Nottinghamshire County Council

HIGHWAY INFRASTRUCTURE ASSET MANAGEMENT PLAN

Contents

Executive Summary

As part of the 2021 Highway Service Review, it was recommended that a number of documents which set out the running of the highway service were updated to reflect the current aims, objectives and pressures faced by Nottinghamshire County Council (NCC).

This Highway Infrastructure Asset Management Plan (HIAMP) is part of the suite of highway infrastructure asset management documents which align the approach of the service to the strategic objectives of the County Council. This document sets out the implementation of asset management principles across the service and is aligned to the highway infrastructure asset management policy and strategy.

Asset management principles enable informed decisions to be made about investment and maintenance funding; assist in targeting resources to where they can be most effective and enable the identification and management of the risks associated with its statutory duties to manage and maintain public infrastructure.

The Highways Service continues to work in an increasingly challenging environment, around deteriorating assets, and emerging priorities such as supporting active travel and sustainability set against a background of funding uncertainty and the post pandemic economic recovery.

In order to recognise the evolving demands of the highway network, its users and its role in supporting a range of wider strategic objectives the approach to managing the asset should evolve. The timeframe that this Plan covers is not specified; however annual reviews are part of this Plan; these reviews enable the evolution in approach to managing the infrastructure assets to be captured and this Plan updated frequently.

This Plan is founded on the principles of continuous improvement, embedding continuous improvement throughout this Plan will help to support the desired long term and sustained improvement in the highway service. The process of continuous improvement encourages officers delivering the management of the infrastructure to identify opportunities for improvement, plan the implementation, execute the improvements, and evaluate the results. Enabling both minor and major improvements in the service, encourages innovation and delivers efficiency.

Innovation is a tool that can be utilised by all aspects of the service to deliver betterment. Technology is developing to further digitise the service; the supply chain is innovating to decarbonise interventions and operations to reduce carbon emissions alongside reducing the cost of delivering the service.

A regime for managing the County Council's highway infrastructure is effectively built on data which is then developed into information to support all types of decision making on the network. The acquisition, use and storage of data needs to be carefully planned to ensure that the right data is maintained for the identified purpose.

The Highways Service has developed a risk-based approach to prioritising work on the network. The principles of developing this are set out in this document, and more specific details on levels of service, the network hierarchy and specific prioritisation are also included in the relevant sections.

Within this Plan is a breakdown of the approach to managing the key asset groups that constitute the highway infrastructure asset. These sections include a summary of the inventory, details of the performance of the assets, summary of condition where suitable information is available and breakdown of the adopted maintenance regime and a section on the way that works are prioritised.

The performance framework has been revised to more appropriately reflect the outcomes of the service to improve the quality of the highway network and improve the customer satisfaction in the Highways Service.

This revised and updated HIAMP has been developed to consider the current and emerging priorities of the County Council and its Service. It is important that this Plan is an agile document that reflects an ever-changing delivery environment, and an evolving use of the network.

Highway Service Review

During May 2021, a motion at a Full Council meeting was approved which resulted in the formation of a cross-party highways review panel. This panel engaged external organisations and professionals to assist in the examination of the methods and technologies utilised within Nottinghamshire to maintain the road network.

Details of the review are available on Nottinghamshire County Council's website. This identified several areas for improvement. The activities identified to improve the service are as follows:

- Reduce the need to use reactive short-term maintenance.
- Publish a longer-term programme of capital works to keep residents informed of likely future works plans.
- Maintain the road network condition and seek to improve it within financial constraints.
- Prioritise local roads and footways.
- Engage more effectively with residents and local communities.
- Increase our effectiveness and efficiency, maximising return on investment by ensuring that our highways maintenance and management works are driven by our policies and strategy.

The recommendations of the highways review panel are being implemented with the launch of a resident survey scheme, the relaunch of the traditional parish Lengthsman Scheme, the resourcing of additional repair teams and the opening of an operational highway service hub.

In order to communicate future programmes of work on the highway asset, a rolling three-year programme has been produced and published to the Nottinghamshire County Council website. This is designed to be updated annually.

These initiatives are focussed on delivering improvements to the way that the County's Road network is managed and maintained. Progress on the Service Review recommendations is available on the Nottinghamshire County Council's website.

Introduction

This Plan comes at a crucial moment for the Highways and Transport sector, decisions being made now must consider the aspirations and needs of future generations. People and goods will be moving across Nottinghamshire in ways that are fundamentally altered by the impact of the recent global pandemic, new and emerging technology, and environmental challenges. The highway infrastructure, and the service that manages it must be ready to accommodate these changes so that Nottinghamshire County Council's ambitions of a healthy, prosperous, and greener future for everyone is realised.

It should be noted that this plan is an evolving document and represents a snapshot in time. Whilst frequent update is required, the wider highway service evolves to enhance the management and maintenance of highway infrastructure across the county. To track the update of this plan there is a section in the document where changes can be recorded.

The highway infrastructure asset is Nottinghamshire County Council's most visible and valuable asset, currently valued in excess of £10bn. As the custodian of such a highly valued asset, the County Council requires a clear asset management plan that:

- Improves how the highway assets are managed.
- Enables a more effective and efficient Highways Service to be delivered.
- Maximises the impact from targeted investment in highway network assets.
- Facilitates the wider objectives of Nottinghamshire County Council.

Principles and context of the Highway Infrastructure Asset Management Plan

Nottinghamshire County Council has an approved Highway Infrastructure Asset Management Strategy (HIAMS) for the period of 2022 - 27, which contains an Asset Management Framework.

This Highway Infrastructure Asset Management Plan has a number of purposes:

- Describes how this strategy is to be implemented.
- Provides detailed information to support investment decisions and enable longer term planning.
- Informs how the highway infrastructure is to be managed and sets out improvements to be achieved.
- Provides a reference for all staff members of the Highways Service, its consultants and contractors on specific aspects of highway maintenance.
- Enables a better understanding of risk and its impacts on the highway infrastructure asset.
- Documents the activities and processes of the Asset Management Framework.

Scope

The document covers seven key asset groups, listed below:

- Carriageways.
- Cycleways and Footways.
- Highway Structures.
- Highway Drainage.
- Street Lighting.
- Intelligent Transport Systems – includes traffic signal installations, software systems that control and influence traffic flows.
- Forestry – includes trees, decorative planting, and areas of landscaping.
- Traffic Signs and Road Markings.
- Vehicle Restraint Systems.

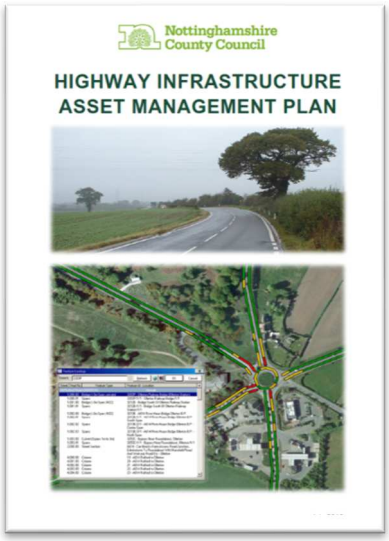
These comprise the majority of the County Council's highway infrastructure asset by asset value or risk. This Plan also covers Street Furniture, Highway Verges, Electric Vehicle Charging Infrastructure, Tram Related Infrastructure, Traffic Enforcement Cameras at a high level.

An asset life cycle plan has been developed for the key asset groups which sets out the function of the asset, a summary of how each of the asset life cycle stages are managed, levels of service, risks, and improvement actions.

Improvements and Achievements

The previous Highway Infrastructure Asset Management Plan 2018 set out a number of core objectives:

Customer Service	Consultation, levels of service, information, etc.
Network Safety	Complying with statutory obligations; Meeting users' needs for safety.
Network Serviceability	Ensuring availability; Achieving integrity; Maintaining reliability.
Enhancing Condition	Improving the overall condition of the network.
Network Sustainability	Minimising cost over time; Maximising value to the community; Maximising environmental contribution.



These objectives have been measured by the service using a suite of performance metrics. The previously developed metrics indicate that the service objectives set out in the 2018 version of the Highway Infrastructure Asset Management Plan have broadly been met. However, as part of the 2022 Highway Improvement Plan the metrics which evaluate the performance of the service have been revised to have a greater focus on the outcome of the service, which align more closely to stakeholder and road user perception.

It is also important to recognise that there have been a number of successes that have been realised by the service since the publication of the previous plan. Examples of these has been the introduction of technology to better define the condition of the highway assets and implementation of a programme to recycle road surfaces. These opportunities to deliver service improvements are based on a greater emphasis on continuous improvement which is outlined in more detail in this updated Plan.

Highway Network Asset Management Framework

Nottinghamshire County Council has been applying the principles of a formalised approach to highway infrastructure asset management for several years and has continued to review the approach to the highway infrastructure asset management.

The Asset Management Framework demonstrates how asset management links to the County Council's broad organisational context and strategic direction of travel, all the way through to frontline delivery of services. This Plan is structured in line with the Asset Management Framework. The interconnections between the different areas of the framework are detailed in figure 1 below.

The Asset Management Framework presented is grouped into four areas: Context, Planning, Enablers and Delivery.

Context	Gives the context for highway infrastructure asset management, the organisation, and the environment within which the Highway Service is delivered.
Planning	The key activities and processes for asset management planning covering performance, asset data, life cycle planning and developing programmes of work. The planning elements will clearly link to the main asset groups.
Enablers	The activities or aspects that support the implementation of the Asset Management Framework. These activities and aspects are included in this Plan but can be supported in more detail by external tools, analysis, and documents.
Delivery	The implementation of the planning stages.

This Plan is predominantly focussed on the Context and Planning areas of the Framework, it also addresses elements in the Enabler and Delivery areas.

Understanding the needs of the County Council's stakeholders is a vital part of forming this Plan and are set out as the Service Aspirations. The needs of stakeholders have been considered in the development of the over-arching levels of service and used to define the long-term Service Aspirations.

It is important that the document should evolve to meet the needs of the network and reflect the results of developments in various part of the Asset Management Framework and the application of continuous improvement processes to the service. To capture the areas where there are actions, including an update schedule for this document, an Action Log is located in a section at the end of this document. This table sets out actions and requires a completion date to encourage the evolution of the Highways Infrastructure Asset Management Plan.

Appendix 1 of this document includes a change log so that the development of this Plan can be documented as a record of how the service has evolved to become more effective and efficient.

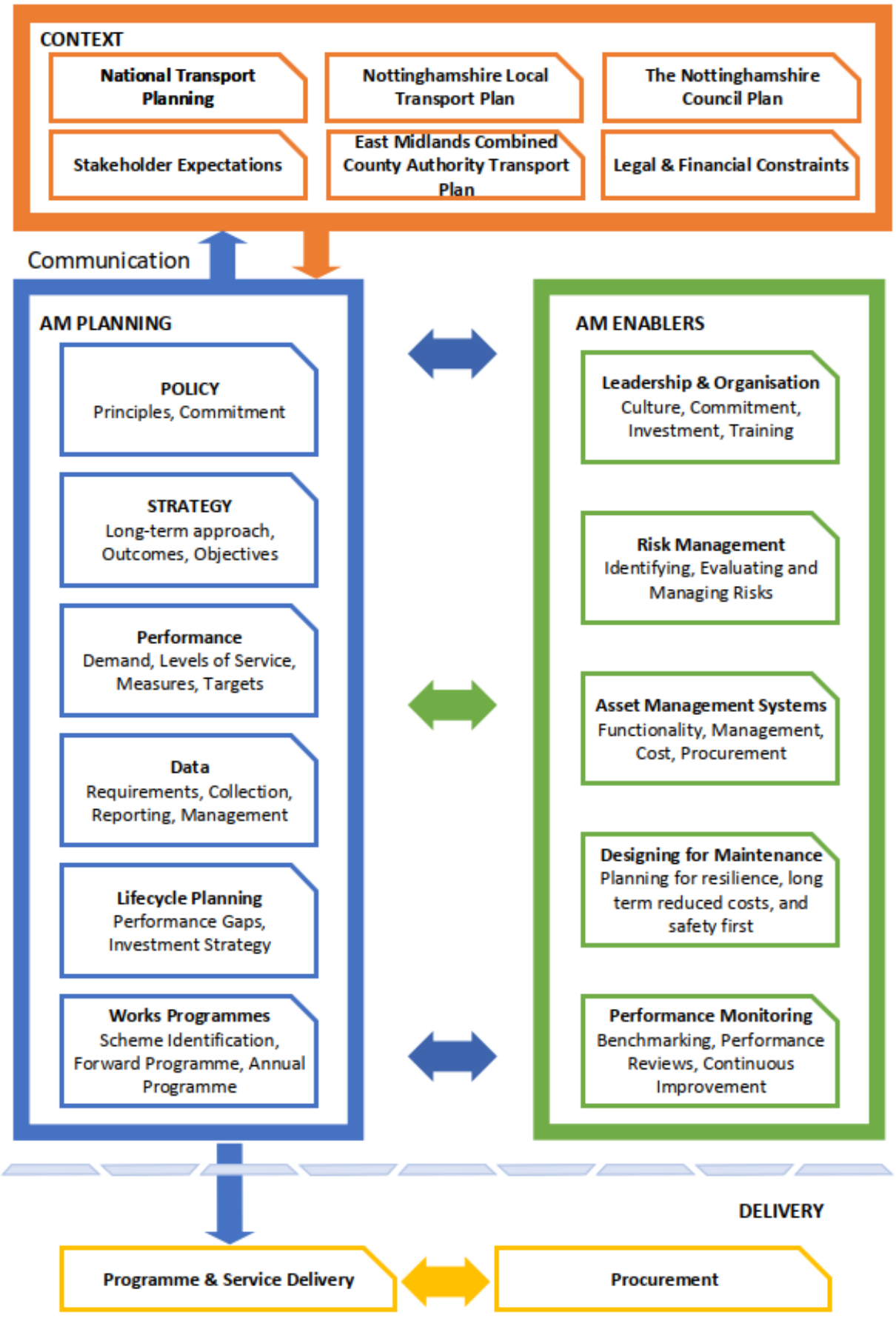


Figure 1: Asset Management Framework

Legal Requirements

In managing highway infrastructure assets, the County Council must comply with many legal duties. Those duties that are specifically aimed at Highway Authorities, such as the Highways Act (1980). The key duties from legislation are listed in Table 1 below:

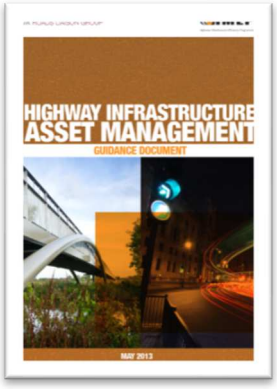
Legislation	Places a duty on the County Council to…
Highways Act (1980)	Maintain highways and to take all reasonable care to ensure that highway is not dangerous to traffic
Traffic Management Act (2004)	Secure the expeditious movement of traffic
New Roads and Street Works Act (1991)	Coordinate works and activities on the highway to ensure safety, minimise inconvenience for all road users and to protect the structure of the street and apparatus in it.
Road Safety Act (1988)	Promote road safety and to undertake studies to reduce the risk of accidents
Flood and Water Management Act (2010)	Investigate the causes of flooding and to undertake measures to reduce flood risk as the Lead Local Flood Authority

Table 1: Key Statutory Duties

There is other legislation, which applies to the County Council in general; these can also be the responsibility of Council Officers and Service Providers. Such legislation covers Health and Safety, the Environment, Equality, Human Rights, and Civil Contingencies.

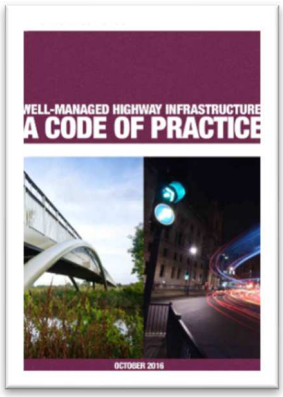
Industry Guidance

Alongside the County Council's legal duties there are several guidance documents, which have been used in the development of this Highways Infrastructure Asset Management Plan.



HMEP Highway Infrastructure Asset Management Guidance (2013) - Provides the basis for a consistent approach and understanding of the implementation and delivery of asset management benefits. This HIAMP explains how the County Council is adopting each of the recommendations in the guidance document.

UKRLG Well-managed Highway Infrastructure: A Code of Practice 2016 - As a code of practice it is a non-statutory document; however, it is deemed to be guidance of best practice. To comply with the code of practice the County Council is required to demonstrate a robust decision-making process and an understanding of the consequences of those decisions and of how the associated risks are managed to ensure highway safety.



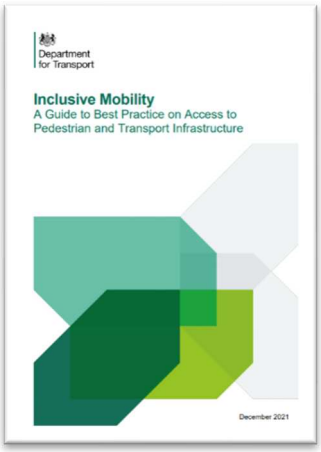
The code of practice is designed to promote the adoption of an integrated asset management approach to highway infrastructure based on the establishment of local levels of service by building a risk-based approach. It recognises that the delivery of a safe and well-maintained highway network relies on good evidence and sound engineering judgement.

Decarbonising Transport - A Better, Greener Britain - Sets out the government's commitments and the actions needed to decarbonise the entire transport system in the UK.

In recognising the role local areas and regions have in reducing emissions from transport the Department for Transport (DfT) has also published a toolkit for local authorities.

The toolkit provides advice to local authorities on planning and taking measures to reduce carbon emissions from transport by:

- Highlighting the benefits of different interventions.
- Setting out the actions local authorities can take to reduce carbon emissions.
- Sharing best practice and lessons learnt from case studies of successful schemes already delivering local benefits.

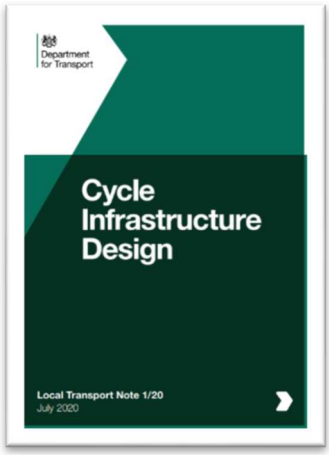


Inclusive Mobility – A Guide to Best Practice on Access to Pedestrian and Transport Infrastructure – This document published by the DfT sets out the best practice guide on access to pedestrian and transport infrastructure.

Whilst much of the content is related to the creation of assets, the document includes guidance on the maintenance of assets to ensure that accessibility is maintained for the life of the asset.

The guidance provides advice on features that need to be considered when developing an inclusive environment for all users. Consideration of these factors can contribute significantly to the attractiveness of the highway network for making walking or other sustainable transport journeys.

Local Transport Note (LTN) 1/20 – Cycle Infrastructure Design – LTN 1/20 was developed to improve the attractiveness of cycle routes and improve safety for all users. The document supports the Cycling and Walking Investment Strategy and is intended to primarily focus on the design of cycle facilities. However, there are several references to the maintenance of facilities to ensure the continued effectiveness and safety of routes.



Maintaining the infrastructure is considered an important strand of improving the attractiveness of the infrastructure. If the infrastructure is considered high quality, it can contribute positively to modal shift away from private motor vehicles.

The document recognises that simplifying maintenance can improve the long-term benefits of a route. Because of this it is important to be mindful of maintenance regimes as part of the design process.

Nottinghamshire County Council Highways Service Documents

Whilst asset management principles should extend into all aspects of the highway operation, it is important to recognise the suite of documents that are published to assist in delivering the full extent of the service and understand how the suite of asset management documents fits into this wider picture. This is a practical interpretation of how the asset management framework is delivered in conjunction with wider service requirements.

Figure 2: Key Service Delivery Documents

Stakeholders and Communication

Engagement

Through all the activities that the County Council undertakes within the Highway Service; the overarching aim is to ensure that the highway network assets meet the needs and expectations of Nottinghamshire County Council's stakeholders and customers.

The information generated by the asset management approach can facilitate engagement by all stakeholders in the management of highways infrastructure. Having effective channels of communication in place and providing the right information at the right time is essential to successful engagement.

In order to manage interventions more effectively on the network it is necessary to engage with all those wishing to work on the network. These may be statutory undertakers delivering works for utility suppliers or developers wishing to build out their planning permissions. Engagement between teams planning works on the network and managing the New Roads and Street Works Act 1991 (NRSWA) & Traffic Management Act 2004 (TMA) provisions are necessary to ensure that works are effectively undertaken utilising the councils permit scheme.

The provisions of the Highways Act 1980, Sections 38 and 278 allow developers and other third parties to amend and add to the network, where possible maintenance works will be coordinated to ensure minimal disruption and maximum benefit to the network is delivered. Similarly, NRSWA Section 50 allows developers and other third parties to lay private apparatus in the highway.

All other opportunities to liaise with third parties working on the highway network will be taken to enable works coordination, minimise disruption and maximise the service life of interventions.

Feedback

Feedback from key stakeholders and highway users is an important part of developing the service. There are a number of ways that customer feedback can be used to improve the outcomes of the Highway Service.

The Nottinghamshire Plan was developed based on the feedback received through the Big Notts Survey. This included several questions which related to transport infrastructure. The development the Nottinghamshire Plan resulted in the strategic objectives which are drawn through the Highway Infrastructure Asset Management Policy and Strategy and into this Plan.

Nottinghamshire County Council takes part in the National Highway and Transport Network (NHT) Customer Satisfaction Survey which canvasses the opinions of a subset of residents each year to evaluate customer satisfaction in the highway asset. The survey returns many results across a wide range of the Highways and Transport service. Table 2 below summarises the key 2021 results for the highways maintenance part of the survey responses.

The table includes a trend when compared to the results from the 2021 results and compares the gap between the 2022 results and the network average. In addition, Table 2 also sets out the Key Benchmark Indicators for walking and cycling provision. This is included because of the importance of ensuring that asset management contributes to the modal shift of road users to sustainable modes of travel.

Ref.	Indicator	Nottinghamshire Result	Trend	NHT Network Average	Gap
Walking and Cycling Key Benchmark Indicators					
KBI 11	Pavements and Footpaths (Overall)	51%	0%	52%	-1%
KBI 12	Pavements and Footpaths (Aspects)	51%	-1%	50%	1%
KBI 13	Cycle Routes and Facilities (Overall)	49%	-1%	50%	-1%
KBI 14	Cycle Routes and Facilities (Aspects)	46%	-2%	48%	-2%
Highway Maintenance Key Benchmark Indicators					
KBI 23	Condition of Highways	23%	0%	34%	-11%
KBI 24	Highway Maintenance	44%	-1%	46%	-2%
KBI 25	Street Lighting	67%	3%	62%	5%
KBI 26	Highway Enforcement/Obstructions	43%	-1%	42%	1%

Table Legend:

Colour	Parameter
	Greater than, or Equal to 0%
	-1% to -3%
	Less than 3%

Table 2: Key Benchmark Indicators from the 2022 NHT Public Satisfaction Survey Report

The survey results are fed back to the service and changes are reviewed. In some cases, it may be necessary to amend or review prioritisation of funding across asset groups, or works to the network, however a data led approach must be followed to ensure that real risks are appropriately mitigated.

The data provided by this feedback will be fed into the service to provide areas for development. This is part of Nottinghamshire County Council's commitment to apply continuous improvement, the information will be analysed for opportunities to identify service enhancement. Often minor amendments can be made to address areas of deficiency or improve efficiency. These opportunities need to be carefully considered for unintended consequences prior to adoption.

Regular liaison is undertaken in one-to-one briefings with county council members in a 6-weekly cycle. This includes a briefing on the highway activities undertaken in the previous 6 weeks and a summary of upcoming works for the next 6 weeks. This is a valuable activity that also allows members to disseminate key data to the parishes within their respective wards. This activity also gives the forum for direct feedback.

Whilst Via East Midlands provide parish council and individual customer feedback on individual defects or issues, additionally, as a result of the highway service review, new options for gathering highway service feedback have been developed. This includes obtaining feedback on individual scheme(s) and pop-up surveys for residents. In terms of providing customers specific feedback on highway defects, this is largely undertaken by the Customer Relationship Management (CRM) process, which includes an

interface with the My Notts app, allowing easy reporting of highway related issues for members of the public.

Information Management

Data and information are fundamental to the development of infrastructure maintenance policy and enhances the ability of the service to communicate effectively with stakeholders. Effective and sustainable management of maintenance related information, which is likely to arise from many sources, and the distribution of that information to stakeholders and network users is crucial.

To embed data and information pathways, set out appropriate data parameters, and ensure that high quality data is maintained by the service a Data and Information Plan will be developed to reflect the diverse needs of the entire service more accurately, including pathways to and from our delivery partner, Via East Midlands.

Communication

In support of County Council's commitment to engaging with stakeholders and customers a highways communication plan will be developed, this communication plan will:

- Identify types of stakeholders and classify these into groups to focus on what is important to them.
- Conduct engagement in a way that focuses on the key interests of each stakeholder group, the channels that they wish to utilise to communicate, and the style of language needed.
- Fulfil the County Council's legal and ethical duty to be open and transparent whilst safeguarding the reputation of the Council.
- Monitor the success of this engagement.

There are a variety of ways that the service will communicate all levels of asset management delivery to stakeholders and all users. The principles of asset management will be communicated via the website, which is considered the primary method for communicating the service activities and approach. This will allow all interested parties the opportunity to digest the key documents that are used.

When informing residents and businesses of works across the highway asset, our information letters contain QR codes which link to our explainer videos, these videos show how and why we maintain different aspects of the highway.

This approach ensures that residents have the opportunity to understand why works are being done and the reasons for the selected treatment.

The works programme will continue to be published on the website so that there is transparency relating to the identification and delivery of works. Property owners, businesses and other key stakeholders will be directly communicated with over works that may have an impact on individual access arrangements.

Development of Service Aspirations

Stakeholder Expectations

A vital part of setting the County Council's Service Aspirations is to consider what its stakeholders need. These needs are addressed as an intrinsic part of the Council Plan and the Local Transport Plan.

In some cases, stakeholders may need to be engaged with in different ways, and these will be developed based on the individual requirements. An example of this is ensuring that landowners are aware of their riparian responsibilities for the wider benefit of the asset resilience and condition. To undertake this, information will be developed and published to assist that engagement.

Levels of Service

Levels of service are a core component of this Plan; they are simple statements that describe the performance of the highway infrastructure assets in a fashion that stakeholders can understand.

The County Council must carefully consider its statutory duties and accepted good practice when defining service levels. Additionally, under a risk-based approach, to define the service level further the asset function, key aspects of highway maintenance and stakeholder's needs were taken into consideration.

Aspect	Objective	Level of Service
Safety	To ensure that highway assets are maintained in a safe condition	Complying with statutory obligations
		Meeting users' needs for safety
Serviceability	To maintain highway infrastructure assets in good condition so that they remain fit-for-purpose and available to highway users so that they can travel reliably	Ensuring availability
		Achieving integrity
		Maintaining reliability
		Resilience
		Managing condition
Sustainability	To consider the future impacts of decisions on value for money, the environment, and stakeholder's expectations, and to address the challenge of climate change	Minimising cost over time
		Maximising value to the community
		Maximising environmental contribution
Customer Service	To understand stakeholder's needs and to keep them informed	Satisfaction, communication, information

Table 3: Levels of Service

The levels of service are addressed throughout this Plan with much of the detail contained within the Highway Asset Lifecycle Plans. Where relevant, the levels of service may be supported by specific performance measures.

Sustainability

Climate Change

In May 2021 Nottinghamshire County Council declared a climate emergency which sets out a commitment to take action to address climate change.

Climate change puts pressure on the highway network from opposing sides. On one side pressure from the impact of the weather events that are associated to climate change, as extreme weather events increase in frequency or severity the damage caused increases. On the other side, the service is actively seeking to reduce its emissions through the more effective delivery of interventions. The Highway Service will need to develop resilience to avoid these pressures becoming a deteriorating cycle because as the damage escalates, so does the need for interventions.

Achieving this will require a holistic approach to managing the asset, with particular importance placed on asset groups which support the longevity of the wider asset, such as highway drainage and weed control.

Carbon Reduction

The management of the highway network can contribute to carbon reduction in several ways, a well-managed network will be more attractive for encouraging active travel by providing safe routes for users to access. Also delivering interventions to the network has carbon emission implications so reducing these interventions and revising their specification can improve the overall carbon footprint of delivering the service.

When considering the highway works intervention to be delivered the carbon emissions from the works should be considered in a whole life way. Planning the lifecycle of the asset to reduce the interventions required is an effective way to reduce carbon emissions associated to the service, as well as reducing the cost. As the supply chain develops alternative lower carbon alternatives these should be considered and implemented if appropriate to further reduce the carbon footprint of delivering the service.

In some cases, there may be opportunities to offset the carbon footprint of delivering works, such as working with the Forestry Team to increase tree planting. These opportunities should be explored on a case-by-case basis.

There are also opportunities to decarbonise the management of the asset by reviewing the operational delivery of the service, for example ultra-low emission vehicle fleet or more sustainably managing travel associated to delivering the service.

In order to create a service that can take advantage of all opportunities to decarbonise, a Decarbonisation Plan will be developed. This Plan should be updated frequently to ensure that both current and future opportunities can be exploited.

Environment & Biodiversity

Careful management of works to the highway network is required to ensure no adverse impacts on the environment are realised. There are a number of legislative controls in place to manage the risk of environmental damage occurring as a result of managing the network.

There are also opportunities to develop biodiversity across the extent of the highway. An example of this is the designated conservation verges that are only cut once annually. These areas need to be carefully considered to ensure that no safety implications arise due to the reduction in cutting frequency.

Improvements in biodiversity within the highway extent will be considered as opportunities arise.

Sustainable Choices

There are a range of ways that the management of the asset can contribute to making more sustainable choices. The most significant of these is managing the network in a way that encourages users to make sustainable travel choices in their day to day lives. This is achieved by making conscious decisions about when to intervene, and with which options when evaluating needs on the network.

In addition to this all operations need to be evaluated for opportunities to improve the sustainability of the service. This needs to be considered in a continuous improvement cycle which allows the service to identify areas for improvement, plan how sustainability in the process can be improved, execute that plan before evaluating the outcome. This is vital in the delivery of the service because taking advantage of emerging technology and innovation to improve the sustainable use, management and maintenance of the asset is an important link to meeting our local and national climate objectives.

Increasing Travel Choice

The Nottinghamshire County Council Local Transport Plan (2011 - 2026) sets out a policy to encourage sustainable and healthy travel choices. In this document there are a number of reasons that people consider barriers to making different travel choices. In terms of the HIAMP the most significant of these reasons is poor route condition and design.

This may apply to the existing cycleway network, quiet routes for cyclists to complete journeys to key amenities and footway condition to improve pedestrian experience of using the network. The way that carriageway, cycleway, and footway programmes are developed is designed to increase the overall condition of these routes, elevating their attractiveness for all users.

Another key area for improving the options for the residents of Nottinghamshire to utilise when travelling is public transport. Facilities need to be maintained and where possible improved to enhance the attractiveness of public transport options. It is acknowledged that the rail network sits outside of the remit of the local highway authority, however bus links to these hubs are important.

Accessibility

A key component for local highway authorities is to consider the accessibility of the network for all users. New or amended facilities, particularly supporting walking and public transport will have regard to the 2021 DfT publication – *'Inclusive Mobility: A Guide to Best Practice on Access to Pedestrian and Transport Infrastructure'*. This will be delivered through our internal design processes or as a result of technical approval for developer works.

