MOSMAN

ASSET MANAGEMENT PLAN 2020-29

STORMWATER

Adopted by Council 6 October 2020

CONTENTS

INTRODUCTION

Background

The Mosman local government area is located in Sydney's northern suburbs, around 6 kilometres from central Sydney. The Council area is predominately residential with commercial areas along Military Road. The Council area includes significant areas of Sydney Harbour foreshore. Early settlement in Mosman dates from the 1800s, but the development of the area was slow until the 1880s when road access was improved. Significant growth in Mosman occurred in the interwar period as well as the 1950s and 1960s when many residential flat buildings were constructed. Since this period, growth has slowed as development opportunities have become fewer.

Assets not included in this Plan are those within State and Federal government lands including HMAS Penguin, National Parks, Sydney Harbour Federation Trust and Taronga Zoo.

The purpose of this AMP is to have a guide to managing stormwater assets safely, efficiently and effectively for the people of Mosman. This AMP outlines the broad approach that will be adopted to manage the condition of and use of stormwater assets over the next 10 years.

Mosman Council provides, operates, and maintains the following stormwater assets:

- Pipelines and culverts
- Pits and manholes
- Converters
- Open drains
- Covers, inlets and outlets
- Pollution control devices
- Drainage control devices
- Stormwater reuse tanks
- Natural watercourses

These assets deliver the following services to the community:

- Limiting the risk of flooding of public and private property
- Limiting the risk to public health from flooding, including to pedestrian and vehicular traffic
- Protecting downstream environments through managing the quality, quantity and location of stormwater discharged
- Helping to manage regional water resources
- Potable water savings through stormwater reuse
- Helping to maintain the provision of public recreational areas

COVID-19

The assets values, data and modelling that informed the Asset Management Plans was done prior to the full ramifications of the COVID-19 pandemic being known. Due to the variability in market conditions during this time, it is recommended that the Stormwater AMP be reviewed and updated in 18 months' time to account for any changes. This has also been included in the Policy as a key performance measure.

Goals and Objectives of Asset Management

Council's goal in managing infrastructure assets is to provide equitable and appropriate services and facilities for the community and ensure they are managed efficiently and effectively and are of a quality consistent with requirements of the Mosman community.

The key elements of infrastructure asset management are:

- Consider a life cycle approach
- Developing cost-effective management strategies for the long term
- Provide a defined level of service and monitoring performance
- Understanding and meeting the demands of growth through demand management and infrastructure investment
- Managing risks associated with asset failures
- Sustainable use of physical resources
- Continuous improvement in asset management practices

This asset management plan sets out objectives over a 10 year period:

- To have provided directly or on behalf of other levels of government adequate, equitable and appropriate services and facilities for the community and to ensure that those services and facilities are managed efficiently and effectively, and are always of high quality consistent with the requirements of the Mosman community
- Aim to have Council's unrestricted current ratio at 2:1
- Seek to meet benchmarks, e.g. sustainability financial indicator of greater than 1.0, backlog ratio less than 2.0% and maintenance ratio greater than 100%
- To have business systems which will meet the increasing demands for management information and that add value to the Council and community by providing integrated, accurate, timely, cost-effective and responsive service
- To have Mosman Council regarded as an employer of choice by all its stakeholders
- To have risk management strategies in place to ensure Mosman is a safe place to live, work and play
- To have integrated sustainable practices into the Council's asset management planning and implementation

Asset Management Plan Framework

In accordance with the NSW government's Integrated Planning and Reporting framework, Mosman Council's Community Strategic Plan (2018-2028), named MOSPLAN, presents a broad outline of Mosman Council's aspirations for serving its residents, based on community engagement.

MOSPLAN's Resourcing Strategy ensures there are adequate financial, human resources and assets to deliver Council's services over 10 years. The Asset Management Framework (see Figure 1) outlines the asset component of the Resourcing Strategy.

The Asset Management Framework is guided by the Asset Management Policy and Asset Management Strategy.

