Asset Management in Highways

Developing our Approach to Asset Management in Highways

Version	Author	Date	Comment
0.1	Alan Casson	15th December 2017	Draft for DivMT Review
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2.0	Alan Casson		Draft for DivMT Review

Contents

Context

This is the first annual review of *"Developing Our Approach to Asset Management in Highways"*. It uses robust data, processes and modelling to record the current condition of highway asset groups and forecasts future condition or standards of service. The original document was approved by E&TCC and published on the Council's website in January 2018. It is the third of a suite of three documents that form part of our Asset Management Framework and are described in more detail in *"Implementing Our Approach to Asset Management in Highways"*.

These three asset management documents are also integral to and support our approach to implementing *"Well-managed Highway Infrastructure – Applying the Code of Practice in Kent"*.

Introduction

Our highway network has a gross replacement cost currently estimated at £24bn[1].

Asset	Quantity	Estimated Value[1] (The cost of a like for like replacement)
Roads	→ 5,400 miles (8,700km) of roads	£6,400m
Structures	→ 1,500 bridges and viaducts → 570 culverts → 540 other structures	£1,300m
Drainage	→ 250,000 roadside drains → 8,500 soakaways → 250 ponds and lagoons	£3,300m
Crash Barriers (Vehicle Restraint Systems)	→ 230 km of safety barriers	£75m
Footways	→ 4,000 miles (6,400km) of footways	£1,100m
Land	→ 75km^2	£11,500m
Soft Landscape	→ 500,000 trees → 4,500,000 m^2 urban grass verges → 5,000 km rural grass verges	*These are not currently included in the valuation estimate*
Street Lighting	→ 119,000 street lights → 17,500 illuminated signs → 4,500 illuminated bollards	£164.5m
Intelligent Traffic Systems	→ 700 traffic lights → 120 CCTV cameras → 500 interactive warning signs	£51.6m
Street Furniture	→ 190,000 unlit signs → 130 km pedestrian guardrail → 14,000 km of road markings → Salt bins	£29m

[1] Figures from the 2017/18 Whole of Government Accounts Valuation

Few of our assets are in 'as new' condition but we are committed to their effective management, not only now but also for future generations.

We recognise that although the highway network is made up of individual asset groups, each managed by a separate team, the assets do not operate in isolation and we therefore consider them as an integrated set. Included in *"Implementing Our Approach to Asset Management in Highways"* is a diagram of the inter-relationships between our highway assets.

The modelling we have undertaken assumes normal deterioration rates and no allowance as been made for any significant damage caused by severe weather. There has also been no allowance made for significant single projects requiring large investment.

Although we have carried out modelling for a ten-year period we recognise things change. We will therefore review this modelling annually in line with available budgets.

We have always managed our highway assets by looking for and implementing the best ways to maintain them. We are now developing a more structured and enhanced Asset Management approach to these activities to ensure we are deriving more value for the residents of Kent by broadening our focus to select strategies that consider the whole life cost of assets. This will improve the long-term value for Kent and support the Council's objectives by allowing informed, evidence-based decision making.

Although the complexity of our approach to asset management varies across the asset groups depending on the completeness of data we hold and the modelling tools available, the same principles have been applied in all areas of the highway service. The table below summarises the approach we have adopted to forecasting future budget needs or performance outcomes for each of the areas.

Asset Group	**Modelling carried out on. . .**	**Current Funding**	**Steady State** (average annual investment)
Roads	Maintenance needs from routine condition surveys	£11,000k	£45,000k
Bridges, Tunnels & Highway Structures	Maintenance needs from routine inspection programme	£2,240k	£2,000k
Drainage	Condition profile based on broad assumptions on defect data and enquiry volumes.	£3,207k	£6,820k
Crash Barriers (Vehicle Restraint Systems)	Maintenance needs from condition survey	£1,000k	£2,400k
Footways/ Cycleways	Maintenance needs from routine condition surveys	£1,000k	£4,800k
Street Lighting	Renewal needs from the routine structural testing programme	£2,873k	£3,700k

Intelligent Traffic Systems	Renewal based on asset age	£578k	£2,800k
Soft Landscape	No modelling	£3,200k	£4,200k
Road Markings, Studs, Lines & Signs	Documented assumptions have been made to estimate the extent of these assets.	£241k	£3,500k

The above figures relate to capital funding for Road and Footway asset groups, revenue funding for the Soft Landscape asset group and a combination of revenue and capital for all remaining groups.

The road funding figures mentioned above do not include around £2m per annum top-sliced for addressing skid deficient sections of main roads.

Condition and Forecasts by Asset Group

Roads

	Road Classification				
	A	B	C	U	Total
miles	611	278	1,169	3,324	5,382
km	986	448	1,883	5,353	8,670

This asset group has excellent condition data and there is a good understanding of how the asset deteriorates. There are also several technologies available to model the impact of different levels of investment.

The condition data we have on this asset has been collected over many years, by specialist survey contractors using nationally recognised and accredited surveys. Originally the primary driver for this data collection was to develop evidence-based maintenance programmes but due to its comprehensive nature, it can also be used for lifecycle planning with Kent specific deterioration rates.

This modelling has been undertaken using Yotta's 'Horizons' software and forecasts condition and maintenance backlog over the next ten years. Horizons selects optimum treatments during modelling based on a range of user defined interventions and triggers, these treatments do not necessarily reflect actual work carried out as currently a different system (JCAM) is used to define the maintenance schemes that are included in the forward works programmes. However, we would not expect the outcomes to be significantly different.

Although weightings have been set in JCAM to give priority, for example, to treating defects on A roads over those of a similar severity on Unclassified roads, these have not yet been set in the Horizons modelling. Although this is expected to have minimal effect on forecasts of overall road condition it is something we will address in the future, see section below.

Routine Road Maintenance

The figures used below relate to proactive, planned capital investment in our road network, predominantly in the form of road asset renewal or preservation treatments such as micro asphalt or surface dressing. They do not include any allowance for the funds the County Council spends each year to reactively repair road defects, including Pothole Blitz campaigns. Whilst surface defects will always occur, and we have experienced a number of weather emergencies in the last decade which have worsened the condition of our network, surface defects are primarily a symptom of a lack of planned investment in the network. The less resource invested in planned maintenance, the more surface defects will occur. Reactive repairs are, on average, twice as expensive per square metre as planned resurfacing. The majority of

reactive road maintenance is in the form of permanent pothole and patching repairs using capital resource.

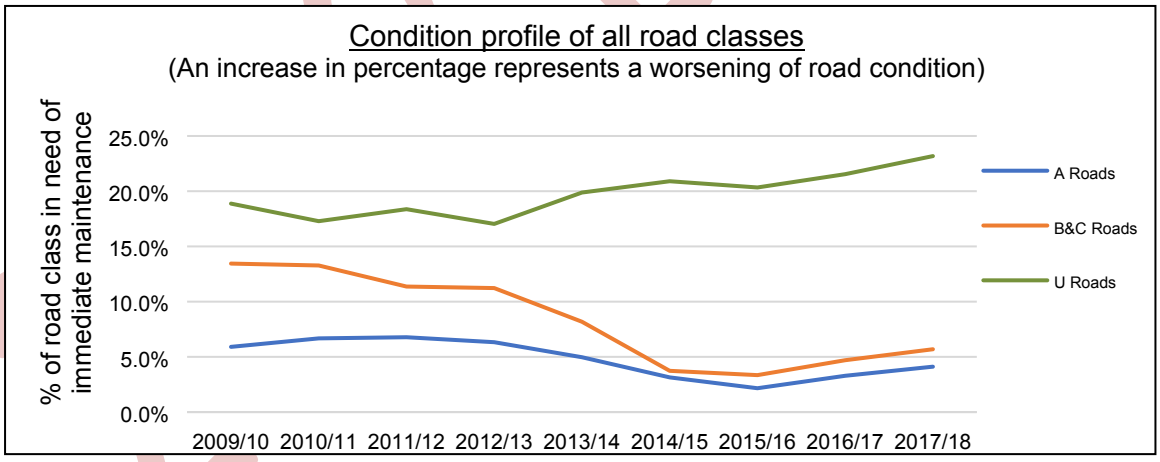
During the period 2013/14 to 2016/17 we spent a total of £27.4m on reactively repairing road defects, an average of £6.8m a year. This increased to £7.2m for the period 2013/14 to 2017/18 with the inclusion of the £8.8m spent in 2017/18. It is very difficult to accurately model the relationship between road condition and the number and cost of surface defects that will occur. However, investment less than that modelled to achieve a steady state condition will result in an increase in defects, increasing the pressure on revenue and capital funds and in turn reducing the amount of capital funding that can be spent on planned maintenance.

Current Condition

Following completion of the 2017/18 road condition surveys, the percentage of our road network in very poor condition is: 4.1% of A roads, 5.7% of B and C roads and 23.2% of unclassified roads, compared to our forecast last year of 4.6% for A roads, 5.5% for B and C roads and 23.1% for unclassified roads, which gives confidence in our condition modelling methodology and clearly evidences a deteriorating trend.

	Year				
Road Class	**2013/14**	**2014/15**	**2015/16**	**2016/17**	**2017/18**
A Roads	5.0%	3.1%	2.2%	3.3%	4.1%
B&C Roads	8.2%	3.7%	3.3%	4.7%	5.7%
U Roads	19.9%	20.9%	20.3%	21.5%	23.2%
All Roads	14.2%	13.3%	12.4%	13.8%	14.9%

Condition profile of all roads 2013/14-2017/18



The improvement in condition of classified roads, shown by the downward trend of the lines, between 2013/14, 2014/15 and 2015/16 reflects the increased investment in 2012/13, 2013/14 and 2014/15 of £22.0m, £20.3m and £22.6m respectively. The budgets for 2015/16 and 2016/17 were lower at £16m and £13m. The lag between investment and recorded changes in condition is due to the survey regime. For example, maintenance undertaken during year 1 will be surveyed in either year 2 or year 3 and the full effect of the work will not appear in the results until the end of year 3. This demonstrates a clear correlation between planned capital investment in and condition of our roads.

