Asset Management Plan

Roads and Road Inventory

Maitland City Council

8 June 2022

The Power of Commitment

Executive summary

Maitland City Council's (MCC) asset portfolio has an estimated financial value of over $1.7B (in 2022$) across seven asset classes. These asset classes are:

- **Roads and Road Inventory** (all road types, kerb and gutter, paths, signs and traffic equipment)
- **Drainage** (trunk drains, culverts and conduits, floodgates and detention basins)
- **Bridges and Major Structures** (road bridges, pedestrian bridges, retaining walls, lookouts and wharfs)
- **Recreation** (parks, buildings, sporting facilities, buildings and open spaces)
- **Buildings** (all MCC owned and operated buildings)
- **Aquatic Centres** (Maitland and East Maitland Aquatic Centres)
- **Plant and Equipment** (plant and equipment used to maintain all MCC asset such as excavators and mowers)

Asset Management Plans (AM Plans) have been developed for each of these asset classes to demonstrate responsive management of assets and associated services, compliance with regulatory requirements, and communicate the level of funding necessary to provide the required levels of service for each asset class.

This AM Plan is for **Roads and Road Inventory assets.** The AM Plan outlines requirements to deliver expected services to the community including Levels of Service; Future Demand and Lifecycle Management activities, informing specific asset investment decisions.

This AM Plan builds upon the previous roads and road inventory plan (completed in 2017) as well as planning work defined in other MCC documents. This plan has been prepared by GHD in close consultation with MCC staff.

What council provides

MCC is expected to provide roads and associated assets to the community that are:

- Safe and functional
- Of appropriate quality
- Reliable
- Compliant with relevant legislation
- Delivered in a cost efficient and sustainable manner

To meet these expectations, MCC manages a range of road pavement and road inventory assets totalling more than 29,000 individual assets including more than **2,040 km** of roads, kerb, gutter and paths with a replacement value of **$950 M (2022$).** These are summarised as follows.

Table E.1 Asset inventory summary

Asset	Asset elements	Total Qty (estimated)	$ Cost breakdown (millions)	% Cost total
Roads	Arterial - Rural	4.2 km	$8.4	1%
	Arterial - Urban	10.5 km	$21.0	3%
	Collector - Rural	63.4 km	$40.8	4%
	Collector - Urban	90.8 km	$122.3	13%
	Distributor - Rural	23.1 km	$22.7	2%
	Distributor - Urban	34.1 km	$52.5	6%
	Local - Rural	147.6 km	$54.2	6%
	Local - Urban	386.0 km	$321.2	32%
	Roads (total)	**759.7 km**	**$642.48**	**68%**

Asset	Asset elements	Total Qty (estimated)	$ Cost breakdown (millions)	% Cost total
Kerb and Gutter		979.5 km	$192.68	20%
Paths	Footpaths, Cycleways/Shared pathways	301.9 km	$108.06	11%
Traffic Equipment and Ancillary Items		>350 of	$2.02	<1%
Signs		>8700	$2.9	<1%
Line Marking		>445 km	$0.2	<1%
Car Parks and Access Road		inc	inc	<1%
Lighting	Metered and solar	**37**	$1.8	<1%
Grand Total			**$950.1 M**	**100%**

MCC measures performance of these assets against technical levels of service targets including, ***Safety*** (zero incidents/accidents); ***Level of Service*** (operational conditions within a traffic stream, and their perception by motorists and/or passengers); and ***Fit for Purpose*** (compliance, condition).

Current asset status

Not every asset is of equal importance or presents the same failure risk. It is therefore important to know which assets are most critical to service delivery. Understanding which assets are critical, and why, helps to focus investment decisions.

Critical assets are those assets that have high **consequences or impacts** if they fail and a high **probability or likelihood** of failing. As an indication of probability of failure asset consumption of road and inventory assets has been calculated based on condition data available, asset age and opinions of appropriate MCC staff. This confirms that the majority of road and road inventory assets are within the first half of their expected life and therefore have a low probability of failure. This is reflective of the historic management strategies applied by MCC in management and maintenance of the MCC road network.

MCC's risk management framework has also been used to determine its risk exposure. This data highlights the following:

– From the more than 750 km of roads, approximately 80% (by length) are meeting or exceeding agreed condition targets. Based on the performance of current operational assets it is generally accepted by MCC that road and road inventory assets meet their "functional" level of service and require only standard operations and maintenance interventions.
– Less than **1%** of road and road inventory assets, are a "**very high**" business risk, with only **6%** of assets being a "**high**" business risk. This equates to a financial replacement estimate (in 2022$) of **~$61.6 M.**

Therefore, the majority of the road and road inventory asset class pose a level of risk that is acceptable to MCC.

Future demand

The Maitland Local Government Area is in a period of extraordinary population growth. Most recent population estimates from the Australian Bureau of Statistics for 2020/21 shows the population grew by 3.5%. These accelerated growth rates are predicted to continue for the next five to ten years, with Maitland's population expected to exceed 104,700 by 2041.

Our current growth rate is the fifth highest in NSW and the highest outside of Greater Sydney.
To accommodate this continued growing population, the majority (>90%) are expected to live in new greenfield developments, all of which require new MCC owned and operated assets (such as roads, drainage, paths, recreation etc). New greenfield developments have conservatively been estimated at around 700 new lots per year for the next 10 years.

From the anticipated growth estimated new road and road inventory assets to be constructed in capital works programs over the coming 10 years to meet this growth include 106 km of roads, 212 km of kerb and gutter and 191 km of footpath and cycleway. Future financial expenditure required to meet this growth as well as replace/renew the existing asset class averages ~$21 M per year over 10 years.

Sustaining the asset portfolio

The estimated cost over time to renew MCC's roads and road inventory assets to the target condition and level of service is shown in Figure E.1 below. As indicated by the horizontal line, the theoretical average annual cost to sustain this asset class (based on long term replacement cycles, asset age/condition and estimated growth) is estimated to be in the order of **$27.4 M** in 2022 dollars. Most of this reinvestment relates to roads assets which make up 67% of the total cost. This average annual cost includes capital works for new assets from growth and replacement of existing assets of around **$301 M** to be constructed/expended by 2032.

This information now provides a target for short term assessments – particularly with regards to priority assets identified and those that have reached the end of their estimated life. Risk exposure can be further reduced through applying appropriate risk reduction measures or obtaining more accurate condition data that confirms extending asset life is practical.

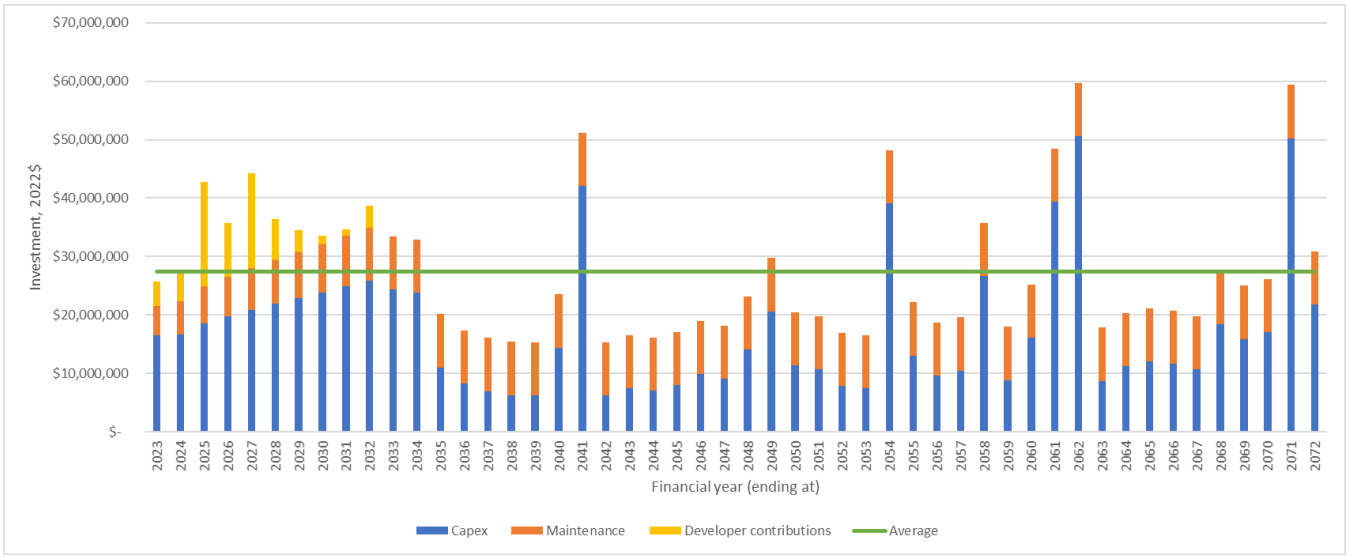

Figure E.1 Financial projection – Total

As roads assets make up the majority of this asset class, the long term re-investment need for roads only is highlighted separately below. This figure indicates that MCC needs to be reinvesting an average amount of approximately **$20.7 M** in its roads assets on an annual basis to sustain its existing and new assets from growth asset portfolio.

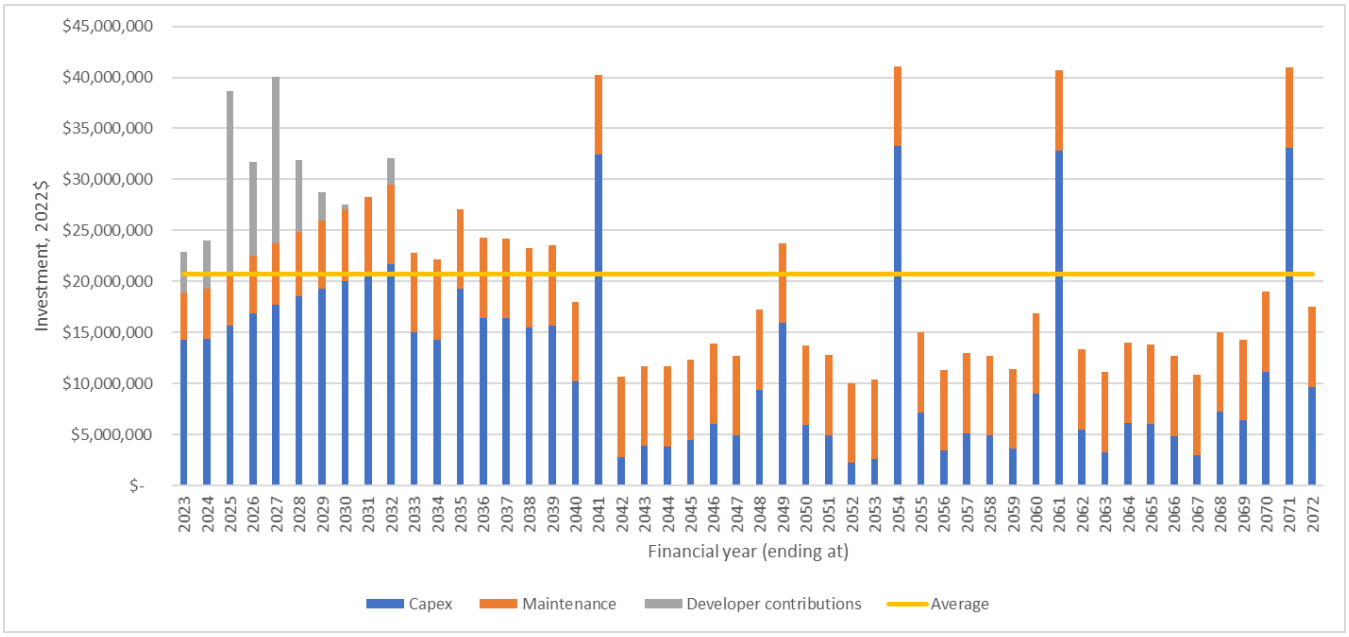

Figure E.2 Financial projection – Roads only

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1. Introduction

1.1 Asset portfolio

Maitland City Council's (MCC) asset portfolio has an estimated financial value of over $1.7B (in 2022$) across seven asset classes. These asset classes are:

- **Roads and Road Inventory** (all road types, kerb and gutter, paths, signs and traffic equipment).
- **Drainage** (trunk drains, culverts and conduits, floodgates and detention basins).
- **Bridges and Major Structures** (road bridges, pedestrian bridges, retaining walls, lookouts and wharfs).
- **Recreation** (parks, buildings, sporting facilities, buildings and open spaces).
- **Buildings** (all MCC owned and operated buildings).
- **Aquatic Centres** (Maitland and East Maitland Aquatic Centres).
- **Plant and Equipment** (plant and equipment used to maintain all MCC asset such as excavators and mowers).

Asset Management Plans (AM Plans) have been developed for each of these asset classes to demonstrate responsible management of assets and associated services, compliance with regulatory requirements, and communicate the level of funding necessary to provide the required levels of service for each asset class.

The AM Plans provide a rational framework to enable systematic and repeatable processes to manage costs, risks and levels of service. They attempt to identify expected future costs and assist in predicting future barriers to efficient and effective service delivery.

1.2 Content of this asset management plan

This AM Plan is for **Roads and Road Inventory assets.** MCC own and operate a local and regional road network consisting of 759 km of road pavement, 979 km of kerb and gutter, 302 km of footpaths and cycleways, and more than 350 traffic inventory assets (such as bus shelters, stops and seats).

The AM Plan outlines the general approach and methodology taken in preparing the Plan as well as discussing key outputs. The specific sections included in the AM Plan are as follows:

- ***Levels of service*** – specifies the services and levels of service to be provided by MCC.
- ***Future demand*** – how the growth of the Maitland region will impact on future service delivery and how this growth is to be met.
- ***Lifecycle management*** – how MCC are/will manage its existing and future assets to provide the required services.
- ***Financial summary*** – what funds are required to provide sustainable services.

1.3 Asset management framework

MCC's asset management policy, plans, strategies, tactics, and activities are part of an integrated, overarching *Asset Management Framework*. This framework defines the relationship between key asset management plans and business processes, and how they interact with MCC's broader corporate plans and activities to deliver the Community Strategic Plan and its service outcomes. The key elements of MCC's Asset Management Framework, and their inter-relationships, are shown in Figure 1.1.

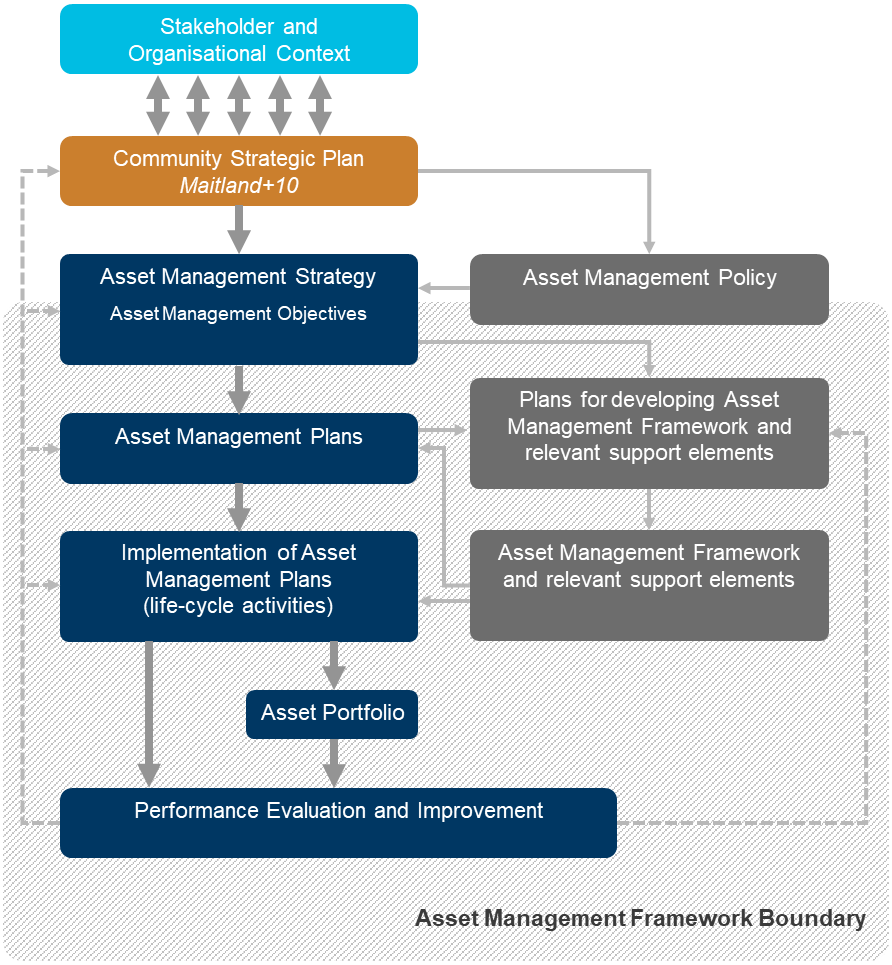

Figure 1.1 Asset management framework

AM Plans are a key element of this framework being a crucial link between city wide strategic asset management goals through to the implementation of tactical service delivery requirements. How the AM Plans relate to other MCC documents and planning outputs is illustrated in the figure below. The AM Plans are a central piece to the Asset Management Framework by consolidating (for each asset class) asset portfolio, master planning and lifecycle information to inform asset status and long term financial reporting.

