



Worcestershire County Council

Highway Assets Lifecycle Plan

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1. Introduction

Worcestershire County Council has in place a Highways Asset Management Policy and Strategy that sets out the major assets that Worcestershire County Council has and how we will manage the highway network to ensure we achieve our corporate priority outcomes, taking into account finance and the current asset condition, differing stakeholder needs, localised priorities and the benefits they provide over the medium to long term in terms of defined outcomes. Our Highway Asset Management Strategy sets out what highway asset management means to us, the asset inventory and outlines the procedures, processes and systems we have, or intend to put in place, to help us ensure that our highway and transport assets are maintained in a condition that is considered fit and safe for reasonable use.

This is an overarching document that describes our approach to lifecycle planning to ensure that our highway assets are effectively and efficiently maintained in accordance with the objectives set the Highway Asset Management Strategy and Framework. It includes a summary section for each major asset group.

2. Lifecycle Planning

Lifecycle planning is a technique which enables Worcestershire County Council to monitor and anticipate the future condition of assets and to know when we need to maintain or replace it. Through detailed knowledge of the size, safety, condition and value of our highways asset, the information enables us to take in to consideration whole life costs when maintaining our assets. Lifecycle planning is a fundamental aspect to determine revenue and capital budgets in the short, medium and longer term.

Lifecycle planning tools have been developed which enable the development of work programmes which make best use of the available funding in meeting long-term objectives, mitigating the risk of failure by allocating funds to where they will be most beneficial.

It must be noted that this type of allocation moves away from a more traditional “worst first” approach and targets work programmes at those parts of the infrastructure which present the greatest risk and where timely treatment can achieve the most beneficial whole of life cost. This approach is advocated in the '[Going the Distance Report](#)' by the Audit Commission in 2011.

Worcestershire County Council also uses lifecycle planning to develop investment strategies to deliver an agreed level of performance or, where funding becomes constrained, a prediction of the effect of particular funding scenarios on the levels of service that can be delivered. This approach enables service delivery to be as effective as possible, allowing a cogent allocation of resources to those areas which will contribute most to the overall objectives and priorities of the Council and allow an assessment to be made of the residual risk.

3. Lifecycle Approach in Worcestershire

To deliver life cycle planning effectively, there are a number of factors which Worcestershire County Council takes into consideration on an annual cyclical basis:

1. Maintenance hierarchy
2. Survey regimes and asset condition
3. Treatment options
4. Treatment costs
5. Treatment lives
6. Budget constraints

In terms of determining the best method of management and repair for our asset groups, the County Council has a comprehensive database of historical schemes and performance data that assists in the planning of maintenance works. On an evolved network, the age of an asset is difficult to determine. Therefore, previous scheme performance data, collected over many years, is used in when assessing the anticipated performance of different treatments and materials in consultation with engineers and current methodologies and innovations in consideration of asset management criteria and community need.

Each asset group has its own lifecycle plan and schedule of works that come together to enable us to identify the optimum management strategy for each group and the highway assets as a whole.

As part of the County's term maintenance Contract with Ringway Infrastructure Services, Ringway have to submit a Contractor's Plan every month for acceptance by the Service Manager. This Contractors Plan details all planned works being carried to major asset groups that includes: carriageways; footways and cycletracks; bridges and structures; planned drainage works; Design & Build works, Planned Reactive works and signage.

4. Objectives of lifecycle planning

Lifecycle planning is an important aspect of asset management and involves drawing up long-term plans for managing an asset group with the aim of providing the required levels of service at the lowest whole life cost. Lifecycle plans capture all information relating to the inventory, its condition and performance. They also identify both the short-term routine maintenance needs and long-term capital costs and enable annual spend profiles per asset to be produced. They also enable long-term predictions about the deterioration of various

assets and their maintenance needs to be forecast. The objectives of lifecycle plans for our major assets are set out below:

- Identify long-term investment for highway infrastructure assets and develop an appropriate maintenance strategy.
- Predict future performance of highway infrastructure assets for different levels of investment and different maintenance strategies.
- Determine the level of investment required to achieve the required performance.
- Determine the performance that will be achieved for available funding and/or future investment.
- Support decision-making, the case for investing in maintenance activities, and demonstrate the impact of different funding scenarios.
- Minimise costs over the lifecycle, whilst maintaining the required performance.

5. Lifecycle Planning Stages

Life cycle Planning is the continuous process of managing an asset throughout its life. An Asset's lifecycle includes the entire time during which an organization spends money on it, from the initial installation/use to the end of the assets life.

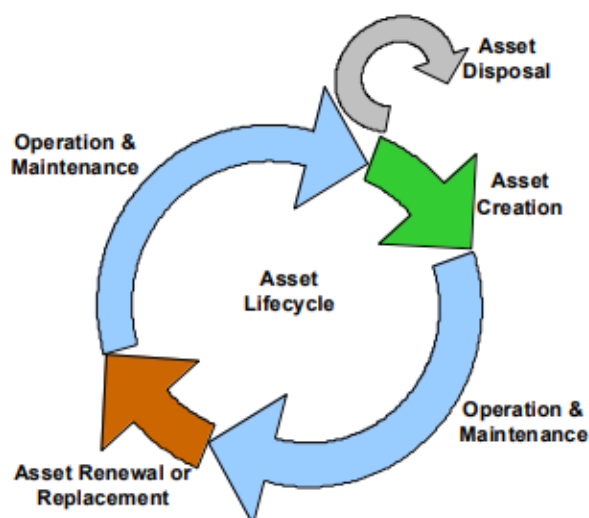
The management of an assets lifecycle can be divided into three distinct areas: Governance, Design and Operations.

An asset's life cycle begins with its installation, proceeds to maintenance and upkeep, and ends in removal from service when the asset is at a high risk of failure and or further maintenance is not applicable.

Each asset goes through the following stages during its lifecycle:

1. Asset Creation or Acquisition Assets are created or acquired in response to either new development, to increase capacity or to improve performance.
2. Operation and Maintenance by carrying out minor works on a cyclical basis to maintain the asset in a serviceable condition.
3. Renewal or Replacement carrying out to return the asset to its "as new" capacity and condition. Upgrading Improve the asset above its original standard.
4. Asset Disposal involves decommissioning, demolishing or selling old, obsolete or surplus assets.

The diagram overleaf shows the lifecycle of an asset:



Worcestershire County Council monitors the performance of all its major assets and uses this condition information as the basis for lifecycle modelling.

6. Asset Inventory and Valuation

Worcestershire County Council uses the Structures Toolkit from the Chartered Institute of Public Finance and Accounting (CIPFA) for determining the Gross Replacement Cost and Depreciated Replacement Costs of its assets. An example of an annual summary return of its asset inventory using the HAMFIG Valuation Toolkit, is shown below:

DESCRIPTION	Length /km	Area /sq.m	DATABASE	GIS Layer
Central Islands (CI)	11.41	58,893	EXOR	Y
Central Reservation (CR)	87.81	364,991	EXOR	Y
Cycle Track (CT)	18.07	30,016	EXOR	Y
Carriageway (CW)	4092.74	23,410,664	EXOR	Y
Footway FW (roadside)	2977.72	5,241,147	EXOR	Y
Footway FW (segregated)	351.85	701,901	EXOR	Y
Lay-by (LB)	22.85	90,538	EXOR	Y
Verges (VG)	5,798.69	9,424,462	EXOR	Y
DESCRIPTION	Length /km		DATABASE	GIS Layer
Fences & Barriers (FB)	95.09		EXOR	Y
Kerb (KB)	4238.76		EXOR	Y
Safety Fence (SF)	111.82		EXOR	Y
DESCRIPTION	No.		DATABASE	GIS Layer
Culverts < 900mm diam (CU)	1,514		EXOR	Y
Roadsigns (SG)	58,725		EXOR	Y
Vehicular Access (VA)	144,875		EXOR	Y
Gully	100,883		DRAINMAN	Y
Bridges	907		AMX	Y
Retaining Walls	137		AMX	Y
Culverts > 900mm diam	374		AMX	Y
Sign/Signal Gantries	13		AMX	Y
Streetlighting units	55,000		MAYRISE	Y
Illuminated signs	4,710		MAYRISE	Y
Zebra Crossing beacons	190		MAYRISE	Y
Traffic Signals	111			Y
Toucan/Puffin crossings	179			Y
Information signs/systems	125			Y

6.1 Asset Valuation

The table below summaries the valuation of each asset group belonging to Worcestershire County Council as of published data in 2018/19:

ASSET GROUP	£000's	£000's	£000's	£000's
	Gross Replacement Cost	Depreciated Replacement Cost	Annual Depreciation	Accumulated Depreciation
Carriageways	4,378,268	4,300,811	9,229	77,457
Footways & Cycleways	453,091	425,728	2,201	27,363
Structures	662,648	417,462	12,072	245,186
Street Lighting	105,645	37,857	2,407	67,787
Traffic Management	22,544	5,912	1,547	16,632
Street Furniture	18,399	9,837	581	8,562
Total	5,640,595	5,197,607	28,037	442,987

7. Summary of Carriageway Lifecycle Plan

Carriageways, one of the key assets, are the most valuable public asset in Worcestershire having a Gross Replacement Cost of nearly £4.06bn. Capital (or renewals) funding for carriageways comes from capital settlements from the Department for Transport (grant formula and competitive element) and revenue funding from Worcestershire County Council recognising the importance of the highway asset to its stakeholders.

