



OUR APPROACH TO LIFECYCLE PLANNING

Highway Asset Management

2018



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1.0 Introduction

1.1 Context

In 2016, Medway Council's Highway Department undertook a study for Whole Government Accounts to estimate the total value of Highway Network Infrastructure. It was estimated that the Net Value or the total cost to replace the network at depreciation value was in excess of £2 Billion. Thus making the Highway Network the most valuable publicly owned asset that Medway Council is responsible for.

Local Highway Authorities in England and Wales are facing significant challenges with regards to the maintenance of a reliable and useable Highway Network Infrastructure.

A recent study conducted by the Asphalt Industry Alliance (AIA) stated in the Alarm Survey that:-

'The gap between funds Local Highway Authorities received in 2017/18 to the amount they actually required to keep the Carriageway in reasonable condition is approaching £556m alone.'

The Alarm Survey (2018) described how on average, each Highway Authority would need up to 14 years to get their local roads back to a reasonable performance level providing they had adequate funds and resources.

The Department for Transport (DfT) began the introduction of funding grants in 2015 for Highway Maintenance. As part of the current tranche of DfT funding, £6 billion has been set aside for Highway Maintenance from the financial years 2015/16 to 2020/21, of which £578 million has been set aside for the Incentive Fund Scheme.

This Funding Scheme is based on the evidence that Local Highway Authorities can provide based on good Asset Management Practices. In order for Local Highway Authorities to receive funds from the Self-Incentive Grant, they would need to introduce Lifecycle Planning for Key Highway Asset Groups as part of on-going improvements in the efficiency of using these funds on the Highway Network.

As part of the key aspects of good Asset Management Practices Medway's Highways Asset Management Plan adopted in January 2018 is an overarching document that provides a framework for Highway Asset Management. It sets out clear goals and objectives of what Highway Asset Management means to Medway Council, outlining key procedures to ensure that Medway's Highway Assets are maintained to a condition that is fit for purpose.

One key procedure that the framework refers to is the importance of using Lifecycle Planning. It involves drawing up medium to long-term financial plans for managing a Highway Asset with the aim of providing the required levels of service at the lowest possible whole life cost.

Lifecycle Planning incorporates information relating to the Local Highway Authority Asset Inventory including condition and performance data. It also identifies both the short-term routine maintenance needs and long-term Capital Investment to enable annual expenditure profiles for Highway Asset Groups.

Lifecycle Plans can also enable Medway Council to gather information on the costs for different treatment options, the effect that this expenditure can have on performance and what improvements can it have year on year. This has not been undertaken for this cycle of the report and treatment costs have been focused on the current Highway Infrastructure Contract (HIC) rates.

This is the first Lifecycle Report produced by Medway Council’s Highway Asset Management Team and focusses on the following Key Highway Asset Groups:-

- Carriageway
- Footway
- Structures
- Street Lighting
- Drainage (Gullies)

The proposed review cycle for Highway Lifecycle Planning is every two years with the priorities for the next two cycles being:

2019-2020	2021-2022
Carriageways	Carriageways
Footways	Footways
Structures	Structures
Medway Tunnel	Medway Tunnel
Street Lighting Columns	Street Lighting Columns
Drainage	Drainage (Soakaways & Flap Valves)
Crash Barriers	Crash Barriers
	Traffic Signals

For the next cycle we shall aim to include:-

- **Street Lighting Columns** – The Prudential Borrowing Scheme investment and Column Replacement Report with up to date conditions for Concrete and Steel columns
- **Medway Tunnel** – Due to the specialist nature of the electrical and mechanical elements associated with the Tunnel, funding for specialist Consultants will need to be secured to support production of a be-spoke Lifecycle Plan
- **Drainage** – In addition to acquiring better Gulley Condition data, we will begin the development of Lifecycle Plans for Soakaway and Flap Valve assets under the programme for inventory and condition data

2.0 Lifecycle Planning

2.1 Highways Maintenance Efficiency Programme (HMEP) Lifecycle Toolkit

The HMEP is a sector-led transformation initiative aiming to maximise returns from investment and deliver efficiencies in Highway Maintenance Services. With sponsorship from the Department for Transport (DfT), HMEP have developed a Lifecycle Modelling Toolkit which is intended to be used by Local Highway Authorities in supporting strategic level planning decisions which include:-

- Assessing impact of different levels of funding on asset performance and asset maintenance needs;
- Investigating current and future levels of funding required to achieve a given condition or set performance target for the Highway Asset;
- Identifying the levels of funding required to minimise whole life costs;
- Allocating resources to assets and treatment types to manage whole life costs.

The common terminologies used within the context of Lifecycle Planning are:-

- **Backlog** – Investment required to bring the asset to the desired condition, not perfect condition
- **Steady State** – The investment required to sustain the asset in its current condition level
- **Service/Design Life** – How long the asset will last before renewal or major refurbishment takes place

In order to develop the Lifecycle Plan to inform us of the Investment/Performance Gaps in Highway Assets, we have imported the following parameters into the Toolkit Model:-

- Key Highway Asset Groups (including size, quantities and condition data)
- Lifecycle Transition Matrix (industry standard design life for each Highway Asset Group)
- Treatment Effects & Cost (the effects of each treatment and the costs taken from our Highway Infrastructure Contract in 2017)
- Treatment Strategies (short/medium/long term strategies for each key Highway Asset Group)
- Budgets (2017/18 budget levels for each key Highway Asset Group)
- Performance Targets (targets stated within the Highway Asset Management Plan)

Although the objectives of Lifecycle Planning involves the development of long-term plans to manage Key Highway Assets; we have focussed this first cycle on the additional levels of investment required to maintain existing condition levels over the short/medium-term at their steady-state. Also for this round of the Lifecycle Modelling we have not included different Treatments with their potential effects and costs.

The HMEP Lifecycle Toolkit does not account for future inflation rates which shall have to be taken into account for the next cycle of modelling.

This report aligns with the requirements of Medway Council's Medium Term Financial Strategy (MTFS).

2.2 Developing the Lifecycle Model

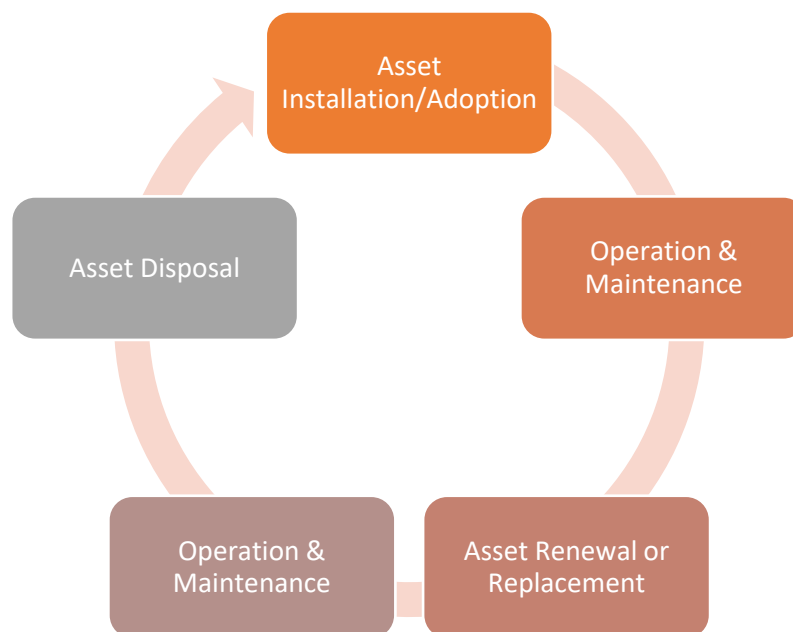
Highway Lifecycle Planning is the process of managing a Highway Asset throughout its lifespan. An Asset's Lifecycle includes the entire time which a Local Highway Authority invests from initial construction or adoption to the end of the assets service life.