As maintenance interventions are delivered, opportunities to remove barriers to accessibility will be taken. This will incrementally improve the network quality, in turn enhancing the attractiveness of sustainable transport options.

Air Quality

A well-maintained highway network can contribute to improved air quality in a variety of ways, for example a reactive approach will require additional traffic management which increases disruption and delay on the network, increasing emissions from idling vehicles.

In addition, an attractive and safe facility will assist in encouraging modal shift to active modes. Removing barriers that users have identified as limiting their use of sustainable transport options the number of vehicle trips can reduce, in turn improving air quality.

Safe & Healthy Travel

Chapter 5 of the Local Transport Plan sets out an approach to encouraging sustainable and healthy travel. This chapter acknowledges that the maintenance of existing routes is as important as providing new facilities. In many cases quiet roads in the county will be utilised as connections to existing facilities, particularly where these are located near to existing cycling and walking routes.

When considering routes that make sustainable choices more attractive there is an option to reallocate road space. This principle can take a variety of forms, and in some cases are delivered with a light touch

solution such as installing lining, or as part of a larger scheme to redefine the highway corridor. When these types of schemes come forward there may need to be maintenance interventions to ensure that the result is an attractive, efficient route that delivers the intended outcome. Routes where this opportunity is taken should have their hierarchy position re-evaluated to properly consider the amended character and usage.

During the development of this Plan, it is recognised that there is currently a Local Cycling, Walking and Infrastructure Plan (LCWIP) being developed by Nottinghamshire County Council in conjunction with Derby City Council, Derbyshire Council and Nottingham City Council covering the D2N2 area. The long-term approach developed by the LCWIP may change the usage of some routes to make them more appropriate as an active travel corridor. In these cases, any changes to the network should be recorded in the inventory, the hierarchy reviewed, and the condition of assets evaluated to ensure they are appropriate.

Innovation and Continuous Improvement

Innovation

Delivering this Plan requires innovation, which is essential to addressing key stakeholders' aspirations, as well as sustainability objectives. Innovation will not just address the challenges but will also provide opportunities to achieve the objectives of this Plan by using new approaches and technologies, including digitisation and machine learning.

Innovation may originate within the Council through an innovation culture, or it may come from other organisations through collaboration and knowledge sharing, including the Council's supply chain or working with Service Improvement Groups.

To realise the value of these innovations, an Innovation and Continuous Improvement Board (ICI) which has representation from both Nottinghamshire County Council and Via East Midlands has been established. Through the activities of the ICI board, the highway service is able to identify innovation opportunities, prioritise innovation resources, and record the gains derived.

It is also acknowledged that other areas of the service may innovate which will require flexibility in the way that assets are managed to support developments in transport systems. An example of this is in highway electric vehicle charging points which can be managed in several ways and requires input from a variety of asset owners, depending on the solutions identified.

Continuous Improvement

Continuous improvement is a key contribution to ensuring that the Highway Service is cost effective, environmentally sustainable, delivers the service objectives, and meets the expectations of its customers. Figure 3 sets out the steps in the continuous improvement cycle.

By applying these principles to the service, advancements in technology and techniques can be taken advantage of. The supply chain is currently evolving to digitise the service and deliver more environmentally conscious solutions, and some of these solutions may be applicable for Nottinghamshire County Council.

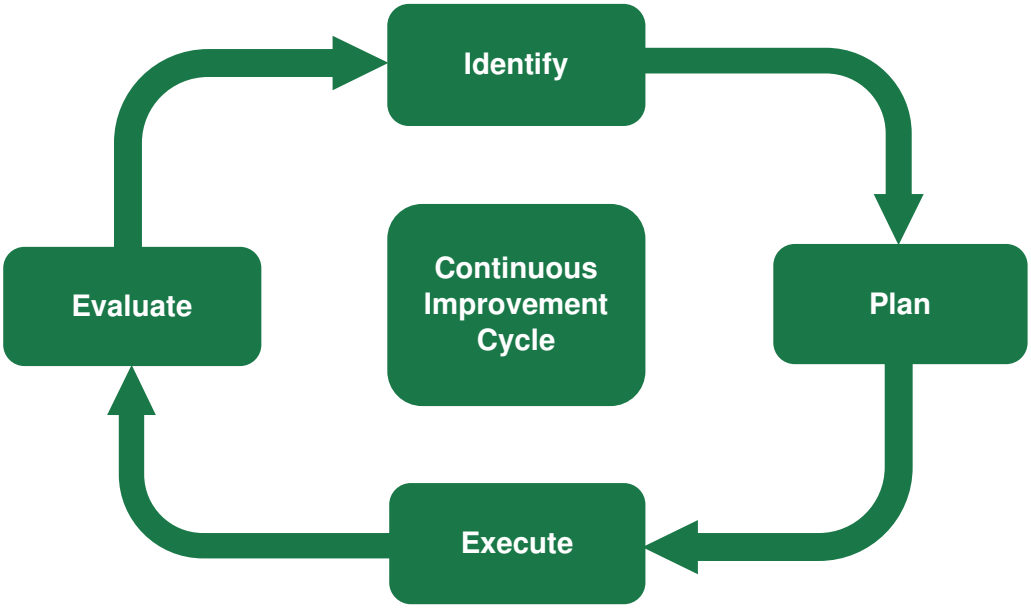


Figure 3: Continuous Improvement Cycle

As a practical example of how the service has taken these principles to the heart of the operation, the teams that maintain carriageway assets have identified opportunities to utilise in-situ recycling. The table below demonstrates how this surface intervention has followed the continuous improvement pathway. Recent developments in the technology of this type of treatment has added value to the process.

Step	Example
Identify	Opportunities were identified to deploy in-situ recycling for the carriageway asset to deliver full reconstruction to suitable parts of the network to renew the asset. These treatments have benefits in terms of reduced carbon emissions compared to traditional reconstruction, cost, and longevity when designed and deployed appropriately.
Plan	A plan was developed in the form of a programme of works for the upcoming financial year and a forward programme.
Execute	The proposed programme will be executed in the financial year and records kept of the works undertaken. The works are subject to usual quality assurance processes to ensure that the actual works are appropriately executed and after care is deployed where necessary.
Evaluate	Following completion of the programme a lesson learnt activity will take place. Learning will be identified for inclusion in the forward programme to refine the efficiency and effectiveness of this treatment. This then restarts the process to drive further improvement.

Table 4: In-situ Recycling – Continuous Improvement Pathway

This material and process choice is applicable to a point in the lifecycle of a carriageway where the structure of the carriageway requires replacement. The principle is to break down the existing construction and then relay it as a single layer with materials that bond the aggregate. It is faster and results in less carbon generation than traditional methods of reconstructing roads. The nature of the process means that it is only applicable on a small number of sites where the long-life underlying courses have reached the end of life and require intervention, it is not a process which is applicable in all situations. As a result, careful site selection is required in the build-up of the programmes.

Financial Management

Highway Maintenance Finance

Revenue and Capital

Funding for the Highway Service falls into two categories, Revenue and Capital. Revenue budgets are used for day-to-day expenditure, and this often includes routine or reactive maintenance of assets. Revenue funds are generally sourced through council tax, business rate retention and charging for services provided. Capital funding is specifically for improving the Council's assets. It can include the establishment of new assets, but it also encompasses the refurbishment of existing assets. Capital funds can be sourced from local, regional and national government to deliver improvements in the network.

From time-to-time opportunities are made available to bid for funding. These funds are often a one-time investment to target a specific asset or outcome. Nottinghamshire County Council will develop bids to applicable funds as they become available to ensure maximum benefits to the network and road users are realised.

Works programmes are published on Nottinghamshire County Council's website, and this includes a forward programme which shows investment for the current year plus two years ahead.

Medium Term Financial Strategy

The Medium-Term Financial Strategy (MTFS) is designed to establish the financial position for the Council over a 4-year period. This strategy highlights any budget challenges and the assumptions on which the budget is based. The current strategy highlights shortfall in the period of the MTFS and therefore efficiency or service reductions may be required to balance the budget.

There is an element of uncertainty that surrounds the MTFS in the form of revenue allocations from central government and the profile of funding that flows from this source and pressures from demand led services.

Specific issues to the Highway Service will need to be accounted for when developing this MTFS on a service level. Principally the inflation being experienced in the construction industry as a result of escalating costs for the supply chain will result in less work being delivered for the investment unless additional funding is made available. This may have a detrimental impact on the quality of the network and will place increased importance on prioritisation processes to manage the outcomes appropriately.

Local Funding

Local funding is primarily sourced in the revenue budgets and is generated from sources such as council tax and charging for services. In addition, capital is invested in the service from local sources to supplement and develop key assets and inventories. This is done to deliver the core strategic objectives and maintain the network for the benefit of users.

Sometimes investment from local sources will be for specific outcomes or objectives such as promoting safety or delivering works to specific parts of the network or delivering active travel or public transport infrastructure to support the principles of modal shift away from private motor vehicles.

Mayoral Combined Authority Funding

Approved by the Government, combined authorities are granted funding and decision-making powers from Westminster for their regions. Nottinghamshire County Council forms one of the four constituent authorities of the East Midlands County Combined Authority (EMCCA) the other authorities being Derbyshire County Council, Derby City Council and Nottingham City Council.

Mayoral Combined Authorities are funded through a variety of sources, which can include:

- Investment funding provided by the Government as part of the Devolution Deal
- A levy on the constituent councils for the costs of operating transport functions
- Precepts issued by a mayoral combined authority to fund mayoral general functions.

- Elected mayors can raise additional resources through a precept (or additional charge) on local council tax bills, but this is only allowed where the order establishing the combined authority permits it.

Central Government

At present, although this will change through EMCCA, a significant source of funding is received from central government via the Department for Transport (DfT). This funding is identified in accordance with the DfT's highway maintenance investment policy which has strong links to the principle of a risk-based approach to managing assets across their whole life. The DfT does not generally stipulate where or how funding is utilised but expects each local highway authority to utilise good asset management principles in its decision making. The current funding allocations can be found on the DfT's website.

Asset Valuation

Traditionally, highway infrastructure assets were valued on the historical cost; this value was determined from the actual cost at the time of installation with an agreed amount of depreciation over time.
HM Treasury values many of its assets using Whole of Government Accounting (WGA) principles; this methodology reflects the current value of assets.

The WGA approach delivers key benefits for highway asset management, the valuation is comparable to the valuation of other council assets. In addition to demonstrating the importance of asset management, it also offers insight into the sort of investment required to maintain the asset.

Asset Group	Gross Replacement Cost (£ 000's)	Depreciated Replacement Cost (£ 000's)	Annual Depreciation (£ 000's)
Carriageway	4,838,103	4,587,680	27,631
Footways & Cycleways	628,262	396,501	33,649
Highway Structures	580,217	392,460	6,463
Street Lighting	184,407	66,493	4,702
Traffic Management	82,787	26,526	5,548
Street Furniture	80,330	19,476	3,252
Land	4,272,635	-	-
TOTAL	**10,666,742**	**9,761,772**	**81,246**

Table 5: Summary of WGA Highway Asset Values

Gross Replacement Cost (GRC) is the cost of constructing an equivalent new asset.

Depreciated Replacement Cost (DRC) is the GRC less a deduction for all physical deterioration and impairment.

Annual depreciation is calculated by identifying all the capital treatments needed to maintain assets or key components over their life cycles and then spreading the total cost evenly over the number of years in the lifecycle.

The difference between the gross and depreciated cost is the cost of restoring the asset from its present condition to 'as new'. Annual depreciation not only represents the annual consumption of service

benefits but also provides a measure of what on average needs to be spent year on year to maintain the assets in a steady state.

This is calculated, in some cases, on older data. To accurately reflect the valuation of Nottinghamshire County Council's network updated methods of collecting and evaluating condition are being implemented which will improve the accuracy of these valuations.

Balancing Priorities & Developing Cross Asset Prioritisation

It is a challenge for local highway authorities to balance the needs of the network with the investment available. It is important that careful consideration is given to how the investment is spread across the various asset types. In order to balance this equitably a method for weighing the needs of the assets against available budget has been developed.

In accordance with the recommendation in Well Managed Highway Infrastructure: A Code of Practice investment is prioritised across its main highway infrastructure asset groups. This has been achieved using asset life cycle models that forecast asset performance. These forecasts define impacts on asset performance for different levels of investment. The process also assesses the potential for other qualitative impacts such as customer satisfaction and risk of claims which are inferred from set levels of asset performance.

Value for Money (VfM)

Value for Money means different things to different stakeholders and is demonstrated in a variety of ways. Generally, VfM is considered against Cost, Quality and Customer values, it is important that these are not separated. For example, a low-cost option may not deliver either quality or meet customer needs.

When considering the demonstration of Value for Money benchmarking data is an important tool. Nottinghamshire County Council has access to the MHA+ Price Evaluation Model (PEM) which can assist in comparing the value of works to the network against other, similar authorities' arrangements. In addition, a Value for Money Assessment is planned through ADEPT and the Future Highway Research Group (FHRG) to be undertaken in 2024/25.

It is important that the results of activities are published for transparency. This will build better understanding of the value of the service and will be particularly useful for elected members and customers of the service. A method for communicating the Value for Money delivered by the service will be developed and published.

Forward Programme

In line with the desire for planning for optimal benefits, Nottinghamshire County Council has developed longer-term programmes of work to be shared with stakeholders. This will enable feedback to be received to ensure that work is prioritised appropriately and allow for coordination with other work affecting the highway.

The forward programme covers 3-year, extending beyond the current financial year. It is important to recognise that this forward programme is subject to change as priorities emerge through the risk-based approach.

The current programme published on Nottinghamshire County Council's website includes details of the current financial year, plus two years into the future. It should be noted that these programmes include unallocated amounts to allow the funding to be targeted on ongoing and emerging network risks. The further into the future the programme extends, the greater the unallocated amount.

The development of programmes includes local knowledge from County Councillors which is fed into the prioritisation that is part of the creation of the candidate lists. This local knowledge is a valuable part of building intelligence on the condition, character and usage of the network.

The forward programme is constructed using a set of priorities that are aligned to the corporate objectives of the County Council. It is important to retain flexibility in the forward programme because risks and issues may alter. An example of this is if a structures inspection identifies a significant repair or replacement is required to a bridge to maintain network integrity and minimise disruption.

The prioritisation of the forward programme is the same as for the annual plan for each of the asset groups. Further details on the prioritisation can be found in each of the Highway Infrastructure Asset Group summaries.

Fundamentals of Asset Data and Information Management

Purpose

Asset data is granular values that describe part of an asset without context. Multiple data values are combined into asset information which provides the context to build a picture of the asset. Records are then formed from this asset information, such as a record of works delivered or the result of a condition survey. These factors draw together to develop knowledge of the asset which develops insight for decision making.

The range of considerations for a data and information strategy is much wider than the scope of this Highways Infrastructure Asset Management Plan, and as a result a separate document that sets out the full process for managing data across the Highways Service such as systems, governance, specifications and requirements, monitoring, audit and managing change is required.

It is important that data and processes are owned by roles within the organisation so that the information generated is appropriate to make good decisions on how to intervene to deliver the service objectives.

As technology develops more efficient methods of developing data into information emerge. It is valuable to ensure that data owners are appropriately appraised of developments and can access tools to help them evaluate benefits to the service. This evaluation is important to ensure that system changes deliver the anticipated benefits, whilst balancing the financial costs of delivering a new system, including training and other business costs.

An overarching objective to the management of data and information is not to maintain it for the sake of holding it, but to use it to make good quality decisions in managing the infrastructure assets. To achieve this, data owners should always maintain a clear understanding of the purpose that the data is being stored for.

Management Systems

When considering the data and information management systems to be utilised it is likely that a suite of system specific to asset groups will be required. There are overarching principles that should be followed across the service to deliver high quality data and information to support the service.

Assign Responsibilities	This may include assigning asset owners, the scope of the data and information and how the information will be represented and defined. In addition, asset owners would be responsible for granting access and maintain a record of change.
Risk Management	Assessment of the consequence of not having the appropriate data is required to inform analysis of development areas. Some operational risks can be mitigated through regimes to improve data availability or quality.
Acquisition of Data	Asset owners will develop opportunities to fill gaps in the asset data and seek effective ways of collecting data. It is important that this data collection has a clear objective. In some cases, a survey to acquire the data will be appropriate, in others a gradual collection of data through operations may be preferable. The cost/benefit of acquisition should be undertaken prior to commencing activities.
Dissemination and Use of Data	Asset owners need to identify stakeholders who would benefit from visibility of the data and arrange sufficient access. Data used within the service should follow a process, such as prioritisation to define how it is used.
Maintenance	Data requires maintenance. This ensures it is appropriate to meet corporate reporting standards and is fit for the purpose intended to create good information to make decisions. Data maintenance will also include security and legal requirements.

Managing Change	Change to the data and information system happens at different scale depending on the point in the information lifecycle the dataset is at. Minor changes can be managed via a change log. More fundamental changes, delivered through continuous improvement or system changes requires a wider set of considerations. For example, consultation may be required with other users. To establish this the impacts of change should be mapped, and training provided to ensure that the change is seamless and delivers service objectives.
Retention and Disposal Regime	The length of time to retain data should be considered by asset owners. For example, structures data is useful for looking up construction details spanning back many decades when developing an intervention, it will not be appropriate to maintain condition data for carriageways for as long a period. Each asset owner should consider a retention schedule for the data under their ownership. A process for approving disposal should be followed to prevent unintentional deletion.
System Review	Continuous improvement is a valuable tool to developing the data and information management system, and this should be supplemented by recording lessons learnt. Review should be undertaken to identify opportunities to improve the system, either at a corporate level or by data and information owners. These opportunities can be planned into the system and executed to deliver improvement. This can then be evaluated and refined as required.

In some cases, specific asset groups require specific systems, and many of these will be digital systems requiring Information Technology solutions to effectively implement them. There are some information technology systems which have value across all asset groups. When evaluating these systems, the ability to turn data into information and then display that information should be at the forefront of the process. The effectiveness of this evaluation and implementation process is the cornerstone of delivering high quality decisions.

Within the County Council the following systems are commonly used to manage data and information:

Geographic Information Systems (GIS)

Nottinghamshire County Council currently utilises Precisely MapInfo for use of mapping data in the county. A wide range of information can be developed from these datasets, including heat maps for developing understanding of risk on the network. This is an effective way of sharing data across the teams and the datasets can be exported into other systems.

Point data can also be developed into mapped representations which is important for developing the basic parameters of an inventory.

Causeway Alloy

The use of Causeway Alloy is a recent development of the highway service, designed to improve the management of the highway asset as a whole. A transition plan was developed and implemented to plan the migration of the service from the previous system.

In terms of the system, Causeway Technologies has acquired the software developer, Yotta. This developer has a history of developing asset management systems and Alloy is its latest. It spans most of the asset groups and can be integrated into several other asset specific systems.

All information can be viewed in one place and the system can be accessed from anywhere, this allows for more efficient planning of works which considers the asset in a holistic way.

The system can be configured in accordance with the needs of the network, includes performance reporting and can be developed to be flexible in the outputs.

FSW Information Technology Solutions – BridgeStation

This is an asset management tool for the highway structures asset group. The software is a single point of storage and access to the inventory, condition reporting, works and inspection management and a lifecycle planning tool. There are significant benefits to utilising this system to improve the way that bridge data is managed and processed into works programmes.

Using this system will allow the team the opportunity to use lifecycle planning to develop a more refined maintenance regime and more efficient management of works to the inventory.

IMTRAC

IMTRAC is used to both store an inventory of the assets associated to the intelligent transport system. This system also allows the team who manages this asset group to access photos and drawings of the assets to plan work, track deterioration and develop maintenance strategies. Alongside this the system also allows for fault management and the organisation of rectification works and manage the ongoing works programme to renew sites as the need arises.

Vaisala Road AI

This is a video-based survey method that is delivered from a standard mobile phone device. The video is captured using a completely hands-free system that videos a route as it is given. The video data is uploaded to the Vaisala servers which then run the video through an artificial intelligence tool. This can identify defects primarily in the carriageway and evaluate the presence and condition change in signing and lining.

Nottinghamshire County Council has trialled the use of this flexible system for improving the knowledge of condition across the network and continue to evaluate the opportunities that the system offers around inventory and condition collection. Future iterations of this Plan will detail advancements in the way this system is used.

Developing a Data Led Approach

At the outset of building an approach to managing assets based on data it is important to first consider why the data is needed. At all stages it is easy to inadvertently start collecting data for the sake of having the data, which is costly both in terms of storage, processing, and maintenance costs.

Data and information should be captured and processed to support business need. The summary below explains examples of this:

Strategic	Required to meet the strategic objectives of the service. For example, data on the performance or safety of the asset.
Tactical	This will be required to develop assessments of prioritisation and works programming activities. These may also be used to support other technical policies.
Operational	These datasets will be focussed on delivering works to the infrastructure asset in an effective and efficient way. An example of operational data may be the location of a work site.

When developing an approach to managing the asset based on data and information there are areas which require development, the first of these is the capability and understanding of all staff, focussed on those who deliver prioritisation, programming or works to the asset. It is important that the flow of data is recognised as two-way, both informing works or returning updated information on the inventory following work.

The second consideration is technology and how it can be used in the service, an example of this may be software solutions for analysing data or providing tablets to works teams to feed data back on the inventory. As technology is adopted processes need to be developed and published to manage change

and the use of the data to meet service objectives. The development of processes also provides an opportunity to embed continuous improvement into the delivery of the service.

The final consideration is the availability of data, specifically where the correct data doesn't exist. A hierarchy is required to establish the importance of data and information in the context of legislative, regulatory, or operational requirements. If data is missing an activity to collect or acquire the data may be required and this should be supplemented with a programme.

Embedding a data led approach enables dissemination of the data to all parts of the service, including beyond the traditional asset management team. In a small number of cases the data may be useful to share across other parts of the organisation or external bodies. An example of this is data captured following a flood event will be required by the Lead Local Flood Authority (LLFA) as part of a Section 19 investigation required by the Flood and Water Management Act (2010) as well as drainage teams looking to develop resilience on the network.

To achieve this data should be stored in an accessible way and the extent of the data and information should be communicated to identified consumers.

Asset Data and Information

Management Principles

Like the assets that it relates to, data and information has a lifecycle. The management of this lifecycle is a key component in developing high quality data. Data quality is an aspect that needs to be 'right first time' and appropriate to the asset group in question. It is important to develop strong processes to manage this effectively to reduce the costs of both storing and processing data, and ineffectively delivering interventions to the network.

At the beginning of the lifecycle data is acquired. This may be a transfer from other systems, or it may be a collection activity. Data is acquired from several sources and will be an ongoing activity as the network changes, is added to or gaps in data are closed.

Assessing and storing the data is important for maintaining the integrity of a data led approach. Insufficiently accurate, out of date, erroneous, poorly stored, or incomplete data may result in poor quality decisions being delivered that do not meet the service objectives. This in turn can erode the quality of the asset and users' perception of it.

To ensure that this risk is mitigated it is necessary to improve data quality using a process to deliver the required upgrade. This may be to undertake gap analysis of inventory or re-evaluate the method of collecting condition data. Improvement should be an ongoing activity.

For the steps of the lifecycle above to be linked to the service objectives data needs to be utilised. This is directly linked to outcomes on the asset and without this step any data is stored for the sake of storing the data. Prioritisation and decisions need to draw on this data to make choices on how to deliver works to the asset. Developing works programmes using this data ensures the delivery of service objectives.

Finally, as data is replaced, or updated archiving may be required. A retention schedule should be developed for each part of the data and information resources and deletion should follow. The cost of storing data will need to be considered and liaison with colleagues in support departments such as Information Technology delivery teams should be undertaken.

The following examples set out the primary data and information sources across the service.

Inventory

The previous version of the HIAMP set out the scale of the recorded inventory at the time the document was developed. Since this time, the inventory has continued to grow.

As works are undertaken, any unrecorded assets will be added to the inventory. This encourages a wider ownership of the inventory and closes the gap to a fully recorded inventory without undertaking a costly one-time survey.

When changes are made to the network, or new assets are commissioned, such as new development sites, the inventory changes and additions will be recorded to ensure that the inventory is updated as appropriate.

Specific improvements have been identified in the Drainage asset group. This inventory is a diverse set of features and there is varying confidence in the records kept. Refinement of areas where asset knowledge is low is being developed such as grip, ditch, and carrier drain locations. This information can then be used to refine problem solving, improve the effectiveness of routine/reactive operations and prioritise improvements. It can also be used to assist stakeholder liaison such as with landowners over their riparian duties or with other bodies such as the Environment Agency or the Lead Local Flood Authorities.

Condition Data

There is a variety of condition data that is used to evaluate the performance of the asset. This data is not necessarily compatible in a single system, so it is sometimes necessary to operate a number of systems across the service.

When selecting a method for measuring condition it is important to consider both technical considerations and customer perception and attempt to balance these needs. Currently, the largest asset group, carriageways, has a requirement from the DfT to survey using Surface Condition Assessment for the National Network of Roads (SCANNER) on the A, B and C road network. There is, however, less stipulations in the other parts of the infrastructure. SCANNER data has several parameters that are not necessarily representative of what road users perceive on the network, but these parameters are key for the integrity of the asset and the safety of users. Similar situations exist in the maintenance of structures, drainage, vehicle restraint systems and the electrical assets, amongst others.

It is important to evaluate the survey frequency for some forms of collecting condition data, the longer the interval, the more importance is required on supplementary data sets to identify deterioration early and prevent more serious failure, and costly rectification.

Specific details of the measurement of condition for each of the asset groups can be found in the Highway Infrastructure Asset Groups section of this document.

Personal Injury Collision Data

Personal Injury Collision data is available for the county from the Police. It is a requirement that the local highway authority conduct studies on the collision data under Section 39 of the Road Traffic Act 1988 to investigate and implement measures to reduce collisions on the network. Whilst there are specific works programmes in place to discharge this statutory duty it is beneficial to consider collision data in a range of prioritisations to add value to the works undertaken by prioritising the risk associated to collision locations.

The data is stored in a proprietary system, KeyAccident by KeySoft Solutions which is managed by the Safer Highways Team. The Safer Highways Team undertakes high level assessments and feeds information into prioritisation where appropriate.

Claims Data

Each year claims are made against the local highway authority relating to defects on the network. This data can be valuable in highlighting areas of the infrastructure asset which are deteriorating to a point where the operation of the highway is impaired.

Claims data can be combined with information in defects from the safety and serviceability sections outlined in the section below.

Using this data as part of a coordinated assessment of incidents on the network can develop good information to inform sound decision making. High quality decision making is a necessity to maintain the quality of the network, meet the expectations of customers and demonstrate value for money from the service.

Defect Data from Inspections

Safety Inspections are undertaken as a primary tool in managing risk and liability on the network. Defects identified as part of these inspections will be repaired within agreed timescales. This data can be used to highlight points on the network where defect generation is developing as an indicator of deterioration.

Details of the nature and frequency of safety inspections can be found in Nottinghamshire County Council's Highways Inspection and Risk Manual (HIRM).

In addition to the more frequent safety inspections an annual service inspection is undertaken to record the overall condition of routes. This data is part of the works programming process which considers a wider range of issues, beyond user safety that impact on resilience, quality, and ease of use.

Ad-hoc inspections in response to specific service requests and enquires from members of the public are also an important source of data.

The records of these defects can be used to supplement the other data to build a picture of deterioration across the network and refine the accuracy and therefore effectiveness of works programmes.

Data from Customer Reports

Information from customer reports on highway defects can provide a wealth of data that is crucial for maintaining road safety and efficiency. Gaining insights into customer satisfaction and road users' perceptions of highway conditions is important to deliver service improvement and enhance the satisfaction of road users.

Using these data points develops intelligence, informs decisions on where to allocate resources for repairs and maintenance and can be used to improve highway maintenance strategies.

Performance Data

Definition

Performance data is used to illustrate the success of service delivery against strategic or operational objectives. There are a range of measures available to undertake this and the development of performance metrics should be carefully considered to ensure that desired behaviours are encouraged, and outcomes achieved.

It is important that the performance data is reviewed to evolve with the demands of the service. As with other data used in the service it is possible for performance data to become out of date. This is detrimental to the service as the performance measurement moves away from evolving strategic objectives and road user perception.

Finally, it is important to carefully consider how data is used for a performance perspective. It is most efficient to utilise data which is used in other decision making for this purpose. An activity to collect data only for the purpose of performance is likely to be considered inefficient, except for collecting stakeholder and customer feedback.

Further details on how the performance of the service is managed can be found in the performance management section.

Financial Data

The development of financial data is important to establish the programme of works across the asset. The cost of delivering works is currently increasing which is reducing the amount of intervention that can be made.

This data is applicable both to inputs and outputs. For example, the further into the future that budgets are known, the more robust the planning that can be undertaken to maintain the infrastructure assets. To provide more certainty with budget impact, cost data for delivering works is a valuable resource. This cost data is a key component to developing programmes and is variable depending on the supply chain and factors influencing works costs.

Digital Agenda

Asset Data Developments

As technology develops emerging opportunities are presented to improve the way that asset data is stored, analysed, and presented. When new technology becomes available it should be evaluated to establish if there is an opportunity to deliver improvement to the service. It may be effective to undertake this evaluation in conjunction with service improvement groups that are available, such as MHA+ to draw on the experience of other authorities.

The DfT is currently evaluating a revised data standard for reporting of carriageway condition. Whilst this is still being developed the likely outcome may allow local authorities more flexibility in the way that condition is surveyed. Nottinghamshire County Council will use opportunities like this to review the way in which condition is measured and deliver improvements as appropriate. This approach is indicative of the continuous improvement aims of the service.

Improving the use of Data

As data integrity develops the way that it is used may need to evolve to ensure that the decisions made are effective. An example of this is the drainage inventory, as the inventory develops the approach to works on the network may evolve to make the service more efficient. For example, it might be useful to collect how full the drainage features are when they are emptied so that high risk areas can be identified to improve network resilience, and more accurately focus resources across the network to meet the strategic objectives.

It is easy to be swayed by emerging technology that deliveries new data or systems. However, it is important to carefully evaluate options before adopting a new way of collecting, managing, or displaying data. It is also important to be clear about the parameters for data collection, it is critical that data is collected appropriately to avoid poor quality data influencing decisions.

In a world that now allows data capture on the condition of the asset to occur daily, it is important to evaluate ‘how much is too much’. There are costs associated to the storage of data, so we need to make sure that data is useful, of high quality, and fits into our wider strategic objectives before it is integrated with our approach.

Working towards achieving a consistent and reliable set of highway data across EMCCA, will enable the combined authority to effectively use data for planning, analysis and decision making.

Benchmarking

It is valuable to assess the performance of the service against other relevant bodies and groups, particularly when considering where to focus resources. There are several opportunities for benchmarking against other authorities and this is generally undertaken annually and disseminated to the teams who manage the asset groups. This can then be used to assist in identifying and evaluating improvements in service delivery.

There are several benchmarking tools available to the service which can be used to assist in the development of improvement.

NHT Survey

As referenced elsewhere in this document the NHT survey benchmarks customer satisfaction by evaluating the responses to questionnaires sent to a random sample of residents in the County Council’s area. The results cover several topics, ranging from public transport provision to the condition of the infrastructure.

The results are set out year on year so changes and trends can be mapped, and the impact of investment tracked.

MHA +

The alliance group which was born out of a merger of three regional efficiencies groups: the Midlands Highway Alliance, the Midlands Service Improvement Group and the West Midlands Highway Alliance.

