APPENDIX 1B

DRAFT – v0.23

Cardiff Council

HAMP-3

Highway Asset Management Plan

2023-2026

CARDIFF
CAERDYDD

Contents

Document Control

Version Number	DRAFT – v0.22
Date	18th May 2023
Council Approval Level	Cabinet Meeting
Next Update Due	2026

Revision	Status	Description	Date	Author	Approved
0.15	DRAFT	General Amendments	16.12.22	A.G.	G.B.
0.16	DRAFT	General Amendments	21.12.22	A.G.	-
0.17	DRAFT	General Amendments	10.02.23	A.G.	G.B.
0.18	DRAFT	Submitted to Corp. Finance for Comment	21.02.23	A.G.	-
0.19	DRAFT	General Amendments	01.03.23	A.G.	-
0.20	DRAFT	Management of Drainage Info Updated	27.03.23	A.G.	G.B.
0.21	DRAFT	Management of Street Lighting & ITS Info Updated	29.03.23	A.G.	G.B.
0.22	DRAFT	Submitted with Cabinet Report for Advice	03.04.23	A.G.	G.B.
0.23	DRAFT	General Amendments	17.04.23	A.G.	-

1. Foreword

This is Cardiff Council's third Highway Asset Management Plan (HAMP) and sets out the council's plans for the management of the Carriageway, Drainage, Footway, Intelligent Transport Systems, Street Furniture & Road Markings, Street Lighting and Structures Highway Assets. It has been produced in accordance with national guidance and recommended good practices.

It is widely recognised that the application of modern asset management practices can enable improved value for money. In these challenging times is it essential that the council embraces these methods and strives to ensure that every penny spent is invested as wisely as possible. This plan forms an important part of the council's commitment to apply good asset management to highway infrastructure.

The plan recognises the views of road users and residents and in particular the importance that is placed upon our Highway Assets. It is essential that an appropriate level of investment is put into the highway asset to maintain and ultimately improve one of the main principles of the council, that of the economic wellbeing of the locality and future generations.

REQUIRES INPUT / APPROVAL FROM CLLR De'Ath

Councillor Signature

Councillor Dan De'Ath
Cabinet Member for Transport & Strategic Planning

1.1 Executive Summary

This HAMP sets out the council's proposals for the management of and investment in the Carriageway, Drainage, Footway, Street Furniture & Road Markings, Street Lighting, Intelligent Transport Systems and Structures Highway Assets and is designed to ensure that highways funding is used in the most efficient and cost-effective way.

Cardiff Council has a successful record of managing the highly complex highway asset. Recent years have presented significant challenges in terms of maintaining a multibillion-pound asset in the context of, significantly constrained Capital and Revenue budgets, the covid lockdown and recovery, and rising costs. Nonetheless, the Council has a track record of not just maintaining the asset but also delivering significant innovation, such as the ongoing LED Street lighting rollout and delivering Wales's first Carbon Neutral road surfacing scheme on 1.2km of the A470 Northern Avenue in 2022. In this context, the aim of this strategy is to develop a foundation for taking forward a robust risk-based approach to highway asset management that also begins to address in a meaningful way the wider issues of climate emergency, economic growth, and transport sustainability.

This plan is based upon the choices made by the Council in terms of the level of investment in the highway asset, what that investment will be directed at and the service standards that the users can expect. The highway asset has a replacement cost with a modern equivalent estimated at approximately **£2.37bn** (see section 4.2 based on pre inflationary values) is the Council's most valuable financial asset and comprises of:

- Carriageways
- Drainage
- Footways
- Street furniture (bollards, traffic signs, barriers etc.) and Road Markings
- Street lighting
- Structures
- Intelligent Transport Systems (traffic signals etc.)

The purpose of the HAMP is to:

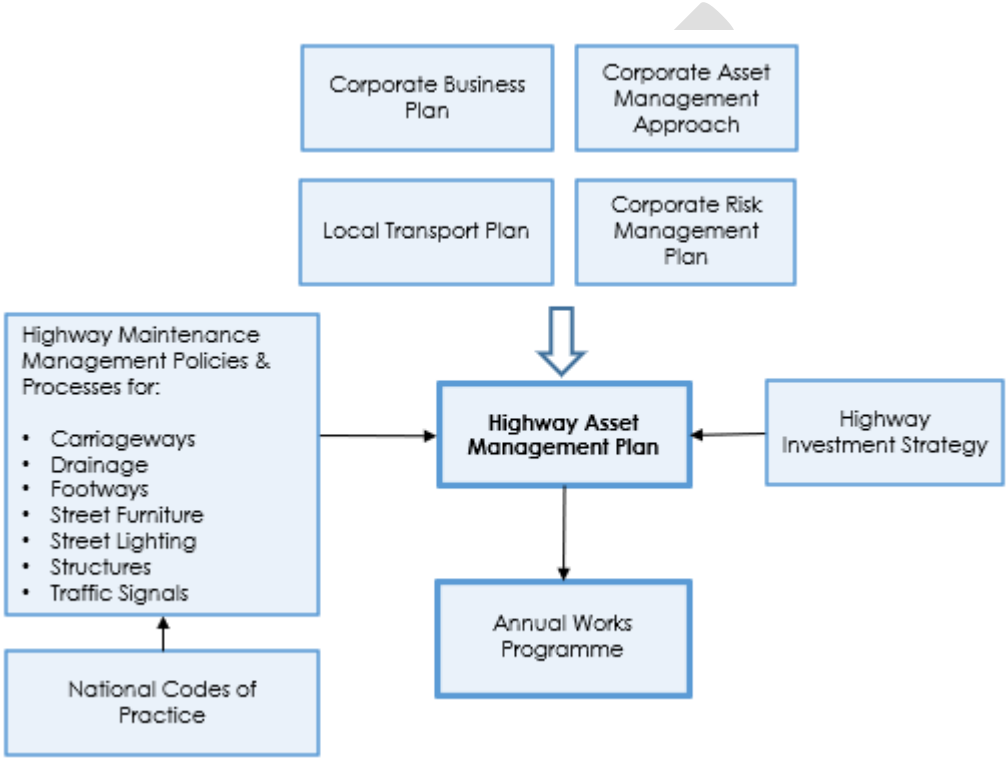
- **Formalise strategies for investment in Highway asset groups.**
- **Define service standards.**
- **Improve how the Highway asset is managed.**
- **Ensure the most efficient service is delivered within available resources.**

2. Introduction

The HAMP links to many Council processes and corporate aspirations along with national legislation, it seeks to respond to both adopting a risk-based approach to maintenance management.

2.1 HAMP's Relationship to Other Council Processes

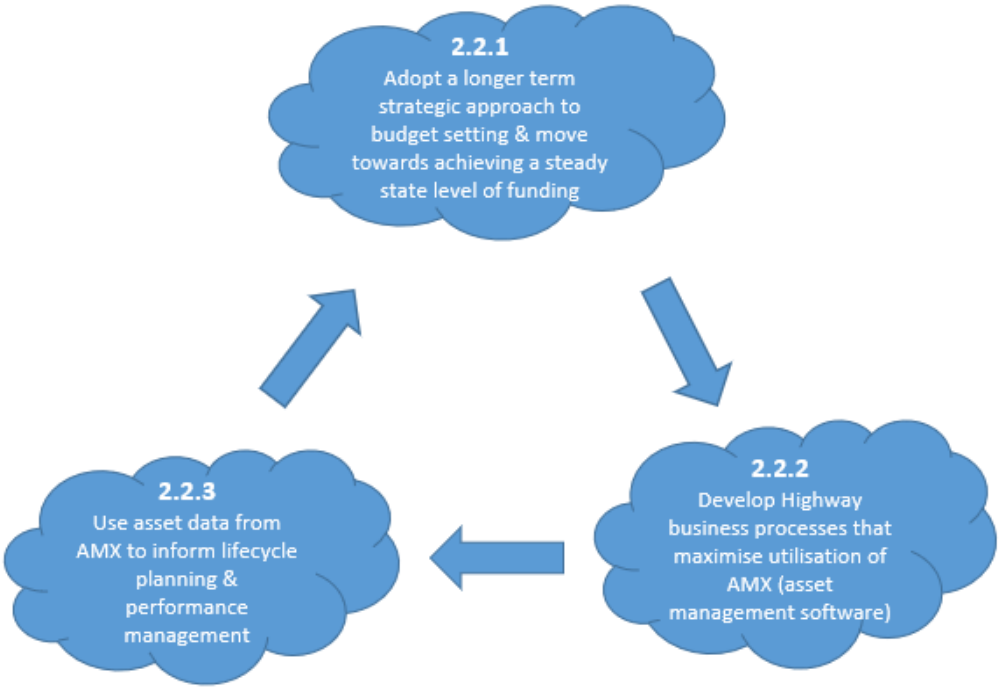
The diagram below shows how this HAMP relates to other Council plans and decision-making processes.



National Codes of practice and legislation inform highway management policies which in turn define investment strategies, **the actual level of investment is dependent on corporate budget settlements**. These processes support longer term HAMP decision making and forward works programmes which all inform the annual works programme.

2.2 Business Principle Aspirations of the HAMP

For the HAMP purposes stated above in 1.1 to be achieved key business principles are being developed to maximise its effectiveness and enhance service delivery:



2.2.1 Adopt a longer-term strategic approach to budget setting and move towards achieving a steady state level of funding.

Traditionally Highway Maintenance budgets have been set annually often based on previous or historic values that creates a short-term reactive approach to management and improvement. Adopting long term funding for maintenance will allow the service to maximise whole life cost and planning benefits that are associated with this type of financial commitment. However, it must be understood that if funding levels are insufficient to address backlogs and slow deterioration no amount of long-term planning will alleviate this underlying problem.

Steady State is a level of funding that maintains an asset in its current condition, neither improving nor deteriorating from an overall perspective. Maintenance funding below steady state will result in an ongoing deteriorating condition and consequent increasing maintenance backlog over time, the speed and level of deterioration is dependent on how far investment is below steady state. Consideration must also be given to the levels of revenue investment that will be required to undertake reactive repairs to the asset. The lower the investment level and poorer the condition of the asset the higher the revenue demands to repair the increasing quantities of reactive safety defects. Calculations for the steady state values of highway assets are shown in section 4.3 (background info shown in section 2.5).

Important Note: Please refer to section 4.3 to understand how the recent (2021-23) cost of living increase has affected the investment values contained in this strategy.

2.2.2 Develop highway business processes that maximise utilisation of AMX (Asset management software)

At every opportunity AMX will be used to manage routine business processes so data can be shared, analysed and reported to improve efficiency, the following activities are currently managed by AMX:

- Highway safety inspections, end to end process management from inspection to repair
- Highway condition inspections
- Data collection, storage and management for highway "child" assets
- Delivery of highway capital improvement programme. Including financial management, site supervision and post construction quality inspections (development ongoing)
- Management of public rights of ways including condition, asset renewal and project delivery
- Manage the interface with the Council App for customer defect reporting on highway assets

2.2.3 Use asset data from AMX to inform lifecycle planning & performance management

As AMX becomes more embedded in the delivery of routine highway business processes the available financial, condition, performance and asset data will be used to provide more informed decision making. This will support lifecycle planning and the ability to show how investment strategies realise expected service standards and performance, over time generating more efficient allocation of resources and service delivery.

2.3 Requirements of Government Legislation

There are two key pieces of national legislation that should be considered for the HAMP. It is important to remember that any level of funding less than steady state will result in, to greater or lesser extent depending on investment, a managed decline of the condition of the highway asset (see section 2.2.1).

Section 41 of the **Highways Act 1980** imposes a legal duty of maintenance on highway authorities (The Council) in respect of those highways that are maintainable at the public expense.

The **Well–being of Future Generations (Wales) Act 2015** is an Act of the National Assembly for Wales to make provision requiring public bodies to do things in pursuit of the economic, social, environmental and cultural well-being of Wales in a way that accords with the sustainable development principle; to require public bodies to report on such action; to establish a Commissioner for Future Generations to advise and assist public bodies in doing things in accordance with this Act; to establish public services boards in local authority areas; to make provision requiring those boards to plan and take action in pursuit of economic, social, environmental and cultural well-being in their area; and for connected purposes.

Of particular relevance to this HAMP is part 2, section 5 of the Act:

> ***Well–being of Future Generations (Wales) Act 2015***
>
> ***Part 2 – Improved Well-being***
> ***Section 5 - The sustainable development principle***
>
> *(1) In this Act, any reference to a public body doing something "in accordance with the sustainable development principle" means that the body must act in a manner which seeks to ensure that the* ***needs of the present are met without compromising the ability of future generations to meet their own needs.***
>
> *(2)In order to act in that manner, a public body must take account of the following things—*
>
> *(a)the* ***importance of balancing short term needs with the need to safeguard the ability to meet long term needs, especially where things done to meet short term needs may have detrimental long term effect****;*

2.4 HAMP Links to the Council's Corporate Aspirations

In this plan we will be exploring the opportunity to focus on aligning the HAMP with the wider corporate priorities found in Stronger, Fairer, Greener (SFG) vision for Cardiff Council. The SFG document states: "A *greener city which, through our One Planet Cardiff programme takes a lead on responding to the climate emergency, which*

celebrates and nurtures biodiversity, with high-quality open spaces within easy reach for rest and play which are connected by convenient, accessible, safe sustainable transport options". In this regard the HAMP will seek to align and integrate to wider corporate strategies and will seek to:

- Align the strategy with – where possible - developing a low carbon response to Highway maintenance
- Maximise the integration of sustainable mode use on the Highway.
- Regard the Highways within the wider context of creating high quality public realm, based on placemaking, greening, accessibility, and design quality – supporting wider economic approach to city and local centre regeneration.

2.4.1 This HAMP will apply the following objectives from the Corporate SFG document, it will enhance the experience of pedestrians, cyclists and motorists and encourage economic growth by making it easier and safer to use the highway network.

- Play a leading role in the Capital Region, including developing strategic economic development, transport and planning strategies, as well as governance and delivery arrangements that support Cardiff's role as the economic, cultural and leisure centre of the region.
- Deliver the 'One Planet Cardiff' response to the climate emergency, accelerating the transition to net zero by putting sustainable development at the heart of everything we do as a Council.
- Continue to deliver an extensive programme of localised improvements to our roads and footways to remove defects such as potholes.
- Adopt the principles of a 15-minute city approach, focusing on sustainability, placemaking, and the density of development that this vision requires.
- Integrate great design, placemaking, greening and sustainability principles into all proposals for development and public spaces.
- City centre recovery

2.4.2 The delivery of innovative, cost-effective risk-based maintenance within allocated budgets underpins the aspirations above and implementation of the following transformative approaches:

i. **Placemaking** is a multi-faceted approach to the planning, design and management of public spaces. Placemaking capitalises on a local community's assets, inspiration, and potential, with the intention of creating public spaces that improve urban vitality and promote people's health, happiness, and well-being. The Council's highway infrastructure links and often maintains these community assets creating a cohesive unit of greater value for the community.

ii. **Low Carbon:** The Council has already utilised highly innovative approach to low carbon asphalt. We will develop further opportunities for low carbon approaches to materials, systems, and working practices.

iii. **Sustainable Transport:** Traditionally the highway has been designed to maximise the efficiency of car and vehicle movements. This innovative approach that this plan will adopt seeks to develop the highway in a manner that also supports the usage of other transport modes in a more balanced manner, including walking, cycling, as well as tackling wider accessibility issues.

iv. **Greening** promotes the concept of healthy streets. Urban greening helps to make streets part of a public realm network that is designed more for people than for vehicles. Greening of Cardiff's streets, buildings and other public spaces does more than change the look of these places. Roofs and walls covered in plants, street trees and small pocket parks in between buildings help combat climate change and make the city a better place to live, work and invest. The **HAMP** manages the interface between existing highway infrastructure (for example, SuDS planting described below and future biodiversity and amenity opportunities relating to flood risk management) and these new and emerging green infrastructure initiatives including the Councils Coed Caerdydd project.

v. **Sustainable Drainage Systems (SuDS)** have been developed to imitate the natural drainage process and provide the community with green spaces promoting diverse wildlife and wellbeing. Traditional drainage systems can increase the risk of flooding and pose a serious risk of contamination, SuDS can help maintain water quality and limit the total amount of water leaving a site. An excellent example of where Cardiff has implemented SuDS is the Greener Grangetown project providing an exemplar of SuDS design. This HAMP outlines the design and maintenance of Cardiff's SuDS undertaken by the Councils highway drainage teams.

vi. The concept of the **15-minute city** seeks to improve liveability and develop more sustainable, local communities by planning for residents to be able to access most of the facilities they need on a daily basis within a 15–20-minute walk, cycle or bus ride from their home. Again, this HAMP will manage the interface between existing highway infrastructure and these new and emerging initiatives.

vii. **City Centre and Local Centre Public Realm** enhancements and maintenance in these more focal economic and social areas with very high levels of footfall and usage provides a particular challenge. Furthermore, due to their prominence there is more attention to any defects. Managing these key environments often requires more attention and resources. However, the extent of support provided needs to be understood as a part of a wider assessment of budgets and priorities. In this regard, it is proposed that we identify a ringfenced sum within the budget to tackle these issues in a balanced yet prioritised manner (see section 4.5).

2.5 Reporting the HAMP Corporately

The Highway Asset Investment Strategy (see section 4.3) illustrates different levels of asset investment and its outcomes was endorsed by the Council's Environmental Scrutiny Committee on 9th September 2014 and again on 17th May 2016. The committee recommended adoption of a steady state investment profile for the highway asset. The reason for this recommendation is that this proves to be the best long term economic solution whilst enabling the network to support other corporate priorities such as economic growth in the city.

.

It is recognised that current financial pressures may make this unachievable at the present time. To make the investment more affordable a "phased approach" to increasing Capital and Revenue investment could be adopted. This would mean investment could be increased annually over an agreed period to reach required Capital steady state and Revenue level.