Condition Forecasts

To help determine the longer-term benefits that can be expected from various levels of funding we have undertaken modelling based on four funding scenarios. The funding scenarios used are: Scenario 1 (Current Budget), Scenario 2 (Current Budget plus additional investment in Years 1 to 3), Scenario 3 (As Scenario 2 but continuing increased investment across the forecast period) and Scenario 4 (No Budget) – see table below.

	Annual Budget (£m)									
	19/20	**20/21**	**21/22**	**22/23**	**23/24**	**24/25**	**25/26**	**26/27**	**27/28**	**28/29**
Scenario 1 (Current Budget)	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
Scenario 2 (Revised Budget v1)	28.5	27.1	21.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
Scenario 3 (Revised Budget v2)	28.5	27.1	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0
Scenario 4 (No Budget)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Scenario 1 - Current Budget

We have modelled the effect on road condition if this level of funding remained unchanged.

Road Class	**Year**									
	2019	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**
A Roads	5.0%	5.9%	6.6%	7.1%	7.8%	8.7%	9.8%	11%	12.3%	13.9%
B&C Roads	6.1%	5.5%	5.7%	6.5%	7.5%	8.6%	9.7%	10.8%	11.9%	13.1%
U Roads	24%	24.2%	24.3%	24.2%	23.8%	23.3%	22.8%	22.5%	29.9%	32.6%

The forecast % of road requiring maintenance soon.

It is estimated that this condition of the road network equates to a current maintenance backlog in the region of £650m, an increase of £20m from last year. It is predicted that if the existing level of funding were maintained this would increase to around £1bn by 2028. This figure has not increased from last year's forecast because of developments in deterioration modelling. If this level of deterioration were to occur, it would become increasingly challenging to meet our Highways Act obligations to maintain a safe highway network.

Scenario 2 – Current Budget plus additional investment in Years 1 to 3

Road Class	**Year**									
	2019	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**
A Roads	5.0	5.1	5.1	5.6	6.3	7.1	8.0	9.0	10.2	11.6
B&C Roads	6.1	4.6	5.0	5.7	6.5	7.1	7.8	8.5	9.3	10.1
U Roads	24.0	24.2	23.3	22.2	21.8	21.3	20.9	20.6	28.0	30.8

The forecast % of road requiring maintenance with scenario 2.

The modelling predicts that with this scenario the maintenance backlog in ten years' time will be in the region of £900m, approximately £100m 'better' than under the previous funding regime for an additional investment of £44m which demonstrates the benefit of planned asset investment.

Scenario 3 – Current Budget plus additional investment for Years 1 to 10

Road Class	Year									
	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
A Roads	5.0	5.1	5.1	5.6	6.2	7.0	7.9	8.8	9.9	11.3
B&C Roads	6.1	4.6	5.0	5.7	6.5	7.1	7.8	8.5	9.3	10.1
U Roads	24.0	24.2	23.3	22.2	21.1	20.1	19.3	18.6	25.3	27.4

The forecast % of road requiring maintenance with scenario 3.

Under this scenario the backlog after ten years is forecast to be around £810m. Representing a road condition in the region of £190m 'better' than under the initial funding regime, for an additional investment of around £114m.

Scenario 4 – No Budget

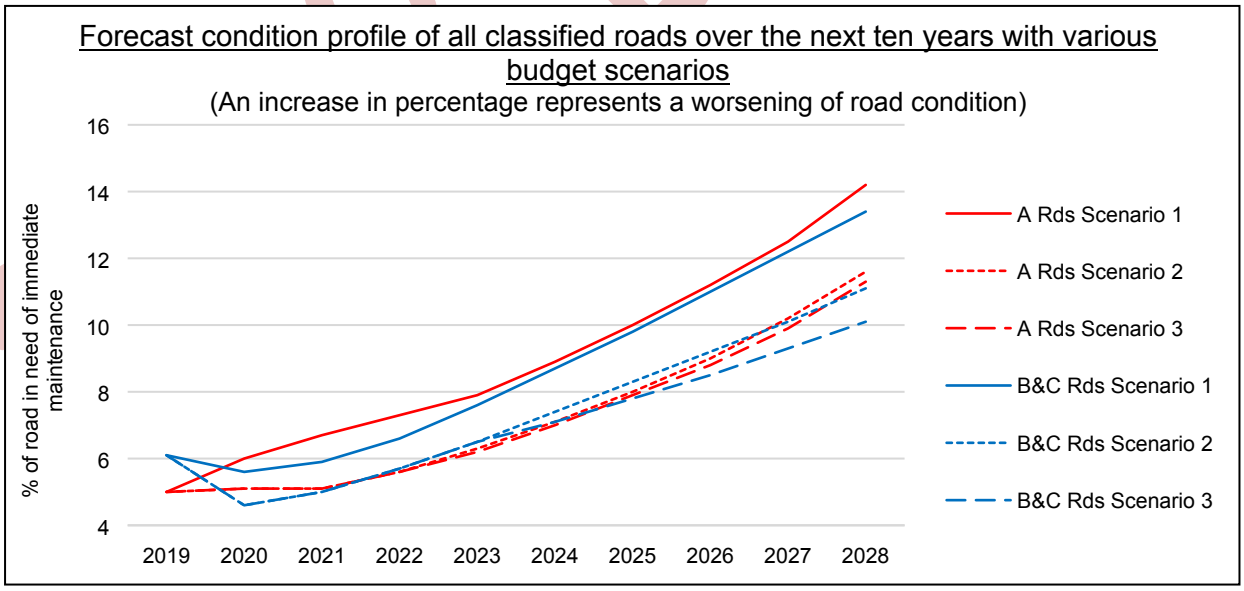
Road Class	Year									
	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
A Roads	5.0	6.1	7.3	8.6	10.1	11.8	13.7	15.6	17.9	20.8
B&C Roads	6.1	7.7	9.5	11.5	13.9	16.4	19.1	22.0	25.2	28.8
U Roads	24.0	24.2	24.3	24.4	24.4	24.6	24.7	25.0	33.1	36.4

The forecast % of road requiring maintenance with no budget.

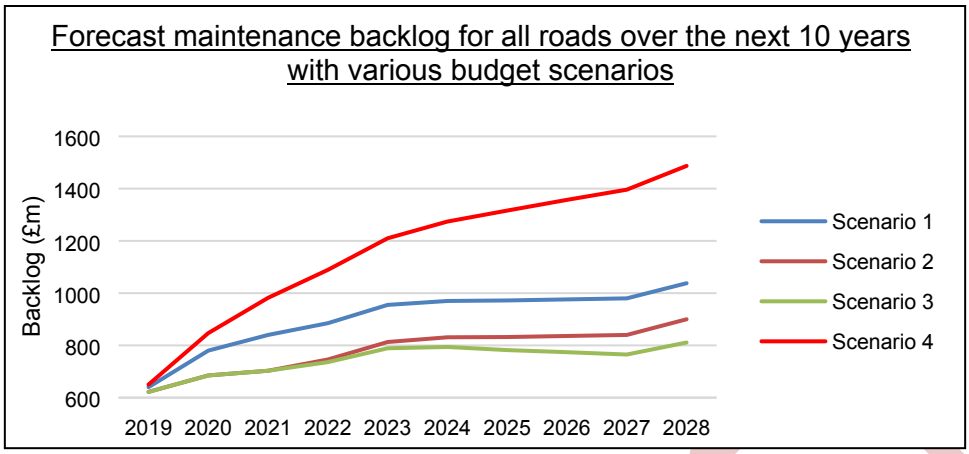
It is forecast that if there were no budget for planned maintenance over the next ten years, representing a saving in the region of £110m relative to the previous existing level of funding, the backlog at the end of this period would be nearly £1.5 bn. This represents a comparative worsening in condition of around £500m which would need to be dealt with by less cost effective reactive maintenance if the roads were to be kept safe.

Comparison of Forecasts

Condition

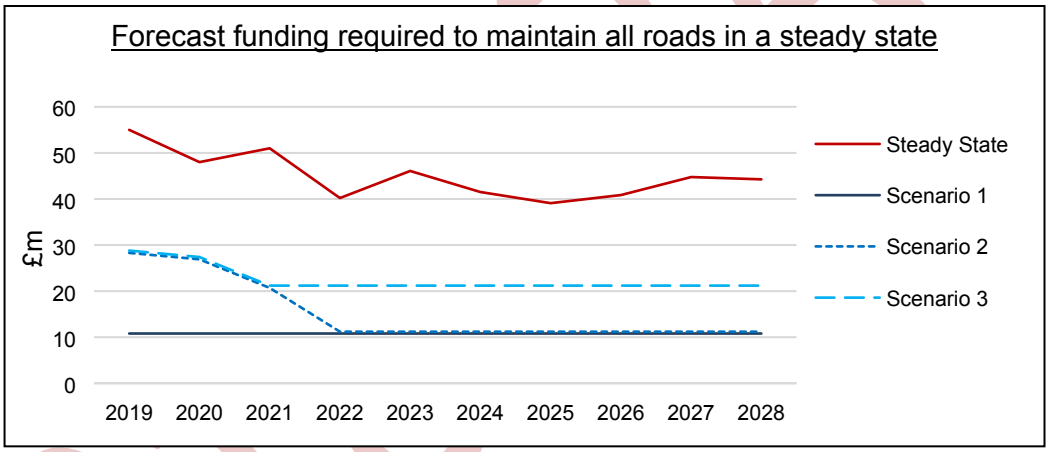


Maintenance Backlog



Steady State Condition

To keep our roads at their current condition level and maintain the backlog at £650m over the next ten years, the modelling has estimated the total cost to be £450m. This equates to an average annual capital investment of £45m.