By developing a Lifecycle Plan for each key Highway Assets, Medway Council has the ability to determine when and how maintenance should take place and the subsequent levels of investment required.

Each of Medway's Key Highway Assets transition through the following stages across its lifespan:

1. Highway Asset constructed or adopted in response to either a new development, to increase Highway Network capacity or to improve performance levels.
2. Operating all Highway Assets at a serviceable condition through routine/cyclical maintenance and minor works.
3. Renewal or Replacement of Highway Assets to return them to a suitable serviceable standard and condition level.
4. Highway Asset disposal

Figure 1 – Typical Highway Asset Lifecycle



3.0 Lifecycle Planning Input

3.1 Key Highway Asset Groups (Asset Inventory)

Table 1 below shows an overarching breakdown of the Highway Inventory Data we hold on Key Highway Assets in our Asset Management System, Confirm. The table is not a full and comprehensive detailed account of what Medway Council holds within Confirm but shows the scope of Highway Assets we manage and that forms this first Lifecycle Planning Report.

Table 1

Asset Group	Major Components	Classification/Highway Asset Types	Extent
Carriageways	Principal and Non-Principal roads	A Class Road B Class Road C Class Road Unclassified Road	103km 32km 85km 615km
Footways	Including Cycleway (forms part of Footway/Carriageway)	Bituminous Flagged Block Paved Concrete	949,576m 48,158m 18,275m 26,932m
Structures		Retaining Wall Culvert Sign Gantry Pedestrian Subway Footbridge Tunnel Bridge (4 or more spans) Bridge (2 or 3 spans) Bridge (single-span) Misc. Structures	97 4 6 11 14 1 2 5 34 4
Drainage		Gully Pipe Manhole/Catchpit Ditches and Grips Linear Drainage Outfalls, Soakaways and SUDS Flap Valves	33,868 300km 2,605 156 6km 253 78
Street Lighting		Streetlights Illuminated Signs Illuminated Bollards Refuge Island Indicator Feeder Pillar Subway Fitting Belisha Beacon School Wig-Wag	26,495 1,872 1,297 322 206 1,490 96 34

Like most Local Highway Authorities, Medway Council holds good data sets on Key Highway Assets but there are gaps in some areas that need to be addressed. It is for this reason Medway Council have developed a Highway Information Management Plan which aims to deliver improved data management through a regular programme of audits. Sample Data Audits have been based upon a six monthly cycle to assess the quality of data to current asset information standards and an annual Process Audit for business processes that use/create/update/interact with asset data.

The Highway Department's Asset Management Working Group will consider an audit programme to be implemented alongside this Information Management Plan within the financial year 2018/19.

3.2 Key Highway Asset Condition Data

For Medway Council to maintain the Highway Network to a suitable operating level and a safe standard for the network users in accordance with the Highways Act (1980), a number of Condition Indices have been developed for each Key Highway Asset Group.

This Condition Data can be used for:

- Providing information on the condition of Medway Council's Highway Network for internal and external publication
- Generating a rolling annual programme of maintenance schemes
- Providing data in a format to satisfy the UK Pavement Management System for Road Maintenance Condition Surveys (UKPMS) which is an industry standard format allowing for National comparisons
- Effective targeting of maintenance spend which is essential to maximise return on investment through the use of Lifecycle Modelling
- Identifying where maintenance is most needed within budget constraints and supporting investment decisions through the Council's annual budget setting process.
- Supporting funding bids to the DfT for highway investment

The condition of Highway Assets can be effected under a number of varying factors which include –

- Highway assets which can naturally deteriorate through oxidation especially in materials with high-voids which will allow oxygen to penetrate easily. Occurs more often at high temperatures and under direct sun-light.
- High temperatures can also increase the likelihood of cracking in the materials of Highway Assets, as overtime through natural ageing this can increase deterioration levels.
- Low temperatures where water begins to freeze on the surface of Highway Assets can also increase deterioration levels. With the cycle of freezing/thawing water can cause expansion of surface defects.
- Presence of chlorides in gritting salts can cause increased deterioration for both major/minor elements of Highway Assets.
- Surface wear due to increased traffic flow particularly as the weight and volume of goods transported increases.
- Natural ground heaving/or root vegetation can cause Highway Assets to loose there structural integrity which can lead to further damage under the surface through water ingress.
- Sub-standard material that has failed before its design life, either through corrosion, improper installation, out-dated scheme designs.

Table 2 in the following page show current condition data we hold for our Key Highway Assets with the text below describing each column's data in the table.

Asset Group – Main Highway Asset Groups

Classification/Highway Asset Types – Classification of Road Types/Sub-set group of Main Highway Assets

Condition/Performance Detail – Condition reports generated on each Highway Asset Group/Performance details of Highway Assets where condition is unavailable

Condition/Performance Level – Condition rating according to data gathered on Highway Asset Group/Performance levels of Highway Asset Group where condition is unavailable

Table 2

Asset Group	Classification/Highway Asset Types	Condition/Performance Detail	Condition/Performance Level (2017/18)
			*NI/BVPI (%)
Carriageways (Principal and Non-Principal Roads)	A Class Road B Class Road C Class Road Unclassified Road	*National Indicators NI130-01 & NI130-02, BVPI224b - % of carriageways requiring maintenance	2.3% 4.9% 4.1% 20%
			**NI187 (%)
Footways	Bituminous Flagged Block Paved Concrete	**Lifecycle Modelling based on Footway Maintenance Surveys - % of footways requiring maintenance	4.2% 3.6% 1.3% 5.8%
			***Average BCI (%)
Structures	Retaining Wall Culvert Sign Gantry Pedestrian Subway Footbridge Tunnel Bridge (4 or more spans) Bridge (2 or 3 spans) Bridge (single-span) Misc Structures	***Bridge Condition Index (BCI) - Minimum 70% before safety measures and weight restrictions apply	84.1 87.5 96.1 81.1 82.8 78.0 80.4 88.9 90.4 85.5
			****Gullies Operating (%)
Drainage	Gully	****Condition assumptions made on number of gullies in operation/number of gullies needing repairs per annum	84%
			*****No. of columns to be replaced
Street Lighting	Streetlight Columns	*****Based on assumed age data and split into condition bandings against Streetlight Column material design life	3171

3.2.1 National Carriageway Condition Comparison

National Indicators are used to inform a number of publications including:-

- The DfT for the percentage of roads that require maintenance
- For Principal A-Class Roads we use NI130-01, for Non-Principal B and C Class we use NI130-02 and Unclassified Roads BVPI-224b to help inform Medway's Carriageway Condition status.

Currently the DfT only acquires the National Performance for Carriageway's as a comparator and this data has been collected annually since 2007/08.

Table 3 shows Carriageway Condition Performance levels in comparison to the National Averages as per DfT's Road Condition Report (2017/18). This shows that Medway Council have made positive progress in improving the condition of its Principal and Non-Principal Road Network with better than average performances for A, B and C Roads. However, investment needs to be secured to improve the condition of local Unclassified Roads.

Table 3

National Road Condition - Local Authority Managed Roads 2017/18		
	<i>National Average</i>	<i>Medway</i>
<i>A Roads</i>	3%	2.30%
<i>B Roads</i>	6%	4.90%
<i>C Roads</i>	6%	4.10%
<i>Unclassified Roads</i>	17%	20%

3.2.2 South East Regional Condition Comparison

Table 4 and Figure 2 shows the historic performances of our A-Roads against other South East Authorities since 2007/08 to 2016/17 (awaiting update on DfT website for 2017/18).

