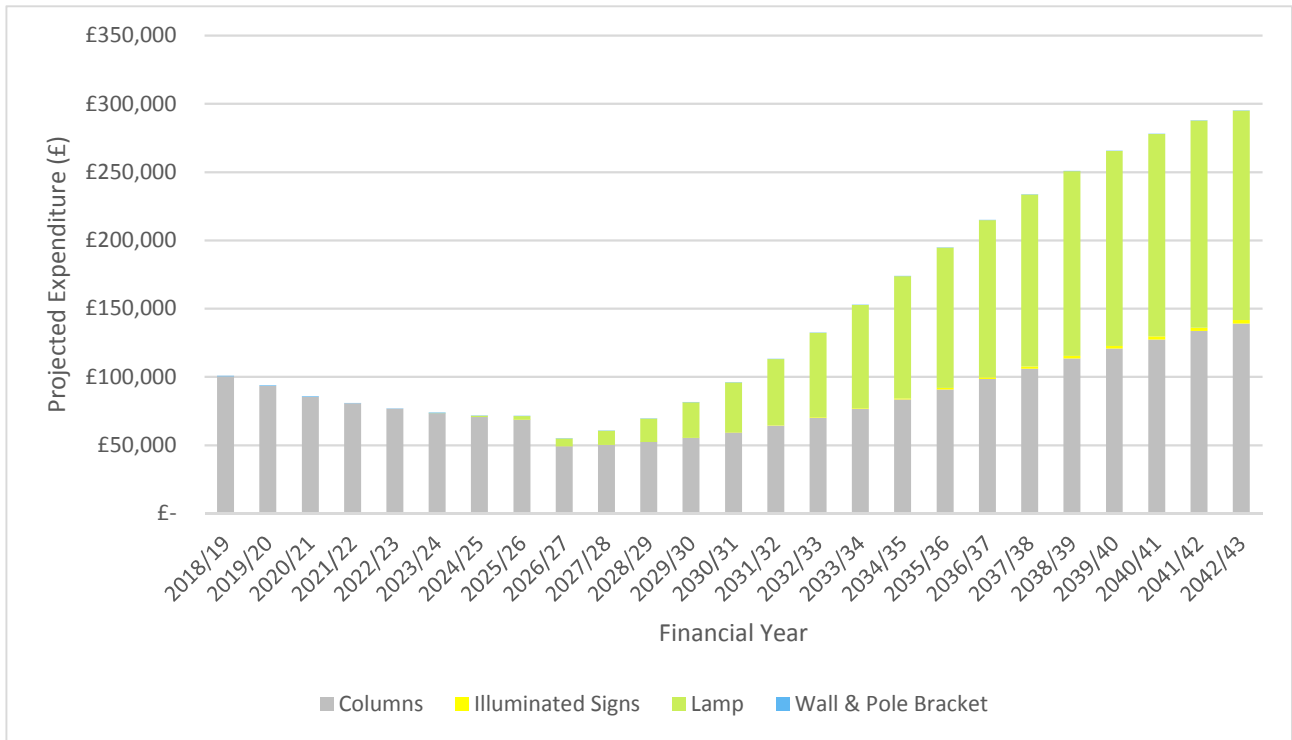


Figure 3-10, below, provides the expenditure profile for the “Replace on failure” scenario; the average annual expenditure is £144,364 over the 25-year analysis period.

