Transport Asset Management Plan
2016 to 2020

SOUTHAMPTON CITY COUNCIL

Working in partnership

SCC TAMP

SOUTHAMPTON CITY COUNCIL

CAPITA

sse Enterprise

Balfour Beatty

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FORWARD

Southampton's vision for highways links to the Council's City Strategy and this Transport Asset Management Plan (TAMP) has been written to reflect the City's needs. It takes account of the various national codes of practice and the country's Highways Maintenance Efficiency Programme (HMEP).

The document needs to be regarded as a live document as we recognise the continual improvement route Southampton is taking within its asset management portfolio. Highway asset condition data is likely to become ever more accurate and this plan will develop, as well as adapt to changes in legislation and guidance. Formal approval of this document by the Council indicates approval of the approach and use of the TAMP as a tool for managing our highway assets.

This document, sitting below the Council's Highway Infrastructure Asset Management Policy and Strategy, sets the framework for delivering high quality highway services within Southampton. I am pleased to endorse this medium to long term approach for the City, which will collectively help Southampton achieve its priorities and aspire to its goal of prosperity for all.

Councillor Jacqui Rayment
Deputy Leader
Cabinet Member for Environment & Transport

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CONTEXT OF HIGHWAY INFRASTRUCTURE

Transport affects people's lives every day. The ease by which people can move around can have a major impact on all aspects of life. Having a high-quality, resilient and well-maintained transportation infrastructure is the catalyst of many positive contributions to citizens, society, economy, and environment.

To achieve these objectives and strengthen local communities, it is vital that a local highway network has enough capacity, is in good condition and is adequately maintained over its lifetime. These requirements affect not only carriageways and footways, but also civil structures, drainage systems, street lighting, road marking, traffic signs and equipment, street furniture and land. Due to the dependency between these assets, higher benefits can be attained if highway assets are managed in a holistic manner as part of a whole rather than individually.

Based on these overarching goals, this Transport Asset Management Plan (TAMP) was developed to enable an efficient and well-balanced transport system to be provided to Southampton citizens and communities using the local highway network.

ASSET MANAGEMENT

Asset management is used as an approach to manage risk and meet the performance requirements of Southampton City Council in the most efficient and sustainable manner (HMEP, 2013). It is defined as a strategic and systematic process that aims to meet the strategic needs for the management and maintenance of highway infrastructure assets through long term planning and optimal allocation of resources. This definition includes some key themes such as:

- Strategic approach – a systematic process that takes a long term view;
- Whole of life – the whole-life/lifecycle of an asset is considered;
- Optimisation – maximising benefits by balancing competing demands;
- Resource allocation – allocation of resources based on assessed needs;
- Customer focused – explicit consideration of customer expectations.

This approach seeks to optimise the value of highway infrastructure over their whole life and its main benefits are:

- facilitating better decision making by supporting engineering judgement with financial, economic and technical analysis;
- enabling better understanding and management of the relationship between whole life cost and asset performance;

- providing data and evidence for effective and sustainable investment and maintenance decisions.

By adopting an effective long term planning and forecasting asset performance, the City Council has means to minimise and prevent expensive short-term repairs. In addition, the adoption of strategic asset processes enables the City Council to manage risk and maintain a highway environment in a safe, accessible, affordable and reliable manner.

CONTEXT OF TRANSPORT ASSET MANAGEMENT PLAN (TAMP)

In October 2015, the City Council produced a Highway Asset Management Policy. This document is a high level guidance that establishes the Council's commitment to Infrastructure Asset Management and demonstrates how this approach aligns with the Council Transport Plan. The TAMP is directly linked to this Policy. It is a living document that compliments and supports the goals and objectives of the Local Transport Plan, to ensure that highway assets are managed and maintained in the most efficient way for the benefit of the highway assets. The document details how the assets are managed - now and in the future - identifies aspects for improvement across the service area, provides tools to make more informed decisions, and justifies the need for additional investment.

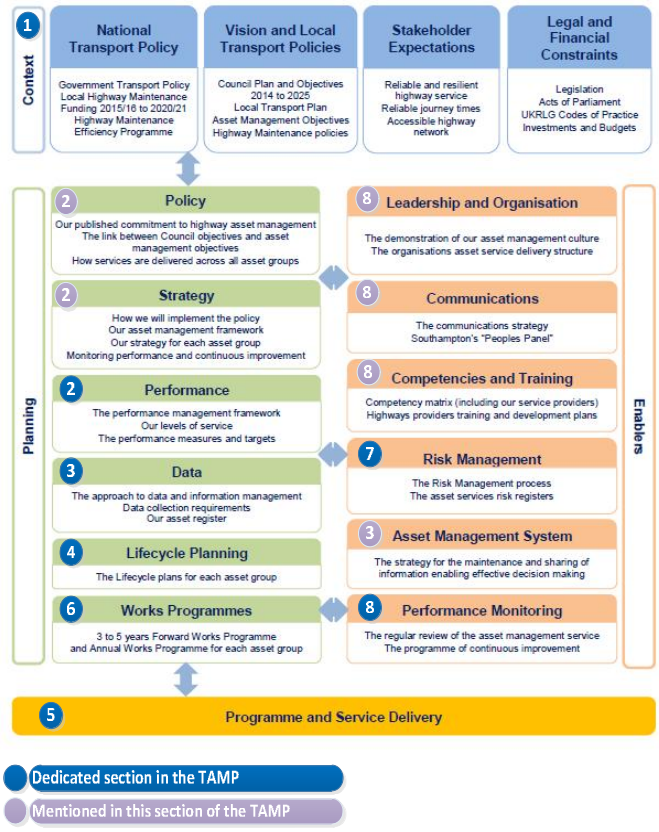
ASSET TYPE	QUANTITY	ASSET VALUE*
Carriageways	79.27 km principal roads (class A) 4.30 km non-principal roads (class B) 56.70 km non-principal roads (class C) 62.50 km unclassified roads (class D) (total: 570.37 km)	£704,160
Drainage	22,367 Highway Gullies 1525 m Ditches 39 Culverts 5 Trash Screens 24 monitored flooding hotspots	(included in carriageways)
Footways and cycle tracks	161.70 km category 1&2 937.20 km (category 3&4) (total: 1098.90 km)	£131,048
Road Markings, Signs and Street Furniture	11.8 km Safety Fencing 24.7 km Pedestrian Barriers 8,832 Traffic Signs (Non-Illum.) 312 Grit Bins 19,061 Bollards, benches and Street Nameplates	£4,709
Street Lighting	23,348 Streetlights 608 Heritage Columns 466 Subway Units 98 Supply Feeder units 1,711 Illuminated Signs 10 Illuminated Bollards	£23,553
Structures	44 Road and footbridges 19 Steps and ramps 41 Subways 51 Retaining Walls	£185,136
Traffic Management Systems	135 Signalised Junctions 92 Pedestrian Crossings 31 Traffic CCTV cameras 44 Variable Message Signs 330 Real Time Passenger Information Units	£4,542
Land assets (total)	833 737 m2	£2,830,575
(*) DRC (Depreciated Replacement Cost) based on the Whole Government Accounts (2014/2015)		

This TAMP covers Southampton City Council's highway network; it includes around 570km of highways and more than 1000km of footways and cycle tracks. In addition, the network includes a large number of complimentary assets such as road markings, traffic signals, street furniture, drainage systems, civil structures, street lighting and traffic management systems, as summarised in the table above.

TAMP CONTENT

This document sets out how the Council can achieve substantially improved value for money and better maintenance work, when compared to current practices. This principally involves the development of a systematic approach to maintenance by investing in the use of the asset management techniques to:

- link the maintenance policy and standards for the highway network to the service delivered;
- identify the standards that reflect the wishes of the stakeholders;
- ensure the network is safe for all stakeholders;
- promote the City Council's objectives;
- enforce and comply with statutory obligations;
- establish the principles by which an effective use of maintenance expenditure can be achieved; and
- identify the key issues affecting the maintenance of the City's highway network.



The figure above illustrates the asset management framework being used and indicates the relationship with the TAMP sections through blue and purple dots.

Section 1. Introduction

This section provides the link for the strategic, tactical and operational delivery of the City Council's Plan and Local Transport Plan. It explains the cornerstones of asset management framework adopted, describes the links between key documents and identifies the key stakeholders of the City's highway network.

Section 2. Measuring performance

This section identifies the levels of service that support the Council's community outcomes based on stakeholder's expectations, statutory requirements and the network hierarchy. The TAMP summarises the strategic goals and levels of service that are relevant to deliver those expectations and requirements. The levels of service are demand-led and concentrate on highway assets. They guide the delivery of an appropriate level of maintenance to each asset of the network. This section also describes the performance framework to assess whether the levels of service are being attained and where is possible, it documents the KPI's linked to those levels of service. In addition, this section identifies the main challenges affecting the management of the City's highways network – now and in the future.

Section 3. Asset data and information systems

Good data is vital to make *good* decisions and having a complete understanding of the existing network of assets is vital to deliver the asset management strategy. To this end, this section categorises the highway assets by type, group, and sub-group. It also includes a data collection strategy and it documents the approach to continuously improve the existing data collection programme.

Section 4. Lifecycle Planning

The adopted asset management strategy is based on the optimisation of the assets lifetime whilst minimising the budget and resources available. The lifecycle plans are the result of this analysis by considering the whole of assets' life and mapping the "cost modelling" with the investment required to maintain assets over a long term period. This enables planned maintenance to be carried out on the network at the *right* time and deliver the expected levels of service. In addition, this section describes the approach adopted for lifecycle planning, including the fundamentals and major cross-asset assumptions.

Section 5. Investment Strategy

This section enables a three year forward works 'strategic' budget to be identified for all assets. It includes details of the funding required to deliver the forward and annual works programmes, including the amount needed to sustain the current condition and enhance the levels of performance.

Section 6. Service Delivery

This section describes the work processes that guide the management of the highway network at the defined levels of performance. It describes the approaches and criteria used to prioritise work schemes, such as Value Management, and to embrace a lifecycle approach.

Section 7. Risk Management

Risk is another aspect covered throughout this plan. This section details how is risk managed over the asset's lifetime and details the main risk management steps, including risk identification, analysis and treatment.

Section 8. Monitoring, reviewing and improvement plan

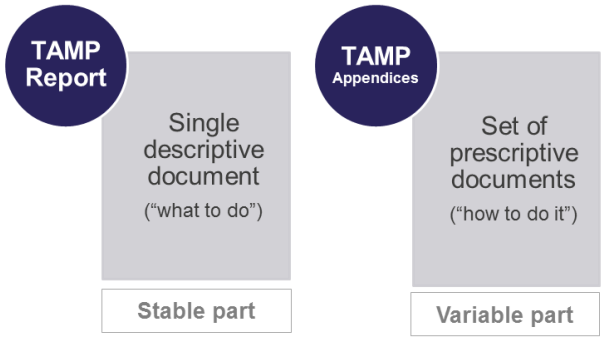
This section describes how the performance is monitored and reviewed and the results fed back into the asset management planning process. It also provides a list of potential improvements and explains how they are managed.

To assist achieving these aims, Southampton City Council is currently working in partnership with three service providers.

SERVICE PROVIDERS	ASSETS MANAGEMENT RESPONSABILITIES
Balfour Beatty Living Places	Carriageways Network Drainage Network Footways and Cycle Tracks Networks Road Markings, Signs and Street Furniture Stock Traffic Management Systems Land Assets
Capita	Civil Structures Stock
SSE	Street Lighting Network

HOW TO READ THIS DOCUMENT?

This document is structured in two main parts - the report and the appendices – as it is illustrated in the figure below.



1 INTRODUCTION

1.1 Preface

Southampton's highway infrastructure provides a vital contribution in creating a City of economic growth and opportunity where everyone thrives. As well as meeting the needs of local communities and supporting the requirements of businesses, the local highway network supports a key national, regional and local transport hub. The location of Southampton at the centre of the Solent means that many trips within and across the Solent pass through the City and its surrounding area. The City has a major international seaport, a key international airport on its doorstep and is a major point of access to the Isle of Wight, all of which contribute to the economic health of the City. The local highway network is the most valuable publically owned asset managed by Southampton City Council. With a total replacement cost of £4.1 billion, the importance of effective and efficient management cannot be understated.

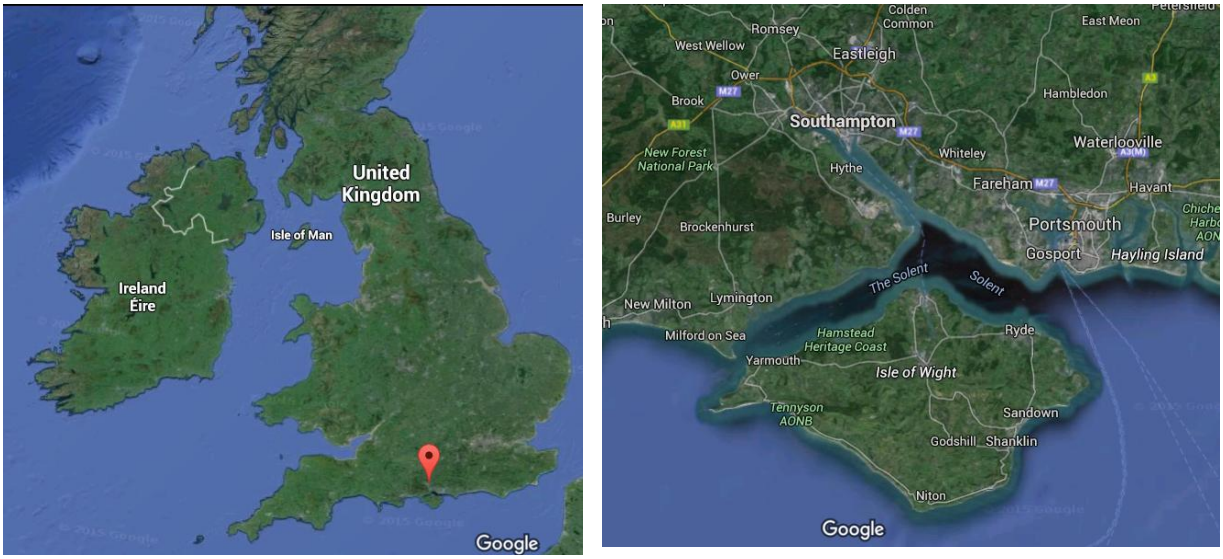


Figure 1.1 - Southampton Satellite Image (source: Google Maps)

1.2 Context of transportation infrastructure

The world of transportation infrastructures is constantly changing requiring local authorities to balance competing demands. The use of highway networks is ever increasing, alongside increased public scrutiny and expectations for improved quality and better service. This is against a political need to limit the (public) costs of infrastructure maintenance. Due to continuous traffic load and environmental pressures (e.g. climate change), the risk associated with the management of infrastructures requires consistent and regular review to safeguard the public interest. This becomes even more complex as assets are ageing and need more maintenance actions while the budget available for maintenance is becoming more constrained. By being aware of these dynamics, the City Council aims at:

- moving away from new-build and focus on the maintenance of the existing assets and infrastructure;
- increasing public expectations for accessibility and availability of the highway network and for reliability of journey times;
- increasing scrutiny, transparency, accountability and media exposure in delivering legal requirements, meeting stakeholders expectations and maintaining the integrity of the network;
- managing the impact of traffic growth;
- dealing with severe financial constraints and clear messages of "more for less" and "make the most of what the City Council has" that create a culture for making best use of existing assets;
- increasing awareness of the link between "maintenance" and "business performance";
- dealing with the impacts of climate change and sustainability; and
- dealing with skills shortage.

1.3 Asset Management: role and benefits

A new approach seeking to optimise the value of highway infrastructure over its whole life is gaining more relevance – asset management. The HMEP (2013) guideline defines asset management as:

> *"a strategic approach to meeting the strategic need for the management and maintenance of highway infrastructure assets through long term planning and optimal allocation of resources in order to manage risk and meet the performance requirements of the authority in the most efficient and sustainable manner"*

This definition includes some key themes:

- Strategic approach – a systematic process that takes a long term view;
- Whole of life – the whole-life/lifecycle of an asset is considered;
- Optimisation – maximising benefits by balancing competing demands;
- Resource allocation –based on assessed needs;
- Customer focused – explicit consideration of customer expectations.

By adopting strategic asset processes, the City Council can better manage risk and maintain a highway environment that is safe and accessible for highway users. Furthermore, by making use of asset management principles, the City Council wants to move from a reactive maintenance approach towards a predictive maintenance approach. The goal is to deliver effective long term planning and

forecast asset performance, which in turn leads to a minimisation and prevention of expensive short term repairs. It is important to highlight that the use of asset management principles does not replace existing good practice; instead, it provides a framework within which this practice can be more effectively implemented, managed and complemented by other processes.

Overall, the main benefits of an effective asset management approach are:

- facilitating better decision making by supporting engineering judgement with financial, economic and technical analysis;
- enabling better understanding and management of the relationship between whole life cost and asset performance; and
- providing data and evidence for effective and sustainable investment and maintenance decisions.

1.4 Asset Management key drivers

This Transport Asset Management Plan (TAMP) has been extensively built upon existing policies, plans, data and records. It gives consideration to several guidance documents and Codes of Practice in its development whilst being consistent with legal, statutory and Government requirements. The key drivers of this plan are:

- Local Transport Plan (LTP): A statutory plan that outlines the strategic approach to how Southampton City Council manages the delivery of transport now and in the future. Following the national guidance, the LTP includes a long term policy strategy and a short term Implementation Plan with information about a capital investment programme of schemes and measures. Asset management is frequently highlighted as a complementary instrument of the LTP. Based on this, the current SCC LTP covers the period between 2011 and 2031 and has a dedicated section for asset management.
- Department for Transport (DfT): The Government has recognised the need for an efficient use of public resources on highway maintenance, as well as the need for transparency and accountability. The efficiencies agenda emphasises the urgency for defendable decisions on spending. To this end, the DfT promotes the use of asset management and has strongly encouraged local Authorities to develop their own TAMP.
- Whole of Government Accounts (WGA): The WGA is a central Government initiative to produce a comprehensive set of accounts in line with the Generally Accepted Accounting Practice (GAAP). This initiative is in place to bring the public sector accounting in line with that of the private sector. The objectives of the WGA align closely with those of asset management by promoting greater accountability, transparency and improved stewardship of public finances.
- Asset Valuation: Since 2009 the Health Check has included guidance on the provision of new financial information to support asset management. This is the basis for some of the interim

approaches described in the Guidance Document for Highway Infrastructure Asset Valuation (CIPFA). Robust Asset Management approaches and processes are required to support the asset valuation process described in the guidance.

- Prudential Code: The objectives of the Prudential Code are to ensure, within a clear framework, that the capital investment plans of local authorities are affordable, prudent and sustainable, and that treasury management decisions follow good professional practice. The framework established by the Prudential Code supports local strategic planning, local asset management planning and proper option appraisal by including stewardship of assets (e.g. asset management planning), service objectives (e.g. alignment with the City Council's Strategic Plan), and practicality (e.g. whether the capital plans are achievable).

- Social Value: The Public Services Act 2012 (Social Value) requires Local Authorities to secure economic, social, and environmental benefits when procuring services. The Social Value Act improves the way public funding is spent on public services. Asset management plays a key role in demonstrating that local authorities are providing best value and supporting performance management.

- Incentive Fund: Recently the central government reviewed local highways maintenance capital funding and introduced an initiative – the Incentive Fund Element - aiming at supporting local highway authorities to maximise returns from investment and deliver efficiencies in highway maintenance services. The incentive funding available to each local highway authority is based on a three-band score (1, low to 3, high) through a self-assessment questionnaire. The funding allocated is relative to the amount received through the Highways Infrastructure Funding Block Allocation formula. With this instrument, the central government intends to motivate local authorities to adopt a long term approach in delivering highway maintenance and enable them to:

    - continuously find new and improved ways of delivering services to highway users and managing highways assets;

    - make use of collaborative partnerships to improve processes and outcomes; and

    - deliver a sustainable balance between meeting the needs of highway users, improving quality and minimising costs and risks.

- Highways Maintenance Efficiency Programme (HMEP): The HMEP exists to support the sector on the journey to transform highway services. It does this by and for the highways sector, working with people and organisations to enable change, so that greater savings and efficiencies can be achieved and the demand for improved highway services can be met. This programme supports the introduction of asset management principles within local authority's procedures through a set of tools and guidelines considered best practice in the sector.

1.5 Scope of this TAMP and network of assets

One of Southampton City Council's statutory obligations is to maintain the existing highway network. With maintenance, the City Council performs repairs and protective measures to limit the effects of any deterioration and to extend the life of existing assets. It also considers the stakeholder expectations and the budgets available to manage condition and asset value.

