Appendix 1

Highways Infrastructure Asset Management Plan

Asset Performance Report 2017/18

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Hertfordshire

HCC HIAMP Asset Performance Report 2017-18

Contents

Executive Summary

The Highways Service helps make Hertfordshire the County of Opportunity by Moving Hertfordshire Forward. The service does this by delivering safe, reliable journeys, sustainably, whilst balancing the needs of the asset, network operation and customers using the resources available.

The Asset Performance Report (APR) is the annual review of Highway Infrastructure Asset Management at Hertfordshire County Council (HCC), including updates on performance, policy, strategy development and other related issues.

As an annual review, much of the material in the APR is a matter of factual updates and statistics, but it also serves as an official recorded update of Policy, Strategy and Service changes linked to the current Corporate Plan (2017-21). Chapters 1 and 2 give an overview of Asset Management nationally and locally while Chapters 3 to 8 detail particular highway asset groups.

Items impacting on Policies and Strategies (new or updated) include:

- DfT Incentive Funding: second successful award of Band 3 status, but with continuing work required to keep this.
- Code of Practice: ongoing work to fully align the highway service with the requirements and recommendations of the new 'Well-Managed Highway Infrastructure' Code for October 2018.
- HIAMP update: ongoing work to update the 2008 TAMP documents in line with the new Code of Practice, new industry practice and the current Corporate Objectives.
- Local Initiatives: Development of specific areas of work to ensure more efficient or effective working as outlined in National Guidance associated with Highways Asset Management.

Introduction

Asset Management continues to be at the heart of government thinking for the delivery of efficiencies within local and national highway services. The DfT incentive element of highway maintenance funding is now well established and I'm pleased to say that Hertfordshire has maintained the top 'Level 3' this year, securing the full funding available to us.

Good progress has been made on implementing the new codes of practice and reviewing and, where necessary, revising our standards to take the new guidance into account and Hertfordshire is on track to comply with the new codes by October as planned.

New initiatives such as the Major Road Network and AM Guidance for Footways and Cycle routes provide further opportunities and encouragement to continue to apply and embed asset management concepts throughout the service in a seamless way.

The apprentice, graduate and 'gap year' programmes are continuing to show their value with some capable young individuals joining the service; we are also working actively with educational bodies, in particular University of Hertfordshire, in developing new courses such as degree apprenticeships in engineering to make further development available to new and existing staff via the apprenticeship levy.

The Hertfordshire County Council highways service continues to be well placed to benefit from its strong position in the field of highway asset management by incorporating further improvements and efficiencies into the service as it develops over the next few years.

Rob Smith

Deputy Director, Environment & Infrastructure (Highways)

May 2018

Asset Management State of the Nation

1.1 National Initiatives

1.1.1 DfT Incentive Funding.

Since 2016/17, an increasing proportion of the Department for Transport's (DfT) capital allocation for highway maintenance has been linked to local authority performance in a number of key areas (including asset management and efficiency). This is demonstrated through evidence based responses to 22 questions, placing authorities into one of the three levels (Band 3 being the highest). Table 1 shows the funding levels based on the level achieved.

Table 1: DfT Incentive Funding Levels.

Year	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
Band 1	100%	90%	60%	30%	10%	0%
Band 2	100%	100%	90%	70%	50%	30%
Band 3	100%	100%	100%	100%	100%	100%
Planned	100%	100%	100%	100%	100%	100%
Actual	**100% Band 2**	**100% Band 2**	**100% Band 3**	**100% Band 3**		

The County Council's fourth and most recent application was submitted in February 2018, meeting the requirements of the Band 3 rating for a second consecutive year. This secured the full funding allocation available (approximately **£17.3 million**).

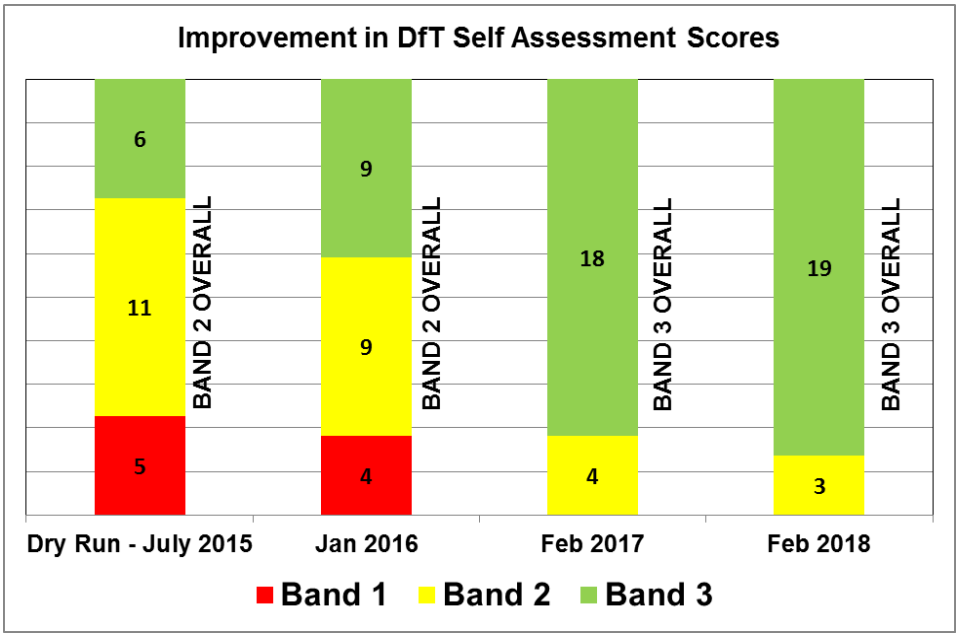

Figure 1: HCC DfT Incentive Fund Scores

A lot of the initial work included compiling large amounts of historical data, implementing changes to practices and creating/updating documents. Moving up from Band 2 to 3 was achieved by demonstrating delivering value for money, carrying out cost effective improvements, achieving planned outcomes, and continuous improvements.

As ongoing annual submissions are required, Hertfordshire County Council must continue to regularly update documents, and monitor performance data. It is anticipated that the DfT will further expand on the evidence required in the future.

1.1.2 Approved Code of Practice Review

The new Code of Practice 'Well-managed Highway Infrastructure' (CoP) was released on 28 October 2016. Highway Authorities have until October 2018 to adopt it. The CoP is designed to promote the establishment of local levels of service through risk based assessment. This relies on good evidence and sound engineering judgement. This should enable more effective allocation of resources with possible cost savings, whilst not compromising statutory duties. There are a number of improvements that have been identified for future review and consideration.

Appendix 1 summarises progress being made in demonstrating compliance with the new CoP, and advises on future implications for the Highways service.

1.1.3 Major Road Network

The government, as part of their Transport Investment Strategy, committed to creating a Major Road Network (MRN). A consultation process that closed in March asked for views on how to define the MRN, the role that different bodies will play in the MRN investment programme and which schemes will be eligible for MRN funds.

The purpose of this new MRN would be to help deliver the following objectives:

- reduce congestion;
- support economic growth and rebalancing;
- support housing delivery;
- support all road users; and

- support the Strategic Road Network.

The creation of an MRN will allow for dedicated funding from the National Roads Fund to be used to improve this middle tier of the country's busiest and most economically important local authority 'A' roads.

1.1.4 Key Guidance - Footways and Cycle Routes

In May 2018, as this report was being finalised, the UK Roads Liaison Group published a series of guidance documents on how best to manage and maintain infrastructure that encourages movement by sustainable means. These guides are likely to support work already ongoing as part of the HIAMP development within Hertfordshire. The documents are summarised below and will be reviewed and considered in more detail in the future as part of the HIAMP development work.

- Task 1 - Pavement Design and Maintenance

  This sets out a process for the design and maintenance of footway and cycle route pavements, signposts existing legislation, codes of practice and guidance and provides further advice where appropriate.

  This first part of the guidance is intended for designers of footways and cycleways, but is broad enough to be useful to assist anyone who is involved in the development, design or delivery of them.

  This guidance is specifically focused on footways and cycleways with bound surface construction (similar to Cycle Superhighway 3 in London) and is not particularly aimed at provision that is part of the main carriageway, leisure trails or unsurfaced tracks.

- Task 2 - An approach to risk based maintenance management

  This second part of the project provides practical guidance on risk based management of maintenance on footways and cycle routes. It includes the 'Footway Safety Risk Tool' [see below] that can be used by practitioners to identify where and when maintenance is best placed. Key steps include:

  - Reviewing hierarchies, including with regard to temporary or seasonal changes;
  - Identifying safety risk factors (22 identified in the tool), serviceability risk factors (17 identified) and sustainability risk factors (11 identified)

- Analysing risks by assessing their relative importance and weighting, and describes the usage of a 'pairwise comparison' as a robust way of doing so.

- Task 3 Cycle Service Levels and Condition Assessment

  The third section of the guidance uses results from a user survey in London to define an approach to the assessment and management of cycle infrastructure that is tailored to the specific need of cyclists.

  This piece of work looks at whether current methods of assessing and determining levels of service for cycling infrastructure are the most appropriate and reflects aspects of condition and usability that are important to cyclists - and which impact on safety and take up of cycling.

  It identified that ironwork related issues, potholes and condition related ride quality were key priorities for most cyclists. The in depth survey of cyclists provides an understanding of defect importance, defect priorities and the application of asset management to dedicated cycle infrastructure.

1.2 Local Initiatives

1.2.1 Highway Infrastructure Asset Management Plan (HIAMP)

One of the purposes of the APR is to serve as an official recorded update of AM Policy and Strategy instead of producing revised documents annually. A review of the previous Transport Asset Management Plan (TAMP) began in 2016. Progress has been made closely aligned with the CoP review (1.1.2) to ensure cohesion. This process will produce a new HIAMP, divided into four parts:

1. Policy
2. Strategy
3. Plan; and
4. Annual Performance Report

This is a large body of work that will include:

- Ensuring the AM Policy and Strategy reflects the desired coordinated whole service approach to AM;
- Incorporating recommendations arising from the DfT Incentive Fund and the new CoP review (where deemed suitable);

- Reviewing the interfaces between asset maintenance, network management and customer inputs; and
- Reviewing the lifecycle planning for main asset types.

1.2.2 Highways Asset Information

Ensuring current and reliable asset data is maintained is crucial when making decisions about service delivery, such as future maintenance treatments.

In April 2017 the AM Team launched the Highway Asset Information (HAI) Initiative, which included a policy, strategy, manual, processes and templates. The aim is to improve the collection and storage of asset information generated from various service areas. Processes have been developed to allow service areas and other business processes to collect and maintain the authority's asset register – Confirm.

As part of the ongoing improvements, the AM Team are developing tools using applications like AGOL (ArcGIS Online) & Survey123, both of which are available to use within the WCS infrastructure and will enable data collection during various stages of a project but primarily upon completion. The simple idea is to use the scheme extents drawn in AutoCAD to translate into ArcGIS to select focussed asset groups within the extent of a scheme. That will enable the project team to be able to utilise the information held in Confirm and collect missing data as well as verifying existing. It is currently being trialled with the drainage community.