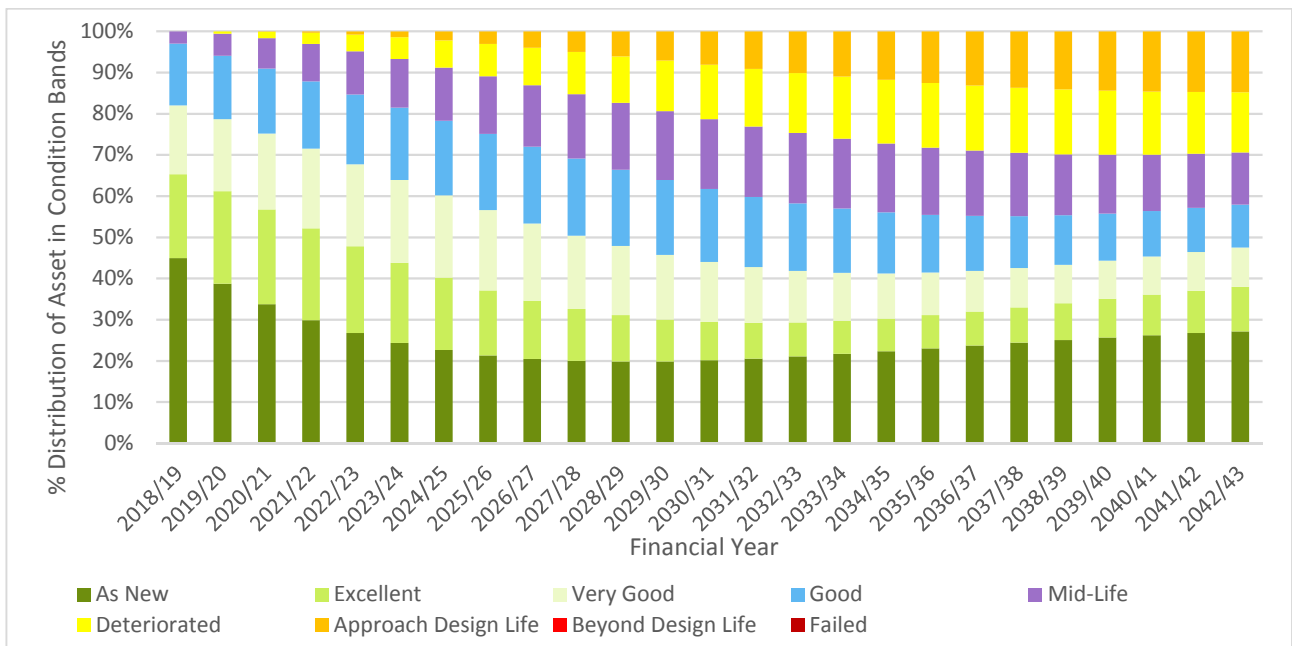
**Figure 3-10 All Asset Projected Expenditure Profile – “Replace on failure” scenario**