Table 1-1 – List of assets

ASSET TYPE	QUANTITY
Carriageways	79.27 km principal roads (class A) 4.30 km non-principal roads (class B) 56.70 km non-principal roads (class C) 62.50 km unclassified roads (class D) (total: 570.37 km)
Drainage	22,367 Highway Gullies 1525 m Ditches 39 Culverts 5 Trash Screens 24 monitored flooding hotspots
Footways and cycle tracks	161.70 km category 1&2 937.20 km (category 3&4) (total: 1098.90 km)
Road Markings, Signs and Street Furniture	11.8 km Safety Fencing 24.7 km Pedestrian Barriers 8,832 Traffic Signs (Non-Illum.) 312 Grit Bins 19,061 Bollards, benches and Street Nameplates
Street Lighting	23,348 Streetlights 608 Heritage Columns 466 Subway Units 98 Supply Feeder units 1,711 Illuminated Signs 10 Illuminated Bollards
Structures	44 Road and footbridges 19 Steps and ramps 41 Subways 51 Retaining Walls.
Traffic Management Systems	135 Signalised Junctions 92 Pedestrian Crossings 31 Traffic CCTV cameras 44 Variable Message Signs 330 Real Time Passenger Information Units
Land assets (verges)	833 737 m2

Based on these prepositions, this plan describes methods to:

- link the maintenance policy and standards for the highway network to the service delivered;
- identify the standards that reflect the wishes of the stakeholders;
- ensure the network is safe for all stakeholders;
- promote the City Council's objectives;

- enforce and comply with statutory obligations;
- establish the principles by which an effective use of maintenance expenditure can be achieved; and
- identify the key issues affecting the maintenance of the highway network.

This TAMP follows a previous edition from 2008 and covers the group of assets described in Table 1-1. As the asset management approach becomes more embedded within the organisation, other transport assets may be added. Also, linking this TAMP with a corporate asset management plan might have to be considered in the future.

1.6 Legal duties and key stakeholders

This TAMP is predicated on the basis that key stakeholders have certain expectations. These key stakeholders are listed in the tables below. The importance of highway infrastructure maintenance and its relevance to asset management has never been more widely recognised. The significant under-investment from earlier years is being addressed to some degree, but signs of neglect are still widespread and visible on local roads, and continue to be the subject of considerable concern for stakeholders. Balancing acceptable standards of safety and serviceability against funding constraints and maintenance priorities is an on-going concern, alongside the ability of the network to effectively fulfil the wider community contribution to quality of life.

Highway infrastructure maintenance is based upon statutory powers and duties contained in legislation and precedents developed over time. Even in the absence of specific duties and powers, local authorities have a general duty of care to users and the community to maintain the highway in a condition that fits for purpose. It is against this principle that decisions are made affecting policy, priority and programming and implementation of highway infrastructure maintenance works.

Table 1-2 – List of key stakeholders

STAKEHOLDER IDENTIFICATION		RELATIONSHIP WITH THE HIGHWAY NETWORK
GROUP	SUB-GROUP	
A. Communities and residents	A1. Commuters (road users)	Users of the highway network
	A2. Pedestrians/ shoppers	
	A3. Young people	
	A4. Senior citizens	
	A5. Cyclists	
	A6. Tourists and visitors	
B. Businesses and industry	B1. Bus companies and representatives (e.g. South Hampshire Bus Operators Association - SHBOA)	Users of the highway network
	B2. Taxi companies and representatives (e.g. Southampton Hackney Association)	Users of the highway network
	B3. Local business and representatives (e.g, Southampton Chamber of Commerce)	Served by the highway network
	B4. Industry and logistic companies and representatives (e.g. Portswood Traders Association)	Users of the highway network
C. Gateways and (transportation) infrastructure providers	C1. Port of Southampton/ Ferry terminals	Served by the highway network
	C2. Southampton Airport	
	C3. Network Rail/ South West Trains	
	C4. Highways England	

Table 1-3 – List of key stakeholders (cont.)

STAKEHOLDER IDENTIFICATION		RELATIONSHIP WITH THE HIGHWAY NETWORK
GROUP	SUB-GROUP	
D. Public services and institutions	D1. Emergency services (i.e. Fire brigades, police and hospitals)	Users of the highway network
	D2. Schools and higher education establishments (i.e. University of Southampton and Solent University)	Served by the highway network
	D3. Cultural institutions (e.g, Mayflower Theatre and Sea City Museum)	
	D4. Sport facilities (Southampton FC)	
E. Legislator, regulator and fund provider	E1. Central Government (DfT)	Owner (responsible for setting the legal regulations)
F. Owner and Manager	F1. City Council elected representatives (Cabinet Member, Members, Ward Councillors, Chief Executive, Executive Director)	Owner/ Manager (responsible for the long and medium-term strategic management of infrastructure assets to the best interest of the users and community at large)
	F2. City Council staff	
G. Operators	G1. Service providers, market parties (i.e. BBLP, Capita, SSE)	Operator (responsible for the day-to-day operation of all activities on a section of the network)
H. Neighbours (Other local transport authorities)	H1. South Hampshire Joint Strategy (i.e. Portsmouth CC, Southampton CC and Hampshire CC)	Served by the highway network (delivers a transport policy and strategy for the region)
I. Water authorities	I1. Lead Local Flood Authority I2. Environment Agency	Served by the highway network (outline the approach to managing the local flood risk)
J. Utility service providers	J1. Utility service providers (e.g. Southern Water, Southern Electric Contracting)	Operators (utility service providers with infrastructure interacting with the highway network)
K. Developers	K1. Land and property developers	Served by the highway network

1.7 Asset management framework

The strategic framework defined reflects the asset management cycle, enabling a flexible approach for different service providers across all asset groups. The Plan-Do-Check-Act cycle aligns with the ISO55000 Asset Management Standard and the HMEP Highway Infrastructure Asset Management Guidance Document (Figure 1.2). It supports the recommendations within the UK Roads Board Code of Practices (Well-maintained Highways, Well-lit Highways, Management of Highway Structures, and Management of Electronic Traffic Equipment). The Asset Management Framework is shown in Figure 1.3.

Figure 1.2 – Plan – Do –Check – Act Cycle

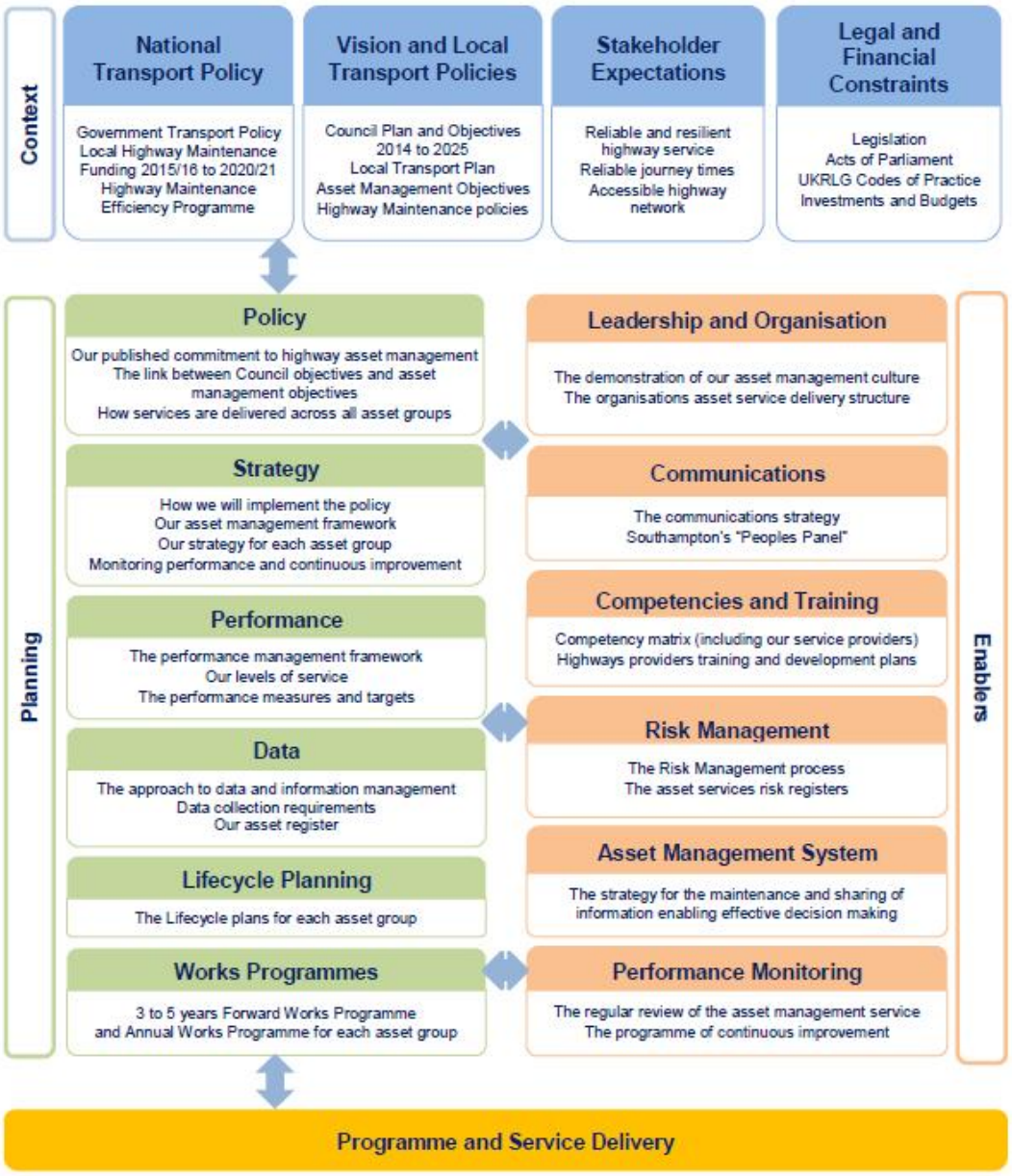
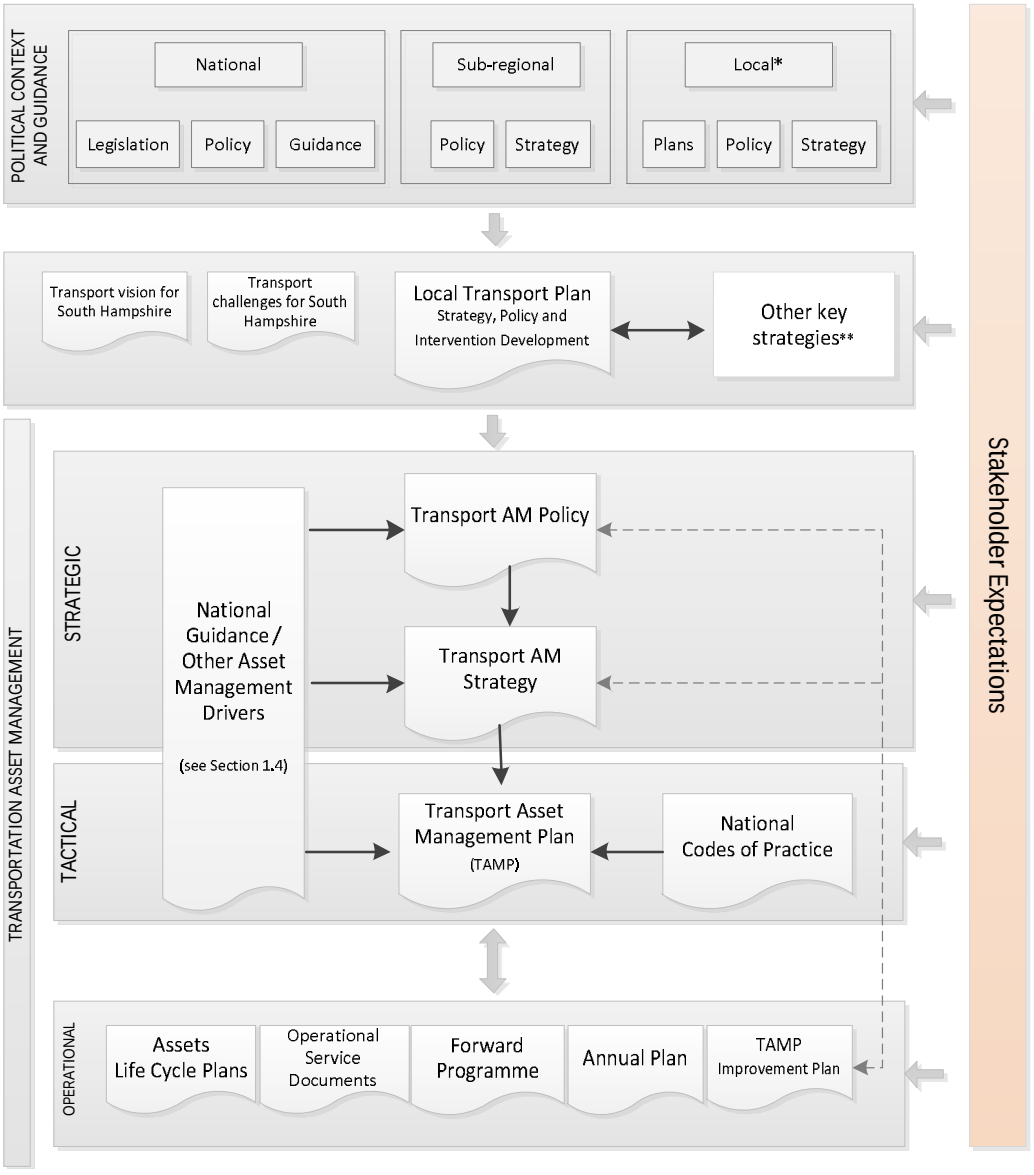


Figure 1.3 – Asset Management Framework

1.8 Relationship with key documents

Figure 1.4 illustrates the relationship between this TAMP and other key documents.



* Key local plans, policies and strategies are:
- Local Development Framework (LDFs) of local planning authorities
- Hampshire County Council's Draft Economic Assessment
- Existing and emerging Local Authority Economic Development Strategies for PUSH, Hampshire, Portsmouth and Southampton
- The Sustainable Community Strategies Hampshire, Portsmouth and Southampton
- Corporate Strategy of, and Corporate Plans of Hampshire, and Corporate Plans of Portsmouth and Southampton
- Children and Young Peoples Plans of Hampshire, Portsmouth and Southampton

** Key strategies are:
City of Southampton Strategy; City Centre Action Plan (CCAP); City Centre Master Plan (CCMP); South Hampshire Multi-Area Agreement (MAA); A Transport Vision for the Southampton Region; Local Neighbourhood Renewal Strategy; Health and Wellbeing Strategy; Children and Young People's Plan; Climate Change and Air Quality Strategy.

Figure 1.4 – Relationship with key documents

1.9 TAMP Leadership

Southampton City Council is committed to implement asset management principles in the management of the highway network through the Policy and Strategy that are publically available. The development of this TAMP – as a tactical instrument - follows those documents. The main objective is to support cross-organisational teams (strategic, tactical and operational) by describing "what to do" and "how to do". Senior management can use it as a systematic approach to monitor and review the

service delivered and understand long term funding requirements and the expected quality of service to be provided. The senior leadership team for highways and the public realm is comprised of senior City Council executives and members of the operational service delivery team. They meet monthly to review progress, provide direction and make decisions on key issues associated with transport asset management. Asset management is a fixed agenda item within this board meeting.

In addition, this TAMP is used by staff undertaking network maintenance and new works to support day-to-day activities, such as good management practices, maintenance intervention levels, improvement activities and timeframes. The key roles and responsibilities of those involved in its development and implementation are described in Appendix 1A.

1.10 Outline of the TAMP

This TAMP is structured as follows:

- Section 2: Measuring Performance – summarises the strategic goals and levels of service that are relevant to the management of the highway network; it describes the performance framework in place to monitor performance against levels of service. In addition, it provides details of current and future challenges affecting the management of the City's highway network.

- Section 3: Asset Data and Information Systems – summarises the network of assets; it includes a breakdown of assets by type, group, sub-group, a data collection strategy and documents the approach to continuously improve the data collection programme.

- Section 4: Lifecycle Plans – describes the approach adopted for lifecycle planning, including the fundamentals and major cross-asset assumptions.

- Section 5: Investment Strategy – includes details of the funding required to deliver the forward and annual works programmes, with the amount needed to sustain the current condition and enhance levels of performance.

- Section 6: Service Delivery – describes the work required to manage and operate the network at the defined performance levels. It summarises how the works programme is developed and prioritised.

- Section 7: Risk Management – details the main steps to manage risks on the highway network from identification to treatment.

- Section 8: Performance Monitoring, Reviewing and Continual Improvement – explains how the performance is monitored and reviewed and the results fed back into the asset management planning process. In addition, it lists further actions needed and explains how they will be managed.

2 MEASURING PERFORMANCE

2.1 Overview

Establishing the relationship between stakeholder's expectations and a performance measurement framework is vital to understand the overall service performance that is being delivered. In addition, it helps to set up a systematic approach to measure progress through asset management principles, and ultimately deliver a long term asset management approach.

To this end, a set of key factors are combined in a top-bottom and open-ended manner supporting the definition of a performance measurement framework (Figure 2.1). The primary goal of this framework is to translate stakeholder's expectations into levels of service. This relationship is based on strategic goals and network objectives. The extent to which the levels of service are delivered is assessed through performance measures and targets.

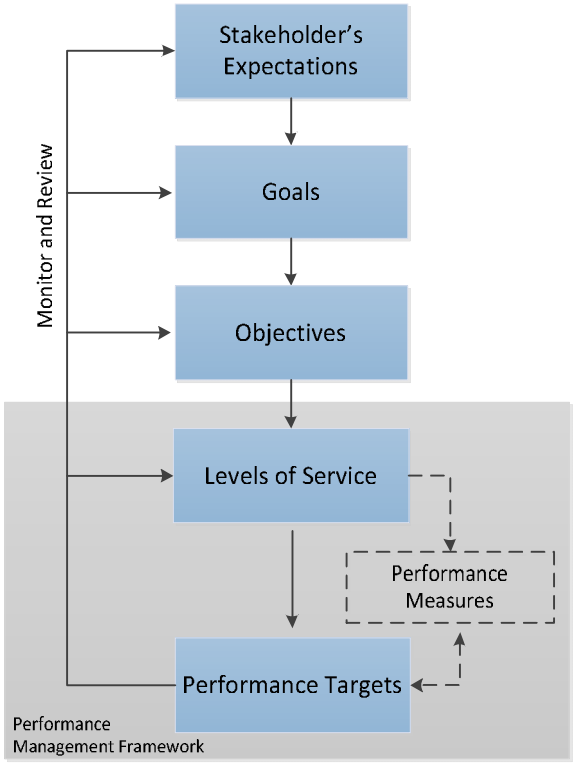


Figure 2.1 – Performance definition framework

The framework includes the following blocks:

- *Stakeholder's Expectations:* description of stakeholder's expectations for the highway infrastructure and the service to be delivered; it gives details of how these expectations are attained (see Appendix 2B).

- *Goals:* broad statements that outline the City Council's vision and intents for the services delivered.

- *Objectives:* statements that align with the goals, but apply to a specific service type (transportation, in this case).

- *Levels of Service:* broad statements that describe the performance of highway assets network in terms that stakeholders can understand; they are related to service outcomes and cover key aspects of asset performance.

- *Performance Measures:* measures that report the actual performance and are used to monitor whether the levels of service are being attained and delivered.

- *Performance Targets:* performance measures are linked to performance targets in order to describe the service performance that needs to be delivered over a time period. Levels of service, performance measures and performance targets are known as the performance framework and are regularly monitored and reviewed to accommodate changes or constraints (e.g. insufficient budget).

2.2 Goals and objectives

The Highway Infrastructure Asset Management Policy (2015-2018) was approved in October 2015 and defines the City's wide vision: *prosperity for all*. This vision supports the definition of high level transportation goals (or priorities) as follows:

- *Prevention and Early Intervention:* by focusing on safety of service users and staff;

- *Services for All:* with the focus on accessibility, mobility and network usage;

- *City Pride*: with the ambition to deliver highly desirable places to live, work and play;

- *A Sustainable City Council*: with emphasis on sustainability aspects.

Based on these goals, the policy also includes a set of key objectives specifically applied to the highway network. These objectives are described below and guide the implementation of this TAMP.

- *Improved knowledge of the highway infrastructure asset*, with the purpose to:

    - collaborate and share information, insight and knowledge;

    - facilitate communications with stakeholders and users; and

    - enable effective and informed decisions including the management of risk.

- *Well managed infrastructure services*, with the purpose to:
    - provide capacity, resources, capabilities, and skills to deliver the service;
    - deliver efficient, sustainable, and effective infrastructure services;
    - deliver services to ensure a safe, attractive, and accessible network.
- *Informed users and stakeholders*, with the purpose to:
    - maintain and improve user focus;
    - increase service performance levels and user satisfaction;
    - deliver the highest standard of user care, maintaining best value.
- *Enable network use,* with the purpose to:
    - Promote active stewardship and operation of the highway infrastructure asset;
    - support and enable reliable journey times;
    - be responsive to the needs of all user groups.

The identification of levels of service is supported by a high level qualitative analysis that maps strategic goals to key objectives. The analysis is based on major, moderate and minor indicators (i.e. meaning strong, medium and weak relationship, respectively) as it is shown in Table 2-1.