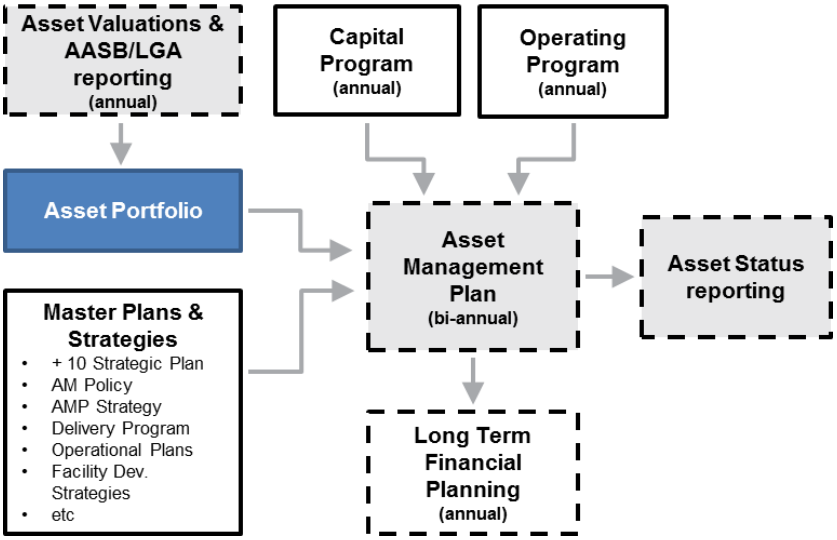

Figure 1.2 AM Plan relationship to other Maitland City Council documents

1.4 Asset management objectives

MCC is responsible for providing services relating to road pavement and road inventory to the community within the broader portfolio of Council assets. To support the inherent goal of meeting levels of service, MCC has adopted key infrastructure Asset Management Objectives and corresponding Tactics, all of which are relevant to this asset class. These objectives are:

- **Objective 1, Health and Safety:** To be a local government leader in how we effectively manage the health and safety risks related to how we use, operate and maintain our assets.
- **Objective 2, Community Focus:** Our asset portfolio supports the Maitland community's growing and changing demand for connectivity, recreational, sporting and community infrastructure and services.
- **Objective 3, Value for Money**: The life cycle management of our assets is sustainable, prioritised and optimised to deliver the right balance of cost, risk and service level outcomes.
- **Objective 4, Empowered and Engaged People**: Our people understand their role in delivering service outcomes and are empowered to consider their decisions and actions from a customer service perspective.
- **Objective 5, Growing Maintenance Maturity:** The maturing knowledge and understanding of our assets supports effective application of our condition and risk-based maintenance approach.
- **Objective 6, Project Delivery:** Our project delivery capability and capacity enable us to consistently meet the expectations and timeframes of our stakeholders.
- **Objective 7, Balanced Growth:** Our city retains its unique balance of heritage, urban, rural, natural character, amenity, lifestyle and physical assets while accommodating growth.
- **Objective 8, Economic Prosperity:** Our infrastructure and asset management practices support and enable the economic prosperity of our City.

1.5 Road and road Inventory service delivery program

To meet these objectives, assets are rated in terms of risk and criticality. Criticality assists lifecycle management decision making by defining which assets are most important to the service delivery program. To inform the MCC's service delivery needs, this AM Plan provides:

- Details of the community expectations (where available) and legislative/regulatory requirements.
- A discussion on the asset management implications from the growth of the Maitland region.
- Lifecycle management strategy recommendations (capital rehabilitation, replacement projects and/or maintenance works) commensurate with asset data available.
- Indications of long term sustainable funding amounts for maintaining adequate services.

1.6 Asset management data model

All asset management data reporting in this AM Plan is documented in an Excel-based Asset Management Planning data model, provided separately to this AM Plan. The logic in this model is based on lifecycle processes, asset condition data and assumptions documented in this AM Plan.

2. Levels of service

2.1 Introduction

One of the basic cornerstones of sound asset management is to provide the level of service that current and future communities want and are prepared to pay for. To achieve this, MCC needs to plan for the provision of desired service levels, for a sustainable cost, over the life span of its assets. Establishing levels of service requires knowledge of customers and stakeholders, and an understanding of their expectations and requirements in terms of road management and inventory services.

This section of the AM Plan covers the following:

– Customer research and expectations.
– Strategic and corporate goals relevant to levels of service.
– Legislative requirements.
– Current Levels of Service.
– Desired (Target) Levels of Service

2.2 Customer expectations

Understanding the customer's expectations are a key input into levels of service and prioritising works across multiple asset types. This understanding will be balanced against legislative requirements and the customers' ability/willingness to pay.

The specific community levels of service expectations are captured in the current Community Strategic Plan. The following table summarises the typical customer expectations that are considered in determining the level of service.

Table 2.1 Typical customer expectations for roads

Community LOS	Community expectation
Safety	Safe roads and appropriate speed limits are provided that minimise number of injuries and/or accidents.
Quality	Maintenance is undertaken regularly to ensure road safety and driveability. Appropriate driver comfort is considered in pavement condition.
Quantity	Roads have sufficient capacity to serve the communities current and future needs.
Reliability	Access to roads is unimpeded and sufficient detours are in place during road closures.
Cost Efficiency	Life cycle costs are managed effectively and efficiently to deliver services within known budget constraints.
Legislative Compliance	Compliance with all applicable legislation.
Sustainability	Long term plans are prepared and implemented to ensure services are delivered for future generations.

2.3 Asset Management Challenges

Within this and other strategic themes of the Community Strategic Plan are a number of challenges that must be confronted in order to achieve the desired community outcomes. These challenges, consistent with the Asset Management Strategy, are summarised as follows and influence outcomes of this AM Plan.

- **Growing and changing demand:** MCC is facing a significant population growth over the coming decades, with an estimated cumulative population growth of 35% over the next 20 years.
- **Aging infrastructure:** Many of MCC's existing assets are approaching the end of the expected lives. As such, their physical condition has deteriorated and will continue to deteriorate at an accelerated pace in the coming years.
- **Legislative Landscape:** The current legislative environment emphasises a need for local government to recognise the equitable recovery of costs from owning and operating infrastructure over the full lifecycle of assets.
- **Heritage Assets:** MCC has a significant number of heritage buildings and infrastructure dating from the early 1800's which present additional challenges and costs for the preservation and maintenance of our unique past.
- **Preserving and restoring natural assets:** The natural environment and unique character of the Hunter River floodplain are an important part of the Maitland's appeal to residents and visitors. In dealing with population growth and urban expansion it is essential that we not only preserve but increase our areas of natural vegetation and green open space.
- **Resilience and sustainability:** While the natural and riverine assets of our city are among its most appealing attributes, they bring with them risks including potential vulnerability to bushfires and floods. Our asset management decision making must be cognizant of these risks and seek to improve the resilience of our flood facilities and infrastructure in a sustainable way.
- **Improving delivery capability:** Across both our capital project and maintenance service delivery processes we have the opportunity to significantly improve our asset information, tools, business processes and skills, and in doing so increase our productivity, efficiency and the value for money of our services.

2.4 Legislative requirements

MCC has to meet many legislative requirements including Australian and State legislation and State regulations in day to day service delivery tasks. These include:

Table 2.2 Legislative requirements

Legislation	Objective/Intent
Local Government Act	Sets out roles, purpose, responsibilities and powers of local governments including the preparation of a long term financial plans supported by asset management plans for sustainable service delivery.
Roads Transport Act 2013	Consolidation of existing statutory provisions concerning road users, road transport and the improvement of road safety.
Roads Act 1993, including supplementary road regulations	Sets out role, purpose, responsibilities and powers with respect to roads.
Transport Administration act 1988	Sets out role, purpose, responsibilities and powers with respect to transport services.
Road Transport (Mass Loading and Access) Regulation 2005	To make provision with respect of: – The mass and loading of vehicles and combinations. – The conditions for access to roads of vehicles and combinations that are too large or too heavy to be allowed general road access. – The conditions under which oversize or over mass vehicles and combinations exempted from normal dimension or mass limits may travel on roads and road related areas.

Legislation	Objective/Intent
	– The use of intelligent transport systems to monitor compliance with conditions of concessions under this Regulation or the Act (Road Transport (General) Act 2005).
Austroads Standards and Guides	Provides comprehensive coverage of traffic management guidance for practitioners involved in traffic engineering, road design, town planning and road safety.
State-wide Mutual Best Practice Manual for Roads, 2012	Highlights the need to identify risks associated with the condition of the Council road network, consistent with AS/NZS ISO 3100:2009 Risk Management.
Manual of Engineering Standards (MoE's)	Manual of Engineering Standards are the engineering guidelines and drawings for major subdivision design and construction, and for individual development sites in the Maitland Local Government area.
Environmental Legislation	Responsible measures to protect environmental issues.
Occupational Health and Safety Act 2000 Occupational Health and Safety Regulation 2001 Work Health and Safety Act 2011	Defines responsibilities of employers and workers to ensure safety is maintained.

2.5 Common levels of service

2.5.1 Roads

For pavement related assets (such as roads and footpaths), MCC has adopted the Austroads Level of Service guidelines and framework. These guidelines define levels of service for roads as follows:

"Level of service is a qualitative measure describing operational conditions within a traffic stream, and their perception by motorists and/or passengers. A level of service definition generally describes these conditions in terms of factors such as speed and travel time, delay, density, freedom to manoeuvre, traffic interruptions, comfort and convenience, and safety."[1]

There are six levels of service, designated A to F, with level of service "A" representing the best operating condition (i.e. free-flow) and level of service "F" the worst (i.e. forced or breakdown flow). These levels of service form the basis of performance targets for the road network, which are inclusive of local, collector, distributor, arterial and commercial roads, as well as stand-alone car parks and access roads.

Definitions are as follows:

Table 2.3 Levels of service for roads

Level of Service Category	Definition
A	A condition of free-flow in which individual drivers are virtually unaffected by the presence of others in the traffic stream. Freedom to select desired speeds and to manoeuvre within the traffic stream is extremely high, and the general level of comfort and convenience provided is excellent.
B	In the zone of stable flow where drivers still have reasonable freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience is a little less than with level of service A.
C	Also in the zone of stable flow, but most drivers are restricted to some extent in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience declines noticeably at this level.
D	Close to the limit of stable flow and approaching unstable flow. All drivers are severely restricted in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience is poor, and small increases in traffic flow will generally cause operational problems.

[1] Austroads 2013, Guide to Traffic Management part 3: Traffic Studies and Analysis

Level of Service Category	Definition
E	Traffic volumes are at or close to capacity, and there is virtually no freedom to select desired speeds or to manoeuvre within the traffic stream. Flow is unstable and minor disturbances within the traffic stream will cause breakdown.
F	In the zone of forced flow, where the amount of traffic approaching the point under consideration exceeds that which can pass it. Flow breakdown occurs, and queuing and delays result.

2.5.2 Paths

Similar to the roads level of service, categories for paths are also defined by a similar A through F scale. These ratings form the basis of levels of service targets for the path network including footpaths, cycleways and shared pathways.

Table 2.4 Levels of services for paths

Level of Service Category	Definition
A	Pedestrians move in desired paths without altering their movements in response to other pedestrians. Walking speeds are freely selected, and conflicts between pedestrians are unlikely.
B	There is sufficient area for pedestrians to select walking speeds freely, to bypass other pedestrians, and to avoid crossing conflicts. Pedestrians begin to be aware of other pedestrians, and to respond to their presence when selecting a walking path.
C	Space is sufficient for normal walking speeds, and for bypassing other pedestrians in primarily unidirectional streams. Reverse-direction or crossing movements can cause minor conflicts, and speeds and flow rate are somewhat lower.
D	Freedom to select individual walking speed and to bypass other pedestrians is restricted. Crossing or reverse flow movements face a high probability of conflict, requiring frequent changes in speed and position. Friction and interaction between pedestrians are likely.
E	Virtually all pedestrians restrict their normal walking speed, frequently adjusting their gait. At the lower range, forward movement is possible only by shuffling. Space is not sufficient for passing slower pedestrians. Cross- or reverse flow movements are possible only with extreme difficulties. Design volumes approach the limit of walkway capacity, with stoppages and interruptions to flow.
F	All walking speeds are severely restricted, and forward progress is made only by shuffling. There is frequent, unavoidable contact with other pedestrians. Cross- and reverse-flow movements are virtually impossible. Flow is sporadic and unstable. Space is more characteristic of queued pedestrians than of moving pedestrian streams.

2.5.3 Function based levels of service

Assets with a relatively simplistic function within this asset class have levels of service defined as either “Functional” or “Not Functional”, meaning the asset in its current state does or does not achieve the original design intent of the asset. Achieving this design intent, or not, is based on one of the core failure modes defined in Section 4.3 of this plan (capacity, condition, financial efficiency, reliability).

Assets within this asset class where this level of service philosophy applies include:

– All kerb and gutter types
– All road signs
– Traffic equipment and ancillary items (such as bus shelters, guard rails, bollards, pedestrian refuges, medians and traffic islands)
– Street lighting

2.6 Target levels of service

To assist in prioritizing asset management activities over the spectrum of MCC’s roads and road inventory assets, the following target level of services categories have been defined by MCC and applied to the asset hierarchy. Target condition ratings have also been allocated, in accordance with MCC’s condition assessment process defined (with “1” being excellent condition and “5” being unserviceable).

These allocations were defined and agreed with applicable Council staff and managers.

Table 2.5 Target levels of service

Level 4	Level 5/6	Target Level of Service	Target Condition
Roads	Local – Rural	D - Limit of Stable Flow	3 - Significant maintenance required
	Local – Urban	D - Limit of Stable Flow	3 - Significant maintenance required
	Collector – Rural	C - Restricted Stable Flow	3 - Significant maintenance required
	Collector – Urban	C - Restricted Stable Flow	3 - Significant maintenance required
	Distributor	C - Restricted Stable Flow	2 - Minor maintenance required plus planned maintenance
	Arterial	B - Stable Flow	1 - Only planned maintenance required
	Industrial / Commercial	B - Stable Flow	2 - Minor maintenance required plus planned maintenance
Kerb and Gutter	All	Functional	3 - Significant maintenance required
Paths	Footpaths: AC, Bitumen, Gravel, Pavers, Sandstone	C - Restricted Stable Flow	3 - Significant maintenance required
	Footpaths: Concrete	C - Restricted Stable Flow	2 - Minor maintenance required plus planned maintenance
	Footpaths: Porphyry	B - Stable Flow	2 - Minor maintenance required plus planned maintenance
	Cycleways, Share pathways	B - Stable Flow	3 - Significant maintenance required
	Stairs and Ramps	Functional	3 - Significant maintenance required
Signs	Combo	Functional	4 - Significant renewal/upgrade required
	Custom	Functional	4 - Significant renewal/upgrade required
	Guidance and Wayfinding	Functional	4 - Significant renewal/upgrade required
	Regulatory	Functional	3 - Significant maintenance required
	Hazard Boards	Functional	3 - Significant maintenance required
	Chevron Alignment	Functional	3 - Significant maintenance required
	Warning	Functional	3 - Significant maintenance required
	Advisory	Functional	3 - Significant maintenance required
	Suburb Name Plinth	Functional	4 - Significant renewal/upgrade required

Level 4	Level 5/6	Target Level of Service	Target Condition
Traffic Inventory	Bus Shelter, Stops and Seats	Functional	2 - Minor maintenance required plus planned maintenance
	Fences and Gates	Functional	4 - Significant renewal/upgrade required
	Guard Rails and Barriers	Functional	2 - Minor maintenance required plus planned maintenance
	Traffic Bollards	Functional	4 - Significant renewal/upgrade required
	Bike Stands	Functional	5 - Unserviceable
	Roadside Bins	Functional	5 - Unserviceable
	Planters	Functional	5 - Unserviceable
	Speed Humps/Raised Thresholds	Functional	3 - Significant maintenance required
	Pedestrian Refuges	Functional	2 - Minor maintenance required plus planned maintenance
	Medians and Islands	Functional	2 - Minor maintenance required plus planned maintenance
	Roundabouts	Functional	2 - Minor maintenance required plus planned maintenance
Line Marking	Water born	As per road type	4 - Significant renewal/upgrade required
	Thermal	As per road type	4 - Significant renewal/upgrade required
Car Parks (stand-alone)	Base	D - Limit of Stable Flow	4 - Significant renewal/upgrade required
	Surface	D - Limit of Stable Flow	4 - Significant renewal/upgrade required
	Kerb and Gutter	Functional	4 - Significant renewal/upgrade required
	Signs	Functional	4 - Significant renewal/upgrade required
	Line marking	D - Limit of Stable Flow	4 - Significant renewal/upgrade required
	Footpaths	C - Restricted Stable Flow	4 - Significant renewal/upgrade required
Lighting	Street lighting – solar	Functional	3 - Significant maintenance required
	Street lighting - metered	Functional	3 - Significant maintenance required

2.7 Asset condition

In understanding levels of service as well as asset performance, MCC use a 1 to 5 condition rating scale (1 = excellent condition, 5 = poor condition) to set target levels of service, manage asset condition against this target as well as inform risk assessments in probability of failure estimates (discussed in section 4.7). These condition targets not only represent expected asset condition, but also the type and level of maintenance strategy to be applied.

