



Asset Management Plan

Bridges and Major Structures

Maitland City Council

8 June 2022

Executive summary

Maitland City Council's (MCC) asset portfolio has an estimated financial value of over \$1.7 B (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 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 **Bridges and Major Structures 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 Bridges AM 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 drainage 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 major structural assets with a replacement value (in 2022\$) of approximately **\$54.6 M**. These are summarised as follows:

Table E.1 Asset inventory summary

Asset	Asset elements	Total Qty (estimated)	\$ Cost breakdown (millions)	% Cost total
Bridges - Road Structures	Concrete Bridge	15	\$10,125,147	19%
	Large Box Culvert	27	\$25,679,217	47%
	Large Pipe Culvert	17	\$12,037,598	22%
	Steel Composite Bridge	1	\$1,461,450	3%
	Timber Bridge	2	\$2,188,293	4%
Pedestrian bridges	Timber Bridges	15	\$276,578	<1%
	Concrete Bridges	9	\$916,676	2%
	Enduroplank Bridges	5	\$160,550	<1%

Asset	Asset elements	Total Qty (estimated)	\$ Cost breakdown (millions)	% Cost total
Retaining Walls	>1m in height*	18	\$84,000	0%
	<1m in height*	17	\$400,000	1%
	Shotcrete retention*	2	TBA	TBA
	Not specified	20	\$630,000	1%
Other major structures	Lookouts*	1	TBA	TBA
	Wharfs	1	\$550,000	1%
	Boat Ramps	1	\$80,000	<1%
	Feature signage*	TBA	TBA	TBA
	Flag poles*	TBA	TBA	TBA
Grand Total			\$54,589,508	100%

*Additional data currently being collected

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 bridge and major structures has been calculated on condition data available, asset age and opinions of appropriate MCC staff. This confirms that the majority of major structures represented in the data (i.e. road bridges) are within the first half of their lifespan, mostly due to estimated life provided by MCC staff and historic bridge maintenance and renewal interventions.

MCC's risk management framework has also been used to determine its risk exposure. This data highlights that no bridges and major structure assets are a **"very high"** business risk, with only **3%** of assets being a **"high"** business risk. This equates to a financial replacement estimate (in 2022\$) of **~\$1.7 M**. These are made up of road bridges and major retaining walls all of which are prioritised in in the FY 2022/23 capital and maintenance plan, specifically:

- The major retaining wall on Hillcrest Drive, retaining the road structure (note that that this retaining wall, whilst in good condition, will always be a high risk asset due to its consequence of failure ranking).
- Aberglasslyn Road to Melville Ford Timber Bridge.
- Anambah Road major culvert.

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.

As defined in the Roads and Road Inventory AM Plan, there is an estimated 106 km of new roads to be constructed over the next 10 years relating predominately to greenfield developments. Within these new roads **10 new major culverts/bridges are expected** (noting the specific size, location and type of the structure has not yet been defined).

Sustaining the asset portfolio

The estimated cost over time to renew MCC’s bridges and major structure 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 **\$0.4 M** in 2022 dollars. This average annual cost includes capital works for new assets from growth of **\$4.63 M** to be constructed/expended by 2032, upon which capital expenditure reduces with exception of the noted replacement works.

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, for example, the assets included in the capital investment spikes in this figure in years 2035 and 2048. 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.

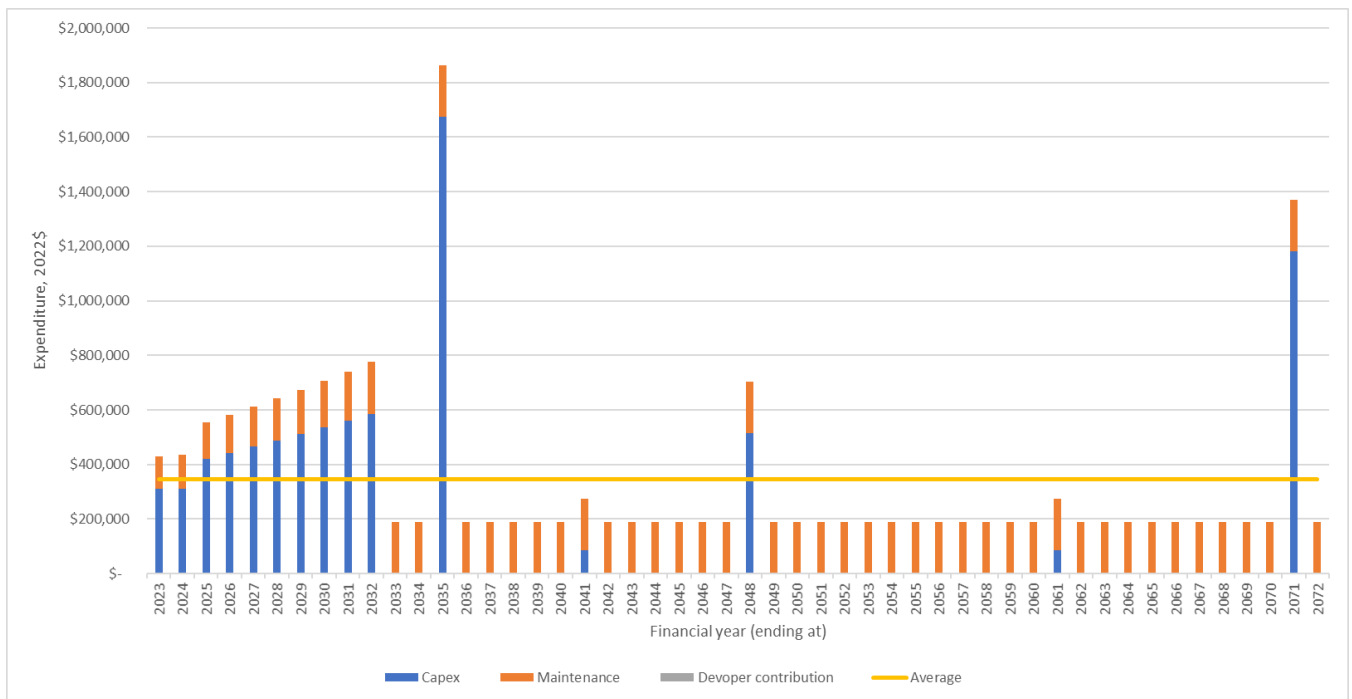


Figure E.1 Financial projection - Total

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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, building, sporting facilities and open spaces).
- **Buildings** (all MCC owned and operated buildings).
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- **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 **Bridges and Major Structures**. Within the region's road and recreation network MCC owns and operates road bridges and major culverts, pedestrian bridges, major retaining walls (>1m in height) as well as a number of other major structures such as lookouts, wharfs and boat ramps.