The existing process takes the budget allocation provided and prioritises based on a set of criteria, including condition and deliverability. Historically the level of funding was insufficient for the true need of the highway network and therefore carriageway condition was deteriorating across the network. Over the last several years, WCC have invested additional funds to provide for improving the condition of the network with further additional investment over the next three years (subject to Council approval in February 2018) to strive Upper Quartile performance in all road categories.

7.1 Carriageway Lengths in Worcestershire

An extensive inventory of highway asset information was collected in the early 1990's and is annually updated to include new road adoptions, road improvements and periodic re-referencing of assets. All asset information is held in the County Council's UKPMS database alongside current and historical highway condition data. All data is network referenced to a standard RMMS link node network made up of some 11,600 sections.

In Worcestershire there is 4,112 Km of carriageway maintained by the County Council:

Carriageway type	Carriageway lengths (KM)
A	576
B	391
C	1066
Unclassified	2079
Total	4112

7.2 Highway (Carriageway) Codes of Practice and Guidance

The carriageway lifecycle plan recognises that the authority has the duty of maintenance for highways maintainable at public expense as contained in the Highways Act 1980 Section 41 and the recommendations contained within various codes of practice, procedures and standards which include:

- UKRLG Well Managed Highways Infrastructure
- HMEP UKRLG Highway Infrastructure Asset Management Guidance
- Manual for Streets
- Design Manual for Roads and Bridges (Volume 7)
- HMEP Pothole Review
- The HMEP Lifecycle Planning Toolkit (used in conjunction with our own Financial Impact Modelling Tool).

The Worcestershire County road network consists of carriageways with a wide range of traffic loadings and varying standards of construction that range from High Speed Principal road dual carriageways designed and built to Highway link design standards to predominantly evolved carriageways with minimal construction.

Maintenance of the road network is based on traffic usage taking into account the Carriageway hierarchies as per the Code of Practice for Highway Maintenance; “Well Managed Highway Infrastructure”. The hierarchies adopted by the County Council, which are aligned to those set out in the Code, are tabulated below:-

Code of Practice Hierarchy

- 2 = Strategic Route (SR)
- 3a = Main Distributor (MD)
- 3b = Secondary Distributor (SD)
- 4a = Local Distributor (LD)
- 4b = Access Road (AR)
- 9 = Keep Safe (KS)
- 9 = Pedestrianised Zone (PZ)

7.3 Lifecycle Options

Creation/Acquisition

- County Council schemes to create new roads are funded via the LTP process and consist of bypasses and relief roads. Other improvement schemes such as traffic engineering schemes are mainly related to safety to enhance existing assets.
- Developer funded schemes can and do provide new carriageway particularly in the form of new housing and industrial estate roads through Section 38,106 or 278 Agreements.
- Regeneration schemes are another source which can increase the size of this asset. These schemes tend to be funded from a variety of sources, including LTP funding.

Upgrading

Specific proposals may arise from time to time which will effectively upgrade a section of highway. The number of such schemes is small.

Renewal/Replacement

There are a large number of Structural Maintenance schemes carried out every year in order to maintain the carriageway in good order by prolonging the life of the surface and structure of the highway. These are discussed further in treatment options.

Disposal

A small element of highway is usually disposed of each year through stopping up or closure orders. These events are related to schemes promoted by the others or ourselves but are generally small in area and have no material impact on the size and extent of the asset.

7.4 Condition Surveys

The condition of the carriageway asset is measured through annual surveys as follows:

Safety Inspection	All carriageways
SCANNER	All A and B class roads and 50% of C class roads (one direction only)
SCRIM	All A class and Strategic or Main Distributor B class roads.
CVI Surveys	All A, B and C class carriageways, in addition to 50% of the Unclassified roads.

7.5 Lifecycle Modelling

This section describes the lifecycle modelling approach currently used by Worcestershire County Council.

The objectives of lifecycle planning are stated by the UK Roads Liaison Group in the Highway Infrastructure Asset Management Guidance as:

- Identify long term investment for highway infrastructure assets and develop an appropriate maintenance strategy.
- Support decision making, the case for investing in maintenance activities and demonstrate the impact of different funding scenarios.
- Predict future performance of highway infrastructure assets for different levels of investment and different maintenance strategies.

To address these objectives, we have established a lifecycle planning process aligned to the recommendations of the guidance and have developed a Financial Impact Modelling Tool (FIMT) for carriageways (we are in the process of developing this model for footways). The FIMT enables the future condition of any class of road to be predicted given a particular level of funding and helps the council to understand and manage risk in terms of asset deterioration in relation to required funding. FIMT is also extremely valuable to aid investment decisions when discussing future funding requirements via our Corporate Planning process with Senior County Councillors and Senior WCC officers, as it helps to clarify the risks involved around funding levels and methods of management and repair from an asset management perspective. Using FIMT, we can also predict the effect of funding strategy and budget decisions on each section of the highway rather than just at a network level. This allows us to calculate the whole cost of those decisions and other options using a mechanised approach that is extremely efficient. The benefits of using FIMT enable us to:

- Adopt carriageway asset lifecycle model, calibrated to local condition and priorities.
- Examine the effect of different maintenance, performance and investment scenarios.
- Outline scenarios aligned to the recommendations of the Highway Infrastructure Asset Management Guidance have been developed.
- Determine the level of investment required to achieve the required performance.
- Determine the performance that will be achieved for available funding and/or future investment.
- Minimising costs over the lifecycle while maintaining the required performance.

The diagram overleaf summarises the decision making and governance process:



Highways Performance Management Framework *(updated May 2020)*

Worcestershire CC Corporate Plan: key themes:

- Championing 'Open For Business'
- Supporting Children and Families
- Protecting The Environment
- Promoting Health and Well-Being



Local Transport Plan v4 (LTP4)



E&I Directorate Business Plan
 Transport Asset Management Plan (TAMP)
 Highways Asset Management Policy & Strategy



lighting assets
 carriageways
 footways
 Public Rights of Way
 waymarked trails and circular walks
 drainage gullies
 bridges/structures



4 x WCC Highways Balanced Score Card KPIs for highways



Strive to be in the upper Quartile of condition of A, B, C & U Roads.

Footways requiring treatment Reduced to 25% by 2020



Highways Asset Management Lifecycle Plan



Asset Condition surveys and financial modelling for treatments & Annual Programme of Works



Highways Maintenance Service Contract Key Performance Indicators (KPIs) x 12



Weekly Contract Management Team review meetings
 Weekly Area Response Team (ART) defect meetings
 Monthly asset meetings
 Forward programme of works



Sharing Best Practice and Collaboration

Members of MHA Plus and HMEP to share best practice and collaborate with external parties such as Highways England, Environment Agency and with District/Borough and Parish/Town Councils for joined-up service delivery

Governance Mechanism

LTP is reviewed regularly.

TAMP – regularly reviewed and updated.

Corporate Strategy Planning process

Business Plan - Annual review by Directorate Leadership Team (linking to the Corporate Plan and providing for the broader framework.)

Quarterly Cabinet Member with Responsibility (CMR) and Directorate review meetings

Strategic Quarterly Review (SQR) mechanism in place.

Performance Management Framework Group – quarterly meetings.