Understanding the application of these conditional ratings as defined in this AM Plan can be complex and are primarily for the use of MCC's asset professionals to inform decision making. The following table aims to articulate how asset condition ratings/targeted are interpreted.

Table 2.6 Asset condition explained

Condition Rating	Maintenance Strategy	Maintenance Principles and Intervention level
1	Predictive Maintenance (Proactive)	– Proactive maintenance approach that uses condition monitoring and high frequency inspections during operation to detect possible failures and fixes them before it fails. – Higher cost of maintenance. – Low level of failures or defects and complaints expected from the community. – High frequency of inspections, condition monitoring and planned preventative maintenance. – Only tolerate normal preventative and planned maintenance interventions. – Maitland Park, Art Gallery, No.1 Sportsground and Arterial Roads.
2	Preventative / Planned Maintenance	– Type of proactive maintenance that keeps assets in good working order and reduces the need for major repairs. – Aims to limit failures to minor corrective maintenance levels only before intervention. – Lower cost than predictive maintenance. – Reduces high consequence failures. – Frequency of inspections lower than predictive, including monitoring condition and intervening when failures are still minor in nature (e.g. potholes). – Assets remain safe but we will tolerate a time frame to allow a defect to be repaired. – Distributor Roads, Library, Road and Pedestrian bridges.
3 and 4	Corrective Maintenance	– Maintenance is carried out following a detection of a failure or defect. This is where we make conscious decisions to allow 'safe' failures to occur and the cost for downtime and repair is known to be lower than a preventative or predictive maintenance program. – Lower cost than preventative maintenance. – Assessment made to let fail then fix within a nominated time frame. – Condition rating 3 - tolerate some major corrective maintenance before intervening. – Condition rating 4 – intentionally delay intervention to a point where major corrective maintenance needs to occur. – Plant and Equipment, Local roads, non-critical drainage assets.
5	Run to Failure (Breakdown Maintenance)	– Simplest maintenance strategy where assets are allowed to operate until they essential break or fail to operate as designed. – Asset receives little to no maintenance until failure or unsafe. – Strategy used mostly where asset failure has low safety or financial consequence. – Lowest cost intervention. – Other than basic maintenance like cleaning and visual inspection, nothing is done until the asset is not functional. – Bike racks, streetlights, garbage bins.

2.8 Known service deficiencies

Known and/or perceived service deficiencies affect the current and future performance of assets. The known deficiencies have been incorporated into this iteration of the AM Plan in the course of the assessment through the comparison of current level of service and condition against the above target levels of service and condition.

At this point in time MCC are not measuring and reporting on actual levels services for their assets. The method to transparently collect and report on service level performance of an asset is currently being assessed as part the ongoing improvement program and will be reported upon in future iterations of the AM Plan.

Service deficiencies of assets are currently captured through condition assessment data and/or a qualitative judgment from appropriate MCC staff. Forward looking maintenance strategies for assets that do not meet agreed condition targets are summarised below and included in the financial summary of this AM Plan.

– Of the **759 km** of road network (all road types), approximately **147 km or ~20%** do not currently meet condition targets.
– Of the **301 km** of paths (all types), **73 km** or **~24%** do not currently meeting condition targets.

Based on performance (of current operational assets) it is generally accepted by MCC that the assets meet their “functional” level of service and require only standard operations and maintenance interventions. Committed expenditure for these deficiencies or works programs is not included in this assessment, however these deficiencies will be considered when developing future capital works and maintenance programs along with asset priorities (based on criticality) provided within this report.

3. Future demand

3.1 Introduction

Future demand is a measure of how much customers will consume the services provided by the assets as well as additional (new) assets required to meet predicted population growth. Understanding and predicting demands enable asset managers to plan and identify the best way to meet future conditions.

MCC are currently in a period of extraordinary population growth, with 2020/21 growth rates estimated by the Australian Bureau of Statistics of 3.5% - a rate that is estimated as being maintained for the next five to ten years. This growth will see Maitland's population grow to more than 104,700 by 2041. This growth rate is the fifth highest in NSW and the highest outside of Greater Sydney. To house this continued growing population, the majority (>90%) are expected to live in new greenfield developments, all of which require new MCC owned and operated assets. New greenfield developments have conservatively been estimated at around 700 new lots per year for the next 10 years.

In addition to new assets, this growth will place a greater demand on parts of the existing asset base, potentially requiring additional (or different) maintenance strategies to be applied.

3.2 Demand forecasts

3.2.1 Forecast methodology

To enable proactive planning, development and management of additional demand on assets created by this growth, MCC have estimated growth projections for roads and road related assets based on the average growth rates experienced between the periods of 2017 and 2021. Combined with published growth rates available in annual reports as well as the estimated lot quantities defined in the development capacity survey completed by MCC's Planning and Environment group, annual asset growth rates were estimated and projected for a period of 10 years (2022 to 2032). This enabled the estimation of asset quantities and costs such as roads, kerb and gutter, footpaths, drainage structures etc, required to service the estimated greenfield lots as well as enhancements to existing assets.

For associated recreation land and drainage reserves, a five year growth rate was derived from an internal survey of dedicated land.

3.2.2 New assets from growth

New assets required to meet growth will be acquired from land developments and re-construction needed as a result of growth by developer contribution and Council budgets. Land Developments are managed by Councils development contribution plans (Sec 7.11) and conditions imposed with development approvals. Acquiring these new assets will commit council to fund ongoing operations and maintenance costs for the period that the service provided from the assets is required. These future costs are identified and considered in developing forecasts of future operating and maintenance costs.

From the anticipated growth, the following is a summary of estimated key road and road inventory assets to be constructed in capital works programs over the coming 10 years to meet this growth:

– 106 km of roads
– 212 km of kerb and gutter
– 191 km of footpath and cycleway

Based on the above methodology, the predicted trend for each of these asset types over the coming ten years is illustrated in Figure 3.1. Figure 3.2 and Figure 3.3 below. Beyond 2031, an additional growth of 2% per annum has also been included in the forecasts for this AM Plan to cater for long term regional growth.

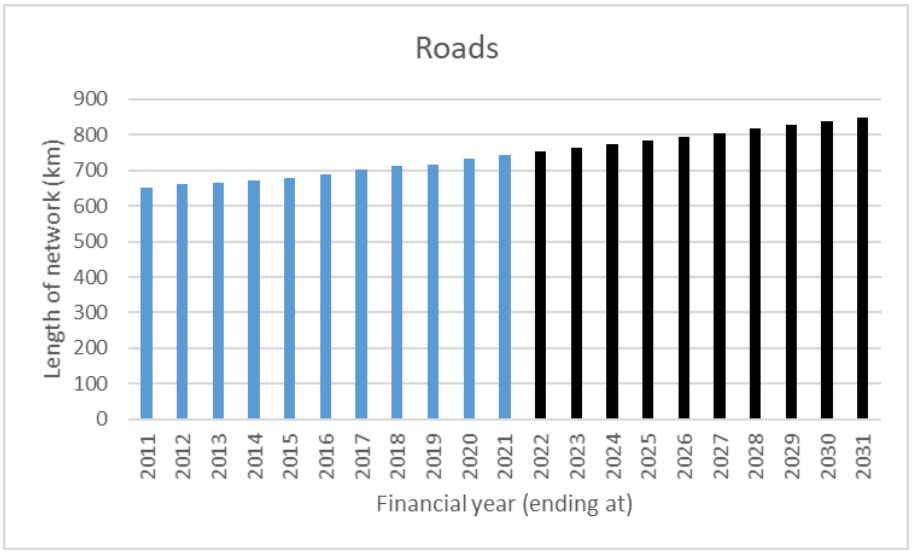

Figure 3.1 Estimated increase in roads

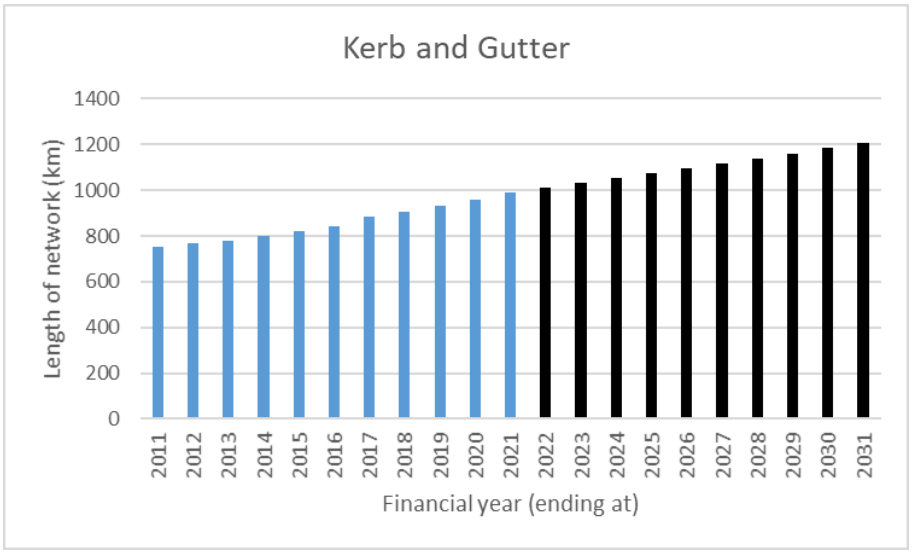

Figure 3.2 Estimated increase in kerb and gutter

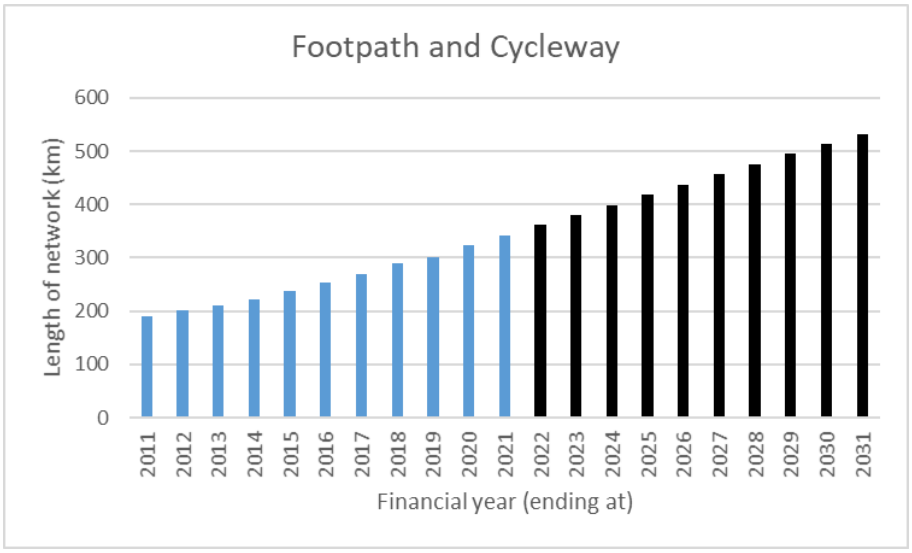

Figure 3.3 Estimated increase in footpaths and cycleways

3.3 Demand management

Consideration of the future growth and impact on services drives the planning and demand management strategies. Strategies to be implemented in this current cycle of asset management planning include resource management and maintenance.

3.3.1 Resources

To manage the surge in capital development over the next ten years, additional resources will be required. It is anticipated these additional resource requirements will be procured from both new MCC recruits as well as external resources such as design consultants, contract staff and third party construction contractors.

3.3.2 Maintenance

From these new assets will come additional operations and maintenance requirements on top of the existing asset base. Consistent with the tactics included in the Asset Management Strategy, maintenance tactics will be applied as defined in the Lifecycle management section of this AM Plan.

3.3.3 Financial Impacts: Capital

To meet the needs of this growth capital investment is required. This includes constructing the identified new assets from growth as well as capital expenditure required to renew or replace ageing assets within the existing asset portfolio.

Table 3.1 summarises capital investment requirements for this asset class, which is consistent with MCC's current Long Term Financial Plan. Over the ten-year period, this investment estimate is **$212 M** (an average of **$21.2 M** per year).

3.3.4 Financial Impacts: Developer contributions

In addition to these capital costs there are additional developer contributions for assets to be constructed as part of the greenfield subdivision developments, specifics of which are yet to be defined. Table 3.2 summarises capital investment requirements for this asset class. Over the ten-year period, this investment estimate is **$90 M** (an average of **$8.9 M** per year).

3.3.5 Financial impacts: Maintenance

Based on the above demands, additional maintenance expenditure will be required. Table 3.3 summarises MCC's estimated maintenance expenditure necessary to maintain levels of service for new road and road inventory assets from growth over the next ten years as well as the existing road and road inventory asset class. Note that these estimates are included in MCC's current Long Term Financial Plan.

Table 3.1 Capital estimated expenditure including new assets from growth 2022 to 2032

	FY 2022/23	FY 2023/24	FY 2024/25	FY 2025/26	FY 2026/27	FY 2027/28	FY 2028/29	FY 2029/30	FY 2030/31	FY 2031/32	TOTAL
Roads	$14,252,000	$14,379,000	$15,700,000	$16,826,000	$17,714,000	$18,504,000	$19,253,000	$20,030,000	$20,834,000	$21,669,000	**$179,161,000**
Footpaths and Cycleways	$1,430,000	$1,430,000	$1,906,000	$1,987,000	$2,126,000	$2,270,000	$2,421,000	$2,580,000	$2,744,000	$2,916,000	**$21,810,000**
Traffic Facilities and Pavement Markings	$830,000	$830,000	$918,000	$990,000	$1,057,000	$1,118,000	$1,172,000	$1,217,000	$1,263,000	$1,311,000	**$10,706,000**
Total	**$16,512,000**	**$16,639,000**	**$18,524,000**	**$19,803,000**	**$20,897,000**	**$21,892,000**	**$22,846,000**	**$23,827,000**	**$24,841,000**	**$25,896,000**	**$211,677,000**

Table 3.2 Capital estimated expenditure for developer contribution works 2022 to 2032

	FY 2022/23	FY 2023/24	FY 2024/25	FY 2025/26	FY 2026/27	FY 2027/28	FY 2028/29	FY 2029/30	FY 2030/31	FY 2031/32	TOTAL
Roads	$4,075,619	$4,799,382	$17,802,065	$9,217,475	$16,295,667	$7,038,572	$2,759,866	$393,332	-	$2,576,465	**$64,958,443**
State owned roads under the care of MCC	$414,490	$9,945,425	$5,987,112	$1,341,380	-	-	-	$2,815,064	-	-	**$20,503,471**
Footpaths and cycleways	-	-	-	-	-	-	$1,100,035	$1,122,036	$1,141,729	$1,164,563	**$4,528,363**
Total	**$4,490,109**	**$14,744,807**	**$23,789,177**	**$10,558,855**	**$16,295,667**	**$7,038,572**	**$3,859,901**	**$4,330,432**	**$1,141,729**	**$3,741,028**	**$89,990,277**

Table 3.3 Maintenance estimated expenditure 2022 to 2032

	FY 2022/23	FY 2023/24	FY 2024/25	FY 2025/26	FY 2026/27	FY 2027/28	FY 2028/29	FY 2029/30	FY 2030/31	FY 2031/32	TOTAL
Roads	$4,612,000	$4,866,000	$5,131,000	$5,658,000	$6,061,000	$6,381,000	$6,718,000	$7,073,000	$7,447,000	$7,840,000	**$61,787,000**
Roads other	$1,712,000	$1,784,000	$1,859,000	$1,937,000	$2,018,000	$2,102,000	$2,190,000	$2,282,000	$2,377,000	$2,476,000	**$20,737,000**
Kerb and Gutter	$452,000	$584,000	$775,000	$821,000	$868,000	$918,000	$971,000	$1,026,000	$1,083,000	$1,143,000	**$8,641,000**
Footpaths and cycleways	$903,000	$1,091,000	$1,287,000	$1,341,000	$1,397,000	$1,455,000	$1,516,000	$1,579,000	$1,645,000	$1,714,000	**$13,928,000**
Total	**$7,679,000**	**$8,325,000**	**$9,052,000**	**$9,757,000**	**$10,344,000**	**$10,856,000**	**$11,395,000**	**$11,960,000**	**$12,552,000**	**$13,173,000**	**$105,093,000**

4. Lifecycle management

4.1 Introduction

This section defines assets owned (including future new assets from growth) and broad plans required to manage and operate the assets at the agreed levels of service (defined in Section 2) while optimising life cycle costs. This section includes:

– Asset details and age profiles
– Maintenance and Renewal Planning
– Asset Lifecycle Activities and Cost Data
– Asset Failure Modes and Consumption Estimates
– Asset Risk Data and Risk Exposure Estimates
– Lifecycle Management Plans

Lifecycle management strategies and tactics, consistent with MCC's AM Strategy are also highlighted throughout this section.