Table 2-1 – Comparison between strategic goal and objectives

		GOALS															
		Prevention and Early Intervention				Services for All				City Pride				A Sustainable Council			
		Create safer highway infrastructure	Deliver right first time services and solutions	Stable investment for required service levels	Quality and reliable repairs and solutions	Services that reflect community need	Understand customers and stakeholders demands	Enabling Network Use	Support accessibility and mobility for all	Create quality places to live, work and relax	Enhance street scene	Improve neighbourhoods	Provide infrastructure to support investment	Maintain Highway Infrastructure value	Promote innovation and continual improvement	Collaborate to unlock key infrastructure	Reduce revenue costs
OBJECTIVES	Improved knowledge of the highway infrastructure asset	Moderate	Major	Major	Major	Major	Major	Moderate	Major	Minor	Moderate	Minor	Major	Major	Moderate	Major	Major
	Well managed infrastructure services	Major	Major	Major	Major	Moderate	Major	Major	Major	Minor	Minor	Minor	Moderate	Major	Major	Major	Major
	Informed customers and stakeholders	Minor	Minor	Minor	Minor	Major	Major	Minor	Moderate	Moderate	Moderate	Moderate	Minor	Moderate	Major	Moderate	Minor
	Enable Network Use	Major	Moderate	Moderate	Major	Moderate	Moderate	Major	Major	Moderate	Minor	Moderate	Minor	Minor	Moderate	Major	Minor

2.3 Levels of service

2.3.1 Purpose

Levels of service are broad statements that describe the performance of the highway network in terms that stakeholders can understand. They affect the whole network rather than individual assets. In addition, they cover asset condition and non-condition demand aspirations; they are a representation of how the asset is performing in terms of delivering the service to users and maintaining its physical integrity at an appropriate level. Overall, the definition of levels of service is vital to:

- ensure that adequate emphasis is given to stakeholder needs and expectations and the focus is given to what is critical;
- ensure that operational activities support the achievement of strategic organisational goals and objectives;
- provide a service that meets statutory standards and obligations;
- adopt and ensure efficiency considerations, where service standards should take account of engineering and economic efficiency requirements that require a long term approach to optimality;
- link the costs with the benefits of the services provided; and
- measure the overall effectiveness of the City Council's approach towards the delivery of transportation asset management.

2.3.2 Sources of information

The definition of levels of service is not a one-off activity. Instead, the identification and characterisation of these levels is a continuous process that follows the stakeholder's needs in a conscious manner. Its definition and review takes into account multiple sources of information as it is illustrated in Figure 2.2.

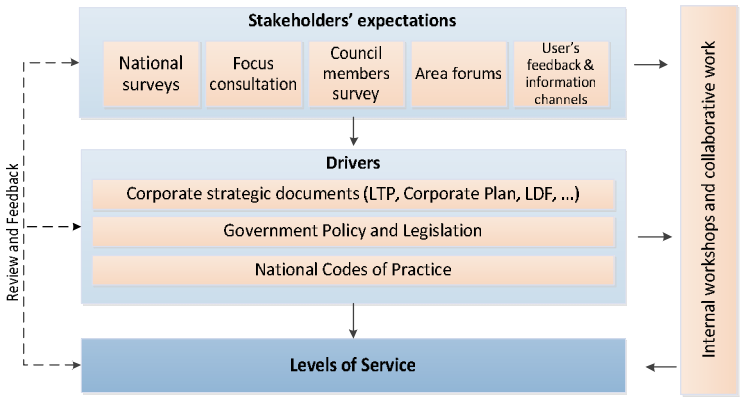


Figure 2.2 – Sources of information to support the development of levels of service

Stakeholder's expectations

National surveys

Multiple national surveys are used as a measure of use satisfaction. The road users NHT (National Highways and Transportation Survey) annual survey is an example of the public satisfaction across the country. Members of the public are asked on a regular basis to rank their satisfaction in a range of transport and highways issues. Themes include accessibility, public transport, walking and cycling, tackling congestion, road safety, highways maintenance and enforcement, among others. Figure 2.3 is an example of a typical result of this survey. The results are tracked over time and benchmarked with other local authorities, which enables user priorities to be established. Recent survey results can be accessed on www.nhtsurvey.org.

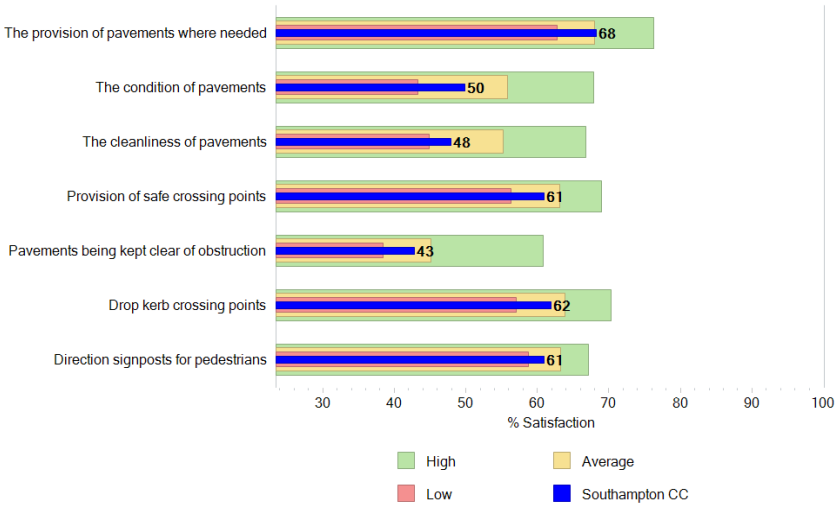


Figure 2.3 – Example of a NHT survey question: level of satisfaction on service areas (NHT, 2015)

The AIA (Asphalt Industry Alliance) is a cooperation of the Mineral Products Association and Eurobitume UK that draws on the knowledge and resources of each association. The AIA promotes the benefits of modern asphalt to the industry, policymakers and the general public. Annually, the AIA produces the local authority road maintenance survey (ALARM). The aim of this survey is to build a picture of the general condition of local roads and the levels of maintenance activity as well as defining the levels of funding needed to keep these roads in a reasonable condition.

Focus consultation

On an annual basis and with the use of a Highways England's Toolkit, the Highways Service Provider (HSP) demonstrates that the City Council has 'full satisfaction' with the schemes completed in accordance with the service agreement established between the two parties. The service provider incorporates the toolkit measures into an evaluation form to assess the level of schemes delivery. The parties agreed that up to six schemes will be subjected to a toolkit review in each financial year. Such schemes are selected by the City Council as part of the annual plan process. Some of these schemes are based on user's opinion.

City Council member's survey

The supply chain partnerships (such as the HSP) conduct member's surveys to determine the satisfaction of the City Council members with the service delivered. The results are compiled in a report that is a snap shot of the provider's performance delivered for each year and includes feedback on the following areas:

- communications about road works and travel information;
- reporting reactive highway issues;
- most frequently raised highway issues;
- understanding of the transport asset management plan (TAMP);
- direct contact with the service provider; and
- overall service provided by the provider (i.e. HSP).

The results of this survey help to inform communications, aid service improvements and build better member engagement.

Area forums

The area forum meetings give local residents an opportunity to discuss local services and issues with the City Councillors. These forums provide a channel for regular feedback to the delivery groups and provide a way for the City Council and the community to work together. It offers a wide range of opportunities for residents to get involved when it suits them to share their views.

User's feedback and information channels

Users and residents can provide their opinions through the City Council's Action service via telephone, web forms or emails. The feedback captured is analysed and incorporated into the levels of service review. In addition, the City Council offers a set of web-based tools to inform users about road works. An example is web platform www.roadworks.org that supports the visualisation of live incidents, road closures and diversions, traffic restrictions, road works and public events.

Drivers

The main drivers are described in Section 1.4. These drivers alongside best practice guidelines, such as the Code of Practice for Highway Maintenance and the HMEP Framework for Highways Infrastructure Asset Management, are considered during the identification and revision of stakeholder priorities.

Internal workshops, focus group and collaborative work

Internal discussions occur frequently in the shape of workshops, focus groups and/or collaborative work in order to review the stakeholder perceptions – and ultimately, the levels of service.

The identification of levels of service is an on-going process and the results obtained are a snapshot at points in time, albeit consistent ones. These sources of expectations described are used to inform and update the TAMP and guarantee its consistency and maturity.

2.3.3 Levels of service

The set of levels of service defined are based on stakeholder's expectations and are described in Table 2-2.

Table 2-2 – Identification of levels of service

CURRENT LEVELS OF SERVICE			
LEVEL OF SERVICE		PURPOSE	APPLICATION WITHIN THE TAMP
Safety	Provide a safe highway network	Management of exposure to risk associated with the maintenance services provided and the integrity of the physical assets. Provide safe access for all users.	Safety is a key priority to the City Council by aiming at reducing risk for the public, users and service provider staff. This is achieved through a continuous focus on: • Optimising asset condition and asset condition profile over its lifetime (deterioration models) • Defining effective and timely maintenance strategies • Defining efficient work programmes
Affordability	Ensure that maintenance of the highway network remains affordable	Make cost-effective use of budget and resources across the network in order to deliver the intended services within acceptable performance levels.	Effective asset lifecycle cost models supported by: • Optimising asset condition and asset condition profile over its lifetime (deterioration models) • Asset service life • Maintenance strategies and treatment options • Asset valuation (i.e. effective use of funding - delivering value for money)
Accessibility	Allow for the highway network to remain accessible (or available) wherever feasible for all users	Minimise barriers to achieving full network availability and use. This includes reducing traffic congestion and improving journey time reliability.	Effective asset lifecycle planning to ensure that physical assets are maintained with appropriate and timely works while minimising disruption to counter congestion. Optimising maintenance works with collaboration between asset groups, utilities and developments through effective network management.
Serviceability	Ensure the serviceability of the highway network	Ability of the highway network to provide service ensuring it is "fit for purpose". Maximize the integrity of the physical assets over the whole lifecycle.	Effective assessments and intervention treatments to maintain assets performance over the whole lifecycle. Maintenance and investment programmes centred on proven, high quality techniques and materials.

In the table below, the levels of service are compared to the main transportation goals defined in the asset management Policy and Strategy. This analysis helps to understand the existing link between the levels of service and those overarching guides providing a qualitative comparative analysis based on major, moderate and minor indicators (i.e. meaning strong, medium and weak relationship, respectively).

Table 2-3 – Comparison of highway infrastructure objectives against levels of service

		HIGHWAY INFRASTRUCTURE OBJECTIVES			
		Improved knowledge of the highway infrastructure asset	Well managed infrastructure services	Informed users and stakeholders	Enable Network Use
LEVELS OF SERVICE	Safety	Major	Major	Moderate	Major
	Affordability	Major	Major	Moderate	Moderate
	Accessibility (or Availability)	Moderate	Major	Major	Major
	Serviceability	Major	Major	Moderate	Major

Due to limited financial resources, at the moment it is not possible to implement all the stakeholder's expectations. However, the City Council aims to address them in the future. To this end, the existing levels of service will be frequently reviewed and will gradually incorporate additional aspects. The City Council has identified some of the aspects that might be addressed in the future. They are briefly discussed in Table 2-4.

Table 2-4 – Additional aspects to include in future levels of service

ASPECTS		PURPOSE
Environmental contribution	Promote environmental contribution	Consider the environmental impact of decision-making by promoting the use of recycling materials and minimizing waste and use of natural or new resources.
Resilience	Enhance collaboration through resilient business processes and services	Promote collaboration between Southampton's neighbouring authorities and create resilient decision-making processes among utilities service delivery.
Public realm	Enhance social contribution and value, now and in the future	Provide reliable working and living conditions and make cost-effective investment decisions.
User service/ quality	Improve user satisfaction	Enhance overall quality of the services delivered and promote efficient and effective communication services via user feedback and consultation.
Trust	Improve user trust in the asset management services	Increase the overall reputation of Southampton City Council.

2.4 Performance management framework

The performance management framework is a tool that links levels of service to performance measures and targets. These measures show how well services are being delivered and whether the objectives are being attained. To this end, a range of input and output measures are used as key indicators that reflect performance in each of the levels of service.

2.4.1 Performance measures and targets

Performance measures are quantitative indicators of the extent to which an activity meets specific objectives. These indicators take into account what is to be delivered, how it will be achieved and how to define and measure it. They help to understand:

- how well is Southampton City Council performing;
- if aims, goals, objectives and levels of service are being met;
- are users satisfied with the delivered service; and
- is there enough control on the processes and delivery.

Good performance measures are SMART, which stands for:

- specific (S): have a specific target;
- measureable (M): quantifiable;
- achievable (A): measure the degree of improvement toward the target when it has not been reached.
- relevant (R): it should give more insight on the performance in obtaining the respective level of service.
- time-bound (T): performance should be measured over a period of time or provide a snapshot at a particular time.

The performance measures are delivered and measured through performance indicators (PI's). A PI defines a measurement expressed as a percentage, index, rate or other comparison that is monitored at regular intervals and is compared to one or more criterion.

When a full set of performance measures is developed and documented, targets are assigned against each measure. These targets reflect - in broad statements - the quantity of service performance. Achieving targets does not necessarily guarantee economical or optimal management of the services delivered. However, it provides a good indication of performance, which is important to inform

multiple levels of decision making. The hierarchy of performance indicators and targets relate to technical indicators from low level operational and service delivery data at one end of the scale, to the high level performance indicator at the other end (Figure 2.4). At the low level, detailed information can be condensed or aggregated into progressively fewer items at successively higher levels. The definition of these measures and targets require collaboration and commitment between key decision-makers across the strategic, tactical and operational levels of the organisation.

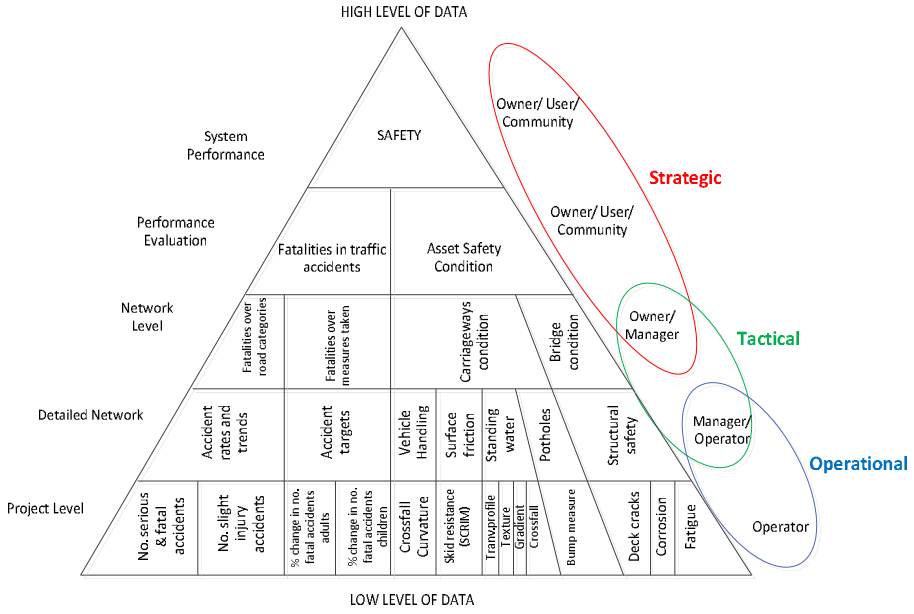


Figure 2.4 – Typical relationship between stakeholder level and information level (adapted from WRA, 2008)

The template used to set the PI's is shown in Table 2-5. Whilst many PI's are already identified, they are currently under review. The performance measurement framework is presented in Appendix 2A and the holistic process being used to identify the performance measures and targets is described in Appendix 2B.

Table 2-5 – Template: performance management framework (applicable to each level of service)

LEVEL OF SERVICE	LEVEL OF MANAGEMENT	PERFORMANCE INDICATOR (PI) (examples)				
		Asset type	Ref.	Technical level of service	Frequency	Format
Safety *(for example)*	Strategic	Network	PI 14	The percentage change in number of people killed or seriously injured during the calendar year compared to the previous year.	Annual	Percentage
	Tactical	Footways and cycle tracks	KPI 2	Safety inspections and surveys of footways and cycle tracks percentage carried out to timetable.	Monthly	Percentage
	Operational	Footways and cycle tracks	KPI 4	The percentage of Category 1 Defects made safe within 24 hours from the Time of Notification.	Monthly	Percentage

2.4.2 Performance scale

The performance scale is a consistent vehicle to report the overall service delivery. Wherever possible, each performance measure is banded and described in qualitative terms that can be easily understood by stakeholders. The City Council defined three levels of performance (Figure 2.5; Table 2-6 and 2-7):

- Good performance (target): meets or exceeds recognised current good practice and meets and exceeds minimum national and local requirements and/or basic information;
- Fair performance (threshold): meets the minimum national and local requirements and/or basic information;
- Poor performance (below threshold): does not meet the minimum national and/or local requirements and/or poor/no information.

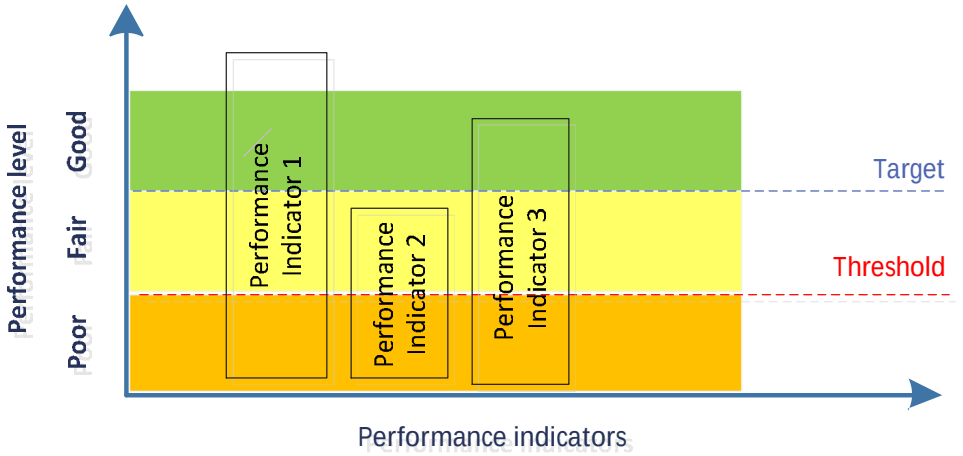


Figure 2.5 – Performance scale scheme

The process of aggregating performance measures into a global qualitative assessment is also under development.

Table 2-6 – Performance measurement scale

LEVELS OF SERVICE	PURPOSE	INTERVENTION LEVELS		
		POOR (threshold below)	FAIR (between threshold and target)	GOOD (target or above)
Safety	Management of exposure to risk associated with the maintenance services provided and the integrity of the physical assets. Provide safe access	Network does not meet minimum national and local safety requirements and/or good practice is not applied.	Network meets minimum national and local safety requirements and/or good practice is applied. This includes reduced number of casualties, improved response time to safety related defects and good information on	Meets or exceeds minimum national and local safety requirements and applies good practice in safety. This includes reduced number of casualties, improved response time to safety related defects and good information on safety related criteria.

	for all users.		safety related criteria.	

Table 2-7 – Performance measurement scale (Cont.)

LEVELS OF SERVICE	PURPOSE	INTERVENTION LEVELS		
		POOR (threshold below)	FAIR (between threshold and target)	GOOD (target or above)
Affordability	Make cost-effective use of budget and resources across the network in order to deliver the intended services within acceptable performance levels.	Limited information on the economy and efficiency of the service and lack of basic techniques in place to ensure money and resources are not unnecessarily wasted; lack of evidence that "Value for Money" is being delivered.	Basic information on economy and efficiency of the service, and basic techniques in place to ensure money and resources are not unnecessarily wasted.	Good information on economy and efficiency of the service, and basic techniques in place to ensure money and resources are not unnecessarily wasted. "Value for Money" techniques established and being used and monitored.
Accessibility	Minimise barriers to achieving full network availability and use. This includes reducing traffic congestion and improving journey time reliability.	Network accessibility does not meet the needs or expectations of stakeholders. The results are an unacceptable amount of delays caused by maintenance, inadequate prediction in time and duration of the works programme and inadequate communication reaching users regarding status of works programme and associated delays.	Network accessibility meets the needs or expectations of stakeholders. This includes little or no delays caused by maintenance, little variation of time and duration predicted for the works programme and good communication reaching users regarding status of works programme.	Network accessibility meets or exceeds the needs or expectations of stakeholders. This includes the inexistence of delays caused by maintenance, adequate prediction in time and duration of the works programme and excellent communication reaching users regarding status of works programme.
Serviceability	Ability of the highway network to provide service ensuring it is "fit for purpose". Maximize the integrity of the physical assets over the whole lifecycle.	Condition of assets dos not meet national or local requirements and/ or limited or unreliable information available on asset condition.	Conditions of assets meet minimum national and local requirements. Some information on asset condition is incomplete or unreliable.	Most (or all) of the asset condition exceeds national and/ or local requirements. Reliable and complete information available on asset condition.

2.5 Expected challenges to the network

The City Council is dealing with multiple challenges with significant impact on the management of the City's highways network. Some key challenges are described below. Note that they are not listed in any order of importance.