Table 4

Percentage of Principal (LA maintained 'A' roads) Requiring Maintenance										
Local Authority	2007 /08	2008 /09	2009 /10	2010 /11	2011 /12	2012 /13	2013 /14	2014 /15	2015 /16	2016 /17
Brighton and Hove UA	11	8	11	14	21	6	7	8	7	11
Medway UA	5	5	4	5	6	5	4	3	2	2
Portsmouth UA	12	4	4	4	8	:	4	2	4	5
West Berkshire UA	5	6	5	5	5	4	3	3	2	3
Kent	6	7	6	7	7	6	5	3	2	3

Figure 2

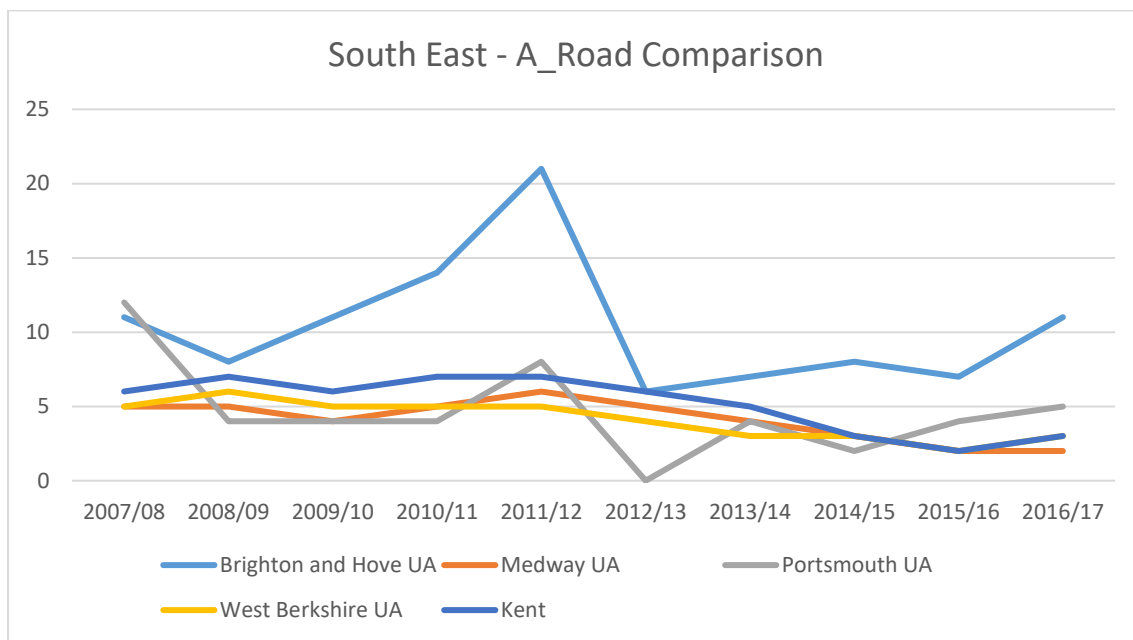
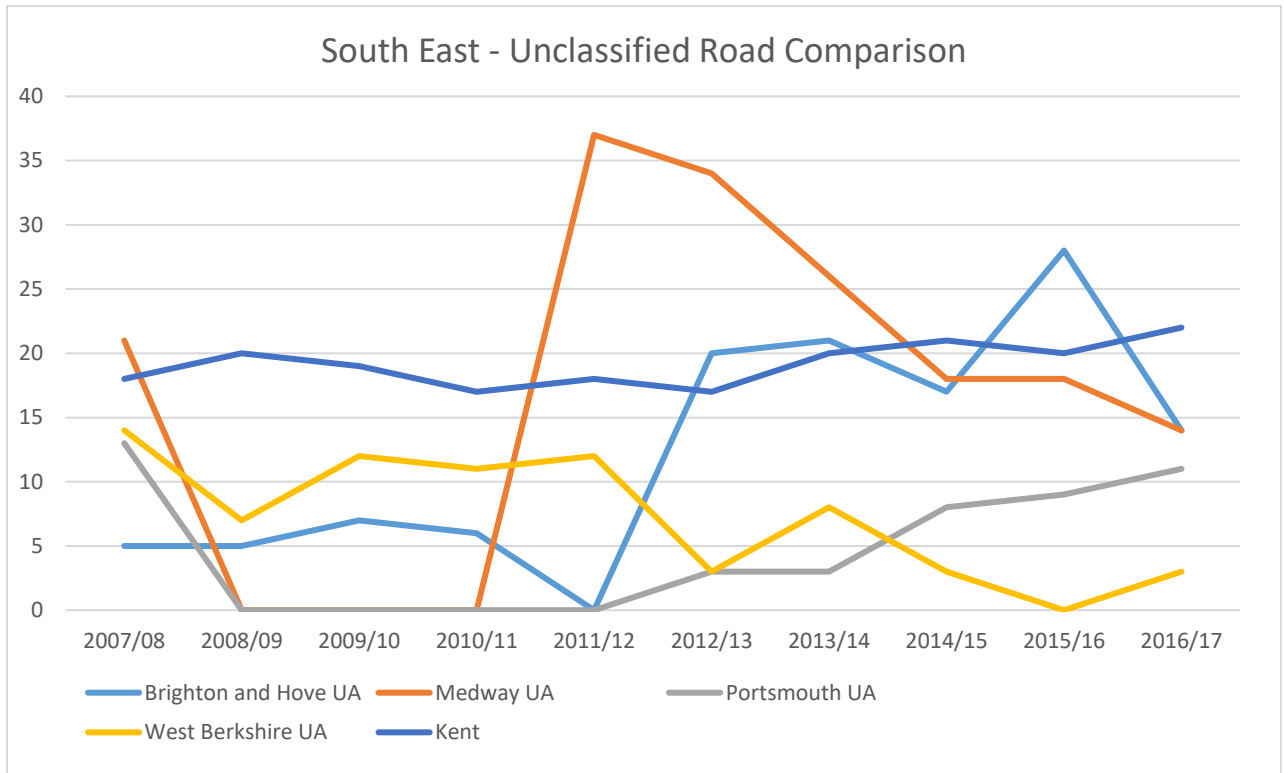


Table 5 and Figure 3 shows the historic performances of our Unclassified Road Network against other South East Authorities between 2007/08 and 2016/17 (awaiting update on DfT website for 2017/18).

Table 5

Percentage of Unclassified Maintained Roads Requiring Maintenance										
Local authority	2007 /08	2008 /09	2009 /10	2010 /11	2011 /12	2012 /13	2013 /14	2014 /15	2015 /16	2016 /17
Brighton and Hove UA	5	5	7	6	:	20	21	17	28	14
Medway UA	21	:	:	:	37	34	26	18	18	14
Portsmouth UA	13	:	:	:	:	3	3	8	9	11
West Berkshire UA	14	7	12	11	12	3	8	3	:	3
Kent	18	20	19	17	18	17	20	21	20	22

Figure 3



3.2.3 Local Highway Maintenance Comparison

In 2017/18 Medway Council undertook a benchmarking exercise on Highway Maintenance Performance with Thurrock Council, this formed part of the supporting evidence for Medway Council's Self-Assessment Submission for the Incentive Fund Scheme. As part of this year's submission (2018/19) we will be repeating this exercise.

Table 6 shows the data comparison with Thurrock Council which gives an overall standing with other Key Highway Assets. Structures Highway Data was omitted from this round as the data at the time had not become available for sharing. This will be included in the next review cycle of the document.

Table 6

Medway Council vs Thurrock Council (Highway Condition Performance)		
	Medway	Thurrock
Carriageway -	<i>(% of carriageway in need of maintenance)</i>	
A Roads	2%	2%
B Roads	5%	3%
C Roads	4%	3%
Unclassified	20%	24%
Footway -	<i>(% of footway in need of maintenance)</i>	
Bituminous	4%	15%
Flagged	4%	10%
Block Paved	1%	4%
Concrete	6%	10%
Drainage -	<i>(% of gullies in need of replacement)</i>	
Gullies	5%	5%
Street Lighting -	<i>(% of columns in Poor Condition)</i>	
Streetlights	12%	*6%

**Thurrock Council have undertaken an LED Programme that also included investment into Street Lighting Column Replacements*

4.0 Carriageway

The condition of the Principal and Non-Principal Classified Highway Network is assessed using SCANNER (Surface Condition Assessment of the National Network of Roads) Survey. SCANNER is a machine-based survey that measures a range of condition parameters to create a Road Condition Indicators (RCI) score every ten metre sub-section of the Principal and Non-Principal Highway Network. The Principal and Non-Principal Highway Network is subject to a SCANNER Survey on a two-year rolling cycle.