This HAMP-3 was presented to the Councils Cabinet on **Thursday 18th May 2023.**

INSERT TEXT DESCRIBING CABINET COMMENTS

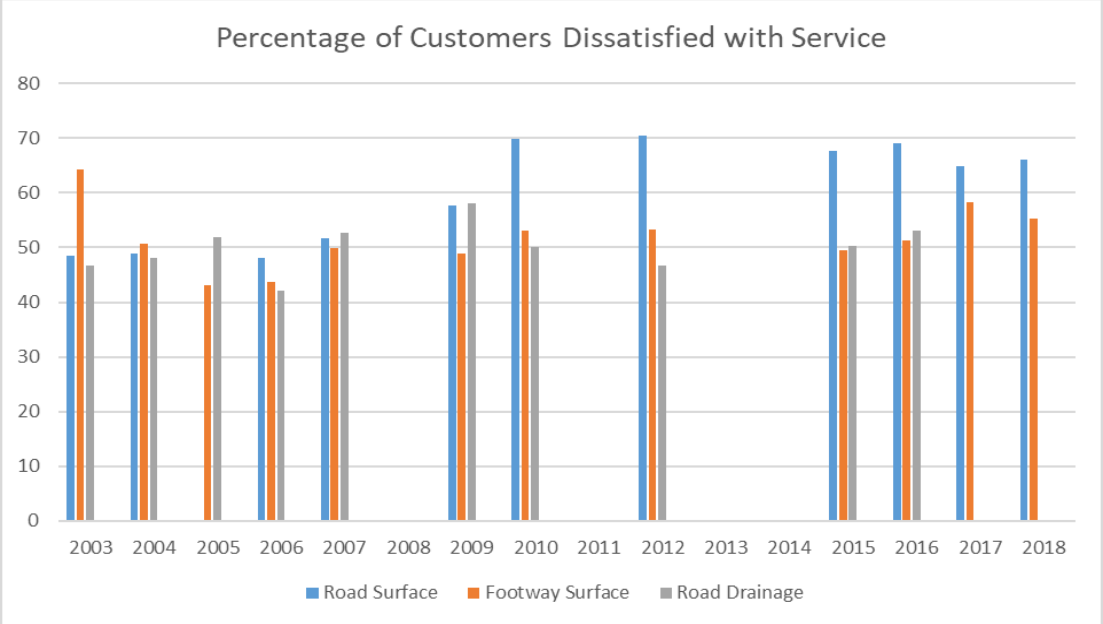
2.6 Assets not Covered in this HAMP

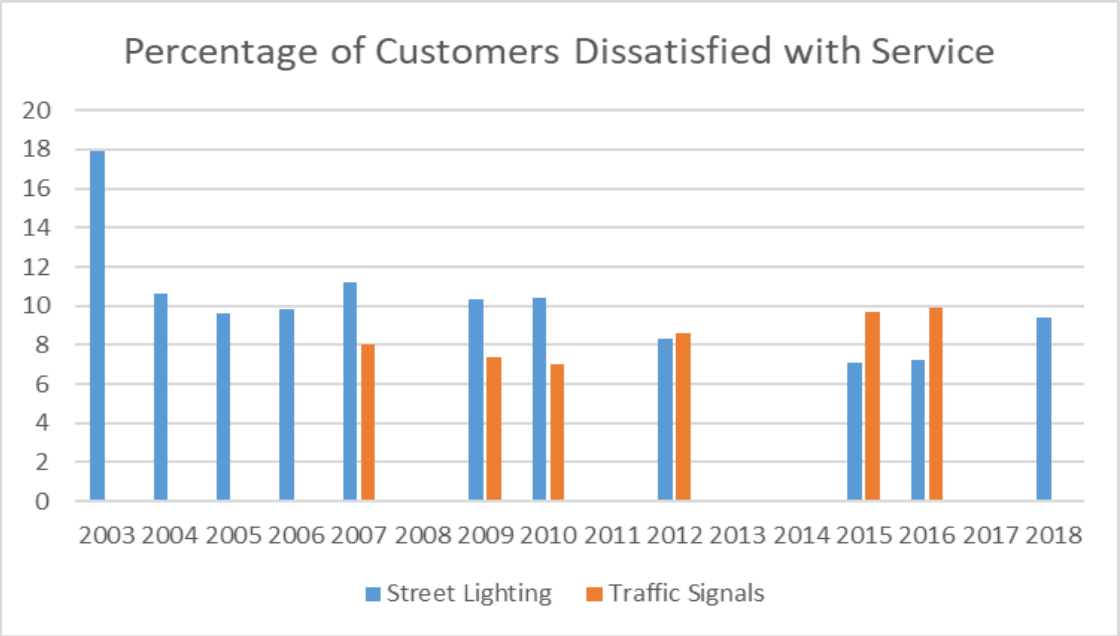
Some related assets that the Highways department maintain are managed elsewhere or out of scope of this HAMP:

- Pay and display car parks
- Footpaths managed by the Councils Housing team
- Bus shelters
- Vegetation and trees
- Land
- Public Rights of Way

2.7 Customer Satisfaction

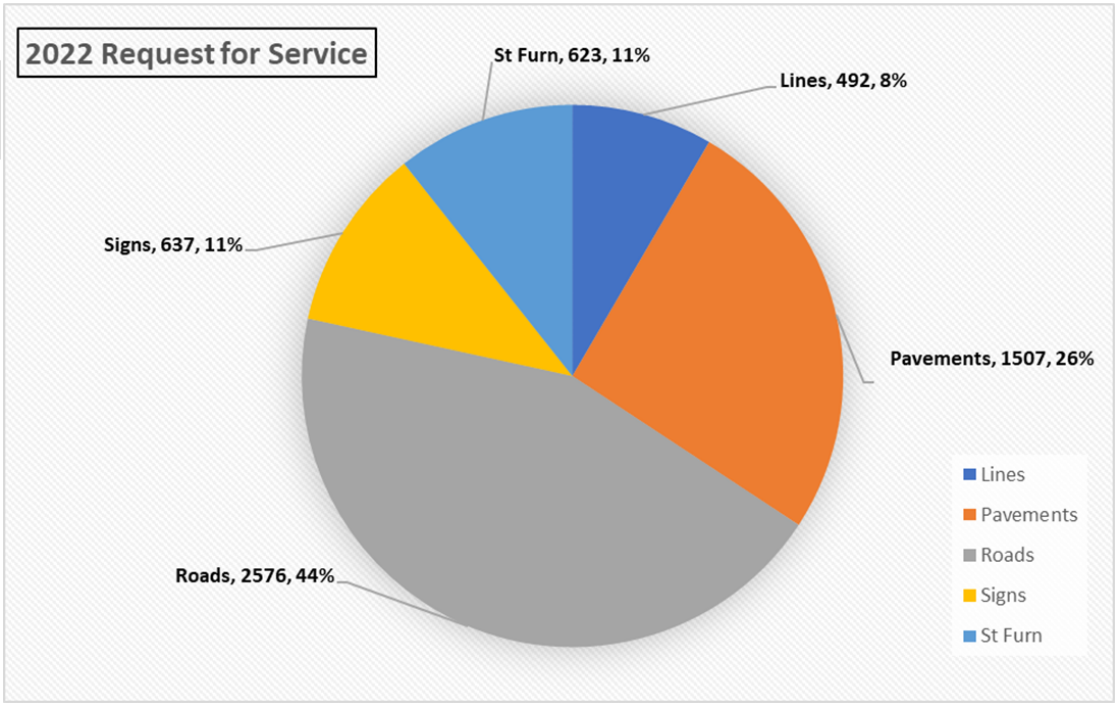
The Council has undertaken public satisfaction surveys which provide valuable insight into their opinions. The graph below shows the percentage of customers that are either fairly or very dissatisfied with the listed highway asset (COVID has prevented compilation of meaningful data for more recent years):

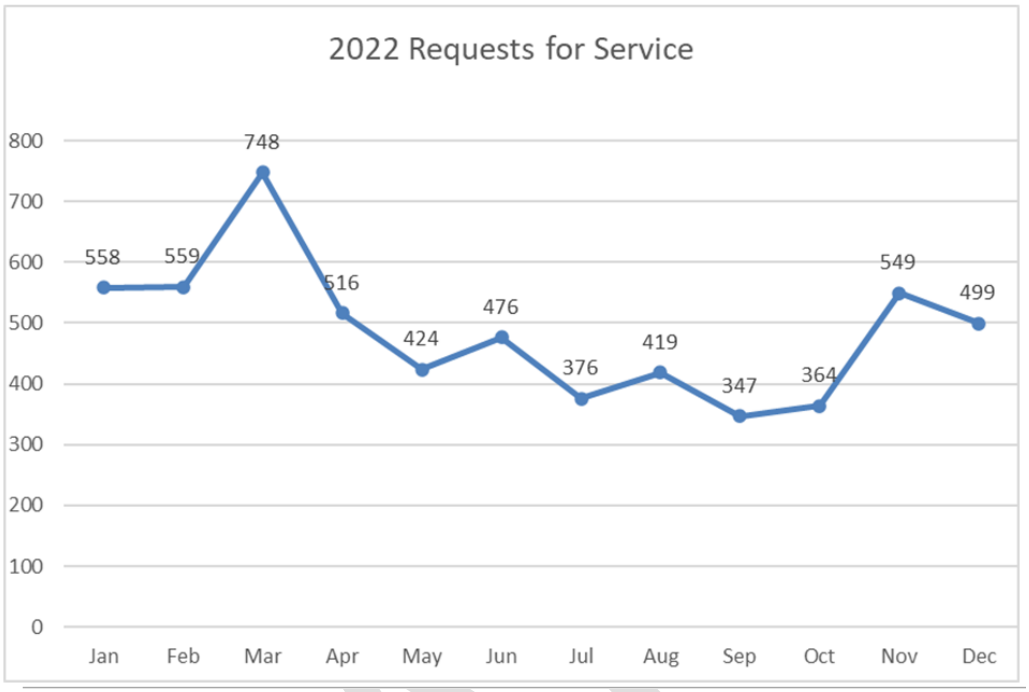




2.7.1 Customer Demand

AMX records customer contacts regarding carriageways, footways, street furniture and road markings, the charts below show contact statistics for requests for service in 2022. There were over 5,800 annual requests, which on average equates to approx. 480 per month and over 110 per week. There are seasonal peaks between January and April because of the effects of winter weather on carriageway condition.





2.8 Increase in Demand

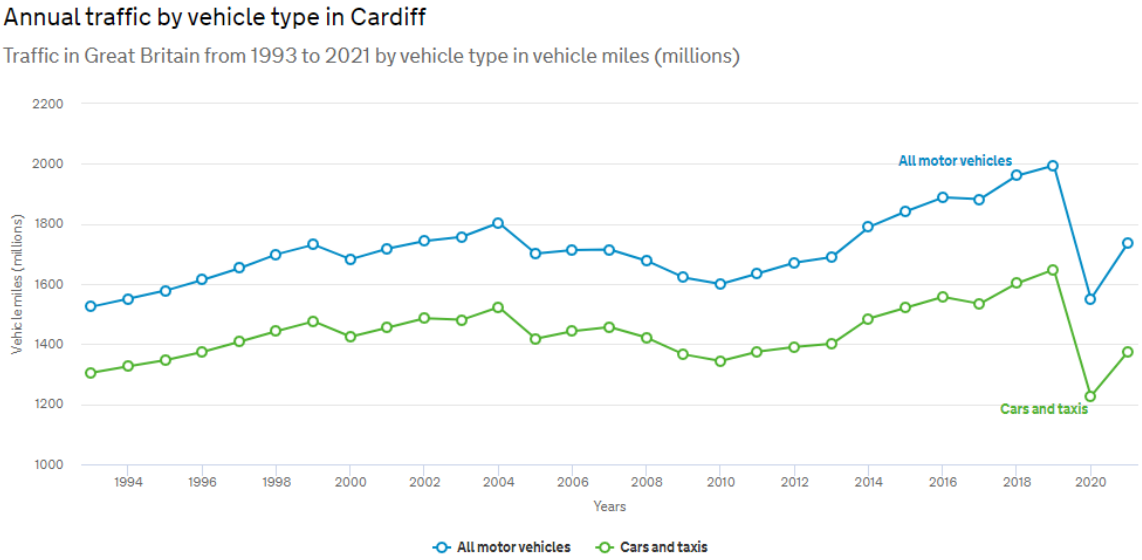
2.8.1 Asset Growth

The highway asset grows each year due to the adoption and construction of new sections of highway often resulting from private developments. This will also include the introduction of new Council promoted schemes on the existing network such as high-status city centre public realm improvements, upgraded junctions, new traffic management such as raised tables and speed humps, segregated cycle lanes etc. This ongoing continual increase in the quantity of highway assets will require future maintenance as they age and deteriorate, placing a continually increasing demand on maintenance budgets.

For example, over the 10-year period 2012-22 the carriageway length has increased by 26.5km and over 1,700 new street lighting columns have been erected.

2.8.2 Traffic Growth

The graph below (source DFT) illustrates a steady growth in traffic volume placing increasing pressure on the Highway network and accelerating deterioration in carriageway condition with HGV's and buses causing disproportionate wear on road surfaces. Some of the main arterial routes into the city have in the region of 80,000 vehicles per day with a proportion of heavy goods vehicles of approximately 6%.



"Whilst historically significant, the long-term trends can be misleading in most cases due to the extraordinary circumstances observed as a result of the coronavirus pandemic. Vehicle miles travelled in Great Britain have had year-on-year growth in each year between 2011 and 2019. Following a sharp decline in 2020, traffic levels for 2021 have increased on the previous year but still remain lower than the 2011 levels. Therefore, to say traffic has fallen over the last decade would misconstrue, as the overall decrease is entirely due to the decline in traffic levels observed in the 2020-2021 estimates". Source DFT

Many of the council's roads have evolved over time and were not designed to accommodate these increased volumes of traffic and therefore tend to exhibit accelerated deterioration thus placing a greater demand on maintenance budgets.

2.8.3 Environmental Conditions

Changing environmental conditions also place increased pressure on maintenance budgets.

Increased frequency of more extreme weather can have direct and indirect impact on road condition. Water can be one of the most damaging elements to an asphalt

surface. Moisture damage decreases strength and durability of asphalt, weakening the bond between the bitumen and the aggregate, thus speeding up deterioration forming potholes and cracking. When cracks form it allows water to seep under the surface, which is damaging to the base beneath. Extended exposure to these defects can have significant detrimental effects to the structure and foundation of the road. Changes in temperature (both high and low temperatures) and rainfall patterns can interact where wider temperature variation promotes cracking, compounding the effects of increased rainfall and damage caused by traffic (especially HGV's).

This cycle of climatic events places an increased burden on existing maintenance budgets. If such extreme events occur during the period of this HAMP and increased damage or deterioration is experienced, it may be necessary to divert existing budgets and revise service standards that are affordable unless additional funding can be secured.

Wherever possible highway teams are adopting modern materials, technologies, and maintenance techniques to minimise the negative effects of climate change on the highway asset. Also, pushing suppliers and contractors to continually develop new approaches and alternative opportunities.

2.8.4 Carbon Reduction

The Council's One Planet carbon reduction policies play an important role in the delivery of the Highway Maintenance service. The service endeavours to adopt effective working practices to promote carbon reduction and help the Council achieve its target of Cardiff become a carbon neutral city by 2030.

For example, warm mix asphalts are used wherever possible replacing traditional hot mixes and carriageway arisings (the removed existing asphalt surface) from resurfacing schemes are recycled by the contractor for future use. Also, utilising a new maintenance contract, arisings from routine repairs and maintenance will be recycled or reused wherever possible.

Preventative cold applied surface treatments are frequently used on carriageways and footways wherever appropriate.

Wales's first carbon neutral highway surfacing scheme utilising recycled steel slag in place of virgin quarried stone aggregate was delivered on 1.2km of the A470 Northern Avenue in 2022 with support of One Planet funding.

- 13,000m^2 of surfacing
- First Net Zero Carbon Emissions scheme in Wales
- Cost approx. £500k - One Planet Cardiff contributed £200k

At the time of preparation of this report the Highways teams were awaiting a response from the One Planet steering group for the funding of another innovative carbon reduction trial. This latest trial is taking the model used on the A470 described above a step further seeking to create genuinely Carbon Zero surfacing materials, without offsetting, using Biochar to sequester Carbon to form a carbon sink and Lignin (a natural plant material) as a bitumen replacement.

The service has had an ongoing programme of replacing existing street lighting units with modern efficient LED units across the entire network. As a result of the efficiencies associated with LED's and its reduced energy consumption, it will contribute favourably towards the Councils carbon reduction targets.