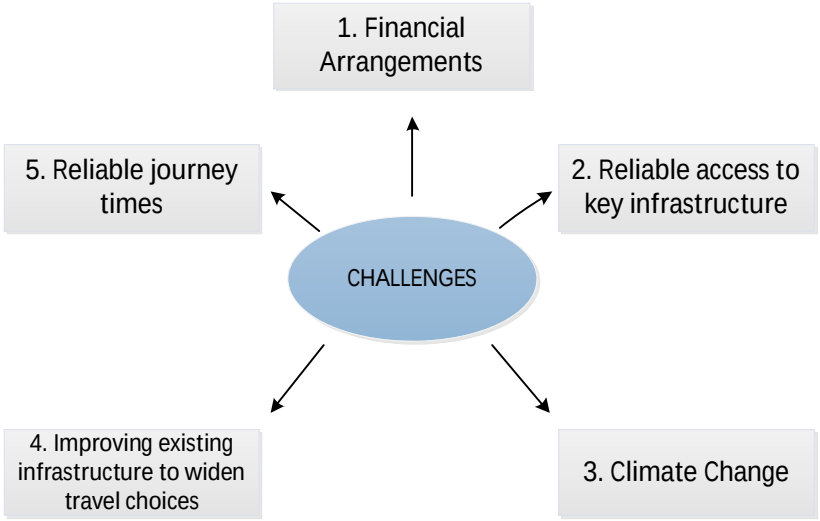


Figure 2.6 – Summary of key challenges affecting the City's highways network

Challenge 1: Financial arrangements

Securing funding to deliver transport improvements during what is expected to be a prolonged period of public-sector spending restraint is a challenge. The financial climate remains uncertain and the delivery of schemes and initiatives that support the levels of service is still complex. While the Government has set out the Local Transport Capital Block Settlement from 2015 to 2018, it remains likely that future budget constraints will impact on spending decisions during 2016 and beyond. The indicative funding of Integrated Transport from 2015-2018 is shown in the table below.

Table 2-8 – Indicative Integrated Transport Capital Block (2015-2018)

Year	Indicative Integrated Transport Capital Block (2015-2018)		
	Highways Maintenance Block	Local Transport Capital Block	Total Grant
2015/2016	£1.704m	£2.124m	£3.828m
2016/2017	£1.562m	£2.124m	£3.686m
2017/2018	£1.515m	£2.124m	£3.639m

In addition to the Local Transport Block Settlement, the City Council is actively seeking other funding opportunities to enable the delivery of major transformational transport projects, such as Platform to Prosperity, Bridges to Prosperity and Station Quarter North, and to guarantee the provision of maintenance works. The City Council has been successful in securing £89M of external investment which will see a number of major transport schemes implemented over the next 3 to 5 years. This includes Local Growth Deal funding secured through the Solent Local Enterprise Partnership to deliver the Station Quarter North public realm improvements, which will be implemented in 2015/2016 and also major maintenance work at Millbrook Roundabout planned for 2016/2017.

In 2014 the Government reviewed the Highways Maintenance Block 'needs' funding allocations for local highway authorities. Following consultation on highways maintenance funding the DfT has allocated a proportion of the total funding to roads, bridges, footways and cycleways from 2015/16 to 2020/21, providing local authorities with forward visibility of highway infrastructure maintenance budgets. Southampton City Council operates a Street Lighting Private Finance Initiative (PFI) that funds the maintenance of street lighting separately.

A total of £6 billion has been made available nationally between 2015/16 and 2020/21 for local highways maintenance capital funding. Of this, £578 million has been set aside for an Incentive Fund element to help reward local highway authorities who can demonstrate they are delivering value for money in carrying out cost effective highway maintenance. The Highways Maintenance Block Funding Allocation (2015/16 to 2020/21) for Southampton is £8.9 million. An additional £1.1 million is available over the 5 years to 2020/21 from the Incentive Fund. Figure 2.7 illustrates the Block Funding allocation to Southampton City Council.

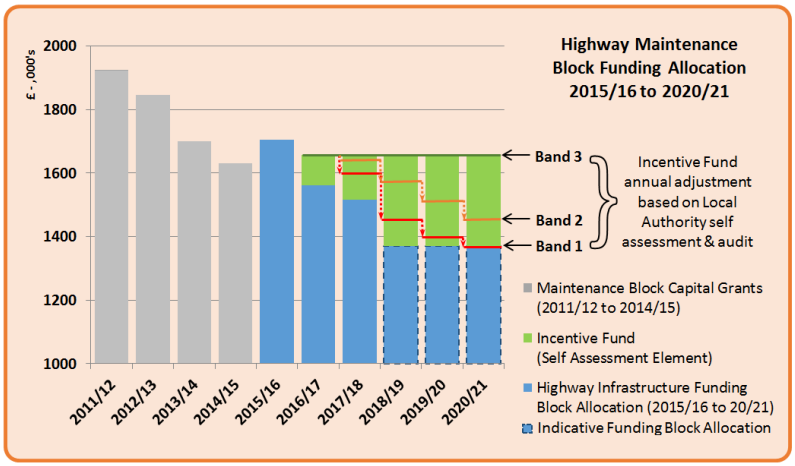


Figure 2.7 – Block funding allocation (DfT)

Developer contributions are important sources of essential transport infrastructure funding. They have become increasingly important in the current funding climate because they are vital to support economic growth. In addition, local authorities need to work more closely with partners to identify and maximise use of alternative funding sources, including the Regional Growth Fund and Local Sustainable Transport Fund, which allocate resources through competitive bidding and give consideration to Tax Increment Financing.

Challenge 2: Ensure continued reliable access to main transport gateways

Ensuring continued reliable transport access to Southampton's international gateways port and airport is a challenge. They both rely on good access for passengers and freight. In the medium to longer term, forecast growth in volumes of passenger and freight traffic originating from all these gateways will be catered for by targeted investment to improve journey time reliability on strategic transport corridors, affecting all transport modes.

Challenge 3: Climate change

One of the biggest threats affecting the Earth is Climate Change. The UK Climate Projections (UKCP09) suggests that communities and residents should be prepared to have hotter days and more heat waves, alongside more intense rainfall on the wettest days. There are higher risks of floods and drought, more frequent episodes of extreme weather, rising sea levels, and more frequent frost/defrost cycles. Such likely events present a significant risk to the integrity of the national and local highway network, have an impact on maintenance, operation and user costs – and ultimately, are a serious threat to the service delivery. Some examples of the risks and potential impacts of climate change are provided in Table 2-9.

Table 2-9 – Impacts of climate change on the levels of service

LEVELS OF SERVICE	CLIMATE CHANGE IMPACTS ON...	EXAMPLES OF CONSEQUENCES
Safety	Safety of the network for all road users, including residents, hauliers, traffic officers, service providers, contractors, and maintenance crews.	Risk of reduced asset condition and safety (assets deteriorate more quickly due to changes in average climatic conditions or as a result of extreme weather events). Increase risk to road works (e.g. a need to work on a network more often, work during extreme climatic events or if it is necessary to perform more 'risky' activities).
Affordability	The ability of Southampton City Council to deliver cost-effective solutions.	Risk of increased costs to maintain a safe and serviceable network (i.e. construction, maintenance, repairs and renewal required more often, new and possibly more expensive solutions required). Risk of increased business management costs (i.e. need for more staff, more frequent incidents to pay for, need for more research to find ways to deal with climate change).
Accessibility	The ability of Southampton City Council to deliver a reliable service and access to all road users.	Risk of reduced network availability and/ or functionality (i.e. need for restrictions on the network to maintain safety and increased need for road works).
Serviceability	The ability of Southampton City Council to deliver service within the levels of performance that is "fit for purpose".	Risk of reduce asset condition and safety (i.e. assets deteriorate more quickly due to changes in average climatic conditions or as a result of extreme weather events).

Maintaining the existing highway network and its resilience to the effects of extreme weather is a challenge. To better understand the overall effect of climate change on the local network it is vital to:

- understand the vulnerability of the network and assets,
- understand the potential impacts on the communities when the network is disrupted;
- understand the potential financial and economic impact on business when the network is disrupted;
- improve the resilience of the network: preparing to adapt and mitigate; and
- understand the financial benefits of a resilient network.

A critical obstacle to creating adaptation strategies is the lack of adequate information on how and when the climate will change. Without this type of information it is difficult to assess risk and develop suitable strategies. However, local authorities have to consider that infrastructure maintenance and replacement will need to be more flexible to incorporate climate adaptation considerations. Appendix 2C provides some examples of the current state-of-the-art approaches used to deal with the effects of climate change in the transportation sector.

Challenge 4: Widening travel choices to offer alternatives by improving existing infrastructure

The complex nature of journey patterns and travel to work across the sub-region has resulted in heavy reliance on private car. In addition, the transportation habits of communities and residents do not seem to be changing and the use of car is still more attractive than the use of alternative transportation options (i.e. non-car modes). As a result, these trends will continue to place increasing pressure on the City's highway network. Based on this preposition, the challenge is to widen travel choices and offer reasonable alternatives to the private car for everyday journeys, reducing the need to travel, and moving towards a low-carbon economy. Among other improvements, walking and cycling must be encouraged as a more viable option for shorter journeys requiring footways and cycle paths to be in good condition.

Challenge 5: Managing the existing transport infrastructure to ensure reliable journey times

Balancing long term demands and keeping the local highway network safe and serviceable is a challenge. While major developments in the City are being completed or commenced, such as Watermark West Quay, Royal Pier Waterfront and Red Funnel's relocation to Trafalgar Dock, there are indicators that the demographic scenario of Southampton will keep changing. The population of the City will continue to grow, change and age. Traffic levels are forecast to grow due to a background increase in car journeys and trips generated by new developments.

Managing the existing transport network to ensure that journey time reliability is maintained and improved will help to support economic competitive regeneration and growth. However, there will be a need to mitigate the impact of this forecast growth in travel, ensure that the sub-region continues to be an attractive place to live and work, and continue to support the economy by safeguarding reliable access to vital parts of the city.

3 ASSET DATA AND INFORMATION SYSTEMS

3.1 Overview

Good asset management implies a systematic and integrated approach to project selection, analysis of trade-offs, resource optimisation, programming and budgeting. This form of management relies on accurate asset inventory, condition, and performance information of assets over their lifetime. Data and the information derived from data are the ingredients of a systematic and integrated asset management approach. They support to:

- characterise network inventory and assess asset performance;
- deliver statutory requirements;
- make effective and informed decisions;
- understand the impact of decisions on the asset and the subsequent level of service and performance;
- assess and manage risk;
- determine investment requirements;
- assess and report financial value; and
- report overall network performance.

To attain such benefits, asset data and information systems must be treated as a valuable asset by handling cross-asset data collection and storage in a consistent fashion. However, effective and efficient collection, storage and usage of data can be a complex, time consuming and expensive activity. A practical example is the condition of data related to unclassified residential carriageways. Whilst it is possible to collect and maintain data for all the infrastructure assets, the condition levels of some minor carriageways cannot be assessed to a very high level of detail because access to the entire surface along these routes may be restricted, and it is difficult to justify costs of collecting more detailed data. It is therefore important to collect and maintain data that supports the objectives of the City Council, informs decision making and helps to monitor the levels of service delivered. Data management is not a one-off exercise; instead, it follows a continuous process of data collection, storage, usage, review and validation (Figure 3.1).

This section focuses on highway infrastructure data collection, storage and usage by describing the procedures adopted for the treatment of existing asset data and information systems. As mentioned above, this TAMP is a live document under continuous review and improvement; future versions of this document will be updated with a focus on improving data and information processes needed to manage the existing network of assets (Table 1-1).

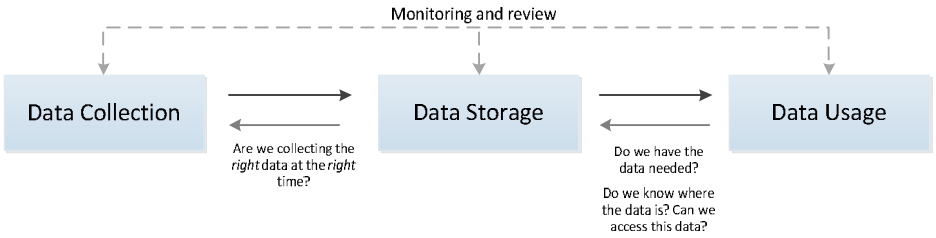


Figure 3.1 – Data process cycle: collection, usage and review

3.2 Asset information strategy

The existing asset information strategy is based on the following key aspects:

- Asset inventory

  It includes asset inventory information, its role in the network and assessment of the condition measurements. This also includes the availability of sufficient data on design, performance and operational characteristics of the highway network.

- Data collection

  Data collection activities should be based on the needs of decision processes. To this end, it is vital that data collected matches the levels of accuracy, precision, and resolution required by those processes. Data requirements should be reviewed through regular gap analysis. Data collection programmes should balance costs, value and benefits.

- Data storage

  Data should be stored in a format that is readily captured, transferred, accessed and used. The structure and location of data should be clearly identified in order to enable consistent data to be available to each decision-maker.

- Data quality

  It ensures that data collected has enough quality to support cross-asset decision processes. This includes the following dimensions of data quality:

  - Accuracy: it is the degree to which data correctly reflects the real world object, or an event being described; in other words, the data values represent as closely as possible the considered piece of information.
  - Completeness: it refers to expected comprehensiveness; it is an indication of whether the data needed to meet the current and future business information demands is available in the asset information systems.
  - Consistency: it means that data across all systems reflects the same information and is in synch with each other across the organisation.
  - Integrity: it means validity of data across the relationships and ensures that all data in a database can be traced and connected to other data.
  - Conformity: it means that data is following the set of standard data definitions like data type, size and format.

- Validity: it means that the given data values are accurate in terms of possible ranges of values.
- Timeliness: it refers to whether information is available when it is expected and needed; timeliness depends on user expectation.

3.3 Data collection, storage and usage: current practices

3.3.1 Classification of assets

As described at the beginning of this section, Southampton is a regional transport hub serving a large network of highway assets that need to be continuously monitored and maintained (Figure 3.2). To this end, asset data is classified in three separate levels: asset type, asset groups and asset components (Table 3-1). A detailed list of asset classification is given in Appendix 3A.

Figure 3.2 – Examples of Southampton's highway network asset

Table 3-1 – Classification of assets

LEVEL	DESCRIPTION	EXAMPLES
Level 1	Asset types	Carriageways, footways and cycle tracks, structures, street lighting, street furniture, traffic management systems and land.
Level 2	Asset groups characterise assets based on design features or characteristics	Taking carriageways as an example: • Area (square metre) based elements • Flexible pavements • Flexible composite pavements • Rigid concrete pavements • Rigid concrete pavements • Linear elements
Level 3	Asset components are defined as criteria by which the asset can be described	Taking carriageways as an example: • Material (pavement layers) • Dimensions • Age (if available)

3.3.2 Data collection categories

Existing asset data is classified into three main categories:

- Inventory data: describes the extent of an asset and can include location, type, size and construction details. Inventory data supports the calculation of maintenance costs.
- Performance data: contains condition information related to aspects of performance, lifecycle planning, identification of works programmes and financial requirements. It includes public satisfaction, public enquiries, third party claims, traffic flows, accident records, maintenance history, energy consumptions and environmental impact.
- Financial data: data that supports budgets, financial planning, the assessment of "value for money" and the prioritisation of maintenance activities.

The next sub-sections describe the current data collection procedures. Appendices 3B and 3C detail the current status of inventory, performance and financial data for each asset type.

3.3.3 Information systems

Consistent and reliable asset data and information is essential to make informed decisions and deliver the service requirements. The City Council and the service providers use distinct types of information systems as follows:

- Asset registers for carriageways, footways and cycleways, structures, street lighting, drainage systems and traffic signals.
- Pavement management systems (including footways), structures management systems (including bridge), traffic signals databases and street lighting systems.
- Systems that support the definition of and visualising of maintenance schemes, forward works plans and lifecycle planning principles.

Table 3-2 summarises the main asset information systems being used. Appendix 3C lists the key data attributes of each information system.

Table 3-2 – Summary of existing information systems

Maintenance management system	Inventory	GIS	UK-PMS	Scheme Management	Condition Surveys
Confirm; BridgeStation	Confirm; BridgeStation; In-house spreadsheets	ArcView	DCL/Yotta; March PMS	Horizons; BridgeStation; In-house spreadsheets	DCL/ Yotta; BridgeStation; In-house spreadsheets

The highway asset inventory managed by the HSP service provider is stored in the Confirm Road Management Maintenance System (RMMS) database. Confirm is a module system and includes a set of computer applications that supports the following business capabilities:

- data management by holding inventory data;
- defect and condition data on a single database;
- analysis and reporting of data both in map-based and textual formats;
- access to tools for optimisation, in terms of minimising whole life cost within the available budget and of pavement maintenance at both a scheme and network level; and
- street works and network management including means to record and manage lane closure information.

The central component of the system is a Network Data Repository (NDR) that has been built around ArcView's software (GIS). Confirm can output to GIS using mapping software to display asset information; however, currently it cannot complete this process for every asset type as the data does not flow as part of a two-way process. However, individual reports can be generated.

The system has embedded capabilities to use customer interface, record incoming mail and telephone calls/complaints. In addition, it has a customer enquiry module that can be used as a mode of reference for inspecting assets and benchmarking performance. At the moment, enquiries are logged by a third party and are not recorded directly in Confirm.

As an enterprise highway management system and database, Confirm is integrated on both desktop and mobile devices across the service delivery. Confirm is managed and maintained by the HSP service provider.

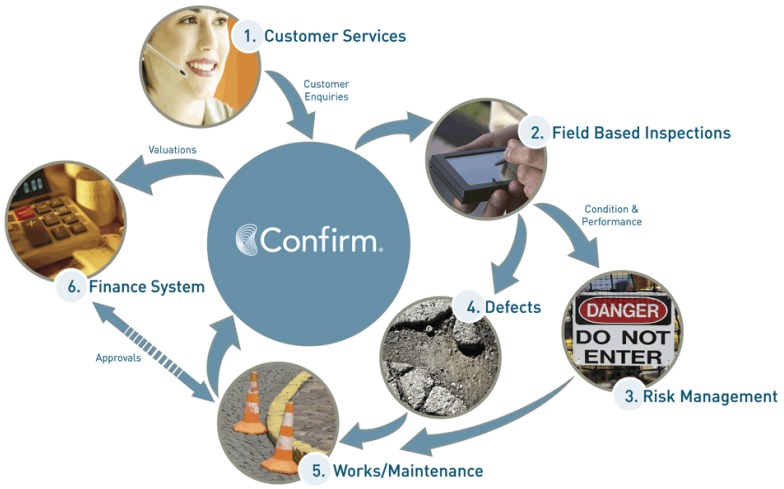


Figure 3.3 – Key blocks of Confirm

MARCHpms

MARCHpms is a commercial database for pavement condition data developed by DCL Yotta. Accredited to the latest UKPMS standards, MARCHpms allows for defining and storing carriageway and footway condition surveys. The software has tools to support all the stages of condition assessment and ensure the process is robust and repeatable.

When it comes to understanding condition data and generating maintenance schemes, automatic and custom processing is available, enabling practitioners to carry out a wide range of analyses. Reports along with the built-in mapping help to display and understand existing data. Many standard reports are configured simply to enable compliance with National Indicators for the Single Data List or Gross and Depreciated Replacement Costs for the Whole of Government Accounts submissions. Being a standalone system, MARCHpms has been developed to facilitate and ensure the delivery of best value from condition data. MARCHpms is maintained by the system's developer Yotta, with data being managed and maintained by the HSP service provider.

HORIZONS

DCL Yotta Horizons is a visualisation asset management software tool used by the HSP service provider. The Horizons software is a web-based mapping application supported by Google maps and displaying geo-spatial asset and condition data. The software is used to support business processes and deliver a combination of pavement management, asset management scheme, programme optimisation and lifecycle planning in a simple-to-use hosted platform (Figure 3.4). The software is a cloud hosted service meaning that no IT infrastructure is required other than internet connection and a web browser. Connectivity to data is therefore available wherever a practitioner is.

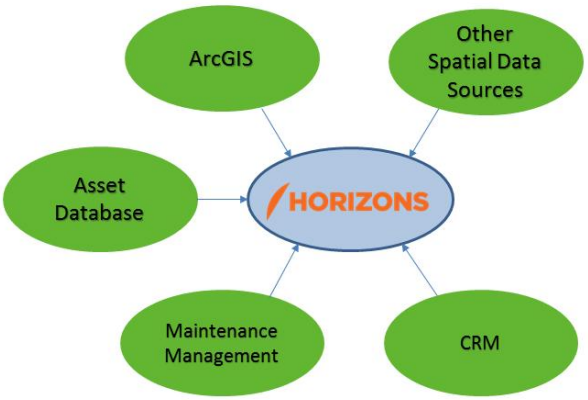


Figure 3.4 – Key blocks of Horizon

The software allows for different types of data to be involved, visualised and used during analysis and decision-making processes. The main goal is to give the highway service provider the ability to strategically plan future asset investment needs and iteratively test different scenarios and strategies for pre-defined periods. Similarly to Confirm, the Horizons software is maintained by the system's developer Yotta and data is managed and maintained by the HSP service provider.