Weekly Contract Management Team (CMT) meetings by senior managers to review Targets & Contractors Plan

Regular Member Led Scrutiny Panels and Process and meetings with Cabinet Member with responsibility for highways

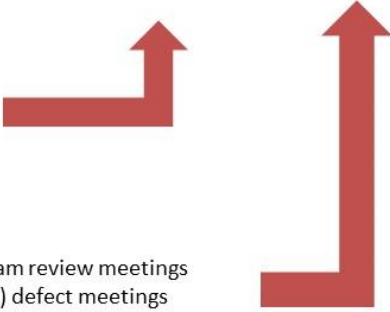
PEMs (Public Enquiries) monitored

Annual NHT Public Satisfaction survey

Divisional Member and CMR Member feedback

Capital funded works

Revenue funded works for defects



7.6 Lifecycle Treatment Options

By using UKPMS surveys together with, UKPMS Rules & Parameters and in conjunction with our Financial Impact Modelling Tool (FIMT), Worcestershire County Council identify required treatment lengths.

Planned maintenance is delivered through annual programmes of works which are capital funded and historically, schemes are determined by spatial analysis of inputs from all the various surveys and data sources refined and confirmed by a scoring process based upon engineering judgement. The management of potholes and other carriageway safety issues and defects across the network are delivered using highway maintenance revenue funding from WCC.

By employing an asset management based approach through optimum levels of service and investment, for the same level of funding it is expected to result in an improved carriageway condition, better coordination of road maintenance and improvement activity. WCC is likely to maintain the asset value achieved from its highway service, improve its network resilience and reduce the burden on revenue budgets.

Carriageway Lifecycle planning supports this approach by:

- using preventative treatments at the optimum times to reduce whole life costs
- resurfacing the carriageway at the optimum time to reduce whole life costs
- using the correct materials for carriageway and footway
- providing appropriate Skid Resistance to the carriageway,
- delivering carriageway maintenance sustainably, economically and effectively.

Our partnership with Ringway enables us to identify whole lifecycle costed programmes of work, prioritised using our locally developed asset value management prioritisation criteria that takes into account not only the condition of each length of highway but also managed risk and the benefit to stakeholders using the highway. Our treatment approach can be categorised as follows:

Short term - reactive

The short term and reactive activities are the inspection and routine maintenance carried out by the Council in order to make the highway safe for users by repairing safety defects such as:

- Pothole repair ('permanent' patch where possible)
- kerb / iron work replacement
- Mini and midi Patching

Medium Term

These are carried out to a programme based on the results of condition surveys and inspections. The expected life of one of these treatments would be 10 -15 years.

- Annual surface dressing programme
- Surface course resurfacing
- Haunching and edge of carriageway repair
- Kerbing (over-run)

Long Term

These are carried out to a programme based on the results of condition surveys and inspections. They are aimed at providing a long life for the asset.

The expected life of one of these treatments would be 20 - 40 years.

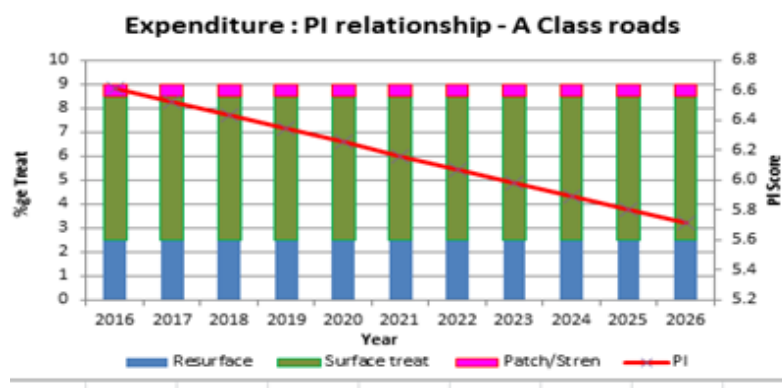
- Structural maintenance (binder Course and Base replacement)
- Reconstruction

7.7 Targets

By adopting lifecycle management principles and the use of our FIMT to predict the effect of the funding strategy and budget decisions on each section of the highway rather than just at a network level, Worcestershire County Council is able to set performance targets for maintaining and improving its carriageways with the investment provided.

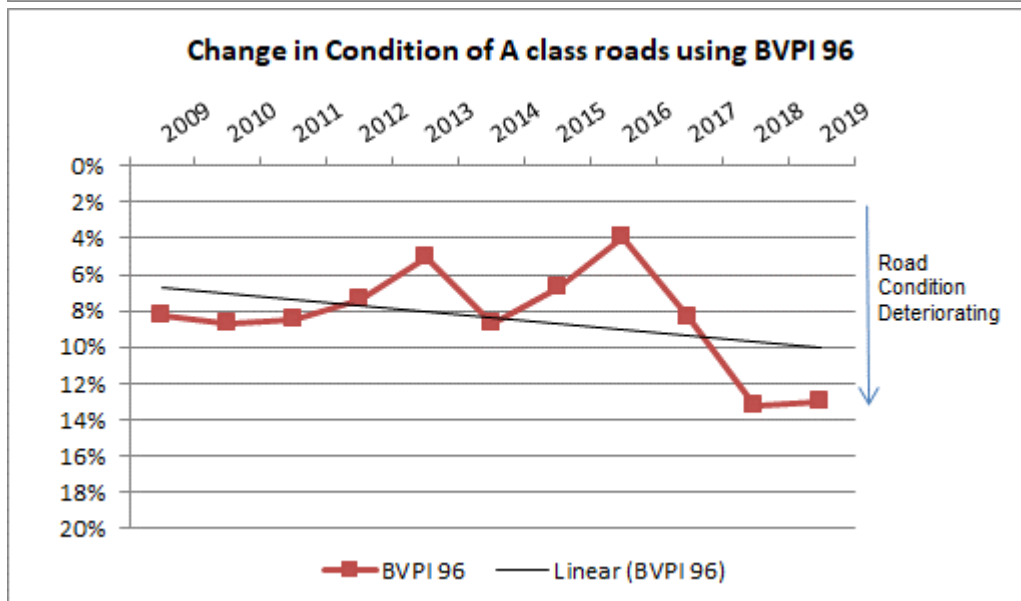
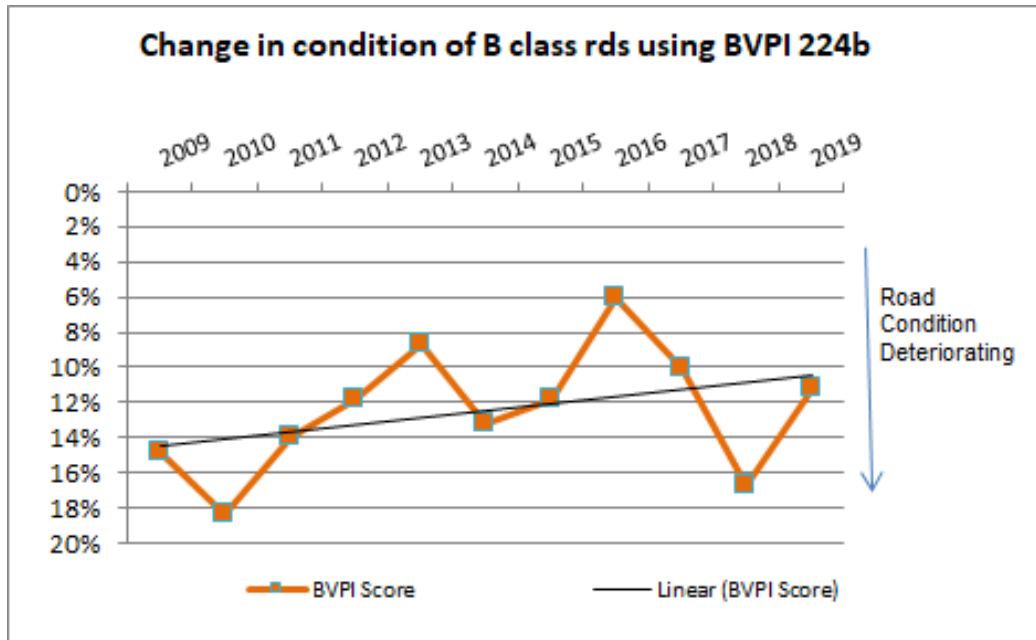
Performance of day to day maintenance is reviewed weekly with Ringway as part of the Performance Management Framework in the Contractor's Plan.