1.2.3 Pavement Management Strategy

Work commenced in late 2016 on the creation of a Pavement Management Strategy (PMS). Approved in May 2018, the PMS details Hertfordshire County Council's strategy for maintaining the paved carriageway network ('pavements').

Disambiguation: 'Pavement' – In technical terms, a pavement is an area with a paved or bound surface. This can include carriageways, footways, car parks and runways, amongst other things. As the PMS is a technical document, it uses pavement in this sense, rather than the more familiar colloquial meaning of pavement as referring solely to footways. Currently the PMS concentrates on carriageway assets but it may be expanded to include other paved assets in the future.

It is intended to help increase the efficiency and effectiveness of carriageway asset management and maintenance. This will ensure that the physical condition of the County's roads is adequate for the needs of road users. In essence it aims to answer the following three questions:

1. What do we want the pavements to deliver / how do we want them to perform?
2. What is the plan to achieve this?
3. How to measure whether this has been achieved?

Figure 2 shows the PMS document which is the key link between the outcome requirements detailed in the contract document and the physical works being completed.

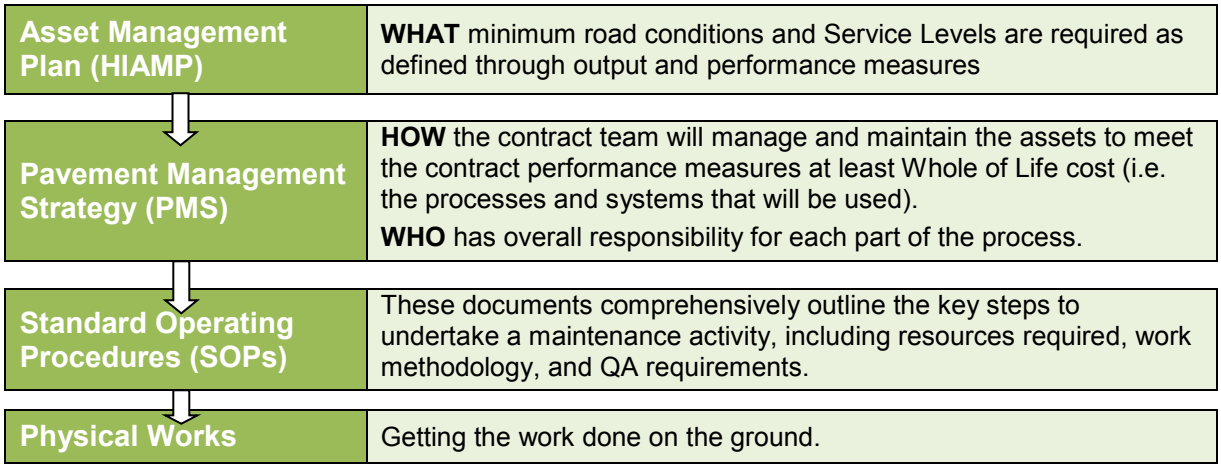

Figure 2: Key Document links of PMS

1.2.4 Roads in Hertfordshire update

Since 2016/17 the AM Team have been providing advice and updates to the Development Management Team who are updating the 'Roads in Hertfordshire: Highway Design Guide' document. This document serves as a guide for how the County's roads should be designed and is especially important for developers. The changes the AM Team are recommending are closely linked to AM functions and include but are not limited to:

- Reducing future maintenance issues/obligations from new adoptions; and
- Ensuring developers provide Hertfordshire County Council with all relevant asset data/information.

The new guide is due for completion by the end of 2018.

1.2.5 Resilience

The Highway Service has identified a Resilient Network, a key piece of evidence required by the DfT Incentive Funding. A Resilient Network Strategy document is being developed that sets out how the service maintains a resilient network and what future improvements could be made to further enhance resilience.

1.2.6 Local Transport Plan 4 (2017-2031)

The new Local Transport Plan Strategy (LTP4) will provide a framework to guide Hertfordshire County Council's future transport planning and investment. It highlights transport problems and issues and identifies ways the County Council can deal with them.

This plan sets out how transport can help deliver a positive future vision of Hertfordshire. The plan covers the period up to 2031, which is the timescale for most of the housing proposals being set out in the ten district Local Plans. However, it also considers how future planning decisions and emerging technology might affect the way that transport needs to be provided in the longer term.

The foundation is a set of nine objectives to deliver the positive future vision framed by the three themes of Prosperity, Place and People in recognition of transport's contribution to most aspects of life. The strategy to deliver these objectives is guided by four principles (application of technology, cost effectiveness, integrating land use and transport planning, encouraging modal shift and active travel) which should be common to all areas of local transport policy and activity.

Policy 22, "Asset Management" makes up one of the 23 policies that are aligned to support delivery of the LTP4 Objectives and Principles.

1.2.7 New Category 6 Works Programme

Category 6 replaces the previously trialled 'Cat 2 Extra' work programme and is made up of three primary work streams:

1. Annualised Activities – developed to maximise the benefit to customers and network condition by providing services in an efficient manner. The following activities are proposed for 2018/19:

- Retain a road marking crew to undertake the refresh of markings on a wholesale basis, in line with a strategy;
- Retain a road sweeper to work on sections of the network to remove detritus build-up, having a knock-on effect to improve drainage, reduce weed growth, etc.

2. Client-led Campaigns and Maintenance Themes – The WCS will develop a series of themes and campaigns for the following financial year to include elected member consultation to allow coordination of the HLB to supplement any campaigns if desired.

3. Activities Identified by Ringway – In line with the prevailing themes and/or campaigns set by the Council, Ringway will, as part of the Virtual Operations Hub interrogate the data it holds from all sources to define a series of targeted activities/candidate sites for the Category 6 work programme. It is proposed to provide early visibility of the themes, activities and candidate sites to elected members to ensure that they are given the opportunity to supplement work with funding from their HLB allocation.

The type of activities that will be included within the Category 6 programme includes, but is not limited to:

- Patching / resurfacing generally greater than 100 linear metres in length but not a priority for the asset management led resurfacing programme
- Drainage grip reinstatement
- Ditching out a watercourse to the side of a road etc.
- Crack and joint sealing
- Gully dig outs and further investigations
- Siding out of a footpath etc.

The service's budget holders will be responsible for developing and agreeing the scope of work and activities within their remit. Close collaboration with the virtual operations hub, inclusive of Ringway will be necessary in the development and approval of activities.

1.2.8 Relevant Highways Cabinet Panel Reports

Since the previous APR a number of important decisions and reports have been processed through the Highways Cabinet Panel. Table 2 summarises the main ones, further information can be found on the Hertfordshire County Council website:

www.hertfordshire.gov.uk/hertfordshire/CabinetandCommittees/tabid/62/ctl/ViewCMIS_CommitteeDetails/mid/381/id/49/Default.aspx

Table 2: Highway Cabinet Panel documents

Date	Title
22 June 2017	TAMP APR 2016 annual update. Information Note. Road Condition Information Update.
5 September 2017	Strategy for ULEV Charging Points. Changes to Highway Fault Reporting.
16 November 2017	Highway Service Review (Contract Extensions) Highways Service Funding Structure Highways Drainage Gully Emptying and Cleaning Service.
31 January 2018	Integrated Plan 2018/19 – 2021/22
7 March 2018	Highway Service Contract Extension Update Information Note: LED Illumination Strategy

2. Highway Infrastructure Overview

2.1 Summary of Highway Inventory and Value

Hertfordshire's complex highway network is the largest, most valuable and most visible infrastructure asset that Hertfordshire County Council is responsible for. As Table 3 shows it is comprised of multiple types of equally complex assets, all working to connect people and move goods across the County (~4.5 million daily journeys on the network).

Table 3: Overview of HCC's Highway Infrastructure Inventory*

Highway Infrastructure Inventory Overview*		GRC (000s)+	DRC (000s)+
Carriageways** – All classes A, B, C and U	Section Lengths - 5,110 km Area – 32.7 million m^2	£ 6,044,234	£ 5,552,622
Footways and Cycleways	Linear – 5,456 km Area – 10.4 million m^2	£ 810,439	£ 729,568
Structures	1,600 structures	£ 994,207	£ 621,352
Street Lighting	115,500 Lamp columns 2,000 feeder pillars 5,800 illuminated bollards 13,600 illuminated signs	£ 196,375	£ 51,146
Traffic Management Equipment (ITS)	467 signal crossings 197 signal junctions Traffic counters, VM signs.	£ 61,186	£ 26,934
Street Furniture	175,000 non illuminated signs 259 km safety fencing Bus stops/shelters, grit bins	£ 121,938	£ 60,969
Land		£12,440,011	***
		£20,677,251	£ 7,046,779

Highway assets managed by Hertfordshire County Council have a current replacement value (GRC: Gross Replacement Cost) of £21 billion, this is the theoretical cost to rebuild HCC's assets from scratch with a modern equivalent asset.

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* Information presented in this table is approximate. Further details are provided in individual sections.

** Whilst HCC as the Highway Authority is responsible for A, B, C and unclassified roads, the motorway and trunk roads operated by Highways England (i.e. M25, M1, A1) are closely linked with these, and how the region operates as a whole.

*** DRC for highway land is not calculated as we do not have condition information.

+ These are the 2016/17 values as at the time of writing the 2017/18 figures have not been calculated.

The current value (DRC: Depreciated Replacement Cost) of £7 billion, this is the value of the assets, in their current deteriorated condition.

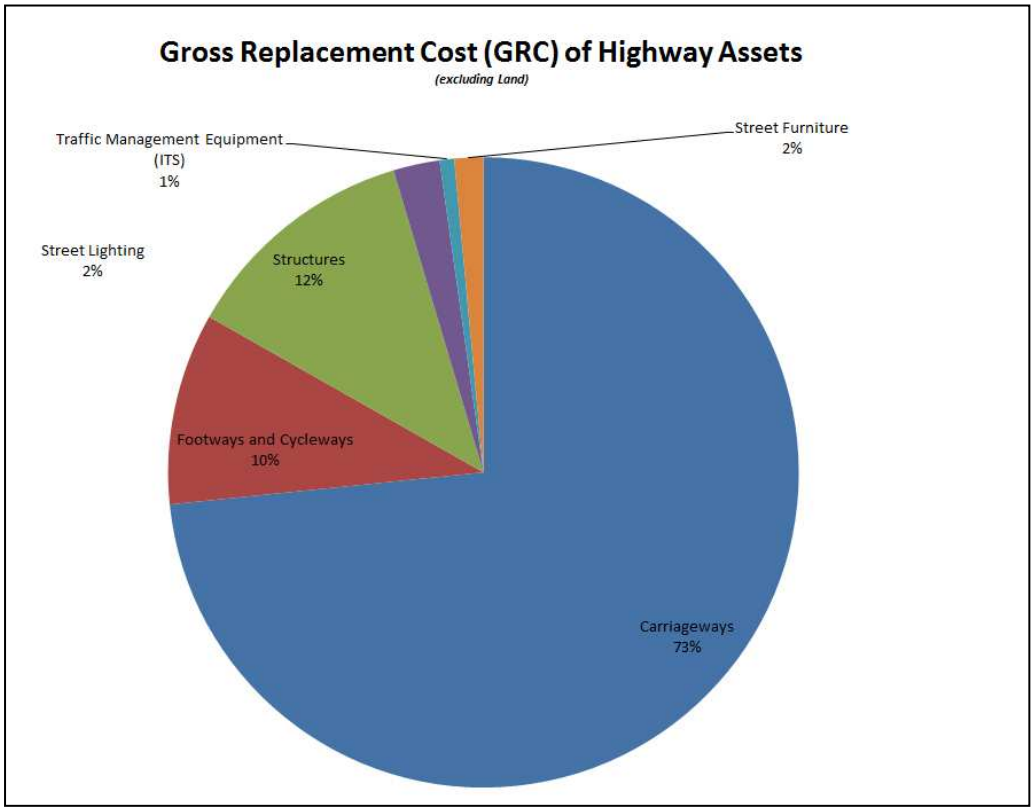

Figure 3: Gross Replacement Cost of Highway Assets

Deriving these asset valuations is complex and varies annually due to factors such as unit rates, condition, inflation and the inventory information held. Small unit rate changes aggregated across millions of square meters impacts the total asset value.