Figure 3.5 – Typical Horizons user interface

ARCVIEW

ArcView is a GIS system that is able to capture, store, manipulate, analyse, manage, and present geospatial data. ArcView enables the application of spatial analysis to support potential highway works mapping of City Council's assets, allowing for investigations regarding the spatial relationships between assets and supporting the application of geometric and attribute amendments.

The majority of the asset data can be accessed via 'map layers' by those who require access within the City Council. The ability to control layers as well as interrogating the layers for further information has improved ease of access for all users. Users are able to record new assets and log potential jobs and enquiries associated with a particular asset alongside the highway network. Assets held within ArcView layers hold unique asset identifiers for referencing purposes as well as a number of other attributes covering asset condition, location and maintenance information. Using hotlinks, the system is able to connect spatial datasets to other associated documents that cannot be stored in a spatial database; examples include digital photographs and technical drawings. Users are able to view various asset layers as well as interrogate the layers to acquire detailed attribute information regarding single features.

Confirm and ArcView are linked to enable easy viewing of geospatial data and the provision of maintenance services. Data is exported from Confirm into ArcView using reports that document the attributes and provide co-ordinate information for GIS integration. The interoperability between Confirm and ArcView has allowed Confirm to become the primary tool for data collection across the highway service contract. The software has the ability to log, respond and action enquiries that are raised against assets. It is also used to plan cyclical inspection and maintenance activities. The reporting functionality allows benchmarking of performance to be undertaken.

Confidence in asset data is maintained by applying read-only locks on the majority of data, reducing the risks of accidental or unnecessary changes to the asset database. ArcView is maintained by the HSP service provider.

BRIDGESTATION

BridgeStation is the asset management tool for bridges and highway structures developed by the London Bridges Engineering Group (LoBEG).

Besides including a bridge and structure inventory database, it allows users to display summary information, including overview photography and location. Furthermore, the system allows for structures to be recorded either with a minimum level of information, or with full details of each physical element. The element hierarchy is displayed in a Windows Explorer style.

The system has the ability to record the condition of each component within the structure, alongside details of individual defects. Component conditions are aggregated and weighted by importance to produce a Bridge Condition Score and Index (BCI) in line with guidelines issued by the UK County Surveyors Society (CSS). The BCI tab shows these scores and indexes from any CSS inspections entered into the system, as well as the latest condition information from corrected defects. Different inspection regimes can be managed over a 12-year time-frame. Defects discovered during the course of inspections are added to a list that is prioritised across the entire bridge stock. Structure locations, restrictions, structure ownership and colour-coded BCI results are visualised in a BridgeStation's mapping module.

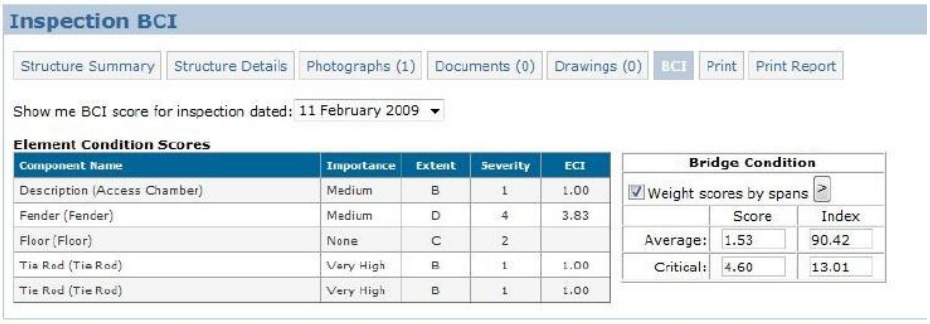


Figure 3.6 – Example of BridgeStation user interface related to Inspection BCI

BridgeStation can store photographs, drawings and other electronic documents related to each structure, component, inspection or individual defect. Forecast costs can be entered for different inspection or structure types which can then be aggregated to define total costs for an inspection regime. BridgeStation has an algorithm to prioritise planned works and is used to control spending profiles and manage funding allocation. A forecast cost breakdown is recorded against each maintenance item which is then used to calculate estimates for works orders. The system also includes an Asset Valuation and a Lifecycle Planner module that supports the definition of a 60-year deterioration model based upon inspected elements.

The system is a web-based platform that can be accessed from site or office - wherever an internet connection is available. User management capability allows designated system administrators to assign various levels of access and authority. Mobile device specific add-on modules allow inspections to be carried out and data input on the spot using a small portable device. Technical documentation and help files are made available to users, as well as forums to discuss issues with other users. All bridge and structure information is hosted by FSW IT Solutions Limited on a server.

Individual spreadsheets and paper records

Other datasets are held in the shape of individual spreadsheets and paper records. On a project-specific base, specific software is used if it offers additional features that are needed over those supported by the main information systems. The resulting documents are mainly used to support expert judgment during the definition of maintenance scenarios and works programmes. Some historical paper, such as design drawings and documents, can be found within the City Council. However, data standards or protocols are not available and the spreadsheets are not integrated or stored in any formal manner.

3.4 Moving towards an integrated asset information management

The recently published PAS 1192-5 provides a framework to assist asset owners and stakeholders. The framework helps to understand key vulnerability issues and the nature of the controls required to deliver digitally built assets within a built environment. Its purpose is not in any way to undermine the collaboration upon which both projects utilising digital technologies and asset management systems are centred, but to ensure that information is shared in a security-minded fashion. It encourages the adoption of an appropriate, proportionate, need-to-know approach to the sharing and publication of information about built assets that could be exploited by those with hostile or malicious intent (Figure 3.6).

Historically, the City Council has promoted the use of data in an integrated manner; however, to move towards a consolidated integration, it is vital to understand to which extent the existing data matches the needs of the existing business processes. This is especially important when decisions are made with a long term perspective. PAS 1192-5 aims to provide guidance to these tasks. This standard highlights the need to link asset information and levels of service and advocates the need to bridge gaps between the current and desired performance of built assets. This is based on the link between asset information requirements and asset information models with the goal to understand:

- the data and information required;
- where it is stored and managed;
- why it is required;
- how it is collected and measured;
- the format it is required in;
- who it is provided by;
- when it shall be provided; and
- the retention requirements

Appendix 3E proposes a framework to assess asset information requirements and from them tailor the details of the data collection programme.

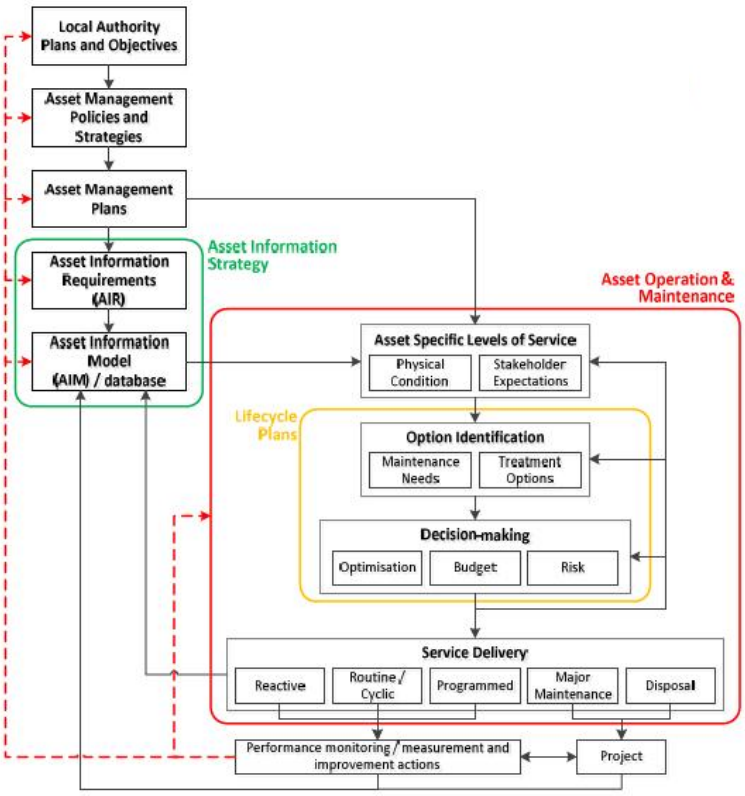


Figure 3.7 – Project work stages and decision points in relation to asset management (adapted from PAS 1192-5)

4 LIFECYCLE PLANNING

4.1 Overview

The objective of lifecycle planning is to achieve the minimum whole life cost of an asset alongside the service provided. Lifecycle planning helps to ensure that asset expenditure is invested in a manner that will deliver value for money over time while meeting the performance targets identified through the levels of service (see Section 2).

To this end, it is vital to consider the future performance of each asset type during their life phases (Figure 4.1), based on a set of maintenance strategies, treatment options (included in reactive, routine or periodic maintenance) and investment scenarios. A lifecycle plan is the output of this analysis and can be used to support the identification of specific maintenance needs over these phases, while providing a link to the shorter term processes.

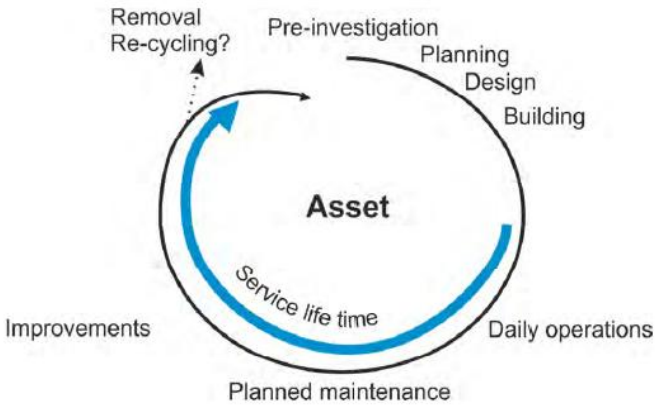


Figure 4.8 – Typical lifetime stages of an asset

When applying a lifecycle approach, the following questions may be answered for a short, medium and long term period of planning:

- What funding is needed to meet the performance targets and keep the assets in a steady state?
- Is there sufficient funding to meet the performance targets? If not, what is the impact on the resulting performance?
- What is the lifecycle plan that delivers the minimum whole life cost?

This section presents the fundamentals used to develop the lifecycle plans of multiple asset types.

4.2 Current state of lifecycle planning

Historically, lifecycle planning has not been considered for most of the maintenance decisions. In most cases, maintenance has been planned for periods not longer than five years. For example, carriageway maintenance scenarios have been developed only to support local engineers during works prioritisation decisions within a three-year period. Those decisions have been done considering asset hierarchy, condition and available funding. Forward funding allocation has been generally based on previous year's expenditure and the overall approach rarely used deterioration or value depreciation models.

The recent introduction of the Incentive Fund Element is acting as a catalyst to develop and implement asset-specific lifecycle plans. The adoption of these plans is vital to guarantee long term funding and deliver an efficient and effective asset management approach.

4.3 Lifecycle planning process

Recently lifecycle plans were developed for each of the following asset types:

- Carriageways (Appendix 4B)
- Footways (Appendix 4C)
- Drainage (Appendix 4D)

The process map shown in Figure 4.2 presents the approach adopted during the development of these plans. Overall the approach breaks down a set of assumptions, performance requirements, maintenance needs and decision-making processes. It also sets out the proposed maintenance strategy, the corresponding timing of interventions and defines a set of investment options to consider over the asset's lifetime. The degree and sophistication to which each aspect is considered depends on the overall quality of asset data available (i.e. inventory, performance and financial data). Similarly to other aspects of this TAMP, lifecycle plans are live documents that should be regularly updated as more quality data becomes available or new adjustments to the overall asset management approach are made.

Each asset group was identified at the network level according to the classification presented in Section 3 (i.e. asset type, asset group and components).

As it was mentioned above, the City Council operates a street lighting Private Finance Initiative (PFI) that funds the maintenance of street lighting separately. Therefore, the street lighting lifecycle plan is not included in this version of the TAMP. The structures lifecycle plan is also not included in this TAMP version due to contractual timeframes incompatibilities. The lifecycle plans of traffic management systems, road marking, traffic signals and street furniture are also excluded due to the current insufficient data quality. However, the development of these plans is considered for the near future (see 'Improvement Plan' in Section 8.6).

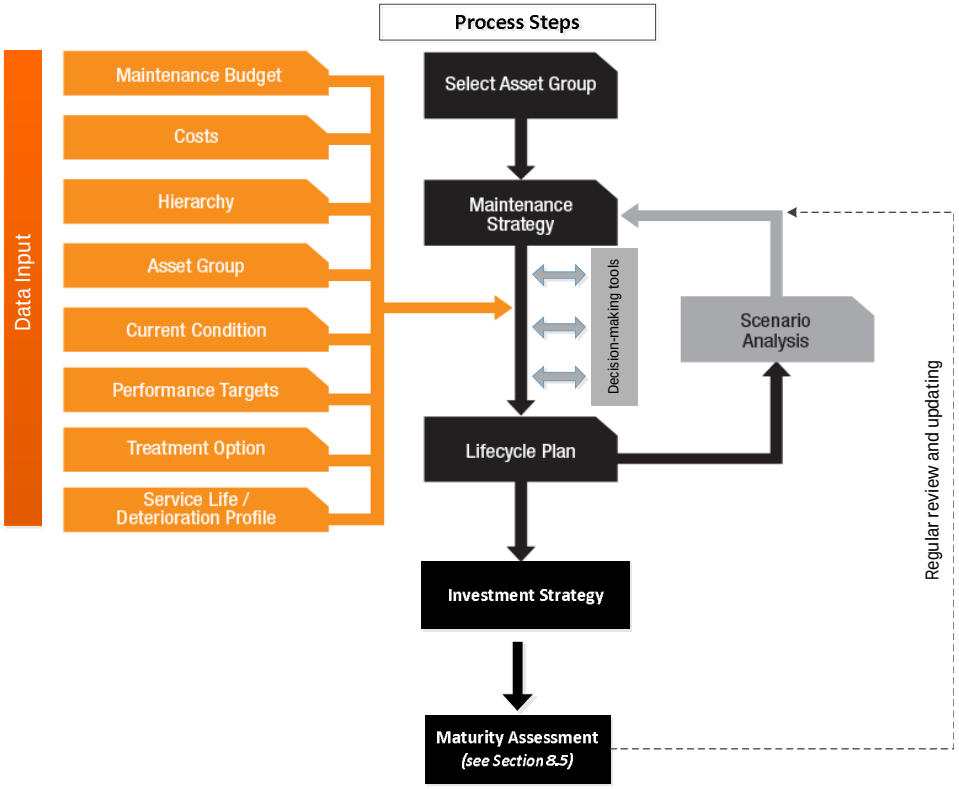


Figure 4.2 – Lifecycle planning process (adapted from HMEP, 2013)

4.4 Lifecycle plan

The following sub-sections describe the principles used to produce the lifecycle plans. With regards to the asset types to be included in future lifecycle plans, the same principles will be adopted and adjusted to accommodate specific demands or requirements.

Hierarchy, asset group and asset data

One of the most important inputs consists of a series of high-quality descriptive data that is representative of the network as a whole. Asset data refers to the categories below:

Table 4-1 – Data categories

CATEGORY	EXAMPLES
Inventory and functional data	Inventory data as: • hierarchy and category of asset type, and • quantities of asset type (if available) functional data as: • traffic flow and • accident rate
Performance data	Including asset condition data based on percentage of - Good, Fair or Poor – or, if not available, based on a set of technical indicators such as roughness ruts, skid resistance and cracking.
Maintenance actions	Including periodic, reactive and routine maintenance actions
Treatment options	• historic performance (if available) • costs of previous treatment options (including traffic management measures) • estimated life of the treatment (i.e. input to define the next intervention)

Data that describes the assets performance is not static. In order to get sufficient information to monitor the network's performance and to decide where, when and how maintenance should be carried out, data should be collected, stored and used according to the principles described in Section 3.

Current condition

Condition data is a key component of lifecycle plans. Reliable condition data is vital to update and develop deterioration and other performance models. Taking carriageways as an example, the degree of explanation between surface condition and the need for maintenance works depends on how complete the data is; this is done through analysis of existing measurements, measurements variables, construction data, layers and materials. Failure to do so results in a mismatch between the appropriations and actual needs, which impacts on the quality of long term maintenance decisions.

Maintenance strategy

The lifecycle pattern of an asset type varies with the performance targets that are defined. Using the same example as above - carriageways - the lifecycle pattern has a limited correspondence from a pavement quality perspective, where the carriageway's quality in terms of serviceability declines under various solicitations such as continuous traffic, climate and geology stresses (Figure 4.3). The overall goal is to perform the *right* type of maintenance activities at the *right* time, to optimise the total cost-benefit relationships of the asset over its lifetime. Periodic maintenance aims to repair high-severity defects and is carried out on a regular basis in order to maintain the condition of the pavement above a certain performance level and restore the pavement quality. Routine maintenance aims to repair low-severity defects and is carried out to reduce the speed of deterioration.

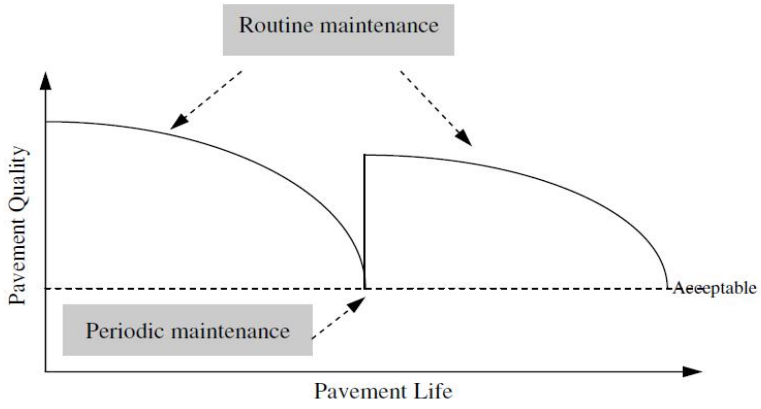


Figure 4.3 – Typical lifecycle performance of carriageways

In each lifecycle plan, a number of maintenance strategies are considered for the treatment of each asset type over a specified time period. In principle, a strategy is a 'living thing' and one or more of the following orientations should be chosen for the purpose of managing maintenance intervention on the network:

- minimisation of whole life costs;

- meeting statutory requirements;
- meeting performance targets; and/ or
- managing risks.

Examples of maintenance strategies are provided in Table 4-2.

Table 4-2 – Examples of maintenance strategies

MAINTENANCE STRATEGY	INTERVENTION DESCRIPTION
Do-nothing	-
Do-minimum maintenance	Routine maintenance only
Reduce the current levels of service	Reduce the performance being delivered
Sustain the current levels of service	Maintain the performance being delivered
Prioritise performance to improve target parts based on constrained budget	Funding being target on a prioritised basis (e.g. exclusive funding for carriageways)
Enhanced level of performance to meet performance targets	Funding being allocated to reach specific performance targets (i.e. based on condition)

The identification of strategy elements for each asset type is presented in Appendix 4A.

Performance targets and maintenance budget

A maintenance decision is always affected by the budget available. There is always a possibility to 'do-nothing' which results in minimal cost on the short term, but on extensive maintenance on the long run. The effect of maintenance depends not only of the chosen maintenance treatment, but also on the conditions before the maintenance is carried out. Thus, each plan defines the performance targets (or triggers) to be delivered, which are in line with the principles defined in Section 2 (Figure 4.4). The setting of trigger levels is in some cases linked to risk management approaches (see Section 7), as for example in drainage asset management.

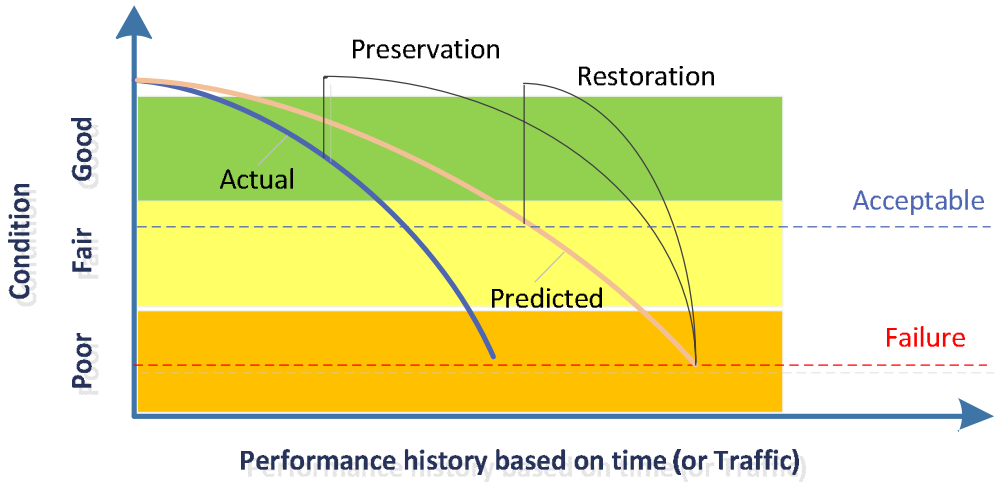


Figure 4.4 – Typical lifecycle performance targets of carriageways

Treatment options, service life time and deterioration profile

Other key elements are the quantification of maintenance needs and resources, the identification of adequate treatments and the respective impact on the asset's future condition (Table 4-3).