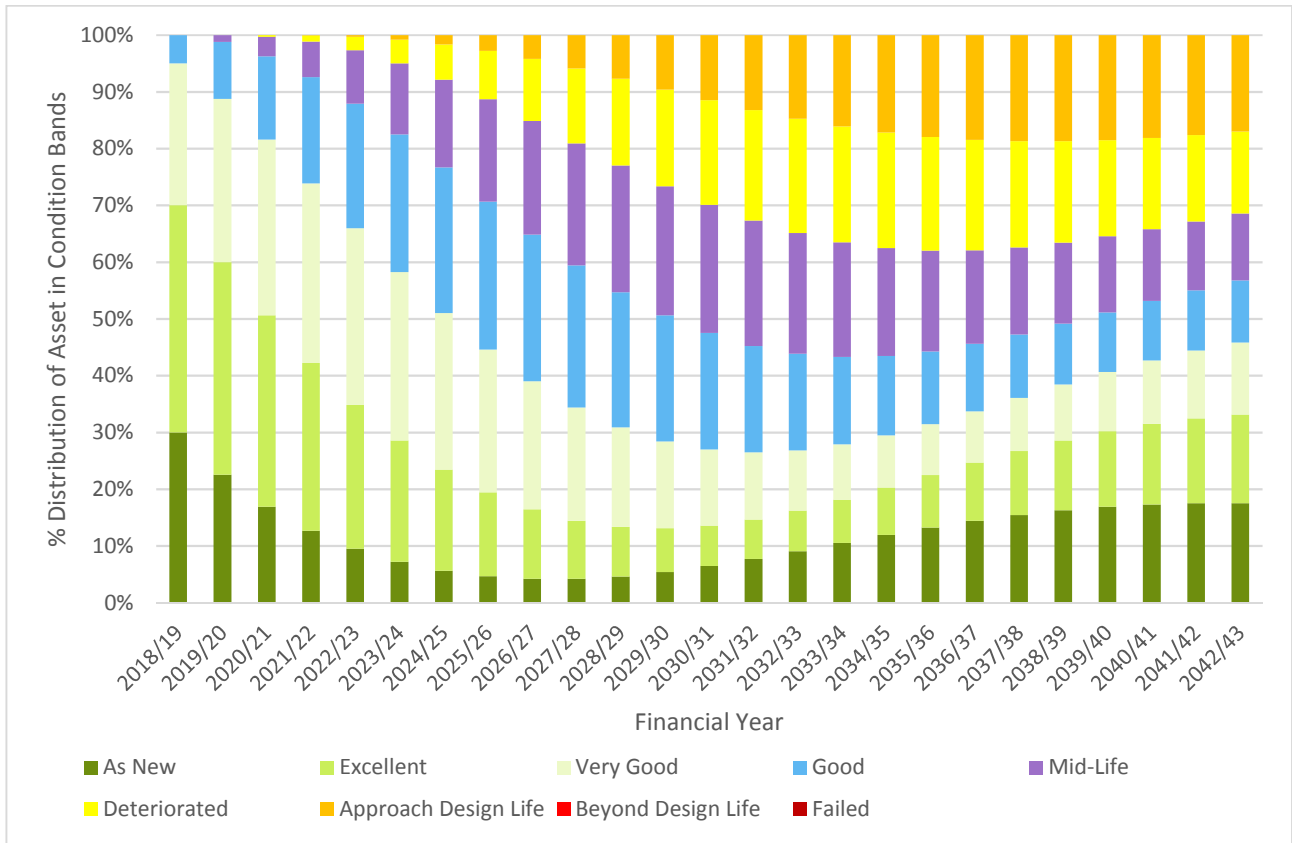
### 3.3. “Service Life” Scenario

Figures 3-11 to 3-15 below provide the Condition Band profiles for the Street Lighting Columns, Street Lighting