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.

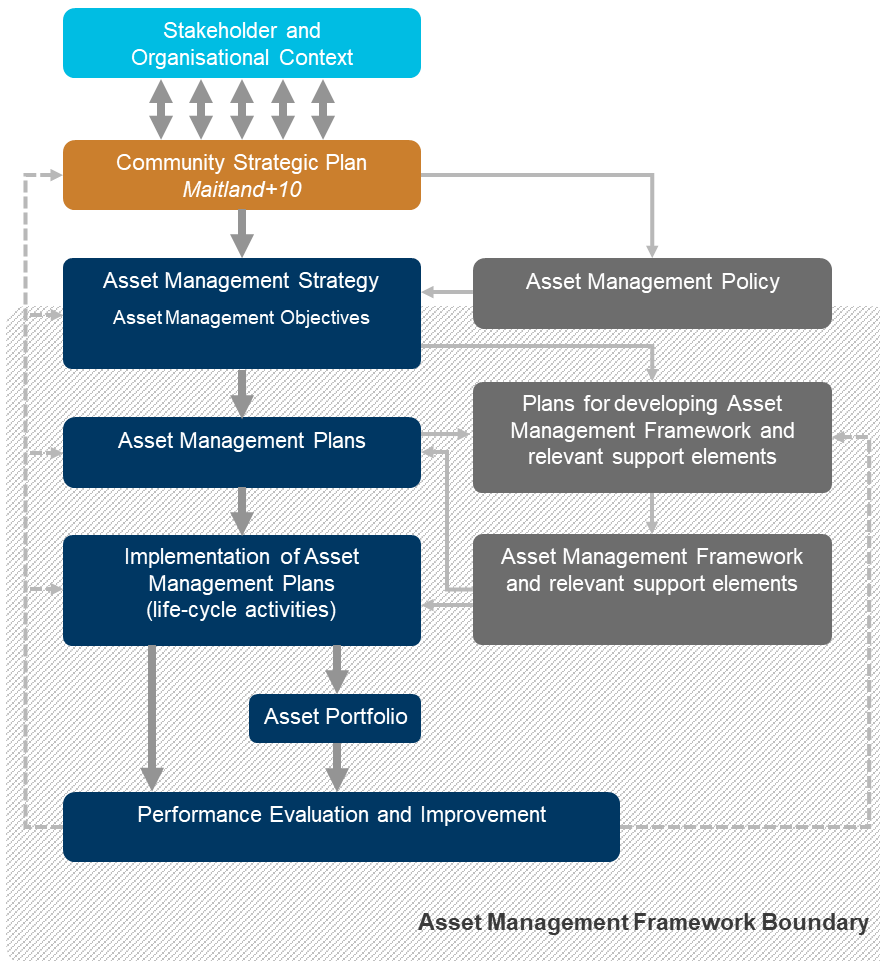


Figure 1.1 Asset management framework

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.

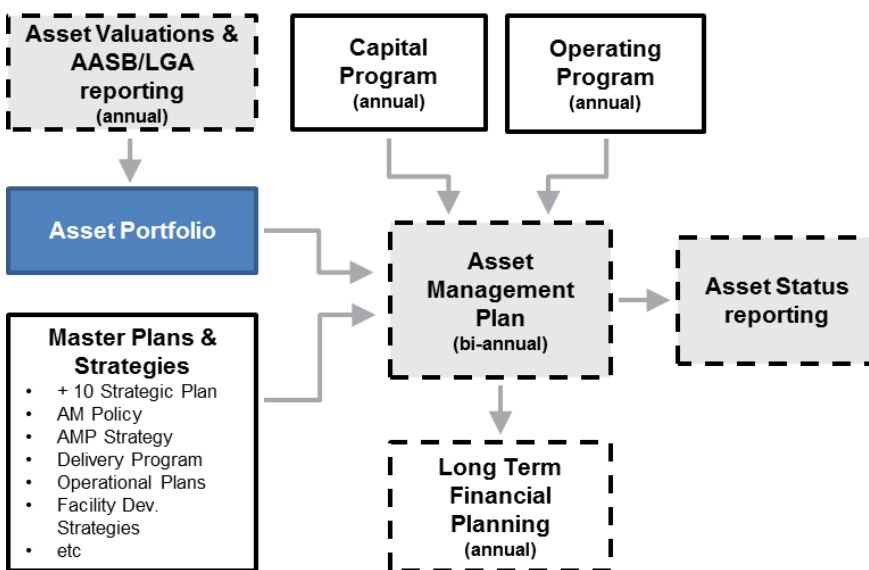


Figure 1.2 AM Plan relationship to other Maitland City Council documents

1.4 Asset management objectives

MCC is responsible for providing services relating to Bridges and Major Structures 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 Bridges and major structures 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. Key data inputs and assumptions have been provided by MCC staff as well as from data from MCC's Bridge Asset Management System "AssetAsyst".

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 bridges and major structure assets.

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 of customer's expectations is 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

Community LOS	Community expectation
Safety	Safe roads (and road bridges) and appropriate speed limits are provided that minimise number of injuries and/or accidents.
Quality	Maintenance is undertaken regularly to ensure all structures can serve their intended function safely.
Quantity	There are sufficient structures (e.g. road and pedestrian bridges) to serve the community's current and future needs.
Reliability	Access to roads and public facilities are not impeded due to structural limitations of assets such as bridges, retaining walls and lookouts. Load and speed limits are managed on bridges.
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 these 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: <ul style="list-style-type: none"> - 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 Bridges – road and pedestrian

For road and pedestrian bridges, levels of service adopted by MCC are based on the following criteria.