The condition of the Unclassified Highway Network is assessed using CVI (Coarse Visual Inspection) Surveys. CVI measures 3 bands of condition parameters (RED/AMBER/AGREEN) which are used to create an RCI Score for Unclassified Roads. The Unclassified Highway Network is surveyed on a four-year rolling cycle (25% per annum).

Table 7 and Figure 4 below show the current condition and short-term condition trends for Carriageways since 2012/13, with the main trends being:

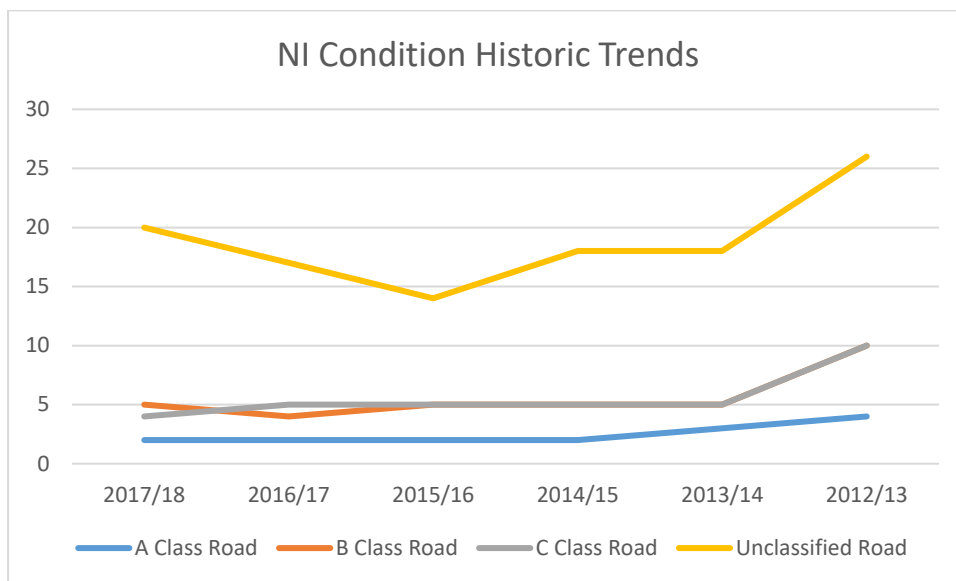
- 1) A Roads have been maintained at a steady state of 2% backlog for the last 4 years being 1% better than the National Average of 3%
- 2) B and C Roads have “broadly” been maintained in a steady state of 5% and 4% respectively since 2013/14 being 1% better than the National Average of 6% (B-Roads) and 2% (C-Roads)
- 3) Unclassified Roads have kept at a steady state since 2013/14 till 2016/17, however show an increase in deterioration with the most recent jump to 20% of backlog

Table 7

Classification/Highway Asset Types	Current Condition Levels	Previous Condition Levels				
		2017/18	2016/17	2015/16	2014/15	2013/14
A Class Road	2	2	2	2	3	4
B Class Road	5	4	5	5	5	10
C Class Road	4	5	5	5	5	10
Unclassified Road	20	17*	18	18	18	26

**The 2016/17 Unclassified figure has been updated to align with an error during exporting/importing condition data that has now been rectified to show the true performance levels. It had originally been reported as 14%.*

Figure 4



4.1 Carriageway Condition Forecast

4.1.1 Current Budget

The annual budget from 2017/18, which was applied to this round of Lifecycle Plans for Carriageways was **£1.7m**. Medway delivers a composite programme covering the entire Highway Network as we do not have separate funding blocks for A, B, C and Unclassified Roads. Additionally, we have not included the Responsive Maintenance budget, due to not adding long-term asset value to the Highway Asset as it is principally allocated to safety repairs.

Table 8 and Figure 5 show the future trends in condition for each Road Classification based on the most recent levels of spending (2017/18), using the HMEP Lifecycle Toolkit.

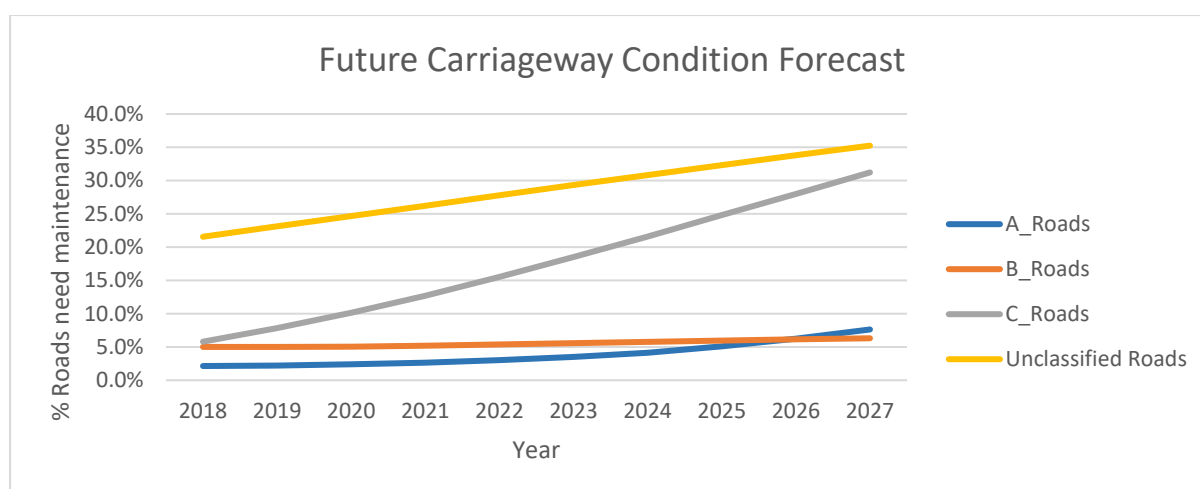
The future condition forecast for Carriageways based on 2017/18 budgets show:-

- 1) A-Roads performance over the next 10 years are predicted to remain stable with the National Average of 3%. To maintain this performance level we would need to continue the level of investment applied from 2017/18 financial year.
- 2) B-Roads similarly are performing very well over the next 10 years remaining below the National Average deterioration levels of 6%. To maintain this performance level we would need to continue the level of investment applied from 2017/18 financial year.
- 3) With C-Roads the Toolkit shows that current budgets are not adequate to maintain the current backlog of 4%. The Lifecycle Model indicates that by year 2020 we will have a backlog of 25% of the network requiring maintenance.
- 4) Unclassified Roads show current expenditure is inadequate to align its performance with the current National Average of 17%. We will see a steady decline in performance over the next 10 years as the Local Highway Network continues to deteriorate.

Table 8

Road Classification	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
A_Roads	2.1%	2.2%	2.4%	2.7%	3.0%	3.5%	4.2%	5.1%	6.3%	7.6%
B_Roads	5.0%	5.0%	5.1%	5.2%	5.4%	5.6%	5.8%	6.0%	6.2%	6.3%
C_Roads	5.8%	7.8%	10.1%	12.7%	15.5%	18.5%	21.6%	24.8%	28.0%	31.2%
Unclassified Roads	21.6%	23.1%	24.7%	26.2%	27.8%	29.3%	30.8%	32.3%	33.8%	35.3%

Figure 5



4.2 Carriageway Summary

The current maintenance backlog for Carriageways is £14.1m based on current condition performance levels. To maintain the Carriageway Network at the current levels of performance (steady-state) the total investment required over the next ten years is £35.9m. This equates to an average additional Capital Investment of £1.89m above existing funding levels.