In addition, each maintenance strategy considers the likely modes of deterioration and/ or failure of the proposed treatment, and when the next intervention will happen (i.e. the time for the asset to reach the end of its serviceable life). Prediction models have an impact on maintenance strategies and are needed to evaluate future condition and to make pro-active decisions. These models are defined when is possible.

Table 4-3 – Characterisation of treatment options

TREATMENT OPTIONS	TIME OF FIRST APPLICATION	TIME OF SUBSEQUENT APPLICATION	CONDITION IMPROVEMENT	DETERIORATION AND MAINTENANCE EFFECT	COST
Option *n*	Year *n*	Year *n*	From current to expected condition	Deterioration rate	£

Table 4-4 – Service life time and deterioration profile

TECNHIQUE	DESCRIPTION
Service life time	The time that assets reach the end of their serviceable life. Two possibilities are considered: • when the asset is no more useful for users, and • when the technical performance of the asset ends.
Deterioration profile	Deterioration profiles of an asset can be determined from one or more of the following sources: • historical performance; • local knowledge; and/or • best practice.

Costs

A lifecycle cost analysis is a subset of a whole lifecycle cost (WLC). The later includes a wider range of costs including externalities, non-construction costs and incomes while the former has an emphasis on the asset owner's costs (Figure 4.5). Cost components that are included in a lifecycle cost model are: design and construction, rehabilitation and maintenance expenditures (treatment options, material and labour). Other costs can be included such as user costs during construction, rehabilitation or maintenance and user costs during normal operations. In principle, rates take into account inflation and if possible, fluctuation in prices should be evened out while long term changes in prices of labour and resources as well as efficiency should be accounted for. The discount of future cash flows can be included. The optimal lifecycle cost of a maintenance solution is the lowest cost resulting from the combination of the costs described (Figure 4.6).

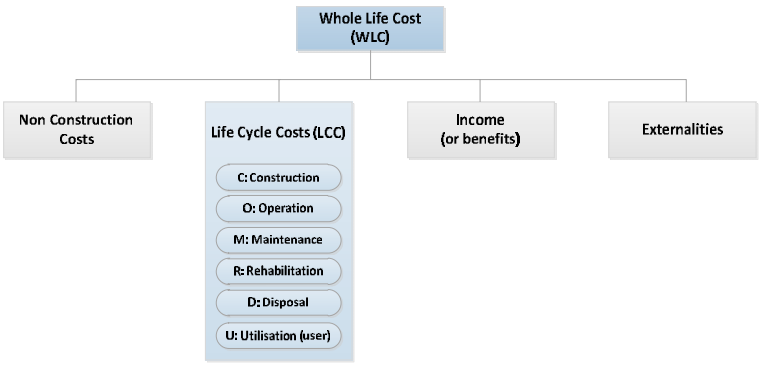


Figure 4.5 – Costs to include in a lifecycle costs analysis (adapted from BS ISO 15686-5)

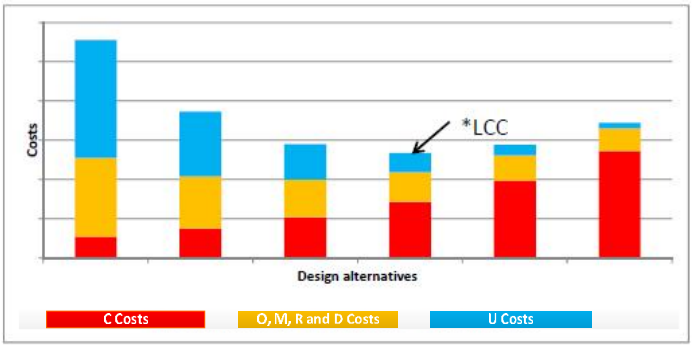


Figure 4.6 – Principles to find an optimal alternative by using a lifecycle cost perspective

Decision-making tools

Several tools or techniques can be used to support the selection of the most appropriate maintenance strategies. Horizons, Confirm, BridgeStation or the HMEP lifecycle planning Toolkit offer supporting tools to model asset deterioration and determine the most suitable investment scenario. Table 4-5 lists the techniques used by each asset type.

Table 4-5 – Decision-making tools

TECNHIQUE	DESCRIPTION	ADDRESSED TO THIS TAMP BY ASSET GROUP
Risk-based evaluation	Focus on minimising the risk associated with an asset through the selection of a maintenance strategy that considers risks at a minimum cost.	Drainage
Whole life cost (see Figure 4.5)	WLC is a cost benefit analysis that quantifies the investment costs, including treatments and subsequent treatment interventions, against economic benefits, such as safety, traffic delays and pollution. The strategy with lowest Net Present Value over a period of analysis provides the lowest whole life cost.	Carriageways* Footways and Cycle Tracks* Structures (to be used)
Multi criteria analysis	It is used to prioritise competing treatment options from which the strategy may be selected. This technique is used where benefits and costs are less tangible to define.	Carriageways* Footways and Cycle Tracks* Traffic Management Systems (to be used)
* Carriageways and footways use lifecycle cost analysis, which is a subset of a whole life cost. Non-construction costs, benefits and externalities are excluded from the current analysis. In addition, carriageways and footways use value management as prioritisation criteria to define maintenance schemes.		

Changes at the strategy level: monitoring and reviewing

As a whole life document, a lifecycle plan can be affected by multiple factors that require a change in approach or maintenance strategy. The table below lists the type of changes that can lead to adjustments of the current maintenance strategies – and ultimately the existing lifecycle plans. In the event of any of these changes, the validity of lifecycle plans might be compromised and therefore must be reviewed.

Table 4-6 – Types of changes that have impact on maintenance strategies

CHANGE TYPE	DESCRIPTION
Number of indicators	Changes on the indicators that have an impact on lifecycle factors. For example, the introduction of more refined and accurate data can lead to adjustments on degradation models and impact on the solution space evaluated in the maintenance scenarios.
Optimisation of management systems	Another possible direction is the change of existing management systems, such as the introduction of new organisation capabilities.
Basic elements of the maintenance scenarios	Scenarios are present in the selection of performance interventions over time; this allows for good flexibility in choices and decisions. However, small changes can have significant impact on investment strategies.
Changes in orientation on the part of senior management	Changes in senior decision-making strategy can introduce new demands on the underlying principles of the lifecycle plans.

5 INVESTMENT STRATEGIES

5.1 Funding sources and capital funding

Historically financial arrangements have been provided through three main sources: (1) LTP grant funding, (2) DfT highways block funding allocation, and (3) revenue funds from Council Resources. The table below summarises the financial budgeting and planning for the period between 2014 and 2016:

Table 5-1 – Funding sources and capital funding between 2014 and 2016 (£000's)

FUNDING STREAM	CAPITAL FUNDING (£000's)	
	2014/2015	2015/2016
Council Resources *Revenue*	£2,484	£500
Section 106	£620	-
Highways Borrowing	-	£1,900
Other Sources	-	£2,600
LTP Government Grants and highways block funding allocation	£1,469	£1,450
	£4,573	£6,450

5.2 Financial budgeting and planning

The budget allocation across asset classes still remains a percentage split based on historic allocations. For its turn, the distribution of budget to specific asset groups is done by the operational delivery teams that assess condition-based maintenance needs (see Section 6). Based on these maintenance needs, the City Council defines a set of annual investment scenarios. Historically, the key elements of these scenarios have been highway condition and past performance. These scenarios help to understand the impact of funding on the network performance, and ultimately apply for funding. Then, based on the funding available, the operational delivery teams use management principles to define and prioritise maintenance schemes.

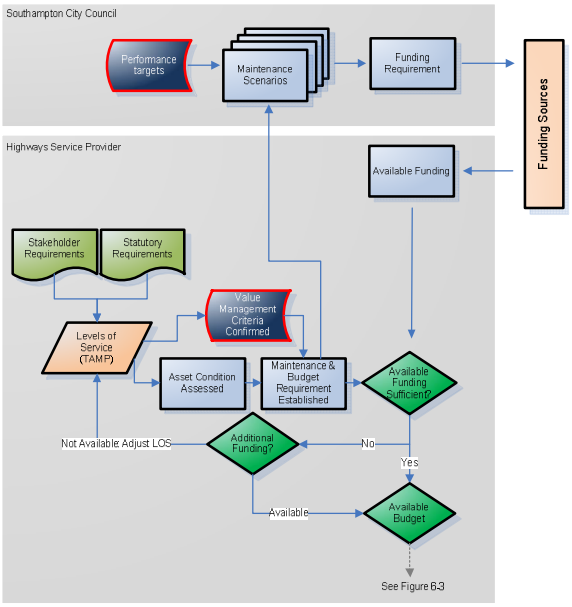


Figure 5.1 – Process to determine funding available

Table 5.2 details the funding expected for the period between 2016 and 2018 according to asset types.

Table 5-2 – Provisional funding available per asset type

ASSET TYPE	FUNDING NEEDED	FUNDING PERIOD	INVESTMENT STRATEGY	IMPACT ON PERFORMANCE
Carriageways	£6,300,000	2016-2018	Scenarios were run over a 10 year period, with an initial focus of spend on the unclassified road network to ascertain a funding need, which is currently in place. The analysis of funding needs had identified a number of options for consideration and the decision was made to try and achieve a small improvement and maintain a steady state network.	-
Principal roads	*£1,800,000*			Overall a slight improvement achieved at end of 10 year period. • Poor ≈ 1% improvement • Fair ≈ 2.91% improvement • Good ≈ 2.7% improvement
Classified roads	*£2,000,000*			Overall an initial improvement with steady state achieved and maintained toward the end of the investment period. • Poor: 0.55% improvement • Fair: 12.53% improvement • Good: 11.98% improvement
Unclassified roads	*£2,500,000*			Overall an initial improvement, with a relatively steady state achieved toward the end of the investment period.
Footways and Cycle Tracks	£2,700,000	2016-2018	Scenarios were based on treating the majority of poorest footways with some proprietary treatments to maintain the fair and good footways and if possible, extend their lifecycle.	*(budget to be reviewed in October 2016)*
Category 1 & 2	*£1,200,000*			Maintain the network on a steady state.
Category 3 & 4 (Bituminous)	*£0,500,000*			Managed network decline.
Category 3&4 (Flags)	*£1,000,000*			Managed network decline.
Drainage	£104,000	2016-2018	The current annual cost of Council's drainage asset maintenance program is £104,000 (2015/16) and forecast to be £185,000 in 2025/26 due to annual cost escalation and the additional maintenance requirements of new assets created over this period. At the moment this investment covers reactive actions; however, there are on-going efforts to implement a more consolidated risk-based asset management approach.	Mostly reactive actions to assure the network functionality.
Structures	£450,000	2016-2017	This value is based on the historical allocation for structures routine and reactive maintenance of structure assets.	*Impact of this investment on the structures performance will require further work and will be part of a structures lifecycle plan.*
Street Lighting	-	-	*Street Lighting is subject to a PFI agreement between SCC and SSE Contracting (part of Scottish and Southern Energy Group) over 25 years.*	

5.3 Asset valuation

In recent years, the HM Treasury Whole of Government Accounts (WGA) policy has been introduced. WGA aims to develop a common set of accounting policies across the whole of the public sector. As part of this, Councils within the country are required to provide details about the value of their highway assets.

A *Depreciated Replacement Cost* (DRC) is a method of valuation that provides the current cost of replacing an asset with its modern equivalent asset (i.e. *Gross Replacement Costs* – GRC) less deductions for all physical deterioration and all relevant forms of obsolescence and optimisation. *Annual Depreciation* is the aggregated cost of all capital replacement/treatments needed to maintain/restore the assets service potential over the lifecycle, spread over the estimated number of years of the cycle. It is a truer calculation of the value of the asset as it takes into account the fact that highways will rarely require full reconstruction.

The calculation formulas are presented below:

GRC – Accumulated Depreciation = DRC	(1)
DRC / Years of Life Remaining = Annual Depreciation	(2)

Table 5-3 summarises the most recent asset valuation estimation for the existing network of assets.

Table 5-3 – Asset valuation according to the WGA (£,000s) (2014-2015)

ASSET GROUP	GRC	ACCUMULATED DEPRECIATION	DRC	DATE OF LAST UPDATE
Carriageways	£837,543	£133,383	£704,160	June 2015
Footways and Cycleway	£162,068	£31,020	£131,048	
Structures	£211,541	£26,405	£185,136	
Traffic Management Systems	£10,767	£6,225	£4,542	
Street Lighting	£31,827	£8,274	£23,553	
Street Furniture	£14,732	£10,023	£4,709	
Land	£2,830,575	-	£2,830,575	
Total	£4,099,052		£3,883,723	

6 SERVICE DELIVERY

6.1 Overview

The development of effective and efficient works programmes for individual asset groups is completed by:

- identifying candidate schemes;
- prioritising works in each asset group or service area;
- selecting and optimising schemes for a forward programme;
- selecting schemes for an annual programme aligned to available budget;
- delivering individual schemes; and
- monitoring works to ensure they meet the approach to asset management.

The forward works programme provides robust and reliable information to identify the asset maintenance to be carried out within the next three to five years. Its purpose is to identify future works and ensure that those works deliver the required levels of service, and therefore value for money. The programme is used to support forward financial planning and communicate planned maintenance to the elected members, local communities and citizens. The annual works programme is developed from the forward works programme. It prioritises maintenance schemes for delivery by taking into account the funding available. Programmes are regularly reviewed and updated by the service provider teams. The next section describes the principles underlying the definition of these programmes.

6.2 Forward works and annual programmes

The works programme is based on agreed criteria for scheme prioritisation. The criteria used to prioritise and optimise the works programme takes into account the levels of service based on condition and serviceability of the asset alongside safety issues, local transport priorities and available budget (affordability). Social, economic and environmental benefits, local community or user demands and political priorities are also used to differentiate and prioritise schemes (Figure 6.1).

To assist this process, the City Council uses engineering assessment and value management criteria based on the Council's priorities. The criteria are agreed locally and communicated within the Local Transport Plan. The level of influence or weighting of each criterion within individual asset group programmes are periodically reviewed with key stakeholders. An example is the definition of carriageways maintenance schemes. These schemes are based on a set of value management qualitative indicators that range from 0 (very good) to 5 (very poor). These indicators are combined into an overall score that supports the decision of whether a scheme is needed (Table 6-1).

Figure 6.1 – Council priorities

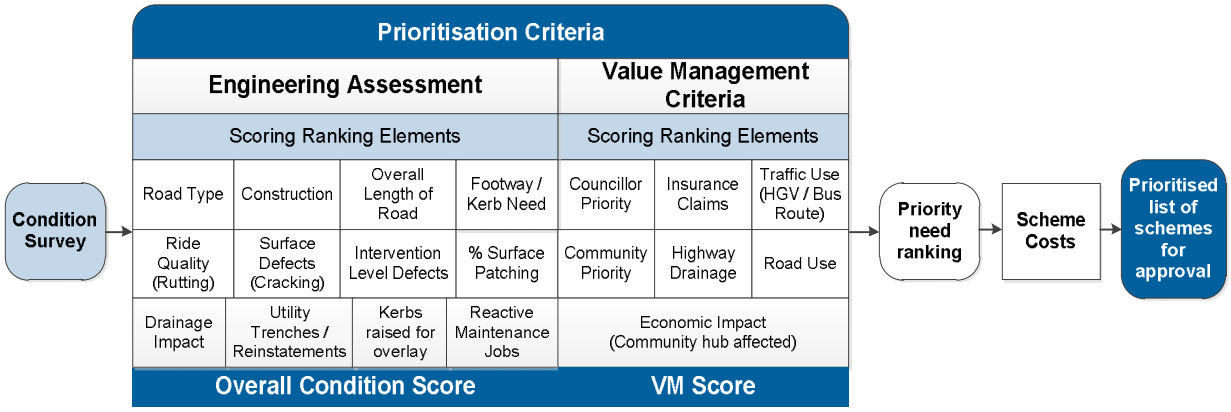


Figure 6.2 – Prioritisation criteria based on value management principles

Table 6-1 – Example of a value management tool applied to carriageways maintenance schemes

ASSESSMENT	SCORE
Good Condition with Minor Defects	0-11
Treatment Scheme	12-15
Possible Scheme	16-22
Requires Scheme	23-30

The budgetary constraints are determined during the budget setting processes for each asset type. The service providers have been charged with the task of developing the works programmes based on these principles alongside these budgetary constraints. The outcomes of the selected works programmes are used to build a financial plan and provide details of the required funding. The processes for identifying candidate schemes and developing both programmes – forward and annual - are illustrated in Figures 6.3 and 6.4.

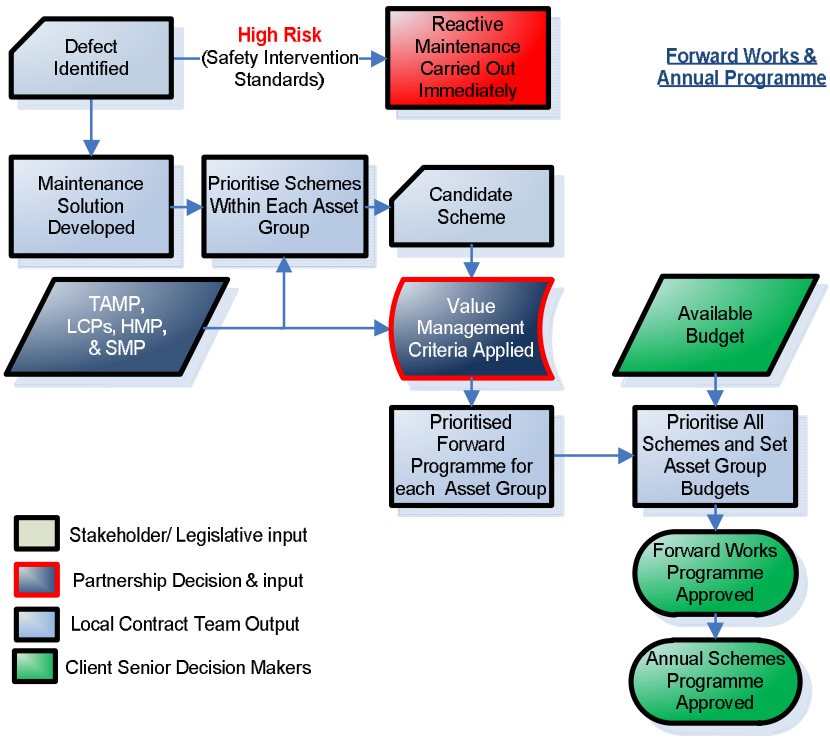


Figure 6.3 – Process to define the forward works and the annual programme

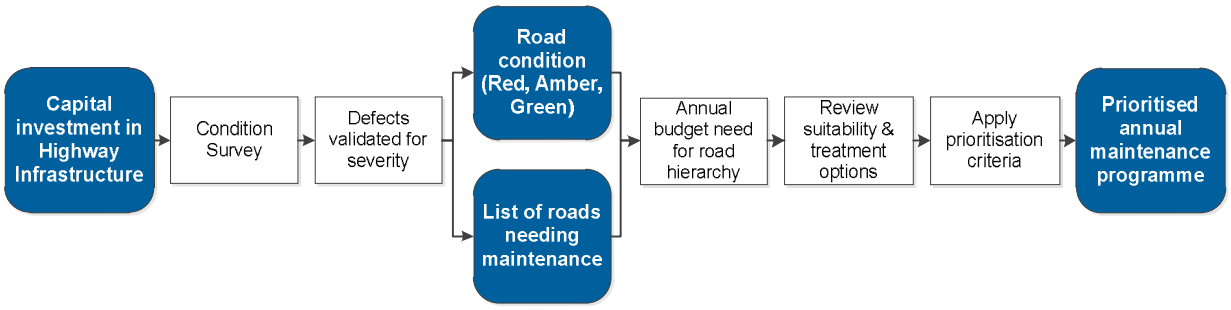


Figure 6.4 – Detailed process to determine the prioritised annual maintenance programme

6.3 Moving towards a lifecycle works programme

Currently the annual works programme uses condition ranking and value management criteria to prioritise a list of schemes for approval. Whilst these criteria are vital to deliver the asset management strategy, there has been little focus on using asset's life deterioration as a key prioritisation criterion. In addition, cross-asset works programmes lack a cohesive integration, which might result in individual and non-optimal maintenance interventions on the network.

Thus, maintenance decisions need to move away from 'worst first' approaches towards lifecycle principles, integrating cross-asset routine and planned maintenance in a cost-effective manner over long term periods.

The introduction of asset management performance measures and the completion of asset lifecycle plans will remove the need to focus on 'worst first' approaches and will prioritise actions based on long term aspects. Maintenance strategies considering different treatment options over the whole life of an asset will be promoted according to the specifics of each plan. Lifecycle 'value' will be achieved by considering both the capital investment and routine maintenance decisions to maximise the value obtained from assets over their whole life. Lifecycle plans will provide 'best value' by supporting the selection of an optimised timing of treatment or a replacement over an asset lifetime, while guiding the definition of funding strategies with the purpose to deliver the minimum lifecycle cost, as explained in Section 4.