Table 2.3 Road and pedestrian bridges levels of service

Level of Service	Road Bridge	Pedestrian Bridge
Structure width	No narrower than road approach	1.8 m minimum clear width between handrails
Load capacity	SM1600 for major collector roads and above as per MCC requirements	5.0 kPA live loading as per MCC requirements
Bridge life	Meets intended design life or agreed Maximum Potential Life (as per Section 4.2)	Meets intended design life or agreed Maximum Potential Life (as per Section 4.2)
Driving / Pedestrian comfort (traffic)	As defined by the corresponding road type and segment in the Roads and Road Inventory AM Plan	As defined by the corresponding path type and segment in the Roads and Road Inventory AM Plan
Speed restrictions	No speed restrictions	N/A
Barriers/Guardrails	As per the requirements of AS55100.1	As per the requirements of AS55100.1
Structure Condition	As per agreed target condition (Section 4.2)	As per agreed target condition (Section 4.2)

2.5.2 Bridge traffic

A qualitative assessment of road and pedestrian bridges is also necessary in defining levels of services for bridges. Consistent with the Roads and Road Inventory AM Plan, these measures are defined 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 within this measure, 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.

These levels of service are defined by the corresponding road/path type and corresponding segment. These levels of service for roads (road bridges) and paths (pedestrian bridges) are defined in Table 2.4 and Table 2.5.

Table 2.4 Levels of service for roads / bridges

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.

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

Level of Service Category	Definition
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.
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.

Table 2.5 Levels of services for pedestrian bridges (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 Other major structures

Levels of service for all other assets in this asset class must meet their intended function and requirements of current MCC and Australian Standards. These assets have a level of service that is either “Functional” or “Not Functional” meaning the asset in its current state does or does not achieve the original design intent of the asset and corresponding standards. Achieving this design intent, or not, is based on one of the core failure modes defined in Section 4.5 of this plan (capacity, condition - including safety, financial efficiency, reliability). These assets are:

- Retaining walls >1 m in height, retaining roads or a road reserve
- Retaining walls >1 m in height, retaining property (e.g. houses, public buildings)
- Retaining walls >1 m in height, retaining active recreation spaces (e.g. sports oval)
- Retaining walls >1 m in height, retaining passive recreation spaces (e.g. open spaces)
- Retaining walls <1 m in height (all purposes)
- Lookouts (structures, guardrails/barriers and surrounding paths)
- Wharfs (Piers, decks, barriers/guardrails, pontoons etc)
- Boat ramp
- Feature signage
- Flag poles.

2.6 Target levels of service

To assist in prioritising asset management activities over the spectrum of MCC’s bridges and major structure assets, the following target level of service 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 in **Error! Reference source not found.** (with “1” being excellent condition and “5” being unserviceable).

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

Table 2.6 Target levels of service

Level 4	Level 5/6	Target Level of Service	Target Condition
Bridges – Roads	Bridge type (timber, steel, concrete)	As per related road type/section	3 - Significant maintenance required
	Major culverts (>6 m in length)	As per related road type/section	3 - Significant maintenance required
Bridges - Pedestrian	Bridge type (timber, steel, concrete)	As per related path type/section	3 - Significant maintenance required
Retaining Walls	>1 m in height (retaining roads)	Functional, meets design standards	2 - Minor maintenance required plus planned maintenance
	>1 m in height (retaining property)	Functional, meets design standards	2 - Minor maintenance required plus planned maintenance
	>1 m in height (retaining active recreation spaces)	Functional, meets design standards	3 - Significant maintenance required
	>1 m in height (retaining active passive spaces)	Functional, meets design standards	3 - Significant maintenance required
	<1 m in height (all types)	Functional, meets design standards	4 - Significant renewal/upgrade required
	Shotcrete retention	Functional, meets design standards	4 - Significant renewal/upgrade required
Lookouts	Structures, barriers/guardrails, paths etc.	Functional, meets design standards	3 - Significant maintenance required
Wharfs	Piers, deck, barriers/guardrails, pontoon, tie points etc.	Functional, meets design standards	2 - Minor maintenance required plus planned maintenance
Boat ramp		Functional, meets design standards	3 - Significant maintenance required
Feature signage	Material type	Functional, meets design standards	3 - Significant maintenance required
	Flagpoles	Functional, meets design standards	5 - Unserviceable

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 4.6). 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 2.7 Asset condition explained

Condition Rating	Maintenance Strategy	Maintenance Principles and Intervention level
1	Predictive Maintenance (Proactive)	<ul style="list-style-type: none"> - 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, Arterial Roads
2	Preventative / Planned Maintenance	<ul style="list-style-type: none"> - 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	<ul style="list-style-type: none"> - 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)	<ul style="list-style-type: none"> - 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 during 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 best 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.

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 major structure 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, drainage structures and major 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 Council's 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.

As defined in the Roads and Road Inventory AMP Plan, there is an estimated 106 km of new roads to be constructed over the next 10 years relating predominately to greenfield developments. Within these new roads **10 new major culverts/bridges are expected** (noting the specific size, location and type of the structure has not yet been defined). Based on the above methodology, the predicted trend for bridges/major culverts over the coming ten years is illustrated below. Note that the other new major structures (such as retaining walls) have not yet been defined.