The MHA+ has a range of Service Improvement Groups covering a range of activities, one of which is the Highway Asset Management Group. This group allows ad hoc benchmarking via the canvas of members to specific issues or problems and specific forums to ask questions of members. This is a valuable resource for evaluating new options in delivering parts of the service.

Nationally Published Datasets

Annually the DfT publish a range of information on highway networks which can be interrogated to develop an understanding of benchmarking against other authorities in England. Much of the data is available for each local authority so similar networks can be assessed. Examples of this data are the Road Lengths, Reported Road Casualties, Road Condition, Count Point Data for traffic flow and Self-Assessment Results for the Incentive Fund.

Risk Based Approach

Principles and Considerations

The 2016 document, well managed Highway Infrastructure: A Code of Practice set out a requirement that local highway authorities should develop a risk-based approach to manage their assets. This is to be applied across the various aspects of the highway assets.

The Highway Asset Management Policy and Strategy set the objectives of the service. Determining an appropriate approach considers the content of these documents alongside other considerations such as levels of service, inspection and condition survey regimes and setting priorities. These aspects need to be weighed with the risks evaluated for each of the asset groups. When developing the approach, it is important that the local priorities are taken into account along with affordability.

The level of risk is considered in the context of the likelihood of an occurrence, and the severity of its outcome on the asset or its users. There are many risks associated to the highway asset, and it is important that these risks are identified, evaluated, and ultimately managed within reasonable parameters.

It is important to maintain a risk-based approach to all aspects of delivering asset management principles. For example, collecting data on the network may be too costly as a one-time activity so a risk-based approach may be appropriate to manage safety or network performance.

Nottinghamshire County Council Corporate Risk Management

The County Council has developed a policy and a strategy for dealing with risk management across the organisation. The policy explains that awareness of risk management is embedded in the organisational culture of the council. The purpose of this culture is to adopt a ‘sensible and balanced approach to risk’ to:

- Safeguard its employees, service users, members, pupils, tenants, and all other persons to whom the Council has a duty of care.
- Ensure compliance with statutory obligations.
- Preserve and enhance service delivery.
- Manage the budget effectively and be cost effective.
- Protect its physical assets and resources.
- Maintain effective control of public funds.
- Promote the image and reputation of the Council.
- Support the quality of the environment.

The corporate policy is subject to regular review, and such a review is ongoing at the time of writing this HIAM Plan.

The corporate strategy sets out a process for managing this requirement. Both a corporate risk register, and a departmental risk register are maintained to develop a clear, documented understanding of risks in the service.

Understanding Risk

The highways asset has a varied spectrum of risks that are associated with it. The examples below are the principal consequences of risks being realised, however further specific risks may exist for certain locations or asset types.

Safety	Because of the nature of the highway network, the safety of users and those who maintain assets is a primary risk. Some of the risks identified below also have secondary links back to safety on the highway network.
Loss or Damage to the Inventory	This may be the removal of an asset due to a collision, or the gradually deterioration through use and time which renders part of the inventory unusable. The failure of assets often has other risks associated to it such as road safety, financial and loss of service.
Reduction or Removal of Service Provision	Service reductions or failure have a variety of implications dependent upon the nature of the failed assets. Structures have significant implications in terms of safety, disruption, and environmental factors.
Environmental	Whilst the most obvious risk is threats to the environment from the way that the asset is managed, the inventory also comes under attack from weather events such as periods of high rainfall, freezing conditions, periods of drought etc. Other risks exist which link to other factors. For example, removal of service provision can result in disruption to the network which can increase vehicle miles and has a knock-on impact to the carbon generated by travel.
Financial	Failure to plan for the deterioration of the asset can lead to missed opportunities to manage the network in a more cost-effective way. Stakeholders and users may also incur higher costs because of other risks to the network materialising.
Contractual	Missed deadlines, disputes, failure to meet key performance requirements all have risks to the overall management of the network.
Reputational	Events, incidents or rapid changes in network condition (such as accidents, safety violations, environmental issues, or controversial decisions) that are not dealt with proactively influence public perception and can harm reputation.

Developing the Risk Based Approach

When considering how risk will be managed on the network a combination of network hierarchy and condition is used alongside specific considerations such as community importance. Risks are different across the asset groups and operation of managing the service. For example, the risks that an inspector will currently evaluate on a carriageway defect will be different to the risks associated with a highway structure.

As a risk-based approach develops it is necessary to found these on the legislative requirements along with the corporate objectives of the service. It is also necessary to base any risk-based approach on the corporate approach to identifying and managing risks.

To build a specific approach it is important to understand the risks to the service as outlined in the principles and considerations section above. These will include the risks to both users and stakeholders as well as Nottinghamshire County Council in its function as the local highway authority and the severity of these risks.

The highway network is diverse, in its use, the assets which make it up, and the data and information required to manage it effectively. To develop an approach that is appropriate for this asset the function, inventory, condition, and criticality needs to be considered.

These overarching principles are applied to asset groups by identifying levels of service, developing a suitable network hierarchy that describes the character and usage of the parts of the network that it applies to, and prioritises the funding across the asset to implement the required interventions in a prioritised way to deliver the agreed outcomes.

To assist in the development of this kind of approach and ensure that it evolves to meet the changing demands of the network it is necessary to maintain a risk register and undertake regular reviews of both this register and the outcomes of the service.

Risks also change, as the network deteriorates new risk can emerge or existing risks get mitigated through works programmes. Inspections and surveys are key tools for developing enhanced appreciation of risk on the network and the recording of these identified risks can be both mitigated immediately through reactive repair or included in a programme to deliver long term mitigation. A similar result is realised from reports of changes in condition from the public, which are fed into the system to be assessed for risk and mitigated as appropriate.

Further details on how the service manages risk from inspection can be found in Nottinghamshire County Council's Highways Inspection and Risk Manual.

Making Decisions Based on Risk

When risks are both understood and an approach to managing them developed, these principles must be applied to delivering works to the asset inventory. It is necessary to apply prioritisation processes specific to the asset groups in question as risks are different, details of the prioritisation that is applied for each asset groups can be found in the Highway Infrastructure Asset Groups section.

These prioritisation processes have been developed to consider data which is used to quantify risk such as condition-based data alongside other indictors of risk such as the hierarchy, detail of the risk registers and the overarching strategic objectives.

When making decisions on how to intervene to mitigate risk, the asset lifecycle will be considered. For example, the risks associated to a newly constructed structure are different to one that is hundreds of years old. Generally, this is accounted for in condition surveys, and managing data efficiently is required to facilitate the balance of factors when enacting a risk-based approach through decisions taken.

Environmental and Wellness Implications

Consequences come in a number of forms on the network. There are consequences to doing nothing, and consequences of doing something. Much of the risk-based approach is weighted towards mitigating safety and liability risks, alongside managing network availability.

As time progresses assets deteriorate. The pace that this occurs at may change depending on factors such as damage from the environment or use. This deterioration has consequences that extend beyond the immediate safety and serviceability factors. Planning works to be mindful of implications on the environment is required to assist with Nottinghamshire's commitment to reducing carbon emissions. To ensure that this is appropriately accounted for when identifying and evaluating risk the risk registers will be reviewed to consider environmental implications.

The highway network environment contributes to users' sense of wellness. It is used in many ways for leisure, be it accessing the countryside or engaging with activities such as cycling or walking. In addition, there are wellness benefits to utilising more public transport or active travel options. To recognise and facilitate these uses there is reference in this Plan to the aspiration that the network remains attractive to

all users. The way that the network is used should be reviewed periodically and any usage changes should be reflected in the hierarchy so that risks can be assessed.

Right Repair at the Right Time

Having identified risks that require intervention, works are sometimes required to deliver the appropriate mitigation. It is important that works are delivered ‘right first time’ as far as possible to properly mitigate risk on the network. In situations where temporary repairs or intervention is required to ensure the safety of users, a permanent solution should be considered.

By taking this approach reactive works are minimised, in turn reducing carbon emission and financial costs in conjunction with removing the risk that the defect repair originally sought to mitigate. It is recognised that where the network deterioration is significant in combination with severe weather that delivering that ‘right first time’ is not always achievable.

Network Hierarchies

Crucial in establishing levels of service and for the County Council to perform its statutory network management duties is having in place a defined network hierarchy which describes the character and usage of individual parts of the network. The foundation of a risk-based maintenance approach is a network hierarchy based on the function of the asset.

The network hierarchy reflects the whole highway network including the needs, priorities, and actual use of each infrastructure asset. Individual asset hierarchies are defined within asset groups.

In the development of the network hierarchy, Nottinghamshire County Council has collaborated with neighbouring authorities to ensure that users have a reasonable continuity of levels of service as they journey across local authority boundaries. Further details of the collaboration undertaken by the service can be found in the collaboration section towards the end of this document.

Consideration has also been given to factors such as usage, resilience to climate change, and winter service operations.

The hierarchy applies to most asset groups, although it has been identified that in some cases prioritisation does not take this into account but focusses on the needs of the asset group and available funding.

EMCCA Key Road Network (KRN)

The EMCCA Key Route Network (KRN) is a network of some of the most important roads in a combined authority for which a Mayoral Combined Authorities (MCA) and its constituent authorities both hold powers. KRNs are typically the busiest main roads; side streets do not, and some other main roads may not, form part of the KRN. A KRN for the whole of the EMCCA is being developed by the combined authority and its constituent highway authorities.

Hierarchy Identification and Development

The hierarchy is a thread that runs through the prioritisation of works to the key assets on the network. This is the primary place in prioritisation processes where the character and usage of a route is evaluated and recorded to ensure that resources are allocated effectively, interventions are specified appropriately and risk properly managed. The highest tier of the hierarchy is the Resilient Network which is where the risk is more challenging to manage.

The method for assigning the hierarchy to the network was undertaken using Geographical Information Systems (GIS). A Feature Manipulation Engine (FME) tool was used to identify and map key data sets which are accounted for in the hierarchy. The key data sets for this process are:

- The Road Network.
- Count Point Data, either locally held or based on the published DfT Count Point Data.
- The Local Land and Property Gazetteer (LLPG) for evaluating property density and use class.
- Winter Service Routes.
- Diversion Routes.

Using this tool, a thematic map has been developed which highlighted routes where the identified thresholds were met. The outputs were sense checked by the service and thresholds revised as required.

Using this process, the hierarchy designations have been applied across the network.

Resilient Network

During 2014 the DfT released "*Transport Resilience Review, A review of the resilience of the transport network to extreme weather event"*. This document made several recommendations, one of which was for local authorities to define a 'resilient network' which will be prioritised for activities during extreme weather to maintain access for the economy and other key services.

A Resilient Network has been defined based on the parameters set out below. This is the highest tier of the carriageway hierarchy in Table 6 below. The maintenance of the Resilient Network as well as other measures will be prioritised to ensure the resilience of links to the national strategic network, access to local facilities and communities, and other transportation needs during disruptive events.

The details of the resilient network will be published to the Nottinghamshire County Council website to provide further detail on the practical application of the parameters described below.

The resilient network is defined as set out in Table 6 below. To apply these practically to the network the following activities were undertaken.

Identification of the Resilient Network

'A' class roads were identified in Nottinghamshire County Council's List of Streets and recorded in GIS tools.

A register of Key Services was identified. This activity was developed alongside consultation with stakeholders to identify service that have high community value. As example of this is hospitals with Accident and Emergency departments.

The full list of key services identified is as follows:

- Fire Stations
- Police Stations
- Accident and Emergency Hospitals
- Winter Service (Gritting) Depot

Emergency diversion routes for the trunk road network was determined with liaison with the trunk road managing authority, National Highways. The diversions are for the motorway and trunk 'A' roads that cross the county area.

To supplement the factors outlined above routes were also considered where there is an identified need for coverage in the winter service plan.

Other Asset Group Hierarchy

Details of the footway hierarchy is located within Table 7 below and the criteria is assessed in a similar way to the carriageway hierarchy. The location of the facilities was identified using GIS datasets which include inventory data.

Finally, the cycleway hierarchy is set out in Table 8. This group was simple to evaluate in that the inventory can be compared to mapped lengths of carriageway and footway lengths to identify which category the various lengths of cycleway fall into.

Updating the Hierarchy

Taking into account the importance of the hierarchy for developing and delivering works to manage the asset it is important to consider the validity of the hierarchy being applied. The current government strategy for delivering housing through Local Development Plans means that in some areas traffic flows are evolving in step with developing communities. This will have an impact on the hierarchy over time, particularly given the parts of the network where flow and property numbers are to be considered.

In order to make sure that the hierarchy designations are appropriate the hierarchy should be revised, and relevant route designations revised every 4 years to ensure that the hierarchy develops at a similar pace to network evolution. This has been included in the action log to be taken forward as part of this Plan.

It may be necessary to temporarily upgrade the hierarchy of a road where a road is being used as a diversion route for 1 month or more, where the traffic volumes increase. Temporary changes shall be recorded in the Asset Management System.

Carriageway Hierarchy

Code	Description	Carriageway Attributes
R	Resilient Network	Is an 'A' class road *or* Has a Key Service* located on it or is required by the Key Service to gain access to the Resilient Network *or* Is an Emergency Diversion Route for the Trunk Road network *or* Is a road identified with an isolation factor associated with the winter maintenance plan (severe weather gritting route)
H1	Main Distributor	Is RURAL and has an AADT of > 5000 *or* Is URBAN and has an AADT of > 2000
H2	Secondary Distributor	Is RURAL and has an AADT of > 1500 *or* Is URBAN and has an AADT of > 1700
H3	Tertiary Distributor	Is a 'B' class road *or* Is RURAL and has an AADT of > 151 *or* Is URBAN and has an AADT of > 101 *or* Has > 200 Residential Properties *or* Has > 10 Commercial Properties with a density of ≥ 50 Properties per Km
H4	Local Access Road	Is an URBAN 'C' class road *or* Is an URBAN Bus Route *or* Is RURAL and has ≥ 28 Residential Properties with a density of 50 to 100 Properties per Km *or* Is URBAN and has ≥ 28 Residential Properties with a density of < 100 Properties per Km
H5	Local Road	Has ≥ 50 Residential Properties with a density of < 10 Properties per Km
H6	Minor Road	Is Metalled
H7	Track	Un-Metalled Is suitable for some Motor Vehicles
H8	Unsuitable for Motor Vehicles	Un-Metalled Unsuitable for Motor Vehicles

Table 6: Carriageway Network Hierarchy

***** Key Services Fire, Police, Ambulance, A&E Hospital, Gritting Depot, Emergency Diversion for Trunk Road Network or connects these to the Strategic (Trunk) Road Network

Footway Hierarchy

Code	Description	Footway Attributes
F1	Primary Walking Route	Is a Pedestrianised Zone as indicated by the presence of Diagram 618.3B in Traffic Signs Regulations & General Directions 2016 or a derivative of it. *or* Has Belisha Beacons indicating a zebra crossing located on it *or* Has Flashing Amber Warning Lights (FAWLS), indicating a school crossing patrol, located on it *or* Has an Educational Facility located on it.
F2	Secondary Walking Route	Is URBAN and is on a BUS ROUTE *or* Has > 10 Commercial Properties, including retail use located on it and is used by Key Services
F3	Tertiary Walking Route	Has > 5 Commercial Properties, including retail use located on it and is used by Key Services
F4	Local Access Footway	Has a 'bound' or slabbed surface
F5	Rights of Way (Footpath)	See NCC 'Countryside Access' for info

Table 7: Footway Network Hierarchy

Cycleway Hierarchy

Code	Description	Cycleway Attributes
C1	Cycleway	On Carriageway
C2	Cycleway	On Footway
C3	Remote Cycleway/Trails on Highway	Cycleway or route on designated facility off carriageway or footway

Table 8: Cycleway Network Hierarchy

Critical Infrastructure Assets

Nottinghamshire County Council does not currently have critical infrastructure assets identified which support network resilience in accordance with section 13.4 of HMEP Highway Infrastructure Asset Management Guidance. Examples of these assets may be structures supporting critical routes or drainage systems that maintain the availability of particularly important routes.

In order to validate the hierarchy, set out above this activity should be undertaken and designations reviewed accordingly. In addition, action plans should be developed in the event that the asset does become compromised to assist in coordinating a response.

In some cases, a safety and security approach may be required involving liaison with key stakeholders, both internal and external such as Emergency Planning and the Police service.

Review of Network Hierarchies

Ensuring that the network hierarchy evolves with the network is an important factor in maintaining the appropriateness of the risk management aspects of its purpose. An example of this is the delivery of large new residential or commercial developments that alter the character and usage of surrounding roads.

The County Council currently operates a dynamic approach to developing hierarchy by receiving feedback from the inspectors on character, usage and routes being upgraded or downgraded as required. The adoption of a new asset management system in Causeway's Alloy software may result in opportunities to automate this process and this should be investigated through exploration of the new system.

Highway Asset Lifecycle Planning

A highway lifecycle plan describes how an asset will be managed throughout its lifetime. In Nottinghamshire, a lifecycle plan helps determine when and how maintenance should be carried out on each key highway asset group, as well as how much investment is required. Nottinghamshire County Council's highway assets transition through stages across their lifespan:

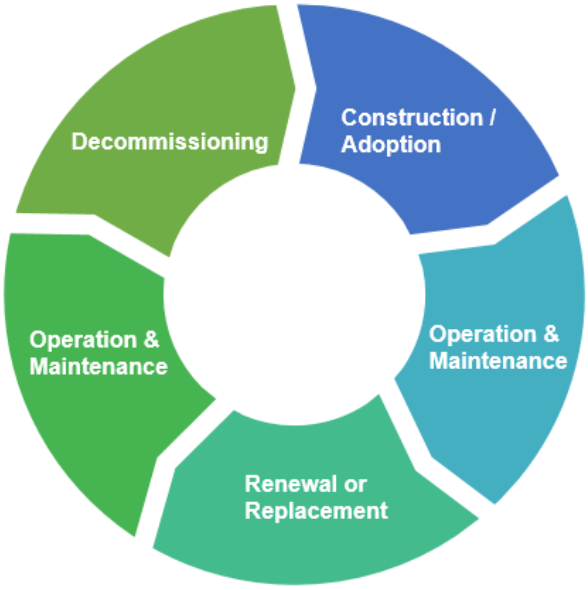


Figure 4: Highway Asset Lifecycle

Creation / Acquisition	Highway assets constructed or adopted in response to either a new development, or to increase Highway Network capacity
Operation & Maintenance	Operating all highway assets at a serviceable condition through routine / cyclical maintenance and minor works
Renewal or Replacement	To return highway assets to a suitable serviceable standard and condition level
Decommissioning	Disposal or removal of highway assets

Consideration of each of the above phases helps drive a shift towards longer-term asset management and planning. Such a longer-term approach is a key element of the asset management approach, influencing some lifecycle plans in the light of future development and regeneration proposals.

Lifecycle Plans have been produced for carriageways further plans are intended to be developed for the major asset groups, using appropriate methodology as set out below:

- Footways and Cycleways
- Highway Structures
- Highway Drainage
- Street Lighting
- Intelligent Transport Systems
- Other Asset Groups as identified on a needs basis

For each group of assets, the life cycle plan sets out the extent of the asset, the condition that it is in (if known), overview of the maintenance strategy for each phase of the life cycle, identifies instances where different components of the asset have different service lives, performance aspirations, risks and the investment required to meet that performance. Where required the life cycle plan will be supported by life cycle modelling which forecasts the investment required.

Inventory	Information detailing the extent of the asset and may be split into different asset types.
Performance	Sets out the current and historical condition of the asset. Where appropriate this section includes statements and standards that define the desired condition of the asset based upon customer feedback on expectations.
Levels of Service	Assess the current level of service, informed by condition assessments where appropriate, against the stated Levels of Service in this Plan.
Risk Management	Issues specific to the asset group which may prevent asset management objectives being achieved.
Maintenance Strategy	Details of the Maintenance Strategy for the asset. Information on the options and approaches available for maintenance of the asset through its lifecycle from creation through to decommissioning.
Improvement Actions & Targets	Actions are required to ensure that the asset management objectives will be achieved.

Planned Interventions, Reactive Repairs and Designing for Maintenance

Each asset group has a specification for works that is relevant to the operations undertaken. It is important that specifications for works are delivered, following appropriate design processes and suitable quality assurance processes utilised. This enables the service life of interventions to be met and enables more accurate lifecycle planning.

In most cases the nationally recognised Manual of Contract Documents for Highway Works (MCHW) is appropriate to define the specification of works, however it is sometimes necessary to develop local standards for items. This can be for a range of reasons, such as insufficient coverage of an operation in MCHW or because the standard would result in an over-engineered solution for some parts of the network hierarchy.

To manage this process, it is important that any locally accepted specifications are available to all those working on the network.

Reactive Highways Defect Repairs - Specification

Whilst it is recognised that prevention is better than cure for all highway assets, this is particularly the case for the greatest number of defects reported on the network, potholes. The prioritisation of all asset groups aims to reduce the number of defects reported, but when these repairs are deployed, they must be delivered with the aim of lasting for as long as the residual service life of the asset. Using these parameters to deliver the right repair at the right time is important for the efficiency of the service, as well as mitigating risks.

When considering what the right repair at the right time means in practice, each repair option has a service life. The right repair delivered at the right time will last as long or longer than the residual service life associated to the surrounding parts of the asset. So, in the example of a carriageway which has a residual service life of 5 years, the repair should be deployed which would meet or exceed that residual service life.

The core specification for highway defect repairs has been refreshed in 2022 to address concerns raised over the quality of some carriageway defect repairs. To address this a revised method statement on the way that minor carriageway patching repairs are undertaken was developed. This included the deployment of gangs to deliver a greater output of higher quality works.

The method statement sets out that the materials and workmanship will be delivered in accordance with the service specification and quality standards.

Quality Assurance Process

To maintain the quality of the asset, and to ensure that repairs and interventions are appropriate and long lasting it is necessary to undertake quality assurance on a sample of the works. This is an integral part of the continuous improvement process when applied to this type of activity.

The contractual arrangement with Via East Midlands has a requirement to adopt a quality management system accredited under ISO 9001. This accreditation was initially achieved in July 2017 and is reassessed periodically in accordance with the requirements of the scheme. This system forms the basis for the quality control of the outputs of the contract with Via East Midlands.

This system includes provision of training for staff to develop internal audits, this is particularly useful as it can be a valuable to develop opportunities to identify areas where continuous improvement can be focussed.

In order to improve the overall quality of works a programme of audit should be developed to act as a vehicle to both inform the quality aspect of establishing value for money and identify opportunities to deliver improvement to the service in terms of either materials use or processes.

Innovation and Continuous Improvement for Works

When considering which materials and techniques to deploy onto the network, advancements in technology should be considered. This is particularly the case as products and techniques emerge to both digitise and de-carbonise the service.

There are a wide range of benefits available to taking an approach founded in continuous improvement to both drive efficiency across the operation and improve the quality of outcomes to users of the network. As options for interventions change, opportunities should be identified, planned into works programmes, executed on site before being evaluated using a suitable method. The evaluation part of this process is critical in establishing the value of the trialled material or process.

Designing for Maintenance

The delivery of improvements to the network may occur from a number of sources. In house teams may design and deliver updates to the network, external designers may deliver a major aspect of infrastructure under contractual arrangements or developer(s) may deliver amendments to facilitate development under a legal agreement. In these cases, it is important that those officers managing the asset are engaged on the details of the scheme to inform the specification of materials and features to make them more efficient to maintain, ensure longevity and consider whole life cost.

In addition, any departures from standard should be communicated to the asset owners as part of the process for acceptance so that all options can be considered for managing the issue requiring the departure.

Managing the Quality of Utilities Reinstatements

The excavation of the highway can result in reductions in service life to the asset groups impacted. This is exacerbated by reinstatements which do not meet the specifications set out in the appropriate guidance associated to the operation of the New Roads and Street Works Act (1991) Permit Scheme.

To ensure that wherever possible service life is maintained, a robust approach to quality assurance for these works is required. To assist local authorities in this activity the Department for Transport (DfT) publishes the Specification for the Reinstatement of Openings in Highways (4th edition). This is managed by the Compliance Team at Via East Midlands.

Highway Infrastructure Asset Groups

The following sections include summaries of the main asset groups size, performance, maintenance strategy, prioritisation, and risk management. The asset groups are diverse, and this requires individual management and system approaches to ensure that there is an efficient and effective management of the asset.

Asset Growth

The highway infrastructure assets grow over time. Some asset groups, such as signage and street lighting grow quickly, others such as structures much more slowly. It is important that there is a process for managing inventory growth to both ensure that assets are reliable, captured and manage which assets are adopted. Further detail on the second part of this can be found in the section below.

In addition to the growth of the asset, the complexity of the asset also evolves as technology and systems develop. An example of this is the introduction of Sustainable Drainage Systems (SuDS) which have features that require different inspection and maintenance regimes to more traditional systems.

Growth of the asset can increase pressure on the service, to manage this effective maintenance regimes are required which are efficient. However, this is sometimes not enough, and these assets will be managed using a risk-based approach.

Amending and Adding to the Asset

There are many ways in which the asset is amended. It is important that both whole life cost and service life is properly considered to reduce the implications of increasing the amount of funding required to maintain the asset. When schemes are developed which either deliver new assets or amendments to the existing network liaison should occur between the team project managing the scheme and the asset owners. By taking this holistic approach to scheme delivery the objectives of the project can be delivered effectively long into its life.

It is important to ensure that variations to the inventory are captured to both identify the presence of the asset and programme works at a point which is suitable. An example of this is new electrical installations such as street lighting which require electrical testing. A process should be developed to ensure that assets installed are recorded by the team which manages the asset groups impacted. This should be linked to the process which ensures liaison.

Carriageways

Inventory

The carriageway asset in Nottinghamshire is the most valuable part of the wider highway infrastructure asset. Table 9 below summarises the road length in the county. The inventory of the data is stored in GIS layers and specific network details are also managed within Causeway Horizons.

Code	Hierarchy Description	Length (Km)
R	Resilient Network	611
H1	Main Distributor	584
H2	Secondary Distributor	264
H3	Tertiary Distributor	453
H4	Local Access Road	600
H5	Local Road	457
H6	Minor Road	1,429
H7	Track	48
H8	Unsuitable for Motor Vehicles	12
	Total Carriageway Length	**4,456**

Table 9: Nottinghamshire Road Lengths

The majority of the network is of an evolved nature; however, sections of the principal road network has been designed, and since the 1950's housing estates. These carriageway types have differing management needs, particularly around the integrity and effectiveness of drainage which is a key support asset for carriageways.

Performance

The condition of the network in Nottinghamshire is measured using a number of survey methods. Surface Condition Assessment for the National Network of Roads (SCANNER) is deployed in accordance with current DfT requirements on the A, B and C class roads. A SCANNER vehicle does not specifically record potholes. Instead, it identifies that there is surface damage and deterioration on that section of the road, according to the parameters that it measures.

The SCANNER survey records many parameters, a small subset of these parameters are used to generate a Road Condition Indicator (RCI) score, giving an indication of the surface condition at that specific location. The RCI enables benchmarking across local authorities. The summaries below set out the 2022 – 2023 benchmarking using data provided by the DfT, which is published by road classification.

The current survey regime for the SCANNER survey is for the survey to be undertaken in one direction every year on the A and B class road network. This results in 100% coverage being achieved across a two-year cycle. The C class network is surveyed on a three-year cycle.

The unclassified road condition is measured using Course Visual Inspection (CVI) and the current data is set out in figure 7 below. This is an inspection undertaken by accredited inspectors and the defects recorded develop a score. The survey covers around a third of the network per year meaning that it takes 3 years to build a complete view of the carriageway network's condition.

Carriageway Life Cycle Model

As part of the asset led approach, a carriageway life cycle model has been developed. The model is based on nationally accepted; life cycle planning toolkit endorsed by UKRLG. The model provides information on levels of service that can be achieved with a range of budget constraints and treatment strategies.

Seven scenarios have been analysed:

1. Baseline
2. Steady state for all roads
3. Target condition
4. Reversing the recent decline in condition
5. Additional funding over two years (EMCCA bid)
6. Additional funding over five years (EMCCA bid)
7. Optimised treatment

In addition, a backlog calculation was undertaken in order calculate the amount of investment required to eliminate all current maintenance needs.

The results of the analysis have been formed using an assumption that the network condition data is sufficiently accurate in terms of reflecting the network condition, risks and maintenance priorities.

As part of the development of the carriageway life cycle model, a benchmarking exercise was undertaken with selected peer authorities in order to better select target conditions for life cycle modelling scenarios. The benchmarking exercise used the latest nationally available condition data published by the Department for Transport (DfT) and the chart below sets out the result of this:

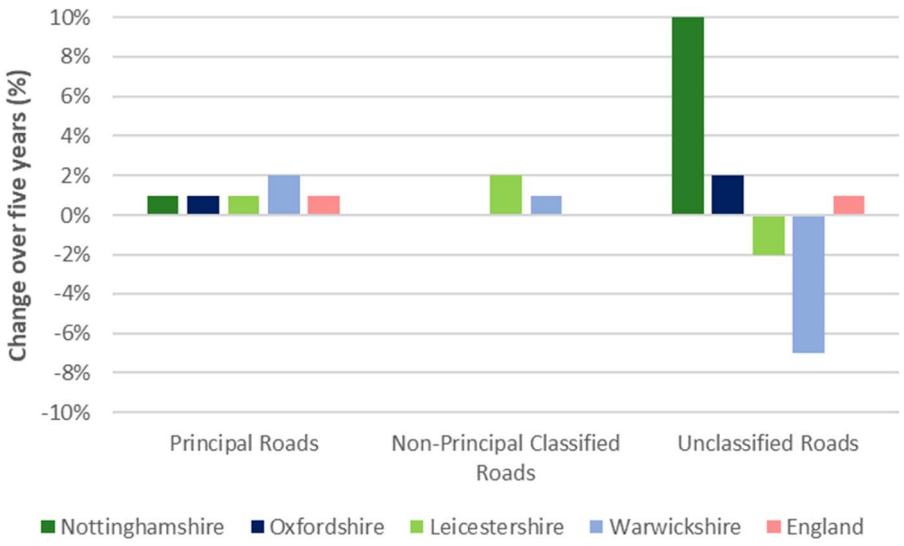


Figure 5: Peer Group Benchmarking - Five-year trend in condition by type of road

Current Carriageway Condition

The condition of the A (548.5 km), B (282.70 km) and C (789.47 km) Roads in the county is generally good when compared to the wider regional and national performance values.

Figures 6 and 7 below set out the recent performance of the network against scores of 100 or more, which is the point at which maintenance should be considered.

When considering the trajectory of the trends shown below (figure 6) the A class principal road network fluctuates between 1.3% and 2% although there is a slight worsening of condition over this period, likely a result of a combination of factors such as increased weather damage or reduced works programmes. The B and C class road network (figure 7) paints a different picture with an improving trend across the period.