4.2.1 Improving Carriageway Lifecycle Plans

In order to improve Carriageway Lifecycle Plans, we have set a number of Key Service Targets that shall align with our review cycle of this document.

KEY SERVICE TARGETS		YEAR
1.	Maintain 2017/18 levels of Investment into the A, B, and C Highway Network.	2018-19
2.	Submit Growth Funding Bid through the Medium Term Financial Strategy (MTFS) to secure targeted funding for a Programme of Investment into the Unclassified Highway Network	2018-19
3.	Model different Treatment Options to maximise Carriageway Investment as part of the next cycle of Lifecycle Planning.	2020-21

5.0 Footway

The condition of the Footway Network is assessed using the Footway Maintenance Survey (FMS). The FMS Survey scans 25% of the Network on an annual basis, covering 100% of the Footway Network over a 4 year cycle. The FMS Survey measures a range of surface condition parameters and is recorded within our Asset Management System, Confirm. These measurements are processed through the system to create a Footway Condition indicator score for every nominated sub-section and material type of the Footway Network.

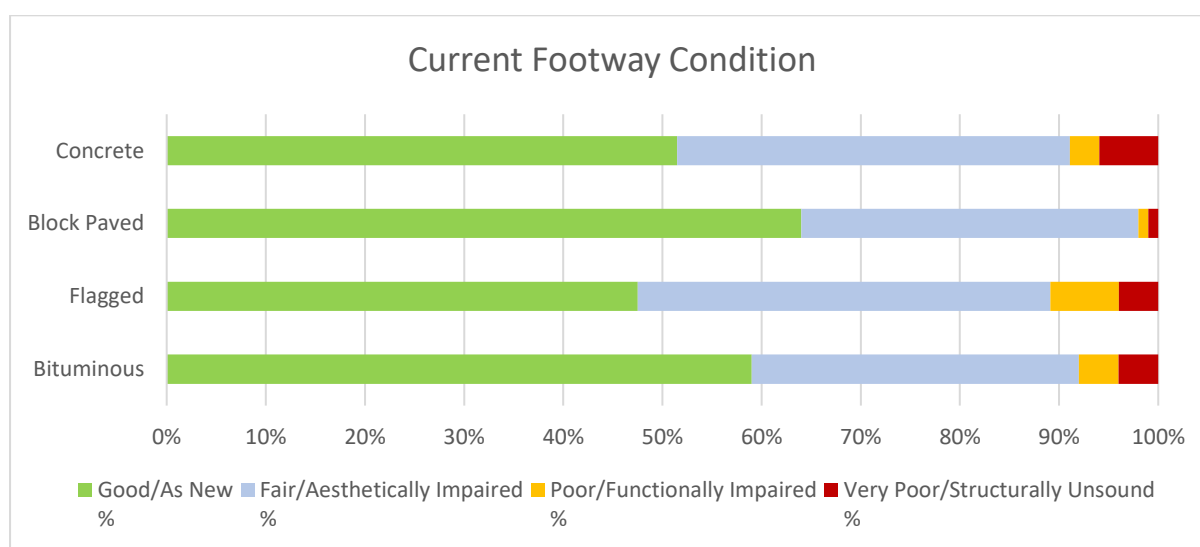
We are unable to provide historic Footway Trends due to it not being a National Indicator requirement for the Dft, unlike Carriageways where we submit results on an annual basis.

Table 9 and Figure 6 below shows the current condition for Footways:

Table 9

Footway Material	Current Condition Levels			
	Good/As New %	Fair/Aesthetically Impaired %	Poor/Functionally Impaired %	Very Poor/Structurally Unsound %
Bituminous	59	33	4	4
Flagged	48	42	7	4
Block Paved	64	34	1	1
Concrete	52	40	3	6

Figure 6



Following completion of the 2016/17 Footway Condition Survey, the percentage of our Footway Network identified to be in 'Very Poor' condition is between 1% and 6% dependent on the material type.

5.1 Footway Condition Forecast

5.1.1 Current Budget

The annual budget that was applied to this round of Lifecycle Plans for Footway was £895,000 (2017/18) and that is a composite programme covering the entire Highway Network, i.e. we do not have separate funding blocks for each Footway Material Type.

We have included both Programmed and Reactive budgets due to the nature of Footway Maintenance, where Flagged and Block Paved would be replaced like for like in either scenario. This is a scenario where the lifespan is extended of the Highway Asset, unlike patchworks or defect repairs for Bituminous material unless we undertake a full structural repair.

Table 10 and Figure 7 show the future performance trend for the Footway Network in Medway using HMEP Lifecycle Toolkit based on the current budget allocation.

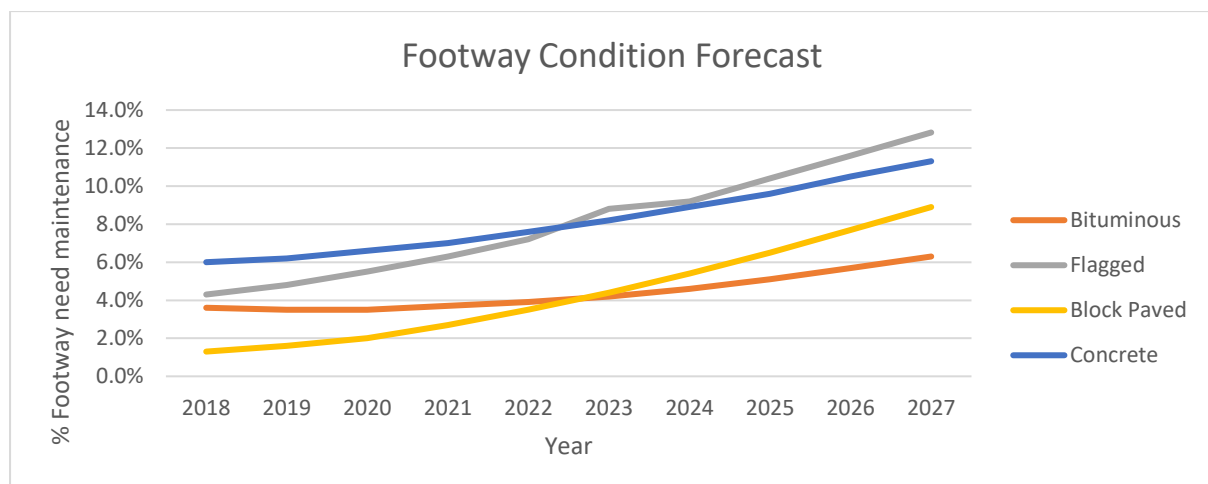
The future condition forecast for Footways with current budgets show:

- 1) A steady increase in deterioration for most footway material with Bituminous and Block Paved performing well
- 2) Concrete and Flagged Footway Material show the biggest increase in deterioration levels with 11% and 12%, respectively, needing maintenance within the 10 year lifecycle
- 3) Although performance levels for Bituminous and Block Paved are performing well, it would be preferable to invest now to avoid the likelihood of further defects on the Footway.

Table 10

Footway Material	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
<i>Bituminous</i>	3.6%	3.5%	3.5%	3.7%	3.9%	4.2%	4.6%	5.1%	5.7%	6.3%
<i>Flagged</i>	4.3%	4.8%	5.5%	6.3%	7.2%	8.8%	9.2%	10.4%	11.6%	12.8%
<i>Block Paved</i>	1.3%	1.6%	2.0%	2.7%	3.5%	4.4%	5.4%	6.5%	7.7%	8.9%
<i>Concrete</i>	6.0%	6.2%	6.6%	7.0%	7.6%	8.2%	8.9%	9.6%	10.5%	11.3%

Figure 7



5.2 Footway Summary

In comparison to the level of deterioration for Carriageways, the Footway Network is currently performing well however the forecast trend shows a steady fall in performance. To maintain the Footway Network at the current level of performance the total investment required based on the HMEP Lifecycle Model is £12.16m over the next ten years which equates to an average Capital Investment additional investment of £321k above existing funding levels.