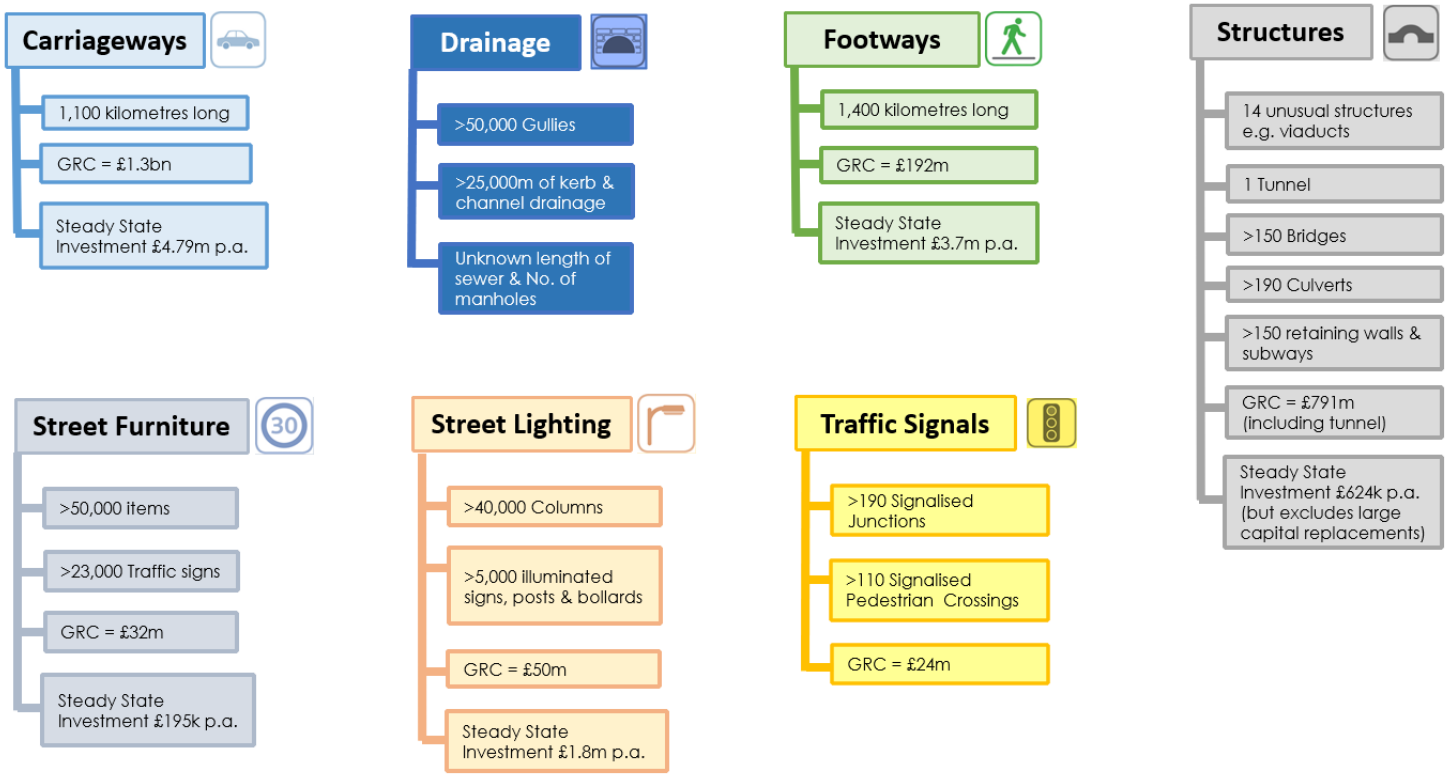
- Strategic Network – 16,500 LED units
- Residential Network – 23,500 LED units
- Over £1.2m energy savings/annum
- Thousands of Tonnes of carbon emission reduction

The Highway teams will continue to seek innovative carbon reduction initiatives as technology and operational opportunities emerge. In addition, the engineers work closely with the County Surveyors Society all Wales HAMP project which is looking to develop models and approaches to assist Highway Authorities implement and measure Carbon reduction solutions.

It should be noted there is a general consensus in the construction industry that the adoption of new low carbon engineering opportunities may be more costly than traditional repairs, treatments and approaches.

3. Overview of the Asset

The figures below provide an overview of important relevant highway asset data:



Description of Terms:

kilometre – measurement of length, 1000 metres or approx. 0.62 miles

Colum – street light

GRC – Gross Replacement Cost, the cost of replacing an existing asset with a modern equivalent

p.a. – per-annum / every year

Viaduct – a long bridge-like structure, typically a series of arches carrying a road

Gullies – iron gratings usually at the edge of a road that provide drainage during rainy weather

Steady State – Achieving a level of investment that maintains condition at its current level (see section 5)

Signalised junction – junction or crossing with traffic lights

3.1 Assets Data

This plan is based upon currently available inventory data for Highway assets. The coverage and quality of inventory data varies by asset, local estimates and sample surveys are used where actual data is missing. An overview of the availability of data is shown on the tables below. A key to the terms used are shown in Table 3.1.4.

Table 3.1.1 – Asset Data

Asset Group	Data Category	Data Confidence		Data Format		
		Extent of Data	Basis	Hard Copy %	Electronic %	System Used
Carriageway	Inventory	Good	Actual	0%	100%	AMX/ PMS/RoadAI
	Condition	Complete	Actual	0%	100%	AMX/PMS/ RoadAI
	Inspection	Complete	Actual	0%	100%	AMX / RoadAI
	Financial	Complete	Actual	0%	100%	AMX / SAP
Drainage	Inventory	Good	Actual	25%	75%	AMX/WincanVX
	Condition	Limited	Actual	25%	75%	AMX/WincanVX
	Inspection	Limited	Actual	25%	75%	AMX/WincanVX
	Financial	Complete	Actual	0%	100%	AMX / SAP
Footways	Inventory	Limited	Actual	0%	100%	AMX
	Condition	Limited	Actual	0%	100%	AMX
	Inspection	Complete	Actual	0%	100%	AMX
	Financial	Complete	Actual	0%	100%	AMX / SAP

Table 3.1.2 - Asset data continued

Asset Group	Data Category	Data Confidence		Data Format		
		Extent of Data	Basis	Hard Copy %	Electronic %	System Used
Street Furniture & Rd Markings	Inventory	Limited	Actual	0%	100%	AMX / RoadAI
	Condition	Limited	Actual	0%	100%	AMX / RoadAI
	Inspection	Complete	Actual	0%	100%	AMX / RoadAI
	Financial	Complete	Actual	0%	100%	AMX / SAP
Street Lighting	Inventory	Complete	Actual	0%	100%	Mayrise/CityTouch
	Condition	Limited	Actual	0%	100%	Mayrise/CityTouch
	Inspection	Good	Actual	0%	100%	Mayrise/CityTouch
	Financial	Complete	Actual	0%	100%	Mayrise / SAP
Illuminated Signs & Bollards	Inventory	Complete	Actual	0%	100%	Mayrise
	Condition	Limited	Actual	0%	100%	Mayrise
	Inspection	Good	Actual	0%	100%	Mayrise
	Financial	Complete	Actual	0%	100%	Mayrise / SAP

Table 3.1.3 - Asset data continued

Asset Group	Data Category	Data Confidence		Data Format		
		Extent of Data	Basis	Hard Copy %	Electronic %	System Used
Intelligent Transport Systems	Inventory	Complete	Actual	0%	100%	Imtrac/Inview/Mayrise/UTC
	Condition	Good	Actual	0%	100%	Imtrac/Inview/Mayrise/UTC
	Inspection	Complete	Actual	0%	100%	Imtrac/Inview/Mayrise/UTC
	Financial	Complete	Actual	0%	100%	SAP
Structures	Inventory	Complete	Actual	0%	100%	AMX
	Condition	Complete	Actual	0%	100%	AMX
	Inspection	Complete	Actual	0%	100%	AMX
	Financial	Complete	Actual	0%	100%	AMX / SAP

Table 3.1.4 – Key to Asset Data Tables 3.1.1 to 3.1.3		
		Description
Data Category	Inventory	Includes lengths, widths, location, materials and general supporting information
	Condition	Provides a condition rating of the asset
	Inspection	Records details and dates of periodic inspections
	Financial	Day to day financial management of works programmes and works order
Data Format	Hard Copy	The % of data held that is stored and managed using manual paper processes
	Electronic	The % of data held that is stored and managed electronically
	System Used	The name of the electronic system used to store and manage the asset data
Data Confidence	Extent of Data	The extent of coverage of asset data being used (as a proportion of the whole), being: o Nil o Limited o Good o Complete
	Basis	The basis of knowledge for the asset data used, being: o Actual (surveyed data) o Sample (surveyed data on a proportion of the asset often prorated to give network wide data) o Default Value (value based on actual data from another legitimate source) o Local Engineers Estimate

4. Financial Summary

The investment strategies and service standards discussed in later sections are based on the predicted funding levels shown in the table below.

Asset	Funding source	Annual Funding - £k				Capital Funding Required to Achieve Steady State - £k	
		Current	Estimated			Pre 2021-22[2]	Post 2021-22[2]
		2022-23	2023-24	2024-25	2025-26		
Carriageways	capital	3,477[1]	3,350[1]	3,350[1]	3,376[1]	3,075[1]	4,797[1]
Drainage	capital	41	30	230	180	160	250
Footway	capital	1,885	880	595	595	2.360	3,681
Street Lighting	capital	2,771	1,000	1,070	270	1,200	1,872
Structures	capital	611	924	1,100	1,100	400	624
Traffic Signals	capital	801	330	630	630	not available	not available

1 – Refer to Section 5.3 and Table 5d to see relationship between Capital investment strategy, Steady State and future condition predictions for carriageways.

2 - Refer to section 4.3 for description of post 2021-22 increase in steady state funding requirements

4.1 Historic Expenditure

		Historic Annual Funding (Expenditure) - £000's									
Asset	**Works**	**2012-13**	**2013-14**	**2014-15**	**2015-16**	**2016-17**	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**
Carriageways	Council - capital	1,118	823	399	2,602	2,076	530	2,878	2,077	3,838	2,724
	External grant/ contributions - capital	3,714	3,163	3,759	1,031	0	2,571	1,725	1,723	1,535	1,715
	Council - revenue	713	1,482	418	570	730	1,301	658	1,336	660	555
	External grant/ contributions - revenue (capital - DRF)	0	0	0	0	100	0	0	0	0	0
	Staff Resource for both Cway & Fway)	614	652	1,355	1,615	1,538	1,457	1,535	1,672	1,688	1,586
	total C/ways	**6,159**	**6,120**	**5,931**	**5,819**	**4,444**	**5,859**	**6,796**	**6,809**	**7,721**	**6,580**

		Historic Annual Funding (Expenditure) - £000's									
Asset	**Works**	**2012-13**	**2013-14**	**2014-15**	**2015-16**	**2016-17**	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**
Footways	Council - capital	611	510	646	85	488	362	805	961	674	988
	External grant/ contributions - capital	0	0	0	409	90	0	0	0	192	0
	Council - revenue	839	971	95	183	202	424	402	433	528	809
	External grant/ contributions - revenue (capital - DRF)	326	0	0	0	0	0	0	0	0	0
	total F/ways	**1,777**	**1,480**	**741**	**677**	**780**	**786**	**1,207**	**1,393**	**1,394**	**1,796**

		Historic Annual Funding (Expenditure) - £000's									
Asset	**Works**	**2012-13**	**2013-14**	**2014-15**	**2015-16**	**2016-17**	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**
Drainage	Council - capital	0	18	306	64	15	9	158	167	37	12
	External grant/ contributions - capital	122	199	1,034	199	0	27	31	463	652	939
	Council - revenue	292	502	157	156	182	172	124	226	258	145
	External grant/ contributions - revenue	0	0	0	0	253	217	74	97	349	240
	Staff Resource	756	247	514	426	189	138	89	171	195	268
	total Drainage	**1,170**	**967**	**2,012**	**845**	**639**	**563**	**476**	**1,124**	**1,491**	**1,604**

		Historic Annual Funding (Expenditure) - £000's									
Asset	**Works**	**2012-13**	**2013-14**	**2014-15**	**2015-16**	**2016-17**	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**
Street Lighting	External grant/ contributions - capital	0	0	0	0	0	0	0	0	0	0
	Council - revenue*	2,900	3,015	2,735	2,797	2,376	2,440	2,214	2,397	2,590	2,280
	Energy - revenue	2,366	2,442	2,551	2,328	2,147	1,879	1,399	1,576	1,688	1,513
	External grant/ contributions - revenue	0	0	0	0	0	0	0	0	0	0
	Staff Resource	277	128	528	575	516	441	480	506	546	573
	total S/L excl*	**3,151**	**2,583**	**3,321**	**4,194**	**4,519**	**6,028**	**2,782**	**2,312**	**2,329**	**4,426**

		Historic Annual Funding (Expenditure) - £000's									
Asset	**Works**	**2012-13**	**2013-14**	**2014-15**	**2015-16**	**2016-17**	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**
Structures	Council - capital	71	80	1,296	258	429	99	1,328	631	553	2,881
	External grant/ contributions - capital	0	0	0	698	16	0	0	0	0	0
	Council - revenue	1,673	1,610	848	805	681	679	682	720	712	703
	External grant/ contributions - revenue	0	0	0	0	0	0	0	0	0	0
	Staff Resource	179	209	161	221	236	224	232	279	244	270
	total Structures	**1,923**	**1,899**	**2,305**	**1,982**	**1,361**	**1,002**	**2,241**	**1,630**	**1,509**	**3,854**

		Historic Annual Funding (Expenditure) - £000's									
Asset	**Works**	**2012-13**	**2013-14**	**2014-15**	**2015-16**	**2016-17**	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**
Intelligent Transport Systems	Council - capital	374	403	283	375	523	656	844	239	172	145
	Council - revenue	1,816	1,410	1,139	1,009	780	1,131	961	993	1,120	1,059
	External grant/ contributions - revenue (DRF)	220	0	0	0	150	150	150	0	0	0
	Staff Resource	360	338	947	879	928	905	940	972	968	959
	total Traffic Sig	**2,770**	**2,151**	**2,369**	**2,262**	**2,381**	**2,842**	**2,895**	**2,204**	**2,259**	**2,163**

		Historic Annual Funding (Expenditure) - £000's									
Asset	**Works**	**2012-13**	**2013-14**	**2014-15**	**2015-16**	**2016-17**	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**
Vehicle Safety Fence	Council - capital	0	26	93	53	0	0	36	0	348	21
	Council - revenue	0	0	0	0	0	0	0	0	0	0
	total VSF	**0**	**26**	**93**	**53**	**0**	**0**	**36**	**0**	**348**	**21**
Winter & Emergency Service	Council - revenue	543	384	420	387	316	310	379	377	452	440
	External grant/ contributions - revenue	0	0	0	0	0	172	0	0	0	0
	Staff Resource	192	179	112	10	205	115	139	154	113	154
	total W&E service	**735**	**563**	**532**	**397**	**521**	**597**	**518**	**531**	**565**	**594**
	total	**17,684**	**15,789**	**17,302**	**16,229**	**14,647**	**17,678**	**16,952**	**16,004**	**17,615**	**21,039**

Guide to WG Grant Funding:

Local Government Borrowing Initiative (LGBI) – 2012/13 to 2014/15

Road Refurbishment Grant- 2018/19

Highway Refurbishment Grant – 2018/19 to 2020/21

4.2 Asset Valuation

The valuation provides the council with a replacement cost of the highway asset with a modern equivalent currently estimated at approximately **£2.37bn** (based on pre-inflationary costs). The calculation has been achieved by utilising specialist tools generated by the **All Wales County Surveyors Society Wales HAMP project** and undertaken in accordance with the methods set out in the **CIPFA Transport Asset Infrastructure Code**. The valuation reports:

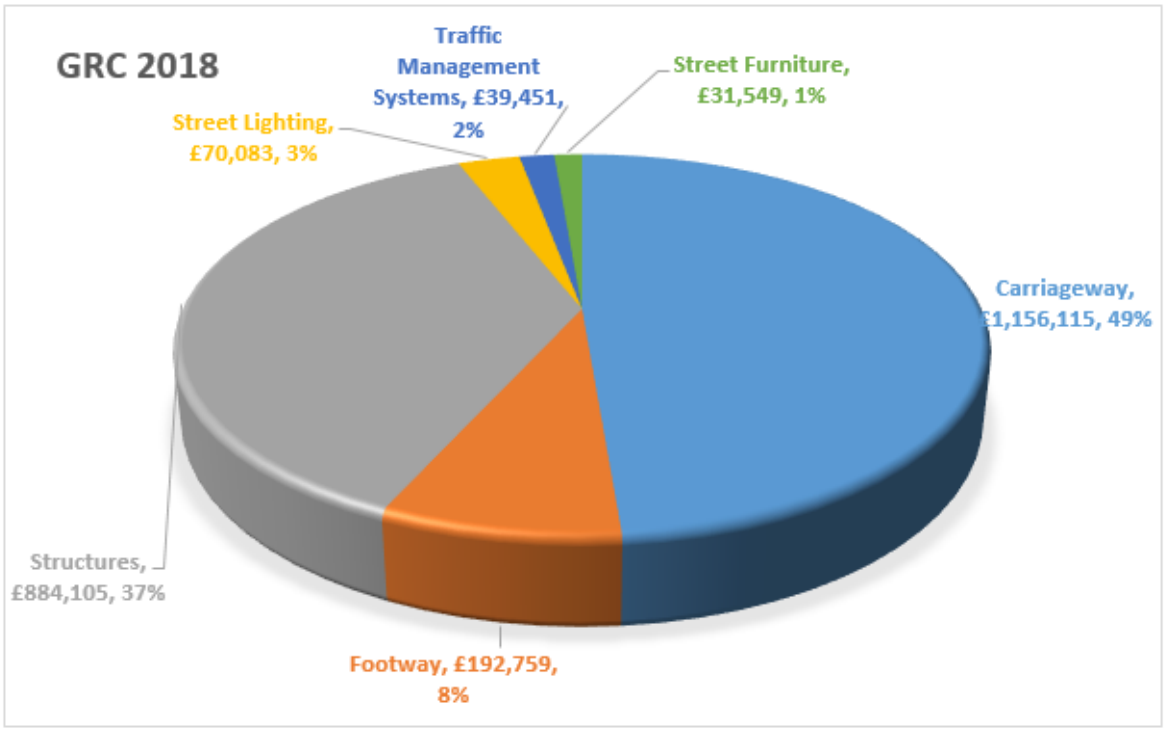
- Gross Replacement Cost (GRC), this is an estimated value of replacing the existing asset with a new equivalent
- Depreciated Replacement Cost (DRC), this is the estimated current monetary value of the asset and accounts for the cost of physical deterioration (i.e deteriorated condition from an as-new condition)

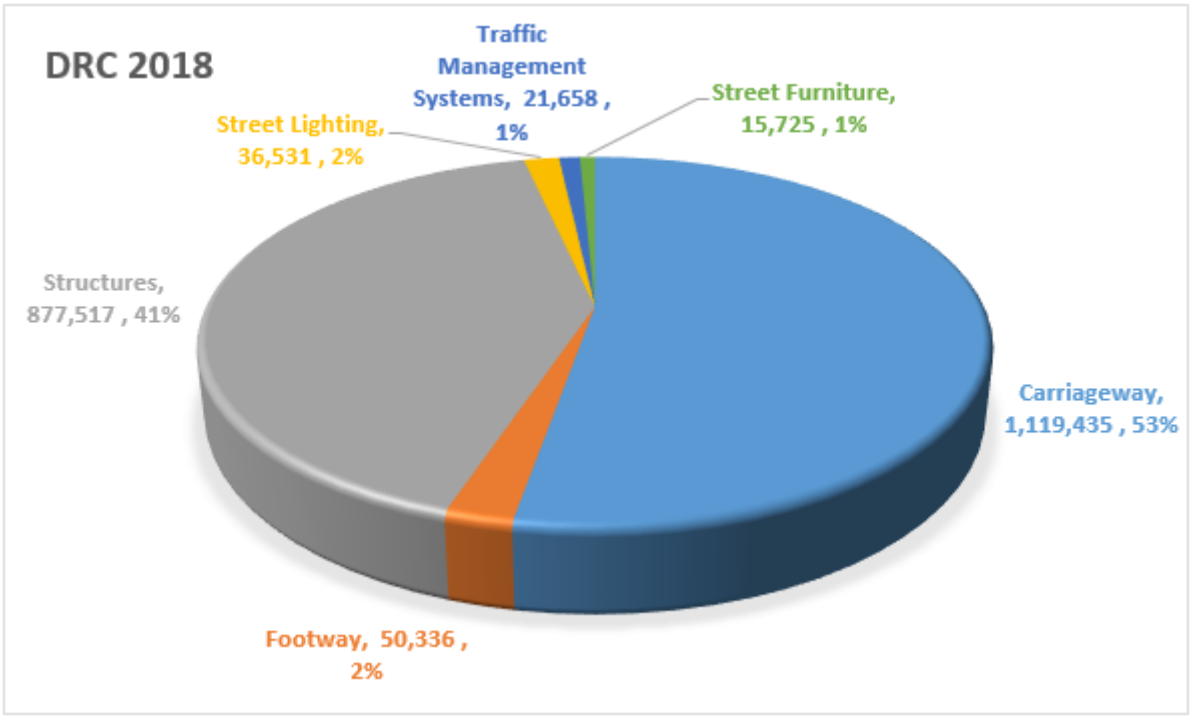
The table below shows the Whole of Government Accounts highway asset valuation as calculated in September 2019.