There is a continual drive for better asset and condition information and use of this information to guide the service and make efficiencies. AM utilises informed decision making which only comes from robust asset inventory and condition information.

2.2 Highway Annual Programme Overview

HCC operates multiple annual work programmes continually throughout the year. Some scheme types are seasonal due to weather requirements (daylight hours and temperatures means summer is preferred), whilst others are less weather dependent and can be done throughout the year. Programmes allow for mobilisation and lead in; time used to finalise site details, designs, apply for necessary permits, traffic orders and order/mobilise materials as required.

Table 4: Overview of the Annual Highway Programmes

Programme	Programme Detail	Programme Information
Carriageway, Footway & Cycleways	Preventative Treatments. (surface dressing, slurry sealing & micro surfacing)	Preventative treatments seal the surface. These are undertaken from spring through to late summer and prepare the carriageway for the winter weather. The large scale and volume of sites covered results in these projects being managed as countywide work streams. Preliminary preparation work, such as patching, precedes the preventative treatment works.
	Surfacing. (overlay, inlay, reconstruction, recycling)	Surfacing works are less weather dependant and can be programmed throughout the year although works can be delayed by wet weather and low temperatures.
Drainage	Schemes	Significant design aspects and longer lead in times require many schemes to be programmed over two years, year 1 investigation and design, year 2 construction. Works carried out throughout the year.
Structures	Maintenance & Upgrades	
Lighting & Traffic Mgmt Equipment (ITS)	Refurbishment & Replacement	Specialist design and construction with delivery throughout the year. Often lighting or ITS improvements are delivered as part of a wider project. Works carried out throughout the year.

2.3 Budget Overview – Highway Infrastructure

Table 5 shows the annual expenditure across the different asset types for the past three years. On the whole, funding proportions are kept relatively constant for asset types across years. This gives consistent expenditure trends which can be tracked against condition. There are several investment peaks in particular years which represents additional funding for specific projects.

Table 5: Expenditure Overview for all Highway Infrastructure Assets 2015/16 – 2017/18

Programme Detail	2015/16 (000)	2016/17 (000)	2017/18 (000)
Carriageway Surfacing & Surface Treatment*	£ 20,278	£ 19,673	£ 17,829
Footway Surfacing & Surface Treatment*	£ 5,035	£ 5,101	£ 4,300
Drainage Schemes	£ 1,200	£ 1,385	£ 1,427
Structures Capital Maintenance Schemes	£ 2,460	£ 4,950	£ 4,830
Street Lighting Replacement	£ 1,000	£ 1,951	£ 2,267
ITS Refurbishment	£ 446	£ 403	£ 638

*Includes HLB and Cat 4 schemes

2.4 Customer Feedback and Satisfaction

The highways maintenance service plays a key role in how the Council's performance is perceived by the public.

- The public view maintenance of carriageways as a **key service** where the existing **level of service should not be reduced**.
- Public **satisfaction** with road maintenance is **below average** but **improving.**

Results from the annual NHT (National Highways & Transport Network) Survey are analysed to show how the public perceive the importance of different aspects of a highway service and also how they score performance based upon a questionnaire containing 200 questions. Surveys are undertaken in a robust way by a professional polling to be representative of local views and comparable across local authority areas with a majority of LAs now taking part.

The NHT survey provides information for authorities to compare their public satisfaction results. To facilitate these comparisons each authority's results are expressed in terms of twenty six Key Benchmark Indicators (KBI's) and over one hundred Benchmark Indicators (BI's). The KBI and BI results are divided between six Highway & Transport Themes, one of which is Highway Maintenance and Enforcement.

From the results the following information has been extracted to help demonstrate how Public Satisfaction in Hertfordshire relates to highway maintenance.

Figure 4 below shows how important the public rated various different aspects of the service with Highway Condition second only to safer roads (by 1%) in the public perception of importance and pavements in third place. This shows how important these aspects of the service are to the public.

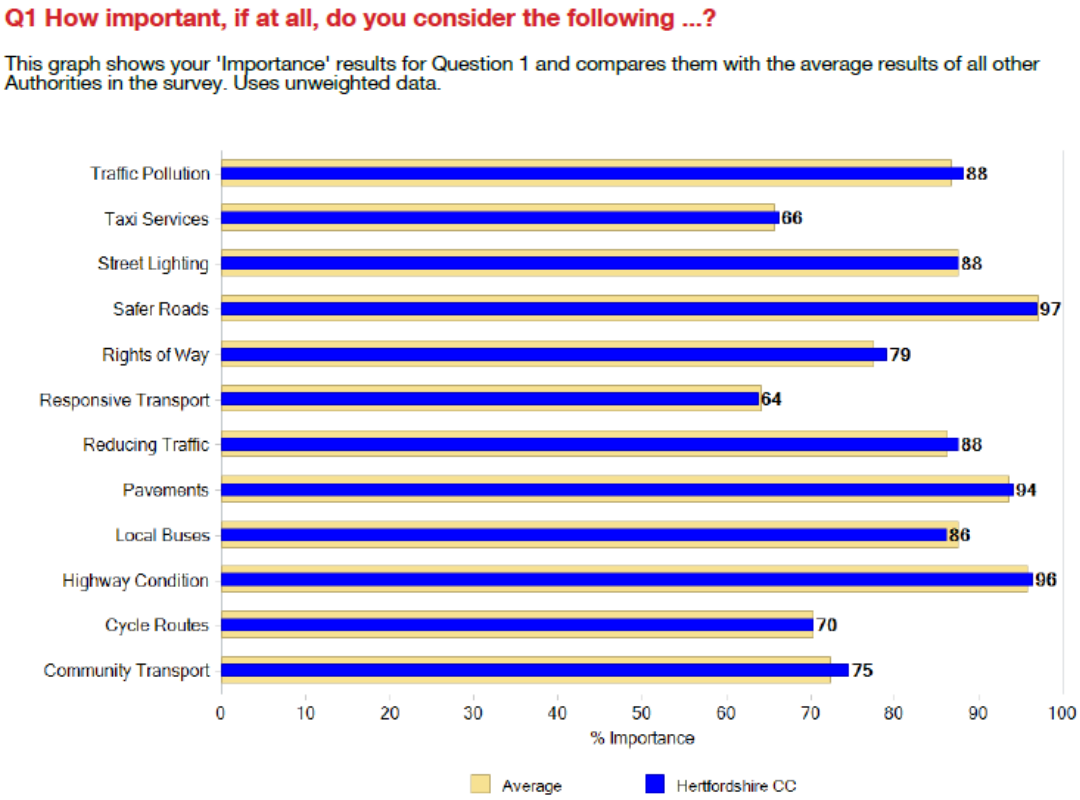

Figure 4: NHT Service Importance to Customers

Figure 5 below shows the areas in which the public believe a reduction in service levels is least acceptable. Maintenance of Roads tops the list with maintenance of pavements second.

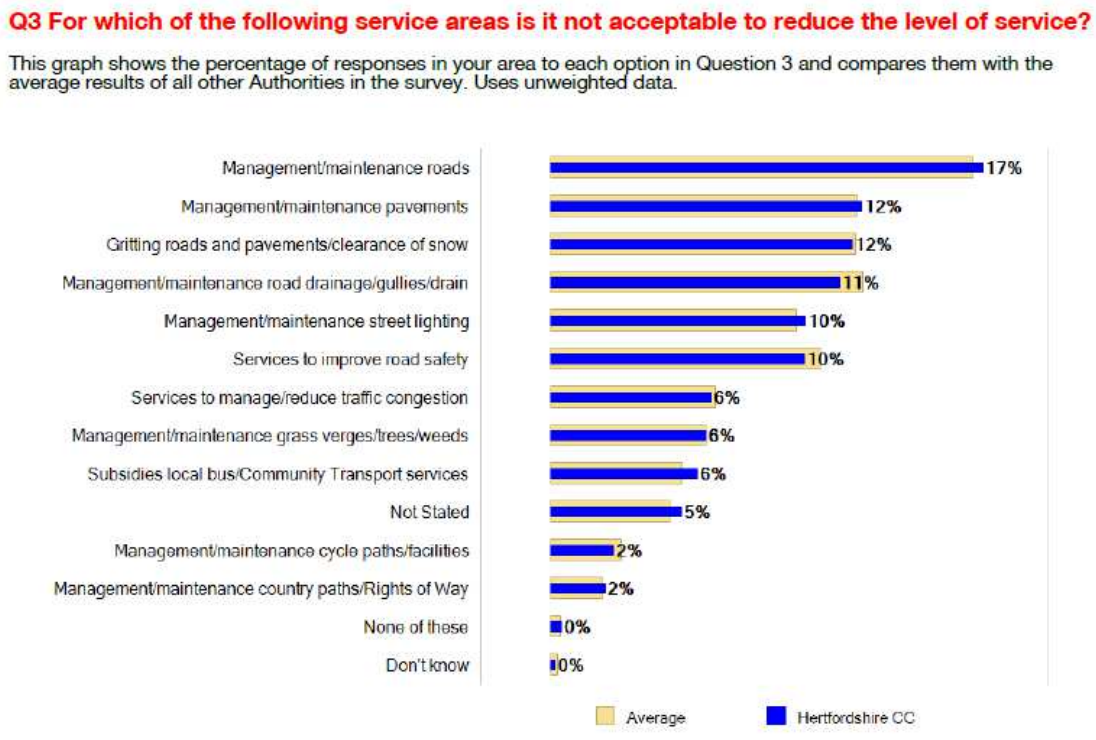

Figure 5: NHT Level of Service Reduction

Figure 6 below shows where Hertfordshire's satisfaction ratings for highway condition sit against peer authorities. Public perception ratings for both Condition of Highways and Highway Maintenance sit slightly below average compared to other authorities.