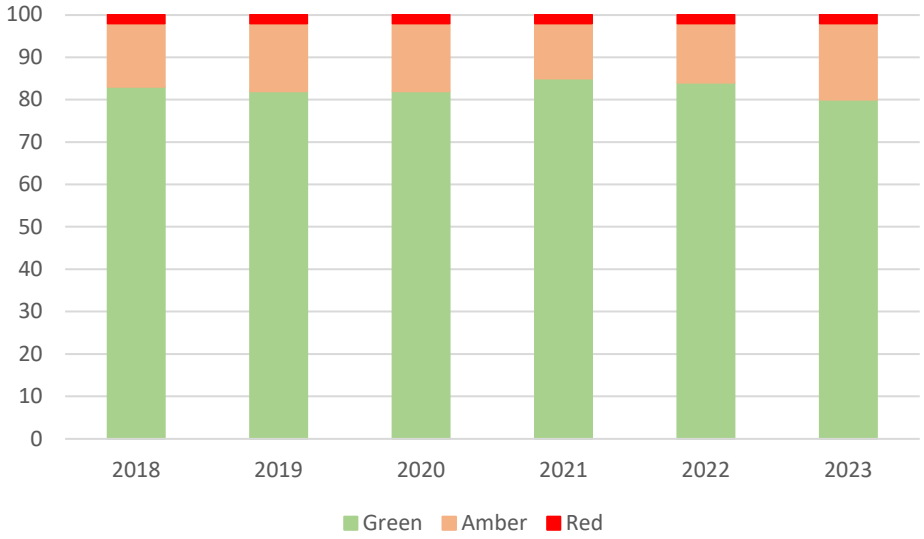


Figure 6: Condition of A Class Roads

It is sometimes important to balance the data gathered through this survey type with information about what road users 'see' when using the network. It should be noted that the 'red' sections are not grouped together but spread across the network, interspersed with sections of Amber and Green. The sections which contribute to these 'red' sections represent a small percentage of the overall network lengths. The consideration of the condition dispersion is a key factor in ensuring the corporate objectives of Nottinghamshire County Council are met and is delivered through the candidate list process.

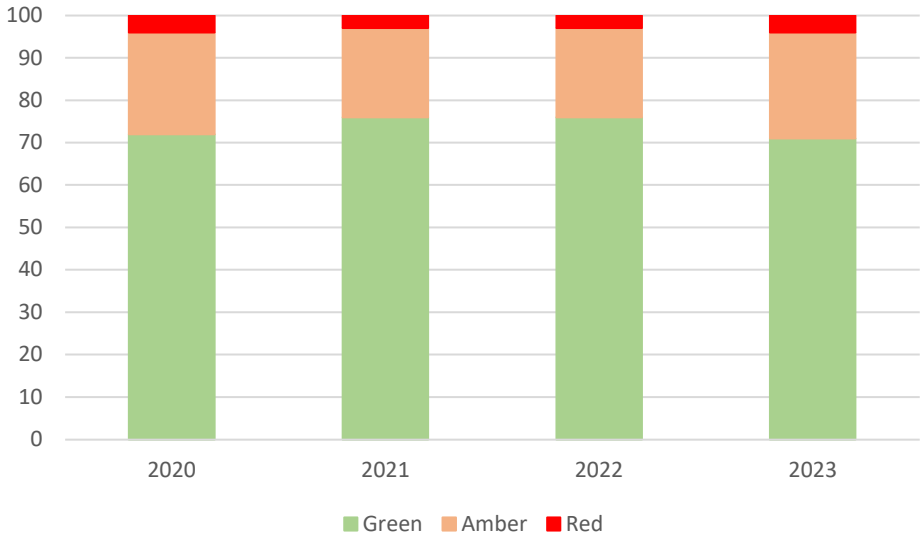


Figure 7: B and C Class Road Condition

In addition to the SCANNER Survey, the A and B class road network is subject to skid resistance survey undertaken with a Sideways force Coefficient Routine Investigation Machine (SCRIM). This is undertaken in the nearside wheel track at 50km per hour and whilst the survey data is reported to the DfT it is important in addressing safety issues on the network associated to skid resistance of surfaces. The survey coverage is to cover this network on a three-year cycle. Parts of the C road network are also subject to survey based on collision records.

The current survey regime is based on classification to align to the DfT reporting requirements. However, a more appropriate way of using the data is based on the network hierarchy. An assessment of this opportunity will be undertaken.

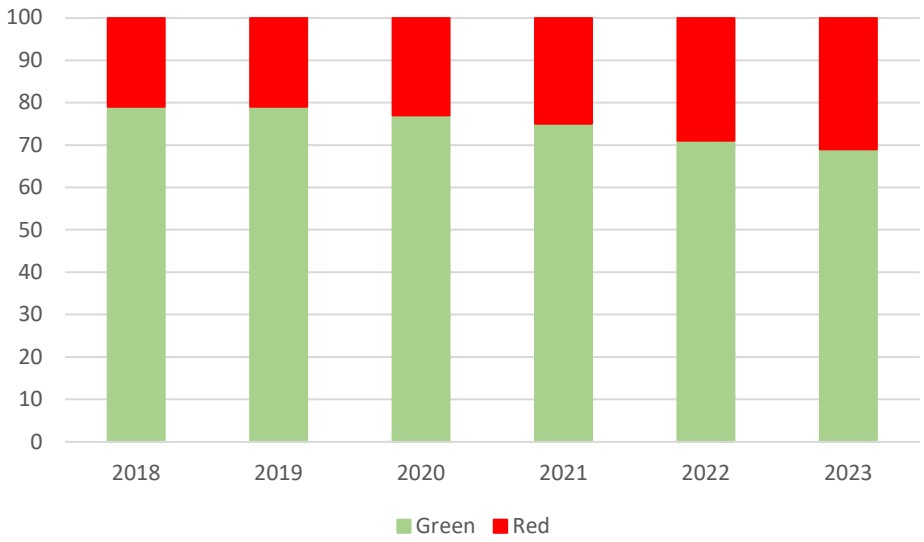


Figure 8: Condition of Unclassified Roads

The percentages where condition is highlighted as deteriorating is higher on the unclassified part of the network (figure 8). This is not uncommon as the method of measurement is fundamentally different. The CVI survey outputs only red and green bands, so some defects identified as 'red' via CVI would likely be Amber on a SCANNER return. There is no direct correlation that allows this to be balanced, so engineers must carefully use the condition data alongside other data and information to build a picture of condition on the network.

To improve the performance of the unclassified road network Nottinghamshire County Council is currently undertaking a trial to better understand condition using a video survey. The potential frequency of the survey also allows rapid changes in condition to be identified. The important factor with this survey type is that it is more representative of 'what the road users observes'. By shifting to this assessment method condition can be more accurately assessed. This enables better quality programming decisions, which leads to an improvement in overall condition, aligned to improved customer satisfaction in the highway environment as works are more effectively targeted. The prioritisation section sets out the detail of how these surveys are integrated into the creation of programmes.

These machine-based surveys are supplemented by an Annual Engineering Inspection (AEI) which is applied to sections or routes of the network where candidate sites have been identified. This activity assists in defining treatments, including the identification of sites where preventative treatments may be appropriate.

There are a number of Performance Indicators which relate to the performance of the carriageway asset. These are as follows:

Reference	Description	Target	23-24 Outturn
130-01	Percentage of A roads not requiring planned maintenance	> 96%	98% ↑
130-02	Percentage of B & C roads not requiring planned maintenance	> 91%	96% ↑
LTP 9	Unclassified roads not requiring planned maintenance	> 81%	69% ↓

Table 10: Primary Carriageway Condition Performance Indicators

These Performance Indicators aim to ensure the condition of the network, improving safety, customer satisfaction, and attractiveness of the network for all users. These performance indicators are

complementary to the other indicators across the service and work together to improve the experience for road users across the network.

Levels of Service

Table 12 below sets out the levels of service for the carriageway asset.

Aspect	Levels of Service
Safety	▪ Ensure the carriageway asset remains in a safe state for all users. ▪ Reduce claims made against the County Council due to the condition of the asset.
Serviceability	▪ To ensure that the network is maintained within agreed target thresholds. ▪ Enhance modal shift aims as opportunities present themselves. ▪ To manage the ride quality of the asset for all users.
Sustainability	▪ Reduce carbon emissions associated to the maintenance of the asset. ▪ Sustainably specify and source treatments regarding natural resources such as aggregates. ▪ Manage our operation to minimise environmental impacts. ▪ Maintain the network to make it attractive to all modes of transport and encourage modal shift to active travel.
Customer Service	▪ Improve journey time and quality. ▪ Ensure accessibility for all communities. ▪ Improve customer satisfaction as measured through the NHT Feedback survey.

Table 11: Levels of Service for the Carriageway Asset

Risk Management

The following are responses to managing risks relating to managing the carriageway asset. In addition, risks are managed using a robust prioritisation process which takes into account the key cornerstones of safety and resilience.

Response to Environmental Challenges	▪ There are a number of environmental risks associated to maintaining the carriageway asset. These can be related to on-site operations or related to the planning of works. ▪ Working in sensitive areas requires additional planning and in some cases approvals to undertake some works. This needs to be planned in the pre works process to manage risks.
Response to Economic Challenges	▪ The economic risks on the service are significant. The budget availability to deliver an optimised service is not available, so decisions are required to manage the financial resource effectively to maintain the network. ▪ This is compounded by the elevated cost of delivering the service due to current inflation in the construction industry. To manage this careful

programme prioritisation and scheme specification is required to deliver value for money and ensure sufficient coverage is attained.

Response to Customer Feedback	▪ Feedback from a variety of sources is received either via direct correspondence from network users or via liaison undertaken by district managers with members. This feedback is considered and fed into the candidate list system of prioritising works.
Collaboration with Stakeholders	▪ Collaboration occurs through a number of routes, there is feedback from Ward members which informs the development of the candidate list. Parishes also feed into the process through these Ward members.
Response to Maintenance Strategy adopted	▪ Adopting a “Worst First” approach to highway maintenance, where the most deteriorated roads are repaired first, can lead to increased costs, inefficient use of resources, and a deteriorating road network over time. ▪ Fixing problems before they threaten the structural integrity of the road is usually more economical. ▪ A data-driven asset management approach, which uses information and technology to make informed decisions, can be more effective than the “Worst First”.

Maintenance Strategy and Operational Approach

The maintenance strategy for the management of surface condition is carefully balanced in the candidate list process. More details of the way this process works can be found in the prioritisation section below, but the overall principle is to consider data and information from a variety of sources. A detailed process of weighing sites is undertaken, and changes in the forward programme to evaluate emerging issues are possible to properly manage risk on the network and improve the safety and serviceability of the highway infrastructure.

There are two strands to the maintenance approach for carriageways, whilst it is most effective to deliver all carriageway works as a programmed renewal, it is necessary to deliver reactive works to manage the integrity of carriageways. The 2022 Highways Service Improvement Plan identified a number of improvements to be implemented to better identify and specify repair works for increased longevity. This may open other opportunities for road surface treatments such as surface dressing in some parts of the network.

Linked to the above, all repairs should be ‘right first time’ unless there is an overwhelming need to deliver a repair which is necessary to ensure the safety or integrity of the network. In order to develop better quality, and therefore increased longevity it is necessary to undertake quality assurance processes, such as supervision and audit of repair and agents managing the quality of sub-contractors. In the cases where it may be necessary to deliver a reactive repair of a lower standard than the prescribed specification for the hierarchy in question, such as an emergency, or the surrounding surface is in a poor state of repair a best possible approach will be used. Any temporary repairs should be identified and repaired with permanent fixes at appropriate times.

Where full reconstruction is required, it is sometimes useful to consider recycling. The use of in-situ recycling is where the fabric of the existing road is broken up and the material reformed into the structure of the road. It is a fast way to deliver full reconstruction with less time on site and reduced carbon emissions compared to undertaking a traditional reconstruction scheme. It is important to remember that this process is only applicable when the structure of the road has reached the end of its life. Because of this the programme is likely to be much smaller than the resurfacing and road surface treatment programmes. As with many options it has a window in the lifecycle of the carriageway where it is both applicable and delivers value, and that window is narrow.

Some of the older bituminous surfaces in Nottinghamshire may contain Coal Tar. This is a hazardous substance and classified as a class 1 carcinogen, and as a result it is of vital importance that it is appropriately considered in the design of schemes to renew or preserve the road surface. It should be recognised that underlying older courses may have this material present. The identification of the material is usually undertaken through the taking of cores, although other testing options which give faster results are more commonplace. The consideration of the presence of Coal Tar in the materials which make up the highway remains a key part of the design process for the schemes delivered across the county.

In addition to surfacing works it is sometimes necessary to side out areas of the carriageway to remove vegetation and detritus build up. These sites are identified through the inspection teams and / or feedback from stakeholders. The current forward programme of these sites extends for around 4 years, and they are prioritised based on assessment.

Prioritisation

Works are required to the asset which are either reactive, responding to defects identified by highway inspectors or information from customers, or programmed works highlighted by the analysis of condition data and other indicators.

Reactive works are generally identified following an inspection by a highways inspector who categorises the defect in accordance with the requirements of Nottinghamshire County Council’s Highways Inspection and Risk Manual. Upon categorisation of a defect the report is fed into the repair regime and prioritised in accordance with the severity of the defect. Repairs are delivered to the network using an appropriate method for the character and usage of the network, as defined in the hierarchy.

When prioritising programmed works, there are broadly four types of repairs deployed, reconstruction, structural patching, resurfacing and road surface treatments.

The reconstruction works tend to be used in extreme cases of structural failure due to the relative cost, environmental considerations, and invasive nature of the treatment. An example of this type of treatment is the in-situ recycling programme deployed in the county, however more traditional methods can be used.

Resurfacing works are more straightforward renewal of the surface course, although some isolated repairs to the binder course is sometimes appropriate. The service life of the surface course ranges from 7 to 20 years depending on the options deployed.

Finally, an important tool to extending the life of road pavements is road surface treatments. There are a wide range of options, and these treatments are both lower cost than resurfacing options and has lower carbon implications.

In all cases it is important to consider whole life cost when selecting treatments. Whole life cost should include the financial cost of the treatment and the environmental cost of delivering the works. For example, a lifecycle that includes road surface treatments is likely to be a lower cost option, whilst resulting in a lower carbon emission across the total event of the lifecycle.

The character and usage of the network determines which treatments are applicable and they are identified using the information held in the candidate list. The candidate list is developed using a variety of inputs as outlined in figure 9 below.

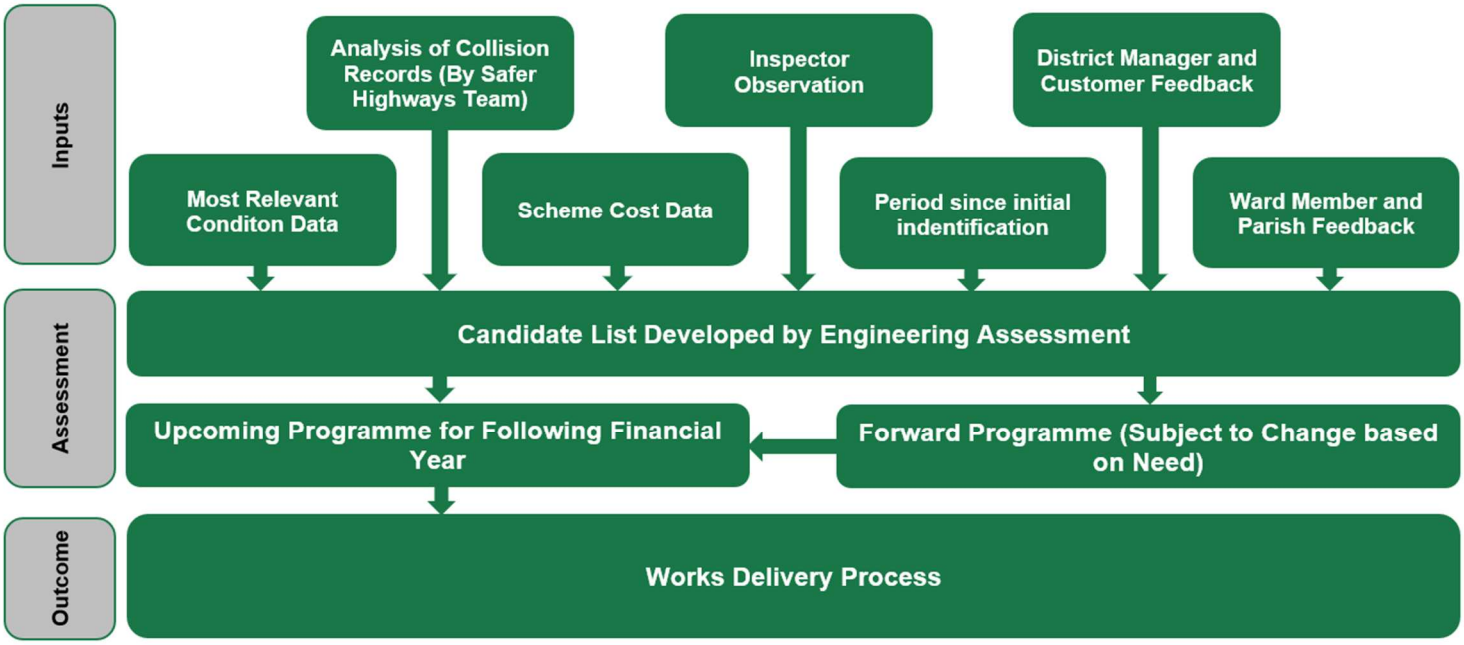


Figure 9: Candidate List Process

The candidate list extends beyond the budget availability for the upcoming financial year. To develop a forward programme the schemes on the candidate list are assigned estimated costs for delivery and the total value of the available budget is identified based on the current priority. It is important that the list remains flexible to allow rapidly emerging issues to be addressed in line with a risk-based approach. The current forward programme is assigned diminishing values to allow sufficient float to manage the evolving needs of the network effectively.

Asset Lifecycle Milestones

The key considerations for the asset milestones for the carriageway asset group are as follows:

Creation / Acquisition	Most of the assets created in the carriageway portion of the wider asset occurs via developers requiring the adoption of new developments. This process is managed via the process set out on the website, which includes a suite of specifications to ensure that these assets are consistent, have longevity and are easy to maintain in the future. This approach ensures an optimised whole life cost can be realised.
Operation & Maintenance	In some cases, reactive repairs are required to address defects in the carriageway asset. These tend to be required as the surface comes to the end of its life. In addition to direct works to the asset, support systems such as drainage require maintenance to extend the operational life of the asset, so a holistic approach is required.
Renewal or Replacement	The renewal of the carriageway occurs as needed. There are options to apply interventions that treat the surface and therefore extend the life of a pavement. These can be used to make significant savings in both cost and carbon emission if timed well.
Decommissioning	The carriageway asset is rarely decommissioned in its entirety with a more common outcome being to transfer it to another asset group, such as cycleways and footways. When carriageways are decommissioned, this would normally be because of an improvement to realign the road in question or extinguish rights entirely. In these cases, the process for removing the asset from the inventory and recording the change can be made in the inventory on a case-by-case basis. In accordance with the requirements of the Highway Infrastructure Asset Management Policy any redundant assets will be removed for re-use or sustainable disposal.

Improvement Actions

In order to develop the service and further embed continuous improvement principles in the operation of managing the carriageway asset a number of developments are to be explored. The first of these is the implementation of an expanded in-situ recycling programme which has been discussed elsewhere in this Plan. This highlights the commitment of the service to delivering innovative improvements and carbon reduction.

In accordance with the outcomes of the Highway Service Review the use of cold laid asphalt materials to repair carriageway defects is to be minimised. This is currently being addressed through the work of the structural patching gangs which are funded until 2027, and a continuous improvement approach is to be followed to make the most of this investment.

In order to support the approach to deliver the right repairs at the right time that are effective at addressing defects and reducing reactive demand, it will be necessary to develop guidance around the selection of materials and methods deployed across the network. This may lead to the requirement to develop specifications or other supporting information.

To supplement this further awareness of emerging options for managing the network will be explored, and if appropriate added to the palette of treatments that are deployed on the network. The overarching goal is to deliver lower whole life cost whilst maintaining performance of the asset.

The DfT have been developing a data standard for the measurement of carriageway condition. This activity has the possibility of allowing a wider range of survey methods to be deployed on the network. Emerging digital technology should be evaluated with a view to establishing if it can be used to develop

more effective treatment programmes across the network. It is likely that a shift in approach may be appropriate to a subset of the network, although these methods should be assessed using the continuous improvement process to ensure that the identified benefits are delivered.

In order to better understand the current backlog of works in the carriageway asset a lifecycle plan is being developed which will investigate this backlog along with the development of a range of investment scenarios for its management.

Finally, the candidate list process should be evaluated to identify opportunities to include more data prioritisation to refine the list. An example is to utilise hierarchy information alongside claims and pothole defect data.

Cycleways and Footways

Inventory

The current footway and cycleway network in the county is 4,337km. This part of the asset grows as highway space is reassigned to walking and cycling and through improvements delivered by both Nottinghamshire County Council directly and developers operating within the county. It should be noted that this asset group excludes the routes identified as Public Rights of Way, referenced in the Nottinghamshire County Council Rights of Way Management Plan (ROWMP).

Cycleway/Footway Environment	Length (Km)
Urban	3,717
Rural	620
Total	**4,337**

Table 12: Inventory Summary

When considering the importance of this asset group, its usage needs to be considered, particularly in the context of encouraging residents to make active travel journeys. A poorly maintained network will likely reduce the attractiveness of using these areas of the wider asset, failing to deliver the wider strategic goals of the organisation.

There are situations where this asset is modified by third parties such as property owners who wish to drop a kerb to create a vehicle crossing. On classified roads this requires planning permission which allows the local highway authority to comment on the works. In all cases works within the highway requires permission from the local highway authority. This safeguards the quality of the works by requiring that it is completed to the Nottinghamshire County Council Specification. This is an important factor in maintaining the integrity of the inventory.

In addition, a trial is to be undertaken allowing 10 channels to be installed within the footway per district to assist residents with electric vehicles, but with no off-street parking to charge their vehicles. The specification and management of these channels will need to be carefully managed to ensure the integrity of the asset. Further details can be found in the section which outlines electric vehicle charging infrastructure.

Performance

The County Council is currently undertaking review of the way that condition data is gathered on this part of the inventory to ensure that the right information informs decisions made on the management of the network. In order to develop this a trial will be required to evaluate the use of a revised system for this purpose.

When considering the performance of the network it is important to take into account its character and usage. Also, the DfT's Inclusive Mobility document sets out that opportunities to improve the network for all users should be taken, and maintenance work is an ideal opportunity to undertake minor improvements to uplift the accessibility of the network. When works are identified a process should be followed to take advantage of these opportunities where possible.

In addition to the points raised in the previous paragraph, cycleway assets have additional safety considerations which include markings, and signage.

As with the carriageway asset an Annual Engineering Inspection (AEI) is applied to sections or routes of the network where candidate sites have been identified to supplement more formal surveys. This activity assists in defining treatments, including the identification of sites where preventative treatments may be appropriate.

Levels of Service

Table 14 below sets out the levels of service for the cycleway and footway asset.

Aspect	Levels of Service
Safety	▪ Ensure the cycleway and footway asset remains in a safe state for all users. ▪ Reduce claims made against the County Council due to the condition of the asset.
Serviceability	▪ To ensure that the network is maintained within agreed target thresholds. ▪ Maintain, and where possible improve the user satisfaction for the asset. ▪ Ensure that the asset remains available for use.
Sustainability	▪ Maintain the network to make it attractive to all modes of transport and encourage modal shift to active travel. ▪ Reduce carbon emissions associated to the maintenance of the asset. ▪ Sustainably specify and source treatments with regard to natural resources such as aggregates. ▪ Manage our operation to minimise environmental impacts.
Customer Service	▪ Improve journey time and quality. ▪ Ensure accessibility for all communities

Table 13: Levels of Service for the Cycleway/Footway Asset

Risk Management

The following sets out the responses to managing risks relating to managing the cycleway/footway asset. In addition, risks are managed using a robust prioritisation process.

Response to Environmental Challenges	▪ There are a number of environmental risks associated to maintaining these assets. These can be related to on-site operations or related to the planning of works. ▪ Working in sensitive areas requires additional planning and in some cases approvals to undertake some works. This needs to be planned in the pre works process to manage risks.
Response to Economic Challenges	▪ The economic risks on the service are significant. The budget availability to deliver an optimised service is limited, so decisions are required to manage the financial resource effectively to maintain the network. ▪ The condition and construction of the asset is such that more invasive treatments are required which are more expensive to deliver. ▪ This is compounded by the elevated cost of delivering the service due to current inflation in the construction industry. To manage this careful programme prioritisation and scheme specification is required to deliver value for money and ensure sufficient coverage is attained.
Response to Customer Feedback	▪ Feedback from a variety of sources is received either via direct correspondence from network users or via liaison undertaken by district

managers with members. This feedback is considered and fed into the candidate list system of prioritising works.

Collaboration with Stakeholders	▪ As with the carriageway asset collaboration occurs through a number of routes, there is feedback from Ward members which informs the development of the candidate list. Parishes also feed into the process through these Ward members.

Maintenance Strategy and Operational Approach

As with the carriageway asset, reactive repairs are required to ensure that the asset remains in a useable state. In all cases the overriding mantra is to deliver a 'right first-time' repair to the network to reduce operational costs, carbon emissions and disruption.

In order to ensure that where possible routes do not fall into a state of disrepair schemes are identified using the candidate list process outlined above in figure 9. These can often have non-invasive treatments applied to return them to an as new condition without incurring the financial or environmental costs of a reconstruction scheme. Undertaking this preventative maintenance is a valuable tool in ensuring the overall condition of the asset is maintained and where possible improved.

Similar to the carriageway asset a detailed process of weighing sites is undertaken, and changes in the forward programme to evaluate emerging issues are possible to properly manage risk on the network and improve the safety and serviceability of the highway infrastructure.

The nature of the asset necessitates reactive repairs from time to time. The specification of these should be 'right first time' and appropriate specification deployed for the nature of the defective areas. It is important that the specification considers the use of the asset and removes risk to users.

Flags and block paved areas are more time consuming to repair, in these cases a 'right first-time' approach is critical to ensure longevity of repairs, in turn delivering long term mitigation of risk to users. in some cases, and where it is appropriate, it may be beneficial to consider the removal of flags and block paving and replacing with bituminous material options. This principle will require review prior to implementation so clear parameters are set out.

The approach should be evolved as further information is made available through surveys or feedback. To develop the most effective way of managing the asset a lifecycle plan is to be developed which considers funding scenarios and builds upon condition data to develop a longer-term view of the costs of maintaining the asset alongside implications of underinvestment. These tools can be used to develop funding bids to support the corporate objectives of the County Council.

In addition to surfacing works it is sometimes necessary to undertake works to areas of footways and cycleways to remove vegetation and detritus build up. These sites are identified through feedback from stakeholders or through the inspection teams. The current forward programme of these sites extends for around 4 years, and they are prioritised based on assessment.

Prioritisation

Works are required to the asset which are either reactive, responding to defects identified by highway inspectors or information from customers, or programmed works highlighted by the analysis of condition data and other indicators through the candidate list.

Similar to carriageway defects, reactive works are generally identified following inspection by a highways inspector who categorises the defect in accordance with the requirements of Nottinghamshire County Council's Highways Inspection and Risk Manual. Upon categorisation of a defect the report is fed into the repair regime and prioritised in accordance with the severity of the defect. Repairs are delivered to the network using an appropriate method for the character and usage of the network, as defined in the hierarchy.

Programmed works are identified using a candidate list of schemes as set out in figure 9. This is based on observations from various sources and the recorded condition of the asset. As a general rule the approach for the selection of schemes is to undertake the 'worst first' to ensure that the overall condition

of the asset is safe and accessible for all users, although preventative maintenance will be scheduled where appropriate.

This prioritisation will require review as the emerging LCWIP is published. As the infrastructure grows it is increasingly important that maintenance is considered to ensure that the benefits that the scheme deliver continues to be delivered as the scheme ages. Further consideration should be given to the designing for maintenance section for those delivering schemes that develop this asset group.

Asset Lifecycle Milestones

The key considerations for the asset milestones for the cycleway/footway asset group are as follows:

Creation / Acquisition	The majority of these assets are likely to be created by developers and adopted by the local highway authority under a legal agreement. However as emerging plans that encourage modal shift are developed it is likely that Nottinghamshire County Council will develop additions to this asset group. To ensure consistency similar materials are specified for all cycleways and footways and a clear service life for these assets should ensure minimal intervention requirements.
Operation & Maintenance	In some cases, reactive repairs are required to address defects in the cycleway/footway asset. These tend to be required as the surface comes to the end of its life. However, planned works to remove defects before they become sever is preferable to maintain the safe and efficient use of these routes.
Renewal or Replacement	This stage is as required. The reality with these assets is that much of the lifespan of the asset is spent in a cycle in this milestone. Highway features have a lifespan that can run into decades long and an appropriate system of component renewal, treatment to extend life and eventual replacement should be considered.
Decommissioning	As with carriageways, cycleways and footways are not decommissioned very frequently. When they are, the inventory should be amended, and any materials sustainably recycled. In accordance with the requirements of the Highway Infrastructure Asset Management Policy any redundant assets will be removed for re-use or sustainable disposal.

Improvement Actions

Most of the cycleways and footways in the county are of bituminous construction, and materials are developing to allow faster repair and construction techniques to be delivered, resulting in less disruption and carbon emissions.

Where possible options will be selected that preserve footways in an appropriate condition, reducing the need for invasive and costly reconstruction works.

As set out in the Performance section opportunities to make inclusive mobility improvements to footways, such as the provision of dropped kerbing and tactile paving in key locations, will be identified and the development of this principle is an action included in the Action Log.

As with the carriageway asset, the candidate list process should be evaluated to identify opportunities to include more data prioritisation to refine the list, such as utilise hierarchy information alongside claims or other defect data.

In order to better inform the candidate list for footways and cycleways a method of condition survey which can be regularly obtained to both benchmark condition and highlight areas which require intervention should be developed. This survey should be specified to allow a condition indicator to be developed for this asset group, which in turn would highlight both risk and maintenance need.

Highway Structures

Inventory

Highways structures are a key part of the infrastructure asset that are not always immediately visible to users of the highway. The integrity of a structure ensures the resilience of a route and failure can result in danger to the highway users, sever communities from one another or access to the network, increase disruption and reduce efficiency. The major parts of the highway structure inventory are summarised in the table below.

Inventory Type	Number of Assets *A & B Class Roads*	Number of Assets *C Class Roads and below*	Total
River Bridges	50	65	115
Over Road Bridges	12	5	17
Canal Bridges	15	13	28
Railway Bridges	22	7	29
Other Small Bridges	62	115	177
Subways	12	13	25
Culverts – 0.9m to 1.5m	80	232	312
Culverts – 1.5m to 3.0m	90	237	327
Footbridges	9	13	22
Retaining Walls (>1.37m)	72	87	159
Total	**424**	**787**	**1,211**

Table 14: Highway Structures Inventory Summary

There are more than 1200 highway structures in the county which support a number of routes across the hierarchy. These perform a diverse range of functions and are generally there to maintain the integrity and availability of other assets.