Asset	Gross Replacement Cost (GRC) £'000	Depreciated Replacement Cost (DRC) £'000
Carriageways[1]	1,156,115	1,119,435
Footway	192,759	50,336
Street Lighting	70,083	36,531
Street Furniture	31,549	15,725
Structures	884,105	877,517
Traffic Management	39,451	21,658
Total[2]	2,374,062	2,121,203

[1] - Carriageway GRC includes consideration for drainage

[2] - Total excludes value for land (Land GRC=£2,737,148,000)


GRC 2018
Traffic Management Systems, £39,451, 2%
Street Furniture, £31,549, 1%
Street Lighting, £70,083, 3%
Carriageway, £1,156,115, 49%
Structures, £884,105, 37%
Footway, £192,759, 8%


DRC 2018
Traffic Management Systems, 21,658 , 1%
Street Furniture, 15,725 , 1%
Street Lighting, 36,531 , 2%
Structures, 877,517 , 41%
Carriageway, 1,119,435 , 53%
Footway, 50,336 , 2%

4.3 Achieving Steady State Investment & the Cost of Living Increase 2021 - 2023

The Steady State calculations contained in the Asset Investment Strategy were undertaken in 2016. Annual inflation and its effects on increasing the cost of goods and services during the period 2016 to 2023 should be noted.

Steady State is a level of funding that maintains an asset in its current condition, neither improving nor deteriorating from an overall perspective. Maintenance funding below steady state will result in an ongoing deteriorating condition and consequent increasing maintenance backlog over time, the speed and level of deterioration is dependent on how far investment is below steady state.

A rapid increase in energy costs, particularly the wholesale price of gas, has been a key driver of the recent increases in inflation, compounded by supply chain stresses, increased prices for commodities and transportation. The cost of living has been increasing across the UK since early 2021. The annual rate of inflation reached 11.1% in October 2022, a 41-year high, before easing to 10.7% in November 2022. High inflation affects the affordability of goods and services.

This rapid increase of inflation is causing additional pressures in the area of highway and footway maintenance, especially around surfacing and surface treatments. This will be the first area that will show deterioration – structures, street lighting and drainage improvements will lag in terms of deterioration, albeit the cost of schemes will increase, so the risks of failed elements will increase over time.

Likewise, the costs relating to localised small-scale repairs such as patching, street furniture, tackling damaged paving, road markings renewal, signage and minor highway improvements has also increased in similar levels, so the volume of works completed will reduce. This unfortunately will promote deterioration further – moving early repairs to more expensive later treatments as we have not been able to provide the appropriate intervention in a timely manner.

The table below shows how construction costs (illustrated by cost per square metre) have increased over the period 2021-2023. They are based on completed scheme costs delivered by carriageway and footway capital improvement programmes with the treatments listed in the left-hand column. The average cost increase is **circa 56%.**

Carriageway m2 rate				
Financial Year	2020-2021	2021-2022	2022-2023	% difference 2021-2023
Reconstruction	£115	£130	£185	61%
Strengthing	£30	£35	£45	50%
Resurface inlay/overlay	£17	£22	£27	59%
Micro Asphalt	£9	£11	£13	45%

Footway m2 rate				
Financial Year	2020-2021	2021-2022	2022-2023	% difference 2021-2023
Reconstruction	£75	£85	£125	66%
Renew surface course	£42	£50	£65	55%
FW Micro Asphalt	£7	£9	£11	57%

The table below is an extract from the Highway Asset Investment Strategy (2016) which shows the calculated steady state investment required for the main highway asset groups. Based on the 56% increases in actual carriageway and footway construction costs shown above, and the steady state calculation below from 2016, it could be logical to assume that the 56% increase demonstrated above could be considered representative across all highway assets. Therefore, we could assume the overall steady state figure could have increased by £4.09m (56% increase on £7.3m) to an annual steady state investment of **£11.41m in 2022-23.**

Overview of Investment Options						
Asset Group	**2015/16 Revenue Budget (£,000)**	**2015/16 Capital Budget (£,000)**	Future **Capital** Investment Option **Costs (2016)**			Adjusted **Steady State** Value for **2023**
			Managed Decline (£,000)	**Steady State (£,000)**	**Enhanced (£,000)**	
Carriageways	*£450*	*£850*	*£850*	*£3,075*	*£5,175*	£4,797
Footways	*£790*	*£595*	*£470*	*£2,360*	*£3,810*	£3,681
Drainage	*£400*	*0*	*0*	*£160*	*£160*	£250
Street Furniture	*£33*	*0*	*0*	*£125*	*£125*	£195
Street Lighting	*£585*	*£270*	*£300*	*£1,200*	*£1,200*	£1,872
Structures	*£320*	*£500*	*£0*	*£400*	*£400*	£624
Total	*£2,578*	*£2,215*	*£1,620*	*£7,320*	*£10,870*	£11,419

The table below demonstrates the gap between current and estimated future funding and the requirements to reach steady state.

Gaps Between Steady State, Current and Estimated Future Funding								
Asset	**Funding source**	**Annual Funding - £k**			**Steady State Requirement (11,419 total)**	**Current 2023-24 Funding Gap between current funding & Steady State**	**Funding Gap between 2024-25 funding & Steady State**	**Funding Gap between 2025-26 funding & Steady State**
		Current	**Estimated**					
		2023-24	**2024-25**	**2025-26**				
Carriageways	capital	3,350 (+2,000 additional funding)	3,350	3,376	**4,797**	-553	1,447	1,421
Drainage	capital	30	230	180	**250**	220	20	70
Footway	capital	880	595	595	**3,876**[1]	2,996	3,281	3,281
Street Lighting	capital	1,000	1,070	270	**1,872**	872	802	1,602
Structures	capital	924	1,100	1,100	**624**	-300	-476	-476
Total Gap between Annual Funding & Steady State						**3,235**	**5,074**	**5,898**

1 – Footway funding includes £195k for Street Furniture
2- Future Steady State funding requirements will be subject to industry inflationary & other increase

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It is important to note that the steady state levels of investment shown relate to Capital investment only. However, maintenance functions and cyclic activities financed thorough revenue budgets are experiencing equivalent pressures and have been frequently subject to historic budgetary reductions implemented to achieve annual cost savings.

It is recognised that current financial pressures may make reaching steady state funding unachievable at the present time. To make the investment more affordable a "phased approach" to increasing Capital and Revenue investment could be adopted. This would mean investment could be increased annually over an agreed period to reach required Capital steady state and Revenue level.

4.4 Revenue Pressures on Maintenance Budgets

There are strict financial rules on what the Council's Capital budgets can be spent on and there are many Highways Maintenance functions, repairs and replacements that can only be funded via Revenue budgets. Whilst we can demonstrate the effects of Capital funding on the condition of highway assets by its proximity to the steady state calculation, it is more difficult to achieve when considering the effect of Revenue investment. The reduction of Revenue budgets will often result in a reduction in service provision or an increase in maintenance backlog, both of which will have some detrimental effect on the short-, medium- and long-term condition of highway assets. Some of the key areas of Revenue pressure for Highway Maintenance functions are described below and later in this document.

The Council's Highway Safety Inspection Policy Part C:001 and the associated inspection and repair regime, is designed, utilising a risk-based approach to maintain the highway network to an approved safe level and forms the basis of the Council's strategy for managing highway liability and risk. Utilising Section 58(1) of the Highways Act 1980 in the defence of 3rd party personal injury and property claims.

In accordance with the Highway Safety Inspection Policy, suitably qualified Safety Inspectors undertake cyclic inspections of the entire highway network identifying safety related defects and categorise them for an appropriate repair utilising the AMX asset management system. For the Council to have a successful defence against any 3rd party insurance claims we must demonstrate we've undertaken the safety inspection

and completed any identified repairs in accordance with the defect investigatory levels and timescales of the Policy.

The Council has a robust safety inspection regime achieving an excellent 3rd party claim repudiation rate of 88%. In 2022 approximately 93% of critical defects were repaired within the required timescale. Over 25,000 safety and maintenance defects were picked up by Inspectors of which approximately 30% were unable to be repaired due to insufficient resources. The definition of these defects is shown below.

Highway Safety Inspection Defect Definitions		
Critical Defect	**Safety Defect**	**Maintenance Defect**
A situation where the inspecting officer considers the risk to safety high enough to require immediate action. Requiring an immediate response to make the site safe	Defects that pose an imminent risk of injury to road users, Requiring a response as soon as possible to remove a potential risk of injury to users	Defects that warrant treatment to prevent them deteriorating into a safety defect prior to the next scheduled inspection, Requiring a response to prevent them becoming a safety defect

The result of defects remaining untreated is their possible accelerated deterioration into more serious defects. To further improve efficiency, resources and processes are being upgraded for the management of performance and prioritisation of work. In addition, a new maintenance contract will be let in the new 2023-24 financial year, which will develop more efficient working practices and a more robust legal defence.

Any defects not repaired as required pose a risk to the Council's 3rd party insurance defence. It is important to appreciate the level of financial risk associated with 3rd party insurance claims. Claims can be categorised into two main groups, property damage and personal injury. Property/vehicle damage claims (e.g., damage to a car wheel resulting from carriageway potholes) are generally of lower cost, in the region of £60 to £300. However, personal injury claims can range from several hundred pounds to millions of pounds, depending on the situation and injury sustained by the claimant. The average cost of a personal injury claim is approximately £15k. It should be noted that most higher value claims arise from footways because of claimed trips and falls.

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4.5 Enhanced Public Realm

Improvements in the public realm can provide significant enhancements to users as described in Section 2.4 above. It is recognised that some **Focal Areas** of the city such as the City Centre, Local Centres and the Bay experience significantly higher volumes of pedestrians, cyclists and public transport. Resulting in, higher levels of servicing activity, being driven on by loading vehicles, higher access of services by utilities, as well as general wear and tear.

Due to the prestige nature of these focal areas, they generally have higher quality materials and bespoke infrastructure which places a disproportionate demand on maintenance budgets due to their significantly higher replacement costs over those of routine materials. e.g., the maintenance of prestige granite paving in the city centre when compared to a paved concrete or asphalt footway on a residential street or the replacement of a damaged bespoke designed hardwood bench in the city centre over an "off the shelf" bench adjacent to the general highway.

Currently these focal areas are inspected and maintained in accordance with the Council's approved Highway Safety Inspection Policy – Part C:001. This policy was based on guidance developed by the County Surveyors Society Wales "All Wales" HAMP project embracing the National Highways Code of Practice (Well Managed Highway Infrastructure 2016) principle of adopting a risk-based approach to Highway Maintenance. As stated in section 4.4, the inspection and maintenance practices implemented by this Policy forms the basis of the Council's management of highway liability and risk.

The prestige maintenance expectation in these focal areas demands a higher "serviceability standard" than the safety/risk-based approach described above. This higher serviceability standard will undertake repairs that would not trigger a safety repair but improve the aesthetics and maintain the overall appearance of these areas. For example, re-painting bollards and lampposts, early repair interventions to footway and carriageway surfaces and street furniture, re-grouting of paving joints etc. However, dedicated Capital and Revenue budgets must be made available beyond existing highway maintenance improvement budgets. The level of serviceability improvements that can be delivered will be dependent on the additional budgets that can be made available.

Cyclic safety inspections would continue in these areas as specified in the Safety Inspection Policy to ensure statutory requirements are met and an appropriate claims defence is maintained.

The HAMP seeks to adopt a level of investment that supports the delivery of high-quality materials and maintenance within the City's prestige focal areas whilst continuing to provide an effective risk-based maintenance and management approach to the rest of the highway network.

4.6 Unforeseen Demand and Invest to Save Opportunities

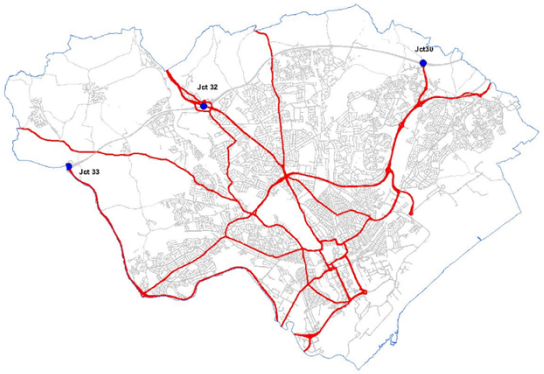
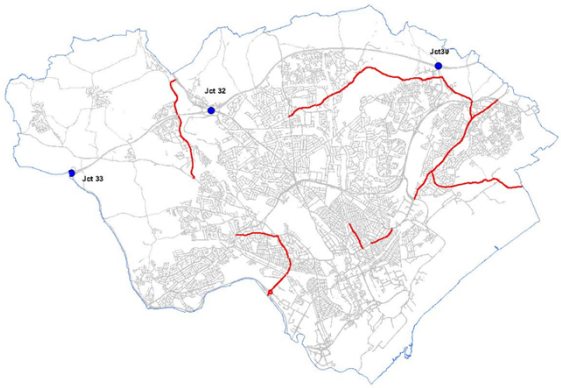
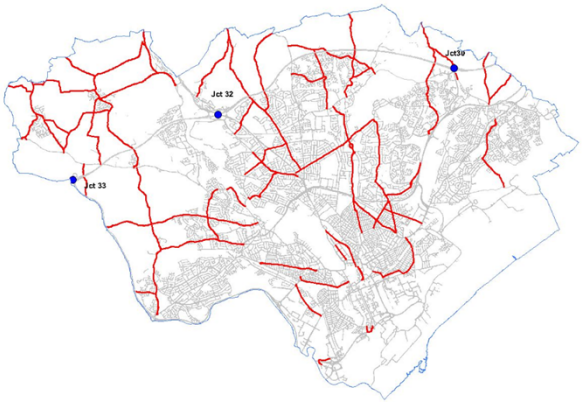
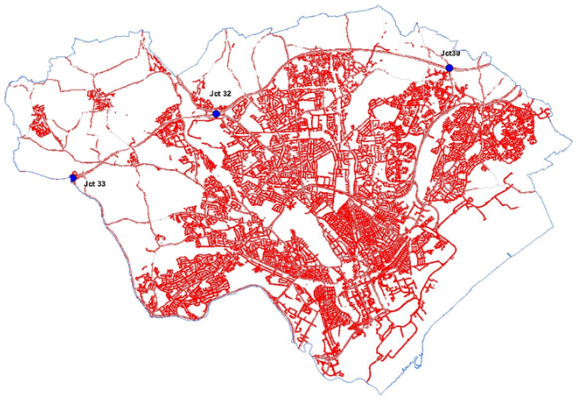
The service has robust condition assessment and works prioritisation processes to implement an effective improvement programme within varying levels of financial settlement. However, unexpected demands or invest to save opportunities do arise that require investment, in some instances these demands, or opportunities can be met by adjusting existing financial priorities but sometimes costs are too high and pressure bids may need to be considered.

5. Management of Carriageways

5.1 Carriageway Lengths

The table below shows Cardiff's carriageway network lengths				
Road Classification	**Urban (km)** i.e. <40mph	**Rural (km)** i.e. >40mph	**Total (km)**	**% of Total Length**
A	52.2	33.8	**86**	8%
B	20.3	5.2	**25.5**	2%
C	75.6	36.4	**112**	10%
U	865	10.9	**875.9**	80%
Sub Total	1013.1	86.3	**1099.4km**	

The figure below shows the extents of each classification of road

A Class Roads	**B Class Roads**
	
C Class Roads	**U Class Roads**
	

Examples of DFT Road Classifications	
A class roads	A4232 Ely Link, A48 Eastern Ave, A4119 Llantrisant Rd
B class roads	B4267 Leckwith Rd, B4562 Ty-Glas Rd, B4488 Llandaf Rd
C class roads	Rhiwbina Hill, Cherry Orchard Rd, Excalibur Drive
U class roads	Residential housing estate or industrial estate

5.2 Carriageways Service Standards

Carriageway service standards reflect the funding levels in the carriageway asset. It defines the standards that users can expect from the carriageway assets during the plan period.

The table below shows the agreed carriageway condition targets by road class and safety inspection and repair targets.