The key points from the Asset Management Policy are:

- Assets are to be managed (from creation, through operation to disposal) in accordance with the Council's objectives and priorities for service delivery
- Each infrastructure asset class (buildings, roads, stormwater drainage, parks and open space, marine structures) has an asset management plan
- Outlines human resource needs and staff roles and responsibilities
- The asset management strategy is to be implemented in order to apply asset management best practice
- Council will promote continuous improvement in asset management

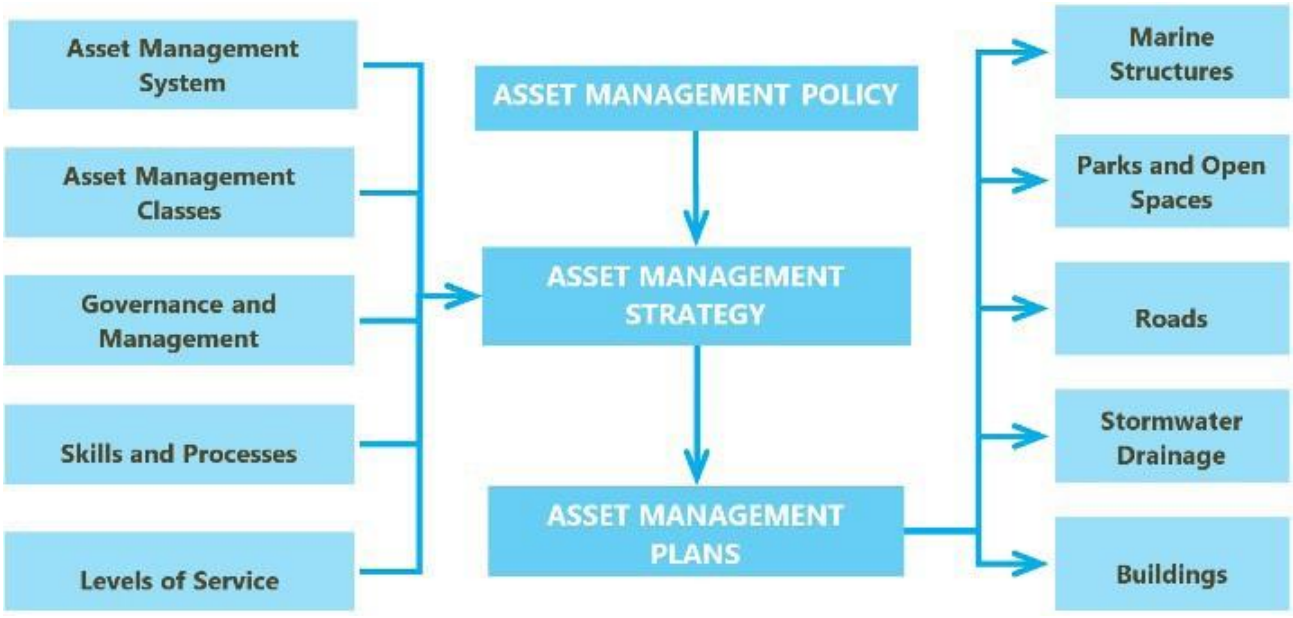


Figure 1 – Asset Management Framework

The Asset Management Strategy is a guide to the content of the asset management plans, relevant legislation, describes the current status of risk management and asset information systems within Council and a broad overview of each plans financial forecasts. This Asset Management Plan is in accordance with the Asset Management Strategy.

The Asset Management Plans then guide the yearly capital works and maintenance budgets and provide important input into the Council's Long Term Financial Plan.

Summary of Assets

This stormwater AMP cover the infrastructure assets in Table 1.

Asset Group	Asset Types	Current Replacement Cost (CRC) '000s ($)
Pits	Includes: 417 junction pits 475 surface inlet pits 1542 kerb inlet pits 125 converters 167 headwalls/endwalls (an additional 101 only consist of pipe outlet) 65 manholes	$9,488,937
Closed Conduits	Includes: Pipes - 62.20km (consists of 3216 assets) Box culverts – 3.59km (consists of 197 assets)	$50,919,760
Open Conduits	Includes: Grate over drain – 0.15km (consists of 25 assets) Half round – 1.43km (consists of 30 assets) Open box drain – 1.85km (consists of 56 assets) Unlined – 0.49km (consists of 13 assets) V-drain – 0.13km (consists of 6 assets)	$3,369,876
Stormwater Quality Improvement Devices (SQIDs)	30 gross pollutant traps 6 NetTech structures	$3,833,328
Rainwater Tanks	2 x 500KL rainwater tanks	$1,402,495
	Total	$69,014,396

Table 1 – Extent of Assets covered by this Plan (as at June 30 2019)

LEVELS OF SERVICE

Description

Levels of service provide the basis for life cycle management strategies and works programs. They intend to align the measurable attributes of the service to the corporate objectives of the organisation.

They must be readily measurable, and easily understood by members of the community. There is an ongoing development of levels of service to address the reasonable needs and expectations of the community.

Stormwater assets are measured by delivery of programs, inspections, adequate asset assessment and customer service, asset operation, prevention of flooding, injury and damage and relevant legislative framework, standards and codes.