5.2.1 Improving Footway Lifecycle Plans

In order to improve Footway Lifecycle Plans, we have set a number of Key Service Targets that shall align with our review cycle of this document.

KEY SERVICE TARGETS		YEAR
1.	Maintain 2017/18 levels of Investment into the Footway Programme.	2018-19
2.	Submit Growth Funding Bid through the Medium Term Financial Strategy (MTFS) to secure targeted funding for the Footway Programme.	2018-19

6.0 Structures

Medway Council's current Highway Structure stock stands at just over 200 including the Medway Tunnel. Cyclical inspection programmes are used to help inform a priority of work programme which is recourse through the Highway Infrastructure Contract (HIC) and Consultants.

The condition of the Highway Structures are supplied in report format through General Inspections every two years and Principal Inspection every six years. The Medway Tunnel is inspected every five to ten years under the General and Principal Inspection regime with the last inspections taken place 2015 and 2016 respectively.

Condition reports use a number of performance indicators dependent on the Structure type to help determine the overall condition and structural integrity. Performance indicators measured against the structure are primarily made up of two factors influencing the condition. The Bridge Structural Stock Condition Indicator (BSSCI) and the Bridge Structure Condition Indicator (BSCI). Highway Structure assets have inspection and condition data collected in accordance with CSS Bridge Condition Indicators Volume Two from the Management of Highway Structures (2005) Code of Practice.

Each Highway Structure will have a number of key elements that make up the Highway Asset. It is each of these elements that are assessed using the BSSCI and BSCI to give an overall Bridge Condition Indices (BCI). The BCI informs a programme of priority works for each Highway Structure dependent on the overall condition levels. The minimum score a Structure must achieve is a BCI of 70% where after we would deem the Highway Structure Asset as possibly not fit for purpose unless immediate steps are taken in maintaining key elements of the Structure.

Asset Inventory Data for Highway Structures are held within our Asset Management System Confirm which has been used to inform our Lifecycle Model. BCI Reports with condition data has also been used to inform the Model to determine the Lifecycle of each Highway Structure.

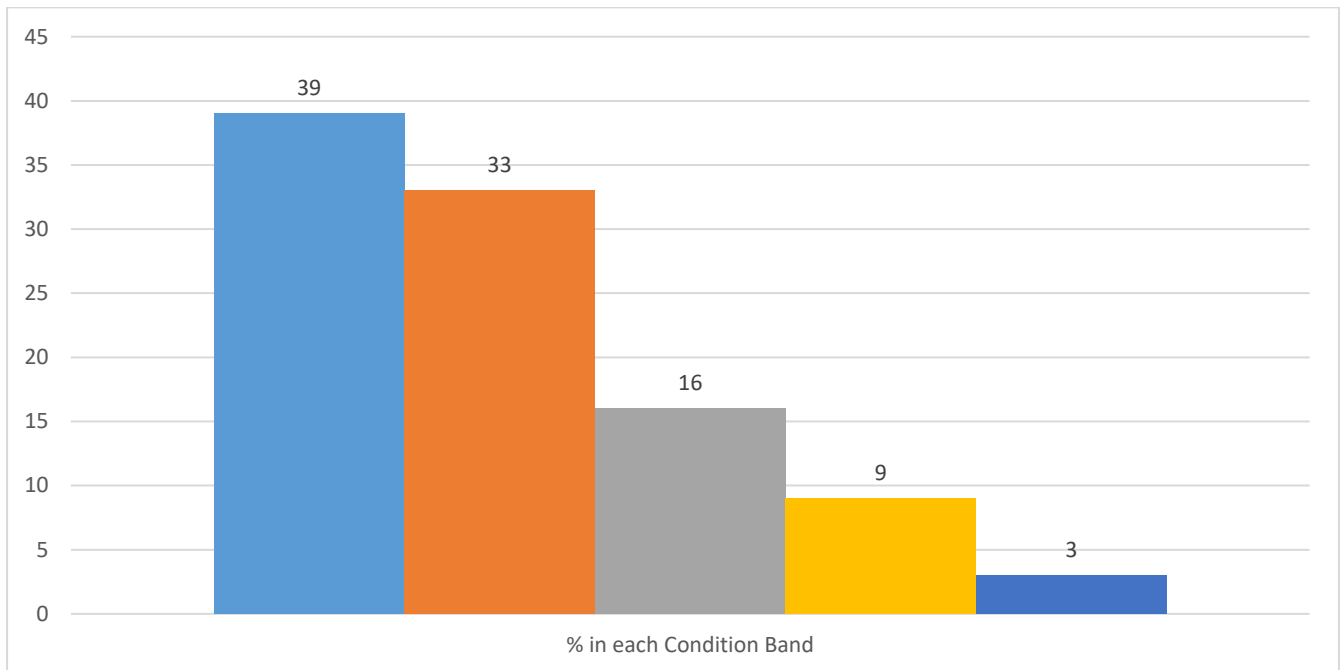
As part of the next cycle of Highway Lifecycle Planning a more detailed Model for the Medway Tunnel needs to be produced that includes all of the Tunnel's associated infrastructure (principally Mechanical and Electrical components).

Table 11 and Figure 8 below show the current condition levels for Medway's Highway Structures. These have been derived from the latest BCI figures taken from Inspection Reports to give a percentage of Structures in each Condition Band. 'Very Good' condition levels mean a BCI score of 99% or more, whereas 'Very Poor' condition levels indicate a BCI score near or below the 70% threshold. These percentage figures have not been recorded previously due to not being a National Indicator.

Table 11

Structures	Current Condition Levels				
	Very Good	Good	Fair	Poor	Very Poor
% in each Condition Band	39	33	16	9	3

Figure 8



6.1 Structures Condition Forecast

6.1.1 Current Budget

The annual budget that has been applied to this round of Lifecycle Plans for Highway Structures was £1.25m which is an amalgamation of all budgets Structures and the Medway Tunnel. We do not separate funding blocks for each Structure type and have included the Medway Tunnel, which does have separate Capital and Revenue budgets. However, for this cycle of the report we have only included the Medway Tunnel Structure (excluding Mechanical/Electrical).

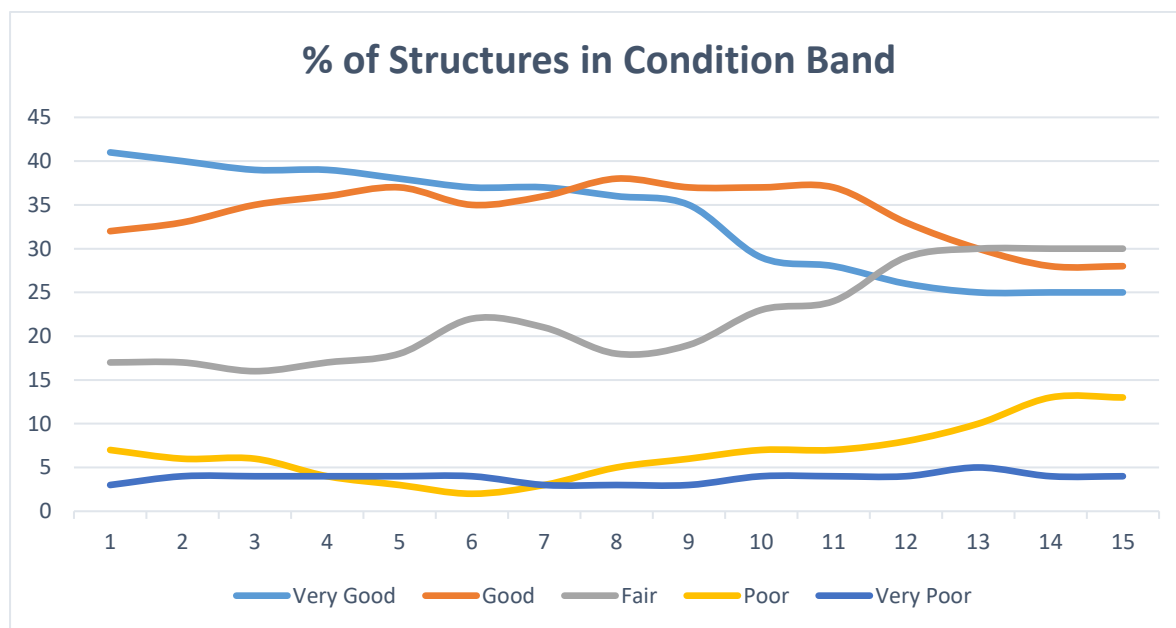
Typically Structures tend to have a much longer lifespan than other Highway Assets, for this reason the forecast has been based on a minimum span of 15 years.