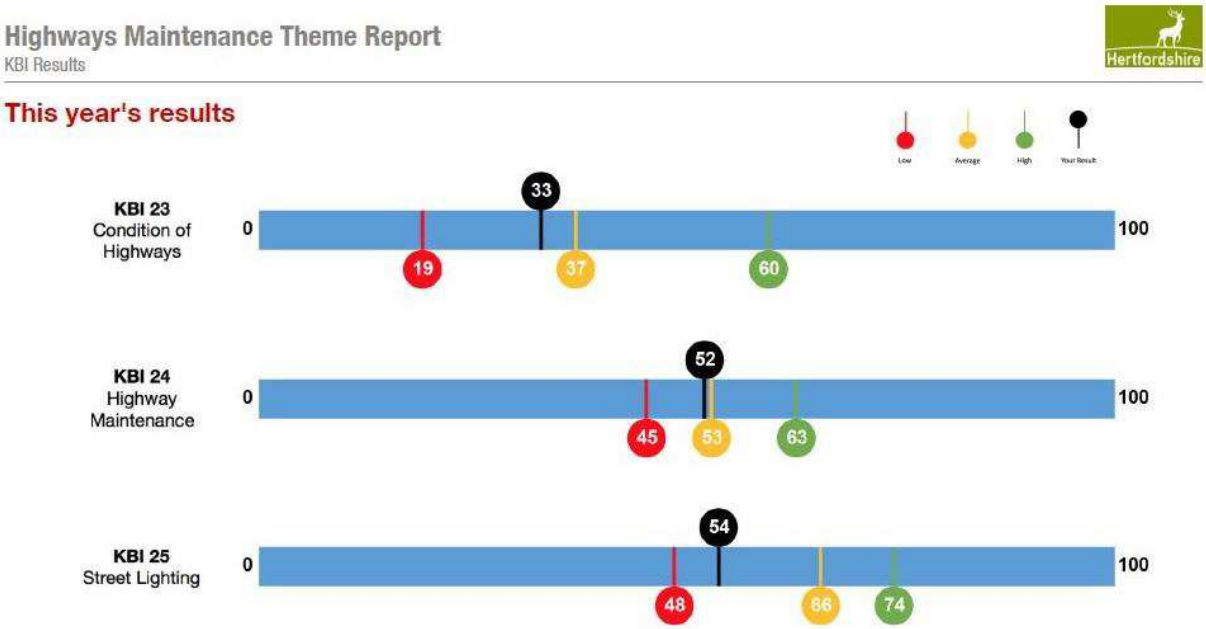

Figure 6: NHT Hertfordshire Satisfaction

3. Carriageways

3.1 Inventory and Value

HCC have approximately *32.7 million m²* of carriageway – the equivalent of about 4,500 football pitches. This equates to over *5,100kms* in total section length distributed as shown in Table 6. They represent the single largest highway asset (excluding land), currently valued at around **£6 billion**.

Table 6: Overview of HCC Carriageway Network

Road Class		Length (km)	Area (m2)	Proportion % Length.	GRC (000s)+	DRC (000s) +
Urban	A	307.9	2,677,101	8.2	£ 550,349	£ 455,315
	B	176.8	1,373,736	4.2	£ 272,302	£ 233,210
	C	359.6	2,319,420	7.1	£ 416,379	£ 394,236
	U	2,638.5	16,833,630	51.5	£ 2,557,425	£ 2,859,600
Rural	A	403.3	3,601,997	11.0	£ 572,746	£ 610,788
	B	154.4	1,033,605	3.2	£ 142,947	£ 177,683
	C	468.3	2,430,477	7.5	£ 296,324	£ 416,446
	U	602.5	2,391,925	7.3	£ 279,147	£ 405,341
Total		**5,111.3**	**32,661,891**		**£ 5,087,619**	
Total carriageway GRC and DRC: Including linear items like kerbing, inflation and regional factors.					£ 6,044,234	£ 5,552,620

+ *These are the 2016/17 values as at the time of writing the 2017/18 figures have not been calculated.*

The carriageway asset is continually growing through the adoption of roads from new developments, new road construction and occasional de-trunking.

HCC has good basic carriageway dimension information (lengths and widths). In addition most roads have further limited information about surface type and construction, but only limited data relating to age and maintenance treatments.

The HAI initiative (section 1.2.2) is helping to improve the information held, by recording more detailed asset information, based on treatment type, material information and location as part of the contractual requirements for HCC suppliers.

This enriched data is improving the deterioration modelling which in turn is enabling more informed decision making about the network investment. The condition and age profile will be used together to determine the right treatment at the right time for

each road section. Optimisation work is used to determine which sections get treated with the limited resource available.

3.2 Strategy and Lifecycle Planning

3.2.1 Maintenance Strategy

The basic strategy for maintaining the carriageway network is:

- To discharge HCC's statutory duty under the Highways Act to maintain the public highway in a safe condition, thus ensuring the safe and efficient movement of people and goods in line with the hierarchy; and
- To extend the life of carriageways and ensure they reach their full service potential as efficiently and effectively as possible by adopting an asset management approach that seeks to minimise whole life costs for a given level of service and maximise the benefits gained from the available investment.

In implementing the strategy account is taken of:

- The agreed Objectives (currently to keep the network in steady-state);
- The Benefits to customers and road-users (busier roads, which benefit more people, typically have a higher priority); and
- The potential Costs and Risks to the authority from different actions.

The strategy is primarily delivered through the Category 1, 2, 4 and 6 programmes.

Table 7: Category 1, 2, 4 and 6 Programmes

Category	Purpose	Typical Work Types	Delivery
Cat 1 (Safety Focus)	Reactive service. Keep the network safe & ensure HCC discharges its legal duties in a robust and efficient way.	Fixing potholes & similar defects	HST Contractor (Ringway)
Cat 2 (Serviceability Focus)	Planned preventative maintenance & repairs. Keep the network serviceable & prevent Cat 1 defects forming & defer the need for Cat 4 work.	Localised patching works & joint sealing to fix specific localised defects or areas of deterioration.	
Cat 4 (Prevention Focus)	Planned preventative maintenance & planned renewals. Keep the network serviceable, prevent Cat 1 defects & deliver best value by focusing on long term benefits and whole life costs of options to deliver optimised programmes of work as efficiently as possible.	Large scheme-type works &, where possible, developed & delivered as work streams in order to get economies of scale	Framework contracts
Cat 6 (Serviceability Focus)	Client-led campaigns, guidance from maintenance communities with maintenance themes and activities identified by the HST Contractor.	Patching / resurfacing generally greater than 100 linear metres in length but not a priority for the asset management led resurfacing programme. Crack and joint sealing and winter recovery	HST Contractor (Ringway) + Framework Contracts

3.2.2 Lifecycle Planning

Lifecycle planning is a key AM tool using condition and performance data to gauge asset deterioration over time and plan the most effective interventions at the right time to get the best performance from the asset.

Carriageway condition data is gathered through surveys and historical trends are compiled to establish how the asset performs and what factors influence longevity and treatment lives. Using this and considering cost and function over the asset life, optimum treatment intervention points are determined. Several models are used for predicting trends through empirical condition and inventory data; and are used to support strategic maintenance planning decisions.

3.3 Condition Monitoring and Performance

3.3.1 Condition Monitoring

The following surveys (machine on A, B & C and visual on U roads) are used to collect carriageway condition data. This condition information is then used to report on a range of Performance Indicators (PI's) and plan future maintenance works.

Table 8: Carriageway Survey Types

Survey Type	Survey Scope	Coverage	Frequency	Output
Surface **C**ondition **A**ssessment for the **N**ational **N**etwork **R**oads (**SCANNER**)	A roads	100%	Annual (Sept – Oct)	Surface Defects, Roughness, Rutting, Spatial geometry
	B, & C roads	100% in one direction		
Coarse **V**isual **I**nspection Survey (**CVI**)	U roads	100%	Annual (Sept – Oct)	Surface Defects, Rutting
Safety Inspections	Varies	Varies	Ongoing	Surface Defects, Rutting – above a given tolerance
Sideways Force **C**oefficient **R**outine **I**nvestigation **M**achine (**SCRIM**)	A roads	100% in one direction	May - Sept	Measure of wet skid resistance of the road surface
	Busy B & C Roads	Varies		
Falling **W**eight **D**eflectometer (**FWD**)	Varies	Varies	Oct - Apr	Structural information
Core Data Logs	Varies	Varies	Oct - Apr	Structural information
Ground **P**enetrating **R**adar (**GPR**)	Varies	Varies	Oct - Apr	Structural information

3.3.2 Carriageway Performance

Current carriageway condition targets are based on maintaining steady-state, relative to a set baseline across a number of PI's. Until 2016/17 this was set at a baseline of the 2010/11 figures.

Table 9: HCC Carriageway Condition Data

PI Description	PI Ref	Old Target	Historic Data				New Target (+/- 2%)	2017/18
			2013/14	2014/15	2015/16	2016/17		
A Road Condition	130-01	8%	4%	4%	3%	3%	**3%**	2%
B&C Road Condition	130-02	11%	14%	8%	6%	5%	**6%**	5%
U Road Condition	*U/C Roads	17%	17%	19%	15%	16%	**15%**	10%
A Road ACI (Average Condition Index)		5.6	6.8	5.7	4.9	4.5	**4.9**	4.0
B, C, U Road ACI (Average Condition Index)		10.4	14.6	10.3	10.2	10.4	**10.2**	10.1

**Not compulsory data.*

As shown in Table 9, since 2015/16 these targets were met across all PI's. In recognition of this in 2017 the baseline was reset to the 2015/16 results (+/- 2%). The 2017/18 results are the first measured against this new baseline, and show improvement once again with the new targets all being met.

National Indicators (NI) - The first two PI's are official NI's which are required under the Local Government Act 1972 and reported to Central Government annually. The third PI, covering U roads, is no longer compulsory but is still collected by most local authorities voluntarily. These results are collated by DfT and published along with the compulsory NIs as part of their annual report 'Road Conditions in England.

Each of these NI's shows *'Percentage of the network where maintenance should be considered'* so a lower number is better and the measure can broadly be thought of as the percentage of the network in 'poor' condition. Consequently this only reflects the proportion of poor roads and doesn't reflect the whole network condition. So although they are NI's and useful for benchmarking, they do not reflect or take account of preventative maintenance done on the network to prevent a road falling into 'poor' condition.