The output of this process will be a list of schemes that are better aligned with the levels of service and therefore are not wholly based on immediate maintenance considerations. By doing this, it is expected that the forward and annual works programmes meet the predefined performance targets. Figure 6.5 illustrates the main steps of a maintenance programme process to be used in the future.

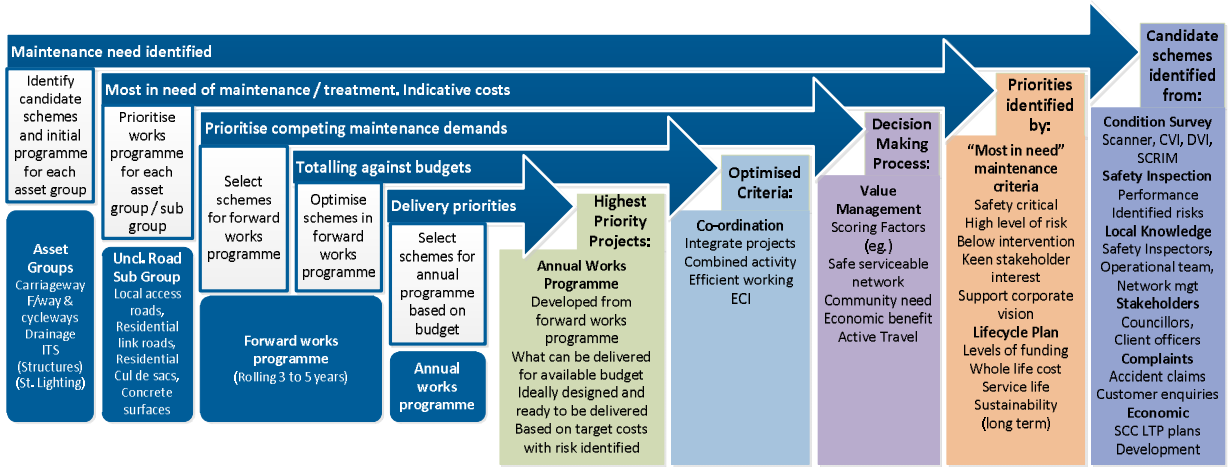


Figure 6.5 – Future considerations to optimise maintenance schemes

7 RISK MANAGEMENT

7.1 Overview

A risk can be defined as an uncertain event, which - should it occur - will have an effect on the desired performance of an asset or series of assets. It consists of the likelihood of a perceived threat or opportunity occurring and the magnitude of its impact (or consequences) on the objectives, where:

- *threat* is used to describe an uncertain event that could have a negative impact on the levels of service; and

- *opportunity* is used to describe an uncertain event that could have a favourable impact on the levels of service.

Traditional risks include anything in relation to infrastructure, personnel and finance. They include not only physical or natural accidents or failures, but also matters of public policy concerning safety, spending, licensing, monitoring and environment, to name a few.

The City Council and the service providers manage a variety of strategic, tactical and operational risks. As a result, the assessment and treatment of risks bring multiple benefits summarised below.

- An effective risk management analysis can demonstrate and document the Council's management of the potential hazards that it needs to deal with; the result contributes to internal documentation to demonstrate compliance with internal corporate policies.

- A risk assessment is a basis for decision making, helping to balance risks against costs associated with risk-reducing measures within certain constraints.

- A risk assessment serves as a basis to communicate with the City's key stakeholders.

7.2 Risks associated with the TAMP

This TAMP is a live document that should be continuously reviewed and updated to ensure that it remains aligned with good practice and takes in account any changes in the legal and management context. Therefore, it is expected that the risks associated with the development and implementation of key activities are identified and frequently updated. The primary goal of a risk management approach is to identify these risks whilst suggesting and employing measures to mitigate potential consequences.

The primary risks related to the implementation of this TAMP are described in Table 7-1 alongside a high level risk characterisation based on probability and impact. To this end, a qualitative scale (L-low; M-medium; H-high) was used.

Table 7-1 – Risks associated with the implementation of this TAMP

TAMP SECTIONS		PRIMARY* RISKS	Probability	Impact	RISK
S2	Measuring performance – levels of service and performance measurement	Development of performance measures that do not reflect the levels of service with respect to each hierarchical level (strategic, tactical and operational).	L	M	M
		Risk related to the delivery of the levels of service due to financial constraints.	M	H	H
S3	Asset data and information systems - Data acquisition	Risk related to the data collected as part of the TAMP. This affects the data collected on each of the assets types (inventory, performance and financial) and details about information systems. Typical risks include the accurate assessment of data properties and description of data collection and storage processes.	M	L	M
S4 S5	Lifecycle plans and Investments strategies	Use of incorrect parameters and assumptions in each of the asset-specific lifecycle plans leading to unreliable results. Typical examples are the use of inaccurate deterioration or cost variables.	M	H	H
		Lack of input data to develop and continuously review the lifecycle plans	L	H	M
		Inaccurate assessment of asset valuation.	M	L	M
		Insufficient expertise or competences within the organisation to embrace a lifecycle approach	M	H	H
S6	Works programming	Risks that the works programmes are not linked to the lifecycle plans and keep being developed on the 'worst-first' basis.	H	H	H
		Schemes developed under the principles of this TAMP are unpopular to the City Councillors or some key stakeholders.	L	H	M
		Works programmes are not well integrated and co-coordinated among asset types/ disciplines.	H	H	H
All TAMP	Strategic Level	Strategic risks are associated with political, legal, financial, commercial and environmental decisions and activities. These may have major impacts on long term plans and would need a review of the TAMP when they become apparent.	L	H	M

** Primary means first level risks based on immediate impact (or consequences).*

7.3 Current state of risk management

Risk management is a key component of the corporate governance arrangements of the City Council and therefore is an indicator of good management. The City Council recognises the need to identify, understand and assess its key strategic risks and is committed to ensure that appropriate arrangements are in place to enable informed risk decision making. It is also accepted that, in order to be effective, both risks - strategic and operational - should be managed on a structured and consistent basis across the organisation. The City Council has defined a risk management strategy that is reviewed and updated on an annual basis. This includes the risk management policy statement and the risk management process (or framework) that provides details of the relationship between the risk management principles and other processes within the City Council. The identification of key risks is informed by, and aligned with, key priorities and outcomes recognising that any mitigating actions should be proportionate to the level of risk assessed.

At the operational level, risk is being managed by the service delivery teams. Typically, the providers carry out a frequent risk assessment that aims to:

- identify potential risks relating to carrying out operational activities and service delivered;
- assess the probability of these risks occurring;

- define a financial estimate of the most likely consequences of each risk occurring as well as its potential impact on the service delivery in terms of time and performance (quality).

In the early stages of their partnerships, the City Council and the service providers performed an initial risk assessment relating to the main risk events affecting service delivery. Such initial risk assessment has subsequently been reviewed and updated to reflect current and emerging service delivery risks. Currently, the set of risk consequences is defined by the service provider through the use of a qualitative scale that ranges from 1 (low) to 5 (high). Similarly, each risk event is scored with a probability level that ranges from 1 (low) to 5 (high). The consequence and probability levels are determined by in-house expert knowledge. A risk score (or level) is assessed through a 5x5 risk matrix that maps out consequences and probabilities of each risk event. When the risk score is determined, a set of treatment actions is defined alongside an advised implementation date.

Risk management is used to determine the most appropriate action based on treatment options: accept, avoid, transfer or manage (i.e. mitigate through further action). Risk treatments are also defined by in-house experts. However, risk acceptance thresholds have not been fully defined and implemented. The risk register where risks are recorded is frequently reviewed and updated.

The following sections describe the existing risk management policy and strategy and provide suggestions for further improvements or developments.

7.4 Risk management policy

In seeking to ensure an effective management of key risks, the City Council developed a risk management policy that aims to:

- promote a consistent and clear approach in terms of how risk should be treated and managed;
- raise the profile and understanding of risk management at all levels throughout the organisation including members;
- support officers and members in terms of taking informed risk decisions; and
- reflect good practice that is aligned to the corporate governance approach.

7.5 Risk management strategy

The risk management strategy defines how risks are managed and includes:

- the identification of risks in connection to the multiple governance levels by using a consistent risk management framework that enables comparison of risks across several services, as it is explained in Table 7-2.

Table 7-2 – Risk to be considered throughout multiple governance levels

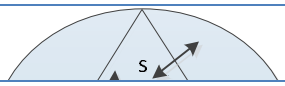
	Corporate	High level risks that effect the whole authority. This includes, for example, corporate

Figure 7.1 – Cross-level governance levels		reputation, civil defence, emergencies, business continuity, health and safety, political and legal and financial risk.
	Strategic (S) and Tactical (T)	Risks affecting the management of the highway should cover the strategic and tactical levels.
	Operational (O)	Risks affecting the management of operational activities.

- the embedding of a risk management culture within the organisational environment, including cross-asset decision-making processes through a consistent risk management framework;
- suitable controls to manage risks;
- risk ratings and controls; and
- regular reporting habits to ensure risk awareness.

Sharing the best practice and lessons learned among key stakeholders through risk workshops or other similar activities are considered vital to promote an efficient risk communication between practitioners.

7.6 Risk management framework

7.6.1 General approach

The risk management framework defines how risk is handled and incudes risk analysis, evaluation, risk treatment (or reduction), risk monitoring and review, and risk communication and consulting. Figure 7.2 shows the risk management framework and process adopted by the City Council.

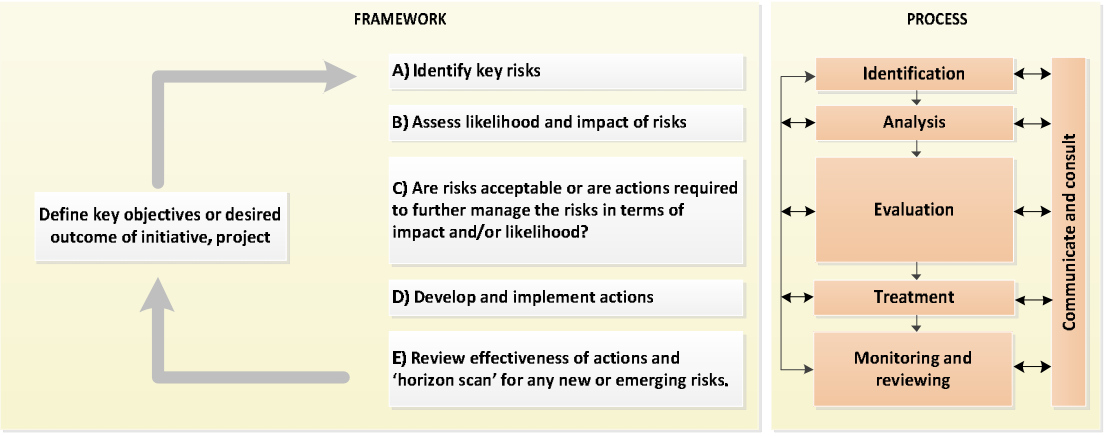


Figure 7.2 – Risk management framework and process

7.6.2 Risk identification

Identifying the risks to be managed is vital to deliver the service within the levels of performance defined. The goal is to identify all types of hazards that might have a potentially adverse impact on the required outcome or objective at any governance level: strategic, tactical, operational or corporate. This recognises that the achievement, or otherwise, of key objectives or outcomes depends upon:

- the City Council doing certain things and not doing others;
- the occurrence of events - both internal and external - that could affect the City Council, and
- the circumstances in which the City Council finds itself.

Major risk groups and field analysis are presented in the table below.

Table 7-3 – Risk groups and fields of analysis

RISK GROUPS	FIELD
Planning Risks	• Strategic planning • Asset management strategy • Performance and level of service • Asset management planning • Funding and investment • Climate Change • Sustainability • Weather events and environmental
Management Risks	• Leadership and organisation • Stakeholder and communication • Information and data • People (including competency) • Financial • IT and asset management systems • Performance management • Resilience and business continuity
Delivery Risks	• Procurement • Cost • Works programming • Scheme identification and design • Contract management • Project management • Resources and capacity
Asset Risks	• Risks common to all assets including investment, performance and loss of service • Risks associated with specific asset groups and types (such as severe consequence of failure, accessibility and construction)

7.6.3 Risk analysis and evaluation

The risk analysis phase aims to answer the fundamental question: “what might happen and what are the consequences?” Consequence (or impact) is the outcome of an event and can be classified into different categories. Currently consequences of an event are grouped as: (1) service delivery, (2) financial and (3) reputation. However, other impact categories can be considered in the future, as presented in Table 7-4.

Table 7-4 – Consequence categories

CONSEQUENCE CATEGORY	CONSEQUENCE DESCRIPTION
	CURRENT DESCRIPTIONS
Service delivery/ key priorities	Impact of a loss or reduction in service at route, asset or component level, such as weight restrictions on a bridge.
Financial	Increased costs due to bringing forward or delaying work, repair costs, fines or litigation costs and loss of income or income potential.
Reputation	Public confidence in organisational integrity.
	FUTURE IMPACT CONSIDERATIONS
Safety	Fatalities and personal injuries of road users and road maintenance staff.
Sustainability	Any impact on future use of highway infrastructure assets.
Environment	Environmental impacts, such as pollution caused through traffic delay or contamination from spillages or the sensitivity of the route/area.
Community costs	Damage to property or other third party losses, which may include business impacts or traffic delays.

To manage risks on a consistent basis, it is necessary to agree on a methodology that includes both consequence and likelihood. The City Council has set criteria for the levels of likelihood and consequences, as shown in tables 7-5 and 7-6. A risk value is then assessed through a risk matrix (Table 7-7). The matrices are not only used to assess original (gross) risk but also to assess residual (net) risk after the introduction of a risk treatment action. Appendix 7A provides a detailed risk matrix for risk evaluation.

Table 7-5 – Descriptions and definitions of consequence of the risk should it occur

DESCRIPTION	CONSEQUENCE	LEVEL/ SCALE
No impact (e.g. loss of income < £10k)	Minor	5
Moderate impact (e.g. loss of income £10k < £500k)	Moderate	4
Some impact (e.g. loss of income £500k < £5m)	Significant	3
Major impact (e.g. loss of income £5m < £10m)	Major	2
Extreme impact (e.g loss of income >£10m)	Extreme	1

Table 7-6 – Descriptions and definition of likelihood of the risk occurring

DESCRIPTION	LIKELIHOOD	SCALE/ LEVEL
May occur only in exceptional circumstances (<5%)	Very unlikely	E
Could occur, but unlikely	Unlikely	D
Might occur (50%)	Possible	C
Will probably occur	Likely	B
Highly likely to occur (>95%)	Almost certain	A

Table 7-7 – Risk rating matrix

		CONSEQUENCE				
		5 Minor	4 Moderate	3 Significant	2 Major	1 Extreme
LIKELIHOOD	A. Almost certain					
	B. Likely					
	C. Possible					
	D. Unlikely					
	E. Very unlikely					

Level of risk	Minor risk -> Low priority
	Significant risk -> Medium priority
	Critical risk -> High priority

7.6.4 Risk treatment

The risk treatment phase depends on the acceptability or risk appetite defined. Risk appetite refers to the amount of risk that the City Council and the service providers are willing to accept in order to pursue its objectives. Any identified risk in excess of this agreed risk appetite needs to be considered in terms of the options available to manage the risk. Possible risk reduction actions include:

- risk avoidance: not getting involved at all (avoiding or terminating the activity);
- risk reduction: reducing risks to an acceptable level (reducing the probability for an event to occur and/or limiting the damage in case of an event) and it results in residual risk;
- risk acceptance (including retention): the level of risk is acceptable and/or the cost of action is disproportionate in respect of the risk to be managed; and
- risk transfer (including sharing): risks will be shared with or transferred to another party (e.g. insurance or contract).

The logic used to treat risk is shown in Figure 7.3.

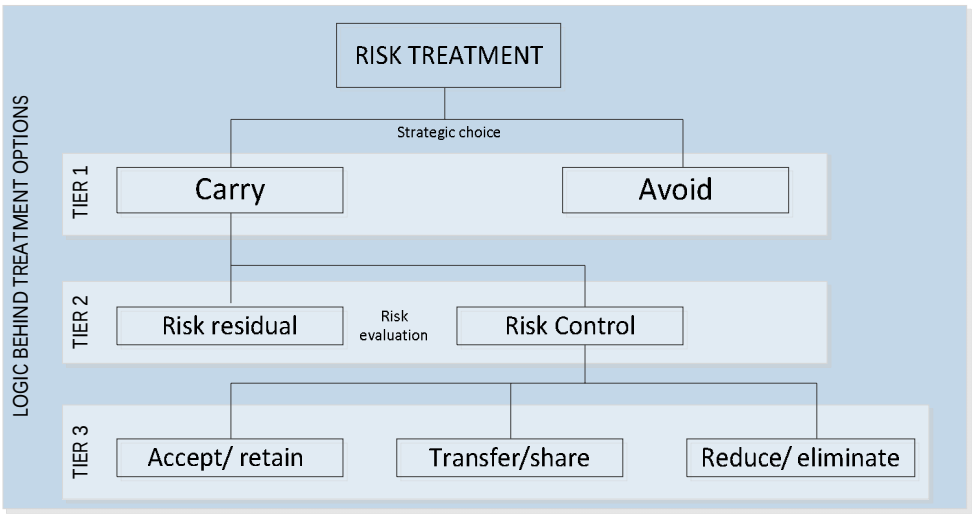


Figure 7.3 – Risk treatment logic

The risk management strategy confirms that if controls or mitigating actions are required to manage a risk to an acceptable level (e.g. by reducing the likelihood or consequence, or both) then they are identified and formally recorded with clearly defined responsibility. The agreed actions to manage the risk are subjected to periodic review to ensure that they are either in place or being progressed satisfactorily. The review provides an opportunity to consider whether there are any new or emerging issues that may impact on risk and whether are there any new risks that need to be considered.

The effectiveness and cost-efficiency of measures taken are determined by using frequency and consequence analysis of scenarios that are positively or negatively affected, under the assumption that a measure has been implemented. The next table provides examples of action responses according to the risk level.

Table 7-8 – Managing risk: example of action response

LEVEL OF RISK	RISK MANAGEMENT Example of action response
Minor (low priority)	Monitor and Review : Review periodically: Risks may not require mitigating actions but status should be reviewed frequently to ensure that conditions have not changed by using: - Control mechanism: review and monitor - Contingency plans: a robust contingency plan may suffice together with early warning mechanisms to detect any deviation from profile
Significant (medium priority)	Manage and review: May require some risk mitigation to reduce likelihood if this can be done cost effectively, good housekeeping may help to ensure that the impact remains manageable. Reassess frequently to ensure conditions remain same. - Control mechanism 1: programmed into maintenance works? - Response time: as resources permit? - Control mechanism 2: effect repair? - Response time: within 4 weeks?
Critical (high priority)	Manage and reduce: Requires active management: Risk requires active management to manage and maintain exposure at an acceptable level. - Control mechanism 1: inspect by competent persons and make safe? - Response time: within 4 hours? - Control mechanism 2: effect repair? - Response time: within 2 working days?

7.6.5 Risk monitoring and review

The risk management strategy document is subject to annual review by the Risk and Assurance Manager and any significant amendments reported to the Governance Committee for approval. Risks and risk registers are monitored on at least a quarterly basis and are subject to a detailed annual review. Risk reports are produced outlining major risk analysis, decisions, treatments and ownership.

7.6.6 Risk communication and consulting

The risk management strategy document and other associated documents are available on the City Council's website and are annually updated. Training and workshops might happen to support parties involved in any of the strategic, tactical, operational or corporate decisions.

7.7 Risk register

The City Council has defined two ways to register a risk. On the strategic level, risks are recorded in the form of a 'risk assurance report'. This tool captures information about each risk in terms of how it should be managed and the effectiveness of the controls in place (via an assurance rating).

On the operational level, the risks capable of affecting service delivery are recorded in a risk register managed by the specific service delivery team. The risk register includes a description of each risk together with the required actions to managed or reduce the risk. These details are then used to track and monitor risks as part of the activity to deliver the required services. The existing risk register is composed of three main blocks: (1) the risk register itself, (2) the risk update in the last review, and (3)

risks removed in the last review. The typical fields of information included in the risk register are described in Table 7-9.