Lanterns, Illuminated Signs and Wall & Post bracket mounted lighting.

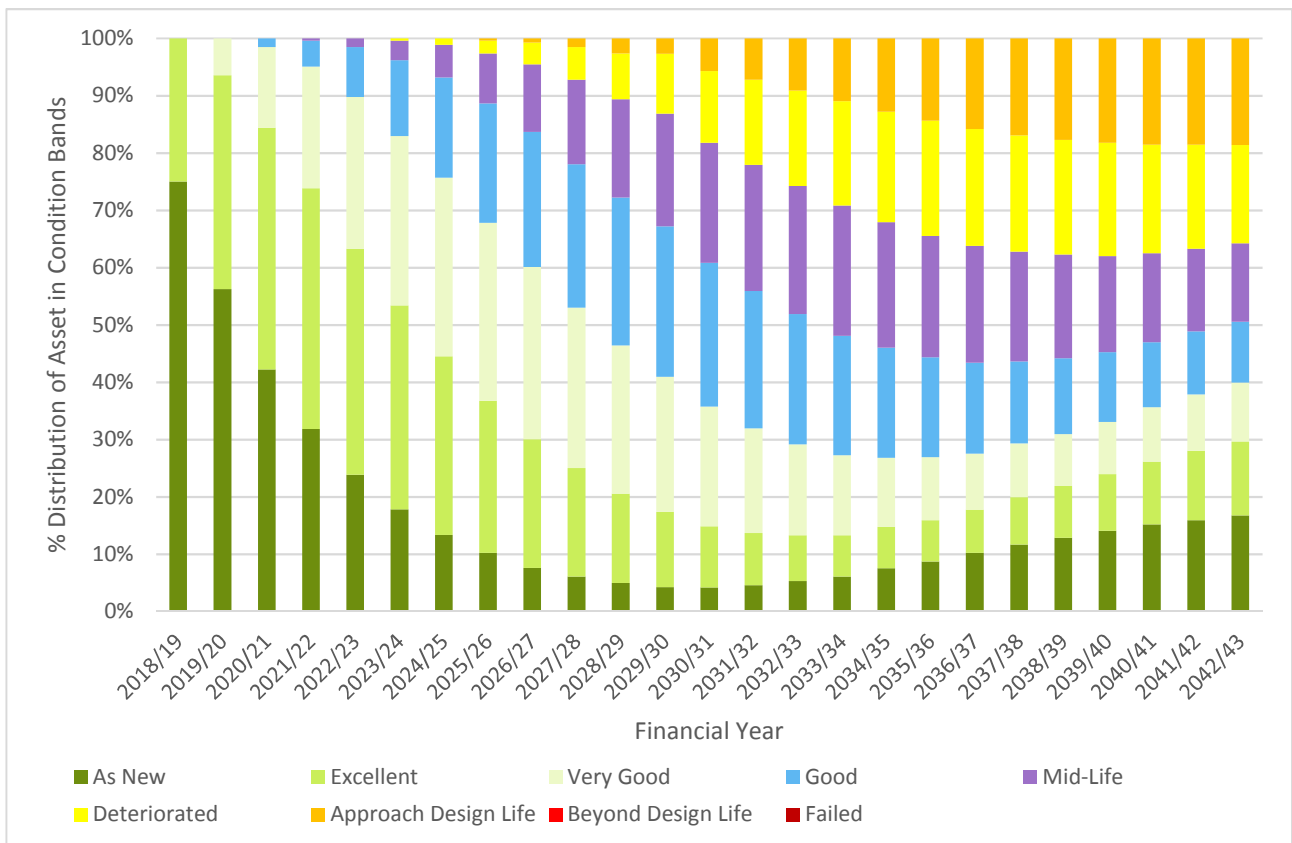
**Figure 3-11 % Distribution of Assets in Condition Bands – Street Lighting Columns**