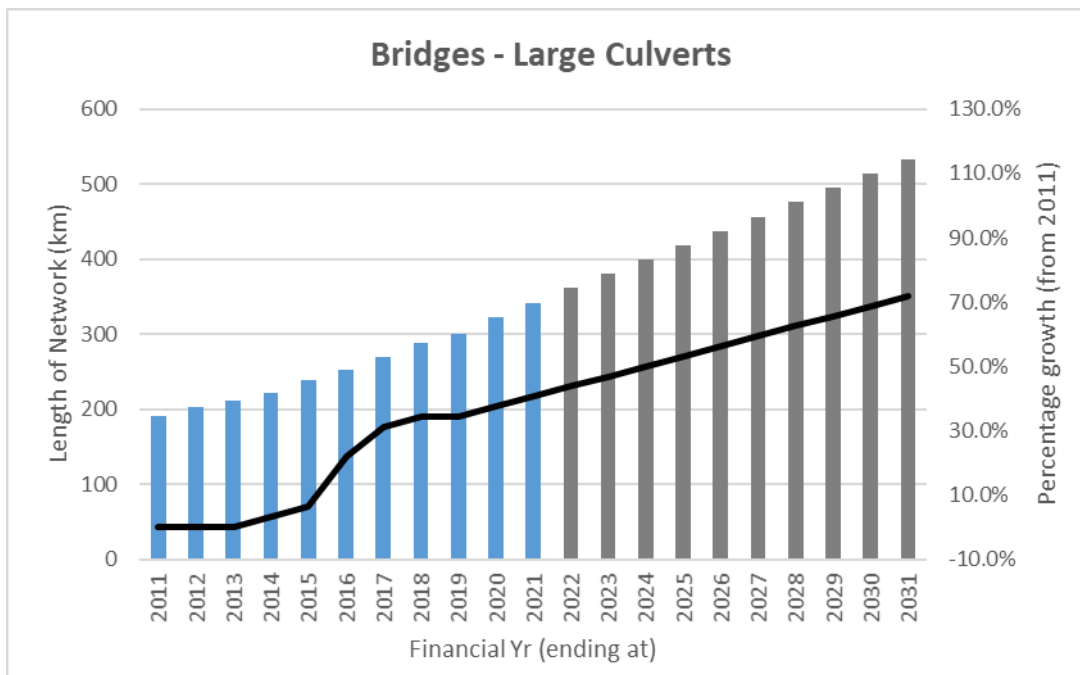


Figure 3.1 Bridges – Large culverts

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 will require significant capital investment. 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 **\$4.6 M** (an average of **\$0.5 M** per year). This relates predominately to bridges.

3.3.4 Financial impacts: Maintenance

Based on the above demands, additional maintenance expenditure will be required. Table 3.2 summarises the 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
Bridges and Major Structures	\$310,000	\$310,000	\$421,000	\$443,000	\$466,000	\$488,000	\$511,000	\$535,000	\$560,000	\$586,000	\$4,630,000

Table 3.2 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
Bridges and Major Structures	\$120,000	\$126,000	\$133,000	\$140,000	\$147,000	\$155,000	\$163,000	\$171,000	\$180,000	\$189,000	\$1,524,000

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 Background data

4.2.1 Asset hierarchy

Asset information is needed to support decision making. The asset hierarchy provides the framework for segmenting MCC’s bridges and major structures inventory into appropriate classifications to assist with lifecycle planning and management. The asset hierarchy used for this AM Plan is shown below.

Table 4.1 Asset hierarchy

Level 2/3	Level 4	Level 5	Level 6
Street Name, Bridge Name, Section ID	Road Bridges	Bridge Type (timber, steel, concrete)	Substructure, abutments/piers, deck, wearing course, approaches, barriers/guard rails, pedestrian access, feature lighting, drainage
		Major culverts (>6m in length)	Substructure, abutments/piers, deck, wearing course, approaches, barriers/guard rails, pedestrian access, feature lighting, drainage
	Pedestrian Bridges	Bridge Type (timber, steel, concrete)	Substructure, abutments/piers, deck, wearing course, approaches, barriers/guard rails
	Retaining Walls	>1 m in height	Retention of roads Retention of property (e.g. buildings) Retention of active recreation (e.g. sports oval) Retention of passive recreation (e.g. open spaces)
		< 1 m in height	
		Shotcrete retention	
	Lookouts	Structure	Structural elements
		Paths/approaches	

Level 2/3	Level 4	Level 5	Level 6
	Wharfs	Piers, deck, barriers/guard rails, pontoon, tie points, feature lighting	
	Boat ramp		
	Feature signage	Material type	
		Flag poles	

4.2.2 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 2.5).
- Target condition (between “1 and 5” as defined in Table 4.2).
- Consequence of failure (CoF) (between “C1 and C5” as defined in Section 4.6/3 and table 4.9).

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 5/6	Target Level of Service	Target Condition	CoF Rating
Bridges – Roads	Bridge type (timber, steel, concrete)	As per related road type/section	3 - Significant maintenance required	4
	Major culverts (>6 m in length)	As per related road type/section	3 - Significant maintenance required	4
Bridges - Pedestrian	Bridge type (timber, steel, concrete)	As per related path type/section	3 - Significant maintenance required	4
Retaining Walls	>1 m in height (retaining roads)	Functional, meets design standards	2 - Minor maintenance required plus planned maintenance	5
	>1 m in height (retaining property)	Functional, meets design standards	2 - Minor maintenance required plus planned maintenance	5
	>1 m in height (retaining active recreation spaces)	Functional, meets design standards	3 - Significant maintenance required	2
	>1 m in height (retaining active passive spaces)	Functional, meets design standards	3 - Significant maintenance required	2
	<1 m in height (all types)	Functional, meets design standards	4 - Significant renewal/upgrade required	1
	Shotcrete retention	Functional, meets design standards	4 - Significant renewal/upgrade required	4
Lookouts	Structures, barriers/guardrails, paths etc.	Functional, meets design standards	3 - Significant maintenance required	4
Wharfs	Piers, deck, barriers/guardrails, pontoon, tie points etc.	Functional, meets design standards	2 - Minor maintenance required plus planned maintenance	3
Boat ramp		Functional, meets design standards	3 - Significant maintenance required	3

Level 4	Level 5/6	Target Level of Service	Target Condition	CoF Rating
Feature signage	Material type	Functional, meets design standards	3 - Significant maintenance required	2
	Flagpoles	Functional, meets design standards	5 - Unserviceable	2

4.3 Asset profiles

4.3.1 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 bridges and major structures asset class has an estimated total replacement value (in 2022\$) of approximately **\$54.6 M** which is made up of:

- Road bridges and major culverts (being culverts >6 m in length) - 62 in total
- Pedestrian bridges
- Retaining walls
- Other major structures including wharf, boat ramps, lookouts and feature signage.

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 in 2022 and other historical cost data (inflated to 2022 dollars).

Note that several asset types in this asset class are missing data (specifically pedestrian bridges and retaining walls) meaning the financial requirements of lifecycle management are understated in this plan.