Table 12 and Figure 9 below show the future performance trend for Medway's Structures using current budget levels.

Table 12

% in each Condition Band should budget remain unchanged															
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
<i>Very Good</i>	41	40	39	39	38	37	37	36	35	29	28	26	25	25	25
<i>Good</i>	32	33	35	36	37	35	36	38	37	37	37	33	30	28	28
<i>Fair</i>	17	17	16	17	18	22	21	18	19	23	24	29	30	30	30
<i>Poor</i>	7	6	6	4	3	2	3	5	6	7	7	8	10	13	13
<i>Very Poor</i>	3	4	4	4	4	4	3	3	3	4	4	4	5	4	4

Figure 9



The future condition forecast for Structures with the current budget levels show:-

- 1) The levels of 'Very Good' and 'Good' Highway Structures will fall at a steady-rate over the 15 year Lifecycle Model
- 2) Increased deterioration levels with 'Fair' and 'Poor' condition levels for Structures
- 3) The Lifecycle Model also notes of serious element failures of some Highway Structures by year 10 which will lead to major disruption on the Highway Network
- 4) By year 15 of the Model we could see up to 8 Structures at risk of serious element failures
- 5) Currently we have 6 structures nearing sub-standard levels of deterioration but are being managed annually; however these will need real investment by year 3 of the lifecycle model to avoid disruption to the Highway Network

6.2 Structures Summary

The current backlog for Structures is around £41.5m. To maintain the Highway Structures at the current level of performance (steady-state) the total level of investment required over the next fifteen years is £24.5m. This equates to an average Capital Investment of £1.5m from year 3 above existing funding levels.

6.2.1 Improving Structures Lifecycle Plans

In order to improve Structure Lifecycle Plans, we have set a number of Key Service Targets that shall align with our review cycle of this document.

	KEY SERVICE TARGETS	YEAR
1.	Maintain 2017/18 levels of Investment into the Highway Structures.	2018-19
2.	Submit Growth Funding Bid through the Medium Term Financial Strategy (MTFS) and Department of Transport (DfT) to secure targeted funding for the Medway Tunnel	2018-19
3.	Commission be-spoke Lifecycle Plan for Medway Tunnel to inform future funding requirements.	2019-2020

7.0 Street Lighting

Medway Council hold an extensive database inventory of its Street Lighting Assets with a total of 26,474 columns at the time the Lifecycle Model was processed. The Database is kept up to date on our Asset Management System Confirm with details on each type of Streetlight column.

For the HMEP Lifecycle Toolkit we undertook an Asset Data Gap Analysis in 2017 using the age data we hold in Confirm. We found that some of the age data we hold for Street Lighting Columns only goes back as far as 1979. For this reason we have worked with an external consultant and Highway Street Lighting Team to give the best guesstimate on current conditions based on age. It was then assumed that any columns that were past their industry standard design life would be categorised as 'Poor' condition or in need of replacement.

Other factors that can affect the lifespan of the Streetlight Column include:

- The type of material the column is constructed of which in Medway can include Steel, Concrete, or Aluminium which determines different lifespans
- Damage caused from passing vehicles
- Cracks developing along the structure from change-able weather conditions
- Internal and external corrosion

Table 13 shows the results of processing assumed age data on our Streetlight columns against the industry standard of design life per Streetlight Column material.

Table 13

Current Condition (based on age)	2017
Very Good	6880
Good	7519
Fair	8904
Poor	3171

In 2017/18 the Highways Department's Street Lighting Team undertook a Structural Testing Programme to determine a more accurate reading of the current condition levels of Streetlight Columns. These Structural Testing programmes should be undertaken every 6 years to determine the structural condition for compliance with legislation and in accordance with guidance from BS5649/EN40 and the Institution of Lighting Professionals Technical Report 22 (2007).

The Structural Testing Programme was undertaken to secure Capital Funding for a Column Replacement Programme spread across two financial years, commencing in 2018/19. We plan to undertake the Lifecycle Model in the following review cycle, with the condition of columns recorded in the structural testing regime and the additional funding received for the Column Replacement Programme.

7.1 Street Lighting Condition Forecast

7.1.1 Current Budget

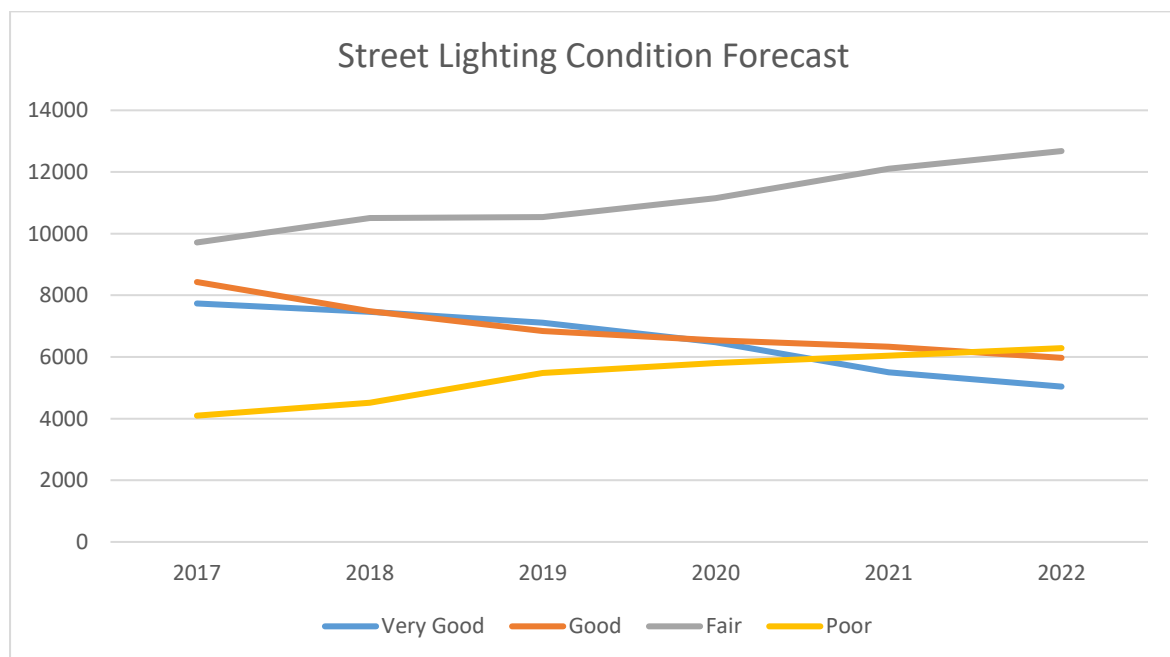
The current annual budget from 2017/18 was applied to this round of Lifecycle Plans for Streetlight Columns of £429,000.