**Figure 3-12 % Distribution of Assets in Condition Bands – Street Lighting Lanterns**



**Figure 3-13 % Distribution of Assets in Condition Bands – Illuminated Signs**





**Figure 3-14 % Distribution of Assets in Condition Bands – Wall & Post Bracket Replacement**

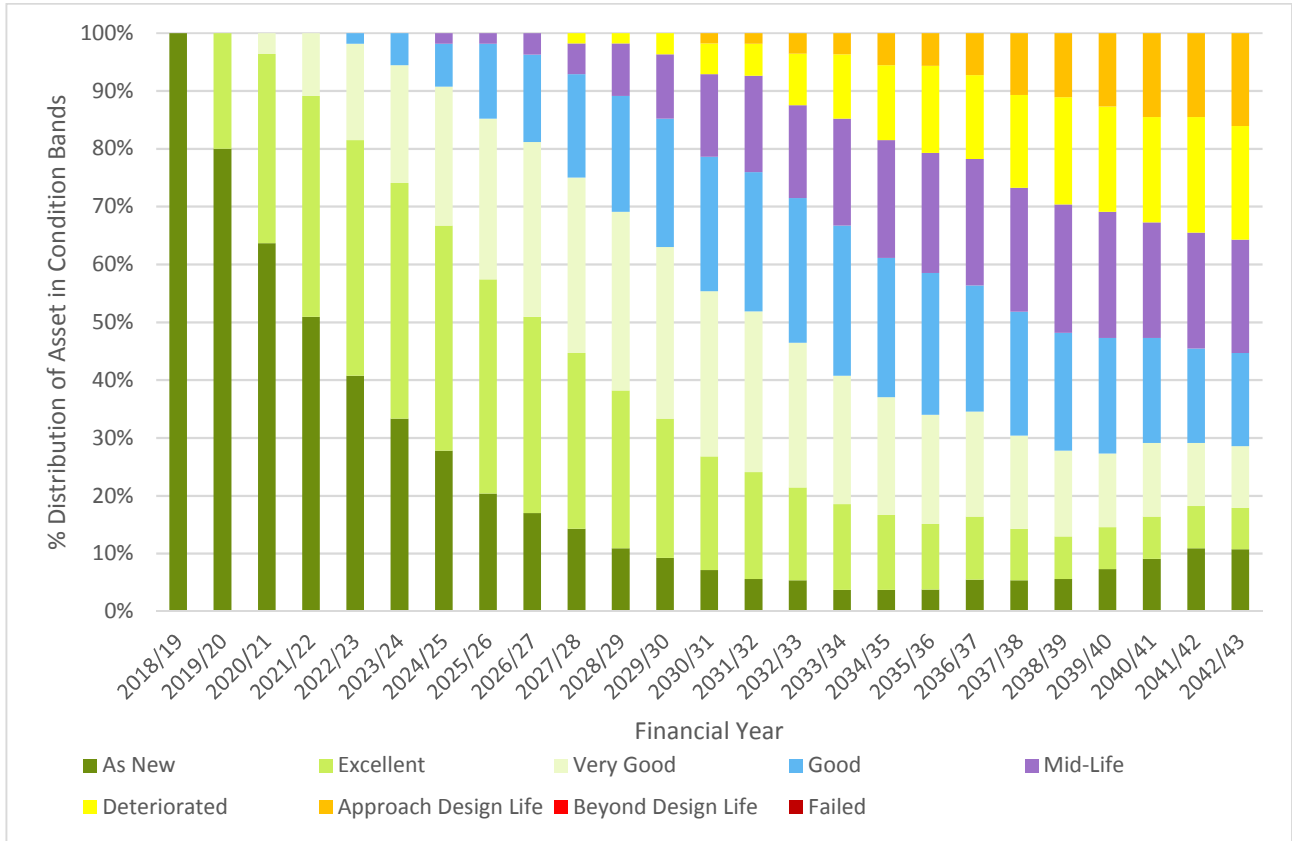
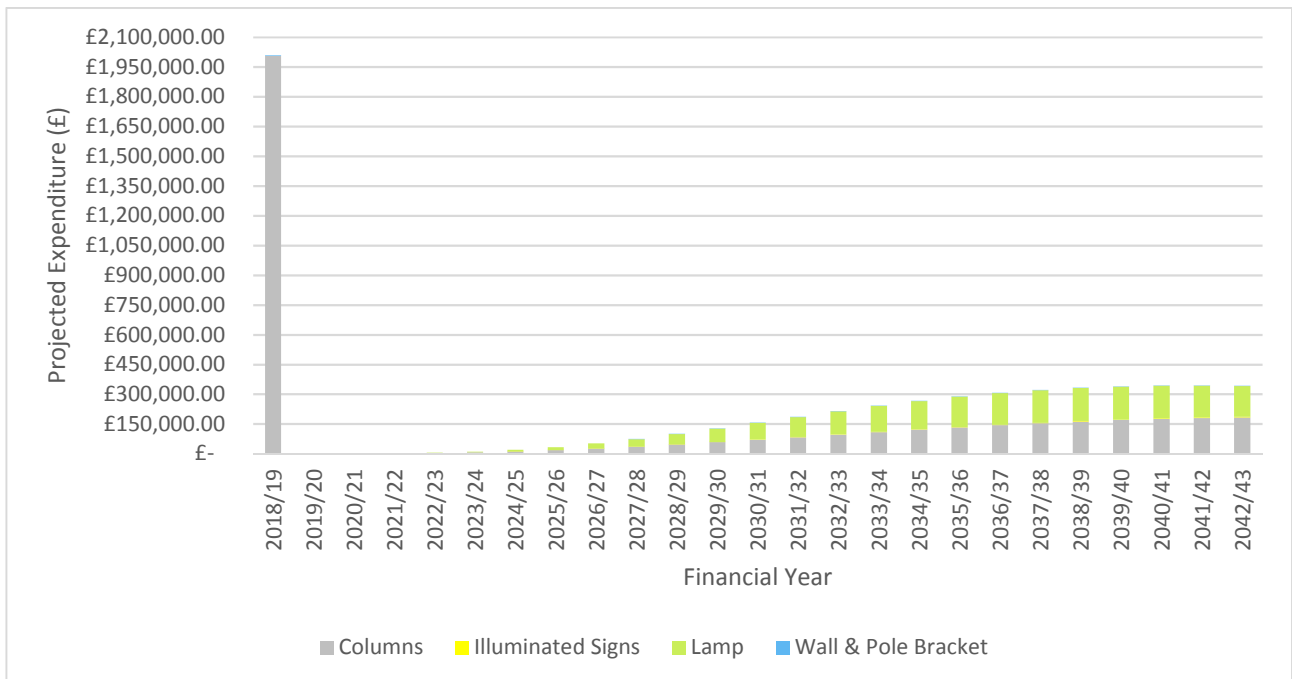