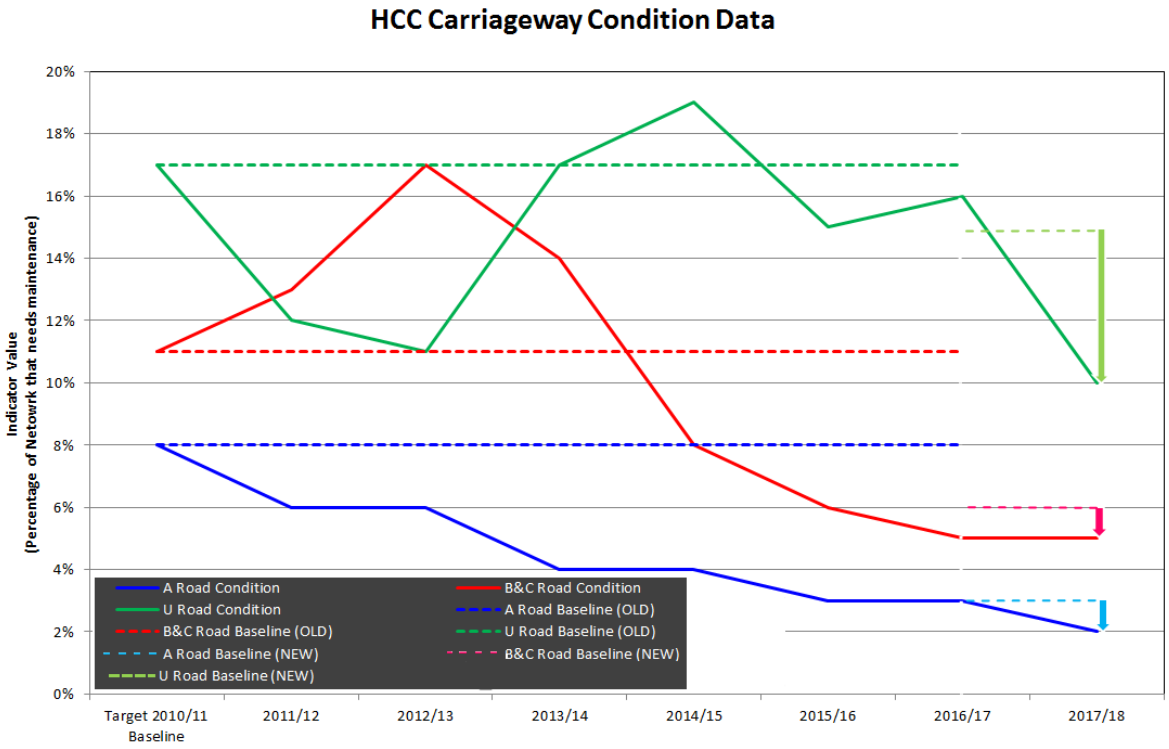

Figure 7: Historic Road Condition (NI).

The NI's recorded in HCC are generally in line with or ahead of national trends, with the condition improving, driving the lines downward.

A Roads – have improved consistently over the past 8 years from 8% down to a record low of 2% in 2017/18 with no occurrences of the condition worsening in this period. *Consistent improvement over the past 8 years, new target met in 2017/18.*

B&C Roads – the first 3 years after the old target was set at 11% saw the condition worsen with a peak level of 17% recorded in 2012/13. Since then it has fallen year on year, passing under the target for the first time in 2014/15. The last 2 years have seen the condition at an all-time low of 5%. *Consistent improvement over the past 5 years, new target met in 2017/18.*

U Roads – the most variable of all the roads, has seen the condition fluctuate up and down during the past 8 years. Since the worst recorded condition in 2014/15 the condition has improved to a record low of 10% in 2017/18. *Inconsistent –the last 2 years improving, new target met in 2017/18.*

However, single-year variances must be treated with caution as condition returns can vary by up to a few percentage points from year to year and trends monitored over a longer period give a more reliable view.

Commentary: Condition Indicators – The latest iterations of the condition indictors (17/18) are based on surveys undertaken in Autumn 2017, this means that they predate the damage done to roads during the three snow events in the following winter; they are also at the final stages of processing at time of publication of this report and should therefore still be considered draft. While the improvements in condition shown are welcome and may well reflect a continuing underlying trend of improvement, it is clear that damage done in the intervening period will have had a significant negative impact on the condition of the roads which is likely to be reflected in the next round of condition surveys, due in late 2018.
It should also be noted that the National Indicators above are based on the proportion of the network where condition is below a particular threshold (i.e. the percentage of 'bad' roads). This can make these indicators very volatile and led by the condition of a fairly small number of roads. The ACI approach (below) is less volatile as it as all roads are considered within the indicator.

Average Condition Index (ACI) - the last two PI's in Table 9 are ACI. Unlike the NI's, ACI is a measure of the overall condition of the network as a whole and has been developed by HCC on its own.

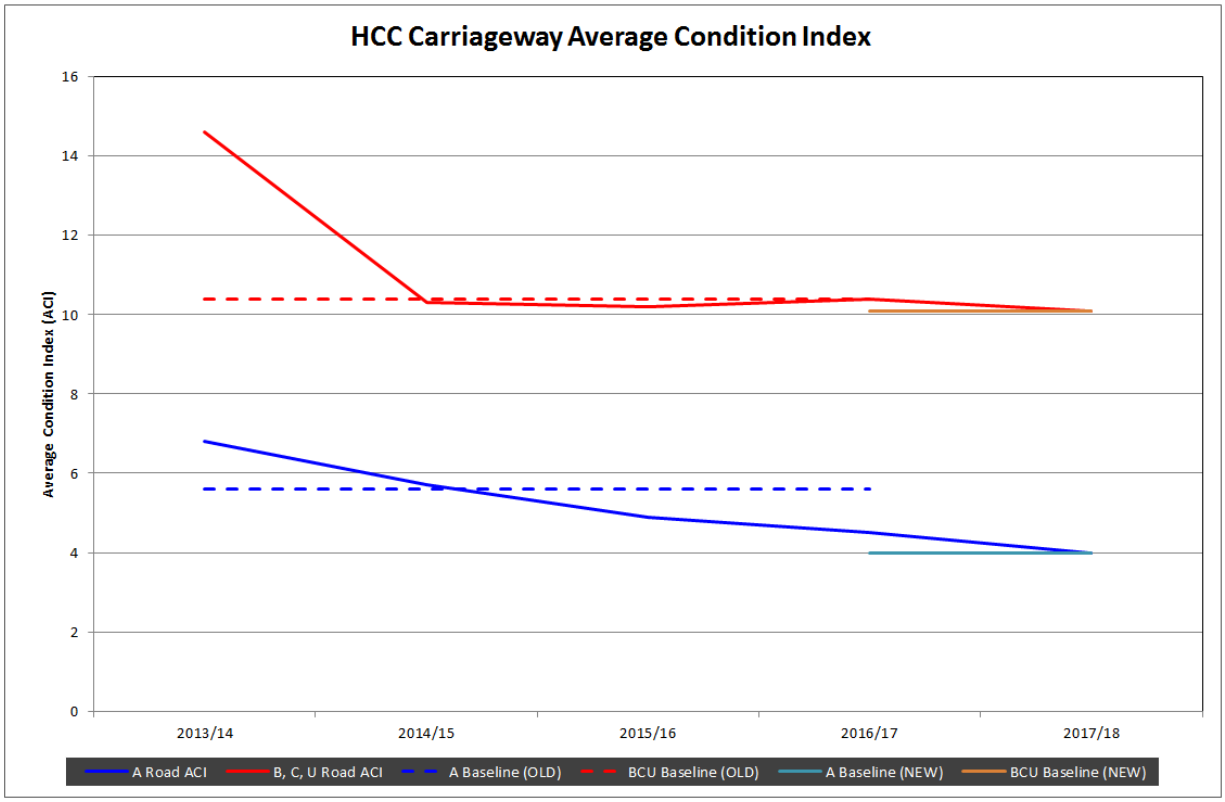

Figure 8: Historic Road Condition (ACI).

A Roads – have fallen consistently over the last 5 years with no occurrences of the condition worsening in the period. *Consistent improvement over the past 5 years.*

B, C & U Roads – condition has varied over the last five years, with the last 4 years being almost flat. *Consistent level for past four years.*

The improvements to Hertfordshire's figures over this period and, especially, the relatively stronger performance when benchmarked against national figures over the same period has been achieved by following asset management-based maintenance strategy to get the best value from the sustained levels of investment made available over the period.

3.4 Budget and Delivery

The overall budget for carriageway capital maintenance 2017/18 was **£17.8 million** distributed across the various work streams as shown in Table 10.

Table 10: Carriageway Capital Maintenance Programme.

Treatment Type	Delivered 2016/17		Delivered 2017/18		Proposed 2018/19	
	Area (m^2)	Cost (000)	Area (m^2)	Cost (000)	Area (m^2)	Cost (000)
A Road Surface Dressing	403,000	£2,000	130,300	£741	208,150	£1,025
A Road Surface Inlay	150,185	£4,361	168,031	£4,708	183,964	£5,570
Total A Roads	553,185	£6,361	298,331	£5,449	392,114	£6,595
Local Road Surface Dressing	272,000	£900	786,225	£2,834	441,052	£1,540,
Local Road Micro Asphalt	457,194	£ 3,405	196,636	£ 1,559	267,807	£1,900
Local Road Surface Inlay	490,000	£ 9,007	377,127	£ 7,514	364,668	£6,328
Local Road Recycling/Recon.	-	-	34,825	£473	23,340	£1,380
Total Local Roads	1,219,194	£13,312	1,394,813	£12,380	1,096,867	£11,148
Total All Roads	1,772,379	£19,673	1,693,144	£17,829	1,488,981	£17,743

3.5 Key Issues and Improvement Actions

Condition Baseline

As detailed in 3.3.2 in 2017 the decision was made to reset the condition baseline to the 2015/16 results (+/- 2%). The 2017/18 results are the first measured against this new baseline.

Maintenance in Design

Design and materials for improvement schemes need to take future maintenance into account. A whole-life cost approach is preferable to a short term view and a strategy and guidance is being developed to provide design engineers with information to assist in designing with this in mind.

Drainage

Poor drainage can contribute to and accelerate carriageway deterioration – hence there is a key link and need to provide a clear strategy/ approach to the design and regular maintenance of drainage for carriageway preservation. The new Cat 6 work programme aims to tackle some of the more common drainage issues.

Invest to Improve (or "i2i") – The Local Roads Improvement Initiative

In 2017 it was agreed that additional funds (£29 million across four years with a possible fifth year beyond the current IP) be spent on local roads maintenance. This Project will supplement the existing programmes by specifically targeting for works unclassified roads that are in, or close to, poor condition allowing the existing programmes to focus on maintaining the asset as a whole and delivering value for money.

The additional funds will be targeted on:

- **unclassified roads** that are in or approaching a
- **poor condition** but are
- **not included** in the **core programmes** because they are a
- **relatively low priority** in pure value for money terms

By targeting additional investment on these roads for a defined period the project aims to:

- Reduce the proportion of ‘poor’ unclassified roads from the current level to a level similar to B & C roads
- Allow those lower priority roads which have had to wait to come forwards sooner

This improved condition will bring a number of direct and indirect benefits to HCC:

- Modest future direct cost savings in terms of reduced reactive spend on potholes (too small to consider as ‘invest to save’)
- Increased network resilience – with these roads fixed the network will be less vulnerable to sudden extreme weather events reducing the likelihood of future disruption and major unexpected costs
- More significant reductions in road user cost savings due to lower vehicle operating costs from better roads (research suggests £1 spent on road maintenance typically saves users about £3)
- Help to reduce our carbon footprint based on more efficient vehicle operation as identified above
- Improved sense of place in many of these roads which typically include residential roads, country lanes and smaller roads in commercial areas; this in turn would be expected to help to:
    - Improve public satisfaction with the service
    - Maintain and enhance economic vibrancy
    - Build upon the Restoration project by making our roads look well cared for

This Project will deliver a package of different types of works suitable to the roads in question; the majority are likely to be ‘whole road’ treatments using conventional resurfacing or surface treatments, delivered as part of the IWP programmes for economies of scale although more specialist or targeted treatments may be applicable in some cases and an element of this work could be delivered through the Cat 6 approach to allow enhanced flexibility and responsiveness.

4. Footways and Cycleways

4.1 Inventory and Value

HCC have over *10 million m²* of surfaced footways and cycleways, currently valued at around **£700 million**. This equates to over 5,400kms of total section length distributed as shown in Table 11, all of which are operated and maintained by HCC.