Improvements in the management of our roads, implemented in the last twelve months

- Development of Road Asset Renewal Contract to improve lifecycle performance.
- Comparison of past condition predictions against actual results to verify accuracy and robustness of modelling methodology.
- Explored the effect of various treatment strategies on whole life costs.
- Started to look at having more influence over new assets added to the network.

Future improvements to enable us to improve the management of our roads

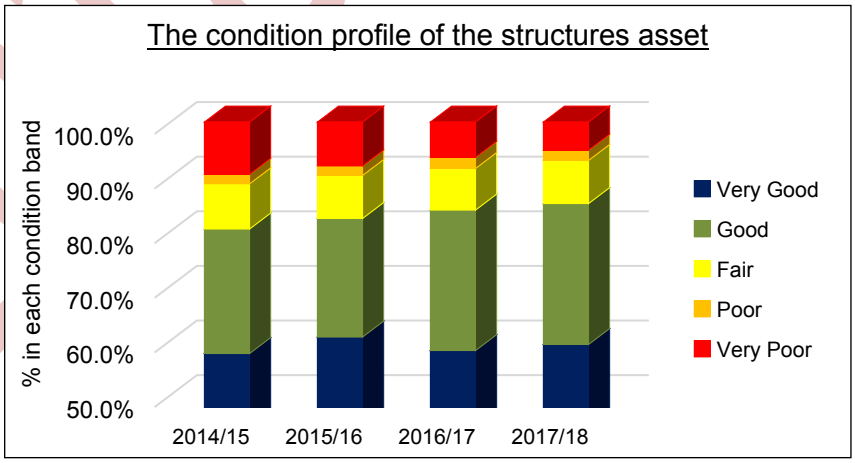
- Continue developing the modelling to improve confidence in forecasting.
- Continue to explore the effects of various treatment strategies on whole life costs.
- Develop modelling to forecast future surface defect quantities and cost based on different investment scenarios.
- Explore possible correlation between overall road condition and accident rates.

Bridges, Tunnels and Highway Structures

Asset	Quantity
Bridges	1,494
Viaducts	6
Footbridges	95
Culverts	568
Gantries	7
Retaining Walls	313
Tunnels	2
Subways	38
Special Structures	177

There is an extensive inventory database and well established, nationally recognised inspection regimes for structures. This has resulted in a wealth of information on this asset group which is currently held on a bespoke database. A recent review of data collection and management within this asset group concluded that while the data collection regimes were fit for purpose the data management systems no longer were. As a result, work was undertaken to established what was now required from a structures management system and this is being implemented. Although underway, implementation of the new structures management system is not complete and as an interim measure the following forecasts of asset condition have been determined using the HMEP ancillary assets toolkit populated with Kent specific data.

Current Condition



Condition Band	2014/15	2015/16	2016/17	2017/18
Very Good	57.5%	60.6%	58.2%	59.3%
Good	22.8%	21.7%	25.7%	25.8%
Fair	8.3%	7.9%	7.6%	7.9%
Poor	1.7%	1.7%	2.0%	1.9%
Very Poor	9.6%	8.0%	6.4%	5.1%

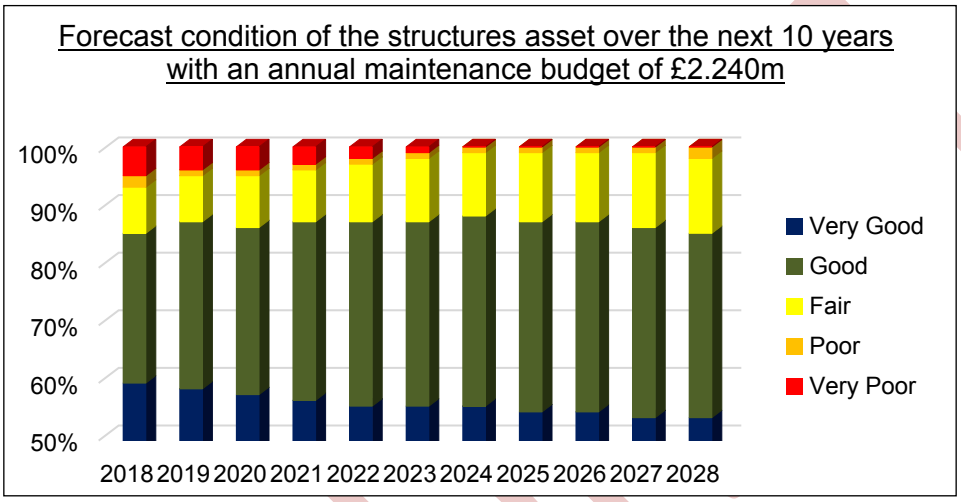
% in each condition band

This shows an improving trend in condition and is similar to what we forecasted last year. However, we recognise a need for more robust modelling for this asset group.

Condition Forecasts

The current annual budget for planned structures asset management is £2.240m. We have modelled the effect on the condition of our structures if this current level of funding remains unchanged.

With Current Budget



Year	% in each condition band if the budget remains at the current level										
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Very Good	59%	58%	57%	56%	55%	55%	55%	54%	54%	53%	53%
Good	26%	29%	29%	31%	32%	32%	33%	33%	33%	33%	32%
Fair	8%	8%	9%	9%	10%	11%	11%	12%	12%	13%	13%
Poor	2%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Very Poor	5%	4%	4%	3%	2%	1%	0%	0%	0%	0%	0%

Forecast % in each condition band

Forecast Budget Required to Maintain Current Overall Condition Profile

Using these modelling forecasts, it has been estimated that the annual average budget needed to maintain the current overall condition profile would be just under £2m.

Improvements in the management of our structures, implemented in the last twelve months

- Procured and started implementing a new structures management system.

Future improvements to enable us to improve the management of our structures asset

- Fully implement the new structures management system to enable more robust lifecycle modelling, particularly for different treatment strategies.

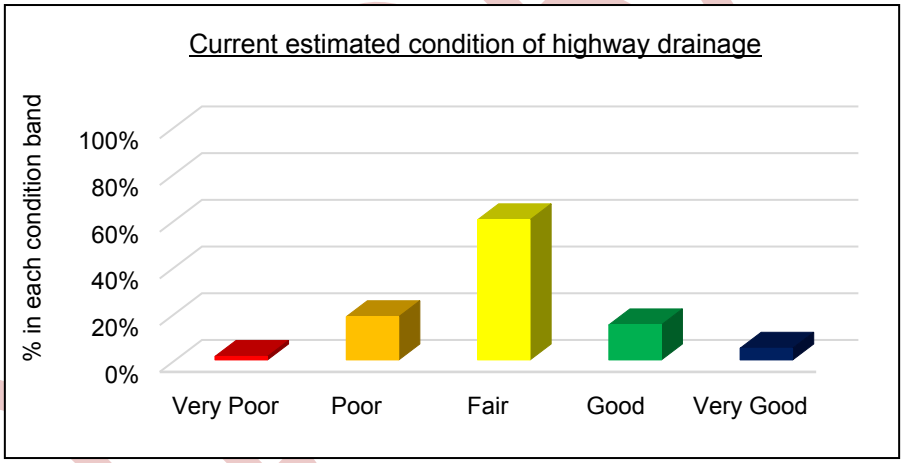
Drainage

Asset	Quantity
Roadside drains	250,000
Ponds and Lagoons	250
Pumping Stations	15
Soakaways	8,500

Given its significant effect on other asset groups, customer service and road safety, management of this asset group is something that should have a high priority.

Although we have a good understanding of the lifecycle of drainage assets the data we have for this asset group is more limited than that for roads or footways. We therefore do not currently have the means to complete detailed modelling of different funding scenarios. However, based on some broad assumptions drawn from defect data and enquiry volumes we have calculated a current condition profile for this asset.