4.2 Pavement management system (roads only)

To support lifecycle decision making, MCC using the SMEC Pavement Management System (PMS). The PMS is intended to help define an appropriate works program to maximise the long-term performance of the road network based on MCC specific treatment and funding strategies. Much of this lifecycle management plan is based on data from the PMS.

To manage the lifecycle of a road from construction to re-construction, the PMS is generally based on the cycles of reseal/resurfacing and insitu pavement rehabilitation. The PMS supports MCC staff in balancing these cycles throughout the asset's lifecycle.

4.3 Background data

4.3.1 Asset hierarchy

Asset information is needed to support decision making. The asset hierarchy provides the framework for segmenting MCC's roads and road inventory into appropriate classifications to assist with lifecycle planning and management. The asset hierarchy used for this AM Plan is shown below. This hierarchy is "rolled down" to additional levels in supporting data.

Table 4.1 Asset hierarchy

Level 1	Level 2	Level 3	Level 4	Level 5	Level 6
Roads and Road Inventory	Street Name	Section/ID	Roads	Local – Rural	Base/Surface
				Local – Urban	Base/Surface
				Collector – Rural	Base/Surface
				Collector – Urban	Base/Surface
				Distributor	Base/Surface
				Arterial	Base/Surface
				Commercial/Industrial	Base/Surface
	Street Name	Section/ID	Kerb and Gutter	Type (e.g. Roll kerb, mountable, barrier, dish, elsholz etc)	Material (e.g. bluestone, concrete, sandstone)

Level 1	Level 2	Level 3	Level 4	Level 5	Level 6
	Street Name	Section/ID	Paths	Footpaths	Material (e.g. AC, bitumen, concrete, gravel, pavers, porphyry, sandstone)
				Cycleways and Shared Pathways	
				Stairs and ramps	
	Street Name	Section/ID	Signs	Category (e.g. combo, custom, guidance, regulatory, hazard, warning, etc)	Sign Type (e.g. Give way, Stop, One Way etc.)
	Street Name	Section/ID	Traffic Equipment and Ancillary Items	Bus shelters, stops and seats	Type (e.g. roll top shelter, box shelter, seat only etc)
				Fences and gates / Guard rails and barriers / traffic bollards / bike stands / roadside bins / planters / raise thresholds / pedestrian refuges / medians / roundabouts / trees / median gardens	
	Street Name	Section/ID	Line Marking	Waterborne / Thermoplastic / Specials	
	Street Name	Section/ID	Car Parks (stand-alone) and Access Roads	Base / Surface Kerb and Gutter Signs Line Marking Footpaths	
	Street Name	Section/ID	Lighting	Solar / Metered	

4.3.2 Asset information and targets

At an appropriate level of the hierarchy, asset information and targets are assigned. This assists in deriving the Maximum Potential Life of an asset and the subsequent Effective Remaining Life. The Maximum Potential Life (MPL) is the time from installation to replacement, with typical maintenance and refurbishment activities taking place during this time frame.

Within the asset hierarchy, the following is allocated in addition to MPL:

– Target level of service (LOS) (between “A and F” as defined in Section 2.6).
– Target condition (between “1 and 5” as defined in Section 2.6 and Table 4.2).
– Consequence of failure (CoF) (between “C1 and C5” as defined in Section 4.7.3 and Table 4.29).

MPL, level of service, condition and consequence of failure figures assigned to assets are aligned to industry experience and are agreed/confirmed with MCC staff and managers. Where required, MCC staff have provided judgement (or exception) figures that override these targets. These are summarised in the following table:

Table 4.2 Asset lifecycle information

Level 4	Level 5	Level 6	MPL (years)	Target LOS	Target Condition	CoF Rating
Roads	Local - Rural	Base	50	D - Limit of Stable Flow	3 - Significant maintenance required.	1
		Surface	20	D - Limit of Stable Flow	3 - Significant maintenance required.	1
	Local - Urban	Base	50	C - Restricted Stable Flow	3 - Significant maintenance required.	2
		Surface	15	C - Restricted Stable Flow	3 - Significant maintenance required.	1
	Collector - Rural	Base	40	C - Restricted Stable Flow	3 - Significant maintenance required.	3
		Surface	15	C - Restricted Stable Flow	3 - Significant maintenance required.	2
	Collector - Urban	Base	30	C - Restricted Stable Flow	3 - Significant maintenance required.	3
		Surface	15	C - Restricted Stable Flow	3 - Significant maintenance required.	2
	Distributor	Base	30	C - Restricted Stable Flow	2 - Minor maintenance required plus planned maintenance	4
		Surface	10	C - Restricted Stable Flow	2 - Minor maintenance required plus planned maintenance	4
	Arterial	Base	30	B - Stable Flow	1 - Only planned maintenance required	4
		Surface	10	B - Stable Flow	1 - Only planned maintenance required	4
	Commercial / Industrial	Base	30	B - Stable Flow	2 - Minor maintenance required plus planned maintenance	4
		Surface	15	B - Stable Flow	2 - Minor maintenance required plus planned maintenance	4
Kerb and Gutter	Roll Kerb	Bluestone	100	Functional	3 - Significant maintenance required.	3
	Mountable	Concrete	60	Functional	3 - Significant maintenance required.	3
	Barrier	Sandstone	100	Functional	3 - Significant maintenance required.	3
	Dish		60	Functional	3 - Significant maintenance required.	3
	Edge Strip		60	Functional	3 - Significant maintenance required.	3
	Kerb		60	Functional	3 - Significant maintenance required.	3
	Gutter		60	Functional	3 - Significant maintenance required.	3
	Integral Drainage Kerbs		60	Functional	3 - Significant maintenance required.	3
	Elsholz Drainage Kerbs		60	Functional	3 - Significant maintenance required.	3
	Gutter Bridges		60	Functional	3 - Significant maintenance required	3

Level 4	Level 5	Level 6	MPL (years)	Target LOS	Target Condition	CoF Rating
Paths	Footpaths	AC	30	C - Restricted Stable Flow	3 - Significant maintenance required.	4
		Bitumen	20	C - Restricted Stable Flow	3 - Significant maintenance required.	4
		Concrete	60	C - Restricted Stable Flow	2 - Minor maintenance required plus planned maintenance	4
		Gravel	10	C - Restricted Stable Flow	3 - Significant maintenance required.	4
		Pavers	50	C - Restricted Stable Flow	3 - Significant maintenance required.	4
		Porphyry	75	B - Stable Flow	2 - Minor maintenance required plus planned maintenance	4
		Sandstone	50	C - Restricted Stable Flow	3 - Significant maintenance required.	4
	Cycleways/ Shared pathways		60	B - Stable Flow	3 - Significant maintenance required.	4
	Stairs and ramps		60	Functional	3 - Significant maintenance required.	3
Signs	Combo	Street Name	15	Functional	4 - Significant renewal/upgrade required	1
	Custom	Intersection Direction	15	Functional	4 - Significant renewal/upgrade required	1
	Guidance and Wayfinding	etc.	15	Functional	4 - Significant renewal/upgrade required	3
	Vehicle Activated		15	Functional	4 - Significant renewal/upgrade required	4
	Regulatory		15	Functional	3 - Significant maintenance required.	4
	Hazard Board		15	Functional	3 - Significant maintenance required.	4
	Chevron Alignment		15	Functional	3 - Significant maintenance required.	4
	Warning (yellow)		15	Functional	3 - Significant maintenance required.	4
	Advisory		15	Functional	3 - Significant maintenance required.	4
	Suburb Name Plinth		15	Functional	4 - Significant renewal/upgrade required	2
Traffic Equipment and Ancillary Items	Bus Shelters, Stops and Seats	Roll Top Shelter	30	Functional	2 - Minor maintenance required plus planned maintenance	4
		Box Shelter	30	Functional	2 - Minor maintenance required plus planned maintenance	4
		Seat only	20	Functional	3 - Significant maintenance required.	2
		Standard Slab only	60	Functional	3 - Significant maintenance required.	2
		Plinth Sign	15	Functional	3 - Significant maintenance required.	2

Level 4	Level 5	Level 6	MPL (years)	Target LOS	Target Condition	CoF Rating
	Fences and Gates		30	Functional	4 - Significant renewal/upgrade required.	2
	Guard Rails and Barriers		50	Functional	2 - Minor maintenance required plus planned maintenance	4
	Traffic Bollards		30	Functional	4 - Significant renewal/upgrade required.	2
	Bike Stands		20	Functional	5 - Unserviceable	1
	Roadside Bins		30	Functional	5 - Unserviceable	1
	Planters		50	Functional	5 - Unserviceable	1
	Speed Humps/Raised Thresholds		30	Functional	3 - Significant maintenance required.	3
	Pedestrian Refuges		60	Functional	2 - Minor maintenance required plus planned maintenance	4
	Medians and Islands		60	Functional	2 - Minor maintenance required plus planned maintenance	4
	Roundabouts		60	Functional	2 - Minor maintenance required plus planned maintenance	4
Line Marking	Waterborne		3	as per road type	as per road type	as per road type
	Thermoplastic		6	as per road type	as per road type	as per road type
	Specials		6	as per road type	as per road type	as per road type
Car Parks and Access Roads	Base		50	D - Limit of Stable Flow	4 - Significant renewal/upgrade required	2
	Surface		15	D - Limit of Stable Flow	4 - Significant renewal/upgrade required	2
	Kerb and Gutter		50	C - Restricted Stable Flow	4 - Significant renewal/upgrade required	2
	Signs		15	C - Restricted Stable Flow	4 - Significant renewal/upgrade required	2
	Line Marking		15	B - Stable Flow	4 - Significant renewal/upgrade required	2
	Footpath		50	C - Restricted Stable Flow	4 - Significant renewal/upgrade required	2
Lighting	Street lighting - solar		20	functional	3 - Significant maintenance required.	4
	Street lighting - metered		20	functional	3 - Significant maintenance required.	4

4.4 Asset profiles

4.4.1 Asset inventory and replacement costs

To focus need for investments, it is helpful to understand the number of assets and replacement value of assets against the hierarchy. The roads and road inventory asset class is the largest of MCC's asset classes in both quantity and value with an estimated total replacement value (in 2022$) of approximately **$950 M** including:

- ~**760 km** of roads (including arterial, collector, distributor and local roads, inclusive of line marking).
- **~980 km** of kerb and gutter of varying types such as standard kerb, roll kerb, sandstone and edge strips.
- **~302 km** of footpaths, cycle ways and shared pathways.
- **>350** individual traffic equipment and ancillary assets (such as bus shelters, roundabouts, and roadside barriers).

The breakdown of these replacement costs (in percentage and $) is illustrated in the following table and figures. Note that replacement values included in this AM Plan are based on the valuations completed by MCC 2022 and other historical cost data (inflated to 2022 dollars). This data illustrates that the road network represents more than two thirds of this asset class.

Table 4.3 Asset inventory summary

Asset	Asset elements	Total Qty (estimated)	$ Cost breakdown (millions)	% Cost total
Roads	Arterial - Rural	4.2 km	$8.4	1%
	Arterial - Urban	10.5 km	$21.0	3%
	Collector - Rural	63.4 km	$40.8	4%
	Collector - Urban	90.8 km	$122.3	13%
	Distributor - Rural	23.1 km	$22.7	2%
	Distributor - Urban	34.1 km	$52.5	6%
	Local - Rural	147.6 km	$54.2	6%
	Local - Urban	386.0 km	$321.2	32%
	Roads (total)	**759.7 km**	**$642.48**	**68%**
Kerb and Gutter		979.5 km	$192.68	20%
Paths	Footpaths, Cycleways/Shared pathways	301.9 km	$108.06	11%
Traffic Equipment and Ancillary Items		>350 of	$2.02	<1%
Signs		>8700	$2.9	<1%
Line Marking		>445 km	$0.2	<1%
Car Parks and Access Road		inc	inc	<1%
Lighting	Metered and solar	**37**	$1.8	<1%
Grand Total			**$950.1 M**	**100%**