Figure 3-15, below, provides the expenditure profile for the “Service Life” scenario; the average annual expenditure is £243,896 over the 25-year analysis period.

**Figure 3-15 All Asset Projected Expenditure Profile – “Replace on failure” scenario**



## 4. Summary

Based on the lifecycle planning analysis, assuming costs of materials, workmanship and budgets do not increase over the 25-year analysis period, the £150,000 capital maintenance budget is forecast to be sufficient for a managed decline in asset condition. However, the £150,000 budget is insufficient to maintain the street lighting from 2035/36 financial year onwards due to a combination of increasing street lighting assets reaching failure and the LED lanterns reaching the end of their service life, causing a pressure on the already stretched budget.

The “Service life” scenario, which looks at replacing the assets when they reach the end of their design life indicates that an annual average budget of £243,896/year would be required. However, this scenario requires £2 million front loading in 2018/19 to replace the remaining concrete columns which have surpassed their 30-year design life together with an average budget of £170,362 per annum in subsequent years.

Please note, all costs contained in this report have not been adjusted for inflation.

## 5. Conclusion

The existing budget levels are insufficient to maintain the existing street lighting stock at the present levels of service and Figure 3-10 demonstrates that the future projected costs of operating the service would require additional future investment in 2033/34 onwards or a review is required of the street lighting stock to determine the service priority. Additionally, it should be noted that this Report only investigates the capital maintenance costs and it predicts that the revenue costs would also increase to fund the necessary inspection/survey regime required to manage the aging asset stock.

Based on the data available, SC has the following available options:

1. Manage the decline in condition of the street lighting stock, through use of regular inspections/surveys (visual assessments and electrical & structural testing) and a well-documented risk assessments based on the data driven approach advocated by Well Managed Highway Infrastructure Code of Practice.
2. Review annual highway infrastructure asset funding based on lifecycle planning across all asset groups to determine the optimum levels based on lifecycle planning and network needs (Highway Infrastructure Asset Management Guidance Document recommendation 6 and Well Managed Highways Infrastructure Code of Practice recommendation 29 & 30).
3. Increase Street Lighting budget or investigate other options to gain further investments, such as Department for Transport Challenge Fund, Prudential Borrowing or other funding streams.

# Appendix A. Data

## A.1. Street Lighting and Illuminated Sign Inventory

The following information was received from the referenced excel file issued by Paul Godward, Southend-on Sea Council:

File name: Extract060617.xls

- Zone
- Street
- Unit Id
- CMS ID Number
- Unit Name
- Location
- Quantity
- Lamp BSCP Code
- Control BSCP Code
- Number of controllers
- Switch Code
- OSGR Easting
- OSGR Northing

File name - Street Lighting Inventory List.xls

- Equipment Number
- Zone Name
- Postal Street Name
- Unit Number
- Bracket Name
- Column Name
- Unit Name
- Height
- Location
- Town Name

File name - Street Lighting Schedule of Rate.xlsx

List of rates for different aspects of the street lighting maintenance, utilised to determine the replacement costs used in the analysis.