Current Condition



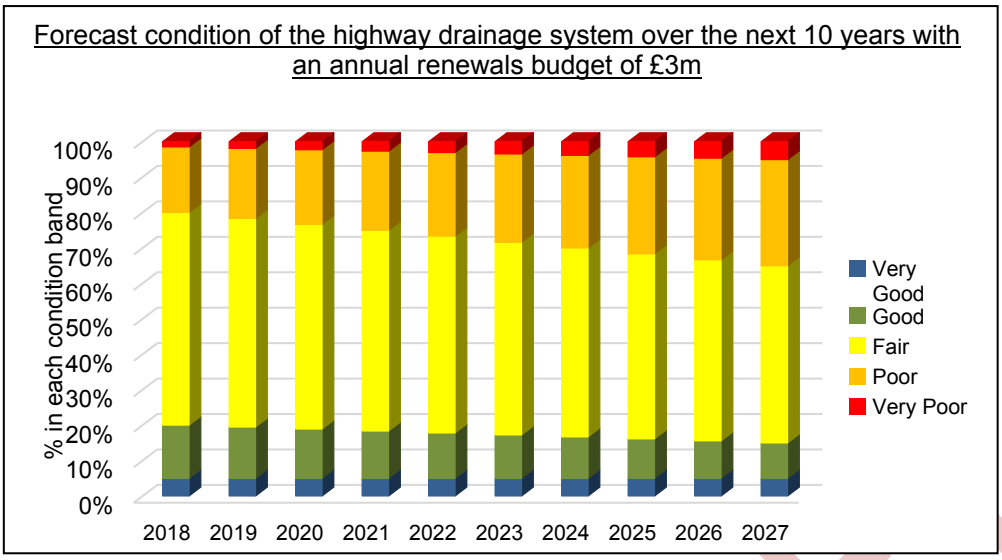
	Very Poor	Poor	Fair	Good	Very Good
% in each condition band	2	19	60	15	5

Estimated % currently in each condition band

Condition Forecasts

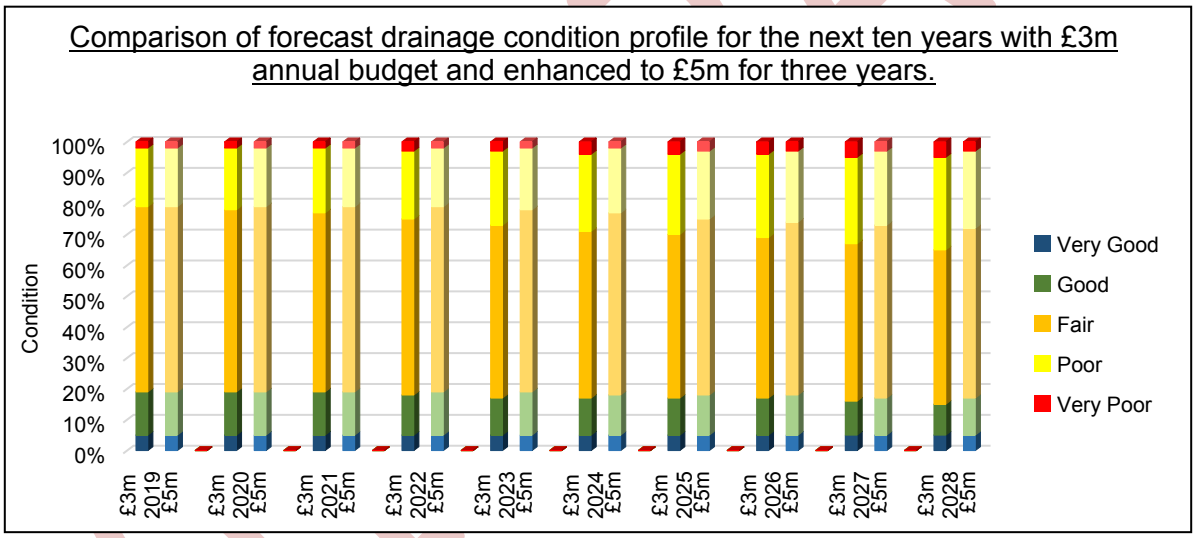
Current Budget

Based on the same broad assumptions as used above we have forecast the future condition of the highway drainage asset for the next ten years with the current £3m annual maintenance budget.



Revised Budget

We have also estimated the future condition profile of this asset for a revised funding level of £5m annually until 2021/22, with £3m a year thereafter.



	2019		2024		2028	
Budget	£3m	£5m (initially)	£3m	£5m (initially)	£3m	£5m (initially)
Very Good	5%	5%	5%	5%	5%	5%
Good	14%	14%	12%	13%	10%	12%
Fair	60%	60%	54%	59%	50%	55%
Poor	19%	19%	25%	21%	30%	25%
Very Poor	2%	2%	4%	2%	5%	3%

Comparison of the forecast in each condition band for the two funding scenarios

The above table shows the forecast percentage of the drainage asset in each condition band. Blue numbers are with an annual budget of £3m and the black numbers are with this enhanced to £5m for the next 3 years.

Improvements in the management of our drainage asset, implemented in the last twelve months

- We have implemented a system that allows us to view information on the location and status of our gullies, updated directly by the cleansing teams, through our Map16 software.

Future improvements to enable us to improve the management of our drainage asset.

- Implementation of computer-based modelling techniques to asses a variety of cleansing and maintenance strategies.

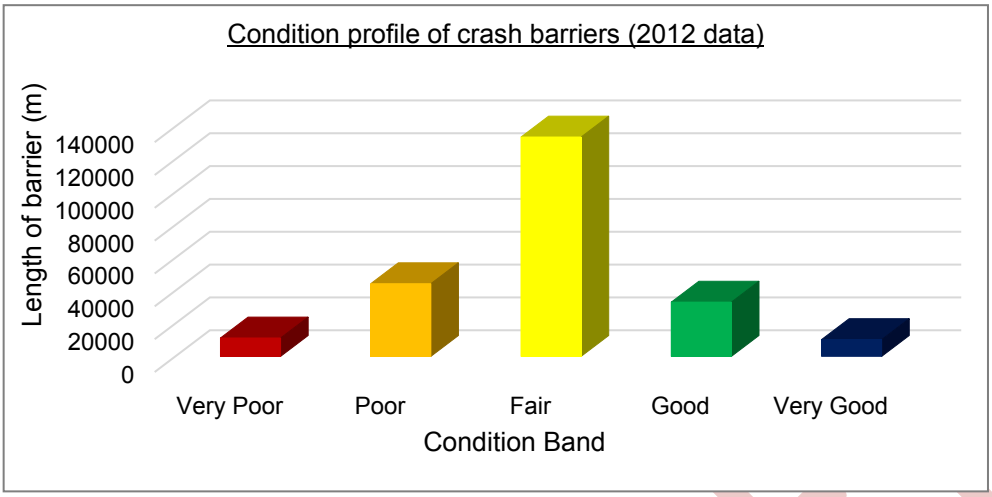
Crash Barriers (Vehicle Restraint Systems [VRS])

Crash barriers fulfil a critical role and their failure to perform as designed has serious implications for highway safety.

In recent years there has been limited management of the crash barrier asset with principal inspections being undertaken by specialist contractors on A and B roads every five years. This information was collated and the barriers graded from one (very poor) to five (very good) for priority repair. The last survey was carried out in 2012.

A new management system is now in place and a revised condition inspection regime is being implemented. 2018/19 is the first year of this revised programme and at the time of writing the condition information is not yet available. We have therefore used the existing grading information in conjunction with the HMEP Ancillary Assets Toolkit to forecast future replacement needs for this asset group. This approach has its limitations, mainly due to the age of the data, but it will still allow us to estimate the size of the problem we already know we have with ageing assets. These initial forecasts include; the replacement/upgrade of barriers, based on an expected life of 25 years; re-tensioning of all tensioned barriers on a two-year cycle, based on a current annual cost of £100k; and a current annual budget of £450k for damage repair.

Current Condition



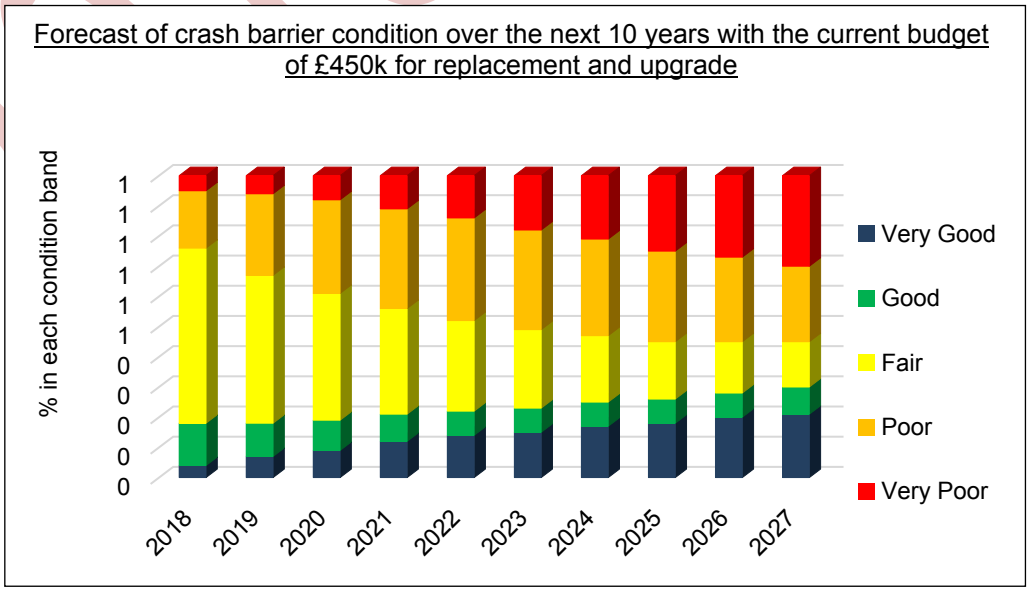
	Total	Very Poor	Poor	Fair	Good	Very Good
Length of asset in each condition band (m)	232,290	11,190	44,263	133,594	33,024	10,219

Based on the results of the 2012 condition survey, we have estimated that the backlog for replacing or upgrading crash barriers that are considered to be in a very poor condition is around £4m. However, this does not take into account the length of crash barrier that due to its age may now not be up to standard and so also require replacing.

Condition Forecasts

Current budget

After allowing for retensioning and damage repair, the current annual budget for replacement and upgrading this asset is £450k.