Carriageway Targets				
	Road Class			
	A	**B**	**C**	**U**
Target that RED condition shall be kept below	5%	7%	7%	10%
Percentage of Cat 1 safety defects made safe within response times			95%	
Percentage of safety inspections completed on time			85%	

<u>Current Carriageway Service Standard</u>
The current long term 20-year carriageway service standard is
Managed Decline

The forecast values in Table 5a below have been calculated using the CSS HAMP carriageway condition prediction model based on long term funding levels as specified in table 5d. This table should be read in conjunction with Table 5c.

A graphical representation of these condition profiles is shown in section 5.4 and 5.5.

Table 5a – Actual & Forecast Carriageway Condition Service Standards				
	Measure	**2021/22 Actual**	**2031 Forecast**	**2041 Forecast**
Condition	% of A class carriageway that are in an overall poor condition (red)	2.8%	6.05%	21.85%
	% of B class carriageway that are in an overall poor condition (red)	3.3%	6.89%	21.07%
	% of C class carriageway that are in an overall poor condition (red)	4.6%	10.89%	25.26%
	% of U class carriageway that are in an overall poor condition (red)	1.5%	11.21%	27.06%
	% of U class carriageway that are in an overall poor condition (red & amber 1)	7.9%	42.01%	55.91%

Table 5b (i) - Historic Carriageway Levels of Service							
	Measure	**2015/16**	**2016/17**	**2017/18**	**2018/19**	**2019/20**	**2020/21**
Safety	Percentage of Cat 1 defects made safe within response times	96%	96%	96%	92%	97%	93%
	% of safety inspections completed on time	99.62%	99.84%	99.72%	82%	87.42%	99.60%
Condition	% of A class carriageway that are in an overall poor condition (red)	3.7%	3.4%	3.7%	3.5%	3.3%	2.6%
	% of B class carriageway that are in an overall poor condition (red)	6.5%	6.1%	5.6%	4.7%	5.6%	4.1%
	% of C class carriageway that are in an overall poor condition (red)	6.6%	6.9%	6.0%	5.8%	5.6%	4.5%
	% of U class carriageway that are in an overall poor condition (red & Amber 1)	n/a	n/a	n/a	10%	7.7%	9.8%

Table 5b (ii) - Historic Carriageway Levels of Service						
	Measure	**2010/11**	**2011/12**	**2012/13**	**2013/14**	**2014/15**
Safety	Percentage of Cat 1 defects made safe within response times	n/a	n/a	n/a	n/a	86%
	% of safety inspections completed on time	80.68%	90.56%	98.49%	99.48%	99.58%
Condition	% of A class carriageway that are in an overall poor condition (red)	9.2%	6.9%	7.0%	4.0%	4.3%
	% of B class carriageway that are in an overall poor condition (red)	15.0%	9.6%	8.4%	8.2%	7.4%
	% of C class carriageway that are in an overall poor condition (red)	10.1%	11.4%	12.8%	10.1%	9.3%
	% of U class carriageway that are in an overall poor condition (red & Amber 1)	n/a	n/a	n/a	n/a	n/a

Utilising WG all Wales KPI's for classified road condition a benchmarking analysis has been undertaken to compare how Cardiff's classified road condition compares with other Welsh Local Authorities, see Tables in section 12 of this HAMP document. These KPI's only apply to the classified A, B and C class roads and are not undertaken on the U class (unclassified) network.

It must be noted that historically classified roads (20% of the network) attract a disproportionate amount of funding compared to unclassified roads (80% of the network). This funding allocation adopts a risk-based approach based on the classified network carrying significantly higher levels of traffic, often at higher speeds, than unclassified roads. As can be seen from Tables in Section 12 Cardiff's classified A, B and C class carriageway network conditions compare favourably against all Wales

averages. However, it should be noted an effect of this risk-based approach and the availability of maintenance budgets means classified roads are kept in a better condition than the unclassified roads. Unfortunately, the majority of residents will live adjacent to the unclassified network in residential areas and might not fully appreciate the increased investment in classified roads that they may use infrequently.

In late 2022 the Council introduced a vehicle mounted video data collection exercise utilising RoadAI technology commissioned to collect carriageway condition. The road Condition data generated by RoadAI can identify lengths of highway that are in various stages of deterioration feeding into the programming of improvement works. This survey is repeatable and will be undertaken on a cyclic basis, building an ongoing record of the changing condition of the carriageway network. At the time of preparation of this report, the RoadAI carriageway data was being processed and evaluated by the Highways Asset Team and a U class condition indicator will be developed from this data. Prior to this new RoadAI survey being implemented the condition of the unclassified network was measured via visual inspections undertaken by highway Safety Inspectors whilst carrying out their cyclic inspection of the highway network.

As previously discussed, the highway's teams adopt a risk-based approach to the development of highway improvement schemes and repairs. A number of innovative machine-based and manual survey techniques inform this process, for example:

- Vaisala RoadAI video survey (as discussed above)
- SCANNER machine-based laser condition survey of the classified A, B and C class carriageways.
- SCRIM skid resistance machine survey
- Manual pendulum test skid resistance surveys (localised areas)
- Cyclic safety inspections managed from inspection to repair via the AMX asset management system.
- Core tests and trial holes.
- Chemical analysis to identify existing tar-bound surfacing.
- Engineers site inspections.

5.3 Carriageway Investment Strategy

The carriageway investment strategy has been developed to maximise a whole life cost approach to maintenance management, to facilitate this a number of different carriageway improvement programmes are delivered on an annual basis as shown in Table 5c below.

Table 5c - Carriageway Treatment Strategies

Category		Description
Preventative – **Surface Treatments**	**Surface Dressing**	High volume and our most cost effective treatment essential to maximise whole life cost of the road. This is only suitable where deterioration is not too advanced.
	Micro Asphalt	High volume and our second most cost effective treatment, essential to maximise whole life cost of the road where dressing is unsuitable due to poorer condition and a more robust solution is required
Resurfacing		The customers preferred choice of treatment used when the condition is too bad for a preventative option and generally replaces the top surface of asphalt of approx. 40mm
Strengthening	**Structural Inlay**	Replacing upper 2 surfaces of carriageway that has reached the end of its life, thicknesses of approx. 100mm.
	Reconstruction	Replacing carriageway that has reached the end of its life, thicknesses approx. 450mm and greater. Failure to undertake this repair may result in road closures
Routine and reactive localised repairs		Patching, localised carriageway improvements and repair of identified defects to current investigation and response times as defined in Policy Part C:001 Highway Safety Inspections. **This investment is not included in the long term condition prediction modelling in table 5d**.

As described in Section 2.2.1 and Section 4.3 the estimated level of steady state funding for the carriageway asset is **£4.8m per annum** (previously £3.075m per annum before recent cost of living increases). Steady State is a level of funding that maintains an asset in its current condition, neither improving nor deteriorating from an overall perspective. Maintenance funding below steady state will result in an ongoing deteriorating condition and consequent increasing maintenance backlog over time, the speed and level of deterioration is dependent on how far investment is below steady state.

The strategy illustrated in Table 5d below shows the capital investment levels used in the CSS prediction tools to generate the service standards shown on table 5a using the treatment options described in table 5c. It uses agreed budgets up to 2022/23 and **forecasts / estimated budgets** for the extended period to year 20. The specialist prediction tools were developed through the CSS Wales HAMP project are utilised to help predict deterioration over the 20 year period (see section 5.4).

Table 5d - Carriageway Capital Investment Strategy Profile (Table 5c Treatments Only)										
Treatment	Actual Capital Spend					Estimated (indicative) Capital Spend				
	2018/19 £000's	2019/20 £000's	2020/21 £000's	2021/22 £000's	2022/23 £000's	2023/24 £000's	2024/25 £000's	2025/26 £000's	2026/27 £000's	2027/42 £000's
Surface Treatments	815	750	1,002	829	642	500	500	500	500	646
Resurfacing	1,629	1,450	2,225	1,522	1,376	1,313	1,313	1,328	1,313	1,313
Strengthening/ Recon	960	38	611	441	391	537	537	548	537	391
Sub Total 1	**3,404**	**2,239**	**3,838**	**2,791**	**2,409**	**2,350**	**2,350**	**2,376**	**2,350**	**2,350**
Other Capital expenditure 2	1,200	1,562	1,534	1,648	1,068	1,000	1,000	1,000	1,000	1,000
Total Capital expenditure	**4,604**	**3,800**	**5,373**	**4,439**	**3,477**	**3,350**	**3,350**	**3,376**	**3,350**	**3,350**
Revenue expenditure	2,193	3,009	2,348	2,141						
Total Annual Investment	**6,796**	**6,809**	**7,721**	**6,580**	**3,477**	**3,350**	**3,350**	**3,376**	**3,350**	**3,350**

Sub Total[1] – *this is the capital investment value modelled in the condition profile graphs in section 5.4*

Other capital expenditure[2] – *capital costs that are not modelled as part of the works programmes shown in section 5.4 such as localised highway improvement works and localised permanent patching (>50m²), legal fees, staff costs etc.*

Whilst every effort is made to follow the investment strategy described above the actual allocation of funds between improvement programmes is dependent on a number of factors which can change on an annual basis e.g. actual overall budget settlements (increase or decrease), unexpected issues arising, political manifesto etc. These factors combined with the scheme selection process define the specific annual programmes of work.

5.3.1 Overview of Works Delivery

Highway improvement works are generally delivered through two main mechanisms:

- Localised improvement works – smaller reactive repairs to the carriageway or footway arising from cyclic highway safety inspections and Councillor/customer requests and complaints, and
- Larger scale capital works – schemes usually providing improvements to the whole or majority of the carriageway or footway.

Localised Improvement Works

Highway safety inspections are undertaken on the entire carriageway and footway network to identify defects that are likely to cause a danger or inconvenience to users. The inspection process follows a well-established format based on the UK highway code of practice "Well Managed Highway Infrastructure" and the County Surveyors Society Wales Risk Based Approach to highway safety inspections, this also forms the basis of the Councils defence against third party highway insurance claims which has proved to be very robust when the Council is challenged in court by those seeking compensation for personal injury or property claims and forms a key aspect of the Councils management of liability and risk.

These cyclic inspection frequencies are based on the network hierarchy of the street and the defect repair response times on the severity of the defect, both criteria are defined by the Highway Maintenance Safety Inspections Policy. Response times for undertaking repairs range in duration from next working day to next available work programme, these priorities relate directly to the severity of the defect and its location i.e. the more severe the defect and busy the location the sooner it will be programmed for repair, those defects that pose the lowest risk may be placed in the next programme of works category that will be prioritised based

on availability of budget and/or efficiency of delivery. Councillor and customer requests for service and complaints relating to localised highway improvements will also be inspected and prioritised using this process.

Larger Scale Capital Works

These works usually involve replacing the entire footway or carriageway with new material or protecting the existing with an impermeable weatherproof overlay, treatments include reconstruction, strengthening, resurfacing and preventative such as micro asphalt. These schemes are prioritised based on an evaluation of condition, usage and need with information coming from network surveys (machine based & visual as listed above), site inspections, safety inspector feedback and Councillor and customer requests and complaints. The data is collated and reviewed to form a draft priority list, final checks are made on each location identified on the list to determine the section that should be considered for treatment. The priority list is then finalised, taking into account the budget available for that treatment programme. Contracts for these works are let throughout the year and the available budget will define the overall number of schemes delivered, local members and residents will be notified of any proposed works. The decision to undertake maintenance schemes considers a balance between immediate need and the best long term solution for the network, for example the use of preventative surfacing within the suite of treatment options enables us to make the best use of the limited resources. However, it sometimes causes confusion when people see us working on roads or footways that appear to be in better condition than some others.

As stated above the works evaluation and delivery processes allow for local member and customer involvement by highlighting locations of concern and passing them onto the Highway Maintenance team for consideration via C2C (the Councils call centre) the Council App or Halo member portal.

5.3.2 Unforeseen Demand and Invest to Save Opportunities for Carriageways

As discussed above the service has robust condition assessment and scheme prioritisation processes to implement an effective improvement programme within varying levels of financial settlement. However, unexpected demands or invest to save opportunities do arise that require investment, in some instances these demands, or opportunities can be met by adjusting existing financial priorities but sometimes

costs are too high and pressure bids may need to be considered. Two examples of this are described below.

Carriageway Reconstruction.

Whilst some allowance is made to include this treatment in annual programmes of work the high cost of these schemes demands a disproportionate amount of the annual budget which would result in a significant reduction of remaining available funding for resurfacing and preventative schemes. Unfortunately, in addition to expected ongoing deterioration the carriageway network is experiencing particular challenges with its concrete roads that were treated with a crack and seat maintenance technique between 1998 and 2007, this treatment has in some locations come to the end of its life failing quite rapidly resulting in very poor condition roads where the only remaining maintenance option is reconstruction.

Carriageway Asphalt Preservation.

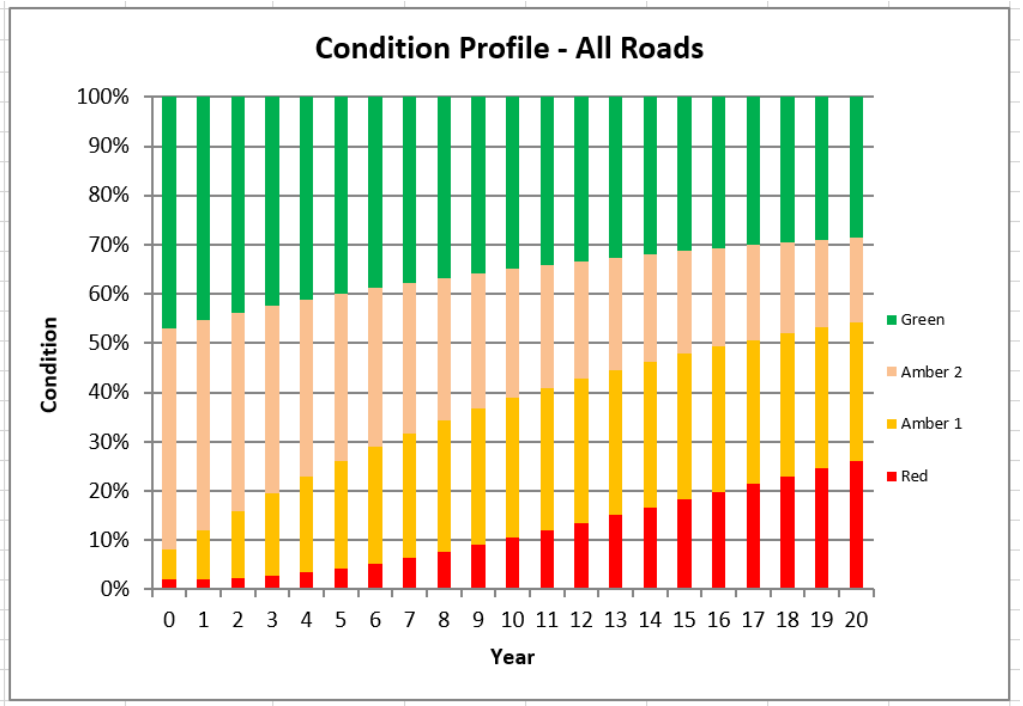
An example where an invest to save opportunity can't be afforded from existing budgets is carriageway asphalt preservation. Over time as the asphalt of a road surface ages micro cracks form allowing water and oxygen to penetrate accelerating the rate of deterioration by weakening the aggregate-bitumen bond. The asphalt preservation treatment is a spray-applied solution of petroleum bitumen and can penetrate up to 30mm on aged asphalt surfaces sealing microcracks and reducing ingress of water, oxygen, salts and contaminants, strengthening the binder-aggregate adhesion and reducing binder oxidation. This reduces aggregate loss and slows the formation of potholes, centre joint failure and other related defects therefore extending the life of the existing road surface.

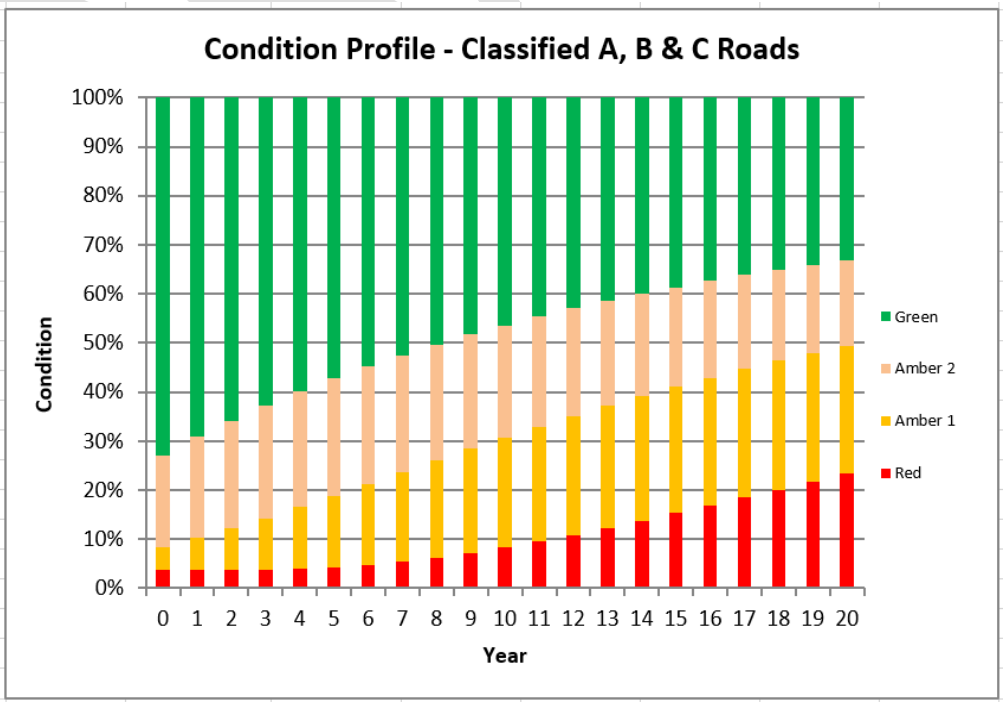
Early intervention when the road surface is a in reasonable condition (green and light amber roads) is essential for an asphalt preservation, the ideal time to treat the road is 2 years before the asphalt surface is expected to show visible surface defects. The asphalt preservation treatment is expected to extend the life of the carriageway surface course before it starts to exhibit defects by 5 years per treatment and can be treated at least 3 times, this maintains and holds the carriageway surface condition which provides a very low component of whole life cycle cost compared to other maintenance treatments and provides significant carbon reduction opportunities and up to 30,000m^2 can be laid in one shift. The approximate cost of Asphalt Preservation is £3.25m^2 compared to £25m^2 for conventional 40mm asphalt inlay.