Table 11: Overview of HCC Footway Network

Footway Hierarchy		Length (km)	Area (m²)	Proportion % Length.	GRC (000s) +	DRC (000s) +
Urban	1	35.8	107,644	0.7	£ 8,864	£ 5,107
	2	169.6	376,630	3.1	£ 28,492	£ 22,617
	3	628.5	1,291,019	11.5	£ 87,066	£ 83,900
	4	3,971.1	7,531,630	72.8	£ 487,673	£ 531,126
Rural	1	0.0	0	0	0	0
	2	1.9	3,383	0	£ 232	0
	3	27.3	54,412	0.5	£ 3,332	£ 3,648
	4	504.4	825,763	9.2	£ 50,388	£ 67,120
Cycleway, bound surface		117.4	213,125	2.2	£ 16,123	£ 16,050
Total		**5,456**	**10,403,606**		**£ 682,170**	
Total footway and cycleway GRC and DRC including inflation and regional factor					£ 810,439	£ 729,568

+ *These are the 2016/17 values as at the time of writing the 2017/18 figures have not been calculated.*

This asset inventory is growing through the adoption of new developments and the creation/extension of existing features across the county. There is a continual need to ensure the footway asset inventory is up to date with accurate information.

The footway inventory is generally quite good, with a lot of available data. The Footway Network Survey (FNS) has improved the type of data available and has been added to the inventory.

Age profiles of footways and cycleways have not been recorded in the past and so condition has had to be related to expected age. The HAI initiative (section 1.2.1) is helping to improve the information held, by recording more detailed asset information when works are carried out.

4.2 Strategy and Lifecycle Planning

4.2.1 Maintenance Strategy

The strategy is to maintain footways as effectively and efficiently as possible by targeting resources to where they will give the greatest overall long-term benefit. Implementation of the strategy takes account of:

- Benefits to customers and pedestrians (busier footways, which will benefit more people, typically have a higher priority); and
- Potential Costs and Risks to the authority from different courses of action.

The strategy is primarily delivered through the Cat 1, 2, 4 and 6 programmes, each of which has its own role to play (see Table 5 for more information).

4.2.2 Lifecycle Planning

A simple lifecycle model uses the condition information collated within the FNS. Each footway is modelled for in-year treatment selection and estimated cost of works. Sites that are identified from the model are verified for suitability and extent by the project manager.

4.3 Condition Monitoring and Performance

4.3.1 Condition Monitoring

The nationally developed FNS was adopted in 2011 as the format to collect footway condition data. It is a quick network level survey tool which enables authorities to determine which footways require further consideration for possible treatment.

It is efficient for surveying of large sections of footways, as traditional surveys collected data relating to individual defects/defect types along a footway section. This was time consuming and resulted in either a very coarse or overly detailed results (depending on survey used). FNS provides a balance by using an assessment rating instead of a defect type.

Alternatives to the standard FNS have been developed as it was felt that its basic form did not provide enough detail for scheme development. HCC have created a simple lifecycle model and the additional inspection data captured is used for analysis and to update the inventory. Furthermore, the collection of ‘additional data’

will enable the creation of a deterioration model. This is the long term objective of condition monitoring and will help provide future value for money.

Table 12: FNS

Survey Type	Survey Scope	Coverage	Frequency	Output
Footway Network Survey	All footways	100%	Network to be covered every 2 years.	Condition banding together with the major cause of defect onsite. Asset inventory information provided for update

Survey results provide a consistent benchmark for site comparisons and aiding scheme selection (but do not yet give a robust means of reporting overall condition). The additions to the survey methodology developed a measure that reasonably reflects the condition of the footway network as the public might perceive it.

4.3.2 Footway Performance

Reporting asset performance is a key part of the longer term desired outcomes for the development of the FNS. This will help to support both performance management and investment decisions.

4.4 Budget and Delivery

The overall budget for footway capital maintenance 2017/18 was **£4 million** distributed across the various work streams as shown in Table 13. Note that this includes significant footway schemes funding via the Highway Locality Budget as well as those that formed part of the core programme.

Table 13: Footway and Cycleway Capital Maintenance Programme.

Treatment Type	Delivered 2016/17		Delivered 2017/18		Proposed 2018/19	
	Area (m^2)	Cost (000)	Area (m^2)	Cost (000)	Area (m^2)	Cost (000)
Surface treatment (micro asphalt)	95,587	£ 1,223	132,288	£ 1,381	55,656	£696
Resurfacing & Reconstruction*	80,470	£ 3,878	80,049	£ 2,642	90,390	£3,201
Total	**176,057**	**£5,101**	**212,337**	**£ 4,023.**	**146,046**	**£3,897**

*Includes HLB schemes

4.5 Key Issues and Improvement Actions

- Footway Lifecycle Planning Model

  The simple network level lifecycle planning model has already evolved into a footway section model. Further work and analysis will be undertaken in conjunction with the FNS survey. Once the rule set for the survey has been established, a lifecycle planning model can utilise the condition information and translate this data into treatment requirements for each footway section.

- Footway Deterioration Model

  Leading on from the lifecycle planning model a deterioration model will be developed over the coming years. This model will provide an optimised programme of works and a condition forecast based on budget expenditure. This can be used to understand what investment level is needed to maintain the footway network at the current service level, or what would happen to future condition based on different budget scenarios.

5. Drainage

5.1 Inventory and Value

The HCC highway drainage system is an evolved asset comprised of several distinct asset sub-groups:

- Carriageway and footway gullies (drainage system inlets);
- Inspection and access chambers (manholes and catchpits);
- Sustainable Drainage Systems (SuDS) such as soakaways and storm cells etc.;
- Highway drains (buried pipework);
- Outfall structures (drainage system outlets to watercourses);
- Roadside grips (shallow unlined ditch inlet channels cut in verges); and
- Road-side ditches (in many cases owned by adjacent landowners).

These assets work in combination to remove surface water from the highway and transport it into a water course, utility storm system or SuDS system.

The drainage asset valuation is included in the carriageway linear items valuation and forms part of the carriageway GRC. Drainage asset inventory is not a readily available data set so general assumptions have been made based upon carriageway classification and modern equivalent design to value the drainage assets.

5.2 Strategy and Lifecycle Planning

5.2.1 Maintenance Strategy

The basic strategy for maintaining the highways drainage network is:

- To discharge HCC's statutory duty under the Highways Act to maintain the public highway in a safe condition, thus ensuring the safe and efficient movement of people and goods in line with the hierarchy; and
- To extend the life of the highway drainage assets and ensure they meet their full service potential efficiently and effectively as possible by adopting an asset management approach that seeks to minimise whole life costs for a given level of service and maximise the benefits gained from the available investment.

The strategy is delivered through the Category 1, 2, 4, 5and 6 programmes.

Table 14: Drainage Service Delivery

Category	Purpose / Activities
Cat 1 **Emergency/Urgent Works**	Placing flood warning signs, cleaning up and jetting pipes from flood events and minor reactive repairs.
Cat 2 **Reactive Maintenance**	Minor repairs and/or ad hoc clearance of non-functioning drainage assets such as grips, ditches and pipe drains etc. Investigation and escalation of more significant issues to the Cat 4 programme.
Cat 4 **IWP Drainage Schemes**	More significant drainage repairs or major improvement works identified through Cat 2 and 5 activities.
Cat 5 **Cyclical Routine Maintenance**	Cyclic cleansing / emptying of road-side gullies and similar drainage assets.
Cat 6	• Drainage grip reinstatement • Ditching out a watercourse to the side of a road etc. • Gully dig outs and further investigations

5.2.2 Lifecycle Planning

Lifecycle Planning is a key AM tool using condition and performance data to gauge asset deterioration over time and predict and plan future interventions to make them as effective and efficient as possible. There are a number of challenges with applying lifecycle planning techniques to drainage assets. Many drainage assets like pipes, gullies and chambers are long- or indefinite-life assets, meaning that they will not need renewal or replacement on a predictable basis within a normal lifecycle. Other assets that do need renewal or replacement, like soakaways, are difficult to access for routine condition surveys and the inventory held is incomplete or unreliable. The confidence in the accuracy of the drainage inventory and the lack of easily obtained, consistent, repeatable condition information (many buried drainage assets require expensive CCTV surveys to assess condition) makes lifecycle planning difficult for drainage assets. Improvements to the asset inventory and condition data techniques may address this in the future but, in the short term, the lifecycle planning focus for drainage assets focuses on key assets and locations where the work will structure. Emptying and cleaning HCC's 168,000 gullies is undertaken on an 18 month cycle with vulnerable gullies (6,828) and those gullies on high speed roads (7,123) cleaned on a 6 and 12 month cycle respectively. Since

July 2017 Ringway have collecting and recording silt levels in gullies as they are cleaned to enable future improvements to the cyclical maintenance scheduling. Knowledge of silt levels will provide a record of asset performance and may allow cleaning schedules to be refined in the future to more closely reflect actual need. More data is still needed before the schedule and frequencies can be changed.

In addition the Cat 1 and 2 services are now being used to inform the Cat 5 and 6 services and will provide further information to identify hot spot areas.

5.3 Condition and Performance

5.3.1 Condition Monitoring

Aside from the silt level measuring and general condition check on gullies during emptying described above there is no routine condition monitoring of drainage assets for the reasons touched on in 5.2.2.

5.3.2 Drainage Performance

The gully emptying and cleaning service has been in the performing zone for the last two years and gully dig outs have reduced blocked gullies to less than 2% of the total number of gullies in each Member division.

Apart from this, there is currently no structured measure of how the drainage asset is performing. Possible measures that could be adopted include but are not limited to:

- Number of highway flooding incidents;
- Silt levels in gullies; and
- Road traffic collisions attributed to highway flooding/surface water.

5.4 Budget and Delivery

The overall budget for drainage maintenance schemes in 2017/18 was £1.43 million distributed across the various project types as shown in Table 15.

significantly improve network resilience.

Cyclical routine maintenance is delivered by the HST contractor Ringway as part of the Cat 5 ‘Contractor Led’ service and has elements of lifecycle planning in its

Table 15: Drainage Capital Maintenance Programme.

Reference	Delivered 2016/17		Delivered 2017/18		Proposed 2018/19	
	No. Schemes	Total Expenditure	No. Schemes	Total Expenditure	No. Schemes	Total Expenditure
Investigation	12	£1,385,000	18	£1,427,000	16	£1,132,000
Quick Win	1		2		0	
Minor Works	1		0		0	
Major Schemes	18		13		11	
3rd Party	0		0		0	
Total	**32**		**33**		**27**	

5.5 Key Issues and Improvement Actions

Asset Data

HCC have a database of carriageway and footway gullies but little information on other drainage assets, despite the huge amount in existence. This currently means HCC cannot organise a cyclical cleaning or inspection regime on these other assets and the lack of regular maintenance could lead to premature failure of said assets.

As part of the HAI initiative, HCC is aiming to continually improve the accuracy and completeness of drainage assets year on year. As described in Section 1.2.2 the drainage community is currently trialling some new data collection tools and software.