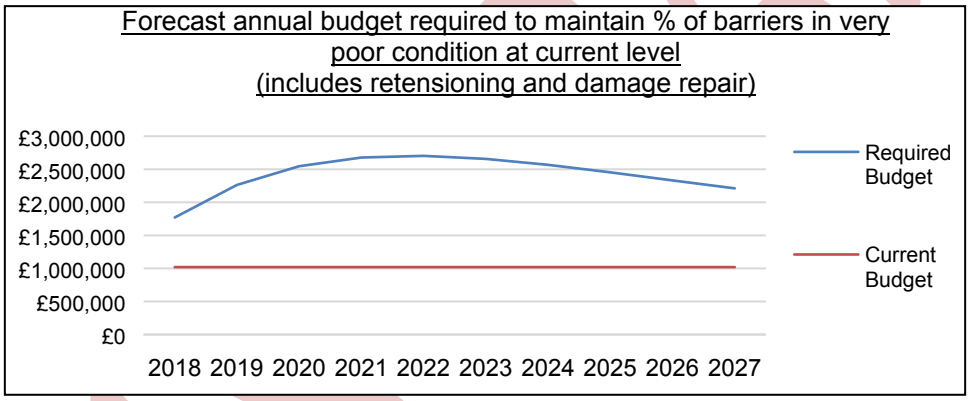


	Length (m) in each condition band if the replacement/upgrade budget remains at the current level									
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Very Good	11671	13813	15740	17475	19037	20442	21706	22845	23869	24791
Good	26946	22724	19560	17222	15525	14324	13503	12973	12663	12517
Fair	114286	96818	82000	69513	59054	50348	43144	37215	32367	28427
Poor	62254	72660	77492	78393	76617	73104	68553	63471	58220	53049
Very Poor	17133	26275	37498	49687	62057	74072	85384	95786	105171	113506

We estimate that the replacement/upgrade backlog by 2027 will be £15.4m if the annual budget remains at the current level.

Budget required to maintain steady state condition

The modelling forecasts an annual average replacement budget of £2.4m would be needed to maintain the percentage of safety barriers in very poor condition at the current level.



Improvements in the management of our crash barriers, implemented in the last twelve months

- We have implemented a new condition inspection regime, collecting data tailored to our asset management needs.
- We have explored data asset management systems with a GIS interface.

Future improvements to enable us to improve the management of our crash barriers

- We intend to further develop the use of the data management system to help with forecasting.

Footways

Footway Type	Bituminous	Slabs	Block Paved	Concrete	Overall
Miles	3,515	251	127	72	3,965
km	5,660	404	204	116	6,384

As with roads, this asset group has a comprehensive set of condition data from nationally recognised surveys, covering a number of years. However, there are fewer sets of complete network data than for roads due to the survey regime.

Due to the nature of the data currently collected a more simplified approach to lifecycle planning has been taken for the asset this year, using the HMEP footway toolkit and the input data used for the Whole of Government Account valuations. The collection of footway condition data is under review and the methods used for lifecycle planning will also be reviewed accordingly.

Reacting to Surface Defects

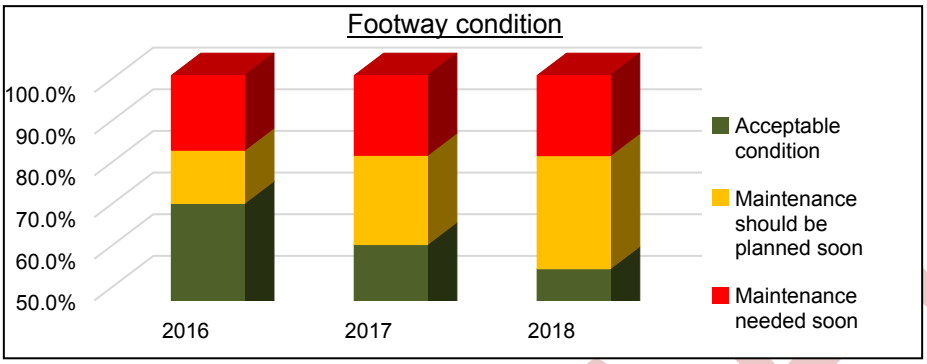
The figures used below only relate to proactive, planned capital investment in our footway network. They do not include any allowance for the funds the County Council spends each year to reactively repair footway surface defects. The majority of reactive footway maintenance is in the form of permanent pothole and patching repairs using capital resource.

In 2017/18 we spent £1.6m on reactively repairing footway defects, giving an annual average spend for the period 2013/14 to 2017/18 of £1.42m. This compares with the average for the period 2013/14 to 2016/17 when we spent a total of £5.5m which equated to an average annual spend of £1.4m. It is very difficult to accurately model the relationship between footway condition and the number and cost of surface defects that will occur. However, investment less than that modelled to achieve a steady state condition will result in an increase in surface defect numbers, increasing the pressure on revenue and capital funds and in turn reducing the amount of capital funding that can be spent on planned maintenance.

Current Condition

Following completion of the 2017/18 footway condition survey, the percentage of our footway network in a very poor condition, where maintenance should be carried out in the very near future, is 19.8% an increase from 19.2% in 2017 and 18% in 2016. This is consistent with previous deterioration forecasts. However, perhaps the more significant concern relates to a substantial increase in the percentage of the footway network that has deteriorated from an acceptable condition to needing maintenance to be planned in the medium term, as can be seen in the table below. Obviously if this portion of the footway network is left to deteriorate significantly, it will make it extremely challenging for the County Council to fulfil its obligations under the Equality Act and seriously impact on other County Council initiatives to encourage people to be more active and less reliant on cars, particularly for short journeys.

	2016	2017	2018
Maintenance Needed Soon	18.0%	19.2%	19.8%
Maintenance Should be Planned	12.8%	21.4%	27.1%
Acceptable Condition	69.3%	59.4%	53.1%

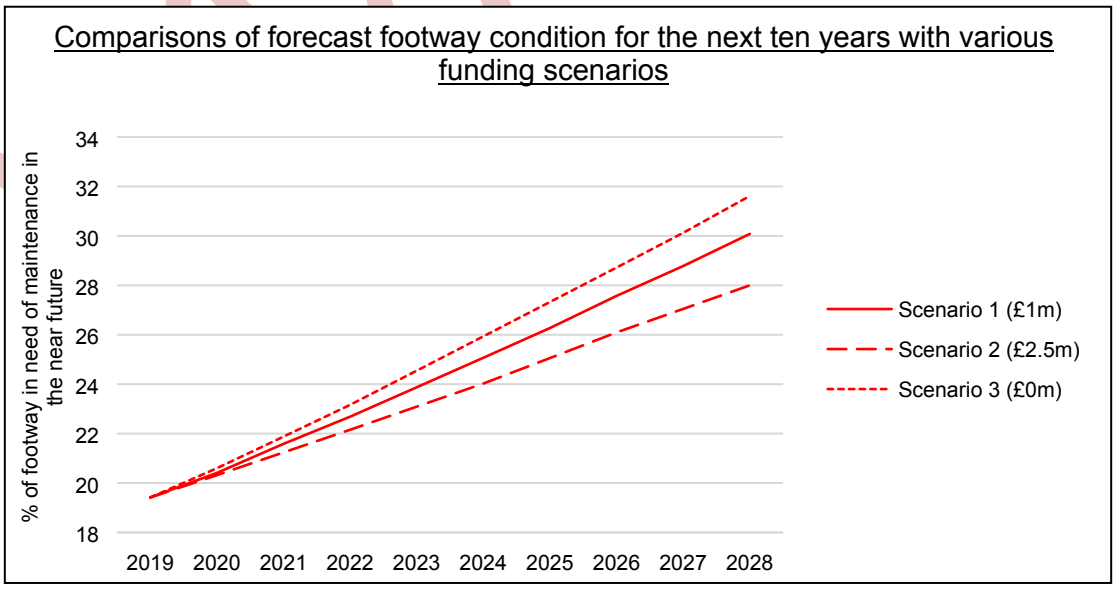


It is estimated that the current maintenance backlog for footways is in the region of £90m.

Condition Forecasts

We have undertaken modelling based on three funding scenarios:

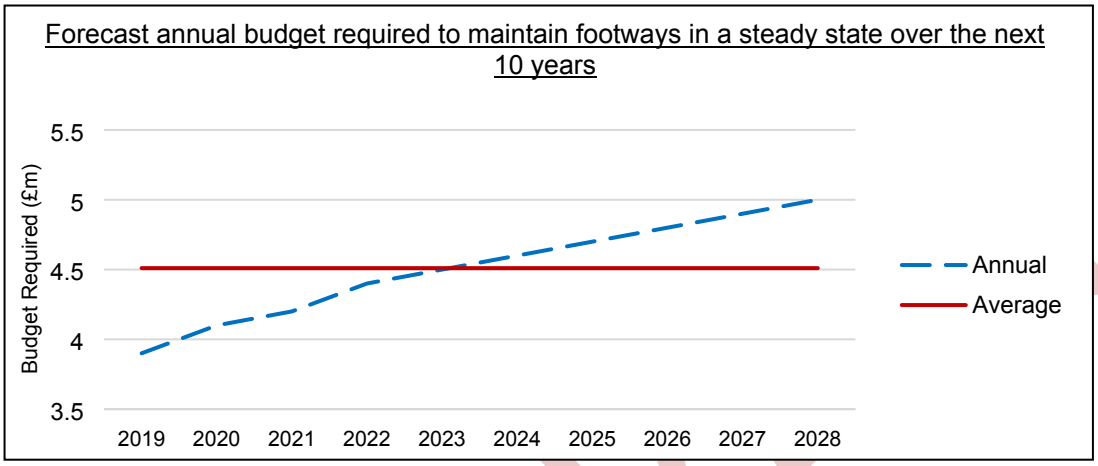
	Funding (£m)									
	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Scenario 1 (Current budget)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Scenario 2 (Increased funding)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Scenario 3 (No budget)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0



This modelling suggests that by 2028 the effect of increasing the annual budget over the next ten years from £1m to £2.5m will reduce the length of footway in need of maintenance in the near future by around 2% or 130 km.