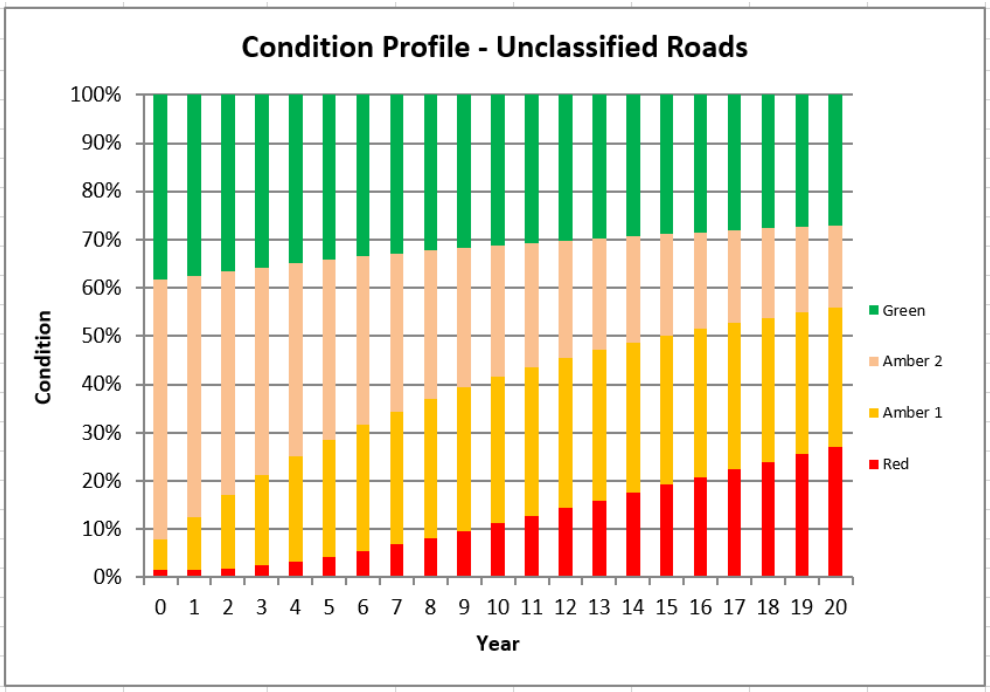
The proposal to undertake a cyclic preservation treatment program to 70km of the strategic carriageway network on a 5-year recurring basis at a cost of approximately £350k per annum. The roads treated include A4232, A4234, A48 and A470 which form the key arterial routes into the city. Over the last 5 years these elements of the strategic network have received significant resurfacing investment due to their extremely high traffic volumes and the associated accelerated deterioration this produces. Applying an Asphalt preservation will protect this investment and enhance the life of these important routes during the treatment cycle (expected to be 15 years (i.e. 3no x 5 year cycles)).

5.4 Long Term Carriageway Condition Prediction

Utilising the CSS Wales carriageway condition prediction tools, the graphs below illustrate how the condition of the carriageway network is expected to change over a 20 year period based on the investment strategy shown in Table 5d.







Description of Carriageway Condition Profile Graphs (above):

There are a number of key features that this graph illustrates:

- The x-axis annotated YEAR illustrates the 20 year profile period with year 0 being 2021/22.
- The y-axis annotated CONDITION illustrates the overall spread of condition of the carriageway in a particular year. The red, amber and green colour coding is as described below and illustrates the proportion of a particular condition type (from good (green) to very poor (red)).
- The decreasing proportion of green and light amber illustrates the **reducing quantity of good & reasonable condition carriageway** over the 20 year period.
- The increasing proportion of red and dark amber illustrates the **increasing quantity of poor condition carriageway** over the 20 year period.

5.5 The Cost of Long-Term Carriageway Deterioration

Based on the levels of investment shown in Table 5d, the tables below quantify the progressive deterioration in carriageway condition and illustrate the cost of returning carriageways in the two worst condition (Red and Amber 1) to the current condition (Table 5.5.1).

Table. 5.5.1 – Current Carriageway Condition

% of Roads in a **Red** Condition **Current Year**	Road Class	% of Roads	Length of Network	% of Roads in a **Amber 1** Condition **Current Year**	Road Class	% of Roads	Length of Network
	A	2.8%	2.40km		A	4.08%	3.51km
	B	3.3%	0.84km		B	5.1%	1.30km
	C	4.6%	5.15km		C	5.18%	5.80km
	U	1.5%	13.13km		U	6.4%	56.05km
RED Total			**21.52km**	**AMBER 1 total**			**66.66km**

Table. 5.5.2 – Cost to Return Year 10 Condition to Current

% of Roads in a **Red** Condition **Year 10**	Road Class	% of Roads	Length of Network	Cost to Improve to Current Condition	% of Roads in a **Amber 1** Condition **YEAR 10**	Road Class	% of Roads	Length of Network	Cost to Improve to Current Condition
	A	6.05%	5.20km	£1.84m – (2.8km)		A	22.86%	19.65km	£4.44m - (16.14km)
	B	6.89%	1.75km	£465k – (0.91km)		B	24.48%	6.24km	£1.05m - (5.12km)
	C	10.89%	12.19km	£3.59m – (7.04km)		C	21.41%	23.97km	£3.89m - (18.17km)
	U	11.21%	98.18km	£37.2m – (85.05km)		U	30.37%	266.01km	£38.54m (209.96km)
RED Totals			**117km**	**£43.1m**	**AMBER 1 Totals**			**315km**	**£47.9m**

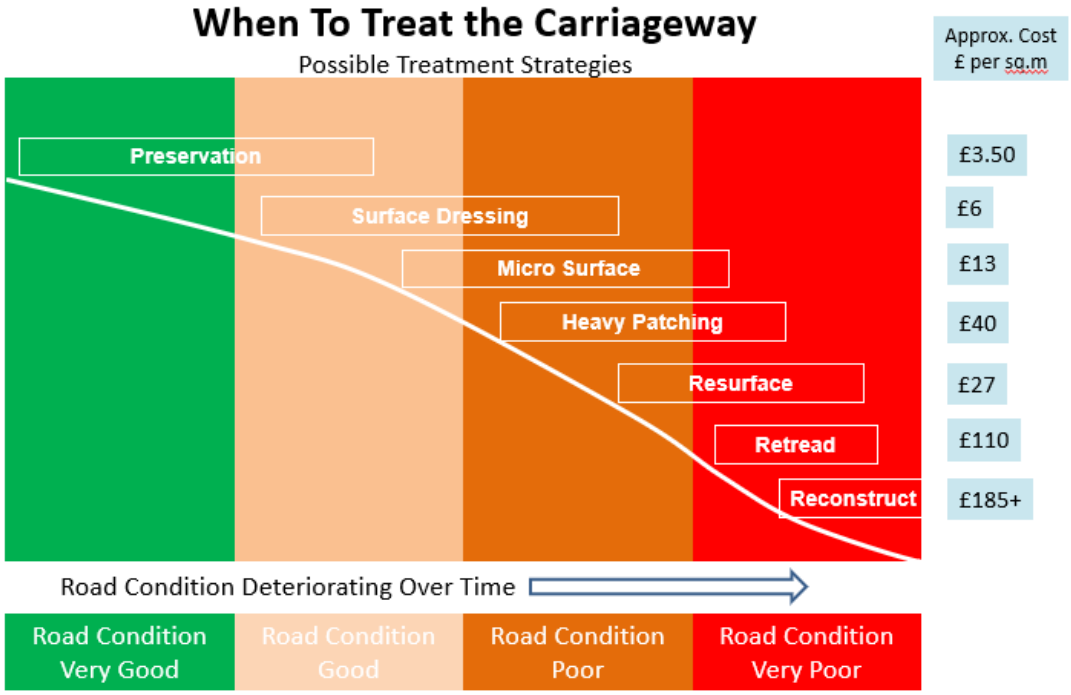
Table. 5.5.3 – Cost to Return Year 20 Condition to Current

% of Roads in a **Red** Condition **YEAR 20**	Road Class	% of Roads	Length of Network	Cost to Improve to Current Condition
	A	21.85%	18.79km	£10.7m – (16.39km)
	B	21.07%	5.37km	£2.31m - (4.53km)
	C	25.26%	28.29km	£11.8m – (23.14km)
	U	27.06%	237.01km	£98m – (223.88km)
RED Totals			**289km**	**£122.9m**

% of Roads in a **Amber 1** Condition **YEAR 20**	Road Class	% of Roads	Length of Network	Cost to Improve to Current Condition
	A	26.03%	22.38km	£5.19m - (18.87km)
	B	30.61%	7.81km	£1.39m - (6.51km)
	C	25.21%	28.23km	£4.8m - (22.43km)
	U	28.85%	252.69km	£36.1m - (196.64km)
AMBER 1 Totals			**311km**	**£47.5m**

5.6 When to use Carriageway Treatments

The figure below illustrates the relationship between carriageway treatment types, their approximate cost and the correct time of intervention based on the condition of the road. It can be seen that as condition deteriorates the cost of an appropriate treatment increases.



The pictures below illustrate how the range of **poor and very poor condition** roads can differ.

a. – Resurfacing Required	b. – Reconstruction Required	c. - Reconstruction Required
		

5.7 Revenue Pressures on Carriageway Maintenance

Refer to section 4.4 for details of the current revenue pressures on the carriageway asset.

6. Management of Drainage

The Drainage asset comprises of a number of asset groups, including:

- Gullies
- Manholes
- Piped network
- Pumping Station
- Sustainable Drainage Assets
- Flood Defences
- Disused Spoil Tips

6.1 Drainage Service Standards

Cardiff Council are responsible for the management and maintenance of approximately 100,000 highway gullies, and an engineer's estimate of 1,000 manhole chambers and 100km of carrier pipe. The highways operational team operate on a reactive basis, responding to reports by members of the public, key stakeholders, and elected members.

A gully scheduling project is underway with phase 1 complete identifying capacity under current resources with phase 2 due to begin mid to late 2023.

6.1.1 Pumping Stations

The flood and coastal risk management team inspect and maintain a number of groundwater and foul pumping stations on behalf of other departments within the council. Monthly inspections are undertaken, and associated reports provided to the asset owner. Any remedial works are undertaken and managed with the prior agreement with the asset owner. The number of pumping stations and related information is detailed in the table below.

Ownership of Pumping Stations		
Category	**Number**	**Asset Owner**
Foul Pumping Station	4	Housing
Foul Pumping Station	1	Strategic Estates
Foul Pumping Station	3	Harbour Authority
Groundwater Pumping Station	8	Harbour Authority
Groundwater Pumping Station	3	Waste
Groundwater Pumping Station	6	Highway Structures (Subways)
Total	25	

6.1.2 Sustainable Drainage Systems (SuDS)

Due to the enactment of Schedule 3 of The Flood and Water Management Act 2010 by The Welsh Government on the 7th January 2019, Cardiff Council has a mandatory duty to adopt sustainable drainage assets of which 2 or more properties connect.

To gain SAB (SuDS Approval Body) approval a maintenance and inspection plan is required and once approved this plan is then utilised to ensure regular inspections are undertaken. Any remedial works will be arranged and undertaken as required.

At present due to the relative infancy of the legislation no assets have currently been adopted by Cardiff Council however the adopted asset number is expected to grow significantly during this HAMP period. However, the following Council implemented highway improvement schemes have incorporated SuDS; Greener Grangetown, Wood Street, Tudor Street, Senghennyd Road and Cowbridge Road East.

6.1.3 Flood Defence

There are currently many flood defences across the city with Cardiff Council having the responsibility for inspection and maintenance of assets such as flood embankments, attenuation basins, flood barriers and debris screens with associated telemetry.

The flood defence assets are inspected annually utilising the industry accepted T98 asset condition scoring method. Currently there is one member of the Flood and coastal risk management team that is a T98 accredited inspector however another member of the team is undertaking the accreditation during the 2023 / 2024 financial year.

6.1.4 Maintenance of Debris Screens on Watercourses

There are approximately 100 watercourse debris screens across the city that Cardiff Council highways operations team maintain. The highways operational teams attend the screens to ensure they are clear before any forecasted inclement weather and out of hours during storms events. 8 of these screens have flow monitoring telemetry installed due to the high risk of internal flooding should they become blocked. The locations are detailed below.

Ward	Number
Llanishen	1
Pentyrch	1
Rhiwbina	4
Whitchurch & Tongwynlais	2

6.1.5 Disused Coal Spoil Tips

A recent joint project undertaken by The Welsh Government & The Coal Authority has determined a large number of uncharted disused coal spoil tips are present throughout Wales. The coal tips are awarded a risk rating between A (least risk) to D (Highest Risk) and inspections are undertaken accordingly. The information regarding the coal tips under Cardiff Council's responsibility is detailed in the table below:

Coal Tip Category	Number	Inspection Frequency
A	1	Once every 2 years
B	8	Once a year
C	0 (1)	Once a month (on behalf of PCC)
D	1	Once a month

6.2 Drainage Investment Strategies

Investment strategies for the highway drainage are developed on a reactive basis responding to highway inspections, resident and elected members reports. However, where the demand for remedial works exceed the annual budgets, specific financial requests will be made.

The investment strategy for SuDS asset will be to utilise the Commuted Sums Payments paid by developers during the adoption process.

The flood risk revenue grant offered by The Welsh Government annually is utilised in part for investment in flood defence assets such as telemetry and debris screens.

6.3 Revenue Pressures on Drainage Assets

The removal of detritus from the highway channels (gutter) and cleansing of drainage gullies allows the free flow of rainwater off the highway into the drainage system to prevent flooding. The removal of rainwater from the highway also helps to maximise the life of the asphalt carriageway.

Water can be one of the most damaging elements to an asphalt surface. Moisture damage decreases strength and durability of asphalt, weakening the bond between the bitumen and the aggregate, thus speeding up deterioration forming potholes and cracking. When cracks form it allows water to seep under the surface, which is damaging to the base beneath. Extended exposure to these defects can have significant detrimental effects to the structure and foundation of the road.

It is very difficult to quantify the direct damage to the carriageway caused by the effects of standing water because of blocked drains and channels. However, reductions in revenue investment for cyclic gully emptying and street sweeping functions, and their consequent reduced frequency, can be attributed to accelerated carriageway deterioration as described above.

As flood defence assets advance along their design life inspection and maintenance is undertaken using Revenue budgets. These assets are critical for the protection of a large number of residential and commercial properties from a range of flood risk sources.

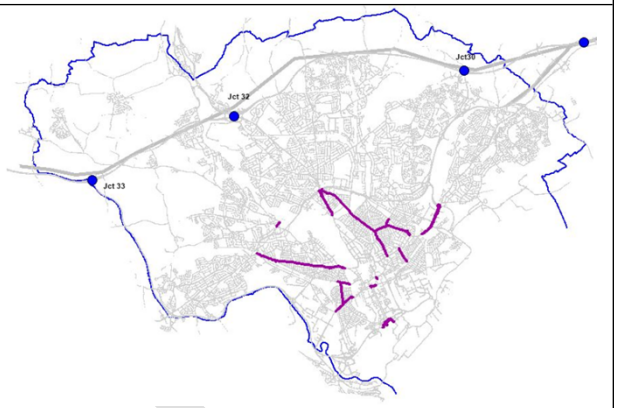
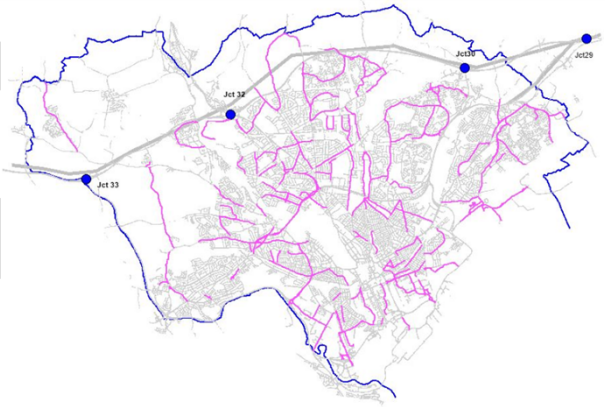
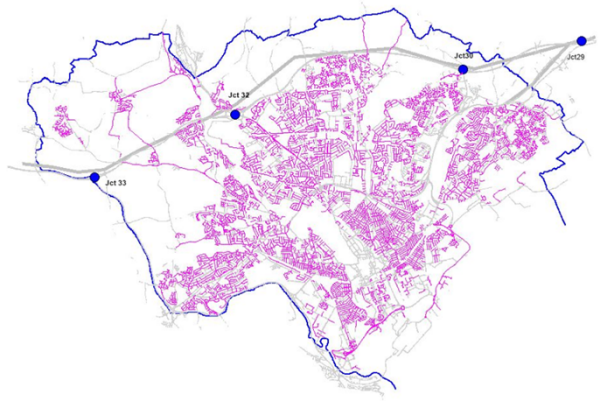
7. Management of Footways

7.1 Footway Lengths

The table below shows Cardiff's footway network lengths		
Footway Hierarchy	**Length (km)**	**% of Total Length**
FHVHU	26	2%
FH1	25	2%
FH2	209	15%
FH3	205	14%
FH4	958	67%
FH5	0	0
Total	**1423km**	

Footway Hierarchy	Description
FHVHU	Very Heavily Used - busy areas of the city centre e.g. Queen St, Hayes, St Mary St, John St
FH1	Busy urban shopping & business areas e.g. Albany Rd, City Rd, Cowbridge Rd
FH2	Footways outside busy public buildings such as train/bus stations, hospitals, schools and colleges or small parade of shops etc. that generate significantly higher levels of use than the adjacent footways.
FH3	Footways that link housing estates and industrial estates to other centres/routes
FH4	All other footways including footways in housing areas where footfall levels are expected to be medium or low.
FH5	The little used rural footways where usage is expected to be below 100 pedestrians per day.