Electronic Mapping of Gullies (including status)

Ringway are developing their electronic system utilising GIS data, to enable efficient collection of data at a gully drain asset level, allow localised flooding and gully digs outs to be easily identified; improve scheduling, coordination of activity, better and more accurate reporting and efficient and effective delivery of the service. The vision is to develop this into web map based information to better inform customers on a self-serve basis. Information available to customers could include, gully status, date of last clean, planned next clean and defects noted. This change is planned to be operational by 1 October 2018. This aligns with the next gully cleaning cycle and allows time for the change to the fault reporting system to become established.

6. Structures

6.1 Inventory and Value

HCC has a large bridge stock being seventh on the list of highway authorities in terms of numbers of structures. HCC's ageing bridge stock is typical of similar Counties, with many historic structures but with a large proportion of reinforced concrete bridges many of which are now more than half way through their anticipated life. HCC's structures are broken down into the structure types shown in Table 16.

Table 16: Overview of Bridge Stock Valuation at April 2016

Asset Group	No. of Assets	GRC Value (000) +	DRC Value (000) +
Bridges	622	£ 692,198	£ 418,522
Retaining Walls	74	£ 16,437	£ 9,259
Culverts	441	£ 93,058	£ 63,595
Sign Gantries	8	£ 737	£ 581
High Masts	114	£ 3,363	£ 1,906
Tunnels & Underpasses	6(1)	£ 65,800	£ 48,079
Other	335	£ 122,615	£ 79,410
Total	**1,600(2)**	**£ 994,207(3)**	**£ 621,352(3)**

Note 1 One underpass has been filled in and a culvert has been adopted by a private developer, so stock reduced by two.
Note 2 A5 de-trunked structures not yet included as adoption inspections not completed.
Note 2 Based on unit rates from March 2016, ignoring inflation allowance to 2017 as indexation details have not yet been provided by CIPFA/DfT

+ *These are the 2016/17 values as at the time of writing the 2017/18 figures have not been calculated.*

This large highway structures stock is currently valued at around **£1 billion**. The 1,600 highway structures listed above are owned and maintained by HCC, but there are 900 more structures in the county owned and maintained by Network Rail, Canals and Rivers Trust and the District and Borough Councils.

6.2 Strategy and Lifecycle Planning

6.2.1 Maintenance Strategy

The basic strategy for maintaining the highways structures assets is:

- To discharge HCC's statutory duty under the Highways Act to maintain the public highway in a safe condition, thus ensuring the safe and efficient movement of people and goods in line with the hierarchy; and
- To extend the life of the highway structures assets and ensure they meet their full service potential efficiently and effectively as possible by adopting an asset management approach that seeks to minimise whole life costs for a given level of service and maximise the benefits gained from the available investment.

Bridges schemes are promoted in two ways as detailed in Table 17 below.

Table 17: Bridge Schemes

Category	Purpose / Activities
Reactive Maintenance	Inspection records identify schemes to correct poor condition
Targeted Preventative Maintenance	Asset Management approach which utilises targeted preventative maintenance interventions to maximise the life and value from the Hertfordshire Structures Decision Support Tool, based on concepts from the DfT Structures Asset Management Planning Toolkit (SAMPT). The approach adopted by the Decision Support Tool is summarised below in Figure 9.

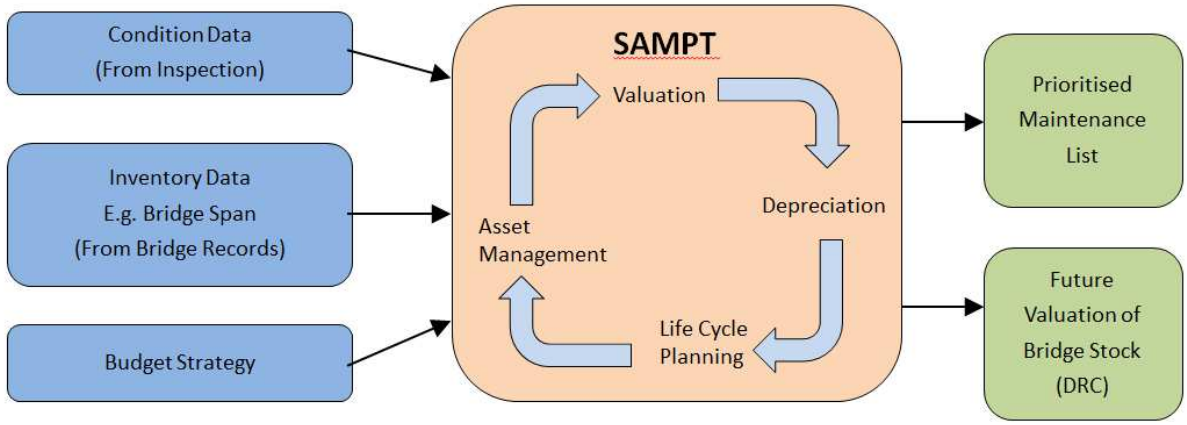

Figure 9: The Structures Asset Management Planning Toolkit

The SAMPT's valuation is used in Hertfordshire's accounts in line with Whole Government Accounting (WGA) Principles.

6.2.2 Lifecycle Planning

The introduction of the Decision Support Tool (DST) has enabled HCC to develop a basis for lifecycle planning. HCC has developed this programme further and uses the base information for determining estimated service lives and deterioration rates for each element.

The DST has been used to look at future predicted condition information based on different capital expenditure. The complexities of the structural model are being further refined, to better inform the life cycle planning and maintenance prioritisation of the structure stock.

6.3 Condition Monitoring and Performance

6.3.1 Condition Monitoring

Condition monitoring of structures is undertaken as follows:

- General Inspection every two years; and
- Detailed Principal Inspection every 6-10 years.

Table 18 – Condition of Structures Stock

Structure Type	Number	Condition Band				
		Very Good	Good	Fair	Poor	Very Poor
Bridges	622	264	233	95	10	0
Retaining Walls	74	33	18	17	6	0
Culverts	441	201	163	63	12	2
Sign/Signal Gantries	8	6	1	1	0	0
High Mast Lighting	114	0	0	0	114	0
Tunnels and Vehicular U/P	6	3	2	1	0	0
Other	335	164	149	20	2	0
Full stock	**1,600**	**691**	**566**	**197**	**153**	**3**

6.3.2 Structures Performance

Condition data generates a Bridge Condition Indicator Score (BCI) for every structure. The BCI's are combined to calculate an overall Bridge Stock Condition

Score (BSCI). $BCI_{AVERAGE}$ scores include all elements of the bridge. $BCI_{CRITICAL}$ score considers only load carrying and safety critical elements.

Hertfordshire's $BSCI_{AVERAGE}$ score is 90.49, $BSCI_{CRITICAL}$ score is 82.75. This places both indicators in the 'good' range.

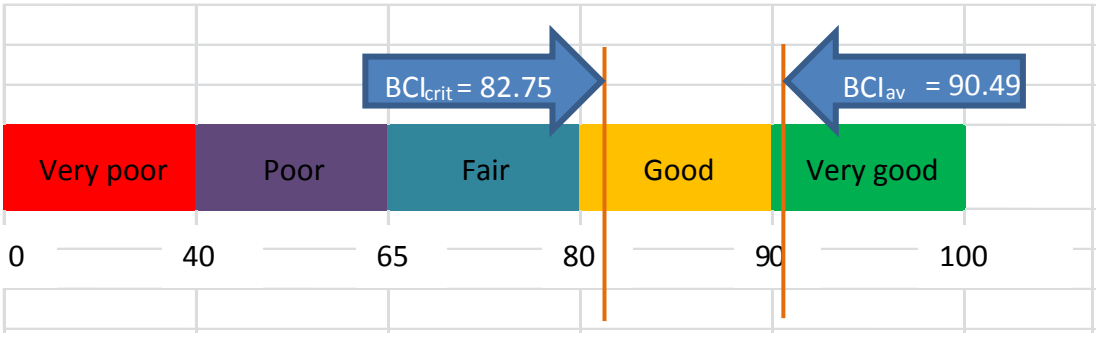

Figure 10: Hertfordshire BCI (Stock) Condition Banding

The April 2018 Bridge Stock Condition Scores have increased slightly from the previous calculation in April 2017. Whilst this could be considered an indication of the effectiveness of the current maintenance strategy, and increased structures maintenance budget, there is insufficient data to confirm that this trend is expected to continue.

Table 19: HCC Structures Condition Scores

Condition	April 2013	April 2014	April 2015	April 2016	April 2017	April 2018
$BSCI_{AVERAGE}$	90	90	89	89.44	89.38	90.49
$BSCI_{CRITICAL}$	87	84	80	81.13	81.13	82.75

6.4 Budget and Delivery

The Structures budget for 2016/17 was increased significantly from previous years, based on an analysis of the risk and deterioration profile of the stock. The forward works programme is planned to deliver a continuing capital spend of £4.95m.

Table 20: IWP Scheme Delivery 2016-2017

Bridges Capital Programme	Delivered 2016/17	Delivered 2017/18	Proposed 2018/19
Highway bridge refurbishment	£ 527,406	£ 838,800	£2,113,600
Footbridge refurbishment	£ 709,608	£1,230,600	£ 679,400
Retaining wall, Culvert and "Orphan"	£ 658,212	£ 611,500	£ 630,000
Waterproofing and joint replacement	£1,603,064	£ 978,700	£ 417,000
Bridge capacity assessment	£ 20,960	£ 110,000	£ 110,000
Programme Management and overheads	£ 226,644	£ 390,800	£ 375,000
Overheads	£ 500,000	£ 600,000	£ 550,000
Asset Management	£ 15,440	£ 70,000	£ 70,000
Total	**£4,261,335**	**£4,830,400**	**£4,950,000**

7. Street Lighting

7.1 Inventory and Value

HCC has the fifth largest number of lighting units for any UK highway authority, with a gross replacement cost of almost **£200 million**. The various street lighting assets are summarised in Table 21.

Table 21: Street Lighting Assets

Street Lighting Assets	Number of units	GRC (000) [+]
Columns up to 12.0m	113,637	£ 179,711
Subway Units	3,907	£ 1,102
Feeder Pillar	1,950	£ 2,954
Columns up to 15.0m	114	£ 275
Footway Street Lighting	905	£ 317
Illuminated Signs.	13,594	£ 9,059
Belisha Beacon	416	£ 383
Bus Shelter	96	£ 21
Centre Island Beacons	338	£ 203
Safety Bollard	5,815	£ 2,350
Total	**140,772**	**£ 196,375**

[+] *These are the 2016/17 values as at the time of writing the 2017/18 figures have not been calculated.*

Since 2014 HCC has been systematically replacing street lighting lanterns with new Light Emitting Diode technology combined with a central management system (LED/CMS Project), in the following Phases:

Table 22: LED/CMS Project Summary

Phase	Description	Appx Number	CapEx
1*	A Roads	12,600	£ 7.1m
2	Exceptions (lights on all night, not A Roads) and heritage lighting on A Roads	21,000	£ 7.0m
3	Outlying settlements and remote footways that are in part night lighting	9,000	£ 3.5m
4**	Part night lit assets	70,000	£18.5m
4***	Belisha Beacons	388	£84,000

All phases of work include survey, design, installation of new LED and CMS

** includes installation of lighting control CMS (central management system) infrastructure*
*** includes other heritage lighting to be reconditioned or refurbished*
**** Conversion of remaining stock to LED only*

To date, circa 65,000 units have been changed (including ad hoc replacements following column knockdowns), with an annual saving in carbon emissions of 9340 tonnes (based on the original consumption of 19,529 tonnes in 2012/13).