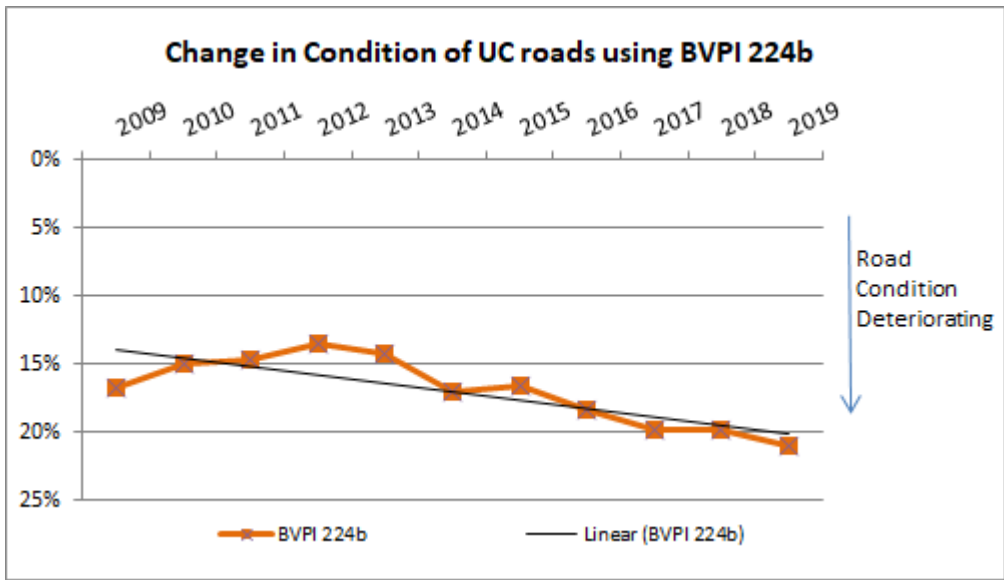
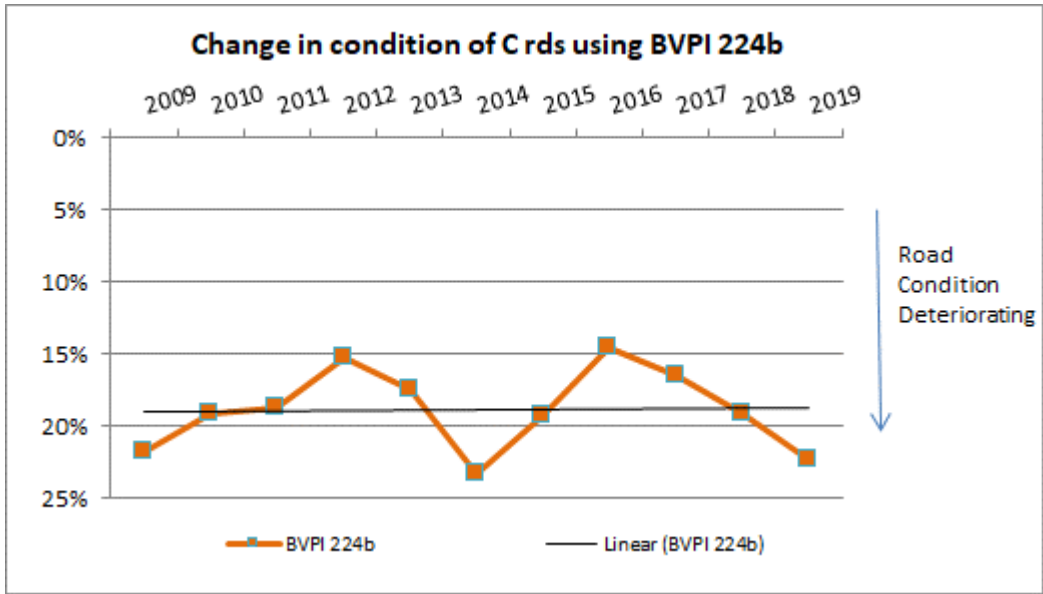
The County Council's Leadership have stated their desire that we will strive to be in the Upper Quartile of condition of A, B, C and U roads in Worcestershire measured with the national average of road condition. Using extensive historical data in combination with the FIMT, Worcestershire County is best able to propose a medium term treatment strategy for each classification of road and the likely impact on the relevant PI based on CVI surveys. For example, for A roads, the graph below shows the impact on PI of the different treatment types forecasted over a ten year period (resurfacing, surface treatments or patching/strengthening):



7.8 Performance History

Using our asset management framework and the investments made with support from the Executive, Worcestershire County Council has not only maintained a steady state in highway condition but improved its condition over the ten year period from 2009 to 2019. The trend line analysis is shown in the graphs below (measured by CVI surveys):





7.9 Projection of Carriageway condition

Using the FIMT, the condition of all classifications of roads can be projected and modelled over a number of years in the future. For this reason, desired outcomes will be achieved through the continued development and implementation of the carriageway element of the asset management strategy, using lifecycle planning and scenario investment testing using our FIMT tool. Worcestershire County Council will use this approach combined with effective performance management in line with our Highway Asset Management Framework, and following best practice through collaboration and consultation with our stakeholders to maximise funding opportunities to continue to improve its condition.

The diagram below shows projection of road condition to 2023:

Year	A Roads - 572km			B Roads - 392km			C Roads - 1066km			UC Roads - 2070km		
	PI	%ge Treat	Exp/£	PI	%ge Treat	Exp/£	PI	%ge Treat	Exp/£	PI	%ge Treat	Exp/£
2005	7.2	4.2	2,612,341	12.9	3.9	854,404	24.5	4.1	1,700,089	20.7	1.8	2,618,496
2006	7.2	5.9	3,343,594	16.0	3.0	1,155,578	28.0	3.0	2,043,742	22.3	2.3	2,267,015
2007	6.7	6.0	2,894,689	15.1	3.7	1,185,860	24.9	5.4	2,365,353	21.4	4.0	4,943,818
2008	8.0	6.6	3,502,022	13.8	3.2	1,183,705	18.7	6.8	3,021,086	17.3	9.7	15,501,927
2009	8.4	5.1	4,269,557	14.9	6.3	2,568,851	21.8	3.5	3,024,723	16.7	3.8	3,316,176
2010	8.7	11.5	4,317,295	18.4	4.1	1,660,975	19.1	6.4	2,168,231	15.0	3.2	2,793,724
2011	8.5	14.9	3,552,000	13.9	20.8	2,852,000	18.8	6.8	3,109,000	14.7	3.8	5,930,000
2012	7.4	9.0	2,842,141	11.9	14.1	1,037,780	15.2	13.3	5,153,765	13.4	6.4	2,134,388
2013	5.1	12.3	3,494,408	8.7	6.8	1,089,274	17.4	6.9	2,906,321	14.2	4.1	2,010,823
2014	8.7	10.3	2,901,316	13.2	5.9	1,932,861	23.3	7.4	3,570,952	17.0	2.6	2,631,112
2015	6.7	8.8	2,237,154	11.8	10.8	2,005,034	19.3	9.1	3,435,573	16.9	2.3	2,103,267
2016	4.0	8.3	3,263,394	6.0	6.6	1,325,375	14.6	7.1	4,540,563	18.3	5.0	7,179,692
2017	8.4	7.1	2,391,279	10.1	7.5	2,077,181	16.5	11.1	3,766,417	19.8	5.7	5,142,452
2018	13.2	9.5	3,481,549	16.7	12.5	2,085,794	19.2	9.4	3,212,525	19.8	6.9	5,605,748
2019	13.0	7.1	4,212,565	11.2	4.2	757,442	22.3	9.0	4,399,294	21.0	5.7	4,348,886
2020	10.0	8.5	3,300,000	14.8	7.8	1,630,000	20.2	7.0	3,100,000	19.7	4.9	5,010,000
2021	10											0,000
2022	10											0,000
2023	10											0,000

Change in condition of all road classes

The chart displays the Performance Index (PI) scores for four road classes: A (red), B (blue), C (green), and U (purple) from 2005 to 2023. The Y-axis represents the PI Score, ranging from 0 at the top to 40 at the bottom, indicating that lower scores represent better road condition. The X-axis shows the years from 2005 to 2023. All four classes show a general downward trend in PI scores over the period, with a notable dip around 2013-2015. A blue arrow on the right side of the chart points downwards, labeled 'Road Condition Deteriorating'.