The figure below shows the extents of each classification of footway

FHVHU – City Centre	FH1 – Busy Urban Shopping Areas
	
FH2 – Local High Use	**FH3 – Link Footways**
	
FH4 – Housing & Industrial Estates	**FH5**
	No footways in this classification

7.2 Footway Service Standards

The table below shows the service standards that users can expect from the footway assets during the plan period.

Footway Service Standards						
	Measure	**2017/18**	**2018/19**	**2019/20**	**2020/21**	**Target**
Safety	Percentage of Cat 1 defects made safe within response times	96%	92%	97%	93%	95%
	% of safety inspections completed on time	99.72%	82%	87.42%	99.60%	85%

7.3 Footway Condition Surveys

At time of preparation of this document, current footway network condition data is unavailable. Plans are underway to implement a network wide condition survey undertaken by Highway Safety Inspectors at the same time as their cyclic inspections. A FNS (footway network survey) condition survey was undertaken in 2012; however, its age makes it unsuitable for use with the footway condition forecasting software (similar to that used for carriageways).

7.4 Footway Investment Strategies

Footway investment strategies have been developed to maximise the whole life cost approach to footway maintenance management, to facilitate this a number of separate footway improvement programmes are delivered on an annual basis (see categories below).

Table 7a - Footway Investment Strategy	
Category	**Description**
Routine and Reactive Localised Repair	Repair of identified defects or to current inspection and response requirements as defined in Policy Part C:001Highway Safety Inspections
Planned Maintenance Preventative surface treatment – **Micro Asphalt**	High volume and our most cost-effective footway treatment essential to maximise whole life cost but only suitable where deterioration is not too advanced.
Planned Maintenance Corrective – **Resurfacing & Reconstruction**	Often the only suitable footway treatment. May include the wholesale replacement of the footway including its foundation, replacement of existing deteriorated macadam or replacing broken and dangerous slabs with more resilient asphalt, kerbs will also often need replacing.

As described in Section 2.2.1 and Section 4.3 the estimated level of steady state funding for the footway asset is **£3.7m per annum** (previously £2.4m per annum before recent cost of living increases). Steady State is a level of funding that maintains an asset in its current condition, neither improving nor deteriorating from an overall perspective. Maintenance funding below steady state will result in an ongoing deteriorating condition and consequent increasing maintenance backlog over time, the speed and level of deterioration is dependent on how far investment is below steady state.

Table 7b - Footway Capital Investment Strategy Profile										
Treatment	**Actual Capital Spend**					**Estimated (indicative) Capital Spend**				
	2018/19 £000's	**2019/20 £000's**	**2020/21 £000's**	**2021/22 £000's**	**2022/23 £000's**	**2023/24 £000's**	**2024/25 £000's**	**2025/26 £000's**	**2026/27 £000's**	**2027/42 £000's**
Preventative - Micro Asphalt	291	58	4	0	643	223	129	129	129	129
Corrective - Resurfacing & Reconstruction	238	693	260	453	401	457	266	266	266	266
Sub Total	**529**	**751**	**264**	**453**	**1044**	**680**	**395**	**395**	**395**	**395**
Other Capital expenditure 1	275	210	602	534	841	200	200	200	200	200
Total Capital expenditure	**805**	**961**	**866**	**988**	**1,885**	**880**	**595**	**595**	**595**	**595**
Revenue expenditure	402	433	528	809						
Total Annual Investment	**1,207**	**1,393**	**1,394**	**1,796**	**1,885**	**880**	**595**	**595**	**595**	**595**

Other capital expenditure[1] – *capital costs that would not be modelled as part of a Steady State works calculation, includes localised footway improvement works and localised permanent patching (>20m²), legal fees, staff costs etc.*

7.5 Revenue Pressures on Footway Maintenance

Refer to section 4.4 for details of the current revenue pressures on the footway asset.

8. Management of Street Furniture & Road Markings

The general street furniture and road marking asset comprises of a number of asset groups, including:

- Bollards
- Pedestrian guardrail
- Seats
- Road markings
- Traffic signs & street nameplates

8.1 Street Furniture & Road Markings Service Standards

Street Furniture & Road Markings Standards						
	Measure	**2017/18**	**2018/19**	**2019/20**	**2020/21**	**Target**
Safety	Percentage of Cat 1 defects made safe within response times	96%	92%	97%	93%	95%
	% of safety inspections completed on time	99.72%	82%	87.42%	99.60%	85%

Safety defects for street furniture and road markings are managed through routine cyclic highway safety inspections. Due to the size and complexity of these asset groups only a limited inventory is currently available and detailed service standards have not been calculated or defined. The implementation and development of AMX has provided the functionality to collect, manage and update "child assets". It is proposed that this asset information is collected over time whilst undertaking routine maintenance activities and as described below utilising the new RoadAI video survey which was undertaken in late 2022 which will continue to develop a more robust dataset on which future informed decision making can be made.

8.2 Investment Strategies

Investment strategies for the street furniture and road marking assets are generally developed on a reactive basis responding to identified defects from safety inspections or customer requests.

However, programmes of planned maintenance are developed on a needs basis to address identified issues, in some cases specific financial requests are made where demand exceed in year budgets. It is anticipated that as understanding of the asset is enhanced following increased data collection (including RoadAI) targeted programmes of improvement will be identified and evaluated. Again, specific Capital and Revenue bids for increased funding may be considered where programmes cannot be accommodated within routine budgets.

8.3 Revenue Pressures on Street Furniture and Road Markings

A significant proportion of road marking, traffic sign and street furniture (bollards, pedestrian guardrail, benches, fences etc) repair and replacement is undertaken using Revenue budgets, other than those replaced as part of wholesale capital highway improvement schemes.

The Council depends on signing and lining for the efficient control and movement of traffic, for enforcement of traffic regulations and, most importantly, as an aid to road safety. Traffic signs and road markings are placed by the Council, through the powers provided by the Road Traffic Regulation Act 1984, to provide warnings, information and details of restrictions to road users.

8.3.1 Road Markings

While faded road markings are not illegal in a definite black-and-white sense, the legislation of the Road Traffic Act 1988 outlines that roads must be safe for users. Therefore, if an accident were to occur due to the lack of road markings, or the inadequate quality of them, then the responsibility may well lie with the Council. An incident caused as a direct result of road marking quality could therefore be a violation of the law. In addition, missing, faded or incorrect road markings make parking restrictions unenforceable.

The recent RoadAI video survey of the highway network has identified that over 300km of the surveyed road markings were in the <25% condition value. At the time of preparation of this report, the RoadAI road marking data was being processed and evaluated by the Highways Asset Team. This data will enable us to establish a maintenance backlog and make more informed bids for planned improvement programmes.

8.3.2 Traffic Signs

Restrictions are legally unenforceable if the signs are missing, incorrect, wrongly orientated or obscured. Again, the legislation of the Road Traffic Act 1988 outlines that roads must be safe for users as described above.

Sign cleaning is undertaken following Councillor or customer request or where inspections have identified badly obscured signs. However, due to restricted Revenue budgets, a cyclic sign cleaning programme is unaffordable.

The replacement of faded, missing or damaged street nameplates is a good example of a continual demand on revenue maintenance budgets. During the three-year period 2020-2023 400 nameplates were replaced on approximately 200 streets at a cost of circa £60k. However, a backlog of 690 nameplates remains at an approx. replacement cost of £103k, at current investment rates this backlog will take more than 5 years to replace. (That is, if no more defective units were added to the backlog).

The recent RoadAI video survey has identified 23,800 traffic signs on the road network. At present the software is unable to automatically categorise sign condition. However, desk top analysis can be undertaken, and condition recorded against each asset. At the time of preparation of this report, the RoadAI traffic sign data was being processed and evaluated by the Highways Asset Team. This data will enable us to establish a maintenance backlog and make more informed bids for planned improvement programmes.

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9. Management of Street Lighting

The Street lighting asset comprises of the following main asset groups:

- 39,054 Lighting Columns
- 4,093 Illuminated Signs
- 522 Illuminated Bollards
- 642 Zebra crossing belisha beacons
- 56 School crossing patrol flashing units

The management of Cardiff Councils Street Lighting asset provides a continuous inspection process which identifies defects that are recorded and managed utilising the Mayrise asset management system. Electrical Inspections and non-destructive structural inspections are undertaken on a cyclic basis with lens cleaning of lamps being undertaken at the same time as the electrical test.

9.1 Street Lighting Service Standards

The Council or its contractor carries out reactive maintenance on the street lighting asset generally resulting from the following incidents, the timescales for rectifying these damaged or missing assets follows a risk-based approach:

- Third party accident damage
- Identified failures from inspections, customer complaints and Central Management System.
- Vandalism

Average Time Taken to Restore Lanterns to Full Working Order							
Fault Performance	**2015-2016**	**2016-2017**	**2017-2018**	**2018-2019**	**2019-2020**	**2020-2021**	**2021-2022**
Average time (in days) taken to restore lanterns to full working order (authority or electricity supplier problem)	6.47	6.56	6.66	3.71	3.85	4.49	3.0
Average time (in days) for authority to restore lanterns to full working order from report (excluding electricity supplier fault)	6	6.2	5.2	2.95	5.67	7.2	7.5

Requests for additional street lighting will generally consider the following criteria, with each request being dealt with on its individual merit:

- The reason for the request
- Consequence of the proposed change
- The impact of change on the existing lighting layout
- The future servicing of the unit
- The impact of the proposal on neighbours, communities, and other stakeholders
- Road safety issues
- Environmental issues

9.2 Street Lighting Investment Strategies

The three main principles underpinning the Street lighting investment strategy are energy use, price reduction and carbon reduction. Thus, supporting the current ongoing implementation of LED units described below.

The Council has had an ongoing programme of replacing existing lighting units with modern efficient LED units across the entire network. Due to the efficiencies associated with LED and its reduced energy consumption it will contribute towards the Councils carbon reduction targets, it is now the product of choice and conversely the production of traditional lighting has reduced. The LED street lighting programme directly supports the corporate One Planet Cardiff objectives by improving the sustainability of the city both financially and environmentally, by reducing the operation energy requirements for lighting and associated CO2 emissions. Furthermore, the LED street lighting technology adopts Smart City approaches to managing infrastructure by the introduction of a Central Management System.

Aluminium columns are also now extensively used due to their increased life expectancy over traditional galvanised steel columns.

9.3 Revenue Pressures on Street Lighting

Ongoing price increases (and fluctuating costs) for street lighting energy places a particular demand on Council Revenue funding. Many repairs to street lighting apparatus such as replacement of failed electrical components, upgrade of equipment and replacement of damaged units can only be funded by Revenue and limited

budgets to undertake these repairs reduces the resilience of the Street Lighting asset. Limited Revenue funding cause particular problems in resolving issues with defective illuminated signs and keep left bollards, all of which play a key role in the safe use of the highway network.

The manufacture of Fluorescent tubes used in illuminated signs is decreasing in line with new legislation and decreasing requirements within other industries which will require existing signs to be either replaced with an LED equivalent or de-illuminated if regulations permit. Whilst this increases initial pressures on budgets, longer term savings will be possible with reduced energy and maintenance costs along with CO2 reductions.

10. Management of Structures

Cardiff Council's Highways Structures Asset consists of:

- 1 Tunnel
- >150 Bridges
- >190 Culverts
- >150 retaining walls and subways

The management of Cardiff Councils 504 highway structures entails a continuous inspection process that identifies defects that are recorded on the AMX system. General Inspections are carried out every 2 years and Principal Inspection carried out every 6 years. A Principal Inspection is a close examination of a Structure requiring careful planning and liaison with third parties e.g., Network Rail and Transport for Wales for rail bridges. Special Inspections are undertaken when further investigation of the condition of a structure is required or following impact from a vehicle traffic collision. In addition, Structural Assessments are carried out to review the bridge vehicle loading capacity to ensure the structure is fit for purpose to enable Abnormal Loads notifications to be validated within the prescribed time scales.

10.1 Structures Service Standards

The service level standard for highway structures is determined by inspections in accordance with the Code of Practice for the "Management of Highway Structures".

The table below shows Bridge Condition Indicators (BCI) of the bridge stock for the last five years, based upon the outcome of inspections completed. While the Average Condition indicator (BCI(av)) is fairly steady, the Critical Condition indicator (BCI(Crit)) for the significant elements of the bridge structure is declining.

In 2022 the Average Condition is 85.31 is classed as Good. The Critical condition is 66.38 classed as fair.

Financial Year	**2018**	**2019**	**2020**	**2021**	**2022**
BCI (Av.)	87.5	86.96	85.96	85.64	85.31
BCI (Crit.)	73.1	70.51	67.42	66.41	66.38

10.2 Structures Investment Strategies

The investment strategy adopts a risk-based approach and is determined by the outcome of Principal Inspections, Structural Assessments and upgrading substandard structures. Prioritisation is based on the demand to ensure structures are 'safe for users and 'fit for purpose'. Intervention with appropriate investment can improve the longevity of a structure to achieve the desired 120-year design, minimising the risk of more substantial costs in the future.

Interim measures may be implemented if the condition of a structure has deteriorated to a poor level or following a Structural Assessment determining that a structure has become substandard. This may require a weight restriction to be imposed, or existing restrictions lowered until funding is available to strengthen the structure to the appropriate current requirements.

Subject to appropriate funding levels, Capital Investment plans and Life Cycle Planning for the Council's Bridge Stock, will reduce the need for repetitive and expensive reactive maintenance from the revenue budget.

10.3 Revenue Pressures on Structures Assets

Painting structures is an essential and cost-effective maintenance strategy to protect the integrity of steelwork and help achieve their design lives of 120 years. Painting prevents corrosion and the subsequent structural deterioration of metal components minimising expensive repairs to strengthen or replace corroded elements. The elements of a structure that benefit from painting are steel beams under the bridge deck, parapets (the fences on the edge of the structure) and complete footbridges.

Modern paintwork systems used on highway structures have a lifecycle of between 20 to 25 years, a significant improvement over older systems lasting from 12 and 15 years, thus extending new treatment cycles but limiting protection of older painted elements. It should be noted that access arrangements for carrying out painting can increase the cost of a scheme significantly, along with the legislative requirements of Railway companies and Natural Resources Wales over rivers.

The current revenue budget available for the maintenance of all Highway Structures is £130k, which is fully allocated to completing essential safety works and minor repairs. There is an estimated current backlog of £900k for painting Highway Structures that have significant steelwork components. Based on current inspection data the painting of structural steelwork comprises approximately 25% of a £4m maintenance backlog.

11. Management of Intelligent Transport Systems (ITS)

Cardiff Council's Intelligent Transport Systems Asset consists of:

- 182 signalised junctions
- 122 pedestrian crossings
- 18 Automatic rising bollards sites
- 9 Manual lift Assist rising bollard sites.
- 360 CCTV Cameras
- Dynamic signing systems, including:
  - 41 Variable message signs (VMS) LED signs
  - 22 Car Park Management LED Signs
  - 94 Rotating plank signs (RPS)
- North Road Lane Control System
- Real time bus information System including 390 shelter displays.
- 29 Speed & 18 Red Light Cameras Housings
- Fibreoptic and Copper cable communication system

The Council depends on signing and signalling for the efficient control and movement of traffic, for enforcement of traffic regulations and, most importantly, as an aid to road safety. Traffic signs are placed by the Council, through the powers provided by the Road Traffic Regulation Act 1984, to provide warnings, information and details of restrictions to road users. Traffic signals are a key tool in managing traffic. They are provided for a number of reasons – to manage flows and delays between main and side roads, to provide safe crossing places, and to reduce conflicts. They achieve this by separating conflicting traffic in time, and sometimes space, safely, efficiently and effectively. Note that the term "traffic" includes all road users: pedestrians, pedal cycles (which are vehicles), equestrians, public service vehicles, and motor vehicles.

11.1 Intelligent Transport System Service Standards

Response times for reactive maintenance on ITS assets are categorised as either urgent or non-urgent. Urgent faults will generally be classified as (but not limited to):

- Damage following an RTA,
- Asset not working,
- Assets displaying incorrect information,
- Power issues

- Assets damaged or in dangerous condition.

An annual site inspection is undertaken on the following assets checking components and equipment:

- Traffic Signals
- Automatic Rising Bollards
- Dynamic Signing Systems

Cyclic electrical testing is undertaken on all electrical installations. Specific cyclic maintenance and inspections are carried out on the moving components of Rotating Plank Signs and Automatic Rising Bollards.

Visual inspections are carried out as part of the periodic maintenance inspections and where structural issues are identified then a replacement is carried out or further structural tests are undertaken as required.

11.2 Intelligent Transport Systems Investment Strategies

The investment strategy for the ITS asset is generally developed on a reactive basis responding to identified defects from the maintenance contractor's periodic inspections, Urban Traffic Control real time faults and customer requests. The ITS asset is continually growing through the introduction of new schemes delivered by both developers and other Council teams. This growth in the ITS asset paces a continually increasing demand on maintenance budgets. ITS upgrades and replacements directly support the corporate One Planet Cardiff objectives by improving the sustainability of the city both financially and environmentally, by reducing the operation energy requirements and associated CO2 emissions.

11.3 Revenue Pressures on Intelligent Transport Systems

As with the Street Lighting asset ongoing price increases (and fluctuating costs) for energy places a particular demand on Council Revenue funding.

As stated above the latest ITS technology improves efficiency of the road network for all road users, providing better provision for pedestrians, cyclists and vulnerable road users as well as motor vehicles. Many repairs to ITS apparatus such as replacement of failed

components, upgrade of equipment and replacement of damaged units can only be funded by Revenue. Limited budgets to undertake these repairs reduces the resilience of the ITS asset.