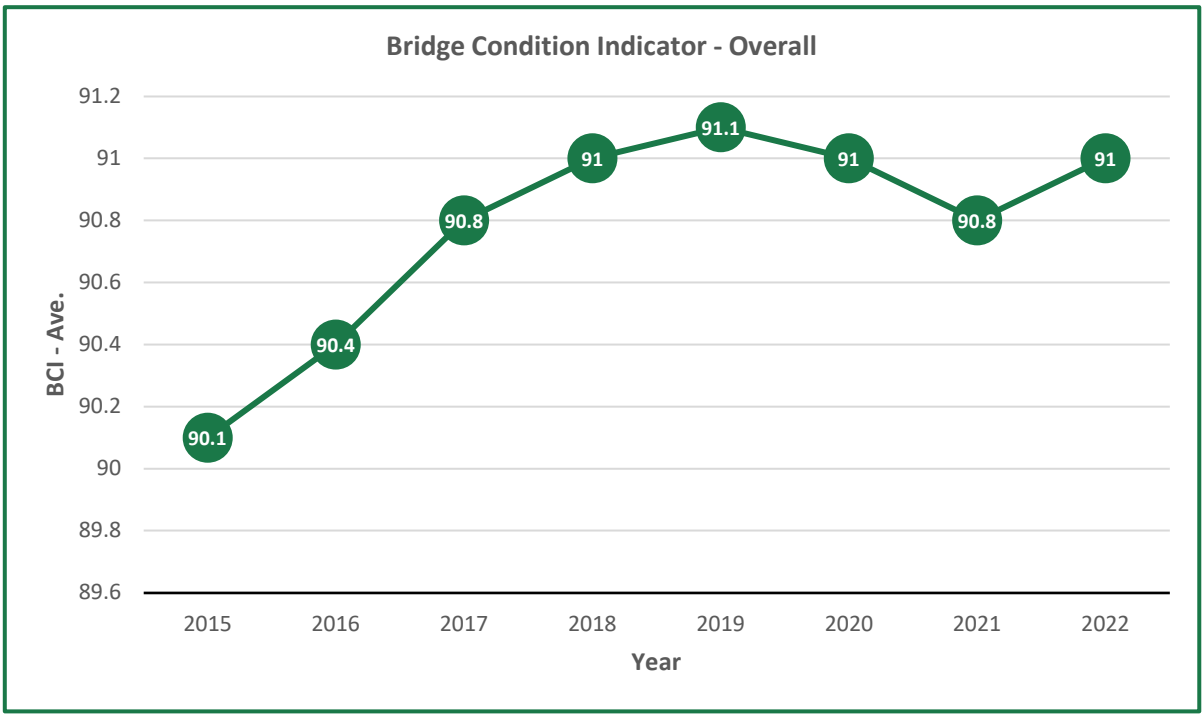
In some cases, the structures inventory is very old. There are 23 listed structures which make up part of the infrastructure. The maintenance of these assets requires careful planning and implementation to maintain the fabric of the structure in a way that is sympathetic to the regulations that govern all works to these important heritage assets.

The inventory of structures, particularly bridges is made up of a variety of material and design types. The materials have different properties, service lives and intervention types which need to be considered in the management of the asset. This places an enhanced importance on keeping comprehensive records in an accessible way.

Performance

The performance of this asset is informed by inspection, which is undertaken using a nationally agreed format developed by ADEPT. In the cases of bridges, a Bridge Condition Indicator (BCI) score is developed to give an indicator of the condition of the bridge stock. Two scores are calculated from the nationally agreed guidance, BCI Crit, the value for the load carrying elements of the structure and BCI Av which is the value for all elements considered together.

The structures asset has a number of inspection types to establish condition and inform the maintenance need on the network.



General Inspection	Remote visual inspections of structures on a 2-year cycle.
Principal Inspection	All elements of the structure are inspected within touching distance, undertaken on a 6-year cycle, unless a risk assessment allows this to be extended to 9 or 12 years.
Confined Space or Underwater Inspection	Specialist inspectors undertake these inspections of parts of the asset which are not readily available or visible. Confined space inspections occur on a 6-year cycle, a 3-year cycle for underwater inspection and these inspections may also occur after a major flood event.
Special Inspection	For specific requirements such as bridge strikes, undertaking Post Tensioned Special Inspections (PTSI) or scour following flooding as required.
Superficial Inspection	Similar to a general inspection but deployed for private bridges that interact with the highway network on a 2-year cycle.

The BCI scores for bridges have been tracked over time to set out the long-term performance of this part of the highway structure asset group. Both BCI Average and BCI Critical are defined on a scale of 100 (best possible condition) to 0 (worst possible condition).

Figure 10: 2015 to 2022 Bridge Condition Indicator – Average Values

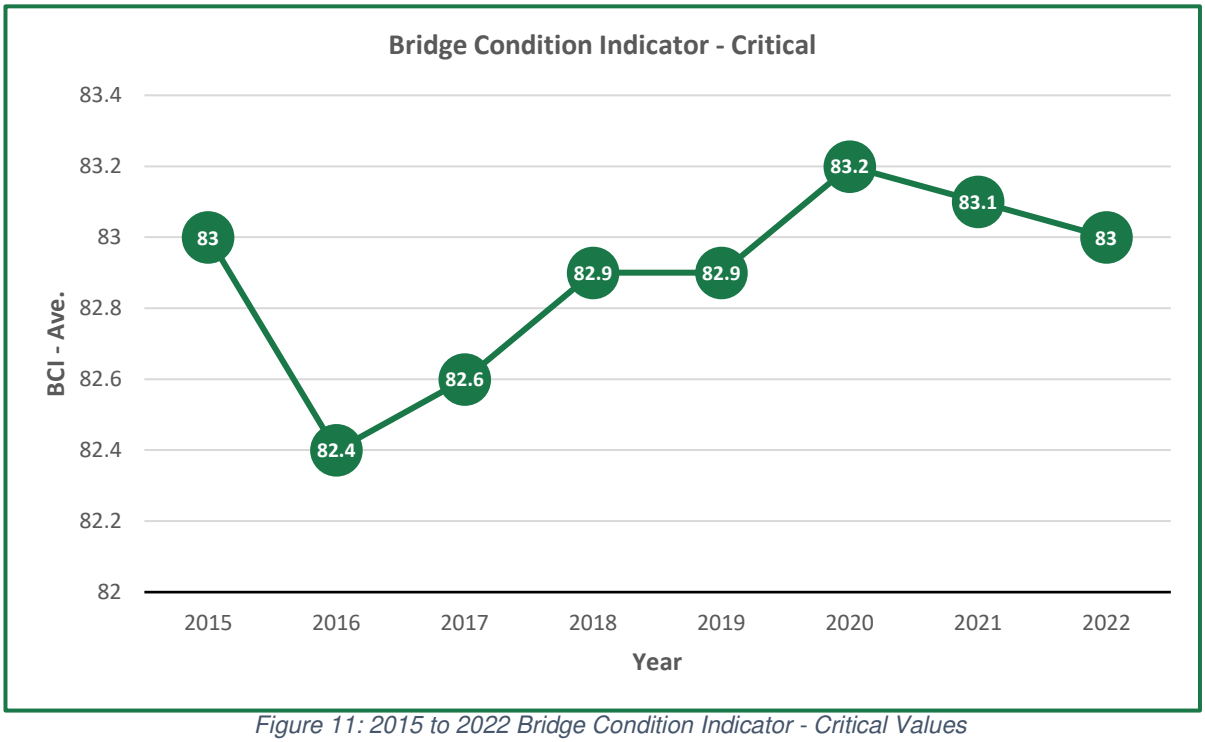


Figure 11: 2015 to 2022 Bridge Condition Indicator - Critical Values

Across the years the data is showing a steady state condition. Whilst a deteriorating value is being recorded from 2019 onwards for the overall condition, the critical structure score has remained within a one-point band for much of the period, indicating that BCI critical remains in a “Good” condition. This historic profile is used to validate the maintenance approach described later in this section. Changes to the condition profile of the asset group will require review to consider the reasons for the change, along with an appreciation of the trajectory. For example, economic pressures may lead to deterioration so mitigation may be appropriate.

The failure of these assets has a profound impact on a range of factors from ecological damage associated to the unplanned collapse of part of the inventory, financial consequence of reinstating the asset and the disruption to the travelling public.

To monitor the performance of the structures asset the following performance indicators have been developed.

Reference	Description	Target	23-24 Outturn
PI 08	Bridge stock condition index for primary elements	83%	80.2%
PI 09	Bridge stock average condition index for all elements	90%	89.1%
KPI 08	Percentage of Principal Bridge Inspections completed within stated frequency	100%	100%

Table 15: Bridge Stock and Inspection Performance Indicators

In addition, a further measurement of bridge availability is being developed to further evaluate the outcome of the service and its impact on disruption to road users.

Levels of Service

Table 17 below sets out the levels of service for the structure asset group.

Aspect	Levels of Service
Safety	▪ To maintain the structures to not endanger users of the network or users of adjacent facilities or property.
Serviceability	▪ Maintain structures within agreed performance thresholds. ▪ Ensure that assets are maintained to keep routes open for all users of the network.
Sustainability	▪ Reduce carbon emissions associated to the maintenance of the asset. ▪ Sustainably specify and source treatments with regard to natural resources such as stone, where possible. ▪ Have regard to the listed status of the historic inventory to ensure the conservation of the structure. ▪ Manage the operation to ensure no environmental impacts, particularly near watercourses and other sites of sensitivity.
Customer Service	▪ Reduce disruption due to defective structures. ▪ Limit the requirement for structural weight limits.

Table 16: Levels of Service for the Structures Asset

Risk Management

The following sets out the responses to managing risks relating to managing the highway structures asset. In addition, risks are managed using a robust prioritisation process.

Response to Environmental Challenges

- There are a number of environmental risks associated to maintaining structures. These can be related to on-site operations or to the planning of works.
- Working in sensitive areas, over water or adjacent to railway infrastructure requires additional planning and coordination and in some cases approvals to undertake works. This needs to be accounted for in programmes to manage risks.

Response to Economic Challenges

- As with other parts of the management of the asset the wider economic landscape has significant influence on the deliverability of the service.
- In order to manage a response to this risk careful prioritisation and design is required to manage costs. It may be preferable to intervene earlier to prevent minor defects become major repairs.
- Emergency repairs can result in delay to the delivery of the planned programme. In the cases of significant failure budget will need to be diverted to maintain access to communities and minimise disruption.

Response to Customer Feedback

- The structures asset performs a role which is not always obvious to users. Only when a structure requires work and the disruption to the network is realised does the impact become clear. In these situations, there is often feedback from a variety of sources and this is managed on a case-by-case basis. From time-to-time reports of a structure's deterioration is received from

members of the public, Ward Members or Parish Councils and this information is fed into the inspection regimes.

Collaboration with Stakeholders	▪ Collaboration primarily occurs with key stakeholders or statutory consultees such as the Environment Agency, Network Rail, the Canal and River Trust or other tiers of local government. Some collaboration also is undertaken with neighbouring authorities where bridges are in joint ownership and managed by agreement. This collaboration occurs as required on areas of the network identified for intervention.

Maintenance Strategy and Operational Approach

The overarching approach delivered is based on the principle that prevention is better than cure. As a result, the works identification regime is based entirely on a risk-based assessment of the defects identified through inspections, and a report based on the bridge condition.

There is no hierarchy for the highways structure assets and all decisions on maintenance need are based on the needs of the structure, the specific details of the defects or the situation and relative importance in the context of the wider network. This is evaluated in the bridge condition reports annually by the team.

The service currently undertakes around 120 principal inspections and in the region of 600 general inspections annually. All the reports from the principal inspections are analysed, works are prioritised and programmed, as necessary. Urgent works from the general inspections are also programmed for completion as soon as possible, generally in the year that the inspection found the defects. This ensures that the overall condition of the asset group is maintained.

To fund these works the DfT budget made available for the maintenance of the highway structure asset group is c£1.4m. This value has been static for the last 5 years, although does vary in the financial year based on the underspend in other parts of the service, and the needs of the asset. In addition, further funding streams may be accessed from other sources, such as central government funds. This value has traditionally maintained a broadly steady state of this asset group, however increasing pressures on the cost of delivering schemes will need to be carefully monitored to avoid a worsening in the condition of the County's structures.

Due to the nature of the repair regimes to these assets, repairs are generally considered on a 'right first-time' basis. The principle of temporary repairs is unlikely to result in value for money, although sometimes measures to mitigate the risk may be required to maintain the safety of road users. To reduce the risks associated to delivering emergency repairs a steady state regime supported by cyclical maintenance is deployed.

Cyclical maintenance programmes play an important part in ensuring the integrity of the various highway structure assets. A programme of routine replacement of waterproofing components, painting of structures, replacement of joints and other similar interventions are delivered annually. These interventions are based on the service life of the treatment being reached and feedback from the inspection to ensure intervention is both timely and cost effective. Leaving some of these components to fail can result in higher replacement costs as well as increased disruption to the network.

To facilitate the delivery of this, it is necessary to programme in a design phase to properly consider the intervention to the structure and plan the delivery of the works in such a way that financial, environmental and disruption to user risks are mitigated as far as possible.

The operational approach is sensitive to the nature of the structure asset group and the placement of these structures in the landscape and environment. Often permissions are required from external bodies such as the Environment Agency, Local Planning Departments, Network Rail amongst others. In addition, teams such as ecology colleagues will need to be consulted for some of the works to the asset group. Obtaining these permissions takes time and needs to be built into the scheme development programme. Additionally, some of these bodies require works to be undertaken in specific windows to mitigate impacts which further pressurises the programme.

The structures team also undertake works to structures to respond to concerns relating to suicide prevention raised by Stakeholders such as the Police, voluntary groups and local members. Following liaison with key groups measures may be installed such as amended parapets.

Prioritisation

Planning maintenance or improvement interventions on structures requires a slightly longer-term approach to account for the potentially significant design phases that are required. A robust data led approach is required to carefully consider the works and reduce the likelihood of abortive costs. As set out above the approach is based on assessment and the prioritisation of defect options are raised from these assessments. The assessment is based on the needs of the structure and the situation of the asset.

No Immediate Action Required	In many cases the fabric of the structure is in sufficient condition to not require intervention until the next scheduled inspection. This is based on feedback from the inspection and assessment of the report.
Increase Inspection Frequency	In some situations, and relating to a variety of defect types, it may be necessary to reduce the interval until the next inspection to monitor deterioration of components of the structure.
Plan Intervention	Some structures have defects which require work to either prevent a worsening of the bridge condition or to prevent more severe failure modes emerging. These works are programmed for the following financial year with the aim being to design and undertake the required works in that year. Taking this approach manages the overall BCI and prevents further deterioration. The aim of the service is to address all of these works in a timely fashion; however, the team may need to undertake an element of risk-based assessment in the event that insufficient budget is available to complete the full list of schemes required. In this case backlog management is required to balance emerging needs with pre-identified schemes.
Programme Urgent Works	A small number of structures require urgent works to maintain their integrity. If this kind of work is required, the scheme will essentially ‘skip the queue’ to be delivered as soon as possible and remove the risk associated with more severe failure as efficiently as possible.
Reassessment of Parameters	Occasionally the parameters of the site where a structure is located may change, this may be due to scour from a flood event or other variables that change the landscape. In the event of such a change the assessment parameters will be updated to consider the variations in risk to the asset.

When considering the prioritisation of schemes, the current approach is to identify works programmes towards the end of year one and deliver design and implementation of schemes in year two, on a rolling basis. By taking this approach to rapidly intervening the overall condition of the asset is maintained and risks of escalating remedial costs emerging through further deterioration is minimised. However, the service will need to maintain a flexible approach depending on the overall impacts of the cost increases being experienced and stretching this to a three-year cycle may become necessary, where design occurs in year two and implementation in year three.

Asset Lifecycle Milestones

The key considerations for the asset milestones for the highway structures asset group are as follows:

Creation / Acquisition	Much of the asset is inherited over time with few structures adopted unless as part of a large scheme delivered by the County Council or developers.

Operation & Maintenance	Cyclic maintenance work is generally undertaken based on records kept from experience of managing the assets. An example of this is vegetation clearance, painting of steelwork, or minor stone and concrete repairs delivered as minor works.
Renewal or Replacement	In most cases structures components are replaced or repaired, and there are a number of listed structures which have prescriptive repair methods in the event of damage. The cost of bridge replacement is high, so the preferred strategy is to make repairs to maintain structures in a timely fashion.
Decommissioning	Structures may be decommissioned in two ways, the first it to allow it to deteriorate, or for it to be removed. Underfilling has been used in some parts of the UK, however there are significant ecological challenges with this, along with a loss of opportunity for future use. When considering these approaches, the economic cost of removing the bridge should be considered against the environmental benefit of safely removing the structure and recycling components as appropriate. It is rare for structures to be removed from the inventory totally given their importance for maintaining safe access for communities and users. In accordance with the requirements of the Highway Infrastructure Asset Management Policy any redundant assets will be removed for re-use or sustainable disposal.

Improvement Actions

As with other aspects of service delivery there are opportunities to develop improved ways of identifying and implementing schemes. These might be to take advantage of technology such as enhanced asset management or inspection systems. To explore these opportunities a review of the system utilised to manage bridge records will be undertaken which will include enhanced mobile options and cloud-based storage to streamline both the inspection and works delivery process.

The Structures Team has been involved with evaluating lower carbon or more environmentally sound ways of maintaining the asset. An assessment of ‘plastic’ bridges has been undertaken for a specific site, although this option was ultimately inappropriate. The team remain committed to evaluating opportunities as they emerge, including technological developments which will both reduce the environmental impacts of delivering this part of the service and improve efficiency.

Critical assets should be identified from the inventory and plans put in place to manage these assets in the event of an issue with one of these assets. This designation will also be identified as a consideration when prioritising schemes.

Currently the prioritisation of works to the structures inventory does not take into account the hierarchy of the route that is supported or protected by the highway structure. To ensure that programme prioritisation considers the relative importance of the routes across the county the current system should be reviewed to include this parameter. In addition, a method for displaying the condition of structures across the hierarchy bands should be developed to provide a clear view on how the risk to structures is apportioned across the asset. The migration to BridgeStation will provide opportunities to develop the prioritisation further.

As part of a prioritisation review a methodology for generating a three-year programme will be investigated. Any development of a three-year programme will be subject to change as other priorities emerge across the network which may be of higher priority.

When considering the safety of the inventory, there are opportunities to operate more proactively on suicide prevention. Regular engagement with stakeholders should be undertaken and risks mitigated as appropriate.

Opportunities to make bids or other representations for enhanced funding will be monitored and cases made as appropriate.

Periodically reviews should be undertaken to identify ways of improving service efficiency or effectiveness following a continuous improvement process.

Highway Drainage

Inventory

The highway drainage assets within the county are a diverse range of features which have varied ownership. Roadside ditches are generally owned and maintained by the adjacent landowners as part of their riparian responsibilities, although the highway authority will work with landowners to ensure the safety and serviceability of the highway network. Nottinghamshire County Council are responsible for some ditches across the highway network, and these are to be included in a data collection exercise to improve the records.

The table below sets out the current understanding of drainage inventory. The coverage is estimated, although some systems will be old and may only be identified when works are delivered. There are a number of activities that are identified to improve the data integrity of the drainage asset. These have been identified through the highway service review. Ditches and grips are to be subject to a data collection activity to improve understanding of the initial features which move water off carriageways, cycleways and footways.

Other aspects of the inventory are to be collected through data collection associated to undertaking works on the network. As drainage teams undertake maintenance of the inventory, the inventory is updated to reflect the actual situation on the network. This approach is efficient and ensures that data is collected in a risk-based way, by following the prioritisation of drainage works on the network. The implementation of Alloy will simplify the recording process, in turn improving data quality and coverage.

Drainage Inventory Type	Data Coverage	Actions Planned to Develop Inventory
Gullies	Good	Manage changes to the network and updates through a ‘whole street approach’.
Grips	Improving	Data collection planned as part of the highway service review.
Ditches	Improving	Data collection planned as part of the highway service review.
Carrier Drains	Poor	Manage changes to the network and updates through a ‘whole street approach’.
Culverts	Good	Manage changes to the network and updates through a ‘whole street approach’.
Head Walls	Poor	Manage changes to the network and updates through a ‘whole street approach’.
Chambers and Manholes	Poor	Manage changes to the network and updates through a ‘whole street approach’.
Soak Aways	Improving	Manage changes to the network and updates through a ‘whole street approach’.

Drainage Inventory Type	Data Coverage	Actions Planned to Develop Inventory
Balancing Ponds	Improving	Manage changes to the network and updates through a 'whole street approach'.
Aco Drains and Beanie Block Kerbing	Poor	Manage changes to the network and updates through a 'whole street approach'.
Pumping Stations	Good	Manage changes as they occur.

Table 17: Drainage Asset Inventory Summary

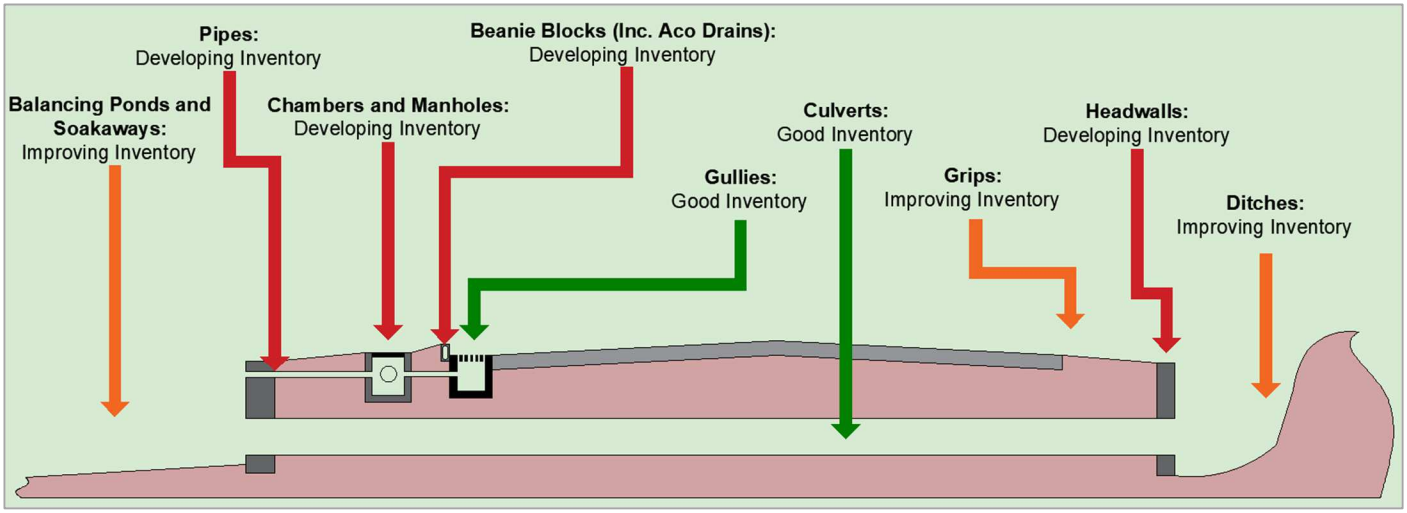


Figure 12: Drainage Asset Inventory Summary

The known portion of the inventory is circa 150,000 gullies and 18,000 offlets and similar features. Whilst other parts of the asset are partially understood, the highway service review identified that a step change in grip location information was to be developed. Growing the drainage inventory is considered important to the development of future strategies for the management and maintenance of drainage assets. There are various opportunities available to grow the known asset by taking a 'whole street' approach, these opportunities will be considered for benefits and costs and implemented as appropriate. As drainage works are undertaken unknown assets should be recorded in the area. As with other aspects of the inventory this is to be managed in Causeway Alloy where it can be made available for the use of all who interact with the drainage systems, such as those delivering improvements.

There are currently 11 pumping stations across the county highway network which are maintained to ensure reliability. Any required maintenance operations are programmed to ensure that the pump remains operational.

Performance

As part of Nottinghamshire County Council's commitment to improving the functionality of the highway drainage asset the increase in inventory coverage will be monitored so that gaps can be addressed, and coverage extended. This vital data can be shared with the Lead Local Flood Authority, and by extension local flood groups to assist in developing an enhanced understanding of all the influence on drainage across the County Council area. To facilitate this the team attends quarterly meetings to ensure a close working relationship is maintained.

In order to evaluate service delivery a Key Performance Indicator has been identified. It is important to remember that the performance of the drainage asset can have direct implications to the achievement of

other key condition metrics, particularly in the carriageway asset group and network resilience. The drainage specific indicator is set out in the table below:

Reference	Description	Target	23-24 Outturn
KPI 09	Percentage of gullies cleansed within stated frequency (gullies only)	90%	94.59% 

Table 18: Primary Highway Drainage Performance Indicators

Levels of Service

Table 20 below sets out the levels of service for the drainage asset.

Aspect	Levels of Service
Safety	▪ To reduce water accumulation on the highway to reduce water related accidents. ▪ To reduce slips and trips due to the formation of ice / snow. ▪ To minimise the damage to other asset groups caused by water, this improves the safety of the overall asset by removing defects caused by water. ▪ Maintain community connectivity in times of flooding.
Serviceability	▪ Ensure that assets are maintained to keep routes open for all users of the network. ▪ Collect data on the unknown parts of the drainage network to fill gaps and apply continuous improvement to the delivery of the service. ▪ To work with other bodies such as the Lead Local Flood Authority, Environment Agency, and other stakeholders to improve drainage performance across the county, while managing our statutory duties. ▪ Prioritise works to the network based on resilience.
Sustainability	▪ Reduce carbon emissions associated to the maintenance of the asset. ▪ To manage waste from drainage systems in an environmentally ethical way.
Customer Service	▪ Reduce disruption due to route severance in inclement weather. ▪ Improve journey times in all weathers. ▪ Maintain community resilience as far as practicable in extreme weather events.

Table 19: Levels of Service for Highway Drainage Assets

Risk Management

The following sets out the responses to managing risks relating to managing the highway drainage asset. In addition, risks are managed using a robust prioritisation process.

Response to Environmental Challenges	▪ There are a number of environmental risks associated to maintaining drainage systems. These can be related to on-site operations or related to the planning of works. ▪ Working in sensitive areas requires additional planning and in some cases approvals to undertake some works. This needs to be planned in the pre works process to manage risks. ▪ The disposal of arisings from gullies, grips, pipes, and ditches is considered contaminated waste and requires sensitive disposal.
Response to Economic Challenges	▪ Revenue activities to maintain systems can suffer from reduced funding due to pressures elsewhere in the County Council, care needs to be taken to effectively target resources and build an image of where the highest risk on the network is to achieve this.
Response to Customer Feedback	▪ Customer Feedback is received via the inspection team, district managers or directly through the CRM system. This raises risk points on the network which are evaluated using a risk matrix. The scored schemes, should one be identified, are then delivered in a ‘worst first’ regime.
Collaboration with Stakeholders	▪ Stakeholders are a valuable source of information for the drainage asset group and this liaison is managed through the Highways Management Team. Local knowledge can be a valuable resource for both identifying and delivering solutions to issues. The Lead Local Flood Authority officers are instrumental in providing information about water related issues and this information can assist in developing risk-based programmes of work. Regular meetings occur with this body to facilitate this data and information sharing.

Maintenance Strategy and Operational Approach

There are three main strands to managing the drainage asset. There is a reactive operation which deals with rapidly emerging issues to remove risk from the network swiftly, in line with the inspection manual. There is also a routine operation which undertakes a planned cleanse of known drainage assets, and a programmed element where improvements are designed and constructed to solve more serious issues on the network.

Reactive Drainage Maintenance

When investigating drainage defects, it is important to reduce the numbers of visits to site before the issue is resolved. Drainage will generally be cleansed in the first instance and in the event that a defect remains the team will identify the problem and recommend a repair. This will then be escalated to a programme, depending on the nature of the recommendation.

In terms of the other drainage assets, such as ditches, grips, headwalls etc. the approach is largely a reactive one, this is because of the relative gaps in inventory. As works are undertaken asset location, type and condition are recorded to allow this reactive part of the service to become planned, particularly in the high-risk areas.

During periods of extreme weather or flood events resources are focussed on areas of flooding to limit or remove water standing on the network or to reduce the risk internal flooding to private property where possible, and therefore mitigate risk to the travelling public and adjacent property owners as appropriate.

Routine Drainage Maintenance

The overarching approach undertaken by the drainage team is to prevent, rather than cure drainage issues across the network. To support this a cyclic programme is designed to cleanse all gullies across an appropriate time scale, generally within three years. This is varied to a targeted cleanse approach in higher risk areas based on records of flooding, silt build-up and other identified local risks.

The management of this routine element of maintenance is carefully planned to ensure that productivity, and therefore inventory coverage is high. For example, where there are areas of the network which have a high volume of on-street parking residents are notified before construction begins by letter drop. This is supplemented by a bespoke traffic management approach, appropriate for the location in question is devised to ensure that as many gullies can be cleansed as possible, with the minimum disruption to road users.

The silt levels in the gully prior to emptying is recorded and this data can be developed into a heat map where gullies that fill within the current cycle period are identified and can be considered for a more frequent regime. The same is also true of gullies that remain partially filled at the cleanse date to allow a longer period between emptying. This, combined with other sources of data such as known flooding locations allow a risk-based approach to be implemented, led by data, to drive an efficient and effective operation.

Capital Drainage Improvement

In some situations, it is necessary to develop and deliver a scheme to modify or replace parts of the drainage inventory. These are programmed in accordance with the prioritisation section below. This approach ensures that the highest risk locations are resolved on the network first, improving safety and network resilience.

There is currently a backlog of drainage schemes on the network, and this backlog is partially attributed to the forward programme. The forward programme may require amendment in the cases where a higher risk issue emerges that requires more urgent intervention.

In some cases, additional defective features will be uncovered during the implementation of a scheme. When this situation occurs, it is preferable to remain on site and organise plant and materials to complete a repair, rather than making a return visit. By taking this approach, travel time and costs are reduced and perception in the service is improved alongside improved asset performance.

Third Party Drainage Systems

The highway drainage system in the county relies on interfaces with other drainage systems. These may be land drainage, water courses or other systems within the highway. Generally, ditches are within the highway, but the responsibility for their maintenance lies with the adjacent landowner. This is known as a riparian responsibility and in cases where a ditch which is a landowners responsibility impedes the water from being appropriately managed in the highway the drainage team, supported by inspectors will liaise with landowners to reduce risks to the highway. This may include engaging legal mechanisms in extreme cases.

Prioritisation

The reactive operation is prioritised based on a risk assessment process which is based on the drainage matrix set out in Table 21 below.

The prioritisation for the cyclic cleanse is informed by data collected through the operation and has regard to the position of routes in the hierarchy and the location of known flooding points, this is an evolving process as more information is recorded.

Drainage issues which require a capital improvement scheme are prioritised using a detailed risk matrix which evaluates the severity of the issue that the drainage is causing, the character of the site in question and the hierarchy of the route. By taking these aspects into account there is a clear appreciation of the character and usage of the route which is a key component in establishing risk.

Further consideration is given to how the defective drainage impacts surrounding land uses with an escalating scale based on the severity of the impact. For example, flooding extending into land is scored

lower than flooding which impacts residential or commercial properties, especially if that impact is internal flooding.

The risk matrix is set out in Table 21 below and schemes are scored between 1 and 5, and this means that a large number of schemes can be found in each of the bands. In order to refine the sensitivity of the prioritisation it may be necessary to include data from other available sources to refine the view on risk.

Drainage Issue	Speed Limit & Geometry	Resilient Network	Main Distributor	Secondary Distributor	Tertiary Distributor	Local Access Road	Local Road	Minor Road
Standing Water < 1.0m in Width	Up to 30mph	2	2	2	2	2	1	1
	40mph (Straight)	3	3	3	3	3	3	3
	40mph (Bend/Dip)	4	4	4	4	4	4	4
	>= 50mph	5	5	5	5	5	5	5
Standing Water Up to Half Carriageway Width	Up to 30mph	3	3	3	3	3	2	2
	40mph (Straight)	4	4	4	4	4	4	4
	40mph (Bend/Dip)	5	5	5	5	5	4	4
	>= 50mph	5	5	5	5	5	5	5
Standing Water Exceeding Half Carriageway Width	Up to 30mph	4	4	4	4	4	3	3
	40mph (Straight)	4	4	4	4	4	4	4
	40mph (Bend/Dip)	5	5	5	5	5	4	4
	>= 50mph	5	5	5	5	5	5	5

Table 20: Highway Drainage Scheme Prioritisation Matrix

The current list of schemes developed using this risk-based scoring system far exceeds the available budget. A forward programme has been developed using the long list of drainage schemes and the forecast budget to create a scheme list which manages risk and network resilience. This is currently published as part of the capital works forward programme on the Nottinghamshire County Council website. As with the other aspects of the programme, the forward programme must remain flexible to allow new schemes to be introduced on a need's basis. This allows merging higher risks to be mitigated swiftly.