7.10 Carriageway lifecycle Overview

Current strategy; Strive for road condition to be in the Upper Quartile of condition of A, B, C and U roads in Worcestershire measured with the national average of road condition.

Routine Maintenance Strategy (Revenue); Routine maintenance on carriageways is predominately concentrated on safety defect repairs (potholes) and the prevention of, driven by the Highway Inspection Manual which sets out, based on national codes of practice, the frequency for routine inspections as well as intervention level criteria and repair time scales. Productivity improvements are continually gained through the partnership arrangement with Ringway to review weekly performance against targets. This

drives better use of technology for gang works. Pothole repairs are made using hot material with square cut and sealed edges to ensure longest possible life. In addition, revenue expenditure on verge maintenance (grass cutting and tree maintenance) and drainage maintenance (gully emptying, jetting and grip cutting) have a direct impact on the performance and condition of the carriageway network. These works are also reviewed weekly against targets.

Structural Maintenance Strategy (Capital); In order to optimise capital budgets and to get the highest value out of routine maintenance patching works, we implement annual surface dressing programmes throughout the county. As a precursor to surface dressing, patching works are carried out using safety defect data to address issues such as reported pothole. Preventative treatments are carried out to prevent potholes forming such as edge of carriageway repairs, mini and midi patching prior to surface dressing or surface treatments to seal and gain longer asset life. Reconstruction and resurfacing works are prioritised and clustered where appropriate, using a combination of road condition and defect data as well as engineer assessments and local stakeholder manager input to ensure best value and public satisfaction.

Routine Maintenance Process; Safety defects are recorded electronically by Highway Safety Inspectors during regular routine inspections of the network. Inspections are carried out in accordance with the county's Highways Inspection Manual v2. Identified safety defects are classified for repair based on their priority. Every repair is evidenced by photographs and are reviewed as a Quality Assurance process. Pothole repairs are made to a high quality standard with most (over 95%) being 'cut out' and repaired with hot material. Every effort is made to coordinate multiple pothole repairs with patching works so that a more permanent repair is made, first time. Preventative maintenance is also carried out with patching works. These are coordinated with structural maintenance repairs so that they can be subsequently surface dressed in following years in order to seal the road and gain the greatest life expectancy from the patching works.

Structural Maintenance Process; In order to get best value from structural maintenance funding, schemes are prioritised using a number of factors but including road condition data, defect data (number of pothole repairs), engineer site assessments as well as cost/benefit analysis using FIMT. A rolling 3 year forward programme of works is developed and consulted on with members each year to ensure local knowledge of customer and community need. Our annual programme of works is managed and implemented via the Contractors' Plan. This Plan provides for an integrated approach, bringing together all areas of work and delivery. This ensures that work programming, coordination and management is more effective and joined up to increase efficient use of resources across the board. We carefully review and consider all key customer enquiries, taking action to resolve any defects, where reasonably practicable and incorporate key customer and communication issues in the development and implementation of our works programmes. Our levels of

service delivery for highways take account of statutory duties and the management and mitigation of risk both to the service user and the authority.

The County follows the asset management principles of intervening at the right time in the life cycle of the carriageway with preventative treatments; this can significantly extend the total life of the asset. As many roads, particularly unclassified roads, are beyond the threshold for preventative maintenance, a significant percentage of the programme remains dedicated to more costly resurfacing and reconstruction treatments.

8. Summary Footway Lifecycle Plan

In this summary, footways are taken to exclude public rights of way, except metalled ones in urban areas, and also to exclude cycleways and joint footway/cycleways.

Footways contribute to our Corporate Plan priorities and are key assets used for utility and recreational purposes supporting local pedestrians with access and mobility as well as being a healthy alternative to car travel. Securing continuous improvement in the safety and serviceability of footways is necessary to support short journeys. Well maintained footways aid social inclusion, particularly improving accessibility for vulnerable people.

8.1 Footway hierarchy and lengths in Worcestershire

The length of the Worcestershire footway network amounts to some 3,357 km. A full inventory of widths and surface types has been collected for all carriageway adjacent footways, with inventory coverage on approximately two thirds of the segregated footway network. The footways non adjacent to the carriageway are primarily made up of either alleyways or paths threading through housing estates. The breakdown of the footway network by hierarchy, length, area and surface type is shown below:

Hierarchy	Description	Roadside length (KM)	Divorced/Segregated length (km)	Total length KM
1	Main Shopping Area	57.46	1.97	59.43
2	Busy Urban	63.93	1.82	65.75
3	Less Used / Quiet Urban	2430.97	365.84	2796.81
4	Busy Rural	20.39	0.11	20.50
	total	2986.73	370.77	3357.50

8.2 Condition surveys

The following footway surveys are carried out each year:

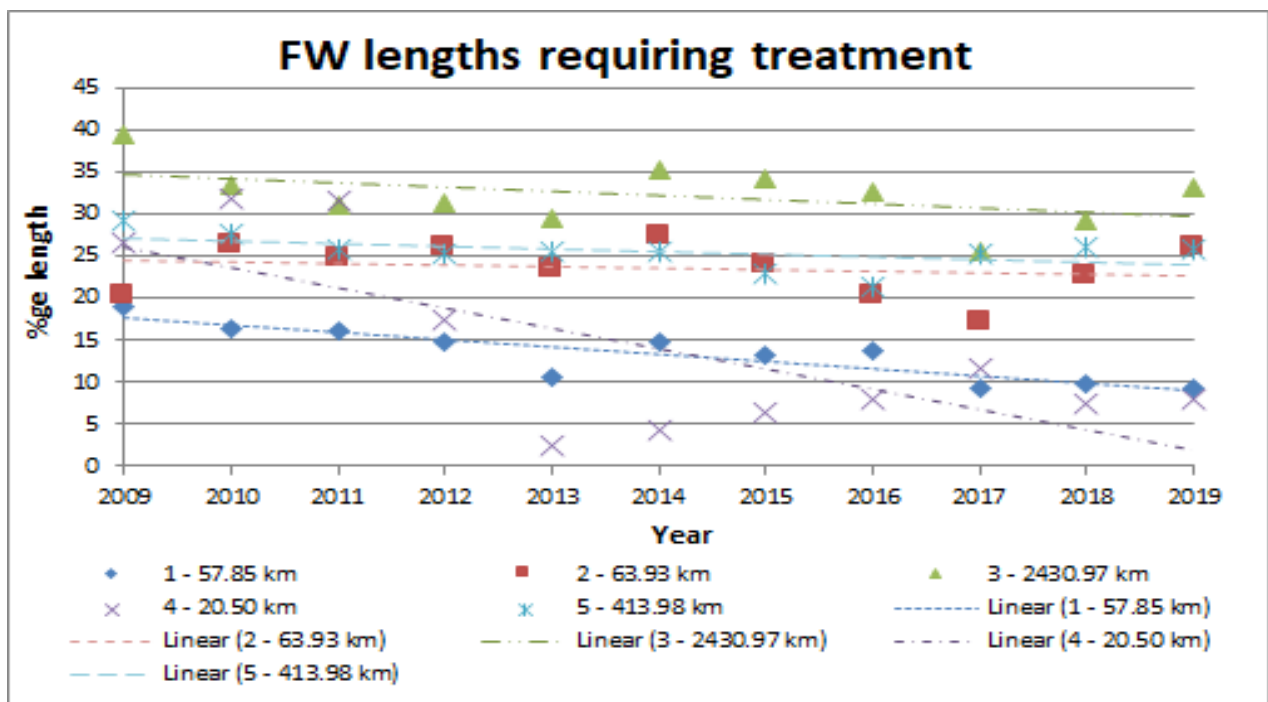
Safety Inspection All footways (adjacent and segregated from the carriageway)

CVI Surveys All footways adjacent to A, B and C class carriageways in addition to 50% of the Unclassified road footways.

All footway safety patrols are routinely carried out on foot by divisional highways staff. For CVI surveys, where the footway is obscured from the road by parked vehicles in built up areas, it is necessary to carry out the survey on foot. All data collected is loaded into UKPMS then processed to produce Condition Indices and indicative treatments with associated costs.