Budget required to maintain steady state condition

We have modelled a scenario where the footways are maintained at their current condition level over the next ten years and calculated that an average annual capital investment in the region of £4.5m, at today's prices, would be required. Any investment less than this would mean that a steady state condition could not be achieved.



Improvements in the management of our footways, implemented in the last twelve months

- We have commissioned analysis of age and disability populations to inform the footway maintenance programme going forward.

Future improvements to enable us to improve the management of our footways

- The footway asset group has recently been extended to include segregated cycleways. These pavements are those cycleways that whilst being appropriately constructed for the purpose, do not adjoin a carriageway section. The condition assessment for these sections of our network needs to be developed.
- The type of data collected for this asset will be reviewed to improve our confidence in the modelling.
- Investigate, through lifecycle planning, the outcomes of different treatment strategies
- Use of the disability and age data to improve scheme prioritisation.
- Use of condition data to enable scheme modelling.

Street Lighting

Asset	Quantity
Street Lights	118,767
Illuminated Signs	17,890
Belisha Beacons	544
Refuge Beacons	1,465
Illuminated Bollards	4,578
Pole Mounted Lights	1,146

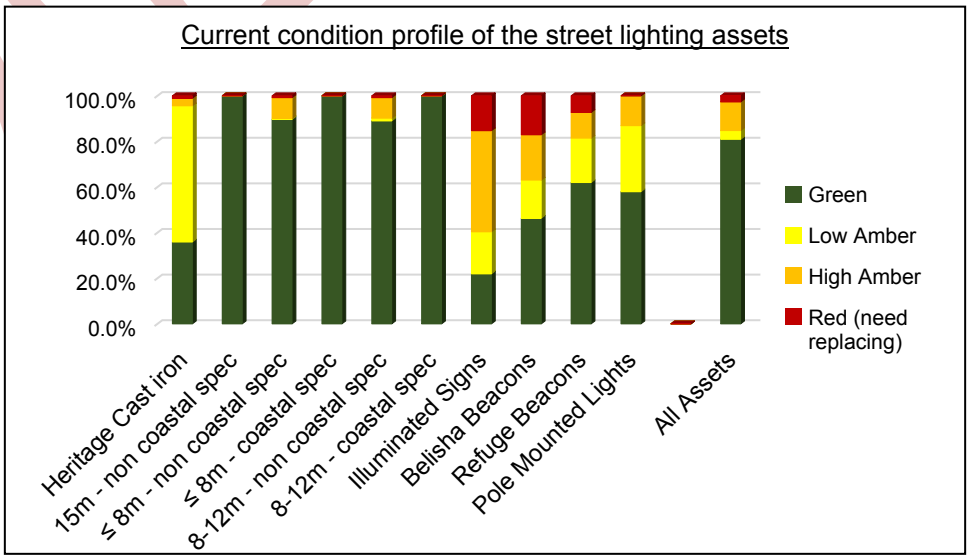
Kent has an extensive inventory and condition database of its Street Lighting asset and this has been used in conjunction with the HMEP Ancillary Assets Toolkit to forecast future asset replacement needs.

There is a robust annual structural testing programme of street lighting assets that classifies the structural integrity of each asset into one of four condition bands; red, high amber, low amber and green. Any asset in the red band is considered to be in need of immediate attention and is included in the replacement programme for the current year.

This year this information, rather than asset age, has been used in the lifecycle planning process. The outcome is that forecasts of future budget needs are now determined from the predictions of the number of assets likely to be classified as 'red' from the testing programme each year. The modelling now also includes illuminated signs, Belisha beacons, refuge beacons and pole mounted lights in addition to columns which were the only asset groups included previously.

Current Condition

The current condition profile is based on the results of the most recent annual structural testing programme completed in March 2018.



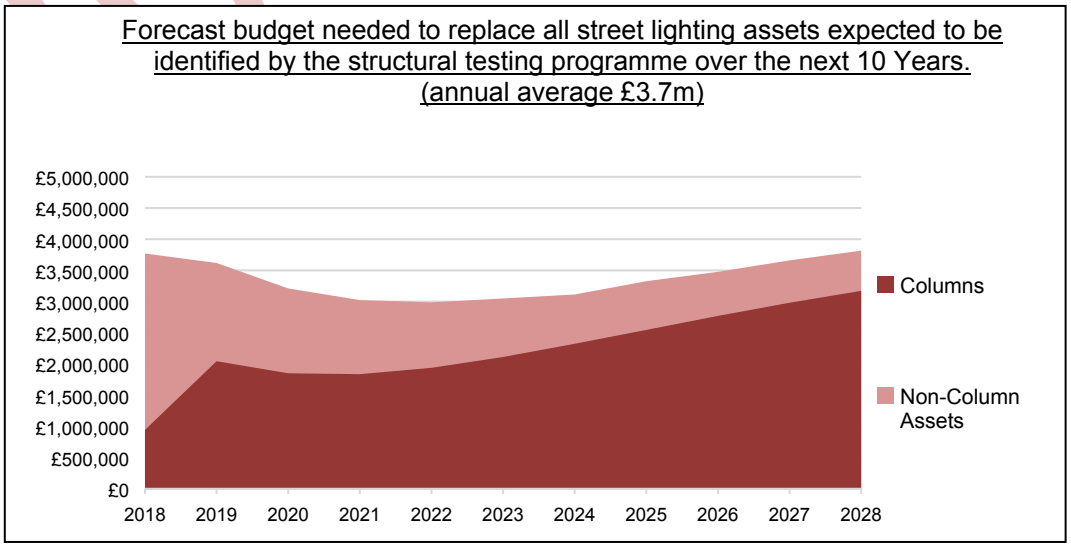
	No.	% in Condition Bands			
		Green	Low Amber	High Amber	Red (need replacing)
Heritage Cast iron	1301	35.9%	59.7%	3.3%	1.1%
15m (non-coastal spec)	9	100.0%	0.0%	0.0%	0.0%
15m (coastal spec)	0	0.0%	0.0%	0.0%	0.0%
≤ 8m (non-coastal spec)	85004	89.6%	0.5%	9.1%	0.8%
≤ 8m (coastal spec)	14740	100.0%	0.0%	0.0%	0.0%
8-12m (non-coastal)	15921	89.0%	1.2%	9.0%	0.8%
8-12m (coastal)	1792	100.0%	0.0%	0.0%	0.0%
Illuminated Signs	17890	21.9%	18.4%	44.3%	15.3%
Belisha Beacons	544	46.3%	16.7%	19.9%	17.1%
Refuge Beacons	1465	62.0%	19.5%	11.3%	7.3%
Pole Mounted Lights	1146	57.9%	29.0%	13.1%	0.0%
Totals	139812	80.9%	3.9%	12.5%	2.7%

Current condition of the street lighting assets

Budget Forecasts

These budget forecasts are based on the number of street lighting assets predicted to be classified as 'Red' from each year's structural testing programme. This means the risk of columns failing is considered too high for them not to be included in the replacement programme for the current year. If the available budget becomes insufficient to replace the required number of assets a programme of permanent asset removal will need to be implemented.

The graph below shows the expected budget that will be needed to replace columns and other street lighting assets as they reach the end of their useful life. It is estimated that the average annual budget required to replace these assets is around £3.7m. The high proportion of non-column assets forecast to need replacement in the next few years is the result of their recent inclusion in the structural testing programme. Previously there was no information on these assets and they were maintained on a reactive basis.



Improvements in the management of our street lighting asset, implemented in the last twelve months

- We have started using results of the structural testing programme to forecast future budget needs, rather than asset age.
- The range of assets included in the forecasting has been extended to include illuminated signs, Belisha beacons, refuge beacons and other pole mounted lights.

Future improvements to enable us to improve the management of our street lighting asset

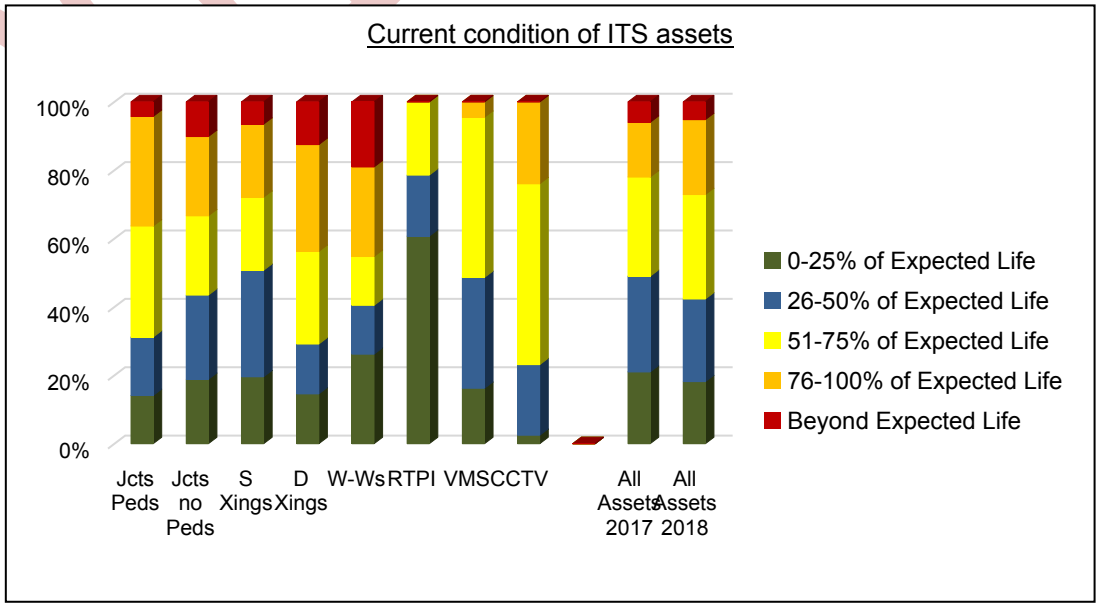
- We are looking to refine the deterioration rates used in the forecasting based on previous results of the structural programme.
- In partnership with our contractor we will explore ways of benchmarking our service.