There are a number of soakaways that form part of the drainage asset. These have not traditionally been subject to a robust method of maintenance regime, and some are reaching the end of their service life. In order to appropriately manage these assets a programme is being developed which will prioritise replacement of those soakaways which require intervention in line with the drainage risk assessment process.

Asset Lifecycle Milestones

The key considerations for the asset milestones for the highway drainage asset group are as follows:

Creation / Acquisition	Highway drainage systems are delivered in a number of ways such as, improvements delivered directly by the Highway Assets and Development Team, highway improvement schemes or those delivered by development. In all or each of these cases the delivery of a scheme will result in the inventory being updated from the as built information for completeness.
Operation & Maintenance	Routine and Reactive maintenance is a key component to the maintenance of this asset group. It is important to target cyclical maintenance to intervene on the asset.
Renewal or Replacement	Assets are frequently renewed as part of a response to incidents on the network. This is undertaken using prioritisation and amendments are recorded in the inventory. In addition to the frequent development of drainage systems, these assets are routinely maintained by being cleansed to ensure their operational efficiency.
Decommissioning	From time-to-time systems are decommissioned. These tend to be in situations where an old system has deteriorated beyond economic repair, so a newly designed and specified system becomes required. In these cases, the inventory will be updated, and historic records retained to inform future solutions. In accordance with the requirements of the Highway Infrastructure Asset Management Policy any redundant assets will be removed for re-use or sustainable disposal.

Improvement Actions

The routine and reactive part of highway drainage maintenance is required to feed information to capital improvements in the majority of cases. To develop the efficiency of this part of the service work will be undertaken to refine the risk-based approach to deploying routine services on the network. This will consider the levels of silt recorded at gullies and known flooding hotspots as they are identified and a ‘heat map’ of risk developed from these data sets. This information should be used to develop a routine cleansing pattern that reduces risk to both the safety of road users and risk to the fabric of the highway.

This approach will allow a more focussed deployment of resources to improve network resilience. In addition, capital works to upgrade systems will focus on removing known issues and further improve the efficiency of systems.

In order to develop more efficient and effective maintenance regime a focussed review of the delivery of drainage schemes should be undertaken to identify opportunities that may be realised by developing resources to support this function. For this to be achievable review of the structure and make-up of the drainage team may be required.

Improvements may be delivered in the area of scheme prioritisation and expanded data input to further subdivide the existing scheme list to include more gradation. Examples of additional data inputs may be aspects such as those sites where there is property at risk of flooding from a highway defect or schemes which have the opportunity to develop highway network resilience in vulnerable areas.

In order to plan future operations more effectively, the drainage inventory should be further developed using both the data collected from operations and the advancements possible by the implementation of Causeway’s Alloy system. This is considered an ongoing activity and will include the use of other data sources to create a more complete drainage inventory.

Street Lighting

Inventory

This asset group is particularly important to facilitate modal shift to active travel options. The lighting of all aspects of the highway contribute to the security of users while travelling on foot or by cycle and improve the attractiveness of public transport facilities. In addition, the lighting of conflict points is a valuable road safety tool for reducing collisions during the hours of darkness.

Not all the streetlights are owned and operated by Nottinghamshire County Council. The district councils within the county have inventory which they manage, and this can lead to issues with assigning defects in a small number of cases.

In recent years Nottinghamshire County Council has embarked on a process of upgrading the street lighting luminaires from low pressure sodium lamp units to LED equivalents, this project has also included the upgrade of columns and other components as appropriate. The project was undertaken for several reasons such as reducing energy requirements and improving reliability. The consequence of this approach is to make a significant step change in the condition of the inventory. This should reduce reliance on reactive maintenance and improve customer satisfaction.

The street lighting asset is made up of a range of components. Alongside the luminaires and columns, there are a range of pole brackets, Photoelectric Control Units (PECU's), cable lengths and ducting. These components are often a range of ages, and the inspection and testing regime is important to meet both legislative duties and to deliver sound asset management principles to the ongoing maintenance of the asset group.

Table 21 below summarises the luminaire inventory which forms part of this asset group.

Luminaire Inventory Type	Number of Assets
Lighting Units (includes columns, wall brackets, up-lighters, and subway units)	95,521
Illuminated Signs	8,301
Bollards (Both Illuminated and Non-Illuminated)	5,627
Beacon Poles	1,250
Flashing Amber Warning Lights (FAWLS)	517
Feeder Pillars	1,478
Total Number of Assets	**112,694**

Table 21: Street Lighting Luminaire Inventory Summary

Table 22 sets out the types and ages of the columns which make up the street lighting inventory.

Column Inventory Type	Under 20 Years Old	Between 20 and 40 Years Old	Over 40 Years Old	Total Number of Assets
Aluminium	213	30	197	**440**
Cast Iron	29	84	184	**297**

Column Inventory Type	Under 20 Years Old	Between 20 and 40 Years Old	Over 40 Years Old	Total Number of Assets
Concrete	24	856	6,250	**7,130**
Galvanised Steel	6,917	121	33	**7,071**
GRP	7	0	0	**7**
Mild Steel	29,158	44,118	6,607	**79,883**
Passive Safe	115	0	0	**115**
Stainless Steel	17	12	7	**36**
Other	12	5	0	**17**
Total Number of Columns by Age	**36,492**	**45,226**	**13,278**	**94,996**

Table 22: Street Lighting Column Inventory Summary

Additional inventory is held for the other components such as the recorded pole brackets, wall brackets used where luminaires are mounted on the walls of properties adjacent to the highway, and PECU's.

As the inventory is amended and grown through the installation of improvement works or the adoption of new developments, the recording of these assets is important to ensure appropriate inspection and testing.

The inventory is to be stored in Alloy and the coverage is considered to be good with high quality information held across the asset, including electrical certificates. To ensure that this remains the case Nottinghamshire County Council designers liaise with the team that manages the asset to develop an asset group that is efficient and easy to maintain.

Performance

The performance of the street lighting asset inventory will naturally improve as the LED replacement scheme renews the inventory across the county area. The step change may lead to higher expectations from the service over time.

The condition of columns is managed through the inspection and testing regime. As columns reached the end of their lives, or are perceived to be deteriorating through inspection, testing is deployed. Should a column require replacement, this is arranged. This approach ensures that only columns which require intervention are replaced.

Performance of the asset inventory is managed through undertaking inspection by trained lighting inspectors. These inspections include a night-time component which allows the various lighting installations to be viewed in operation. This approach allows a swift intervention to address a failure. Maintaining the asset in this way ensures that the County Council's system of street lighting contributes to safe and secure communities.

The following Performance Indicators have been identified to manage the outcomes of the service relating to the street lighting asset:

Reference	Description	Target	23-24 Outturn
KPI 10	Percentage of street lighting faults under the control of the	85%	81.5%

	Highway Authority repaired within response time (7 days)		
PI 01	Average number of days to undertake Distribution Network Operator (DNO) street lighting repair	<35	22.8 
PI 28	Average number of days to repair a street lighting faults under the control of the Local Authority	<7	6.89 

Table 23: Primary Street Lighting Performance Indicators

Levels of Service

Table 24 below sets out the levels of service for the street lighting asset.

Aspect	Levels of Service
Safety	▪ Maintain lit areas to make communities safer during the hours of darkness. ▪ Ensure that conflict areas are appropriately lit.
Serviceability	▪ Minimise breakdowns through a system of inspection and testing. ▪ Renewal of elderly low pressure sodium lamp units has been undertaken to upgrade to LED equivalents. This upgrade will deliver a step change in asset condition.
Sustainability	▪ Reduce carbon emissions associated to the operation and maintenance of the asset. ▪ To utilise renewable energy sources as appropriate and available. ▪ LED Lamp Units are dimmed between 10pm and 7am to conserve power in some areas where it is appropriate, such as areas where there is not history of darkness related collisions or major junctions.
Customer Service	▪ Improve customer perception of the network during hours of darkness. ▪ Enhance the attractiveness of walking and cycling during the hours of darkness.

Table 24: Levels of Service for the Street Lighting Assets

Risk Management

The following sets out the responses to managing risks relating to managing the street lighting asset. In addition, risks are managed using a robust prioritisation process.

Response to Environmental Challenges

- Flexibility in the use and the operation of the asset may be required to meet wider environmental objectives. An example of this is the dimming programme to reduce environmental implications of the service.
- Careful design of new assets to ensure no adverse ecological impacts such as interference with bat flight paths or observance of dark sky areas.

Response to Economic Challenges	▪ The rising cost of energy has implications on the cost of delivering the service. Options are available to minimise the cost of running the asset, reducing the operational time of assets or further dimming are examples. ▪ As assets are damaged because of collisions, failure to reclaim the value of repairs can burden the service. To mitigate these issues green claims will be utilised to claim back damage rectification.
Response to Customer Feedback	▪ Customer Feedback is received from direct reference from members of the public, parish, and district councils. The user feedback is received via direct contact through the customer relationship management process. The overall response to these queries is part of a service level performance metric.
Collaboration with Stakeholders	▪ Collaboration occurs across the service to manage the assets that are installed in a way which ensures that they are easy to maintain with a low whole life cost. ▪ Parish and district council liaison occurs through the street lighting inspectors who have a good relationship with these bodies to inform the need on the network, and where appropriate manage expectation.

Maintenance Strategy and Operational Approach

The one-time improvement has enabled a shift to a cyclic maintenance regime for the inventory that is at the end of service life. This allows steady state to be maintained with minimal interventions and is founded on the investment made by the County Council supplemented by a sound inspection and testing regime. This inspection regime informs programmes of developing issues or more urgent replacement requirements. This is relevant to all aspects of the street lighting asset group, including columns and electrical installations.

In addition, a column replacement programme has been developed which has focussed on replacing columns which have reached the end of their service life. This operation has been aligned to the LED lamp replacement programme to add value to the condition change. Around 7% of the column inventory has aged beyond its service life and is therefore included within this activity.

To ensure that the replacement of columns is arranged at the optimal time the electrical team undertakes a series of tests to establish if the column represents risk of failure. Specific hammer testing is undertaken on 8m, 10m, and 12m poles and the team also undertake non-destructive testing to establish if a column has reached the end of its service life. The non-destructive testing is often deployed following a concern raised by an inspector to ensure that an information-based approach is deployed when managing risk, particularly that of column failure, across the highway network.

From time-to-time 3rd parties or other departments from across Nottinghamshire County Council request to attach items to our street lighting columns. In order to ensure that the load does not exceed the safe capacity of the column there is a rigorous licencing process which includes the testing of the column to establish its suitability for the proposed attachment.

Opportunities are taken to undertake an electrical test and visual inspection of the asset at the time of replacement of components where appropriate, including the PECU array. This limits the requirement for multiple visits to the same asset.

From time to time an electrical installation might be struck by a vehicle or suffer some damage from a third party. Where possible details of the party which undertook the damage will be sought and an insurance ‘green’ claim made to reimburse the service for the rectification costs. This reduces future financial risks that may be realised from unforeseeable circumstances.

The maintenance strategy for all components of the asset group is firmly founded in cyclical maintenance supplemented by feedback from inspection and testing regimes. This minimises the failure in the asset and ensures that the overall condition is maintained. To develop consistency across the

County Council area moderation between the inspectors is required and a method is currently being developed.

Finally, the quality of works is managed through a clear process of upskilling operational staff and ensuring they remain qualified to work on the electrical assets. This includes a strong supervision presence to assist in delivering high quality work. By taking this approach the optimal service life for the components can be attained.

Prioritisation

The recently completed LED conversion project is delivering significant benefits to not only the environmental impacts of running the asset but also reduces the likelihood of reactive repairs being required.

As a result of the inventory replacement a 6 yearly cycle of electrical testing is to follow this up to maintain the inventory in good condition. This will maximise the benefit for the investment and reducing the running costs of the asset. This proactive maintenance regime is assisted by the one-time step change in condition and the continuous improvement of the operation to manage the asset.

The works programmes are informed exclusively by inspection, of both the electrical elements of the asset and the columns. To assist in developing more efficient works programmes efforts are made to group the works by area and minimise travel by the gang and to coordinate interventions with other works happening on the network to reduce traffic management costs.

To inform the column prioritisation the team have purchased equipment to undertake non-destructive tests of the columns. This will allow the quality of the column to be more accurately evaluated and thresholds set for the replacement of the column. This will drive a situation where fewer columns are replaced, improving resource allocation to more critical parts of the maintenance regime.

Asset Lifecycle Milestones

The key considerations for the asset milestones for the street lighting asset group are as follows:

Creation / Acquisition	Assets are created via installations as a result of improvement schemes or as part of development adoption. New assets will be installed to the accepted highways specification to ensure consistency across the inventory.
Operation & Maintenance	Maintaining all electrical highway assets at a serviceable condition through routine / cyclical maintenance and minor works. In some cases, reactive works may be required to address vehicle strikes.
Renewal or Replacement	Renewals may be required as a result of road traffic collisions or other general age-related deterioration. Replacement inventory should be made with consistency to the wider asset group.
Decommissioning	Periodically some assets may be removed as part of a redesign of lighting provision. These assets will be removed from the inventory as required and any apparatus recycled or reused as appropriate. In accordance with the requirements of the Highway Infrastructure Asset Management Policy any redundant assets will be removed for re-use or sustainable disposal.

Improvement Actions

The team which manages this asset group maintain a positive approach to continuous improvement and there are examples in the service delivery of this.

From the principle of ‘de-illuminating’ the network to ensure that the asset is maintainable and the evolving quest to find higher quality components that deliver longer service life there are many advancements being considered.

To assist the team in managing additions to asset groups, a more formal relationship with the team delivering improvements to the network should be adopted. A process for this would be useful as part of the design standards for the development of improvements to the network. This approach would also have efficiency benefits in terms of whole life cost and carbon emissions associated with delivering the service.

Intelligent Transport Systems

Inventory

The inventory for the ITS asset group is varied and includes Information Technology and communication systems that allow traffic signal junctions and crossings to communicate with one another to improve traffic flow and network efficiency. This asset group also includes electronic signing devices, rising bollards at bus gates or similar features and CCTV systems for monitoring traffic flow. It also includes an interface with Real Time Information Systems which are managed by the Public Transport Team relating to bus operations.

This is a fast-growing asset group with new development contributing assets to the network. These are recorded on the inventory and designs are reviewed by the team prior to construction and subsequent adoption.

There are a number of signals operations systems that are used in the county. The Urban Traffic Control (UTC) system is the primary point of connection for the various installations on the network. The current approach for renewals is to connect as many installations to this system as possible which can be used to monitor and manage the network more efficiently.

There are software solutions which are used to control the junctions within the parameters of the programming in the controller. These are Split Cycle Offset Optimisation Technique (SCOOT) and Microprocessor Optimised Vehicle Actuation (MOVA), a small number of isolated installations remain on a vehicle actuated system which simply operates when vehicles are detected.

To monitor the operation of these isolated traffic signals installations, a Remote Monitoring System is utilised, however this is being phased out in favour of connection to other systems. The wider network is monitored by a traffic control centre which is shared with Nottingham City Council. This identifies and detects issues in the function of the system and communicates them as appropriate.

When considering traffic signals installations, it is worth noting that an installation is made up of a range of components. Traffic signal heads for both vehicles and other road users are installed on poles which are operated from a controller. There is an array of ducts, cables, inductive loops, detectors and other parts that enable the efficient operation of the signals.

In addition to traffic signals installations, Nottinghamshire County Council is growing the provision of Real Time Information (RTI) systems at bus stops and hubs to develop improvements in the quality of the public transport provision. This system is being used across the D2N2 area. These systems track the bus via satellite positioning and the route time is calculated. The information from this activity is displayed in screens located in the bus tops to give passengers information on waiting times and buses are given priority through traffic signals where possible to maintain journey times.

The inventory includes electronic signage, these fall into 3 broad categories, Speed Indicator Devices (SID), Vehicle Activated Signs (VAS) and Variable Message Signs (VMS). These are largely used as road safety improvement features, although the VMS signs are used to convey information. These assets are managed using proprietary software which can amend sign details or where possible download data. They also have the capability to monitor any faults present in the system, this minimises trips to site.

The table below sets out the main assets for this group, although it should be noted that this represents a high-level view, rather than the full spectrum of component parts.

Inventory Type	Number of Assets
Signal Controlled Junctions	
Signal Controlled Junction without Pedestrian Facilities	42
Signal Controlled Shuttle Working at Bridges	5
Signal Controlled Junction with Far Sided Pedestrian or Cycle Crossing Facilities	30
Signal Controlled Junction with Near Sided Pedestrian Crossing Facilities	178
Total Signal Controlled Junctions	**255**
Signal Controlled Road Crossings	
Single Puffin Crossing	123
Dual Puffin Crossing	8
Single Toucan Crossing	52
Dual Toucan Crossing	10
Single Pegasus Crossing	5
Dual Pegasus Crossing	1
Total Signal Controlled Crossings	**199**
Electronic Signage and Traffic Management Equipment	
Vehicle Activated Signs	521
Variable Message Signs	4
Low Bridge Warning Signs	5
Rising Bollard Installations	2
CCTV Cameras for Monitoring Traffic Flow	189
Total Electronic signage and Traffic Management Installations	**721**
Total Number of Installations	**1,175**

Table 25: Inventory Summary

Performance

The performance of this asset group is focused on reliability. For the systems to effectively manage the traffic and minimise disruption for all users they must function as expected. In order to measure this on the network, a series of performance indicators have been identified and are reported on to evaluate this reliability. These are set out in Table 26 below.

Maintaining the performance of these assets require a periodic inspection of the components on each of the site and regular updates to software and operating systems as required. Many of these operating systems of the inventory are proprietary and supported by the developing software publishers. Whilst much less invasive than many of the other interventions on the network, the update and renewal of software is an important part of improving the efficiency of the transport system.

The table below sets out the condition profile of the asset group. It should be noted that the CCTV installations have limited information available. The condition assessment is based on a percentage where 100% is considered as new condition. As the value decreases the asset deteriorates to a point where it is then considered for inclusion in the programme. The nature of the decline is a factor in establishing the position in the programme.

Asset Description	No. Installations	Average Age - Years	No. Faults Generated Annually	Ave. Faults per Installation	Average Condition - %
Junction Installations	257	11.0	1741	6.8	76%
Crossing Facilities	201	11.3	714	3.6	74.7%
Rising Bollard Traffic Management Installations	2	7.6	2.5	2.5	56.7%
Vehicle Activated Signage	529	8.9	248	0.5	74%
Variable Message Signs	4	1.52	3	1.3	100%
‘Wig-Wag’ Flashing Warning Signs	1	7.4	2	2	98.7%
Low Bridge Warning Signs	5	9.9	4	0.8	73.9%
CCTV Installations Limited Data Available	160	6.1	1	0	75%

Table 26: ITS Inventory Condition Summary

The renewal of installations is a growing cost on the network and the available budgets do not allow the backlog to be maintained at current levels. As a result of this there is a growing need for reactive works to repair individual component failure. This has a performance disbenefit as the roll out of up-to-date technology is stifled.

Reference	Description	Target	23-24 Outturn
PI 02	Number of signal emergencies made safe within response time (1 Hour)	N/A	3 
	Signal emergencies attended	N/A	3
PI 03 a	Percentage of compliance with other signal fault repair response time (Urgent Faults - 2 Hours)	90%	100% (70) 
PI 03 b	Percentage of compliance with other signal fault repair response time (Non-Urgent Faults - 8 Hours)	90%	99.7% (517) 

Table 27: Primary ITS Performance Indicators (Figures in Brackets are Actual Numbers)

Levels of Service

Table 28 below sets out the levels of service for the Intelligent Transport System asset.

Aspect	Levels of Service
Safety	▪ Maintenance of the operation of these systems are important for managing safety on the network. Most of the installations will include pedestrian facilities which are important for preventing severance of routes.
Serviceability	▪ The various aspects of some of these assets are critical for managing congestion and disruption on the network.
Sustainability	▪ The efficient operation of these assets is a key part of reducing vehicle emissions on the network. The efficient flow of traffic improves air quality and emissions. ▪ The effective application of these systems is an important factor in users making active travel choices thereby facilitating modal shift.
Customer Service	▪ Disruption and congestion on the network are considered an area which is important to the users of the network. Minimising disruption is key to improving customer experience.

Table 28: Levels of Service for the ITS Assets

Risk Management

The following sets out the responses to managing risks relating to managing Intelligent Transport System assets. In addition, risks are managed using a robust prioritisation process.

Response to Environmental Challenges	▪ These systems are increasingly important to deliver improvements in the modal shift of users. To deliver this the systems will need to evolve to better reflect the hierarchy of users, prioritising pedestrian, and cycle connectivity.

- In addition to delivering modal shift, these systems are vital in reducing congestion on the network. A continuous improvement model will be necessary to deliver efficiency to the highway network.

Response to Economic Challenges

- Economic challenges for this asset group are a little different to the other assets. The principal threat to the local economy is related to the inefficient operation of these systems, slowing the operation of all sectors of the economy, and reducing the attractiveness of Nottinghamshire. As with the environmental considerations, the efficient operation of the system is the overall goal and changes need to be carefully considered to ensure no adverse impacts arise.

Response to Customer Feedback

- Customer feedback falls into two categories, the first is information about defects that impact on the asset group such as lamp failures or pole strikes. The second group relates to the effectiveness of the signals. In these cases, investigation is undertaken and where appropriate actions fed back to the customer.
- This approach is similarly applied across the other aspects of the asset group.

Collaboration with Stakeholders

- Collaboration occurs with other teams relating to new assets and additions to existing assets. This may include liaison with the teams which manage developers works.

Maintenance Strategy and Operational Approach

The installations are inspected on an annual cycle which identifies any issues and records overall condition this is a key part of the maintenance approach as it informs of the overall condition of the asset group.

There are broadly two works streams for the management of the ITS asset group, the first is reactive, responding to defects and changes in condition as they are identified. The second is a planned system of renewals which also seek to upgrade the existing technology to ensure that the systems do not fall behind. This process also seeks to, where possible, refine communication aspects to reduce reliance and therefore cost of supplier's apparatus. This approach facilitates the evolution of the network and reduces the need to make one time step changes in inventory to prevent obsolescence.

In terms of the reactive works, details of the response are in the prioritisation section below, but the overarching approach is to maintain the integrity of the asset to make sure that sites are safe for all modes and efficient.

In some cases, make safe options may be deployed such as signage, lane closures, provision of temporary signals or any other appropriate measure.

Finally, much of the adoption of technology is related to increasing the efficiency of managing the asset. By reducing travel time to site visits through the remote monitoring of sites, staff time and carbon emissions are reduced. Alongside this efficiency the swift identification of issues and monitoring of the operation of the installations improves traffic flow and safety across the county, reducing disruption and travel times for road users.

Prioritisation

Sites are treated with higher priority if a permanent repair is required at any site that has been made safe, or those sites where an inspection highlights a more urgent issue. This approach ensures that the site in question remains operational and safe.

In terms of faults reported to the team as a result of incidents or other observations made by either road users or inspectors are coordinated into three categories to reflect the severity of risk that may be presented.

Any temporary repairs are then programmed to be made permanent as soon as practicable and this has regard to obtaining road space through the permit scheme and coordination of materials or subcontractors. In many cases a repair may be deliverable by the visiting engineer.

In order to ensure that faults can be rectified swiftly and efficiently the installations are designed for consistency. This means that spare parts can be obtained quickly, and engineers become familiar with the installations. In addition, careful thought is given to designing for maintenance when either checking external designs or developing them in house. Whilst ensuring installations can be safely maintained is a core part of the Construction Design and Management Regulations 2015, it also makes the operation more efficient.

In terms of installation renewal, the programme for these is built upon the condition information fed back from the annual inspections. There is engineering judgement to weigh the various potential schemes with the relative risk, cost to replace and importance of the junctions, but the general theme is to undertake a worst first approach.

A three-year programme is updated annually which is developed in accordance with the process outlined above. The list is arranged in order of priority. Estimated costs are attributed to each scheme, and the final cost of delivering the scheme may vary from this, which can influence the volume of schemes delivered. In addition, the programme will need to be varied from time to time to account for rapidly emerging issues and the requirement to mitigate risk on the network.

Asset Lifecycle Milestones

The key considerations for the asset milestones for Intelligent Transport System assets are as follows:

Creation / Acquisition	There are a wide range of asset types within this overarching group, these range from poles associated to signal apparatus to the hardware and software that enable the Urban Traffic Control (UTC) system to function. Generally, these are installed as planned installations because of improvements or developer works. In the case of a system such as SCOOT, the creation of the asset will include a server and associated software, requiring configuration and validation as part of the commissioning process.
Operation & Maintenance	The installations are inspected annually, and defects raised which maintain the assets for the life of the components. In addition, electrical testing and in some cases structural testing of poles is required to maintain the asset in an appropriate condition.
Renewal or Replacement	Parts of this asset group are periodically replaced as a result of individual failure such as the result of vehicle strike during a collision. Other aspects of the asset reach the end of life and inspection identifies these in advance of the programme to allow for planned intervention.
Decommissioning	Periodically some assets may be removed as part of a redesign of asset provision. These assets will be removed from the inventory as required and any apparatus recycled or reused as appropriate. In the case of system decommissioning this will only be undertaken after the new system is ready to be run to avoid unnecessary disruption. In accordance with the requirements of the Highway Infrastructure Asset Management Policy any redundant assets will be removed for re-use or sustainable disposal.

Improvement Actions and Targets

The management of Intelligent Transport Systems is at the leading edge of digitisation in the highway service. As a result, continuous evaluation of emerging technological improvements is required to keep specifications and installations current. This is an important aspect of this part of the highway infrastructure asset.

Resources make it challenging for the installations to be reviewed for their efficient operation as frequently as would be optimal. As road usage evolves over time, the operation of the installations should be monitored and validated with a view to making changes to reduce congestion across the network. A regime may be considered to deliver these improvements in a more continuous way.

In addition to the above the service must remain agile to facilitate modal shift from the use of the private motor car to sustainable travel methods. Bus priority as well as cycling and pedestrian crossings are key enablers in removing route severance for these modes, and therefore encourage their use.

Forestry

The forestry service manages the maintenance of highway trees and shrubs. The grass located within the highway network is managed by the seasonal works team and set out in the verges section.

To prevent the network safety or integrity being compromised by the failure of a highway tree or trees, the Forestry Team conduct inspections and programme works to address compromised trees. This is particularly the case for ash trees that are suffering ash dieback (Chalara) which causes these trees to die.

The Forestry Team are instrumental in protecting trees in the highway and operate on the understanding that no healthy trees are to be removed, apart from where there are exceptional circumstances.

Inventory

The inventory is set out below, however this asset group inventory grows significantly over time because of schemes which are delivered on the network. For example, a link road make include significant areas of grass and a large amount of compensatory planting within the highway verge to mitigate the impacts of the scheme. These assets are then handed to the service for maintenance which increases demand. Table 29 below sets out the key components of this asset group.

Code	Hierarchy Description	Number of Trees Recorded
R	Resilient Network	7,998
H1	Main Distributor	6,187
H2	Secondary Distributor	1,795
H3	Tertiary Distributor	2,687
H4	Local Access Road	3,900
H5	Local Road	2,933
H6	Minor Road	5,898
H7	Track	82
H8	Unsuitable for Motor Vehicles	510
All	Individual Trees That Form Groups Estimated	150,000
	Other NCC Assets	321
	Estimated Number of Trees	**182,311**

Table 29: Inventory Summary

The groups of trees in the table above are defined as areas across the county where there are small, wooded areas or clusters of trees. These are more difficult to develop into an inventory as trees in these areas are often wild seeded. As a result, there could be up to 150,000 additional trees which fall under the forestry team remit, and this is reflected in the table above.

The inventory is to be stored in the Causeway Alloy system which also manages part of the works ordering process. In utilising this system there are likely to be further enhancements that can be

considered in the way that these assets are inspected and maintained. This can form part of the continuous improvement approach to service delivery.

It should be noted that the inventory grows annually as new trees are planted.

Performance

This part of the service has a significant impact on the amenity of places. As a result, this is a visible asset group that does generate feedback from both highway users and stakeholders. Managing the integrity of trees particularly is a challenge because of the influencing factors. Those working in the highway have a role to play in maintaining the forestry asset, particularly where excavations occur near trees and improved awareness would be beneficial to safeguard the integrity of these assets.

Performance is managed by the inspection regime which highlights defects in the asset. The regime for inspecting highway trees is based on a five-year interval, however the Forestry Team aim for 4-year cycle to manage the risk of missing the inspection window due to unforeseen circumstances.

The service is also responsible for delivering planting in the highway extent. There are currently internal targets on the delivery of tree planting. To manage this with other service pressures bids have been made for external funding, which have been successful.

A significant risk associated to highway trees is claims related issues from roots and other damage. The Forestry Team are engaged with evaluating these issues and organising works to mitigate future risks in accordance with a risk-based approach.

Reference	Description	Target	23-24 Outturn
PI 37 a	Highway Tree - percentage of instances where remedial works are proposed to NCC's R+I Team within 14 days	100%	100% 
PI 37 b	Highway Tree - percentage of instances where works are undertaken within 28 days following receipt of an instruction. From NCC R+I Team	100%	N/A 

Table 30: Primary Forestry Performance Indicators

Levels of Service

Table 31 below sets out the levels of service for the Forestry asset.

Aspect	Levels of Service
Safety	▪ The green infrastructure contributes to the safe operation of the asset. The tree inspection and maintenance reduce the risk of tree fall onto the public highway and to reduce statutory nuisance. ▪ When considering where to not undertake maintenance for biodiversity reasons safety implications will need to be carefully considered and the result of this consideration should be recorded. ▪ In the event of outstanding works across a period, these will be included within a risk register for future monitoring and mitigation.

Aspect	Levels of Service
Serviceability	▪ The use of the highway will need to be considered when evaluating interventions. Unrestricted vegetation growth can limit the use of some spaces of the highway through encroachment. ▪ Amenity for residents is a key factor in the consideration of serviceability for the level of service associated to this part of the asset. ▪ Managing failing parts of the asset is important to remove risk of network disruption. An example of this is the disruption and subsequent diversion that may result from trees falling on the public highway necessitating short term closure.
Sustainability	▪ Managing the asset in a sustainable way will be managed by limiting the interventions applied. This will often contribute to improving the biodiversity of some areas of the network. ▪ Consideration to electric or Ultra Low Emissions Fleet may assist in reducing the carbon emissions associated to delivering maintenance to this asset. ▪ Establishing appropriate methods of disposing of arisings will potentially deliver improvements to the overall sustainability of delivering the service.
Customer Service	▪ Customers require areas of landscaping to be attractive. This may be appropriate in some places; however, some expectation management may be required as frequent maintenance may be undesirable from a biodiversity perspective, or unachievable from a financial standpoint.

Table 31: Levels of Service for the Forestry Assets

Risk Management

The following sets out the responses to managing risks relating to managing the forestry asset. In addition, risks are managed using a robust prioritisation process.