8.3 Lifecycle Modelling

The linear trend analysis shows steady improvement for all footway hierarchies, with footway lengths requiring treatment in decline year-on-year up to 2019:



Funding is therefore prioritised and allocated based upon:

- Information and modelling scenarios provided by the Asset Management Team. This identifies the lengths of footways requiring consideration for treatment in all categories of footway.
- Identified footways defects and clusters of defects (termed as Advisories).
- Third Party Claims information in relation to footways.
- An onsite engineering assessment of each footway identified from the above information.

8.4 Lifecycle treatment options

Reactive repairs are carried out as a priority to all reported and identified safety defects. Our existing intervention levels are deemed appropriate in accordance with national guidelines. Deviating from the national guidance could incur potential risks and liability.

Intervention levels for reactive maintenance are outlined in our Highways Inspection Manual which is based on guidance defined by the Code of Practice "Well Managed Highway Infrastructure".

The Highways Inspection Manual that we adhere to, sets out the investigatory and intervention levels for footway defects such as trips and potholes. These take into consideration the risk assessment to determine the defect category and response time. The intervention level (when a repair should be considered, subject to the risk level defined) for all footway defects is 20mm.

As indicated by the data sets below, accident information is taken into account when identifying and prioritising works:

1. UKPMS Automatic pass results of latest CVI surveys. (Footways with Overall CI>20)
2. Safety Inspection defects recorded over last 3 years. (Recorded by way of Routine Safety Patrols and service requests logged by the County's Transportation Control Centre.)
3. Locations of Third Party Claims on Footways influence safety critical defects to be addressed as a priority.

8.5 Methods of treatment/repair of footways

- Whilst there is some scope for preventative maintenance within the Footway asset for which two main processes shown below are used. Overlay – where a thin surface of tarmac is applied to the footway (mainly for use on divorced footways). This can provide for a significant extension to the life cycle of the footway treated.
- Micro-ashphalt thin film surfacing – where a thin layer of micro-ashphalt can be applied to an existing footway surface (whose condition, whilst sound structurally, requires surface re-sealing to extend the life of the footway). This method of treatment, can extend the life of the treated footway for 10 to 12 years.

However, much of the network is beyond this form of maintenance and for these we employ:

- Full depth reconstruction – where the footway requires major repair due to its poor condition.
- Shallow depth resurfacing – where a footway requires repair, but this can be achieved by the planing out of a shallower depth of tarmac and resurfaced.

8.5.1 Rural footways and their treatment

There are lengths of rural footways in the County which due to their limited use by the public, over time have become more narrow and overgrown by side encroaching grass and vegetation. We combat this by using a machine called the 'Mulithog' for siding out operations in order to reinstate the full width footway.

8.6 Target

The aim of the County Council is to achieve a level of service whereby the percentage length of the overall footway network requiring treatment falls below a figure of 20%.

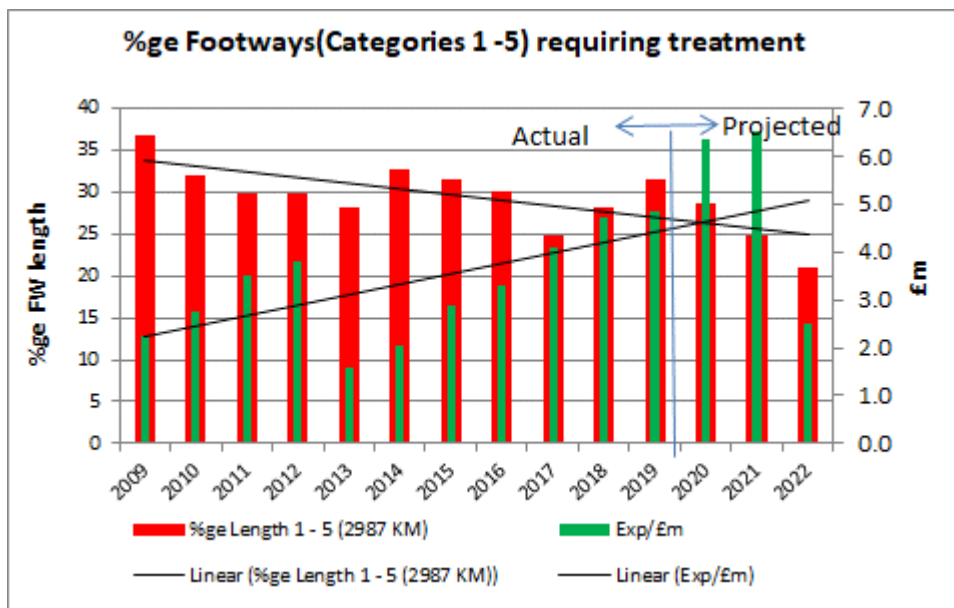
In addition, all sections of the network are to be maintained to the safety standards set out in the Highways Maintenance Plan.

8.7 Desired Outcomes

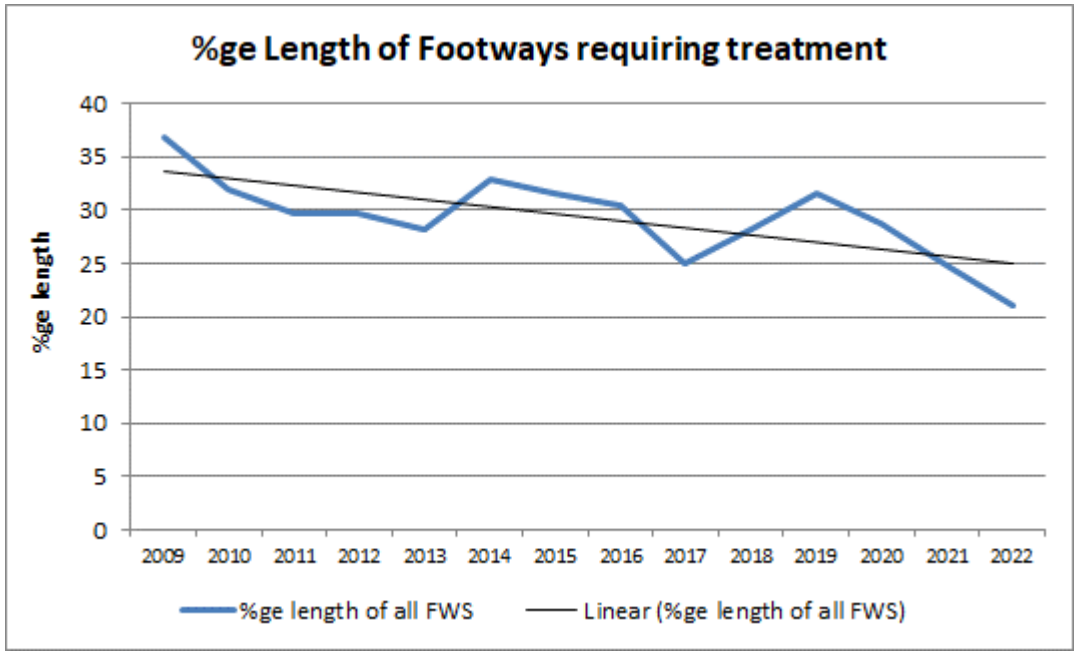
Desired outcomes will be achieved through the continued development and implementation of the asset management strategy in line with our Highway Asset Management Framework. WCC is developing the FIMT for footways as per its use for carriageways.

8.8 Projections of footway condition

It is possible to quantify the relationship between overall footway spend and overall footway network condition as demonstrated in the graph overleaf. The red bars indicate the percentage length of all footways requiring maintenance (referenced to the primary Y axis). The green lines (referenced to the secondary Y axis) indicate the annual footway expenditure both actual and projected to 2022:



The stated aim of the County Council is to achieve a level of service whereby the percentage length of the overall footway network requiring treatment falls below a figure of 20%. Worcestershire County is therefore able to demonstrate the level of expenditure required to achieve this by 2022 and the impact on condition:



8.9 Footway lifecycle plan overview

Current strategy: The aim of the County Council is to achieve a level of service whereby the percentage length of the overall footway network requiring treatment falls below a figure of 20%.