Traffic signals have for many years been reliant on M32 Halogen capsule lamps and Cardiff like many other cities in the UK has a number of these legacy installations. The worldwide consumption of halogen lamps has however reduced significantly in recent years driven mainly by the advances in LED technology and as other major consumers of halogen lamps have transitioned, along with difficulties in obtaining raw materials, many manufacturers have ceased producing these products resulting in reduced availability and increased costs. These Halogen units are gradually being replaced with more efficient modern LED signal heads. However, these upgrades are not always as simple as replacing old halogen with new LED units, there are often compatibility issues with the existing signal controller that can significantly increases replacement costs. The advantages of using LED traffic lights are:

- Much greater energy efficiency which is good for the environment and produces a substantial reduction in the running costs of traffic signals.
- LED heads have a much longer lifetime between replacements, measured in years rather than months.
- Halogen signal heads suddenly fail at the end of their life, whereas the individual LEDs within each head will fail over a period of time, providing plenty of warning as to when to change the light - much safer than a sudden loss of a traffic signal aspect.
- Brighter illumination with better contrast against direct sunlight
- Reduction in CO2 from decreased energy and maintenance requirements

New installations benefit from the move towards the use of extra low voltage (ELV) equipment. Traffic signal sites have traditionally operated at the nominal mains voltage of 230v, operating traffic signal installations at a lower voltage of 48v offers several benefits:

- Reduces chances of an electric shock being received from an installation should a fault occur.
- When coupled with LED signal heads energy savings increase.

- Provides significant reductions in CO2 emissions due to lower power requirements, and reductions in raw material usage, resulting from the need for fewer street cables.

Additional pressures on ITS equipment include:

- The requirement to upgrade legacy obsolete analogue transmission equipment with digital IP
- The requirement to upgrade obsolete analogue CCTV cameras to digital HD.
- Obsolete components within LED VMS requiring complete sign renewal.
- Traffic Signal poles that require replacing due to age
- Traffic signal cabling and controllers that has been operated beyond its expected lifespan through carefully managed ongoing maintenance.

As described above limited Revenue funding places considerable pressure of the effective maintenance of the ITS asset.

12. Benchmarking

Benchmarking data is available in the form of the carriageway condition performance indicators for the A, B and C class roads referenced in Section 5.2. The tables below provide a comparison of Welsh Highway Authorities road condition between 2012 and 2022.

Council	THS/012a - A Roads - % in Red Condition										
	Length (km)	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22
Anglesey	145.20	3.40%	3.10%	3.69%	2.70%	2.30%	3.20%	2.90%	4.00%	4.60%	3.00%
Blaenau Gwent	44.62	7.20%	4.80%	3.60%	2.60%	2.30%	2.60%	2.60%			
Bridgend	104.00	5.70%	5.00%	5.24%	4.70%	5.20%	4.50%	4.00%			
Caerphilly	96.60	5.00%	5.40%	4.16%	4.50%	4.30%	4.60%	3.90%	4.10%	3.00%	3.20%
Cardiff	152.00	7.00%	4.00%	4.29%	3.70%	4.10%	3.30%	3.50%	3.30%	2.60%	2.80%
Carmarthenshire	249.10	6.60%	4.70%	4.34%	4.60%	4.30%	4.10%	5.20%	5.40%	4.10%	3.60%
Ceredigion	158.30	6.60%	5.90%	4.90%	5.12%	4.10%	4.20%	4.70%		3.20%	
Conwy	118.06	4.30%	2.60%	2.87%	2.90%	3.10%	3.50%	3.90%	4.30%	3.90%	
Denbighshire	139.80	5.60%	3.70%	3.51%	3.00%	2.70%	2.70%	3.40%	3.60%	3.50%	2.60%
Flintshire	152.00	2.20%	1.50%	1.23%	1.40%	1.50%	1.40%	1.70%	2.20%	2.10%	
Gwynedd	310.20	5.20%	4.40%	3.53%	3.10%	3.50%	3.20%	3.30%	3.50%	2.80%	2.60%
Merthyr Tydfil	27.62	5.30%	5.60%	3.47%	3.30%	3.20%	3.30%	3.60%	3.70%	2.70%	
Monmouthshire	59.00	4.20%	3.00%	2.56%	2.30%	2.10%	2.40%	2.70%	2.60%	2.70%	
Neath Port Talbot	140.19	7.90%	6.80%	5.87%	4.50%	4.10%	4.50%	5.30%	5.00%		
Newport	51.30	3.10%	3.30%	2.58%	2.20%	2.60%	2.60%	2.30%	2.70%	2.30%	2.10%
Pembrokeshire	160.30	5.70%	4.50%	4.94%	4.60%	5.40%	5.40%	4.80%	4.40%	3.90%	3.90%
Powys	238.20	4.70%	5.00%	3.35%	2.80%	3.60%	3.90%	3.90%	3.90%	3.40%	3.00%
Rhondda Cynon Taf	165.40	7.60%	8.10%	8.01%	7.20%	5.70%	5.20%	4.90%	4.70%	4.60%	3.70%
Swansea	102.30	3.70%	3.90%	3.18%	3.30%	3.20%	3.20%	4.10%	4.00%	3.10%	2.60%
Torfaen	26.00	2.30%	1.50%	1.18%	1.40%	1.70%	2.10%	2.50%			
Vale of Glamorgan	73.90	6.80%	6.00%	5.62%	5.90%	5.90%	6.54%	6.30%	6.00%	5.10%	
Wrexham	110.00	2.90%	2.80%	2.70%	2.30%	2.40%	2.40%	3.30%	3.80%	3.20%	3.50%
	Welsh Avg	**5.14%**	**4.35%**	**3.86%**	**3.55%**	**3.51%**	**3.58%**	**3.76%**	**3.96%**	**3.38%**	**3.05%**

Council	THS/012b - B Roads - % in Red Condition										
	Length (km)	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22
Anglesey	122.50	7.50%	5.90%	5.11%	3.80%	3.20%	4.40%	3.80%	3.80%	3.80%	2.80%
Blaenau Gwent	17.95	8.10%	6.80%	5.48%	4.80%	5.10%	5.60%	5.60%			
Bridgend	30.90	7.70%	6.10%	4.84%	4.90%	3.30%	4.20%	3.90%			
Caerphilly	64.80	6.30%	4.80%	3.44%	4.10%	3.70%	3.60%	3.40%	3.30%	2.40%	2.20%
Cardiff	32.00	8.40%	8.20%	7.34%	6.50%	7.10%	5.60%	4.70%	5.60%	4.10%	3.30%
Carmarthenshire	331.50	7.70%	5.50%	3.61%	4.00%	3.50%	3.10%	4.20%	4.70%	3.40%	2.80%
Ceredigion	325.00	10.00%	7.70%	5.40%	5.17%	3.10%	3.00%	3.50%		2.00%	
Conwy	173.28	7.30%	6.50%	6.06%	4.30%	4.30%	4.30%	5.80%	5.90%	4.80%	
Denbighshire	133.70	9.30%	8.80%	7.71%	6.50%	5.80%	5.10%	4.70%	5.30%	5.00%	3.80%
Flintshire	78.00	2.80%	1.20%	1.34%	1.50%	1.30%	1.30%	1.40%	1.80%	1.90%	
Gwynedd	204.22	5.30%	4.70%	3.72%	3.40%	3.90%	3.80%	3.90%	3.90%	3.00%	2.50%
Merthyr Tydfil	12.13	11.80%	14.40%	10.83%	8.80%	8.60%	7.40%	6.20%	7.10%	7.20%	
Monmouthshire	151.00	6.10%	5.30%	5.30%	5.10%	4.30%	4.90%	4.70%	5.10%	5.20%	
Neath Port Talbot	63.42	6.70%	5.20%	4.04%	2.60%	2.40%	2.90%	2.90%	2.80%		
Newport	46.70	6.50%	6.00%	4.99%	4.00%	4.20%	4.40%	4.20%	5.00%	4.40%	3.10%
Pembrokeshire	240.90	6.90%	5.10%	4.97%	4.00%	4.40%	5.20%	5.60%	5.40%	4.10%	3.40%
Powys	604.10	9.40%	8.60%	5.98%	5.20%	5.50%	5.70%	5.30%	5.10%	4.50%	4.10%
Rhondda Cynon Taf	76.20	9.90%	8.40%	6.43%	7.10%	5.90%	6.20%	6.50%	6.20%	5.90%	4.80%
Swansea	101.60	5.70%	5.60%	4.04%	4.50%	5.00%	4.50%	5.10%	5.10%	4.20%	3.10%
Torfaen	17.00	6.20%	5.60%	5.60%	5.60%	4.20%	4.30%	4.80%			
Vale of Glamorgan	57.80	5.90%	4.80%	5.04%	4.70%	4.20%	4.96%	4.10%	5.10%	5.20%	
Wrexham	142.50	5.70%	4.60%	2.83%	2.70%	2.70%	2.40%	2.60%	2.90%	2.60%	3.00%
	Welsh Avg	**7.33%**	**6.35%**	**5.19%**	**4.69%**	**4.35%**	**4.40%**	**4.40%**	**4.67%**	**4.09%**	**3.24%**

Council	THS/012c - C Roads - % in Red Condition										
	Length (km)	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22
Anglesey	360.90	17.60%	17.60%	15.80%	13.40%	10.10%	8.90%	8.70%	8.20%	8.50%	8.20%
Blaenau Gwent	55.25	17.70%	10.50%	9.44%	7.00%	6.40%	6.10%	5.50%			
Bridgend	108.10	11.80%	11.40%	12.78%	10.10%	8.90%	8.60%	8.00%			
Caerphilly	152.40	13.40%	12.80%	9.90%	9.20%	8.70%	7.30%	6.60%	6.00%	4.90%	4.70%
Cardiff	106.00	12.80%	10.10%	9.29%	6.60%	6.90%	6.00%	5.80%	5.60%	4.50%	4.60%
Carmarthenshire	1,271.50	21.80%	20.40%	15.56%	13.70%	11.60%	11.90%	12.50%	12.50%	12.00%	11.70%
Ceredigion	840.60	22.60%	21.60%	21.90%	21.02%	19.10%	19.40%	17.30%		14.70%	
Conwy	485.86	13.80%	17.10%	16.95%	15.30%	15.70%	14.04%	15.40%	15.50%	15.10%	
Denbighshire	521.60	13.90%	14.50%	12.95%	13.30%	10.50%	10.20%	8.20%	8.30%	7.60%	7.50%
Flintshire	262.00	8.00%	6.90%	7.25%	6.30%	5.00%	5.30%	5.80%	4.90%	5.30%	
Gwynedd	923.25	10.30%	14.70%	14.23%	15.80%	15.20%	14.10%	14.50%	14.20%	12.90%	11.00%
Merthyr Tydfil	34.77	8.40%	6.70%	5.93%	5.20%	5.20%	4.00%	4.10%	3.90%	3.30%	
Monmouthshire	459.00	9.90%	14.20%	13.41%	12.30%	8.00%	7.70%	7.30%	7.60%	7.70%	
Neath Port Talbot	53.08	9.60%	8.20%	7.04%	5.90%	5.40%	5.30%	5.30%	5.70%		
Newport	142.40	11.00%	10.70%	10.63%	7.00%	6.90%	7.10%	6.90%	7.40%	6.40%	5.90%
Pembrokeshire	979.60	15.60%	14.90%	10.80%	7.50%	7.70%	7.20%	8.90%	9.40%	8.50%	7.60%
Powys	2,102.00	26.00%	26.70%	27.09%	25.10%	24.40%	23.00%	21.60%	22.00%	19.60%	17.90%
Rhondda Cynon Taf	123.50	13.90%	13.60%	13.28%	11.60%	10.20%	6.20%	3.00%	3.50%	3.40%	2.30%
Swansea	127.90	10.40%	10.10%	7.10%	7.30%	6.80%	6.70%	6.90%	7.00%	6.20%	5.20%
Torfaen	85.00	9.10%	8.70%	7.58%	7.00%	6.00%	5.30%	5.10%			
Vale of Glamorgan	311.30	16.20%	15.10%	13.91%	12.30%	11.20%	10.47%	9.70%	10.30%	8.10%	
Wrexham	370.50	21.00%	24.00%	21.55%	19.70%	18.50%	16.30%	16.20%	19.00%	18.90%	19.70%
	Welsh Avg	**14.31%**	**14.11%**	**12.93%**	**11.48%**	**10.38%**	**9.60%**	**9.24%**	**9.50%**	**9.31%**	**8.86%**

13. Risks to the Plan

Using the Councils corporate risk matrix, the risks that could prevent service standards being achieved are:

Ref	Risk Description	Inherent Risk			Current Control	Residual Risk		
		Likelihood	Impact	Priority		Likelihood	Impact	Priority
1	Available budgets have been assumed as shown in the financial section 4. However, external pressures could result in reduced funding in highway assets	C	3	MED	Target service standards will be revised to suit the reduced funding levels	D	4	LOW
2	Duration of investment levels are sustained for the period assumed. However, external pressures could result in reduced funding in highway assets.	C	3	MED	Target service standards will be revised to suit the reduced funding levels	D	4	LOW
3	Levels of defect and deterioration are based on current data which is limited for some assets. Asset deterioration could be more rapid than predicted and the investment required to meet targets is insufficient	C	4	LOW	Budgets and predictions will be revised and this plan updated	D	4	LOW
4	Levels of asset deterioration are based on routine predicted levels. However, unexpected catastrophic asset failure beyond routine funding levels could occur e.g. structural failure of bridge carriageway on principle network	C	2	MED	In year pressure bids made to cover costs of replacement to supplement existing funding levels	C	3	MED
5	Adverse weather could create higher levels of defects and deterioration than have been allowed for	C	3	MED	Budgets and predictions will be revised and this plan updated if abnormally harsh winters occur	D	4	LOW

Risk Matrix and Definitions

High Priority	**Red** - Significant management action, control, evaluation or improvements required with continued proactive monitoring.
Medium Priority	**Red / Amber** - Seek cost effective management action, control, evaluation or improvements with continued proactive monitoring.
Medium Priority	**Amber / Green** - Seek cost effective control improvements if possible and/or monitor and review regularly.
Low Priority	**Green** - Seek control improvements if possible and/or monitor and review.

LIKELIHOOD	IMPACT 1	2	3	4
A	A1	A2	A3	A4
B	B1	B2	B3	B4
C	C1	C2	C3	C4
D	D1	D2	D3	D4
E	E1	E2	E3	E4

Likelihood:

A. Very Likely
B. Likely
C. Possible
D. Unlikely
E. Very Unlikely

Impact:

1. Major
2. Significant
3. Moderate
4. Minor

The '**LIKELIHOOD**' table below provides a framework by which you can use to score the likelihood of your risk occurring giving a score of A being very likely to E being very unlikely.

Description	Probability	Criteria
A. Very Likely	**75% +** chance of occurrence	• Expected to occur in most circumstances • Circumstances and near misses frequently encountered (e.g. daily / weekly /monthly / quarterly)
B. Likely	**50% - 74%** chance of occurrence	• Will probably occur in most circumstances • Circumstances frequently encountered • Near misses regularly encountered (e.g. once or twice a year)
C. Possible	**30% – 49%** chance of occurrence	• Not likely to occur but a distinct possibility • Circumstances regularly encountered • Near misses occasionally experienced (e.g. every 1 - 3 years)
D. Unlikely	**10% - 29%** chance of occurrence	• Not expected to happen but there is the potential • Circumstances occasionally encountered • Any near misses are infrequent (e.g. 3 years +)
E. Very Unlikely	**Less than 10%** chance of occurrence	• May only happen in exceptional circumstances • Has rarely / never happened before.

The '**IMPACT**' table:

Description	1 - Major	2 - Significant	3 - Moderate	4 - Minor
Implications for Service and / or Achievement of Key Targets / Objectives	Major loss of service, including several important areas of service and / or protracted period Service Disruption 5+ Days Major impact on achievement of several key targets / objectives	Complete loss of an important service for a short period Significant effect to services in one or more areas for a period of weeks Service Disruption 3-5 Days Significant impact on achievement of a key target / objective or some impact on several	Moderate effect to an important service for a short period Adverse effect to services in one or more areas for a period of weeks Service Disruption 2-3 Days Moderate impact on achievement of one or more targets / objectives	Brief disruption of service Minor effect to non-crucial service Service Disruption 1 Day Minor impact on achievement of targets and objectives
Reputation	Adverse and persistent national media coverage Adverse central government response, involving (threat of) removal of delegated powers Officer(s) and / or Members forced to resign	Adverse publicity in professional / municipal press, affecting perception / standing in professional / local government community Adverse local publicity of a significant and persistent nature	Adverse local publicity / local public opinion Statutory prosecution of a non-serious nature	Contained within Directorate Complaint from individual / small group, of arguable merit
Health & Safety	Fatality (ies)	Incidents reportable to the HSE (i.e. specified injuries to workers, over seven days lost from work accidents, specified non-fatal accidents to non-workers, specified occupational diseases / dangerous occurrences / gas incidents). Cases of other injury's (not reportable to HSE).	Minor injuries No time lost from work	No injuries but incident has occurred
Failure to provide statutory duties / meet Legal Obligations	Multiple Litigation	Litigation	Ombudsman	Individual claims
Financial	Corporate Budget re-alignment	Budget adjustment across Directorates	Contained within Directorate	Contained within Section / Team
Implications for Partnership (e.g. objectives / deadlines)	Complete failure / breakdown of partnership	Significant impact on partnership or most of expected benefits fail	Adverse effect on partnering arrangements	Minimal impact on partnership
Implications for the Community or the Environment	Extensive, long-term impact Major public health / environmental incident or loss of significant community facility	Long-term environmental or social impact such as a chronic and / or significant discharge of pollutant	Short-term, local environmental or social impact such as a major fire	No lasting detrimental effect on the environment or the community e.g. noise, fumes, dust etc.
Stakeholders	Stakeholders would be unable to pursue their rights and entitlement and may face life threatening consequences	Stakeholders would experience considerable difficulty in pursuing rights and entitlements	Some minor effects on ability of stakeholders to pursue rights and entitlements, e.g. other sources or avenues would be available to stakeholders	The interests of stakeholders would not be affected