The objectives of the levels of service in this Stormwater AMP are intended to:

- Inform the community of the proposed type and level of service to be offered
- Assist with the identification of the costs and benefits of the services being offered
- Enable the community to assess suitability, affordability and equity of the services offered
- Provide a measure of the effectiveness of the asset management plan
- Provide focus for the development of the asset management strategies
- Provide guidance for current and future services to be offered, the manner of the service delivery and definition of the specific levels of service which the organisation wishes to achieve

The levels of service outlined in this section are based on:

- Information gathered and interpreted from customers on the importance of and satisfaction with services and in some cases expected quality and cost of services
- Information obtained from expert advice on asset condition and performance capacity
- Strategic and corporate goals
- Legislative requirements
- Regulations, environmental standards and industry and Australian Standards that specify minimum design parameters for infrastructure delivery
- Australian design standards and codes of practice which specify minimum design parameters for infrastructure delivery
- Availability of resources and the financial environment

Mosman Community Satisfaction, Research and Request

Council regularly conducts community surveys to determine the importance and satisfaction with infrastructure and services. The latest Mosman Community Survey was conducted in June 2018. The community survey asks how the Council manages and protects the environment where one of the components is stormwater. Most resident's responses were satisfied with the Council's efforts in managing the environment.

The number of complaints received due to stormwater infrastructure is also measured and generally within acceptable levels when compared with the number of assets managed. For example, approximately 1.6% of council managed pits resulted in a complaint throughout the year.

See the Levels of Service Matrix (Table 3) for the full comparison between our performance targets and current performance.

Legislative Requirements

Council has to meet many requirements including National and State legislation and regulations. These are listed in Council's Asset Management Strategy document.

Stormwater Roles & Responsibilities within NSW State Government

A number of State agencies in New South Wales share responsibility for stormwater management with Mosman Council, these include:

- Sydney Water is responsible for the large (or trunk) drains within their operational areas. They are required to maintain both the condition and hydraulic capacity of these assets. Sydney Water's stormwater assets extend across 27 local government areas in the greater Sydney metropolitan area
- Transport for NSW (TfNSW) is responsible for stormwater assets on state roads and in Sydney harbour (below the mean high tide watermark)

The Department of Planning, Industry & Environment also covers a wide range of responsibilities for environmental and natural resource management, including stormwater management. These include:

- Coordinating the policy direction for stormwater management in New South Wales
- Holding fundamental responsibility for the management of natural resources within the State
- Promoting integrated water cycle management by water utilities to manage water systems in a sustainable way that benefits the community and local environment

Asset Rating Systems

Condition Ratings

The standard condition rating scale used for stormwater assets (excluding non-valued assets) is the 1-5 rating approach as defined by the IPWEA and is detailed below in Table 2.

Assets in condition 1 to 3 are considered to be in a "satisfactory" condition while those in condition 4 and 5 are considered to be in an "unsatisfactory" condition. The condition ratings were determined initially by the community via the Mosman Asset Management Reference Group in 2011/12. The descriptions determined by the group have been reviewed regularly and remain consistent to how the condition rating would be described today. The service levels determine what the condition the asset should be in before it is renewed.

Condition	Rating	Description of Asset Condition
"Satisfactory" Condition		
1	Excellent	Insignificant deterioration has occurred. Appears to be in good condition.
2	Good	Minor deterioration has occurred. Minor defects are present.
3	Average	Moderate deterioration has occurred. Developed defects are present but do not affect short/medium term structural integrity.
"Unsatisfactory" Condition		
4	Poor	Serious deterioration has occurred. Significant defects are present that affect structural integrity.
5	Very Poor/ Failed	Failure has occurred or is imminent.

Table 2 – Condition Rating Scale

Renewal Intervention Strategy

Council adheres to a Condition 4 'Intervention' program where assets that decline into a Condition 4 rating (unsatisfactory) ratio are scheduled to be renewed as soon as practical, preferably within the next two financial years.

However, due to stormwater assets having long useful lives, the recommended time for renewal is generally longer and dependent on the risk. The time for renewal may be extended to within 2-3 years for condition 5 assets and within 3-5 years for condition 4 assets.

The renewal intervention level was selected to optimise the desired level of service, mitigate risk and optimise maintenance and renewal expenditure. The aim is to minimise assets in an unsatisfactory condition and therefore a renewals intervention strategy that proposes asset renewal as the asset falls into condition 4 is considered desirable.

Condition 4 assets will be added to the capital works program to be replaced within 3-5 years unless their failure does not pose a risk. Alternate funding or shifting lower priority work to later years are two ways to ensure condition 4 assets are replaced.