Table 4.3 Asset inventory summary

Asset	Asset elements	Total Qty (estimated)	\$ Cost breakdown (millions)	% Cost total
Bridges - Road Structures	Concrete Bridge	15	\$10,125,147	19%
	Large Box Culvert	27	\$25,679,217	47%
	Large Pipe Culvert	17	\$12,037,598	22%
	Steel Composite Bridge	1	\$1,461,450	3%
	Timber Bridge	2	\$2,188,293	4%
Pedestrian bridges	Timber Bridges	15	\$276,578	<1%
	Concrete Bridges	9	\$916,676	2%
	Enduroplank Bridges	5	\$160,550	<1%
Retaining Walls	>1m in height*	18	\$84,000	0%
	<1m in height*	17	\$400,000	1%
	Shotcrete retention*	2	TBA	TBA
	Not specified	20	\$630,000	1%
Other major structures	Lookouts*	1	TBA	TBA
	Wharfs	1	\$550,000	1%
	Boat Ramps	1	\$80,000	<1%
	Feature signage*	TBA	TBA	TBA
	Flag poles*	TBA	TBA	TBA
Grand Total			\$54,589,508	100%

*Additional data currently being collected

4.3.2 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. Note that due to available data, this figure predominately represents road bridges.

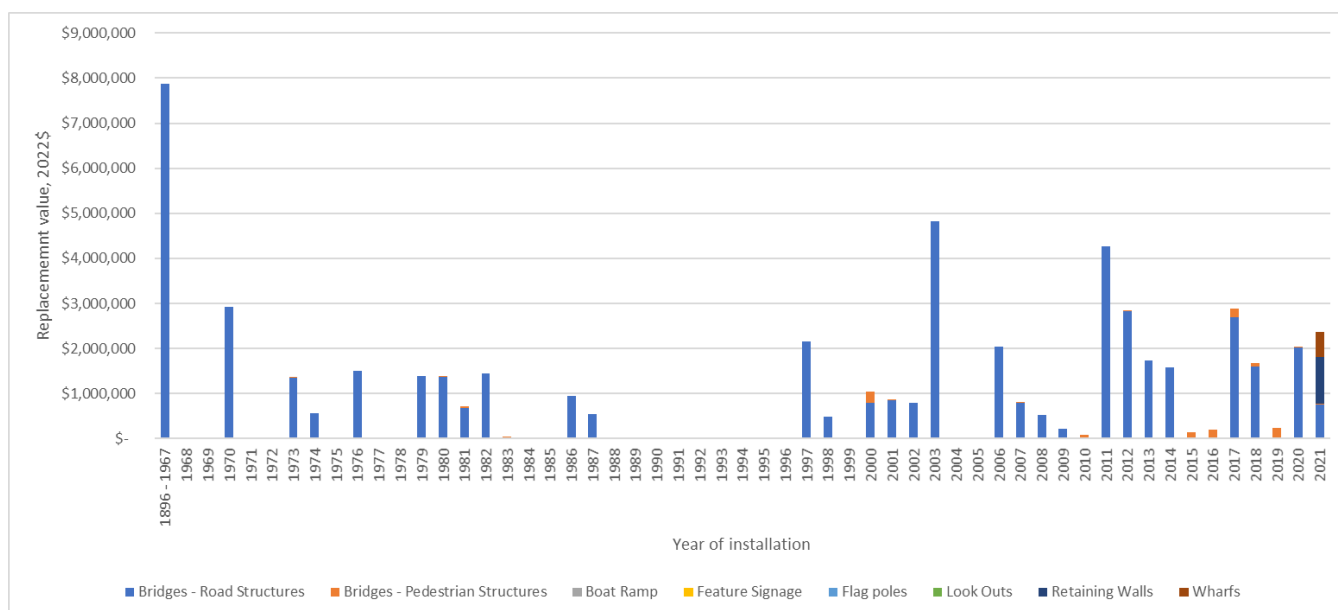


Figure 4.1 Installation profile: Total

4.4 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.

4.4.1 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. 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 (value \$152,400 / per year).

4.4.2 Maintenance and renewal planning

MCC currently carries out maintenance activities that are necessary to assets operating, including emergency maintenance for instances where portions of the asset may 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.

4.4.3 Standards and specification

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

With regards to inspections of major structures, MCC monitors the condition of their bridge and major structures in accordance with the Australian Road Research Board's (ARRB) *Local Bridge Road Management Manual*. This manual provides an inspection methodology that is preferred by MCC and includes the following levels of inspection:

- Level 1 – Routine Maintenance Inspection
- Level 2 – Bridge Condition Inspection
- Level 3 – Detailed Structural Engineering Inspection

Level 1 and 2 inspections are programmed inspections that are scheduled to be undertaken on a regular interval. The frequency of inspection varies depending on the type of structure, structure condition and the level of inspection.

During a Level 2 inspection, all components on the structure and the structure as a whole are rated in one of five condition states, general consistent with MCC's one to five condition rating scale. A more detailed definition of the condition states can be found in section 3.8.3 of the *Bridge Inspection Manual (2004)*.

4.4.4 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 are ~\$4.63 M per year until 2032.

4.5 Asset failure modes and consumption estimates

4.5.1 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 (or one of its components) 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. deterioration of a structure renders it unable to meet design standards).

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).

4.5.2 Remaining life and asset consumption

For bridge and major structure assets, 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 regarding 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 4.2.2.
- **Condition Rating:** A condition rating was applied to each asset based on available condition data or judgment of MCC staff as per Section 2.7

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.

The following graph indicates that the majority of major structures represented in the data (i.e. road bridges) are within the first half of their lifespan, mostly due to estimated life provided by MCC staff and historic bridge maintenance and renewal interventions.