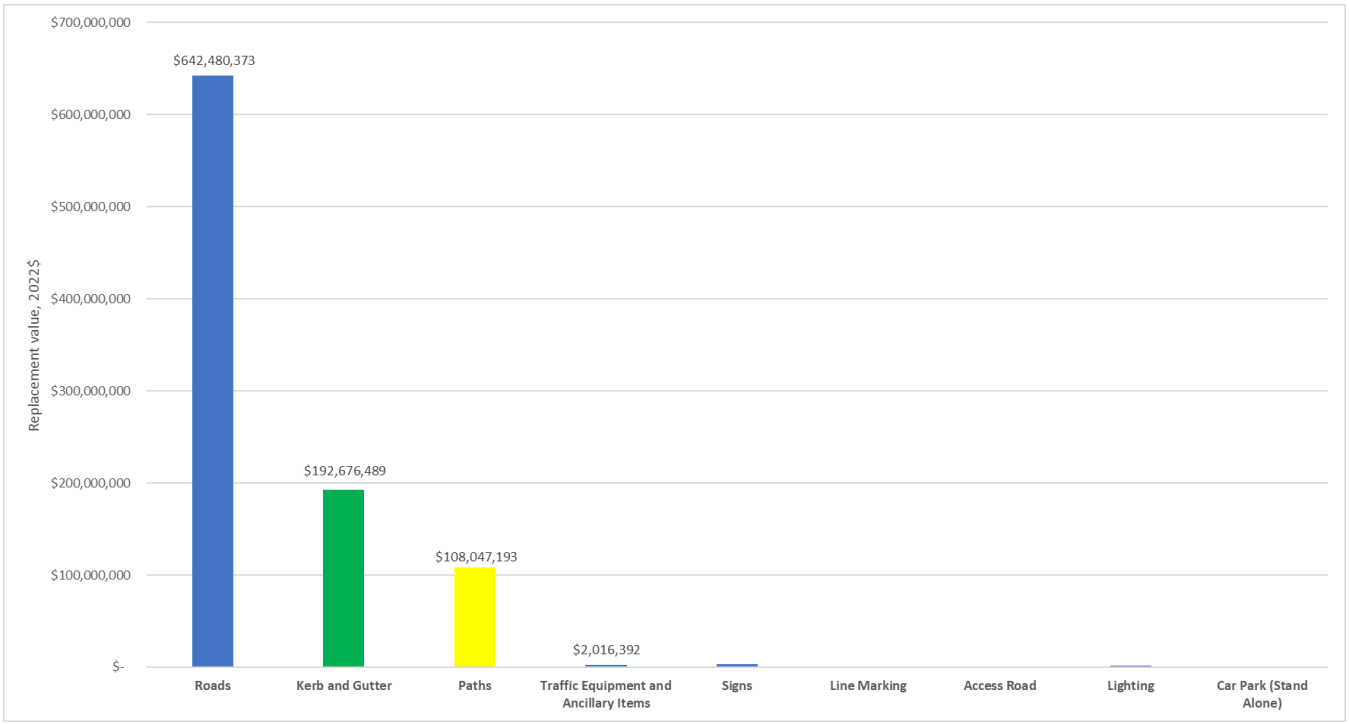

Figure 4.1 Replacement costs: Total

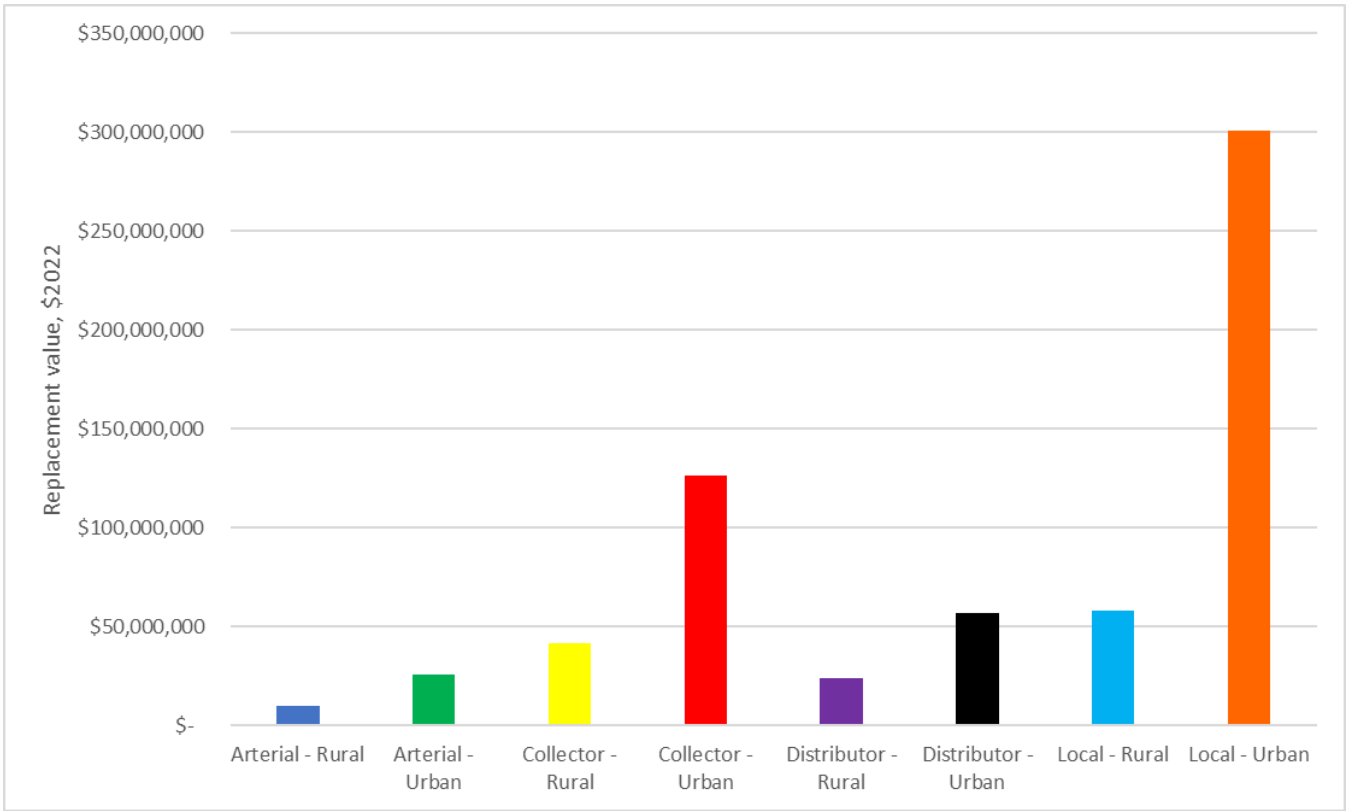

Figure 4.2 Replacement costs: Roads, by road type

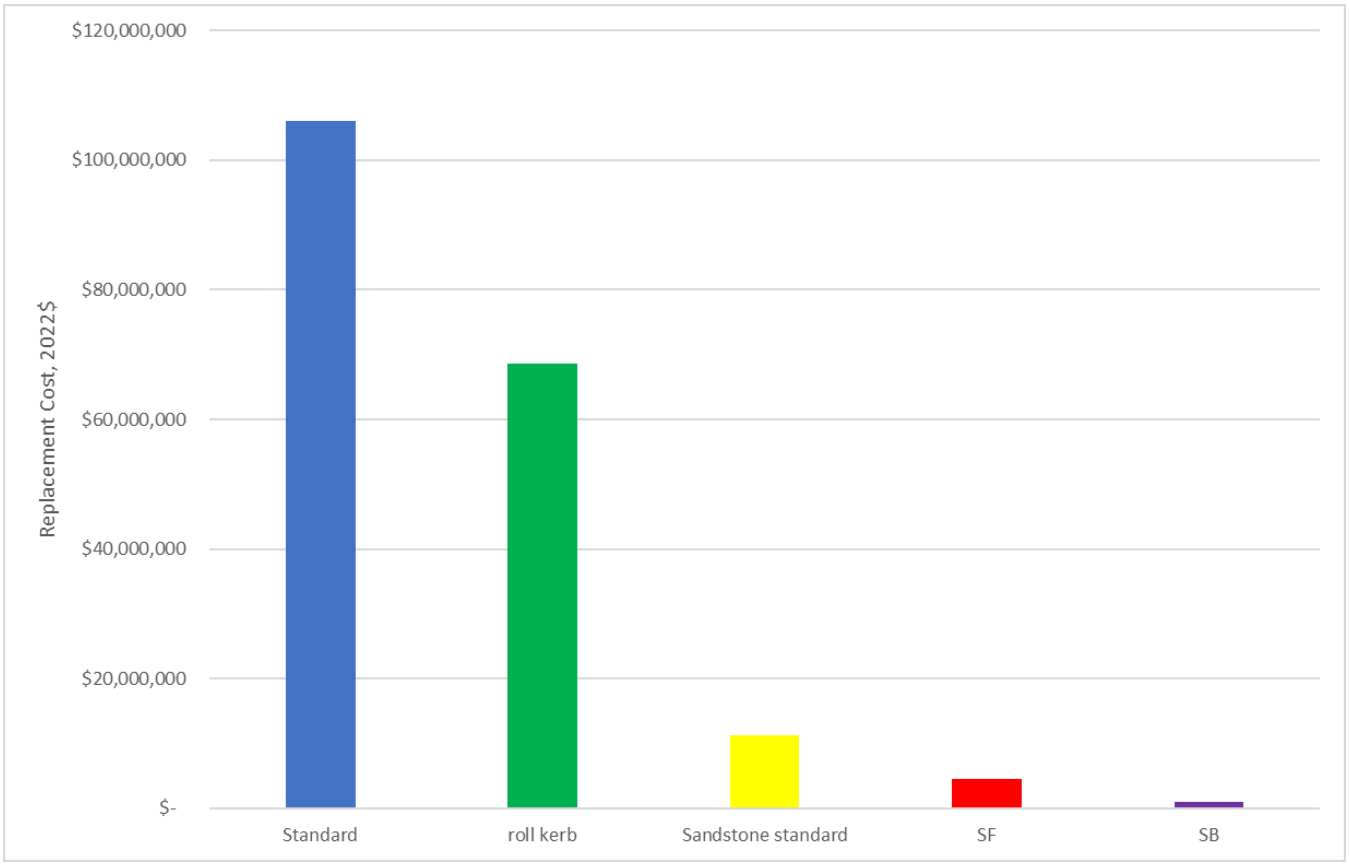

Figure 4.3 Replacement costs: Kerbs and gutters, by type

4.4.2 Installation profile of assets

To assist MCC with asset management decision making including future funding needs analysis, it is helpful to understand the installation profile of the asset portfolio. The following graphs show the replacement value of the assets by year of installation, in 2022 dollar value. This indicates that the majority of MCC road and road inventory assets have been constructed (or renewed with scheduled upgrades) within the last 20 years. Note the peak of installation in the year 1980 is based on this year being used as a default year of installation for assets where actual install year is unknown.