Table 14 and Figure 10 below shows how the Street Lighting stock shall deteriorate over time if no further investment is made based on age data. The table shows six years in advance as per Column Testing periods set by industry standards.

Table 14

COLUMNS - Current	2017	2018	2019	2020	2021	2022
v good	6880	6757	6583	6098	5220	4878
good	7519	6446	5685	5357	5102	4729
fair	8904	9691	9727	10343	11293	11971
poor	3171	3580	4479	4676	4859	4896

Figure 10



The future condition forecast for Streetlight Columns based on age data with current budget levels show:

- 1) A steady increase in the number of 'Poor' Streetlight Columns
- 2) Potential risks to network user with increased likelihood of structural failure of some columns.
- 3) Street Lighting Columns are an aging asset with many already past their design life and in immediate need of replacement.

7.2 Street Lighting Summary

By using the condition data that we developed using age profiles (design life) for Street Lighting, the Lifecycle Model has estimated the current backlog to be £27m. The Model suggests that over a period of six years, Medway would need to increase their budgets by an additional £1.57m per annum to reduce the number of age expired columns to zero.

Since producing the Lifecycle Plan for Street Lighting in 2017/18 additional capital funding (Prudential Borrowing) has been secured to replace columns based on condition data not age profile (design life). Condition Data provides a risk-based assessment of the columns and its individual requirements for repair and replacement irrespective of its age profile (design life).

It is proposed to run a separate Lifecycle Model for Street Lighting based on Condition Data forecast to establish investment requirements using a risk based model.

7.2.1 Improving Street Lighting Lifecycle Plans

In order to improve Structure Lifecycle Plans, we have set a number of Key Service Targets that shall align with our review cycle of this document.

	KEY SERVICE TARGETS	YEAR
1.	Implement the Capital Funding Programme for Street Lighting Column Replacements.	2018-19 to 2019-20
2.	Re-Model the Lifecycle Plan for Street Lighting to take account of the Capital Funding Programme for Street Lighting Column Replacements.	2018-19

8.0 Drainage (Gullies)

The main functions of a Gully is to drain the Highway Network to outfalls or watercourses, thereby reducing the amount of standing water on the Carriageway and allowing vehicles to pass safely.

Medway Council's Highway Department currently hold good inventory data on Highway Gully Assets in our Asset Management System, Confirm. Other Sub-Category Drainage Assets are shown in Table 1 (page 7) which are subject to a Data Inventory and Condition audit over the next few years. We have therefore only applied the Drainage Assets of Gullies into this first cycle of Lifecycle Modelling.

Although there is no industry standard to record drainage condition data, we have used local knowledge and data collected from the routine gully cleansing programme to help inform the Lifecycle Toolkit. The condition of the Gully Asset has been based upon a mixture of how many Gullies are in need of replacing and water depth levels.

Table 15 below shows how the condition grading has been split for the 33,868 gullies within Medway's Highway Network.

Table 15

Type of Asset	Condition/Service Grade (grade 1 - New / grade 5 - Needs Replacing)				
	1	2	3	4	5
Gully	25%	40%	25%	5%	5%

8.1 Drainage (Gully) Condition Forecast

8.1.1 Current Budget

The current budget applied to the Gully Lifecycle Model was £527,000. The Lifecycle Model suggests that current budget levels are sufficient to sustain the gullies at their current performance levels with no Backlog. This could be due to the way we have graded our current stock of Gully data as no standard for recording this information is in place.

Going forward we are looking to improve upon our data to give a more robust and coherent Lifecycle Model especially since we are looking to expand our Drainage Inventory with other Highway Drainage Assets. The likelihood of which shall see us with a Lifecycle Model that produces a more cohesive Backlog of Drainage Assets.

8.1.2 Improving Drainage Lifecycle Plans

In order to improve Drainage Lifecycle Plans, we have set a number of Key Service Targets that shall align with our review cycle of this document.

	KEY SERVICE TARGETS	YEAR
1.	Implement the targeted inventory and condition surveys for Soakaway Drainage Assets.	2018-19 to 2019-20
2.	Re-Model the Lifecycle Plan for Gullies and other Key Highway Drainage Assets to take into account actual current condition and inventory levels to help inform actual investment levels.	2020-21

9.0 Summary

9.1 Current Condition and Forecast Deterioration

This first Lifecycle Report has been written in the context of evaluating our Highway Assets and determine if current budget provisions, based on 2017/18 figures, are sufficient enough to sustain the Highway Infrastructure Asset at a steady-rate.

For some key Highway Assets it has been a major challenge to ensure that it is kept safe and reliable for the Network Users. From the Lifecycle Modelling we can see that currently some Assets are performing well under current investment levels. For instance A and B Roads are holding well due to the recent additional investment in Carriageway Programme for major routes. Or even where our Highway Structures have been able to sustain the level of performance for the next year or so without additional investment.

However, the Lifecycle Model shows key areas where investment is required to enable Medway Council to discharge its statutory duty and maintain the Highway Network in a safe condition for all network users. Areas such as the Unclassified Road Network and Street Lighting Columns require immediate investment if we are to keep the performance levels at a steady-state.

Lifecycle Planning gives us the ability to make reasonable and careful decisions as to when is the best time to invest into the key Highway Assets. Table 16 below shows the total summary of the Lifecycle Financial Gap over the next ten years with regards to our Key Highway Assets if current condition levels (steady-state) are to be maintained.

Table 16

	Current Budget (17/18)	Carriageway	Footway	Structures	Street Lighting	Gullies	
		£1.7m	£895k	£1.25m	£429k	£210k	
		(£'000)	(£'000)	(£'000)	(£'000)	(£'000)	(£'000)
Lifecycle Financial Gap	1	£1,900	£321	-	£1,570	-	
	2	£1,900	£321	-	£1,570	-	
	3	£1,900	£321	£1,500	£1,570	-	
	4	£1,900	£321	£1,500	£1,570	-	
	5	£1,900	£321	£1,500	£1,570	-	
	6	£1,900	£321	£1,500	£1,570	-	
	7	£1,900	£321	£1,500	-	-	
	8	£1,900	£321	£1,500	-	-	
	9	£1,900	£321	£1,500	-	-	
	10	£1,900	£321	£1,500	-	-	
	Financial Gap (additional req.)	£19,000	£3,210	£12,000	£9,420	-	£43,630
	Total Investment Required	£36,000	£12,160	£24,500	£13,710		£86,370

In 2017 we conducted a study alongside Consultants to calculate a Total Highway Maintenance Backlog which estimated to be over £83m for Medway. This recent study into the Key Highway Asset

Groups shows a total investment gap over the next 10 years to be in the region of £43.53m against current levels of budgets applied to the Key Highway Assets.

9.2 Lifecycle Planning Review Cycles

The proposed review cycle in table 17 shows Highway Lifecycle Planning is every two years with the priorities for the next two cycles being:-

Table 17

2019-2020	2021-2022
Carriageways	Carriageways
Footways	Footways
Structures	Structures
Medway Tunnel	Medway Tunnel
Street Lighting Columns	Street Lighting Columns
Drainage	Drainage (Soakaways & Flap Valves)
Crash Barriers	Crash Barriers
	Traffic Signals

For the next cycle we shall aim to include:-

- 1) **Street Lighting Columns** – The Prudential Borrowing Scheme investment and Column Replacement Report with up to date conditions for Concrete and Steel columns.
- 2) **Medway Tunnel** – Due to the specialist nature of the electrical and mechanical elements associated with the Tunnel, funding for specialist Consultants will need to be secured to support production of a be-spoke Lifecycle Plan.
- 3) **Drainage** – In addition to acquiring better Gulley Condition data, we will begin the development of Lifecycle Plans for Soakaway and Flap Valve assets under the programme for inventory and condition data.