Intelligent Traffic Systems

We have excellent inventory and condition data on this asset group that has been built up over many years. The HMEP Ancillary Assets Toolkit has been used to model expected asset renewal needs and outcomes for the next ten years.

The current approach to modelling is based solely on asset age. Due to the relatively low number of assets, compared to other asset groups, and the limited number of generally high cost treatments that have been used, this modelling currently has its limitations. In practice, the determination of replacement priorities is not based on age alone but includes other criteria, such as fault rates. In reality, interventions other than total asset replacement are also available to extend the life of an asset. Therefore, we need to include these considerations in any future development of the modelling.

Current Age Profile of the ITS Asset



	Total No. of Assets	Condition Band (% of Expected Life)				
		0-25	26-50	51-75	76-100	>100
Junctions with Pedestrians	234	14	17	33	32	4
Junctions with no Pedestrians	69	19	25	23	23	10
Single Crossings	337	20	31	21	21	7
Dual Crossings	48	15	15	27	31	13
Wig-Wags etc	42	26	14	14	26	19
Real-time Passenger Information	56	61	18	21	0	0
Variable Message Signs	111	16	32	47	5	0
CCTV Cameras	123	2	20	52	22	0
All ITS Assets 2018	1007	185	246	311	223	53

Percentage of ITS asset sub-groups in each condition band

It is estimated this current condition represents a renewal backlog of £3.84m.

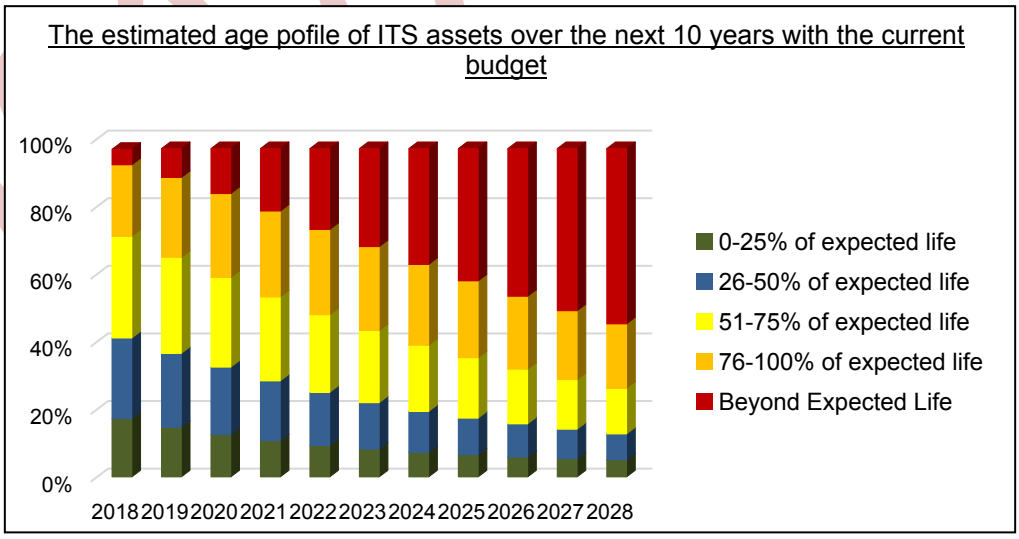
Age Profile Forecasts

The above information has been used to model the budget requirements and the age profile of the asset to forecast expected outcomes from two scenarios;

- The condition over the next ten years based on the current budget
- The budget required to keep the asset at a steady state over the next ten years

Current Budget

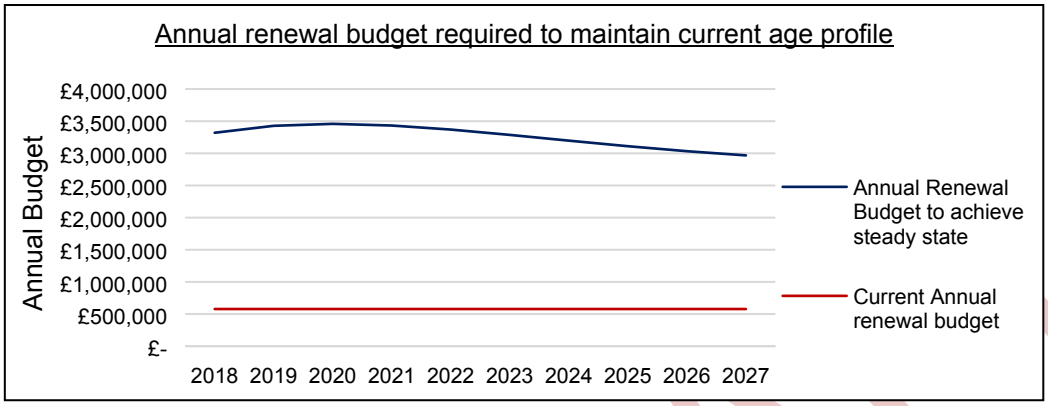
The age profile of the ITS asset has been modelled for the next ten years, using the current annual renewal budget of £578,000. It is estimated that this will result in a renewal backlog of around £25.9m by 2028. An asset that has reached the end of its expected life is unlikely to immediately stop working. However, at this point in its lifecycle it is likely to develop faults more frequently which will require more expensive reactive type maintenance.



	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
0-25% of expected life	176	148	126	108	94	83	73	66	59	54	51
26-50% of expected life	240	220	201	178	158	138	122	109	99	88	77
51-75% of expected life	303	286	267	250	231	215	197	180	163	148	136
76-100% of expected life	213	238	250	256	254	250	241	229	217	205	192
Beyond expected Life	46	86	134	186	241	292	345	394	440	483	522

Steady State

We have estimated the budget profile needed to maintain the current number of the ITS assets beyond their expected life for the next ten years. It is estimated that over ten years the cost would be £32.6m, which equates to an average annual renewal budget of around £3.3m.



Improvements in the management of our ITS assets, implemented in the last twelve months

- Removal of legacy communications equipment and upgraded to IP-addressable traffic signals.
- Replacement of carriageway detector loops with above ground detection, where practicable.

Future improvements to enable us to improve the management of our ITS asset

- Continuing to move to more flexible and modular signal design, as technology allows, which will further enable partial site refurbishments and individual component changes to be made to extend asset life, i.e. above ground detection systems.
- We consider adjacent third-party developments when determining our site refurbishment list, as we can optimise third party funding to invest in assets and offset our liability, e.g. Springfield development.
- Develop the deterioration modelling to better represent what is happening in terms of fault rates and offer a wider range of asset treatments, other than full renewal.
- Consider the impact of developments and other schemes on adjacent sites and seek asset improvements where practicable and justifiable.
- Investigating new products which may be of benefit to maintaining the asset and reducing the impact on other asset groups, i.e. detection systems.

Soft Landscape

We have collected extensive data on our soft landscape asset but due to the nature of the asset and type of maintenance involved we consider a forecast of maintenance frequencies for different funding levels to be more appropriate than the lifecycle planning approach taken for other asset groups.

Maintenance Frequencies

Previous Maintenance Frequencies

The table below gives an overview of the history of soft landscape maintenance frequencies. The notable reductions since 2009/10 are a result of ongoing financial pressures.

Service provision	Maintenance Frequency		
	(2009/2010)	(2016/17)	(2017/18)
Urban Grass Cutting	10-16	8	6
Shrub Bed Maintenance	2-12	1	1
Urban Hedges	2	1	1
Weed spraying (Hard Surfaces)	2-3	1	1
Rural Swathe Cutting	2-3	1	1
Visibility cuts	3	3	3
Rural Hedge Cutting	1-2	1	1
High Speed Roads (HSR)	2	1	1
Bus Routes	Ad-Hoc Safety Critical Work only		
Tree Maintenance	Ad-Hoc Safety Critical Work only		

Annual maintenance frequencies are reviewed periodically in accordance with available funding.

Forecasts of Maintenance Frequencies

The table below summarises the forecast maintenance frequencies for three levels of funding.

Service Provision	Steady State Service (£4.2m)	Current Budget Reduced Service (£3.1m)	Statutory Minimum Service (£2.2m)
Urban Grass Cutting	8	6	1-3
Shrub Bed Maintenance	2	1	0
Urban Hedges	2	1	0
Weed Spraying (Hard surface)	2	1	0
Rural Swathe Cutting	2	1	1
Visibility cuts	3	3	3
Rural Hedge Cutting	1 - 2	1	every other year
High Speed Road (HSR)	2	1	1
Bus Routes	Safety & amenity	Safety critical only	
Tree Maintenance	Safety, amenity & nuisance	Safety critical only	

We are aware that the current maintenance frequencies fall short of what is required to prevent both medium and long-term asset deterioration.

Improvements in the management of our soft landscape asset, implemented in the last twelve months

- Introduced the CAVAT (Capital Asset Value for Amenity Trees) method of valuing our tree asset. At the strategic level this will help us to put a value on the countywide tree stock. It will also enable us to calculate an evidenced value to claims for trees that are removed or damaged.
- Exploring ways of quantifying the effect less than optimum maintenance levels of this asset has on other asset groups.
- Introduced improved asset gathering techniques for invasive weeds.
- Improved reporting of programmed works progress and defect correction using GIS.
- Introduction of training to provide operational staff with more information regarding highway boundaries improving asset collection and management.