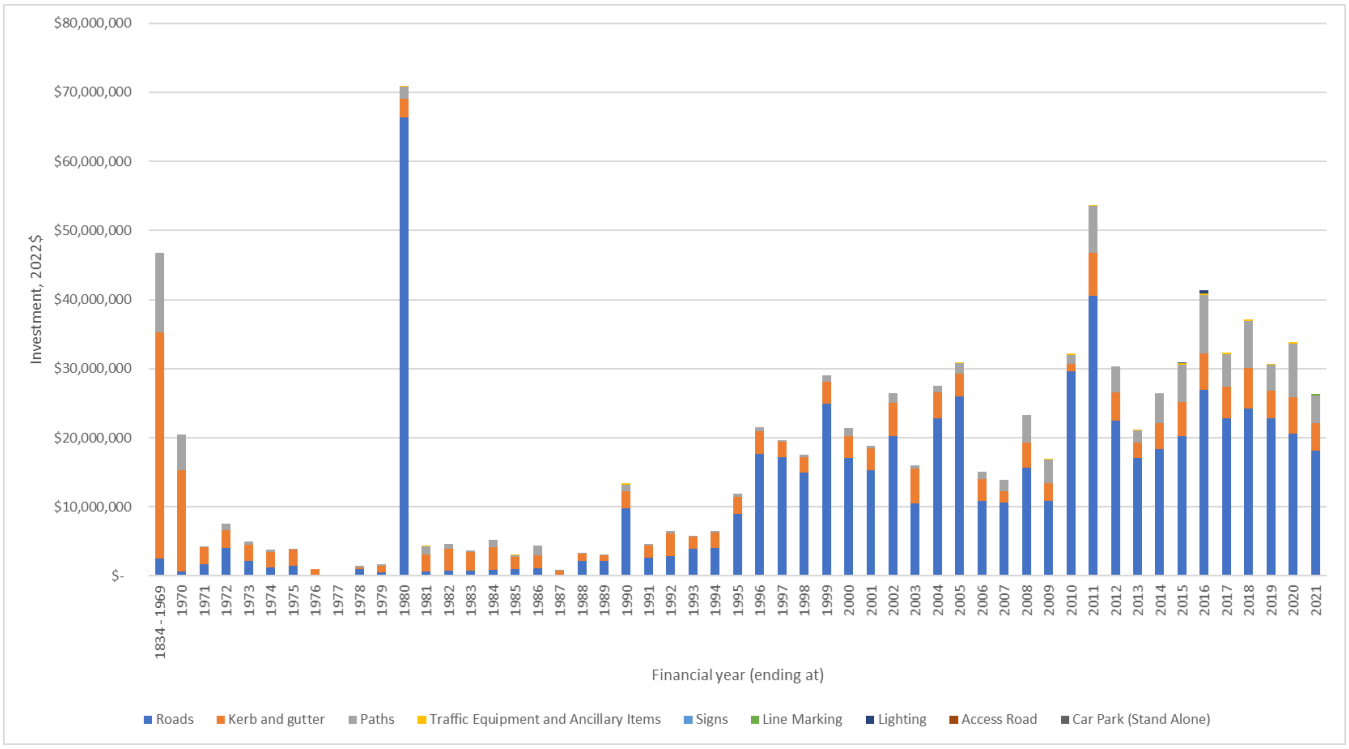

Figure 4.4 Installation profile: Total

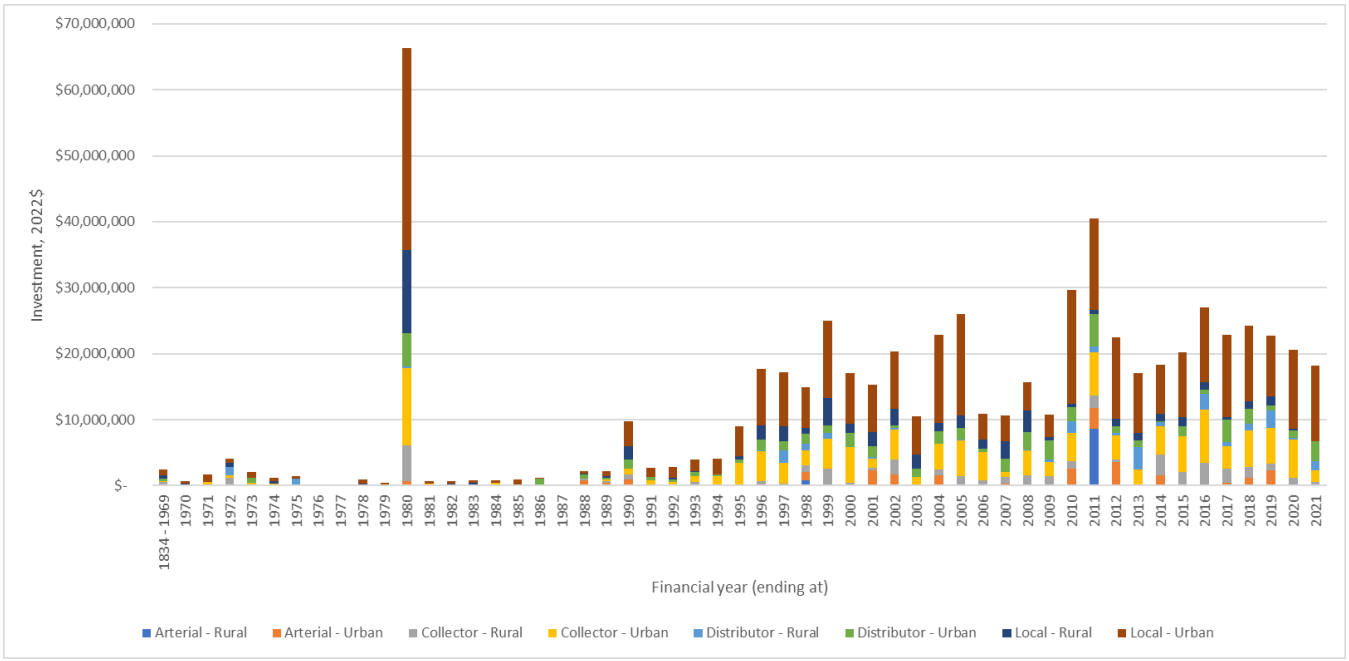

Figure 4.5 Installation profile: Roads

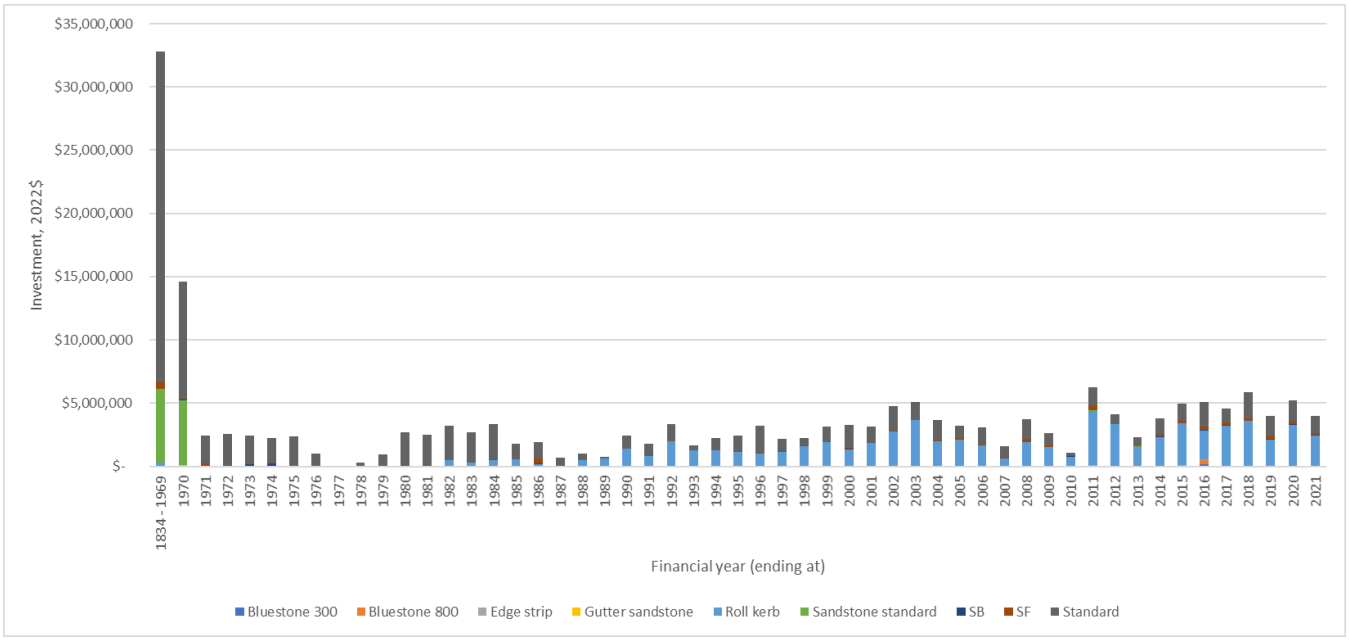

Figure 4.6 Installation profile: Kerbs and gutters

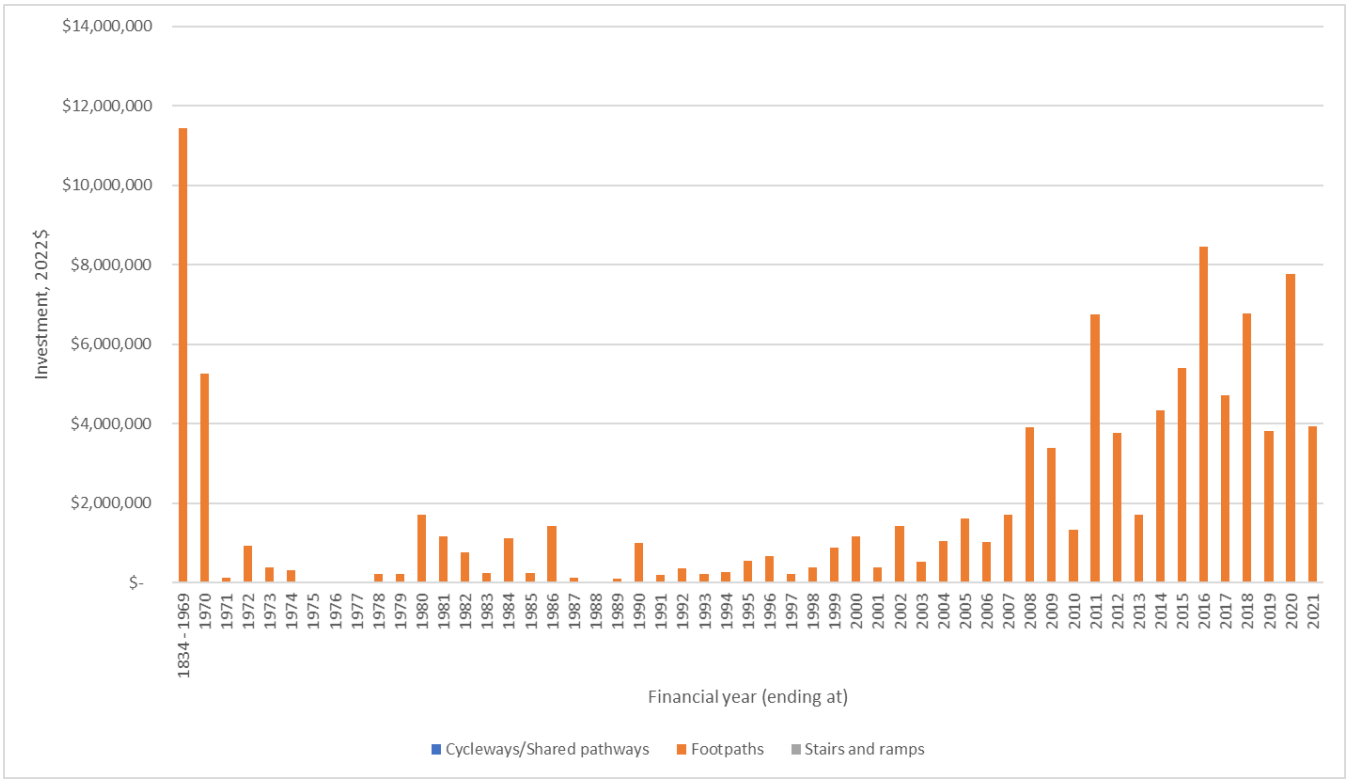

Figure 4.7 Installation profile: Paths

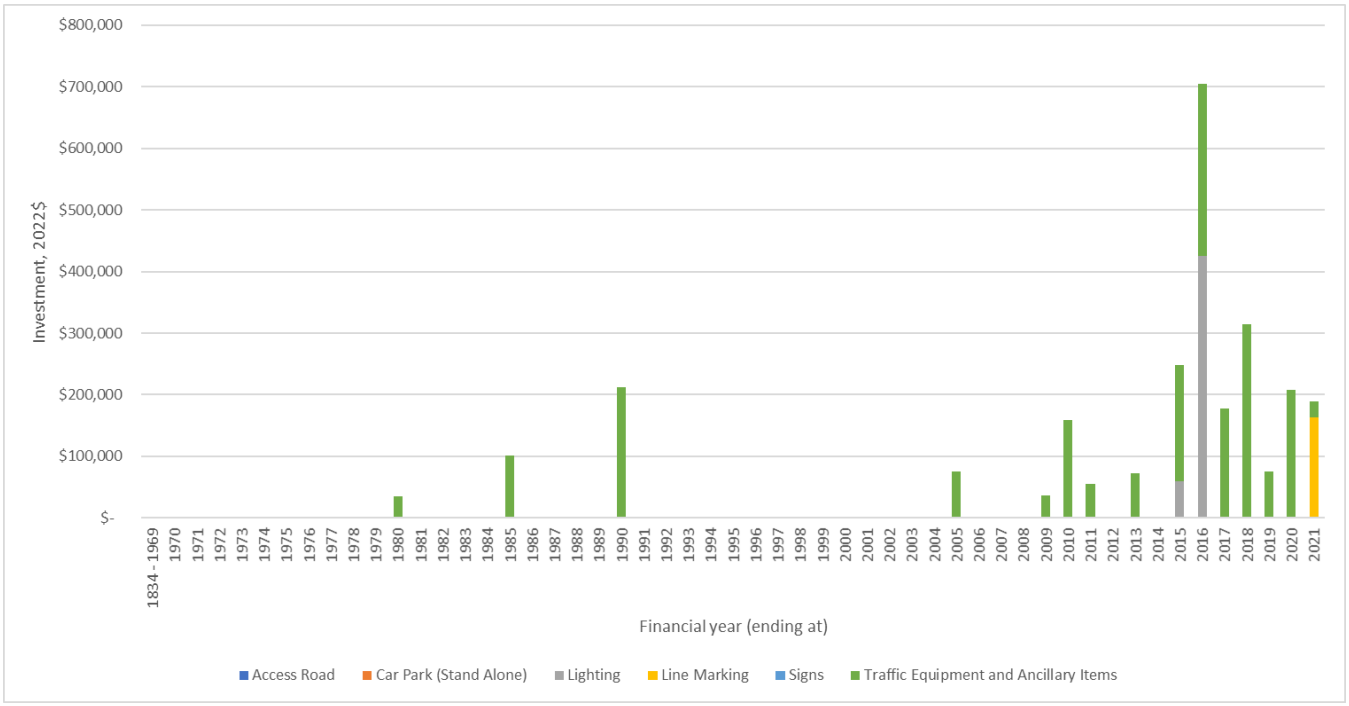

Figure 4.8 Installation profile: All other road and road inventory assets

4.5 Asset lifecycle activities

Lifecycle activities can be categorized into the following main areas:

- ***Create or Acquire:*** Activities that provide new or donated/gifted assets that increase service potential, performance capability or capacity.
- ***Operate***: The active process of using an asset which may consume resources such as manpower, energy, chemicals, and materials.
- ***Maintain:*** Activities necessary to retain an asset as near as practicable in its original condition but excluding refurbishment / rehabilitation or replacement.
- ***Refurbish or Rehabilitate:*** Activities to sustain the original service potential or substantially extend the life of existing assets by replacing component systems or assemblies without increasing service potential, performance capability or capacity.
- ***Enhance:*** Activities that augment or upgrade existing assets to increase service potential, performance capability or capacity.
- ***Replace:*** Activities that replace existing assets with assets of equivalent service potential, performance capability or capacity.
- ***Dispose:*** Work that permanently removes assets from service.

The lifecycle activities and associated costs for the MCC owned roads and road furniture are further described in the following sections.

4.5.1 Maintenance expenditure/budgets

Estimated Operating and Maintenance (O&M) and capital investment costs for the roads and road inventory for future financial years 2022 to 2032 is as defined in Section 3.3.3. These costs have been estimated by MCC based on historic maintenance expenditure and required maintenance effort for new assets from growth and are consistent to MCC's long term financial plan. This equates to an average annual O&M expenditure for existing and new (future) assets of $10.51 M.

4.5.2 Maintenance and renewal planning

MCC currently carries out maintenance activities that are necessary to keep road assets operating, including emergency maintenance for instances where portions of the asset fail and detrimentally affect service and the safety of the facility users. Maintenance includes reactive, planned and cyclic maintenance work activities.

- ***Reactive maintenance*** is unplanned repair work carried out in response to service requests and management/supervisory directions.
- ***Planned maintenance*** activities include inspection, assessing the condition against failure/breakdown experience, prioritising, scheduling, actioning the work and reporting what was done to develop a maintenance history and improve maintenance and service delivery performance.
- ***Cyclic maintenance*** is replacement of higher value components/sub-components of assets that is undertaken on a regular cycle. This work generally falls below the capital/maintenance threshold.

Consistent with the AM Strategy, specific maintenance strategies and tactics to be implemented by MCC staff in Standards and specification

Maintenance work on major roads is carried out in accordance with MCC and TfNSW Standards and Specifications. Local road maintenance standards are also defined in the Road Risk Management Procedures which are currently under review.

4.5.3 Capital works

New works are those works that create a new asset that did not previously exist or works which upgrade or improve an existing asset beyond its existing capacity. They may result from growth, social or environmental needs. New assets from growth, identified in Section 3 of this AM Plan as well as other minor capital works for the existing asset base are planned, developed and implemented as per MCC's annual capital works program. Capital works estimates for the purpose of this AM Plan is ~$18.7M per year until 2032.

4.6 Asset failure modes and consumption estimates

4.6.1 Failure modes

There are several different ways that an asset can fail to provide its required level of service. These are known as the failure modes of an asset. Each of these failure modes could have a different probability or consequence of failure. Most asset failures can be classified under one of the following four failure modes.

- **Utilisation (capacity):** The demand exceeds the capacity of the existing asset or network of assets, or vice versa in some cases (e.g. usage of a building maybe greater than design capacity due to population increase).
- **Physical Mortality (condition):** The condition of the asset is such that it has reached the end of its effective life (e.g. deterioration of a road etc.).
- **Financial Efficiency (cost):** The asset is not being maintained at the lowest lifecycle cost, that is, the cost to execute the current maintenance strategies over time exceed that of the replacement cost.
- **Level of Service:** The asset no longer performs reliably, does not meet the agreed target level of service or does not meet mandatory regulatory requirements (e.g. pool water quality does not meet health targets).

Decisions about the refurbishment and replacement of an asset and the timing of these activities should be based on a sound determination of its predominant or critical failure mode (the failure mode with the highest consequence and probability of occurrence).

4.6.2 Remaining life and asset consumption

For road pavement assets, remaining life and asset consumption was defined from the latest "Pavement Condition Index" and "Remaining Life" within the Pavement Management System. For all other assets within this AM Plan, remaining life and asset consumption was determined at an appropriate level in the hierarchy simply as follows:

– Install year + estimated MPL – current year (2022).
– Applying a ***remaining life factor*** (which is a reduction factor based on the asset condition rating and current level of service). A good condition correlates to a high residual life factor, and a poor condition correlates to a low residual life factor as illustrated below.

If the result of this method did not appear appropriate based on what is inherently known about the asset, a judgement residual life was applied which overrides the above.

These elements are described as follows:

– ***Install Year:*** The year an asset was first installed or replaced.
– ***Estimated MPL:*** As per Section 4.3.2.
– ***Condition Rating:*** A condition rating was applied to each asset based on available condition data or judgment of MCC staff as per section 2.8

The “remaining life factor” was applied based on combined performance rating of condition and level of service is as follows:

Table 4.4 Remaining life factor

Combined Performance	Residual life factor
1	0.99
2	0.90
3	0.66
4	0.325
5	0.075

Based on the remaining life predictions, the consumption of each asset in the hierarchy has been calculated on a least remaining life basis. The Asset Consumption Distribution graphs shown in the following figures illustrate the value of assets that are new (0% consumed) through to assets that have reached their maximum potential life (100% consumed). These graphs provide a good indication of which assets are at the end or nearing the end of their life and require replacing or a significant maintenance intervention.

Level of Service Rating: A target level of service has been allocated for each asset. Historically, actual levels of service for assets have not been consistently or formally documented meaning level of service performance cannot be consistently defined at this stage. This will be addressed in future iterations of this AM Plan.