Performance History	Future Projection
<p>%ge Footways(Categories 1 -5) requiring treatment</p> <p>Actual ← → Projected</p> <p>Y-axis: %ge FW length (0-40), £m (0.0-7.0)</p> <p>Legend: %ge Length 1 - 5 (2987 KM), Exp/£m, Linear (%ge Length 1 - 5 (2987 KM)), Linear (Exp/£m)</p>	<p>%ge Length of Footways requiring treatment</p> <p>Y-axis: %ge length (0-40)</p> <p>X-axis: 2009-2022</p> <p>Legend: %ge length of all FWS, Linear (%ge length of all FWS)</p>
<p>Routine Maintenance Strategy (revenue)</p> <p>Routine maintenance on footways, much like carriageways, is predominately concentrated on safety defect repairs (potholes and trip hazards) driven by the Highway Inspection Manual which sets out, based on national codes of practice, the frequency for routine inspections as well as intervention level criteria and repair time scales.</p>	<p>Structural Maintenance Strategy (capital)</p> <p>In addition to our annual capital programme, the County Council has and continues to make additional investments to improve the condition of its footways. These additional investment programmes involve the close liaison with our Divisional Members to ensure footways are prioritised in line with community need. All additional investment programmes use a combination of treatment methods in line with lifecycle options.</p>
<p>Routine Maintenance Process</p> <p>Defects are identified via regular safety inspections, they are categorised and responded to reactively in line with the Highway Maintenance Plan. Response times are based on the risk presented by the defect. Apart from the highest risk defects that are responded to within 24hrs. All Cat 1, 2A & 2B defects have permanent fixes carried out.</p> <p>The process for the identification and repair of footway defects is the same as for carriageway defects with the criteria for defects and repair timescales being set by the Highway Inspection Manual.</p>	<p>Structural Maintenance Process</p> <p>Programmes of work and future condition predictions will be developed using FIMT to better inform decisions about the future condition in relation to funding scenarios.</p> <p>Schemes of maintenance work are prioritised, following consultation, using multi-criteria analysis that takes account of safety issues, making best use of treatment options, clustering works where possible and achieving lowest whole life cost. Forecast condition and funding requirements are based upon historic recorded deterioration rates, current costs as well as assumed current rates of inflation.</p>

9. Summary Structures Lifecycle Plan

Worcestershire County Council actively manages its structural assets broadly following principles set out in Well Managed Highway Infrastructure; A Code of Practice published by UK Roads Liaison Group in 2016.

There are approximately 2,000 bridges and culverts, and retaining walls forming part of the highway network, of which approximately 500 are owned by third parties. The total Gross Replacement Cost is estimated to be £625m. This is calculated using the Structures Toolkit from the Chartered Institute of Public Finance and Accounting (CIPFA) for determining the Gross Replacement Cost and Depreciated Replacement Costs using the HAMFIG Valuation Toolkit. Routine maintenance of structures is based on a prioritised system of required work with the aim of minimising the risk to public safety and reduce future maintenance costs.

The condition of the structures asset is measured primarily by two factors, BSSCI (Bridge Structural Stock Condition Indicator) and BSCI (Bridge Structure Condition Indicator) and these are derived from bridge inspections. In accordance with the nationally recognised indicators published by ADEPT Worcestershire's BSSCI is within the range denoted as 'good'; the stock having a BSSCI average of 83.2%. This information is stored within a bespoke database (AMX) and can be used to assist in determining lifecycle planning strategies. The maintenance needs are determined by using the AMX database using the condition score and engineering judgement.

All structures are maintained in an appropriate condition. If safety critical components are identified as being deficient after inspections, immediate steps are taken to make them safe. At present, one substandard structure is monitored to determine its structural performance. A further five bridges currently have a structural weight limit on them.

9.1 Approach

The approach is to undertake inspections on all structures, in accordance with the Code of Practice, so that the respective structures components are checked for deterioration. From these a forward works programme can be developed to meet the asset management policy. A risk based approach is being used to determine the PI programme.

9.2 Desired Outcomes

The principal factor for determining the forward strategy is to maintain the asset in an appropriate risk managed condition with safety critical defects actioned. Additional targets include:

- Completion of the annual programme of routine inspections and timely actioning of maintenance works prioritised according to risk and available budget
- Continuing an ongoing programme of Structural Reviews in accordance with BD101/11

- Continuing a work bank of structural assessments in accordance with BD21/01
- Continuing progress on a work bank of capital investment into structures

9.3 Structures lifecycle plan overview

Current strategy: To maintain structures in an appropriate risk managed condition with safety critical defects actioned.

Inventory;

- 907 bridges
- 137 retaining walls
- 374 culverts >900 mm
- 1,514 culverts < 900mm

Performance requirements; The condition of the structures asset is measured primarily by two factors, BSSCI (Bridge Structural Stock Condition Indicator) and BSCI (Bridge Structure Condition Indicator) and these are derived from bridge inspections. In accordance with the nationally recognised indicators published by ADEPT Worcestershire's BSSCI is within the range denoted as 'good'; the stock having a BSSCI average of 83.2%. This information is stored within a bespoke database (AMX) and can be used to assist in determining lifecycle planning strategies.

Routine Maintenance Strategy (revenue); This includes routine maintenance such as vegetation clearance, debris and silt blockages to prevent flooding, graffiti removal, and also reactive and planned maintenance to structures, such as parapet repairs or scour protection.

Small amounts of repointing of masonry or repainting of parapets will also be done from this budget.

Structural Maintenance Strategy (capital); The work bank consists of strengthening, major maintenance, replacement of life limited elements, structure replacements and extensions.

Work is prioritised on engineering judgement based on risk to users, likely rate of deterioration, long term effect on other structural elements and network impact. The amount of work which can be undertaken is limited by budget available. Generally bridges are designed to last 120 years but Worcestershire County Council maintains a significant number of historic structures which exceed this age.

Worcestershire also has a history of flooding and contains three major rivers; River Severn, River Avon, River Teme. The bridges spanning these rivers are critical to the county's

highway network and are focused upon after flood events and if inspections find flood related damage.

Structural reviews are targeted based on a priority system of consequence and importance to the network to identify the most appropriate management strategy for them.

Routine Maintenance Process; Revenue works are generally planned cyclical works; i.e. yearly clearance of vegetation to facilitate the following year's inspection programme, removal of silt and/or debris causing disruption to water flows and the removal of graffiti; although this is also done on an as needed basis.

Reactive works generated by the County's Public Enquiry Management system are also generally carried out under routine maintenance. This is where members of the public report any issues with structures which are then inspected to establish if there is a risk to public safety.

Structural Maintenance Process; Capital works are identified as a result of routine inspections, Special Inspections and Structural Reviews. If any of these inputs identify the requirement for a capital expenditure on the structure then a scheme is added to the Capital Budget work bank and programmed based on priority and budget availability.

Revenue Investment; Due to the limitations of the Bridge Maintenance budget, the inspections are prioritised by span, age (including heritage structures) and material type (early reinforced concrete and cast iron). There are likely to be further financial pressures in the future, reducing the availability of funding for the maintenance of the structures stock. The key structures driver is to ensure that the time for intervention of planned maintenance to a structure is determined to deliver the optimum return for that investment. This will be managed by use of the Structures Toolkit and AMX, to determine forward network wide investment need, monitoring the BSSCIs and applying professional engineering judgement.

Capital Investment; The total Gross Replacement Cost value of structures is estimated to be £625.6m. The County have followed the DfT recommendation that Local Authorities should invest 14% of the annual maintenance allocation. In addition to this the County Council are prepared to invest further sums following extraordinary events. An example of this was £2m being invested in 2016 to replace the Eastham bridge in Tenbury Wells after the Grade 2 listed structure collapsed.

10. Summary Drainage Lifecycle Plan

There are 100,883 gullies in Worcestershire, the main function of which is to drain the highway to outfalls or watercourses, thereby reducing the amount of standing water on the

carriageway and allowing vehicles to pass safely. Additionally, effective maintenance of gullies and other highway drainage assets is essential as non-functioning or inadequate drainage has the potential to speed up the deterioration process of the road and footway construction, through water ingress.

10.1 Approach

Worcestershire County Council manages its highway drainage asset through:

- Routine and cyclic revenue-funded maintenance of gullies.
- Targeted revenue-funded maintenance of high priority gullies ahead of severe weather events.
- Responsive revenue-funded maintenance of gullies and other drainage assets during and after weather events.
- An ongoing revenue-funded programme of broken gully repairs.
- An ongoing revenue-funded programme of relatively small scale drainage asset maintenance and improvement schemes.
- An ongoing capital-funded programme of larger scale drainage asset improvement schemes.