Response to Environmental Challenges

- The service will need to continuously improve the management of a diverse range of landscape features to reduce ecological and environmental impacts. This will range from improving the way that vegetation is managed on the network to evaluating the emissions that arise from operational works.
- To deliver improvements opportunities may need to be taken such as electric vehicle fleets or a perceived reduction in some parts of the service.
- The emerging Greener Highways Plan will provide guidance for meeting the environmental challenges of the service.
- Because of the increase demand on some parts of the maintenance of the asset, such as shrub bed maintenance. This requires careful planning to manage the maintenance alongside the amenity value provided by the asset. These are managed by careful planning in the Forestry Team which balance the requirements of the asset group with other considerations to time the maintenance.

Response to Economic Challenges	▪ This part of the service is often underfunded due to the pressure in higher risk, higher profile parts of the network. To manage this the service will continue to be run efficiently to meet the service objectives. ▪ To take advantage of alternative investment, projects will be identified to make one-time improvements.
Response to Customer Feedback	▪ Customer Feedback is received from direct reference from members of the public, parish, and district councils. The user feedback is received via direct contact through the customer relationship management process. The overall response to these queries is part of a service level performance metric. ▪ Resources have entered development to provide more information on the roles and responsibilities of the service to make dealing with customer feedback more efficient. The development of the Greener Highways Plan is an opportunity to update details on service provision and provide clarity on what is not included within the management of these assets. ▪ The management of the forestry asset is, by its nature, evolving in a wide variety of ways. This means that programmes require flexibility to ensure that interventions are delivered at an appropriate time, and some works may be delayed ensuring risk is mitigated across the wider asset.
Collaboration with Stakeholders	▪ Collaboration occurs in a number of ways, but primarily advice is given on the specification of highway trees, evaluating works impacts on trees, evaluating schemes that alter the highway sense of place and liaising with external bodies on funding opportunities.

Maintenance Strategy and Operational Approach

When considering the maintenance strategy, the overarching policy for managing trees is considered. This is not robustly set out and would benefit from update to consider the evolving requirements of the service from these assets..

There are three strands to managing and maintaining the asset in terms of delivering interventions. The first is cyclical maintenance such as pollarding. There is a significant reactive demand that feeds from inspection and defects reported from outside the service and programmed works to plant trees and therefore grow the inventory.

Cyclical works are identified in a rolling programme at pre-determined intervals and are designed to remove risk from some aspects of tree growth. These works are focussed on maintaining visibility, removing the risk of cycleway/footway encroachment, reducing statutory nuisance and generally maintaining the operation and amenity of the network. This is an important process because it contributes to making the network attractive and removes barriers to the use of sustainable transport modes.

The management of risk for the forestry assets are focussed on the inspection regimes. These regimes identify risks on the network and works are programmed in accordance with the risk identified.

Reactive response operates within the same timescales as the response times in the Highways Inspection Manual and requires inspectors to validate the defect categorisation, or record no works required. If works are needed these are scheduled through the works ordering system.

Ash Dieback (Chalara) is a disease that affects ash trees and results in the decline of this species of trees until they fail. This is placing additional demands on the service and requires management within the maintenance regime. Within Nottinghamshire these trees have been identified as part of the tree survey and a heat map developed using GIS tools to highlight areas where there is the highest concentration of risk. The approach taken to managing the decline of trees is to leave them in-situ until around 50% or more of the canopy has reduced. At this point the tree is scheduled for removal. Where

possible and appropriate the heat map of Ash Dieback is used to identify areas where gaps will exist in the landscape and the new tree planting can help fill these gaps. This approach also fits in with external funding opportunities.

To supplement the standard inspection regime additional inspection routes have been created to allow an inspection frequency of two years to be undertaken on Ash trees to monitor Ash Dieback. These inspections inform the following inspection frequency, allowing it to be brought forward or moved back as appropriate. It may also specify that an intervention is appropriate to manage the risk on the network. In making this assessment the condition of the tree is considered alongside hazards to the users or integrity of highway assets and the overall situation surrounding the location of the tree.

Trees that are assessed to be of higher risk, either in terms of condition or the location of the tree, can be indicated as a 'tree of concern'. These high-risk trees are then subject to increased inspection frequency. The condition of the tree will be a primary driver in establishing an elevated condition inspection, and either the tree will recover, and the inspection frequency will decrease, or work may be programmed as appropriate.

To manage quality a significant amount of work has been undertaken to develop the communication of job requirements to the internal or external workforce. This is supplemented by supervision and an audit sample of the highest profile jobs delivered. This works together to feedback on quality and allow adjustments to be made.

In order to ensure that the resources are best utilised cross team collaboration across the Via East Midlands and NCC teams is valuable to ensure that the integrity of the asset is maintained, and the delivery of key works is facilitated.

Prioritisation

Works are prioritised based on the defect category. The less urgent categories are largely where the works backlog is located, and these are focussed on a 'worst first' approach. The defect can be re-categorised if the risk increases which escalates it in the prioritisation.

The cyclical maintenance regime is important to reduce the demand that occurs from the reactive defects.

There are aspirations to plant more trees in areas where it is appropriate to do so. The service develops bids for funding from external sources to deliver new trees, where opportunities present themselves. However, there is a residual backlog in the numbers of trees requiring maintenance work across the highway network.

Asset Lifecycle Milestones

The key considerations for the asset milestones for the forestry assets are as follows:

Creation / Acquisition	Assets are acquired from a number of sources, including wild seeded in rural areas. Where installation is planned appropriate specification to ensure longevity, success for the species selected and managed to prevent damage to other assets is required. In all cases inventory should be updated as far as practicable to ensure that asset size is understood.
Operation & Maintenance	Cyclical and reactive works are required to manage the trees to meet the needs of highway users, including managing safety for all users.
Renewal or Replacement	Replacement of the inventory should be required infrequently. Therefore, it is important to select species carefully and apply a suitable watering regime for new installations. When considering renewal of parts of this asset it may not be possible to undertake a like for like arrangement. In some cases, it may be appropriate to replant elsewhere.

Decommissioning	Some assets may be decommissioned for a number of reasons. In terms of trees, Ash is currently experiencing dieback which is causing some examples to die, and others become dangerous and require intervention. In the case of removal of part of the asset being required the details should be recorded in the inventory. In accordance with the requirements of the Highway Infrastructure Asset Management Policy any redundant assets will be removed for re-use or sustainable disposal.

Improvement Actions

The service regularly receives enquiries regarding the maintenance of roadside hedges, this is particularly common when hedges on residential of commercial boundaries were previously associated to agricultural land use. The teams responsible for managing the asset will work with the Highway Development Management Teams to ensure that these issues are highlighted early in the planning process.

The principal action is to develop a future ready policy for setting parameters around the way that trees are managed in the highway network. This is not the way that they are maintained, but the parameters for the interaction with others working on the highway network. In addition, the principle that healthy trees will not be removed and parameters around the provisions of new highway trees should be included. This may be most appropriately addressed in the emerging Greener Highways Plan.

In developing the policy and guidance around trees and Forestry Assets and issues such as Ash Dieback, a webtool or enhanced webpage would be beneficial to explain the process more accurately and fully for identifying statutory nuisance and safety issues to remove some demand which is generated from customer reporting.

Given the valuable input that trees present from an amenity perspective, the use of the Capital Asset Value for Amenity Trees (CAVAT) would be a useful tool to better define the asset and make the case for investment. The use of this tool, and the integration of the results should be considered.

The success that has been realised in the successful bids from external funding opportunities should be continued to supplement service delivery.

Traffic Signs and Road Markings

Inventory

This asset group is diverse and has a significant role to play in the safety of road users on the network as well as the functional use of the highway.

Road signs are important to not only warn those using the network of hazards and features that require negotiation but also to inform users of the location of key locations, amenities, and points of interest. Hazard warning signs play a role in reducing collisions on the network and should be maintained by keeping them clean and free from vegetation. The inventory is poorly recorded, and steps are to be taken to improve the inventory to make it easier to maintain.

Whilst this is an important part of the inventory it is a feature that can be overused. Sign clutter can contribute to confusion as well and being more obtrusive and detrimental to the visual amenity of an area. As part of all signing schemes a regime of questioning the usefulness and validity of signing will be undertaken to facilitate reducing sign clutter wherever possible. This will also deliver the benefit of reducing the inventory to a more manageable level.

Similar to signing, road markings are a highly used tool by road safety teams in reducing collisions on the network. The use of markings can warn of hazards, delineate road alignment and features, and provide enhanced clarity during the hours of darkness. As with signing the lining inventory is poorly recorded and maintenance relies on information from inspectors as part of the safety or serviceability inspections.

There are in excess of 50,000 individual signs recorded across the network. The signing inventory can be categorised into a range of signage types, set out in the table below, and it should be noted that this summary excludes public rights of way signs, temporary signs, and diversion information:

Inventory Type	Number of Assets
Hazard Warning Signs	7,960
Regulatory Signs	26,818
Information Signs	4,477
Direction and Location Signs	6,746
Cycle Route Signs	2,734
Bus Related Signs	270
Railway Crossing Signs	3,360
Miscellaneous Other Signs	1,675
Total	**54,040**

Table 32: Road Signage Inventory Summary

The lining inventory is not well recorded, however the standardisation of the inventory to the requirements of the Traffic Signs Manual means that replacement works can be easily managed. The renewal strategy is reactive to address identified defects which removes the sensitivity around maintaining an inventory.

Developing the understanding of the scale of these assets is an improvement which is required for these asset groups. As works are specified the inventory will be updated. This will deliver incremental growth of the records associated to the asset. This approach grows the inventory without incurring the cost of a single, major, data collection exercise. There are also opportunities to utilise technology such as Vaisala Road AI which can be used to swiftly develop inventory, particularly of line markings.

Performance

In terms of the traffic signing and road markings part of the asset, the recorded personal injury collisions which occur on the network can be used as an indicator of the effectiveness of, particularly, hazard warning in the county. Whilst a subset of collisions can be attributed to behaviours that fall outside of the sphere of influence of this inventory, a portion of the collisions can be influenced by these features.

Whilst no particular metric is appropriate to measure the effectiveness of these assets, they are subject to regular inspection through the safety and serviceability inspections as set out in the Highways Inspection and Risk Manual. This feedback from inspectors is important in highlighting deficiency and maintaining the effectiveness of the inventory. Inspectors should be encouraged to be mindful of the safety and amenity of these assets and how they contribute to the safe operation of the network.

In order to ensure the effectiveness of road markings are maintained a programme to proactively retrace markings on routes where lining is in the early stages of failure is undertaken when resources permit. These activities are also undertaken periodically on parking restriction markings to ensure they can be appreciated by drivers and enforced if necessary.

Levels of Service

Table 33 below sets out the levels of service for the Traffic Signs, Road Markings asset.

Aspect	Levels of Service
Safety	▪ Road markings and traffic signs have a vital part to play in manging the safety of the asset. This is particularly the case at conflict points on the network and markings and signs that have been installed as part of collision remedial schemes. ▪ Route delineation is a key service requirement for road markings. This can be important in communicating both the alignment and overtaking status of a route during the hours of darkness.
Serviceability	▪ Deterioration in the road markings and traffic signs have similar serviceability issues, the retroreflective property of the asset begins to reduce which reduces its effectiveness. ▪ Signs should be visible from the appropriate distance for the type of sign as set out the various chapters of the Traffic Signs Manual. ▪ Road markings should be visible in all weather conditions and replaced when worn.
Sustainability	▪ There are challenges in sustainably managing this diverse and widely spread asset. Because of this it is important to consider minor, light touch and infrequent interventions to reduce the necessity for replacement. ▪ When considering how interventions will be delivered it is advantageous to, where possible, group the programme by area to reduce travel between sites.
Customer Service	▪ Customers often don't realise that this service is undertaken, the assets are taken for granted. Because this is sometimes important because of the safety implications, to communicate what is happening in this area to elevate its importance. ▪ The visual appearance of all aspects of this asset group contributes to the sense of place for an area.

Table 33: Levels of Service for Traffic Signage and Road Marking Assets

Risk Management

The following sets out the responses to managing risks relating to managing the road marking and traffic signage assets. In addition, risks are managed using a robust prioritisation process.

Response to Environmental Challenges	▪ Given the diverse nature of this portion of the asset there are a number of sources of challenge, but the overriding issue will be fleet travel associated to the maintenance of the asset. ▪ The quality of the asset will contribute to environmental improvements associated to delivering modal shift, as a result these assets which contribute to the appearance of the network are an important part of promoting the attractiveness of the network for all users. ▪ Reducing collisions on the network reduces travel time and disruption, and this asset group is a particularly important part of warning and informing users. To achieve this the asset should be clean, clear, and visible and safety inspection will inform these programmes.
Response to Economic Challenges	▪ As with other parts of the network where there are routine or reactive interventions required the revenue implications of delivering the service may not allow the desired level of service to be attained. In these cases, prioritisation will be required to ensure that assets which are safety critical remain in good condition. ▪ To assist with mitigating the implications of the above preventative or light touch implications may be appropriate to prevent the asset deteriorating to a point where replacement is required. ▪ When assets are damaged because of collisions, failure to reclaim the value of repairs can burden the service. To mitigate these issues green claims will be utilised to claim back damage rectification.
Response to Customer Feedback	▪ Customer feedback is responded to directly by the recording of defects on the inventory. Feedback is received from a number of sources, but typically it will be from the inspectors or via customer raised defects. This includes defects raised by district or parish councils.
Collaboration with Stakeholders	▪ Collaboration with stakeholders is limited to an ad-hoc approach as issues arise. More regular collaboration occurs with other teams in Via East Midlands to coordinate works, reducing scheme cost and therefore delivering efficiency.

Maintenance Strategy and Operational Approach

Defects are identified in accordance with the content of Nottinghamshire County Council's Highways Inspection and Risk Manual. The regime for repair is largely routine or reactive dependent upon information from inspectors.

However, there are opportunities with capital improvement works to rationalise and redeploy signage to ensure that it is deployed in an effective way. Additionally, area wide improvements, such as redefining the use of the highway corridor to support modal shift to active or sustainable transport modes can rationalise the inventory to warn and inform users more effectively.

The maintenance strategy for the road signing part of the inventory is based on a routine strategy which covers all the county roads in a 3-year cycle. A team is available with a vehicle which has a Pure Water system to clean sign faces, which can be utilised up to 150m from the parked vehicle. They have access to hand tools to clear vegetation and make minor repairs. In the event that replacements are required this is also available to the team. Defects are recorded and grouped into areas. This allows an efficient working practice which is based on reducing travel time.

The management of the lining inventory is largely reactive to ensure that rapid changes in condition can be arrested with an appropriate intervention. Lining can deteriorate swiftly in areas where the marking is overrun, often exacerbated by the build-up of detritus over winter periods. In order to ensure that this deterioration is not left within mitigation for prolonged periods the programme is flexible to meet this demand. The programme is constructed using the defects raised on the network, paying particular attention to those markings which have the greatest contribution to road safety. This approach is also efficient as it allows a wider range of works to be grouped by area to maximise the reinstatement coverage.

When considering the regime for replacing worn road markings, this will need to be undertaken during dry periods where no road salt is present to ensure the longevity of the replacement. To achieve this the majority of the lining programme is undertaken between the end of March and October, with only limited retracing occurring on an emergency basis outside of these times. This ensures the longevity of the treatment. It is most effective to build a programme and deliver works in planned programmes to realise efficiencies and reduce travel time. In some emergency cases this is not possible and will need to be addressed in an ad-hoc way to appropriately manage the risk.

Currently the condition of markings is defined by the defects on the network. There are opportunities with the use of some video survey tools, such as Vaisala Road AI to survey the condition of these markings and create a condition index of the network. This should be explored as an improvement action to better define lining condition across the network.

It is important to remember that the road marking asset is renewed at the time of a treatment to the carriageway asset. As a result, programmes need to be aligned to avoid duplicated operations, although if a scheme is in a forward programme, it may be appropriate to re-line the site to ensure road safety is not compromised whilst the scheme is being developed.

Prioritisation

Works to the road signage on the network are prioritised on the basis of the feedback from the sign cleaning teams and feedback from the inspectors. The objective is to ensure that all defects are addressed, and where possible recover signage as a preventative maintenance regime.

This is currently achievable, with the teams working to develop increasingly efficient ways of working to ensure that a proactive approach to maintaining the asset is delivered. This allows the coverage of the whole network and reducing the need to prioritise routes or defects associated to this part of the inventory. An example of this is collaborating with other teams to make use of traffic management and removing costs for this aspect of delivering works.

When balancing the prioritisation of works to this asset considerations will be based on the safety benefits that they deliver and the hierarchy that they are located on. For example, give way lines, solid line systems, warning signage and other safety related features will be delivered ahead of other parts of the inventory. This is risk assessed by the team and prioritised accordingly.

The prioritisation of the lining inventory follows the same process, with more safety critical markings prioritised. Due to the difficulties with laying lining in inclement weather, there is a backlog of lining defects which remain outstanding, these lower priority items are included as part of the approach to address other lining jobs in the area, and drive efficiency from the programme of works.

Asset Lifecycle Milestones

The key considerations for the asset milestones for the traffic signs, road markings and street furniture asset group are as follows:

Creation / Acquisition	There are a number of sources of asset creation, such as traffic management teams installing new speed limits or other traffic management features, road safety teams improving warning of hazards and other more general improvements such as developer works. In all cases inventory should be updated as far as practicable to ensure that asset scale is understood.
Operation & Maintenance	Periodic vegetation clearance, cleaning and retracing may be required to maintain the performance of the asset.
Renewal or Replacement	Replacement of the inventory should be required infrequently, however replacing road markings may need to be undertaken on a routine basis to maintain their effectiveness. These should be prioritised based on the hierarchy of the route and the safety value of the markings.
Decommissioning	In accordance with the requirements of the Highway Infrastructure Asset Management Policy any redundant assets will be removed for re-use or sustainable disposal.

Improvement Actions

When considering how the delivery of maintenance to this service can be optimised further information on the condition of the asset is required. This can be delivered via the scheduled safety and serviceability inspections undertaken by the highway inspection team, or digital options can be developed using systems already held by Nottinghamshire County Council.

In order to develop the current approach to managing the traffic signs and road markings across Nottinghamshire a review of the maintenance approach is required. There is a cyclical approach to resolving traffic signing defects before they represent a road safety issue through the sign cleaning programme, but a more proactive approach to the management of road markings, particularly at those sites where measures have been introduced to improve road safety or there are safety critical markings.

Vaisala Road AI can be used to measure changes in condition for both the traffic signage and road marking parts of the inventory. This change in condition can then be used to supplement any inspected defects which assist in delivering preventative maintenance and maintains the safety of the network. Assessment and development of this option will be undertaken to establish the suitability of the approach with the information available to Nottinghamshire County Council.

Vehicle Restraint Systems

Inventory

There are a range of different systems in place across the county. These function in a variety of ways: to protect the occupants of errant vehicles from serious injuries as a result of striking roadside features such as masts, bridge parapets etc., or leaving the highway at a point where there is a significant drop or proximity to a watercourse.

These features require specialist design, installation, inspection, and maintenance and require replacement when they reach the end of their operational life.

The asset scale is sizeable. There are circa 70,000 linear metres of vehicle restraint system on the network within Nottinghamshire. This is subdivided into a variety of system types, with a variety of attributes and ages.

The inventory is well developed and currently stored in Microsoft Excel spreadsheets; however, the introduction of Causeway Alloy is to be considered as an appropriate recording system, which may also assist inspectors with feeding back identified damage.

Inventory Type	Length (km)
Open Box Beam	27.266
Un-Tensioned Corrugated Beam	4.608
Tensioned Construction Barrier	11.446
Wire Rope	2.96
Double Rail Open Box Beam	0.084
Proprietary Systems	42.3
Parapet	0.796
Total	**89.46**

Table 34: VRS Inventory Summary

The majority of the inventory is located on the upper tiers of the hierarchy, this increases the cost of delivering interventions because of the increased complexity with working on busier or higher speed roads. This places a premium on planning the works using the inventory and delivering light touch interventions to extend life.

Inventory is designed and installed in accordance with the requirements of the Design Manual for Roads and Bridges, CD 377 – Requirements for Road Restraint Systems and the relevant British Standards.

Performance

This part of the highway infrastructure asset is unique in so much as it is hoped that it is never needed to be used. As a result, there are no specific measures of its effective use, and the asset needs to be held in readiness to perform in the event that it is needed. To ensure that this is undertaken inspection is expected at high level by the highway inspectors completing scheduled safety and serviceability inspection. More specific structural inspection occurs on an area-by-area basis as resources permit.

The performance of this asset is measured using the available information to develop the works programme. This is undertaken on a ‘worst first’ basis in terms of risk, also accounting for the character and usage of the route in question and the nature of the risk that the vehicle restraint system mitigates.

The completion of inspections will be monitored, and inventory updated as asset growth occurs to ensure that no part of the inventory falls outside of the inspection regime.

The current resource allocated to the asset group has resulted in a backlog developing. A one-time investment was made using funding from the DfT's Safer Roads Fund, and similar funding opportunities should be explored to reduce the backlog.

Levels of Service

Table 35 below sets out the levels of service for the vehicle restraint system asset.

Aspect	Levels of Service
Safety	▪ Vehicle restraint systems are specifically installed to reduce the risk of road users being injured in the event of a collision due to a roadside feature. These are often installed to protect significant drops, approaches to bridge parapets, to divert vehicles away from structures or on dual carriageways to prevent and errant vehicle entering the oncoming lane. ▪ The design and installation of such features are carefully regulated as failure in the event of a strike can introduce a new hazard. ▪ Designs have developed to make these systems more effective at arresting an errant vehicle.
Serviceability	▪ The systems have reasonably long service lives and intervention is generally only required in the event of a defect occurring or vehicle strike being reported. ▪ When establishing replacement of systems, it will be necessary to upgrade the system to the current standards. In some cases, this may not be possible without managing a departure from standard. These will be managed and recorded as appropriate.
Sustainability	▪ The systems do require inspection to ensure that they will perform as intended. These inspections should be planned in a way to minimise travel as much as possible. ▪ In many cases these facilities will be located near to sites of ecological sensitivity such as watercourses. Works to the assets will need to be carefully planned to avoid causing damage.
Customer Service	▪ Customers do not always realise the value of this part of the asset unless they need to use it. As a result, the most effective way to make sure that road user's interests are met is to make sure that systems operate as intended in the event that they are required.

Table 35: Levels of Service for Vehicle Restraint Systems

Risk Management

The following sets out the responses to managing risks relating to managing the vehicle restraint system assets. In addition, risks are managed using a robust prioritisation process.

Response to Environmental Challenges	▪ Given the construction of these systems rely on steel and concrete, there are continued environmental challenges with the maintenance and replacement of these assets. In order to address this, materials will be sustainably sourced where possible.

Response to Economic Challenges	▪ A significant number of interventions are required following vehicle strikes. In these cases, a green claim should be made to recover the costs of the repair from the vehicle's insurer. This reduces risk on budgets available to undertake planned works to the inventory.
Response to Customer Feedback	▪ Customer Feedback is received infrequently from either road users or local district and parish council's, this is not uncommon with this type of asset. In the event that customer feedback is received, the response is considered in the context of the current backlog, nature of the issue raised, relative risk attached to the installation in question and the assessed risks of the issue.
Collaboration with Stakeholders	▪ Collaboration occurs with other teams surrounding the delivery of works to the asset group. This generally occurs within Via East Midlands, but other collaboration has occurred with National Highways on sections of the network which interact with the national strategic road network. This collaboration reduces costs where it is possible to coordinate works.

Maintenance Strategy and Operational Approach

The approach to maintaining this asset is led by inspection. It is important that barriers are cleared of vegetation so that strikes can be identified as part of the safety inspections and fed back to the maintaining teams for investigation. In addition, the clearance of the vegetation is required to allow the detailed inspection of the features to take place, when they are scheduled.

Upon completion of the inspection defects are prioritised based on their severity, the location of the asset in the network, along with the character and usage of the route. The nature of the damage is also considered in the process and in cases where there is a greater risk to road users, the repair of the system is afforded more priority.

The list of maintenance backlog is considered annually for an engineering assessment that considers the above factors alongside the parameters of repair. A balanced programme is then developed and delivered annually, although the available resource results in a worsening state in terms of backlog.

Where possible details of the party which undertook the damage will be sought and an insurance 'green' claim made to reimburse the service for the rectification costs. This reduces future financial risks that may be realised from unforeseeable circumstances.

In many cases as the standards develop or the other assets age, the requirements for delivering replacement barriers may alter. In these cases, the resources identified to undertake the replacement will also need to carryout consequential works such as ground stabilisation to deliver the scheme. This has a direct link to the volume of backlog which can be resolved.

This asset group grows over time. New schemes, including developer works deliver new assets to the inventory and over time this can increase maintenance pressures.

Innovation is evaluated as opportunities are presented. Proprietary systems, and advancements in both ground stability and the digitisation of asset data are examples of how developments in the supply chain can shape the way that these assets are managed, and interventions delivered.

The requirement for new assets is assessed using the Road Restraint Risk Assessment Process (RRRAP) which evaluates the hazards present and proposes a method of mitigating that risk with appropriate vehicle containment. The preference is to use the National Highways toolkit for this, with other methods being used in exceptional circumstances.

Prioritisation

Prioritisation is based on an annual engineering assessment of the known backlog on the network is the primary strand of the way that interventions are selected across the network.

The following parameters form part of the engineering assessment which informs the programme which is delivered annually:

- Position in the network.
- Speed of traffic at the location.
- Nature of hazards.
- Previous history of other strikes at the site.
- Nature of the damage to be resolved.
- The overall scheme cost.

As resources are available the regular regime of inspection of the restraint systems for the purpose of evaluating condition should also inform this prioritisation process.

The backlog is such that the renewal of installations which have reached the end of their service life is not possible. These installations are considered alongside the damaged parts of the inventory using the parameters above.

Asset Lifecycle Milestones

The key considerations for the asset milestones for the vehicle restraint system asset group are as follows:

Creation / Acquisition	Assets have been created over a number of years as hazards are identified for protection. In all cases vehicle restraint systems should be designed and installed in accordance with the relevant standard. Any departures due to on-site constraints should follow a managed process to ensure that newly created assets are fit for purpose, will have longevity and be easy to maintain.
Operation & Maintenance	Periodic vegetation clearance is required to make strikes easy to identify and facilitate inspection. In the case of tensioned systems, it may be necessary to periodically check the torque of the bolts in the barrier as part of an inspection regime and record the activity. A small subset of the inventory may be painted to highlight a hazard, such as the approach to a bridge and this may require periodic maintenance.
Renewal or Replacement	Replacements are required as the system reaches the end of life or is struck significantly. In the cases of minor strikes individual components may be undertaken. As replacement barriers are installed the details of the replacement should be recorded to assist both inspection and future maintenance operations on the asset.
Decommissioning	Some of the systems may be removed and not replaced due to alterations in the roadside environment, in these cases the reasons for removal shall be documented and recorded on the inventory for future reference. In accordance with the requirements of the Highway Infrastructure Asset Management Policy any redundant assets will be removed for re-use or sustainable disposal.

Improvement Actions and Targets

The information that can be provided by inspectors is key in developing a greater understanding of changes in network condition. Evidence of strikes should be reported back through the inspection system to the team, who can then evaluate the damage and if possible, initiate the process to recover costs. This may need to be included in future training and moderation activities with the inspectors.

When evaluating future resources, the detailed inspection of this asset should be included. The implications of reduced performance are potentially severe in the event that an errant vehicle strikes a barrier which has a defect which inhibits its performance. A short-term action is to develop an inspection regime to identify barriers where there are structural defects and build a picture of condition. This can then be used to prioritise the renewal or repair of assets on a ‘worst first’ basis to manage risk on the network. In the event that a large number of defective barriers are identified the prioritisation should include network hierarchy and the nature of the hazards at the site. In developing this assessment protocol, which should be included in the Inspection Manual, a forward programme should be developed extending three years.

The adoption of Causeway Alloy may offer the opportunity to better store the system inventory which may also support inspectors logging of identified defects. This opportunity should be evaluated as the Alloy system is rolled out across the service.

When evaluating future resources, the detailed inspection of this asset should be considered. The implications of reduced performance are potentially severe in the event that an errant vehicle strikes a barrier which has a defect which inhibits its performance.

Opportunities should be taken to identify funding to make one time step changes in the condition of this asset group.

Summary of Other Assets

Street Furniture

This asset group has a wide range of features and a varied need in terms of its management. These assets have a key role in enhancing the functional use of the highway and contributing to its amenity. The inventory for these aspects is recorded where appropriate.

This part of the inventory is important for a range of reasons. For example, grit bins are key aspects of the winter service, maintaining safety on lower hierarchy roads and hills in the county during freezing conditions. These grit bins are filled at the start of the winter period and then re-filled as dictated by the weather conditions experienced.

Cycle parking, guard rails and other furniture all contribute to the safety and sense of place of an area. Bus shelters and stops are key facilitators for the public transport network. These items of the inventory often work together to make the network a more pleasant and effective facility to use. As with signage these aspects of the inventory can contribute to visual clutter, so rationalisation is appropriate as part of schemes.

It should be noted that some assets within the highway network are managed or maintained by the district or parish councils as opposed to Nottinghamshire County Council. Examples of these are street name plates, litter bins and benches.

These assets are currently dealt with as part of a reactive maintenance programme in a risk-based way. The recorded inventory can be developed over time to improve the efficiency of the management of these assets, should a defined need arise.

Highway Verges

Highway verges are mown by the Seasonal Works Team to maintain the safety of the network.

Some verges are identified as Notified Road verges which are managed with a conservation perspective. These are given specific designations and are areas where there are biodiversity or other ecological considerations where it is beneficial to reduce the cutting regime and ancillary works.

Local wildlife sites are also identified for a reduced cutting regime. These areas are assessed for their importance from a road safety perspective prior to the designation being applied. These verges are cut once annually, usually in September.

There are currently 3 wildflower locations across the county which have a cutting regime developed specifically to enhance these areas. There are also areas which are wildflower verges managed by others and these are notified to the team to ensure that they are not mown during the planned cuts.

Parish Councils can apply to the County Council to undertake works to cut grass on highway verges, this offers the parishes the opportunity to be funded to undertake the specified cuts in their parish, and where they wish to, enhance the regime.

In addition to the grass cutting operation weed spraying is also undertaken to prevent damage to the infrastructure from vegetation. This is undertaken on a cyclical basis with areas where the speed limit is 30mph or less being sprayed twice a year, with weather dictating the timing of the operation.

Trials are being undertaken to evaluate methods of weed control which are more environmentally sound, and this is balanced against the implications of repairing weed damaged infrastructure.

Public Rights of Way (PROW)

A significant part of the highway network is the Public Rights of Way routes, which equates to nearly 2,800km in Nottinghamshire. This part of the highway network is managed using specific documents and information which are set out below. Generally, landowners have a greater role to play in ensuring that this network is passable and suitable for the intended use. Details of managing this part of the network are not included in this Plan to avoid duplication or contradiction with specific plans.