Table 7-9 – Risk register definition

	FIELD	DEFINITION
Risk description	Risk number	Unique identifier for each risk
	Risk description	The "trigger" that will show that the risk has happened
	Consequences	The result the impact of the risk happening
Current risk score	Risk likelihood	The probability of risk occurrence
	Risk impact	The consequence (or impact) as a result of the risk occurring
	Risk score initial	The risk score (likelihood x impact)
	Risk score target	Revised risk score taking into account the mitigations introduced as part of the risk action plan
Risk action plan	Owner	The person who has overall responsibility for the risk
	Mitigations (risk control)	Mitigation strategies that can be implemented to control the risk (e.g. prevent, reduce, accept, transfer and contingency)
	Action member	Member of service team responsible for carrying out the control measures
	Action implementation	Date by which the risk action plan (control measure) is to be implemented
Target score	Risk likelihood 1-5	Revised likelihood score taking into account the mitigations introduced as part of the risk action plan
	Risk consequence 1-5	Revised consequence score taking into account the mitigations introduced as part of the risk action plan
	Risk score	Level of risk (likelihood x consequence)
Risk status	Comments	General field for the inclusion of comments
	Data reviewed	Date the risk was reviewed
	Projected reviewed date	Date that the risk is to be reviewed
	Status	Status of the risk whether the risk is new or obsolete, or whether the risk rating as increased or decreased

7.8 Assets criticality

Critical assets are those that are essential for supporting social and business needs that affect both the local and national economy. They will have a high consequence of failure, but not necessarily a high likelihood of failure, such as special and major structures. Thus, these assets should be identified separately and assessed in greater detail. Criticality can be assessed by applying broad assumptions about the implications of failure. For example, it is vital to analyse whether the closing of a major structure or road will have a significant impact on the local or national economy, or assuming that higher trafficked roads have a larger consequence of failure than lower trafficked. Simple criteria is used, such as assuming the loss of use of a road which can affect specific parts of a community, can affect businesses of different sizes and significance, or can affect a specific number of road users/hours. For each level of criticality, the risk management approach may be at a network level, for example, by ensuring diversions with minimal impact. If necessary, analysis can be done on an individual asset level. The asset criticality analysis for the City's highway network needs to be further developed and is planned as an improvement action (see Section 8.6).

8 MONITORING, REVIEWING AND CONTINUAL IMPROVEMENT

8.1 Overview

Performance monitoring is the process of monitoring and reviewing the asset management framework. This process is the basis to deliver and improve the proposed asset management strategy, performance requirements, works programmes – and ultimately, the overall service. Figure 8.1 illustrates the main aspects included in this section.

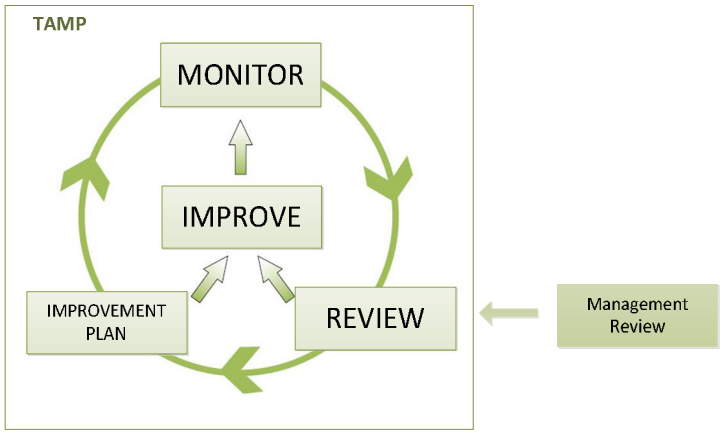


Figure 8.1 – Logic underlying performance monitoring, reviewing and improving

8.2 Performance monitoring

The City Council and the service delivery teams are systematically collecting data in the shape of indicators to understand the level of service delivered. Information data arising from implementing and delivering asset management is used to identify actions for continuous improvements by assessing relevant processes and practices and if required, integrating lessons learned. Four types of performance monitoring are used:

- Strategic monitoring: aiming to seek assurance that asset management is being operated as intended. This includes monitoring to ascertain whether the asset management strategy outcomes are being attained.

- Performance measures and targets: assessing the effectiveness and efficiency of asset management at strategic, tactical and operational levels.

- System audits: monitoring data in the asset management systems, as well as reviewing the output and how it is being used in order to determine whether it is fit for purpose.

- Compliance monitoring: monitoring contractual obligations.

Table 8-1 summarises the main monitoring activities:

Table 8-1 – Performance monitoring

PERFORMANCE MONITORING		WHAT TO MONITOR?	FREQUENCY	RESPONSIBLE
Strategic monitoring	Stakeholders	Stakeholders expectations	Annually	AM team
		Levels of service	Annually	AM team
	Asset management	Documentation and implementation of the asset management framework	Monthly	AM team
	Effectiveness of supporting processes	Risk management (including risk register)	Monthly/ Quarterly	Risk Managers (multiple levels)
Performance measures and targets	Alignment between levels of service and supporting performance targets	Asset management performance measures	Annually	AM team
		Service audits for the PFI levels of service	Annually	SCC
System audits	Asset data and information systems	Asset information requirements Asset information model	Monthly	AM team Data Manager Asset Leads
Compliance monitoring	Forward programme		Monthly	Contract/ Programme Manager
	Annual plans schemes		Monthly	
	Contract performance management		Monthly	Performance Manager

8.3 Performance reviewing

Regular reviews are vital to promote a continuous improvement of the service delivery. Table 8-2 summarises the main reviewing activities:

Table 8-2 – Performance reviewing

PERFORMANCE REVIEWING	WHAT TO REVIEW?	FREQUENCY	RESPONSIBLE
Performance requirements	Levels of service AM performance framework (measures and targets)	Annually	SCC
	Public Satisfaction Survey	Annually	Performance Manager
Enabling processes	Asset data strategy Asset data and information systems • Asset information requirements • Asset information model (database) • Data collection framework	Annually	AM team Data Manager Asset Leads
	Risk management policy and strategy Risk management framework • Risk register • Risk rating matrix • Risk treatments	Annually	Risk Managers (multiple levels)
Operational requirements	Forward works programme	Annually	Contract/ Programme Manager
	Annual works programme	Annually	
	Contract performance framework	Annually	Performance Manager
Corporate documents	Local Transport Plan (LTP)	5 years	SCC
	Emerging Local Development Framework	3 years	SCC
	AM Policy	Annually	AM team
	AM Strategy	Annually	
	Transport Asset Management Plan (TAMP)	Annually	
	Asset-Specific lifecycle plans	Annually	Asset Leads AM team

8.4 Management review

The Council's senior managers and the service providers conduct management reviews at frequent intervals. An example is the Operations Improvement Resolution Board (OIRB) that meets every two months and focuses on service delivery aspects. Overall, the reviews include:

- the results of internal audits and evaluations of compliance with applicable legal and other requirements;
- the results of stakeholders engagement and relevant communications, including complaints;
- records or reports on performance of the highway infrastructure;
- the extent to which the performance requirements have been met;
- follow-up actions from previous management reviews;
- changing circumstances, including changes in legislation, funding or other requirements related to the highway infrastructure;
- changes in technology; and
- comparisons of performance with similar organisations.

The outputs of management reviews are used to define a list of improvement actions and possible changes to:

- Asset management policy and strategy;
- Asset management performance requirements;
- Resources for highway infrastructure maintenance and support; and
- Other elements of the asset management framework.

8.5 Incentive Fund Scheme: Maturity Assessment

In December 2014 the Secretary of State for Transport introduced an Incentive Fund Scheme to reward local authorities who demonstrate they are delivering value for money in carrying out cost effective improvements. Similarly to other local authorities, Southampton City Council needed to complete a self-assessment questionnaire, in order to establish the share of the incentive fund it will be eligible for in coming years. The Incentive Fund Scheme is composed by 22 questions divided into the following sections (Table 8-3).

The self-assessment bands (or levels) are based on the maturity of the City Council in key areas, which are described in each question. The principle on which the levels of maturity for each question were determined is described below:

- Band 1: the City Council has a basic understanding of key areas and is in the process of taking it further.

- Band 2: the City Council can demonstrate that outputs have been produced that support the implementation of key areas that will lead towards improvement.

- Band 3: the City Council can demonstrate that outcomes have been achieved in key areas as part of a continuous improvement process.

Table 8-3 – Self-Assessment sections

SECTIONS	QUESTIONS	DESCRIPTION
Asset Management	1 to 8	Based on the recommendations of the UKRLG/ HMEP Highway Infrastructure Asset Management Guidance
Resilience	9 to 11	Based on reviews and guidance produced as a result of the impact on the highway network of a succession of severe events
Customer	12 to 14	Related to consulting and informing customers and stakeholders, namely about customer satisfaction, feedback and information
Benchmark and Efficiency	15 to 16	Related to the current procedures adopted for benchmarking in order to assess efficiency savings
Operational Delivery	17 to 22	Related to having effective operational service delivery mechanisms in order to provide a cost-effective highway maintenance service

This TAMP has a strong link with the Self-Assessment Questionnaire, especially with the questions in the Asset Management section (question 1 to 8). Table 8-4 demonstrates the links between these two instruments.

Table 8-4 – Relationship between Self-Assessment questionnaire and this TAMP

SELF-ASSESSMENT QUESTIONNAIRE		CORRESPONDENCE WITH THIS TAMP	
SECTION	QUESTIONS	SECTIONS	DESCRIPTION
Asset Management	1. Policy and Strategy	Sections 1 and 2	Public documents that align with the corporate vision and demonstrate the contribution asset management makes towards achieving this vision. They are vital to define the levels of service.
	2. Communications	Sections 1 and 2	Relevant information associated with asset management is actively communicated with relevant stakeholders in setting requirements, making decisions and reporting performance. Communication is vital to identify levels of service.
	3. Performance Management	Section 2	A performance management framework is a clear instrument accessible to key stakeholder and aims to support the asset management strategy.
	4. Asset Data Management	Section 3	All data supporting asset management is collected, stored and managed through organised processes in order to guarantee its quality, currency, appropriateness and completeness.
	5. Lifecycle Planning	Section 4	Lifecycle Plans report the approach to maintain the City's highway assets from construction to disposal. It is the prediction of future performance of the assets based on investment scenarios and maintenance strategies.
	6. Leadership and Commitment	-	-
	7. Competencies and Training	Section 8	*(see recommendations on section 8.7)*
	8. Risk Management	Section 7	The management of current and future risks associated with assets are strongly connected to asset management. This includes strategic, tactical and operational risks, as well as appropriate

			mitigation measures.

Figure 8.2 summarises the results of the Incentive Fund Self-Assessment mechanism (2017). The questions between 1 and 8 are specifically related to Asset Management and its maturity.

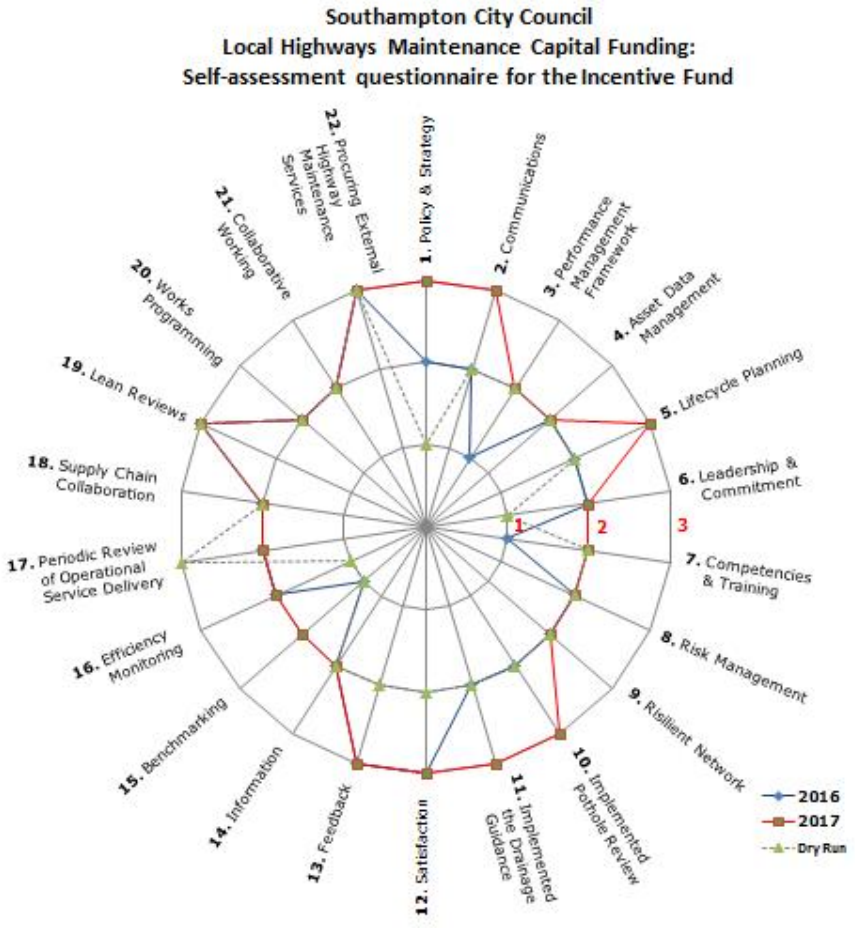


Figure 8.2 – Star chart: summary of the maturity assessment for the asset management questions

Table 8-5 – Self-Assessment: Incentive Fund and this TAMP

SELF-ASSESSMENT LEVELS		SECTION 1 - INTRODUCTION		
LEVEL	OVERALL MATURITY	SECTION 2 - LEVELS OF SERVICE AND PERFORMANCE MEASUREMENT		
Band 1	Has a basic understanding of key areas and is in the process of taking it forward.	No asset management policy and strategy is in place but there is an awareness that it should be developed. or A commitment to producing an asset management policy and strategy has been given, but it has not been approved.	No approach to communication has been developed. or The need for communication with key stakeholders is understood, however no relevant action has been undertaken. There is an intent to improve the organisation's ability to communicate asset management activities that affect stakeholders.	No reference to performance measures and monitoring linked to asset management. or Historical measures are being used as the only point of measuring and monitoring asset management performance. These are not being used to support asset management decisions or continuous improvement.
Band 2	Can demonstrate that outputs have been produced that support the implementation of key areas that will lead towards improvement.	An asset management policy and strategy has been developed, clearly documenting the links with corporate vision and other policy documents providing the "line of sight" for the asset management strategy. It has been endorsed by the Executive and published on the authority's website. This document must have been published or reviewed in the past 24 months.	All key stakeholders have been identified. Progress has been made in communicating with them around the benefits of and the reasons behind decisions that affect them. This should be supported by a procedure for communicating and, where appropriate, consulting on relevant issues on a regular basis that is transparent and understood.	A set of performance measures and a monitoring regime have been developed to support the implementation of the asset management strategy, the works programmes and other aspects that will support continuous improvement. This includes measures of stakeholder satisfaction, safety, serviceability and sustainability of the network. These are measured and reported on a regular basis and the approach is clearly documented, together with relevant action plans.
Band 3	Can demonstrate that outcomes have been achieved in key areas as part of a continuous improvement process.	In addition: Outcomes from investment in the asset are clearly identified in the strategy. Demonstration that the strategy has been used to develop the level of service for setting and measuring performance, and the outcomes from the strategy can be demonstrated. All staff and stakeholders can demonstrate knowledge and alignment to this policy and strategy. Regular asset management briefings with the senior decision-makers, and relevant staff.	In addition: Communication strategy is in place, its implementation is monitored and "lessons learnt" are incorporated. Stakeholder consultation information is used to develop levels of service. There is a transparent process for decision-making available to the public.	A complete performance management framework is in place. Performance targets are in place and link to investment levels. Stakeholders including road users, other groups and senior decision-makers have been liaised with in the development of customer focused measures and levels of service. Performance targets are aligned to financial requirements over the next 3 years and the funding required has been identified. Regular reviews by senior management are undertaken and improvement actions developed as a consequence. These have been aligned with senior decision-makers and the service delivery.
Correspondence with Self-Assessment Questions		Policy and Strategy*	Communication*	Performance Management
January 2017		3	3	2
January 2018 (target)		3	3	3

* These topics – policy and strategy and communication – are not fully covered in the scope of this TAMP; however, they are part of the definition of levels of service and performance measures.

Table 8-6 – Self-Assessment: Incentive Fund and this TAMP (cont.)

SELF-ASSESSMENT LEVELS		SECTION 3	SECTION 4	SECTION 7
LEVEL	OVERALL MATURITY	ASSET DATA AND INFORMATION MANAGEMENT	LIFECYCLE PLANS	RISK MANAGEMENT
Band 1	Has a basic understanding of key areas and is in the process of taking it forward.	There is no asset register. or Inventory data is held for major assets in an asset register, but is incomplete and not updated regularly.	There is an awareness of the need for an investment plan for major assets that can be achieved through lifecycle planning. or An approach to lifecycle planning is commencing but has not yet been implemented and adopted to support investment planning.	Senior decision-makers are not involved in the decisions to develop or implement asset management. Or Senior decision-makers have stated they are aware of the need to provide leadership in order to implement asset management but no credible plan is in place.
Band 2	Can demonstrate that outputs have been produced that support the implementation of key areas that will lead towards improvement.	Major assets have been identified and data is collected at specified frequencies. (This data is the minimum required to support asset valuation). Gaps in data are documented and action plans are in place to collect this data. An asset register is in place and accessible to all relevant asset management staff. There is evidence of regular documented audits of data coverage and quality.	An approach to lifecycle planning for carriageways has been adopted and investment is managed on this basis. Processes to apply appropriate analyses to determine the investment needed are in place, such as the HMEP Lifecycle Toolkit. Investment for future funding has been developed using scenarios in order to identify best return from investment. Lifecycle plans are used to support investment decisions, audited and checked.	The Executive has communicated its commitment to the implementation of asset management and endorsed the policy and strategy. They have provided resources, including finances, to deliver the programme of works. Senior decision-makers have identified and appointed the person responsible for leading asset management and developed a plan of action for the implementation of asset management.
Band 3	Can demonstrate that outcomes have been achieved in key areas as part of a continuous improvement process.	In addition: An information strategy has been developed and implemented that supports the asset management strategy and the performance management framework. The strategy should be appropriate for the authority and proportionate to the funding allocated for asset management. The information required to support performance management is documented, auditable and used to inform decisions.	In addition: The requirements of Level 2 for all major assets (not just carriageways. For carriageways: Performance targets link to the performance management framework. Lifecycle planning decisions are based on documented evidence of the performance of the asset. Deterioration profiles have been developed and are continuously improved. There is a fully optimised approach to lifecycle planning that can be demonstrated, together with the benefits of that optimal approach.	In addition: Senior decision-makers are involved in providing direction to asset management and are consulted on an appropriate basis through reviews. These reviews include all parties involved in the delivery of asset management, such as contractors, service providers and in-house teams.
Correspondence with Self-Assessment Questions		Asset Data Management	Lifecycle Planning	Risk Management
January 2017		2	3	2
January 2018 (target)		3	3	3

8.6 Improvement plan

During the development of this TAMP, a set of aspects with potential for improvement was identified. They are summarised in the table below.

Table 8-7 – Actions for consideration (2017-2018)

SECTION OF THIS TAMP	ACTION	IMPORTANCE	OWNER
Section 2: Measuring Performance	Develop performance indicators in relation to LoS	High	AM team/ SCC
	Define a strategy to assess the impact of climate change	Low	AM team
Section 3: Asset Data and Information Systems	Define asset information requirements Undertake a gap analysis to identify whether asset data is relevant, exists or has the required properties	Medium	Asset leads/ AM team
	Define asset information requirements Undertake a gap analysis to identify whether asset data is relevant, exists or has the required properties		
	Develop and implement data quality protocols	Medium	AM team
Section 4: Lifecycle Plans	- Conclude LCP: ▪ Structures - Develop remaining LCP ▪ Street lighting ▪ Road markings and street furniture - Inform and update LCP for each asset group	Very High	Asset leads/ AM team
	Improve asset valuation by using CIPFA guidance for all the asset types	Low	AM team
	Develop more robust asset deterioration models by undertaking more detailed analysis and using better quality data	Low	AM team
Section 5: Investment Strategies	Complete investment strategies based on the input of LCP	High	Asset leads/ AM team
	Define long term funding strategies, with a choice of service level options for each asset group	Medium	Asset leads/ AM team
Section 6: Service Delivery	Develop an integrated forward works programme to assist with the appraisal of whole life costing options for each asset group, of up to 10 years	Medium	Asset leads
Section 7: Risk Management	Link risk management procedures of all levels of corporate risk management	High	AM team/ OI team
	Implement a risk-based asset management approach for critical assets	Medium	Asset leads
Overall TAMP	Full TAMP is presented to the Council for approval	High	SCC
	Asset management maturity according to ISO 55000	Low	AM team/ SCC

8.7 Raising awareness of asset management principles within the organisation

One of the asset management cornerstones is collaboration. Collaboration between people involved in cross-discipline decision processes is vital to deliver an efficient and effective asset management strategy. To this end, a full commitment between practitioners must be ensured in order to be in line with asset management principles and contribute to enhance its maturity within the City Council. Therefore, the City Council should promote the engagement of key practitioners through collaborative activities. Some examples of key activities are provided below:

- Promote educational training (e-learning tool kits or other learning tools): an on-line, free to access example is the Asset Management E-Learning Toolkit; it provides consistency for Local Highway Authorities staff in learning the essential long term planning skills needed to help deliver better roads and more efficient services. The online training allows highway practitioners to learn in their own time, at their own pace, while generating a completion certificate in association with The Chartered Institution of Highways Transportation (CIHT).

- Promote cross-group sessions to engage practitioners into asset management practices and encourage common appreciation of best practice.

- Meet on a regular basis through workshops and group meetings to discuss current issues, promote the discussion of latest state-of-the-art and evaluate the possibility to address findings and recommendations into the existing asset management practices.

- Promote leadership presentations, share experiences and lessons learned practices in the sector as widely as possible.

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A APPENDICES

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