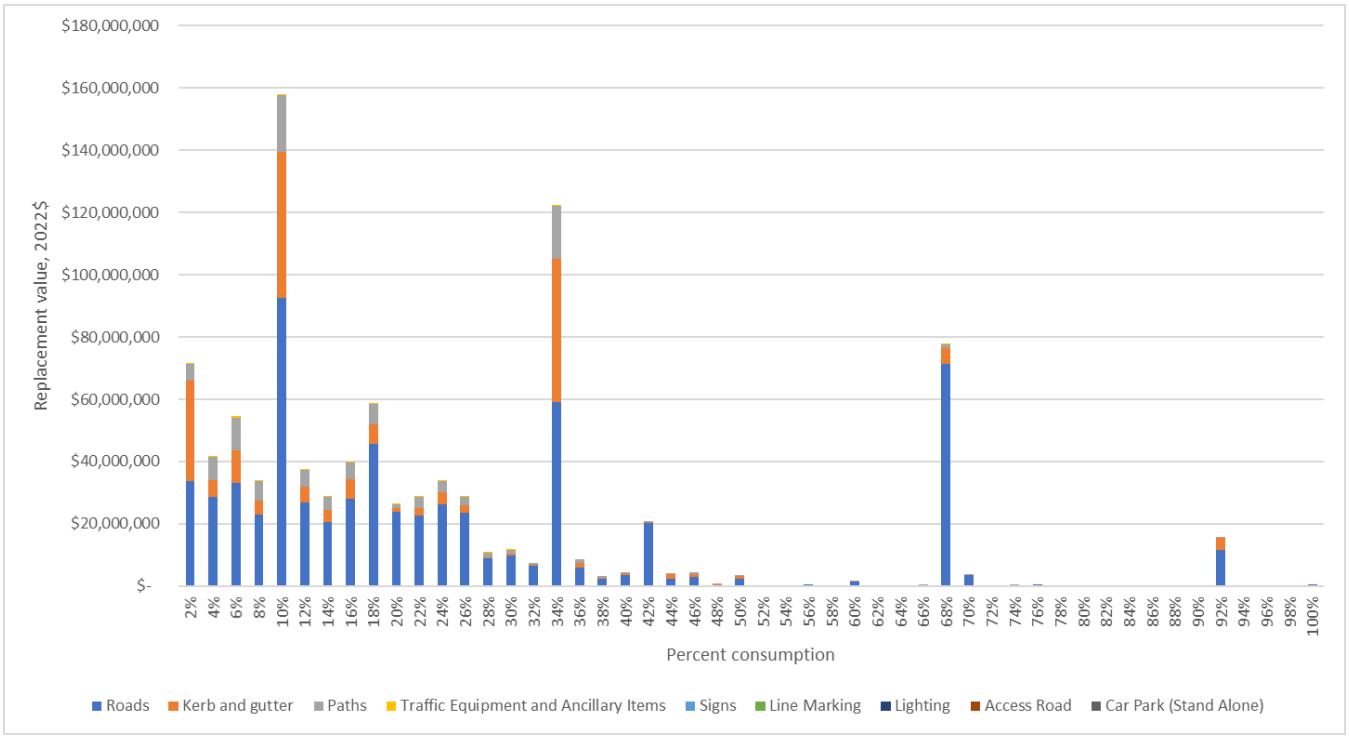

Figure 4.9 Asset consumption: Total roads and road inventory

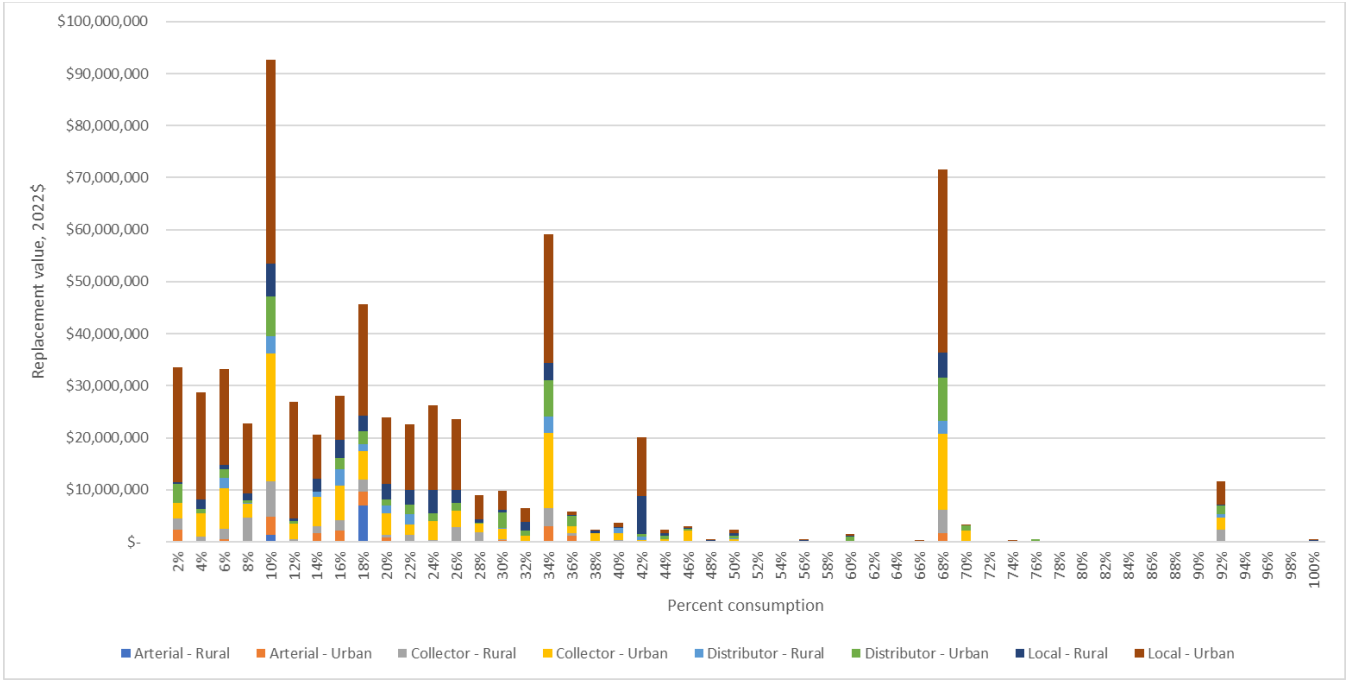

Figure 4.10 Asset consumption: Roads

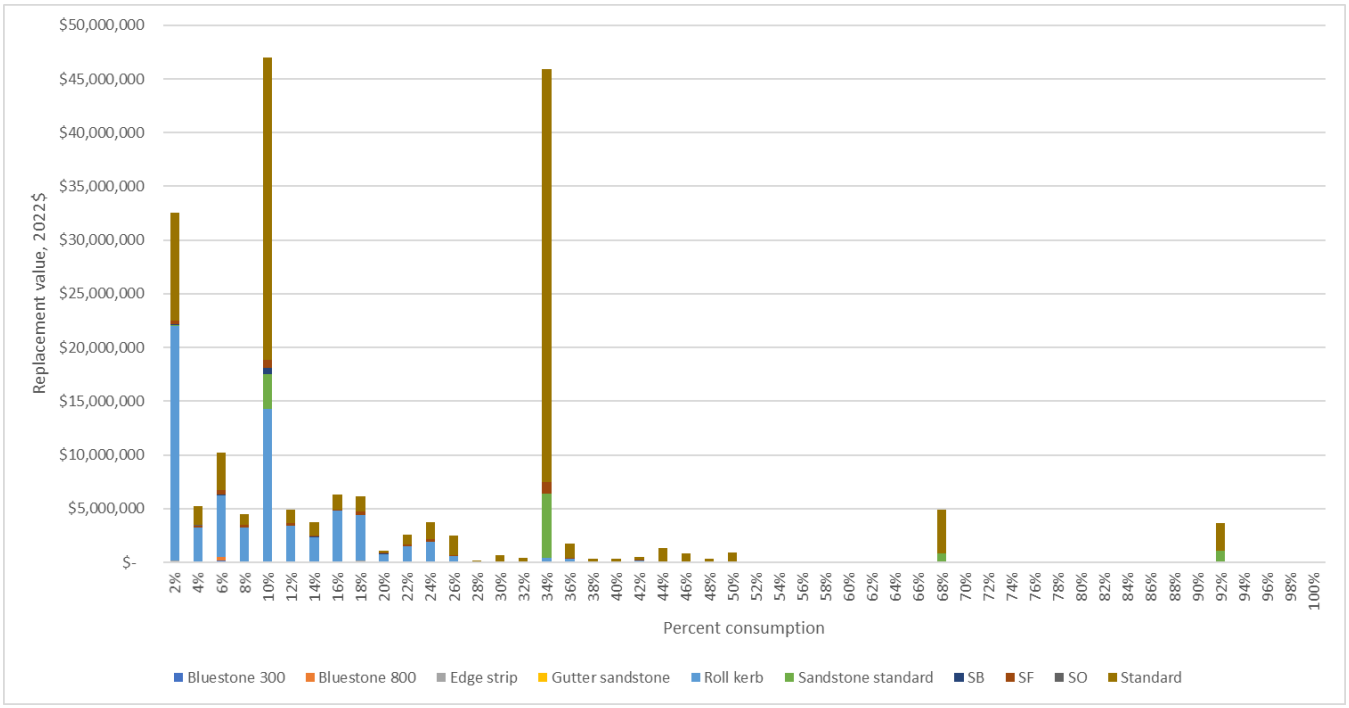

Figure 4.11 Asset consumption: Kerb and gutter

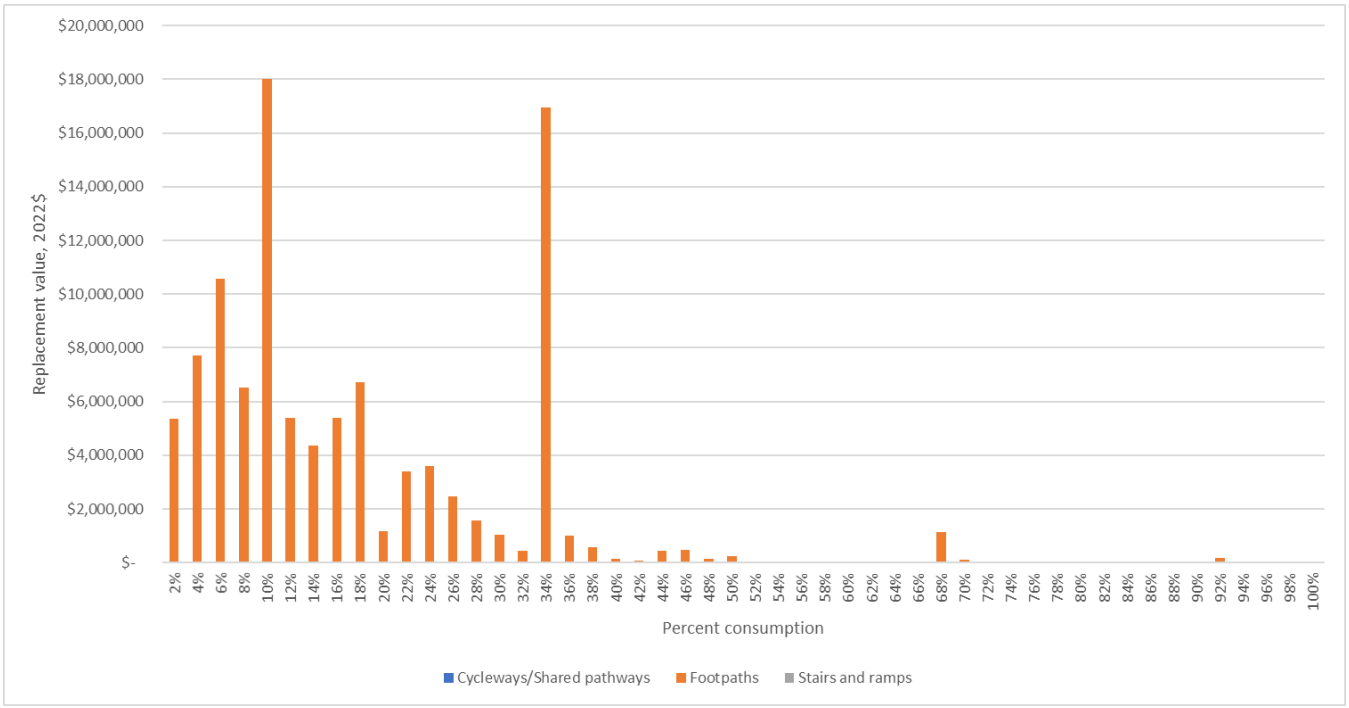

Figure 4.12 Asset consumption: Paths

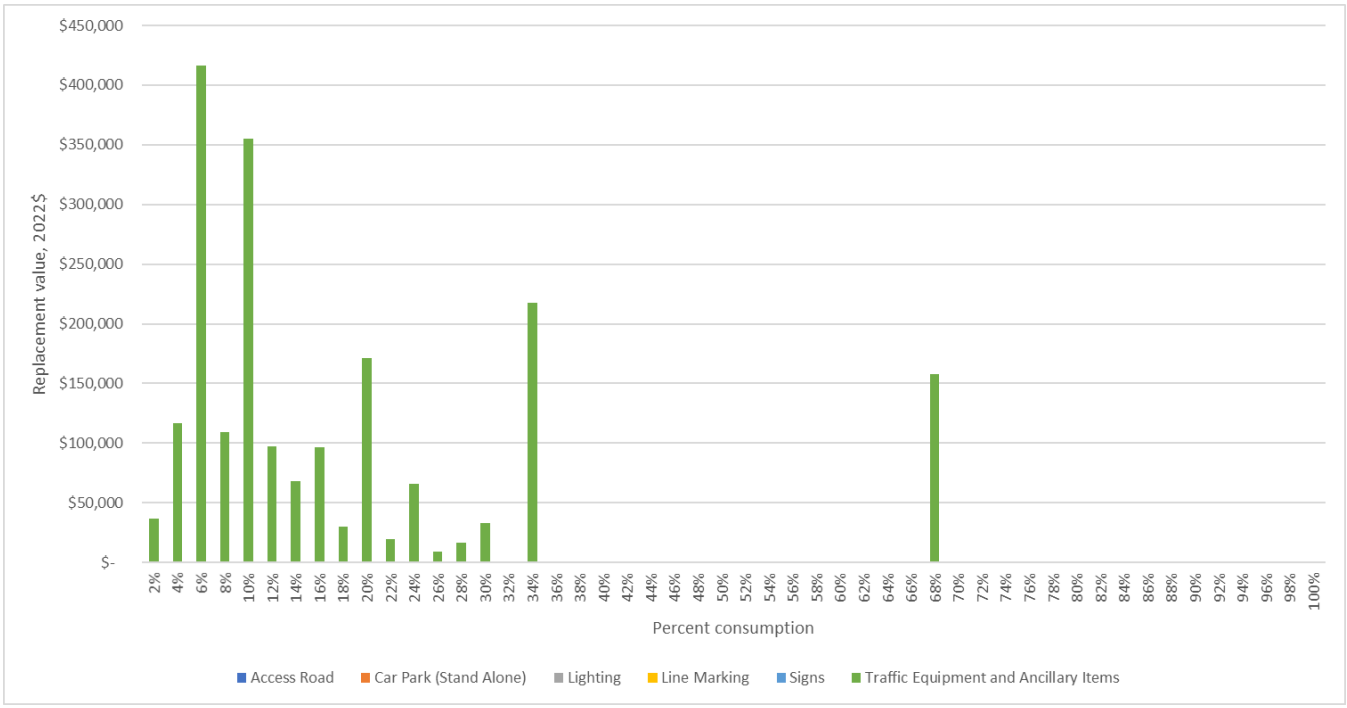

Figure 4.13 Asset consumption: All other road and road inventory assets

4.7 Asset risk data and risk exposure estimates

4.7.1 Overview

Not every asset is of equal importance or presents the same failure risk. Understanding which assets are critical and how they might fail helps focus lifecycle management strategies on what is most important. Critical road and road inventory assets are those that have major consequences or impacts if they fail and a high probability or likelihood of failing.

The asset consumptions determined in the preceding section provides an insight into the likelihood or probability of assets failing. To determine which of these assets are critical the consequence of failure must also be assessed and included in the analysis.

To determine the risk exposure of the assets, the following simple calculation is applied:

Risk Exposure = Probability of Failure (Pof) x Consequence of Failure (CoF).

The basis of determining the relative priority for each asset is the calculation of a Business Risk Exposure (BRE) rating index. The BRE is a probability-consequence risk matrix determination, using MCCs risk matrix structure as shown below:

Probability of Failure						
P5	Almost Certain	7	14	17	23	25
P4	Likeley	6	9	16	19	24
P3	Possible	3	8	15	18	22
P2	Unlikely	2	5	11	13	21
P1	Rare	1	4	10	12	20
		Insignificant	Minor	Moderate	Major	Catastrophic
		C1	C2	C3	C4	C5

Consequence of Failure

Figure 4.14 Risk matrix

4.7.2 Probability of failure

The probability of failure was derived by using the asset consumption defined in the previous section and MCC's likelihood scale (included in the MCC's Risk Management process), as illustrated in the following table.

Assets that are reaching the end of their estimated life (i.e. high% asset consumption) have a high probability of failure. Assets that are at the start of their estimated life (i.e. low % consumption) have a low probability of failure.

Table 4.5 Probability of failure

% Life consumed	Level	Probability / likelihood	Descriptor	Probability of occurrence
0% to 20%	P1	Rare	May occur only in exceptional circumstances	More than 20 years
21% to 40%	P2	Unlikely	Could occur at some time	Within 10-20 years
41% to 60%	P3	Possible	Might occur at some time	Within 3-5 years
60% to 80%	P4	Likely	Will probably occur in most circumstances	Within 2 years
80% to 100%	P5	Almost certain	Expected to occur in most circumstances	Within 1 year

4.7.3 Consequence of failure

Consequence of Failure was determined in a workshop with MCC staff using the following consequence ratings. These ratings are based on the ratings included the MCC's corporate Risk management process. Consequence of Failure ratings applied for each asset is defined in Table 4.6.

Table 4.6 Consequence of failure

Level	Consequence	Operational & Technical	Financial	Social	Environmental
C1	Insignificant	None or negligible service disruptions	Financial loss < $10K	No injuries No litigation exposure No media interest	None or negligible environmental impacts
C2	Minor	Isolated disruption to non-essential services	Financial loss between $10K and $50K	First Aid treatment Acceptable exposure to litigation Local media coverage	On site environmental impact immediately contained
C3	Moderate	Isolated disruption to essential services Wide disruption to non-essential services	Financial loss between $50K and $200K	Medical treatment required Moderate exposure to litigation Regional media coverage	On site environmental impact contained with outside assistance
C4	Major	Wide disruption to essential services Some non-essential services unavailable	Financial loss between $200K and $1M	Extensive (multiple) injuries Some state/national media coverage Major exposure to litigation	Off-site environmental impact with no detrimental effects
C5	Catastrophic	Essential and non-essential services unavailable	Financial loss >$1M	Loss of life Extensive state/national media coverage Unacceptable exposure to litigation	Toxic release off site

4.7.4 Asset risk exposure estimate

The following section includes risk maps showing the total replacement value of assets for Risk Exposure by asset type, based on the risk methodology and criteria described above. The risk maps have enabled the identification and prioritisation of higher risk assets that need to become candidates for closer inspection (to verify if they truly are high risk), renewal or replacement.

The determination of the BRE is a function of the selected PoF and CoF figures for each individual asset. Using the Risk Matrix shown in Figure 4.14, a ranking was determined (Very High, High, Medium or Low) for each asset included in the hierarchy.