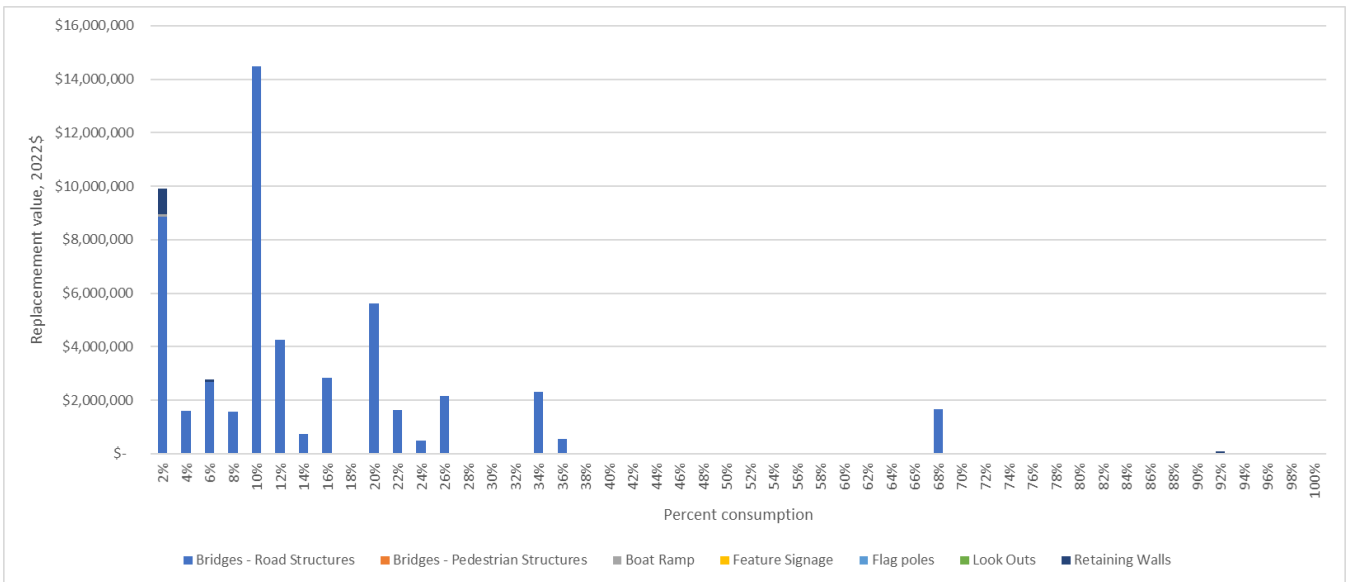


Figure 4.2 Asset consumption: total bridges and major structures

4.6 Asset risk data and risk exposure estimates

4.6.1 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 bridge and major structural 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:

$$\text{Risk Exposure} = \text{Probability of Failure (Pof)} \times \text{Consequence of Failure (CoF)}$$

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	Unlikley	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 4.3 Risk matrix

4.6.2 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

4.6.3 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 and 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

4.6.4 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 4.3, a ranking was determined (Very High, High, Medium or Low) for each asset included in the hierarchy.

In summary, no bridges and major structures assets are a “**very high**” business risk, with only **3%** of assets being a “**high**” business risk. This equates to a financial replacement estimate (in 2022\$) of **~\$1.7 M**. These are made up of road bridges and major retaining walls.

Note that due to estimated consequence of failure from major retaining walls retaining other high value/consequence assets (CoF rating of “5”) such as roads and buildings, these assets will always appear as a high risk asset regardless of age and condition using the current methodology. This is due to consequence of a failure resulting in situations considered “catastrophic” resulting in significant financial losses, loss of life and extended loss of essential services.

Probability of Failure	P5	Almost Certain	\$ -	\$ -	\$ 80,000	\$ -	\$ -
	P4	Likeley	\$ -	\$ -	\$ -	\$ 1,673,971	\$ -
	P3	Possible	\$ -	\$ -	\$ -	\$ -	\$ -
	P2	Unlikely	\$ -	\$ -	\$ -	\$ 7,129,103	\$ -
	P1	Rare	\$ 54,000	\$ 430,000	\$ 1,180,000	\$ 42,688,630	\$ -
			Insignificant	Minor	Moderate	Major	Catastrophic
		1	2	3	4	5	
Consequence of Failure							

Figure 4.4 Asset risk exposure estimate: Total – replacement value

Probability of Failure	P5	Almost Certain	0%	0%	<1%	0%	0%
	P4	Likeley	0%	0%	0%	3%	0%
	P3	Possible	0%	0%	0%	0%	0%
	P2	Unlikely	0%	0%	0%	13%	0%
	P1	Rare	<1%	1%	2%	78%	0%
			Insignificant	Minor	Moderate	Major	Catastrophic
		1	2	3	4	5	
Consequence of Failure							

Figure 4.5 Asset risk exposure estimate: Total – percentage

4.6.5 High priority assets

High priority assets (very high and/or high risk assets) are summarised below. These assets are currently prioritised in in the FY 2022/23 capital and maintenance plan.

- The major retaining wall on Hillcrest Drive, retaining the road structure (note that that this retaining wall, whilst in good condition, will always be a high risk asset due to its consequence of failure ranking).
- Aberglasslyn Road to Melville Ford Timber Bridge.
- Anambah Road major culvert.

The detailed list of asset priorities in this asset class is as follows.