Clarification – Asset Condition

- Magna Steel Tubular installed within the last 5 years
- Steel Tubular/Octagonal Steel and Oxford Steel Tubular installed within the last 5 to 15 years
- Concrete installed within the last 40 to 60 years
- Cast-iron Painted and Ornate Cast-iron Painted installed over 60 years
- Stainless Steel installed within the last 5 to 15 years

The LED replacement programme is being undertaken through various different work streams being progressed on alternating timetables so it would be very time consuming to predict progress by zone, however, I anticipate that 95% of our lighting column stock will be converted by the end of August. The programme includes the replacement of all cast-iron columns and a substantial number of concrete columns depending on available budget.

## Appendix B. Asset Groups

**Table B-1 Asset Groups, Asset Totals and 2017/18 % Condition distribution**

		AN – As New		EX – Excellent		VG – Very Good		G – Good		
		ML – Mid-life		D – Deteriorated		ADL – Approaching Design Life				
		BDL – Beyond Design Life		F – Failure						
Asset Groups	No of Assets	AN	EX	VG	G	ML	D	ADL	BDL	F
5m Concrete Columns	1,460	0%	0%	0%	0%	0%	0%	0%	100%	0%
6m Concrete Columns	44	0%	0%	0%	0%	0%	0%	0%	100%	0%
8m Concrete Columns	2,320	0%	0%	0%	0%	0%	0%	0%	100%	0%
10m Concrete Columns	120	0%	0%	0%	0%	0%	0%	0%	100%	0%
12m Concrete Columns	52	0%	0%	0%	0%	0%	0%	0%	100%	0%
4m Steel Tubular	43	0%	93%	7%	0%	0%	0%	0%	0%	0%
5m Steel Tubular	4217	5%	25%	34%	37%	0%	0%	0%	0%	0%
6m Steel Tubular	220	0%	19%	57%	24%	0%	0%	0%	0%	0%
8m Steel Tubular	1,644	23%	16%	29%	32%	0%	0%	0%	0%	0%
10m Steel Tubular	1,353	0%	31%	37%	33%	0%	0%	0%	0%	0%
12m Steel Tubular	29	4%	21%	66%	10%	0%	0%	0%	0%	0%
6m Octagonal Steel	12	0%	0%	100%	0%	0%	0%	0%	0%	0%

		AN – As New	EX – Excellent	VG – Very Good	G – Good	ML – Mid-life	D – Deteriorated	ADL – Approaching Design Life	BDL – Beyond Design Life	F – Failure
Asset Groups	No of Assets	AN	EX	VG	G	ML	D	ADL	BDL	F
8m Octagonal Steel	7	0%	14%	14%	71%	0%	0%	0%	0%	0%
10m Octagonal Steel	1	0%	0%	0%	100%	0%	0%	0%	0%	0%
8m Stainless Steel	22	0%	0%	100%	0%	0%	0%	0%	0%	0%
5m Magma Steel Tubular	3,180	34%	66%	0%	0%	0%	0%	0%	0%	0%
5m Oxford Steel Tubular	77	0%	74%	26%	0%	0%	0%	0%	0%	0%
6m Oxford Steel Tubular	9	0%	33%	67%	0%	0%	0%	0%	0%	0%
Pole Bracket	6	0%	0%	0%	0%	0%	0%	0%	100%	0%
Wall Bracket	49	0%	0%	0%	0%	0%	0%	0%	100%	0%
Street Lighting Lanterns	14,749	40%	40%	20%	0%	0%	0%	0%	0%	0%
Illuminated Signs	264	100%	0%	0%	0%	0%	0%	0%	0%	0%

## Appendix C. Condition Bands

SC provided design life for each of the asset types; the columns and street lighting Lanterns have a design life of 30 and 15 years respectively, therefore the following bands were generated:

**Table C-1 Condition Bands**

Condition Band	Column Age Range (years)	Lamp Age Range (year)
As New (AN)	0-3	0-1
Excellent (EX)	4-6	2-3
Very Good (VG)	7-10	4-5
Good (G)	11-14	6-7
Mid-life (ML)	15-20	8-9
Deteriorated (D)	21-25	10-12
Approaching Design Life (ADL)	26-30	13-15
Beyond Design Life (BDL)	>30	>15
Failed (F)	Failure	Failure