In summary, less than **1%** of road and road inventory assets, are a "**very high**" business risk, with a further **6%** of assets being a "**high**" business risk. This equates to a financial replacement estimate (in 2022$) of ~**$61.6 M.**

A breakdown of this risk profile for the total asset class and by asset category is as follows (in dollars and percentage):

Probability of Failure							
	P5	Almost Certain	$780,527	$5,246,012	$8,071,685	$1,362,164	$0
	P4	Likeley	$9,891,926	$26,547,131	$16,488,701	$15,031,535	$0
	P3	Possible	$10,918,791	$14,801,990	$7,818,276	$7,615,112	$0
	P2	Unlikely	$35,071,492	$65,338,879	$100,088,722	$63,573,674	$0
	P1	Rare	$45,152,895	$174,299,409	$201,708,963	$140,012,799	$0
			Insignificant	Minor	Moderate	Major	Catastrophic
			1	2	3	4	5

Consequence of Failure

Figure 4.15 Asset risk exposure estimate: Total – replacement value

Probability of Failure							
	P5	Almost Certain	0%	1%	1%	<1%	0%
	P4	Likeley	1%	3%	2%	2%	0%
	P3	Possible	1%	2%	1%	1%	0%
	P2	Unlikely	4%	7%	11%	7%	0%
	P1	Rare	5%	18%	21%	15%	0%
			Insignificant	Minor	Moderate	Major	Catastrophic
			1	2	3	4	5

Consequence of Failure

Figure 4.16 Asset risk exposure estimate: Total – percentage

Probability of Failure							
	P5	Almost Certain	$726,432	$5,227,180	$4,383,588	$1,108,718	$0
	P4	Likeley	$9,855,979	$26,533,007	$11,526,168	$13,498,787	$0
	P3	Possible	$10,918,791	$14,801,990	$3,887,177	$6,133,166	$0
	P2	Unlikely	$34,981,450	$65,040,231	$41,820,000	$31,522,153	$0
	P1	Rare	$44,432,210	$173,031,643	$79,882,926	$63,081,740	$0
			Insignificant	Minor	Moderate	Major	Catastrophic
			1	2	3	4	5

Consequence of Failure

Figure 4.17 Asset risk exposure estimate: Roads – replacement value

Probability of Failure							
	P5	Almost Certain	0%	1%	1%	<1%	0%
	P4	Likeley	2%	4%	2%	2%	0%
	P3	Possible	2%	2%	1%	1%	0%
	P2	Unlikely	5%	10%	7%	5%	0%
	P1	Rare	7%	27%	12%	10%	0%
			Insignificant	Minor	Moderate	Major	Catastrophic
			1	2	3	4	5
			Consequence of Failure				

Figure 4.18 Asset risk exposure estimate: Roads – percentage

Probability of Failure							
	P5	Almost Certain	$0	$0	$3,688,097	$0	$0
	P4	Likeley	$0	$0	$4,962,533	$0	$0
	P3	Possible	$0	$0	$3,931,099	$0	$0
	P2	Unlikely	$0	$0	$58,268,722	$0	$0
	P1	Rare	$0	$0	$121,826,037	$0	$0
			Insignificant	Minor	Moderate	Major	Catastrophic
			1	2	3	4	5
			Consequence of Failure				

Figure 4.19 Asset risk exposure estimate: Kerb and gutter – replacement value

Probability of Failure							
	P5	Almost Certain	0%	0%	2%	0%	0%
	P4	Likeley	0%	0%	3%	0%	0%
	P3	Possible	0%	0%	2%	0%	0%
	P2	Unlikely	0%	0%	30%	0%	0%
	P1	Rare	0%	0%	63%	0%	0%
			Insignificant	Minor	Moderate	Major	Catastrophic
			1	2	3	4	5
			Consequence of Failure				

Figure 4.20 Asset risk exposure estimate: Kerb and gutter – percentage

Probability of Failure							
	P5	Almost Certain	$0	$0	$0	$151,901	$0
	P4	Likeley	$0	$0	$0	$1,307,871	$0
	P3	Possible	$0	$0	$0	$1,481,946	$0
	P2	Unlikely	$0	$0	$0	$31,542,280	$0
	P1	Rare	$0	$0	$0	$73,563,196	$0
			Insignificant	Minor	Moderate	Major	Catastrophic
			1	2	3	4	5
			Consequence of Failure				

Figure 4.21 Asset risk exposure estimate: Paths – replacement value

Probability of Failure							
	P5	Almost Certain	0%	0%	0%	0%	0%
	P4	Likeley	0%	0%	0%	1%	0%
	P3	Possible	0%	0%	0%	1%	0%
	P2	Unlikely	0%	0%	0%	29%	0%
	P1	Rare	0%	0%	0%	68%	0%
			Insignificant	Minor	Moderate	Major	Catastrophic
			1	2	3	4	5
			Consequence of Failure				

Figure 4.22 Asset risk exposure estimate: Paths – percentage

Probability of Failure							
	P5	Almost Certain	$54,095	$18,832	$0	$101,545	$0
	P4	Likeley	$35,947	$14,124	$0	$224,877	$0
	P3	Possible	$0	$0	$0	$0	$0
	P2	Unlikely	$90,042	$298,648	$0	$509,241	$0
	P1	Rare	$720,685	$1,267,766	$0	$3,367,863	$0
			Insignificant	Minor	Moderate	Major	Catastrophic
			1	2	3	4	5
			Consequence of Failure				

Figure 4.23 Asset risk exposure estimate: All other road inventory assets – replacement value

Probability of Failure							
	P5	Almost Certain	1%	0%	0%	1%	0%
	P4	Likeley	0%	0%	0%	3%	0%
	P3	Possible	0%	0%	0%	0%	0%
	P2	Unlikely	1%	4%	0%	7%	0%
	P1	Rare	10%	18%	0%	47%	0%
			Insignificant	Minor	Moderate	Major	Catastrophic
			1	2	3	4	5
			Consequence of Failure				

Figure 4.24 Asset risk exposure estimate: All other road inventory assets – percentage

4.7.5 High priority assets

High priority assets (very high risk assets) are summarised in Table 4.7 and Table 4.8.

These assets should be prioritised in future capital, operations and maintenance planning and delivery. Note that whilst this plan identified these very high risk assets, it does not necessarily mean a high cost intervention is required. Further detail on high priority assets is defined in the data model.

Table 4.7 High priority assets - summary

Asset	Estimated Quantity
Arterial - Urban	0.15 km
Distributor - Rural	0.57 km
Distributor - Urban	0.60 km
Footpaths	0.50 km

Table 4.8 High priority assets – detailed

Asset	Street Name / Location	Section ID	Segment Length (m)
Arterial - Urban	Glenwood Drive, Thornton	899:10 Thornton to Hartley	150
Distributor - Rural	Haussman Drive, Thornton	265:6 Taylor to R/Terrace Road	570
Distributor - Urban	Chisholm Road, East Maitland	110:1 New England Hwy to Molly Morgan	160
	Denton Park Drive, Aberglasslyn	156:8 Poplar to Tea Tree	188
	Richardson Street, East Maitland	498:2 Ultimo to Brisbane	161
	Edwards Ave, Thornton	838:2 #22 to Roundabout Start at #32	100

Asset	Street Name / Location	Section ID	Segment Length (m)
Footpath	Carrington Street, Maitland	f-1043 beside # 34 hunter	32
	Hunter Street, Maitland	f-1044 #52 to #54	19
	Free Church Street, Maitland	f-1047 Rear #274 High	14
	Little Hunter Street, Maitland	f-1062 Carpark to High	77
	Erin Close, Ashtonfield	f-1086 Adj #8 Erin	38
	Churchill Crescent. Rutherford	f-2141 Adj #14 Churchill	39
	Carrington Street, Maitland	f-2303 #106	19
	NEH, East Maitland	f-253 Adj William	20
	Bourke Street, Maitland	f-2632 #78 to #80	19
	Carrington Street, Maitland	f-363 Hunter to Plaistowe	49
	Junction Street, Telarah	f-401 Frontage #6	13
	Edward Street, Lorn	f-460 Short to end	36
	Swan Street, Morpeth	f-653-3 #153-#157 Swan	23
	Hannan Street, Maitland	f-745 Frontage #33/#35	31
	Wolfe Street, Maitland	f-751 Frontage #18	13
	Regent Street, Maitland	f-758 Frontage #72	20
	Crofton Street, Tenambit	f-924 Adj #22 Crofton	38

4.8 Renewal and enhancement plan

Short term renewal and enhancement plans are defined through MCC's annual capital and maintenance planning processes. Current renewal and enhancement plans incorporate high priority assets identified within this AM Plan consistent with the cost estimates included in the Capital Works Program. Renewal and enhancement of ageing assets over a longer period of time from this AM Plan are also consistent with the current Long Term Financial Plan. Both of these estimates are defined in Section 3.3.

4.9 Creation/acquisition/upgrade plan

New assets from growth as defined in Section 3 as well as major renewals based on the outputs of this AM model are included in future financial projections of the AM Plan. These new assets will be planned, scheduled and delivered on an annual basis as per MCC's capital programming and project delivery processes and within the limits of the Council endorsed four year capital works budget.

4.10 Disposal plan

Disposal includes any activity associated with disposal of a decommissioned asset including sale, demolition or relocation. Rationalisation of roads or road inventory and the services they provide will be considered in future development of this plan.

5. Financial summary

5.1 Overview

This section contains the financial requirements resulting from all the information presented in the previous sections of this asset management plan. The financial projections will be improved as further information becomes available on desired levels of service and current and projected asset performance.

5.2 Financial projections for asset renewal

The estimated cost over time to renew MCC's roads and road inventory assets to the target condition and level of service is shown in Figure 5.1 below. As indicated by the horizontal line, the theoretical average annual cost to sustain this asset class (based on long term replacement cycles, asset age/condition and estimated growth) is estimated to be in the order of **$27.4 M** in 2022 dollars. Most of this reinvestment relates to roads assets which make up 67% of the total cost. This average annual cost includes capital works for new assets from growth and replacement of existing assets of around **$301 M** to be constructed/expended by 2032.

This information now provides a target for short term assessments – particularly with regards to priority assets identified and those that have reach the end of their estimated life. Risk exposure can be further reduced through applying appropriate risk reduction measures or obtaining more accurate condition data that confirms extending asset life is practical.

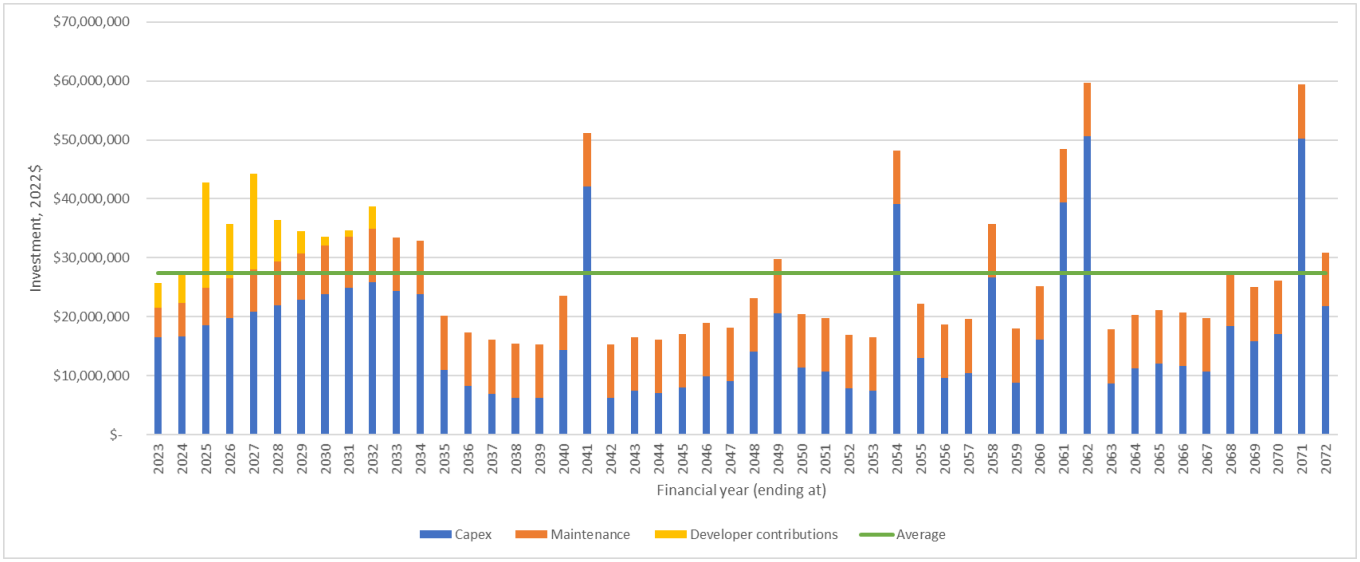

Figure 5.1 Financial projection – Total

As roads assets make up the majority of this asset class, the long term re-investment need for roads only is highlighted separately below. This figure indicates that MCC needs to be reinvesting an average amount of approximately **$20.7 M** in its roads assets on an annual basis to sustain its existing and new assets from growth asset portfolio.

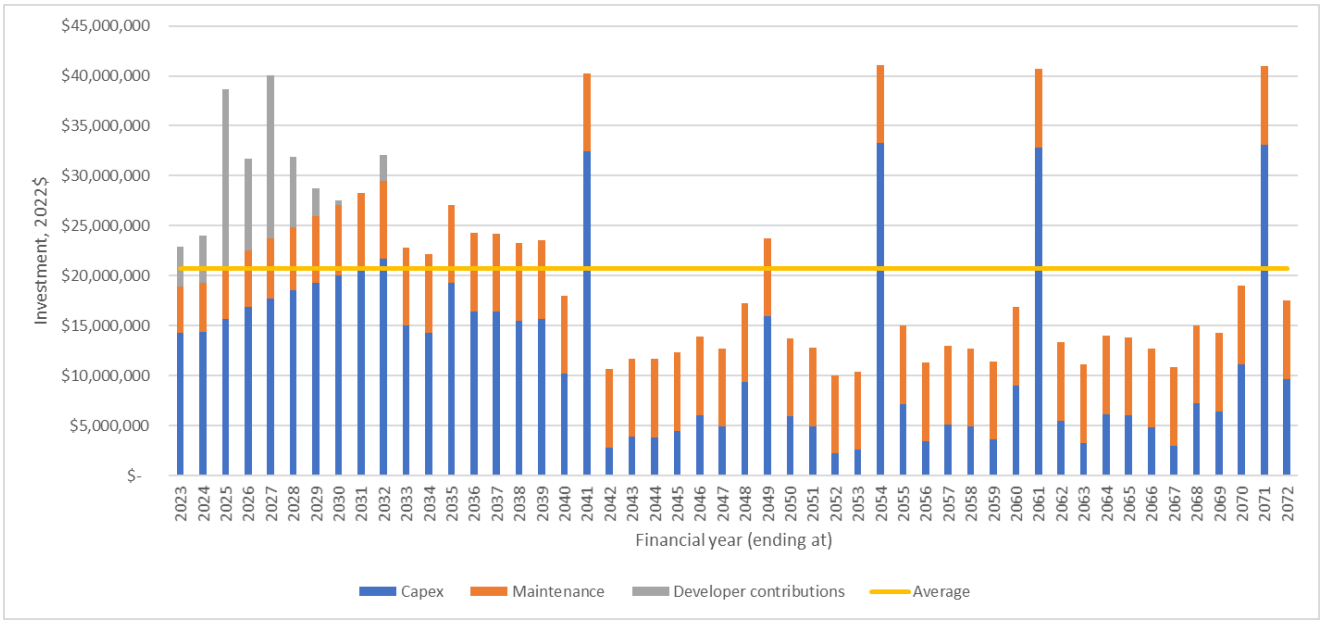

Figure 5.2 Financial projection – Roads only

5.3 Long term funding mechanisms

Long term funding mechanisms will be addressed in Council's resourcing strategy and associated rate rises. These are currently being realised in the current capital/maintenance works program and the 2022 Long Term Financial Plan which was endorsed by Council in early 2022.

Appendices

Appendix A

Limitations and assumptions

Limitations

This report has been prepared by GHD for Maitland City Council and may only be used and relied on by Maitland City Council for the purpose agreed between GHD and Maitland City Council. GHD otherwise disclaims responsibility to any person other than Maitland City Council arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

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GHD has prepared financial information set out in this report ("Cost Estimate") using information reasonably available to the GHD employee(s) who prepared this report; and based on assumptions and judgments made by GHD and using information provided by Maitland City Council The Cost Estimate has been prepared for the purpose of asset management planning and must not be used for any other purpose.

The Cost Estimate is a preliminary estimate only. Actual prices, costs and other variables may be different to those used to prepare the Cost Estimate and may change. Unless as otherwise specified in this report, no detailed quotation has been obtained for actions identified in this report. GHD does not represent, warrant or guarantee that the [works/project] can or will be undertaken at a cost which is the same or less than the Cost Estimate.

Where estimates of potential costs are provided with an indicated level of confidence, notwithstanding the conservatism of the level of confidence selected as the planning level, there remains a chance that the cost will be greater than the planning estimate, and any funding would not be adequate. The confidence level considered to be most appropriate for planning purposes will vary depending on the conservatism of the user and the nature of the project. The user should therefore select appropriate confidence levels to suit their particular risk profile.

Assumptions

- All data outcomes presented are commensurate with the data provided by MCC. Data provided is generally high level.
- Maintenance, capital and replacement costs are as per provided by MCC until financial year 2033.
- Maintenance cost for financial year 2033 onwards assumed to be the same value as financial year 2032.
- Capital expenditure for financial years 2033 onwards are based on the replacement costs, installation date, condition, and maximum potential life of the road and road inventory assets in addition to a growth factor of 2% per year.
- When the condition of the asset is reflected by the age of the asset, the age of the asset is used to calculate the residual life. Conversely, when the condition of the asset is not reflected by the age of the asset, the condition of the asset is used to calculate the residual life. To determine whether the condition of the asset is reflected by the age of the asset, the residual life based on condition must be between $\frac{3}{4}\times$ residual life based on age and $\frac{4}{3}\times$ residual life based on age.
- For financial projection purposes, where a road segment (inclusive of pavement, base and sub-base) has a prorated operations and maintenance cost commensurate with the segment, the maximum potential life has been increased by a factor of 2 to recognise the value of the operations and maintenance intervention. This assumption requires validation from MCC.
- "MCC Asset Hierarchy and Lifecycle Inputs – Roads" is assumed to be the FY 2021 figure.

- % consumed have been rounded to the nearest multiple of 2.
- Roads “not defined” are assumed to be “local”.
- Maintenance costs are based on MCC’s “Maintenance LTFP” excel spreadsheet.
- Total maintenance cost per year has been prorated proportional to the length each asset.
- Maintenance cost for financial year 2032 onwards assumed to be the same value as financial year 2031.
- For financial projection purposes, kerb and gutter assets with a calculated residual life of 39.6 years are assumed to have a residual life of 40 years.
- For financial projection purposes, paths with a calculated residual life of 39.6 years are assumed to have a residual life of 36 years.

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