Table 4.7 *Asset priorities*

Priority	Street Name / Location	Section ID	Asset category
High	Hillcrest Drive	2253:5 Horizon to Redwood	Retaining Walls
High	Aberglasslyn Road (Melville Ford Bridge)	4:15 Aberglasslyn to Melville Ford Bridge	Bridges - Road Structures
High	Perth (reserve)	Pb4	Bridges - Pedestrian Structures
High	Ray Lawler Reserve, Morpeth Common	Pb10	Bridges - Pedestrian Structures
Medium	Anambah Road	19:8 bend at #199 to cos past culvert	Bridges - Road Structures
Medium	Four Mile Creek Road	987:3 #45 to end	Bridges - Road Structures
Medium	Wollombi Road (Bishops Bridge)	633:19 Ravensfield to bridge	Bridges - Road Structures
Medium	Dagworth Road	141:4 floodgate to bridge	Bridges - Road Structures
Medium	Racecourse Road	672:2 culvert ch305 to h / no 89	Bridges - Road Structures
Medium	Woodlands Drive	997:1 Whiteley to bridge	Bridges - Road Structures
Medium	Somerset Drive	953:12 Benwerrin to government	Bridges - Road Structures
Medium	Schanck Drive	753:3 Casuarina to bridge	Bridges - Road Structures
Medium	Hunterglen Drive	8871:2 Highland to culvert	Bridges - Road Structures
Medium	Perth (reserve)	pb3	Bridges - Pedestrian Structures
Medium	Freeman-Occupation	pb11	Bridges - Pedestrian Structures
Medium	Occupation Lane	pb12	Bridges - Pedestrian Structures
Medium	Drummond (reserve)	pb9	Bridges - Pedestrian Structures
Medium	Telarah Lagoon	pb25	Bridges - Pedestrian Structures
Medium	Tenambit Sports Complex Training	pb26	Bridges - Pedestrian Structures
Medium	Brooklyn Park The Boulevard	pb33	Bridges - Pedestrian Structures
Medium	Walka Waterworks Trail West	pb36	Bridges - Pedestrian Structures
Medium	Walka Waterworks Trail	pb35	Bridges - Pedestrian Structures
Medium	Walka Waterworks Trail East	pb34	Bridges - Pedestrian Structures
Medium	Tom Lantry Park Metford Road Opp. B	pb37	Bridges - Pedestrian Structures
Medium	McFarlanes Road	379:10 # 302 to Bridge	Bridges - Road Structures
Medium	Bingara Street	938:3 Crothers to Aberglasslyn	Bridges - Road Structures
Medium	Maitland Vale Road	363:8 #301 to Campbells	Bridges - Road Structures
Medium	Glenwood Drive	899:11 Hartley to Weakleys	Bridges - Road Structures
Medium	Desalis Drive	2382:1 Weakleys to City Boundary	Bridges - Road Structures
Medium	Duckenfield Road	169:3 Culvert to Bridge	Bridges - Road Structures
Medium	River Road	500:4 Lerra to Sandstone	Bridges - Road Structures
Medium	Sandstone Drive	2158:1 River to She Oak	Bridges - Road Structures
Medium	Springs Street	2185:1 Saddlers to River Oak	Bridges - Road Structures
Medium	Duckenfield Road	169:8 Bridge to Eales Rd	Bridges - Road Structures
Medium	Mustang Drive	2201:2 Spitfire To Sabre	Bridges - Road Structures

Priority	Street Name / Location	Section ID	Asset category
Medium	Flat Road	208:10 H/No 135 to H/No 79	Bridges - Road Structures
Medium	Flat Road	466:1 Melbourne to Rail Bridge Start	Bridges - Road Structures
Medium	Flat Road	466:4 Pitnacree Close to Pitnacree Road	Bridges - Road Structures
Medium	Government Road	248:5 Roundabout End at Wirraway to Roundabout Start at Somerset	Bridges - Road Structures
Medium	Darcys Circuit	2179:2 Hero to #20	Lookouts
Medium	McKeachie Drive	2196:1 Aberglasslyn to Redgum	Bridges - Road Structures
Medium	Anambah Road	19:10 Cos Past Stockpile Site to Cos at #390	Bridges - Road Structures
Medium	Flat Road	208:12 Twin Culvert to Roundabout at Paterson Road	Bridges - Road Structures
Medium	Trappaud Road	586:1 Wallis to Bridge	Bridges - Road Structures
Medium	Hillsborough Road	276:1 Maitland Vale to Bridge	Bridges - Road Structures
Medium	Windermere Road	630:5 150m Past #259 to #344	Bridges - Road Structures
Medium	Luskintyre Road	359:3 #93 to Bridge	Bridges - Road Structures
Medium	Louth Park Road (Yarrabong Bridge)	358:5 Trappaud to Bridge	Bridges - Road Structures
Medium	High Street (Victoria Bridge)	414:1 Fitzroy to Victoria Bridge	Bridges - Road Structures
Medium	Turton Street	593:2 #67 to Chifley	Bridges - Road Structures
Medium	Fieldsend Street	204:1 Metford to Turton	Bridges - Road Structures
Medium	Schanck Drive	753:2 Lycett to Casuarina	Bridges - Road Structures
Medium	Woodberry Road	638:10 Turners to Culvert	Bridges - Road Structures
Medium	Wollombi Road	633:7 #131 to Owl Pen	Bridges - Road Structures
Medium	Racecourse Road	672:1 New England Hwy to Culvert Ch305	Bridges - Road Structures
Medium	Thornton Road	579:4 Huntingdale to Bridge	Bridges - Road Structures
Medium	Woodberry Road	638:8 Cos Ch 2270 to Bridge	Bridges - Road Structures
Medium	Victory Way	2315:1 Racecourse to Roundabout Start at Grand	Bridges - Road Structures
Medium	Dragonfly Drive	2275:4 Billabong to Pinchtail	Bridges - Road Structures
Medium	She Oak Close	2159:1 Sandstone to End	Bridges - Road Structures
Medium	Grand Parade near Discovery Way	2319:14 Victory to Discovery	Bridges - Road Structures
Medium	Grand Parade near Victory Way	2319:14 Victory to Discovery	Bridges - Road Structures
Medium	Wirraway Drive	2419:5 Lawrenson to Government	Bridges - Road Structures
Medium	Grand Parade	2319:11 Conquest to Ranger	Bridges - Road Structures
Medium	Duckenfield Road	169:4 Bridge to Bridge	Bridges - Road Structures
Medium	Day Street	149:4 William to Banks	Bridges - Road Structures
Medium	Lawes Street	339:1 Page to Alliance	Bridges - Road Structures
Medium	Metford Road	387:5 Roundabout to Pound	Bridges - Road Structures
Medium	Wollombi Road	633:17 #514 to #564	Bridges - Road Structures
Medium	Maitland Vale Road	363:30 Hillsborough Road to #1405	Bridges - Road Structures