## Appendix D. Treatments and Costs

**Table D-2 Asset Groups, Treatment Type and Unit Cost**

Asset Groups	Treatment	Cost per Unit
5m Concrete Columns	Replace with 5m Steel Tubular	£384.53
6m Concrete Columns	Replace with 6m Steel Tubular	£247.67
8m Concrete Columns	Replace with 8m Steel Tubular	£568.05
10m Concrete Columns	Replace with 10m Steel Tubular	£622.82
12m Concrete Columns	Replace with 12m Steel Tubular	£763.70
4m Steel Tubular	Replace with 4m Steel Tubular	£164.06
5m Steel Tubular	Replace with 5m Steel Tubular	£148.06
6m Steel Tubular	Replace with 6m Steel Tubular	£179.67
8m Steel Tubular	Replace with 8m Steel Tubular	£326.98
10m Steel Tubular	Replace with 10m Steel Tubular	£389.67
12m Steel Tubular	Replace with 12m Steel Tubular	£544.47
6m Octagonal Steel	Replace with 6m Steel Tubular	£181.31
8m Octagonal Steel	Replace with 8m Steel Tubular	£327.09
10m Octagonal Steel	Replace with 10m Steel Tubular	£381.54
8m Stainless Steel	Replace with 8m Steel Tubular	£327.51



<b>Asset Groups</b>	<b>Treatment</b>	<b>Cost per Unit</b>
5m Magma Steel	Replace with 5m Magma Steel	£751.56
5m Oxford Steel	Replace with 5m Oxford Steel	£138.19
6m Oxford Steel	Replace with 5m Oxford Steel	£171.86
Pole Bracket	Pole Bracket (LED)	£74.25
Wall Bracket	Wall Bracket (LED)	£74.25
Street Lighting Lanterns	Street Lighting Lanterns (LED)	£240.00
Illuminated Signs	Illuminated Signs (LED)	£240.00

# Appendix E. Transition Matrix

## Asset Groups, Asset Totals and 2017/18 % Condition distribution

AN – As New		EX – Excellent		VG – Very Good		G – Good				
ML – Mid-life		D – Deteriorated		ADL – Approaching Design Life						
BDL – Beyond Design Life		F - Failure								
Asset Groups	Existing Condition Band	Transition Band								
		AN	EX	VG	G	ML	D	ADL	BDL	F
Concrete Columns	AN	77.5%	22.5%	0%	0%	0%	0%	0%	0%	0%
	EX		77.5%	22.5%	0%	0%	0%	0%	0%	0%
	VG			77.5%	22.5%	0%	0%	0%	0%	0%
	G				77.5%	22.5%	0%	0%	0%	0%
	ML					77.5%	22.5%	0%	0%	0%
	D						77.5%	22.5%	0%	0%
	ADL							77.5%	22.5%	0%
	F								95%	5%
Steel Columns	AN	80%	20%	0%	0%	0%	0%	0%	0%	0%
	EX		80%	20%	0%	0%	0%	0%	0%	0%
	VG			80%	20%	0%	0%	0%	0%	0%
	G				80%	20%	0%	0%	0%	0%
	ML					80%	20%	0%	0%	0%
	D						80%	20%	0%	0%

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AN – As New ML – Mid-life BDL – Beyond Design Life		EX – Excellent D – Deteriorated F - Failure		VG – Very Good		G – Good ADL – Approaching Design Life				
Asset Groups	Existing Condition Band	Transition Band								
		AN	EX	VG	G	ML	D	ADL	BDL	F
	ADL							80%	20%	0%
	F								85%	15%
Street Lighting & Illuminated Sign Lanterns	AN	75%	25%	0%	0%	0%	0%	0%	0%	0%
	EX		75%	25%	0%	0%	0%	0%	0%	0%
	VG			75%	25%	0%	0%	0%	0%	0%
	G				75%	25%	0%	0%	0%	0%
	ML					75%	25%	0%	0%	0%
	D						75%	25%	0%	0%
	ADL							75%	25%	0%
	F								75%	25%

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