Future improvements to enable us to improve the management of our soft landscape asset

- Further implement and develop the use of CAVAT.
- Continue to explore ways of quantifying the effect this asset has on other asset groups.
- Further develop and fine tune the current data held on this asset to ensure the maintenance programmes continue to be fit for purpose and procurement of services is cost efficient.
- Further explore software models such as iTree which calculate the benefits and ecosystem services that trees provide, and value them in monetary terms. This provides an evidence-based approach in the development of informed urban forestry programmes, management plans and projects.
- Enhance our risk-based approach to highway tree surveying incorporating industry best practice to deliver efficiencies in tree safety inspections.

Road Markings and Studs, Pedestrian Guardrail and Unlit Signs

Due to their relatively low value and the generally reactive nature of their maintenance we have very little data on these assets. However, we have made estimates of their respective sizes. This has been done to help us in future quantify likely levels of condition or serviceability that can be expected with different funding levels.

Estimated Extent of the Assets

		Road Classification				
Asset		**A**	**B**	**C**	**U**	**All**
Type	**Sub Group**					
Unlit Signs (No.)	Warning	6,900	5,200	15,800	19,100	47,000
	Regulatory	7,700	3,600	10,000	35,500	56,800
	Directional	6,600	3,150	6,900	8,800	25,450
	Information	1,150	290	850	7,200	9,490
	Boundary	1,000	800	2,900	26,100	30,800

	Parking Directional	280	70	-	270	620
	Other	700	800	2,600	21,300	25,400
	Total	24,330	13,910	39,050	118,270	195,560
Pedestrian Guardrail (Lin. metre)		53,250	12,400	13,000	52,000	130,650
Road Markings (Linear metre)	Centre line[1]	985,870	448,450	1,883,380	3,018,180	6,335,880
	Edge line[2]	872,956	531,160	2,867,360	-	4,271,476
	Rib edge line[3]	374,124	-	-	-	374,124
	Pedestrian crossings[4]	75,000	31,000	-	-	106,000
	Junction markings[5]	1,000,000	1,000,000	500,000	500,000	3,000,000
	Yellow box junctions[6]	140,000	-	-	-	140,000
	Lettering & Arrows[7]	240,000	240,000	-	-	480,000
	Total	3,687,950	2,250,610	5,250,740	3,068,180	14,707,480
Road Studs[8] (No.)		187,062	79,674	430,104	-	696,840

Assumptions made in estimating the size of this asset:

- Centre line[1] - All A, B, C & urban U roads. No rural U roads.
- Edge line[2] - All rural A, B & C roads minus rib edge lining.
- Rib edge lines[3] – on 30% of rural A roads.
- Pedestrian crossings[4] - Estimate 400 signal-controlled crossings & 2,000 zebra crossings, assume 50 metres of line per crossing (including zig-zags) = 2,400 x 50 = 120,000 metres of lining.
- Junction markings[5] - Estimate 200,000 junctions at 15 metres each = 3,000,000 metres.
- Yellow box junctions[6] - Estimate 350 at 400 metres each = 140,000m.
- Lettering and arrows[7] - 12 Districts have estimate of 20,000 letters and arrows each = 240,000 markings. Estimate of 2 metres each marking = 480,000 metres of marking.
- Road studs[8] - Estimate 1 for every 2 metres of centre line for 60% of all classified rural roads.
- The number of unlit signs has been estimated from the 'Hertfordshire' model in the Whole of Government Accounts valuation process.

Current Levels of Funding

The current level of funding on these assets is;

Asset	Total Funding	Capital/Planned Funding	Revenue/Reactive Funding*
Road Markings & Studs	£551k	£241k	£310k
Pedestrian Guardrail	£105k	-	£105k
Unlit Signs	£415k	£0k	£415k

*- this is not from the budget allocated to these assets but the average of what might be spent annually on them from the general reactive maintenance budget

Forecast Levels of Service Outcomes

Road Markings and Studs

The current funding means that safety critical lining and studs can be maintained on 20% of the A road networks and 15% of the B road network as reactive repairs. No non-safety critical lining and studs can currently be maintained.

Pedestrian Guardrail

The current funding means that we are able to remove, repair or make safe all damaged pedestrian guardrail which is assessed as being safety critical as reactive repairs.

Unlit Signs

The current funding means that we have to carefully consider what safety critical signs we replace on all parts of the network. Currently the funding means that unlit safety critical signs can be maintained on 25% of the A road network, and we prioritise the high-speed road network, and 20% of the B road network as reactive repairs. No non-safety critical signing is currently maintained.

Improvements in the management of these asset groups, implemented in the last twelve months

- We have started collecting information on unlit signs.
- We have started to make estimates of the extent of all these assets.

Future improvements to enable us to improve the management of these asset groups

- Further refine our estimates of the extent of these assets.
- Consider ways of enabling us to quantify the effects of different funding levels on these assets.
- Continue with the collection of asset information for unlit signs.

Summary of Asset Condition

Ref:	PERFORMANCE MEASURE		Measured Values		Asset Performance Forecast[1]			Method of Measurement	Frequency of Review
			16/17	17/18	17/18	18/19	Condition Trend		
1	**Roads**	% of **A-class** roads in a very poor condition and needing maintenance[2]	3.3%	4.1%	4.6%	5.0%	↓	National Indicator NI 130-01	Annually
2		% of **B&C-class** roads in a very poor condition and needing maintenance[2]	4.7%	5.6%	5.5%	6.1%	↓	National Indicator NI 130-02	Annually
3		% of **Unclassified** roads in a very poor condition and needing maintenance[2]	22.4%	23.2%	23.1%	24.0%	↓	Former National Indicator BV224b	Annually
4		% of tested road network (A, B & strategic C-class) at or below **skidding resistance** investigatory level	29.9%	29.9%	29.9%	29.9%	↔	SCRIM (skidding resistance) survey. DfT annual survey.	Annually
5	**Drainage** condition		N/A	N/A	N/A	N/A	N/A	Insufficient data. Project in 2019 to develop an appropriate measure of drainage asset performance.	N/A
6	% (by length) of **Crash Barriers** in very poor or sub-standard condition		21.2% (2012)	N/A	N/A	N/A	N/A	Based on 2012 Survey. Current regime does not enable annual monitoring. Project in 2018 to develop an appropriate measure of barrier asset performance.	N/A
7	% of **Structures** in poor or very poor condition		8.4%	7.0%	7.7%	5.0%	↑	Whole of Government Accounts (WGA) structures toolkit analysis	Annually
8	% of **Footways** in a poor condition and needing maintenance soon		19.2%	19.8%	19.4%	20.4%	↓	% of network in 'Red' condition from WGA valuation	Annually
9	% of **Streetlight**[3] assets needing replacement		N/A	2.7%	N/A	2.5%[4]	↓	Based on the results of the structural testing programme, and HMEP modelling	Annually
10	% of **Traffic Signals**[5] equipment beyond expected life		5.7%	5.2%	8%	9%	↓	Based on equipment age in inventory, and HMEP modelling	Annually

[1] - Based on current investment in these assets

[2] - See longer term performance forecast for road asset group, based on current investment levels.

[3] - First year of a revised performance measure, therefore no previous forecast figures

[4] - Assumes all 'red' assets from the previous year have been replaced or removed.

[5] - Limitations of the current approach to forecasting for traffic signals are outlined in the asset specific section of this document.

Future Workstreams

The Department for Transport has recently announced a change to the Incentive Fund mechanism that it will test in 2018/19. This concerns additional questions around data collection and use, and compliance with the new Code of Practice, Well-managed Highway Infrastructure, with a view to including these questions in the 2020/21 self-assessment questionnaire (that we will complete and submit in early 2020). There have also been suggestions that DfT may introduce a higher level, Band 4, or there may be further additional questions, for example around environmental matters. It is conceivable that a greater percentage of Government capital grant funding will in future be dependent on our Incentive Fund rating.

Even if none of these changes occur, we will need to carry out further detailed work in 2019 to enhance our asset management approach and cement our Band 3 rating going forward. We will also need to continue with work to take full advantage of the opportunities presented by the Well-managed Highways Infrastructure code of practice. These workstreams will include regularly reviewing, developing and improving the plans, frameworks and strategies that Kent has put in place. It also includes refining and improving our data collection and management to improve our ability to carry out lifecycle planning. We also need to commission a new contract or contracts covering our road and footway asset condition surveys and strategic asset management functionality.

Given the scale of maintenance backlogs and modelled deterioration across most asset groups, and continued funding challenges, it is important that we examine what more we can do to reduce lifecycle costs and improve future maintainability. This is important not only in terms of existing highway assets when they are renewed or life-extended but also in relation to new assets, whether they are installed by KCC and others or added to our inventory through adoption. These new highway assets bring significant other benefits to KCC and the people and businesses of Kent. However, moving forward we need to consider how we get the balance right between those benefits and our ability to maintain these assets over their lifecycle.

It is therefore intended that officers will continue work to examine a number of key areas relating to new assets being installed on our network to minimise lifecycle costs and improve future maintainability. These include:

- reviewing the Kent Design Guide to include more focus on reducing lifecycle costs and improving future maintainability;
- introducing a new road, footway and cycleway specification guide;
- introducing technical guidance notes for each asset group;
- introducing a technical approval process for each asset group, requiring future improvement projects to demonstrate that different lifecycle options have been considered and balanced against other drivers;
- reviewing outputs from the NHT Network surveys on public perception, CQC efficiency and performance management, that KCC participated in for the first time in 2018, to consider how the information could be taken forward and/or incorporated into existing processes.