Priority	Street Name / Location	Section ID	Asset category
Medium	Mt Dee Road	403:2 Cos Ch 320 to Bridge	Bridges - Road Structures
Medium	Tocal Road	994101:25 Mindaribba Station to No 541	Bridges - Road Structures
Medium	Maitland Vale Road	363:21 #902 to #954	Bridges - Road Structures
Medium	Bungaree Street	80:1 Roundabout to Ledsam	Bridges - Road Structures
Medium	Bungaree Street Cycleway	80:2 Ledsam to Telarah	Bridges - Road Structures
Medium	Spitfire Place	2203:3 Bdy 37/41 to Meteor Pl	Bridges - Road Structures
Medium	Maitland Vale Road	363:27 #1212 to Cos Ch12400	Bridges - Road Structures
Medium	Whitewater (Reserve)	pb20	Bridges - Pedestrian Structures
Medium	New England Highway	pb22	Bridges - Pedestrian Structures
Medium	New England Highway/Garnett	pb1	Bridges - Pedestrian Structures
Medium	Garnett-Adelaide (reserve)	pb2	Bridges - Pedestrian Structures
Medium	Lochend (reserve 15)	pb7	Bridges - Pedestrian Structures
Medium	Billabong (reserve)	pb21	Bridges - Pedestrian Structures
Medium	Fieldsend St	pb23	Bridges - Pedestrian Structures
Medium	Turnbull (reserve 37)	pb6	Bridges - Pedestrian Structures
Medium	Glenayre (reserve)	pb8	Bridges - Pedestrian Structures
Medium	Cessnock Road (Fishery Creek)	pb24	Bridges - Pedestrian Structures
Medium	Luzon	pb5	Bridges - Pedestrian Structures
Medium	Morpeth Common rear	pb27	Bridges - Pedestrian Structures
Medium	Adams Street opp No.21	pb28	Bridges - Pedestrian Structures
Medium	Adams Street opp No.17	pb29	Bridges - Pedestrian Structures
Medium	Brunswick Street near No.163	pb31	Bridges - Pedestrian Structures
Medium	Vista Parade behind No.18	pb32	Bridges - Pedestrian Structures
Medium	Queens Wharf Road	480:1 Swan to End Of Seal	Wharfs
Medium	Queens Wharf Road	480:1 Swan to End Of Seal	Boat Ramp
Medium	Queens Wharf Road	480:1 Swan to End Of Seal	Retaining Walls
Medium	Queens Wharf Road	480:1 Swan to End Of Seal	Retaining Walls
Medium	Queens Wharf Road	480:1 Swan to End Of Seal	Retaining Walls

4.7 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 aging 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.

4.8 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.

4.9 Disposal plan

Disposal includes any activity associated with disposal of a decommissioned asset including sale, demolition or relocation. Rationalisation of bridges and major structures, 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 bridges and major structure 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 **\$0.4 M** in 2022 dollars. This average annual cost includes capital works for new assets from growth of **\$4.63 M** to be constructed/expended by 2032, upon which capital expenditure reduces with exception of the noted replacement works.

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, for example, the assets included in the capital investment spikes in this figure in years 2035 and 2048. 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.

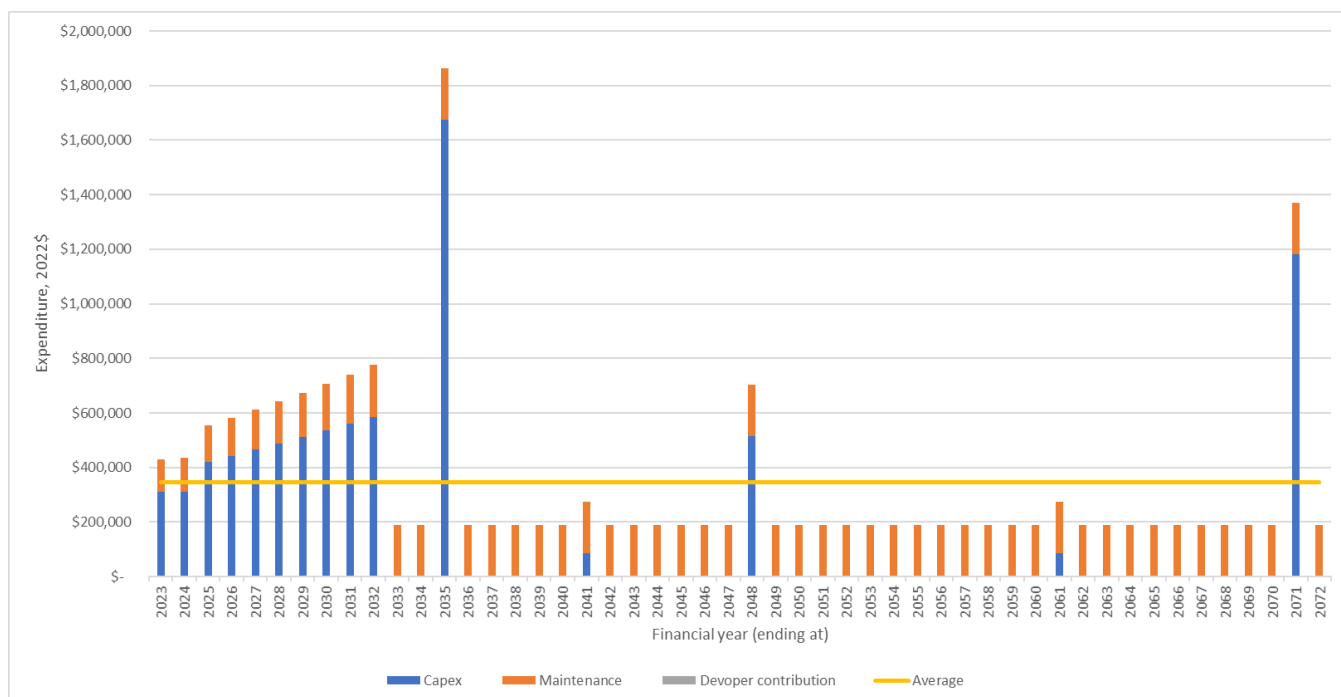


Figure 5.1 Financial projection – Total

5.3 Long term funding mechanisms

Long term funding mechanisms will be addressed 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.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report. The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared. The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Maitland City Council which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

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 and capital expenditure and are as per provided by MCC until financial year 2033.
- Maintenance expenditure for financial year 2033 onwards is assumed to be the same value as financial year 2032.
- Capital expenditure for financial year 2033 onwards is based on the replacement value, maximum potential life, judgement residual life, year of install, and/or condition of the assets provided by MCC.
- 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.
- % consumed has been rounded to the nearest multiple of 2.



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