7.2 Strategy and Lifecycle Planning

7.2.1 Maintenance Strategy

Street lighting maintenance is delivered by the HST contractor Ringway as part of the Cat 5 'Contractor Led' service. The strategy is implemented through the 'safe and operational' approach with regard to the ongoing maintenance and replacement of the existing street lighting and illuminated signs infrastructure. All replacements are installed with LED/CMS technology to ensure they fully integrate with the Council's long term strategy.

The strategy is based on **new technology** installed on **structurally sound** apparatus. This asset management approach is data driven and condition led, resulting in less wastage and making the best use of the existing infrastructure.

The Capital Bids for 2018/19 included the replacement or renewal (where required) of the remaining street lighting assets not included within the LED/CMS project, these include high mast lighting, subways, illuminated signs, bollards, school crossing lights, and the existing underground private cable network.

7.2.2 Lifecycle Planning

The HMEP suite of tools includes a lifecycle planning toolkit for Ancillary Assets which has been reviewed by the HCC AM Team. Further work is required to complete a fully functional lifecycle plan for lighting assets; this will allow us to provide robust analysis of the works projects to optimise the budget spent.

7.3 Condition Monitoring and Performance

7.3.1 Condition Monitoring

An ongoing programme of non-destructive structural testing is being undertaken on street lighting columns 10 years old or older. Since the commencement of the HST contract, around 93,000 tests have been undertaken, some of which are now into their second 3-year cycle. A 6-year testing strategy is currently being developed.

The structural testing programme is now producing robust information, where only columns identified as life-expired are actually replaced. The remaining units which have passed the structural inspection are factored back into the rolling programme for inspection within a three or six year period. This process has ensured that the life of individual units is maximised.

7.3.2 Street Lighting Performance

Table 23 below sets out the structural testing quantities, along with the estimated number of replacements for the year following the test.

Table 23: Structural Testing Programme

Year	Total Number of Structural Tests	Estimated Number of Column Replacements
2016/17	16,483	495 (2017/18)
2017/18	10,030	301 (2018/19)
2018/19	8,215	247 (2019/20)
2019/20	7,488	225 (2020/21)

In addition to the column replacements as a consequence of the planned structural testing, an additional circa 1,500 units per annum are replaced as a consequence of accident damage, vandalism and visual detection via reactive inspections.

7.4 Budget and Delivery

The overall budget for street lighting capital maintenance 2017/18 was **£2.3 million** distributed across the various work streams as shown in Table 24.

Table 24: Street Lighting Capital Maintenance

Street Lighting Schemes	Delivered 2016/17		Delivered 2017/18		Proposed 2018/19	
	Number of units	Cost (000)	Number of units	Cost (000)	Number of units	Cost (£000)
Replacement Street Lighting	1,103	£ 1,336	1,240	£ 1,500	1500	£1,875
Conversion of High Masts to LED/CMS	0	0	0	0	38	£ 240
Sign Lighting / De-Illumination	552	£ 591	600	£ 642	60	£ 33
Cable Replacement	8	£ 19	40	£ 100	TBC	£ 150
Replacement Subway Fittings	12	£ 5	60	£ 25	20	£ 134
Total	**1,675**	**£ 1,951**	**1,940**	**£ 2,267**	**1618**	**£2432**

7.5 Key Issues and Improvement Actions

In response to interest shown, the Council has shared its approach and lessons learned regarding the LED/CMS project at a regional (e.g. ADEPT), national (e.g. Highway Electrical Association Conference) and international level (e.g. Portugal and Singapore). The Council's paper 'from PFI to LED' won the CIHT Sustainability Award 2017.

With conversion of part night lit assets on Traffic Routes - B & C roads (part of Phase 4 of the LED/CMS project) which was substantially completed in June 2017, a review of the existing customer fault reporting and the night scouting process has been undertaken. There is now a proposal to cease the scouting of lights on Traffic Routes, with all other equipment (signs and bollards etc.) scouted on a 20 day cycle, and in addition, all subways across the county will be subject to a daytime scout on a 20 day cycle

The Project Team is currently developing an LED Illumination Strategy, which includes further dimming, in conjunction with the road safety team, and police.

The Council, in collaboration with Essex County Council is also undertaking trials in Hoddesdon with regard to using the CMS to integrate the following applications and to consolidate existing systems, viz.

- Dynamic dimming of street lighting based on traffic flow
- Air quality and wind speed sensors
- Sensors in gullies to measure silt levels and in traffic cones to give travel information

8. Intelligent Transport Systems

8.1 Inventory and Value

The Intelligent Transport System (ITS) asset is made up of a wide range of specialist electronic equipment across the County, performing a multitude of different functions, as shown in Table 25. Its purpose is to facilitate the efficient movement of vehicles, pedestrians, cyclists and ease congestion around the HCC network. The ITS assets are currently worth **£61 million.**

Table 25: ITS Assets

Asset Type	No of Units	GRC Value (000) +
Signal controlled crossings	475	£ 25,754
Signal Controlled Road Junction	200	£ 20,680
Zebra Crossing	198	£ 5,940
Vehicle Activated Signs - (VAS)	143	£ 500
ANPR and CCTV Cameras	234	£ 1,047
Safety and speed camera equipment	219	£ 2,190
Automatic Traffic Counters	417	£ 228
E P Information Point	47	£ 470
School Crossing (flashing amber lights per sign)	157	£ 628
Fixed and Mobile EMS/VMS Signs	80	£ 1,316
Real time passenger info (display & remote comms)	131	£ 655
Real time passenger info (in vehicle)	140	£ 840
Car Park Signs	33	£ 495
Other ITS equipment (23 Car Park Counters, 6 Rising Bollards, 39 Speed Indicator Devices, 5 Overhead Vehicle Detectors and 3 Fire Station Warning Signs)	76	£ 569
Total	**2,550**	**£ 61,312**

8.2 Strategy and Lifecycle Planning

8.2.1 Maintenance Strategy

The basic strategy for maintaining the highways ITS assets is:

- To discharge HCC's statutory duty under the Highways Act to maintain the public highway in a safe condition, thus ensuring the safe and efficient movement of people and goods in line with the hierarchy; and

- To ensure the expeditious movement of traffic under the Traffic Management Act (TMA) 2004.

ITS maintenance is delivered by the HST contractor Ringway as part of the Cat 5 'Contractor Led' service. The strategy is implemented through the 'safe and operational' approach with regard to the ongoing maintenance and replacement of the existing ITS infrastructure.

Many traffic signals are operating outside of their recommended life cycle (15 years). Existing equipment has become increasingly unreliable and difficult to maintain with problems including leaning poles, poor detection and connection issues and sites vulnerable to water ingress and pest infestation.

Replacing individual traffic signal components can prolong the life of the junction arrangement, but this approach is not always cost effective and does not deliver many additional benefits. Compatibility issues, maintaining outmoded spares and negligible energy savings can ultimately lead to increased maintenance costs without significantly reducing the likelihood of failures.

Renewing whole junction installations provide the means to update all the associated hardware including control equipment, resulting in improved optimised journey times, remote monitoring and operation, reduced maintenance liability and reduced energy consumption.

Works are being carried out based on the current Asset Profile to develop Capital Bids for 2019/20 with regard to the refurbishment or replacement of ITS assets that comprise:

- Traffic signal junction sites on the priority network which are in urgent need of replacement and already exceed the recommended 15 year replacement period
- Sites which exceed the 15 year life expectancy; replacing the remaining sites within the county which use Halogen signal heads with LED signals; and

8.2.2 Lifecycle Planning

The HMEP suite of tools includes a lifecycle planning toolkit for Ancillary Assets which has been reviewed by the HCC AM Team. Further work is required to complete a fully functional lifecycle plan for ITS assets, but this is required to provide robust, realistic analysis of the works projects to optimise the budget spent.

On the basis of a 15 year asset life, there are approximately 440 sites (65%) within the county which are fully or partially older than this and a further 100 sites which will also exceed the expected life cycle within the next five years. As around 20 sites are refurbished per year, this could mean the effects of not having a lifecycle plan could be felt if funding were to be reduced/delayed.

Refurbishment is the preferred option as it allows HCC to maintain the equipment at an age limit which maximises reliability and effectiveness. Sites are selected on the basis of age, current reliability levels and the junction/crossings strategic importance.

8.3 Condition Monitoring and Performance

8.3.1 Condition Monitoring

ITS maintenance is delivered by the HST contractor Ringway as part of the Cat 5 'Contractor Led' service and as such condition monitoring is integrated as part of this service. An ongoing programme of non-destructive structural and electrical testing is being undertaken on ITS assets that require it.

8.3.2 ITS Performance

The performance of ITS equipment is closely related to the Network Management function of the highway network. The safe and reliable operation of signal controlled junctions is vital to effective performance of the highway network. Signal failures at junctions quickly lead to congestion, increased journey times, accidents and environmental impacts.

As related to asset management there is currently no defined performance management system or measures in place.

8.4 Budget and Delivery

The overall budget for ITS capital maintenance 2017/18 was £638k distributed across the two work streams as shown in Table 26.

Table 26: ITS Capital Maintenance Programme

Traffic Management Equipment	Delivered 2016/17		Delivered 2017/18		Proposed 2018/19	
	No. of units	Cost (000)	No. of units	Cost (000)	No. of units	Cost (£000)
Replacement Junction	3	£189	4	£263	12	990
Replacement Crossing	16	£214	17	£375	13	319
Replacement CCTV	0	0	0	0	11	90
Replacement ANPR	0	0	0	0		90
Replacement VMS	0	0	0	0		
Total	**19**	**£403**	**21**	**£638**	**36**	**1,489**

8.5 Key Issues and Improvement Actions

HCC submitted a capital bid to the DfT (circa £1million) in late March 2017 for Highways Maintenance Challenge Fund (2017/18) to replace 12 traffic signal junctions on the primary route network. These sites are essential to the safe and reliable operation of the highway and provide vital resilience to the strategic road network. The bid was not successful, hence these sites form part of the proposed 2018/19 programme.

Development of the Asset Profile including performance management and measures to include for example: fault rate per site per year and associated potential to reduce maintenance costs; savings accrued through the reduction in accidents, delay at a junctions, carbon emissions and energy consumption.

This will enable HCC to develop its asset management approach and robust business cases in the support of optimising budgets for maintenance, improve coordination of network operations (e.g. with Highways England and neighbouring Local Highways Authorities) and optimising journey times.

Modern equipment provides better control of through traffic by vehicle detection and optimisation of signal phases, increasing junction capacity and reducing failures.

Linking control systems provides the ability to remotely monitor and adjust traffic flow through individual junctions and wider areas in real time, for regular peak hours and “one off” situations. Priority can also be provided for buses and emergency vehicles. The physical layout of junctions can also be changed to improve turning movements for vehicles or to provide better facilities for pedestrians a pedestrian phase may also

be a required improvement. The future requirements for the ability to freely distribute signal data for public use also need to be considered.