10.2 Desired Outcomes

To effectively manage the drainage assets through a combination of reactive, routine and cyclic drainage asset maintenance and a prioritised drainage asset improvement programme in order to reduce the impact of water on the highway network, highway users and receptors downstream of the highway.

The following service outcomes are in place for Ringway to:

- **Provide the Cyclic Drainage Service**, covering the inventory of gullies across the county.
- **Gullies are maintained effectively** to minimise flooding across hard highway surfaces and provide an effective highways drainage system.
- **Provide for improved road user perception** – reduced reported complaints.
- **Maximise opportunities** to deliver multiple service objectives – optimising works where practicable.

10.3 Drainage lifecycle plan overview

Current strategy:

To effectively manage the drainage assets through a combination of reactive, routine and cyclic drainage asset maintenance and a prioritised drainage asset improvement programme in order to reduce the impact of water on the highway network, highway users and receptors downstream of the highway.

Inventory; WCC uses telematics to record the status of the county's gullies and drainage assets. This data is stored and made available within the County's Geographic Information System (GIS).

The drainage network comprises:

- Gullies = 100,883
- Culverts <900mm diam = 1,514
- Culverts >900mm diam = 374

Performance Requirements; The highway drainage network is maintained by Ringway to the safety standards set out in the 'Highways Maintenance Plan' and service delivery outcomes defined in the Highway Maintenance Service Contract. The following key objectives are considered:

- the rapid removal of surface water from the carriageway to provide a safe highway and minimise nuisance;
- the provision of effective sub-surface drainage to maximise longevity of the highway and its underlying layers;
- the minimisation of the impact of the runoff on the receiving environment; and flood risk assets to fill their intended function of reducing the risk of flooding.

Routine Maintenance Strategy (revenue); Maintenance of the highway drainage asset is carried out by a combination of a:

- Routine and cyclic approach
- Reactive response and
- Targeted and prioritised pro-active risk-based approach

WCC is also using a new innovation called SmartWater that uses sensors to capture real time weather data and other data sources to help predict flooding and to manage the asset on a day to day basis.

Structural Maintenance Strategy (capital); Highway drainage and flooding issues which look likely to require larger scale works are dealt with in an ongoing capital-funded programme of schemes.

The schemes in this programme are prioritised according to a standard, criteria-based assessment of the scale of impact of the issue on:

- Safety
- Residential property
- Businesses
- Infrastructure (inc the highway itself)

Routine Maintenance Process; Highway drainage maintenance activities are centrally coordinated by a Highway Drainage Team to ensure that a targeted, efficient and productive outcome based service is provided. Works are implemented by Ringway.

Routine and cyclic maintenance activities are constantly adjusted based on an intelligent data collection technique (Telematics) which assesses the condition of the asset and its future likely required frequency of attention. For example, as part of the cyclical drainage we not only have our regular cleanse which is programmed from the data collected on Drainman, we also have monthly cleansings for locations that have a tendency to flood so they get cleaned every month.

Targeted proactive maintenance is guided by intelligence about high priority and / or particularly vulnerable assets.

Reactive maintenance is triggered by:

- Routine safety and condition inspections
- Reports from the public either directly or via elected members etc
- Inspections following flood events
- WCC responsibly manage gully waste, working with the Environment Agency; we have a process at Lye Depot for separating arisings (heavy materials) which would otherwise be a waste product from the water decanted from the gullies. The arisings are mixed with green waste to decompose as a single entity.

Structural Maintenance Process; The capital highway drainage programme comprises locations which flow through the revenue maintenance process and which are identified as potentially requiring a larger scale response.

Once identified they are investigated and programmed by a dedicated Highway Drainage Team and implemented by Ringway.

Revenue Investment; An additional £600k has been invested in revenue highway drainage maintenance in each of the last 5 years.

Capital investment; Over £1m has been invested in capital highway drainage schemes in each of the last 5 years. In addition, WCC has recently delivered a £4m programme of large highway flood adaptation schemes funded by the Local Enterprise Partnership in key locations around the County in order to keep roads open for longer during flooding events.

11. Summary Street Lighting & Illuminated Signs Lifecycle Plan

Street lighting is a key asset that is managed by a small 'in-house' team with maintenance works being carried out by Prysmian by way of a Term Maintenance Contract. The street lighting inventory is held electronically on a data management system called Mayrise and the Gross Replacement Cost for street lighting in the county is currently valued at £98 m.

Worcestershire County Council operates a routine maintenance service, for the recorded 55,000 street lighting units and 4,710 illuminated signs. On each maintenance visit, a visual

condition inspection is undertaken and uploaded into Mayrise. The columns are classified into risk categories 1, 2 to 5 as below:

- category 1 columns should be re-tested in 5 years' time,
- category 2 columns should be re-tested in 3 years' time,
- category 3 columns should be re-tested in 2 years' time,
- category 4 columns should be removed as soon as practicable
- category 5 column should be removed immediately.

11.1 Approach

In light of the fact that SOX lanterns have been phased out of production and other traditional light sources following suit, the County's strategy is being reviewed to include a roll out of LED lantern replacements. At the same time, replacing concrete columns with steel. In order to create a better picture of the concrete column asset, a survey of all concrete columns was commissioned which has been fed into the Asset Management Plan and replacement programme.

Worcestershire County Council has a single repair KPI where the service provider is expected to repair 99.5% of faults within 7 days. For non LED based installations, Worcestershire County Council operates a building life cycle cost (BLCC) programme based on the lamp manufacturer's recommendation.

For illuminated signs, formal condition surveys are not presently undertaken, as the risk of failure and consequent damage to public and property is deemed to be low considering sign face heights are generally lower than 2m. Visual inspections however, are undertaken during routine maintenance and at the renewal time, illuminated signs will be evaluated to determine whether there is still a need for them to be illuminated in line with national guidance and best practice, and if not the lantern and service are removed as part of any replacement work.

11.2 Desired Outcomes

We will review replacement concrete columns with steel and use LED lanterns as a matter of course. We will continue with the routine inspection and maintenance programmes to keep the street lighting assets in a serviceable condition and to maintain street lighting assets in accordance with best practice and safety. We will maintain the KPI target for repairing all non-urgent faults within 7 days of reporting.

11.3 Street lighting and Illuminated Signs lifecycle plan overview

Current strategy: To maintain the safety of the current street lighting stock, whilst investing in new energy reduction technologies and the further proliferation of part-night

lighting and dimming to reduce the county's carbon foot print and control energy expenditure.

Inventory: Gross Replacement Cost for street lighting in the county is currently valued at £98 m.

WCC has:

- 55,000 street lighting units
- 4,710 illuminated signs

Performance History: The use of LED lighting saves between 40% and 50% on energy usage and reduces maintenance costs as LED's last longer. Energy savings is also being driven through part-night lighting and dimming projects with over 90% of residential roads having 30% to 40% of lights turned off between midnight and 5:30am

Routine Maintenance Strategy: Street lighting faults are reported by members of the public both on-line and through the Transport & Highways Control Centre. In addition, all roads with vehicular access are inspected monthly with night inspections to identify faults. Efficiencies are being made on cyclical maintenance activities with reductions to the frequency of lamp replacement given research into the life expectancy of modern lamps. Lighting on all mainroads in the county is dimmed between 10pm and 5am.

Structural Maintenance Strategy: The priority will be for capital expenditure for column replacement on those columns at the highest risk of collapse. The remaining capital funds will be used to develop LED lighting schemes in urban areas.

Routine Maintenance Process: The current routine maintenance process is as follows

- All illuminated assets are electrically tested every 6 years
- Assets are visited and cleaned every 2 years
- sign lights which are changed as and when they are faulty.

Structural Maintenance Process: Street columns testing has been carried out for a number of years and as such there is good data available which is used to determine the programme of testing going forward. Following the recently commissioned concrete column inspection, this data will feed into a programme of replacements and re-inspection as determined by the results.

It should be noted that the strategy for replacing SOX lanterns and life expired Concrete columns is under review and the lifecycle plans will be altered to accommodate the non-availability of SOX lamps and safety issues associated with the concrete assets.