Definitive Map and Statement	This is a legal record of all PROW Routes in the county. Definitive Map and Statement | Nottinghamshire County Council
Rights of Way Management Plan (ROWMP)	Contains an assessment of the network to cater for current and future demands alongside a statement of strategic actions to manage rights of way and deliver improvements. ROWMP 2018 - 2026
Rights of Way News	A summary of current declarations, temporary closures, or access restrictions on the network. Rights of Way News | Nottinghamshire County Council
Changing a Right of Way	From time to time, it is necessary to make an amendment to the line of a Right of Way. Generally, this will be to facilitate development or accommodate some other physical change. This requires a legal process and details of that process can be found by following the link below. Changing a Right of Way | Nottinghamshire County Council

Electric Vehicle Charging Infrastructure

As the ownership for electric vehicles increases the infrastructure that charges then will need to be more widespread to cater for demand. Whilst a significant amount of charging infrastructure is located away from the highway network there is an ever-growing demand for facilities to be located within streets to facilitate charging.

Nottinghamshire County Council has recently secured funding from a successful bid through the Local Electric Vehicle Infrastructure (LEVI) pilot scheme. This is intended to enable local authorities to work with industry suppliers to create a more widespread and accessible charging network.

The current process for delivering on street charging is for a property to apply for a channel crossing which is delivered under a Section 50 Licence (NRSWA). This is a fixed term agreement which extends 7 years. After this time, the channel will become an asset of the highway authority and managed as part of the footway/cycleway asset group. If the feature is not required within the 7-year period, the property owner will be required to remove it at their expense. The works are to be delivered and managed by Via East Midlands to ensure that asset integrity is not compromised.

Currently Nottinghamshire County council are delivering investment in EV charging across the county, including in the public highway. The management of these facilities will be evaluated as schemes emerge and the technology develops and it is important that liaison occurs with the teams responsible for managing and maintaining the asset to ensure that there are no unintended consequences or unexpected cost implications.

Tram Related Infrastructure

Some of the routes in the county have tram infrastructure within the highway extent. These areas are managed between Nottinghamshire County Council and the current concessionaire for the tram infrastructure as set out in a Highway Interface Document. The lines and any substructure to support them are managed by the concessionaire, although highways inspectors will highlight defects in these areas to the concessionaire as part of a duty of care to all users. The required overhead apparatus to provide power to the tram is also in the control of the concessionaire.

All other aspects of these routes are managed by the local highway authority in accordance with the relevant documents.

There are likely to be challenges with delivering maintenance works to these routes to ensure that the principles of this Plan and statutory duties are maintained. Liaison with the tram concessionaire will be required to facilitate works and maintain the integrity of the network.

Traffic Enforcement Cameras

There are a number of traffic enforcement cameras which are managed by Nottinghamshire County Council across the highway network. These are managed and maintained in accordance with both the maintenance need of the asset group in terms of its reliability and to ensure appropriate calibration for the nature of the enforcement on a cyclical basis.

This asset group is likely to expand as the enforcement of moving traffic offences have migrated to local authorities.

Security Related Assets

When considering the safety of the public within Nottinghamshire some measures are installed on the public highway as a result of the release of central government document, CONTEST – UK Strategy for Countering Terrorism in 2018. These assets are specifically designed to perform a protective duty at key locations and are managed by the Emergency Planning Team who liaise with highways teams at Via East Midlands as required.

Other Assets

There are a range of other assets which fall outside of the groups above that are managed by the highways service for the benefit of users. An example of this is the network of weather stations used for forecasting to inform the winter service operations. These assets are generally maintained in a reactive way unless specific plans or monitoring arrangements are in place, as is the case with weather stations or data collections equipment.

Performance Management Framework

Service Objectives

The service objectives for asset management are set out in the Highway Infrastructure Asset Management Policy and are aligned to the ambitions of The Nottinghamshire Plan 2021 – 31. Table 36 below sets out the strategic outcomes and how the service will deliver the objectives.

Ambition	Relationship to Highways Asset Management
Ambition 1 - Helping our people live healthier and more independent lives	A well-managed highway infrastructure has a significant role to play in healthy lifestyle activities. A safe and accessible highway network including facilities such as public rights of way and other country paths, contribute to physical and mental well-being helping communities be safe, active, independent, and socially cohesive.
Ambition 2 - Supporting communities and families	A well-managed local road network will ensure that those in greatest need of access to local services have the best possible ease of movement, whilst also facilitating the support to vulnerable people within their own communities.
Ambition 3 - Keeping children, vulnerable adults, and communities safe	The use of asset management techniques - which strengthen and maintain the highway network's reliability and resilience - ensure that the highway infrastructure assets safeguard and protect communities from the effects of flooding and other severe weather events.
Ambition 4 - Building skills that help people get good jobs	Maintaining and managing highway assets provides rewarding opportunities for training and development within the County Council and its partners, which include many regional small & medium enterprises (SME's). Creating high-quality apprenticeships, placements, and training opportunities, ensure that local people have the right skills and qualifications and enhances social value and brings benefits to local communities.
Ambition 5 - Strengthening businesses and creating better-quality jobs	As a catalyst for success, the highways network supports the County Council to deliver its services for the benefit of the people of Nottinghamshire particularly through the post-pandemic recovery period. The pandemic has shown that the County Council can adapt quickly, improving the quality and availability of the highway network removes barriers to mobility thereby enabling residents to have choice and flexibility where to work.
Ambition 6 - Making Nottinghamshire somewhere people love to live, work and visit	A well-planned highway network will give access to safe and healthy travel choices. Residents will be able to lead more independent lives. The highway network contributes to community cohesion, through supporting social connection, fostering community pride at the same time increasing safety and reducing crime.
Ambition 7 - Attracting investment in infrastructure, the economy and green growth	Highway asset management provides the framework to manage and maintain vital infrastructure. Infrastructure which is critical for the success of Nottinghamshire's economy through access for goods, services, employment, education, leisure, and tourism. A well-maintained and managed highway network is essential to encourage investment in the County and stimulate growth.

Ambition	Relationship to Highways Asset Management
Ambition 8 - Improving transport and digital connections	Adopting an asset management decision-making process which is aligned to the County Council's ambitions, ensures that highway assets being invested now will also benefit the future highway network, supporting Nottinghamshire County Council's ambition to keep the County well connected through providing a sustainable service. Making the best use of the existing assets, through effective treatments at the right time and the use of appropriate technology, contributes to delivering defined service levels within available budgets.
Ambition 9 - Protecting the environment and reducing our carbon footprint	A system of asset management empowers the County Council to meet the challenges of climate change and carbon reduction with the use of digital technology and processes that give it the opportunity to embrace environmental innovation, accelerating the green transition, reducing emissions, improving air quality locally, and protecting biodiversity.

Table 36: Strategic Objectives for Infrastructure Asset Management

Review Process

To ensure that the service continues to deliver the objectives it is important that regular review is undertaken to keep them current and evaluate areas where service redesign is required. This is a key factor in making sure that the service continuously improves, both the way that the service is delivered and its outcomes.

A review process is currently underway to develop performance metrics into an outcome focussed measure of the performance of the Highways Service. This process has sought to align the outcomes with the strategic objectives whilst acknowledging the collaborative nature of service delivery between Nottinghamshire County Council and Via East Midlands.

Whilst the ongoing review process has sought to develop a more appropriate set of performance measurements which reflect the importance of the service, these measures will need to be reviewed regularly to ensure that they are fit for purpose and the appropriate data is available and reliable.

Performance Reporting

To monitor the progress of the service against these objectives a series of performance indicators are required. These have been developed to both measure these strategic outcomes and manage and improve the operational efficiency of the network.

There are also contractual performance metrics which are designed to be within the control of Via East Midlands and are generally tactical or operational measures which are likely to be measures of outputs rather than outcomes, however these are a key part of developing an efficient, end to end service.

In order to develop a suitable performance management framework, a total of five outcome statements were developed for the service, based on its overarching purpose "*to safely manage, maintain and improve Nottinghamshire's highways*". These statements are set out below and directly link to ambition six, seven, eight and nine of the Nottinghamshire Plan:

Outcome Statement 1	The health, safety and wellbeing of all highway users is improved.
Outcome Statement 2	The highway network and associated infrastructure remains fit for purpose.

Outcome Statement 3	Disruption to the highway network is minimised.
Outcome Statement 4	Residents are satisfied with the condition of the highway network.
Outcome Statement 5	The impact on the environment of the delivery of the highway service is reduced.

Figure 13 below sets out the Strategy and Performance Breakdown for the service.

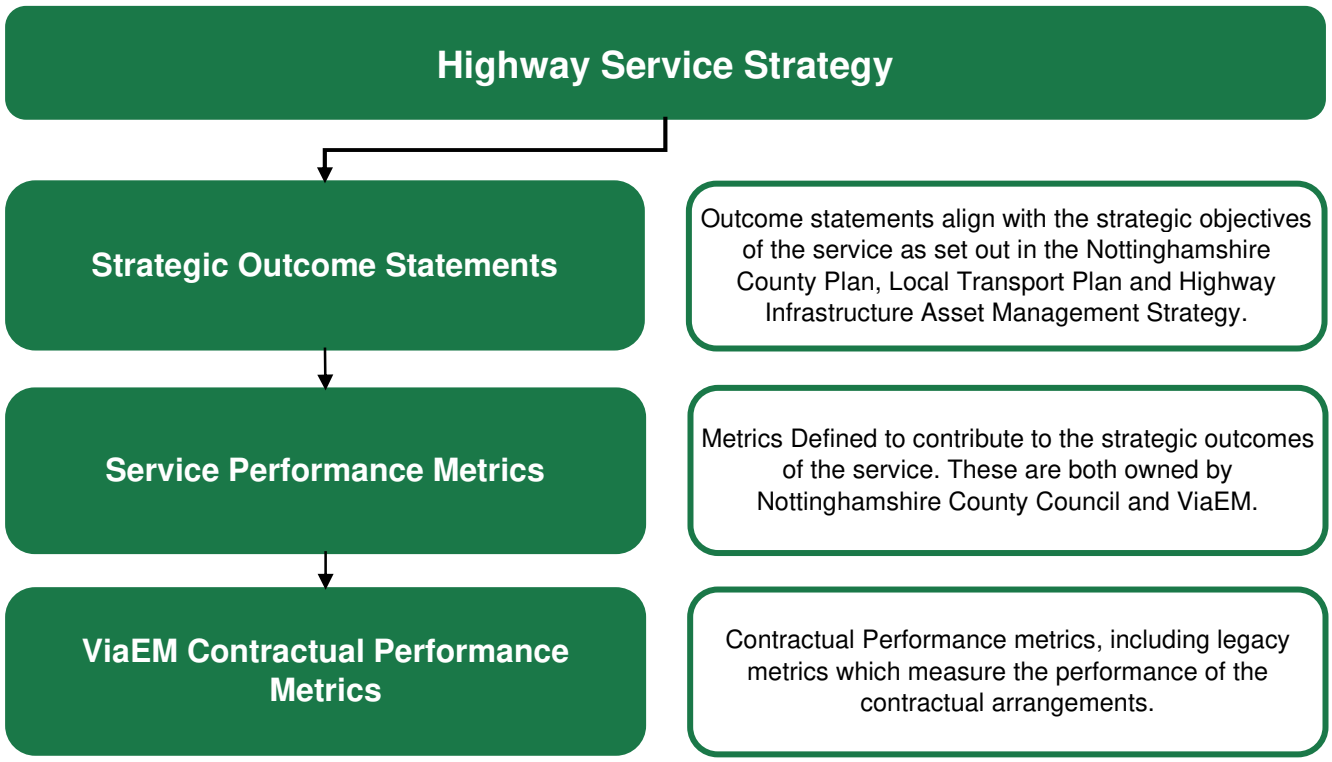


Figure 13: Performance Metrics Hierarchy

The following table sets out the way that success is measured across the Highway Service, when considered against the strategic objectives. Some of these metrics are related to reporting of National Indicators (NI) to central government to monitor the performance of the part of the national network of local authority roads managed by Nottinghamshire County Council.

Outcome	Ref.	Description	Method of Measurement
Outcome 1	PI 19, 20	Number of People Killed or Seriously Injured (KSI) in reported Road Traffic Collisions (RTC)	Percentage reduction in KSI casualties from RTCs. This value is calculated against a baseline of the average number of casualties between 2015 to 2019
		Children Killed or Seriously Injured in reported RTCs	Percentage reduction in child KSI casualties from RTCs. This value is calculated against a baseline of the average number of casualties between 2015 to 2019

Outcome	Ref.	Description	Method of Measurement
Outcome 2	130-01	Percentage of A roads not requiring planned maintenance	The percentage of the A road network where the RCI score calculated from the SCANNER survey is less than 100.
	130-02	Percentage of B & C roads not requiring planned maintenance	The percentage of the B & C road network where the RCI score calculated from the SCANNER survey is less than 100.
	LTP 9	Unclassified roads not requiring planned maintenance	The percentage of the unclassified road network which is classified as green from the CVI surveys undertaken on the unclassified road network.
Outcome 3	LTP 1	Average Journey Time per mile during the morning peak on the urban centre networks in the county	Figures are calculated using the Accession software based on the percentage of households within a 30-minute travel time to a town centre by public transport and within 400m of a bus or tram stop.
	LTP 2	Changes in areas wide traffic mileage	Calculated based on the DfT's National Road Traffic Survey base, counts taken over 12-hour period for A class roads. AADT values are calculated into annual vehicle kilometres using known link lengths.
	LTP 7	Traffic Flows into town centres	Based on Surveys undertaken on all main radial routes and A6514 Ring Road orbital route in Greater Nottingham. Vehicle occupancy and bus journey times measured in the morning peak at specified periods in the year.
Outcome 4		Increase in NHT Public Satisfaction Scores	Based on the annual customer satisfaction survey which evaluates a number of parameters within the delivery of the highways and transport service.
Outcome 5	LTP 4	Number of air quality management areas (AQMAs) on County Council managed roads	AQMAs are declared where there is an exceedance of a pollutant. This is based on information published in air quality annual status reports published on the borough/district websites.
	LTP 5	CO_2 emission from road transport	Particulate levels in AQMAs are monitored and reported by the relevant borough / district and are published online in the borough / district's air quality annual status report This is therefore based on the relevant published air quality annual status report.
	LTP 14	Particulate levels in air quality management areas	CO_2 emissions are monitored at a national level and are based on Department for Business, Energy & Industrial Strategy published data.

Table 37: Highway Service Strategic Performance Metrics

The Lifecycle Asset Groups Section identifies the asset specific performance indicators. There are some additional metrics which are focussed on managing the overall safety and performance of the network. many of these are related to the inspection of the network and the delivery of reactive works. These are summarised in the table below. These are not representative of all the metrics which apply to the delivery of the highway service. These metrics are not the strategic measures outlined above but are from the Service or Contractual tiers of the performance framework.

Reference	Description	Target	23-24 Outturn
KPI 01	Percentage of emergency incidents attended within response time (2 hours).	100%	96.66%
KPI 02	Percentage of Cat 1 defects made safe within response time (end of next working day).	90%	80%
KPI 03	Percentage of Cat 2 defects made safe within response time (28 days).	90%	75%
KPI 04	Percentage of Cat 3 defects made safe within response time (90 days).	90%	85%
KPI 05	Percentage of NRSWA inspections achieved against agreed target (Annual Target).	100%	99.46%
KPI 06	Percentage of network inspected within stated frequency.	97%	90.05%

Table 38: Inspection, Serviceability and Network Availability Performance Indicators

In addition to these existing performance indicators some new metrics are being developed around the management of the NRSWA Permit Scheme and network availability. As these are developed, they will be added into the performance framework. This is a good example of the way that the performance framework develops over time to meet the evolving needs of the network and service.

Contractual Arrangements with Via East Midlands

The current contractual arrangements for the delivery of highways services have a performance component which sets out a number of performance indicators. These have been reviewed to shift the focus of the contract to be more in touch with outcomes. The metrics include a range of measurements including a set of around 16 new measures which are intended to achieve a greater focus on outcomes. Six of these measures are directly focussed at improving the environmental impact of the service. Most of these metrics are outcome or output based, however metrics based on Highway Service demands, such as the total number of enquiries are based on input. As these are developed and adopted the service will evolve to deliver these alongside the strategic objectives and associated metrics.

Governance

Leadership and Organisation

The following table is taken from the previous version of this Plan to illustrate how the organisation can implement asset management delivery.

Tier of Asset Management Delivery	Resources	Indicative Tasks
Strategic	**Senior Decision Makers**	▪ Set Asset Management Policy and Strategy ▪ Endorse Asset Management Framework ▪ Align Levels of Service with Strategic Objectives ▪ Agree Performance Targets ▪ Establish Context for Risk Management
Tactical	**Asset Management Staff**	▪ Implement the Asset Management Framework ▪ Provide Information to Support Decision Making
Operational	**Operations Staff and the Maintenance Workforce**	▪ Implement Works Programmes ▪ Measuring Performance

Table 39: Organisational Hierarchy

The policy and strategy are set out through meetings with the Cabinet Member with guidance from key officers in the service. In terms of the organisational hierarchy within the service the following roles are at the heart of the delivery of asset management principles across the organisation.

Nottinghamshire County Council has the responsibility of setting policy for the service. The responsibility for the delivery of this service falls to Via East Midlands. This arrangement is largely collaborative, and the County Council maintains a ‘thin’ client to oversee the contractual arrangement.

Competencies

The Highway Infrastructure Asset Management Strategy (HIAMS) recognises that employees are the most important resource of the service.

Crucial to the success of asset management within the County Council is that staff are competent, the County Council acknowledges that competency can be demonstrated both by experience and behaviour, as well as formal training and membership of a professional body.

To support staff engaged in asset management the Council will utilise the UKRLG Asset Management Competence Framework which is a nationally recognised framework that has been produced for highway authorities in the UK and is aligned to both the Code of Practice and the international standard for Asset Management (ISO55000). This framework will be used to assess the current level of competence for staff in key Highway Infrastructure Asset Management roles and to prioritise the development of staff in those key roles.

In order to make the most of digital advances it is important that staff keep themselves up to date with advancements in technological developments. In addition, if digital technology is adopted it is important that staff skills are developed to facilitate its effective use. By considering staff competency alongside technology can maximise the benefits that can be realised from the adoption of these systems.

Collaboration and Knowledge Sharing

Nottinghamshire County Council collaborates with other members of the D2N2 group of local authorities. This alliance operates at a high level and supports funding bids such as to the DfT Challenge Fund. Whilst not an alliance which influences the day-to-day operations in terms of the management of the infrastructure asset the support of funding bids can positively influence the available funds for the network.

The highway service review has initiated a continuous improvement approach to all aspects of the service, including to the relationship between the County Council and Via East Midlands. To facilitate this a Continuous Improvement Plan is being established. The purpose of this Plan is to develop an efficient service that contributes to the corporate objectives of Nottinghamshire County Council and enhances customer satisfaction. This Plan sets out a platform for the recording of improvement actions, assign owners for those actions, monitor progress, provide feedback and establish suitable improvements as business as usual.

In order to enhance the current collaboration between asset owners a forum is to be established which will provide the platform to share best practice, opportunities for continuous improvement and evaluate developing technology to drive a range of service improvements. The implementation of this group is noted in the Action Plan.

Nottinghamshire County Council is also a member of the Local Council Roads Innovation Group (LCRIG). Membership of this group allows a platform for engagement with the industry and the Department for Transport on a range of issues. It also allows early access to suppliers that are innovating in their field and collaboration with like-minded authorities. In addition to this collaboration LCRIG membership has facilitated procurement routes and access to a more diverse supply chain.

Membership of the Association for Public Service Excellence (APSE) is also maintained. This forum allows benchmarking against other similar local authorities as well as the opportunity to tap into the thoughts of other authorities.

In addition, the County Council is a member of the service improvement group, MHA+. There are around 30 local authorities who contribute to this group where members share best practice, liaise over common issues, and create a regional approach to common themes across a range of highways services.

Cross border liaison largely occurs through the MHA+ service improvement groups. In some cases, liaison will occur through the management of the Local Street Gazetteer which flags mismatches across borders between local highway authorities. Additionally, liaison occurred during the development of network hierarchy to ensure continuity across county boundaries.

Review of the Highway Infrastructure Asset Management Plan

The Highway Infrastructure Asset Management Plan will be formally reviewed annually. The review will assess progress with the delivery of this Plan with a report to senior decision makers. Recommendations from the review could lead to an update of this Plan or to revision of procedures as required.

To inform this process a register of lessons learnt should be kept by an appropriate team and as feedback is received or the service develops the register should be updated. This resource will inform updates for this Plan and ensure that all details are properly accounted for.

Appendix 1: Highway Infrastructure Asset Management Plan Change Log

As set out in the 'Review of the Highway Infrastructure Asset Management Plan' section this Plan will need regular update. Table 1-1 below sets out the nature of the changes made as a record of how the document has evolved.

Version Number	Summary of Amendment	Date Complete
1.00	2018 Plan published which sought to consolidate the approach taken into a single document.	July 2018
2.00	2023 iteration of the Highway Infrastructure Asset Management Plan adopted	June 2023

Table 1-1: Change Log

Appendix 2: Glossary of Terms and Acronyms

Term or Acronym	Explanation
AADT	**Annual Average Daily Traffic** – Generally this is the total flow of traffic, in both directions divided by the number of days in a year to express how busy a road is.
AEI	**Annual Engineering Inspection** – Generally undertaken on 'Candidate Sites' to establish maintenance need and intervention selection.
ADEPT	**Association of Directors of Environment, Economy, Planning and Transport** – An organisation that represent 'place based' service directors. This group is instrumental in informing national policy and developments in service delivery.
APSE	**Association for Public Sector Excellence** – An organisation which facilitates the sharing of best practice, benchmarking, and information amongst member local authorities.
Ash Dieback	Chalara is a disease that causes Ash trees to die. This can increase risk to road users as the tree structure fails. Management of this situation is required to mitigate this risk.
Asset Group	Because of the variety of assets associated to the highway network and its scale it is necessary to subdivide the infrastructure assets into groups, such as carriageways, structures etc. Whilst there are many groups, the most significant groups are detailed in this Plan.
Asset Management	A holistic approach to managing all aspects of the highway infrastructure. This is the delivery vehicle for the strategic, operational, and tactical objectives of the service and ultimately is a key contributor to improving service outcomes.
Asset Management Framework	The Asset Management Framework demonstrates how asset management links to the County Council's broad organisational context and strategic direction of travel, all the way through to frontline delivery of services.
Asset Valuation	A method for applying monetary value to parts of, or the collective highway asset in the county.
BCI	**Bridge Condition Index** – A nationally developed methodology for expressing the condition of bridges.
Candidate List	An evolving list of works required to the county highway infrastructure assets. These lists are developed in accordance with the prioritisation for each of the asset groups.
Capital Budget	Funding specifically for improving the County Council's assets. It can include the establishment of new assets, but it also encompasses the refurbishment of existing assets.
Continuous Improvement Process	A process that is applicable to all aspects of the service and is embedded in the culture of the organisation. This process encourages opportunities for improvement to be identified, planned for implementation, executed, and evaluated to ensure that the service evolves to maintain effectiveness and efficiency.
Customer	All users of the public highway in the county are customers of the service.

Term or Acronym	Explanation
CVI	**Course Visual Inspection** – This is a rapid survey that is deployed on the unclassified network to establish condition. It is generally undertaken from a vehicle by accredited inspectors.
D2N2	A collaboration of Nottinghamshire County Council, Nottingham City, Derbyshire, and Derby City Councils.
Deterioration	The detrimental change in condition of assets and data associated to the service.
DfT	**Department for Transport** – The central government department that oversees transport systems in England. They provide policy, guidance, and funding to local authorities to maintain the local road network.
DMRB	**Design Manual for Roads and Bridges** – This is a document which is applicable to the design and assessment of schemes on the trunk road network managed by Highways England. Some aspects of this document are utilised on the local road network, and its application is at the discretion of the local highway authority.
DRC	**Depreciated Replacement Cost** – This is the current value of the asset, it includes allowance for the accumulated depreciation and impairment that is a result of age, use and other damage that occurs to the infrastructure.
DVI	**Detailed Visual Inspection** – Generally a walked inspection and survey that is more detailed than the CVI survey. This is generally deployed in areas where need is identified from other datasets and supplements routine survey methods.
FHRG	**Future Highways Research Group** – Affiliated to ADEPT, the FHRG offers leaders the opportunity to discuss, develop and test innovation in the highways sector.
FNS	**Footway Network Survey** – A simple walked survey of the footway network undertaken to provide an understanding of condition.
GIS	**Geographic Information System** – These are information technology systems that can be manipulated to process, analyse and display data relating to the asset. This might be inventory or condition data and is used widely with high levels of compatibility across systems which makes it a valuable platform for data sharing.
HIAM Plan	**Highways Infrastructure Asset Management Plan** – This Plan which details the delivery of the HIAMS and the Policy.
HIAM Policy	**Highways Infrastructure Asset Management Policy** – is a statement which establishes how NCC will manage its Highway Infrastructure Assets in a way which is consistent with its corporate objectives.
HIAM Strategy	**Highways Infrastructure Asset Management Strategy** – The strategic objectives of highway asset management delivery in the county.
Hierarchy	A series of hierarchies that describe the highway infrastructure assets and consider expected use, resilience, economic support, and social factors such as access to education or healthcare.

Term or Acronym	Explanation
LCRIG	**Local Council Roads Innovation Group –** A service improvement group which is committed to both promoting innovation in the highways sector alongside promoting improvements to highway services with the outcome of raising standards for users.
LCWIP	**Local Cycling, Walking and Infrastructure Plan** – A long term pan which is intended to guide the development of walking and cycling infrastructure. In Nottinghamshire this is being developed across the D2N2 area.
Levels of Service	Statements that describe the performance of the highway infrastructure assets in a fashion that stakeholders can understand.
Lifecycle Plan	A specific plan for an asset group that sets out the management of the lifecycle of the asset in question. This generally includes the modelling of investment scenarios and the planning of interventions to extend service life and reduce whole life cost.
LLFA	**Lead Local Flood Authority** – Has responsibilities under the Flood and Water Management Act (2010) to conduct investigations, including liaising with water management bodies, following flood events.
LSG	**Local Street Gazetteer** – A centrally developed resister of the attributes of streets in an authority area. The LSG includes private streets, although maintenance status is recorded in the gazetteer. The system is managed by Geo-Place and authorities are measured on the data quality in the LSG.
LTP	**Local Transport Plan –** The local strategic document that sets out the direction of all aspects of transport delivery for the county. This includes both the maintenance and operation of the infrastructure and the use of the network alongside initiatives to change behaviours.
MCHW	**Manual of Contract Documents for Highway Works** – Whilst intended as a specification for works to the national trunk road network managed by National Highways this specification is often used as a baseline for local requirements. Any variations in requirements are recorded in the local documents and made available to those working on Nottinghamshire County Council's network.
MHA +	**Midlands Highway Alliance Plus** – A regional service improvement group which has a number of subgroups which assist authorities share information, benchmark performance, and liaise as required. The group also sets out regional resources which member authorities can access.
MOVA	**Microprocessor Optimised Vehicle Actuation** – This is a control system for junctions and crossings that are in isolation to a UTC system. It optimises the operation of the facility and balances the demands for all users.
NHT	**National Highway and Transport Network** A performance improvement organisation which assists members in measuring and comparing their performance to improve.
NI	**National Indicator** – National reporting on performance of key metrics relating to a range of local and national services. Specific to the highways and transport functions there are primary measures of network condition and use.

Term or Acronym	Explanation
Nottinghamshire Plan	The overarching county wide strategic document that sets out commitments over a 4-year period.
NRSWA	**New Roads and Street Works Act** – The legislation that controls and manages all works within the highway extent from a traffic management and permissions perspective.
PMS	**Pavement Management Systems** – The system, often proprietary that is used for managing carriageway and cycleway/footway data to generate programmes.
PROW	**Public Rights of Way –** This network is a significant part of the overall highway network that includes Footpaths, Bridleways, Byways Open to All Traffic and Restricted Byways. These are managed differently to the assets described in this document and specific PROW documents should be reviewed for more details on how this network is managed.
Quality Assurance Process	The process that is available to manage the quality of works on the network, and feedback issues to ensure the longevity of treatments and the performance of the network. This is also a key component in demonstrating value for money from works.
RCI	**Road Condition Index** – This is a nationally set measurement of road condition based on several parameters measured by the SCANNER Survey. This is generally a measure of the condition of the A, B and C road classifications, although it can be deployed on the unclassified network. If it is used in this classification weighting sets may be required.
Resilient Network	Recommended as part of the 2014 DfT 'Transport Resilience Review' document this designation is intended to highlight the most important routes to maintain movement in the county. This designation attracts the prioritisation of funds and interventions to maintain the required resilience.
Revenue Budgets	Revenue budgets are used for day-to-day expenditure, and this often includes routine or reactive maintenance of assets. These funds are sourced through council tax and charging for services provided.
Riparian Responsibilities	The owner of land or property that adjoins a watercourse, such as a roadside ditch, is known as the riparian owner. The Highway Authority is responsible for the highway, but not the subsoil in most cases. The owner of the land or property adjoining the highway is normally the sole riparian owner. Both sides of hedges are also the responsibility of riparian owners.
RMS	**Remote Monitoring System** – This is used to access traffic signals installations to monitor the operation of the system and identify faults.
RTI	**Real Time Information** – These systems are installed at public transport stops and hubs to relay the expected arrival time of services.
SCANNER	**Surface Condition Assessment for the National Network of Roads** – Based on a national set of parameters, contractors are regulated by annual testing by TRL to ensure consistency across the surveys. This can provide a useful benchmarking dataset. There are around 40 parameters that are recorded in the survey and the data is often used in the development of programmes.

Term or Acronym	Explanation
SCOOT	**Split Cycle Offset Optimisation Technique** – This is a real-time traffic control system that coordinates the control of traffic signals across and area to improve and optimise traffic flow.
SCRIM	**Sideways force Coefficient Routine Investigation Machine** – This is a nationally accredited measure of the skid resistance properties of a carriageway. This is an important survey for supplementing road safety performance and preventing collisions.
Service Life	The anticipated lifespan of treatments on the network. This is important in developing understanding of whole life cost. It is important that designs and specifications deliver the anticipated service life. This avoids increases in cost and loss of opportunity that will result in early retreatment of deteriorated assets. Some asset groups like drainage have a bearing on the service life of associated assets.
Specification	The highways service has a number of specifications that are relevant, the primary specification is that which delivers works to the network. This is important to ensure service life and performance attributes are delivered. In addition, specifications can exist for supporting aspects of the service such as data and information.
Stakeholder	Stakeholders can be statutory or non-statutory bodies who have an interest in the way that the network is managed. Examples are the Police Service or Environment Agency.
UKRLG	**United Kingdom Roads Leadership Group –** there are several boards which consider specific aspects of the Highway Service and is made up of representation from national and local government.
UTC	**Urban Traffic Control** – this is a system of coordinating the flow of traffic through urban areas. SCOOT is a method of UTC.
Vaisala Road AI	A proprietary system that utilised video surveys undertaken from windscreen mounted smart phones. The system analyses footage using AI modules to establish road condition, based on CVI parameters, road marking condition and traffic sign condition.
Via East Midlands	The primary delivery organisation for Nottinghamshire County Council for the maintenance, design, and construction of a range of highways related functions. Via East Midlands are a key component of the delivery of asset management in the county.
Well Managed Highway Infrastructure: A Code of Practice	The Code of Practice was published in 2016 and authorities had until 2018 to adopt the recommendations in the code. The thread that runs through the document requires authorities to have a risk-based approach to managing the asset.
Whole Life Cost	This can be expressed as a financial or carbon emission value. It is a useful value to evaluate options for delivering a specific lifecycle plan and can be used to develop long term funding requirements. When carbon emissions are used treatment scenarios can be developed to lower the carbon implications of delivering the service.

Table 2-1: Glossary of Terms and Acronyms