Condition 5 assets are to be replaced as soon as practically possible, especially if the asset poses a higher risk.

Levels of Service

Stormwater Levels of Service are measured by community feedback and on a technical basis. For each service description, there are a number of performance measures that aim to measure whether that service is at a satisfactory level. To assess Council's current level of service, a number of datasets and other data sources are used to assess performance against the set target.

Levels of Service are detailed in Table 3 and it is expected that where current performance is unknown it will be measured during the life of the plan.

Service Description	Performance Measure Process	Performance Target	Current Performance
Adequate capital works planning	Capital works program in place	Yes	Yes
Community involved in planning	Community consultation process implemented	Yes	Yes
Public health and safety	Number of injuries attributable to poorly maintained stormwater drains per year	0	- 0 injuries reported 2018/19 - 1 injury reported 2017/18 - 1 injury reported 2016/17 - 0 injuries reported 2015/16
Lack of public nuisance	Number of complaints per year concerning stormwater network blockages	50	54 (between Oct 2018 – Mar 2019)
Protection of private property from flooding damage	Number of properties damaged as a result of flooding per year which result in a reported incident to Council	5	2018-19:8 2017-18:0 2016-17: 3 2015-16: 3
Stormwater resource management	Volume of collected stormwater in Council stormwater tanks reused per year	2 ML/year	2018-19: 3.0 ML 2017-18: 4.0 ML 2016-17: 2.1 ML 2015-16: 2.5 ML
Adequate asset assessment	Percentage of pipes CCTV assessed per year (average)	2.5%	3%
	Percentage of open conduits assessed per year (average)	20%	20%
	Percentage of pits and manholes assessed per year (average)	10%	20%
	Percentage of SQIDs condition assessed per year (average)	20%	20%
Continuation of service	Percentage of responses to blockages of pipes/pits within 10 days in last year	85%	98%
Risk assessment	Management of risk treatments	Undertake risk planning & treatments within designated time frame as described in risk management plan	Risk treatments undertaken as required

Table 3 - Levels of Service Matrix

FUTURE DEMAND

Demographics and Growth

The community of Mosman generates the demand for the services provided by the stormwater assets.

The estimated population of Mosman as of 30 June 2018 was 30,877 people (www.profile.id.com.au/mosman). There is expected to be minor population growth over the next few years with a rate of 82 people per year until 2036.

The slight increase in population density is unlikely to affect that demand for stormwater assets.

Demand Management

Mosman is a well-developed area of Sydney and the number of greenfield sites available for development is extremely limited. Additional stormwater loads may come from redevelopment or increases in storm intensity.

Council will add new stormwater assets, where the need arises to prevent flooding, increase the capacity of existing drainage assets, adapting to climate change and development in the area, such as streetscape upgrades. The need will be balanced against the high costs and sometimes impractical nature of installing new underground assets.

It is preferred that that any increased runoff will be managed through water sensitive urban design (WSUD) solutions. Strategies employed to achieve WSUD include the following:

- Limiting discharges to a rate corresponding to the drainage systems existing capacity
- Developing catchment-based policy
- Utilising on-site stormwater detention (OSD), to limit both the peak load on the stormwater system and flooding to private property
- Flood risk management

In addition to the high costs of new stormwater assets, they can also impact upon on heritage sites and private property requiring a legal easement. Easements can be difficult to obtain and are generally are last resort.

Examples of heritage sites that may be impacted by new stormwater assets include sites of indigenous cultural significance such as campsites and heritage sandstone walls.

Changes in Technology

More sophisticated technology to predict flooding and stormwater will be beneficial to managing the network. A model to determine the areas in Mosman that will be a risk of flooding is being investigated.

Other improvements in manufacturing and construction also will further improve stormwater works, by bringing down costs and saving time.

Impact of Climate Change & Other Environmental Factors

Climate change is predicted to increase storm intensity and place a bigger burden on stormwater assets. This may make levels of service more difficult to achieve. A significant rainfall event in 2018, highlighted areas where the stormwater system needed to be upgraded to increase the capacity.

Council is currently preparing a Climate Strategy and Action Plan which aims to address to impacts of climate change.

The action plan will be in addition to some of the steps already undertaken by Council to mitigate the impacts on the environment such as:

- The roll out of SQIDS (stormwater quality improvement devices) on the majority of catchments
- OSD for new developments in Mosman
- Reducing car usage through the expansion of the active transport network
- Improved recycling and rubbish collection including pit cleaning and street sweeping
- Installation of solar panels and LED lighting and public infrastructure

CURRENT STATE OF ASSETS

An external consultant compiled the stormwater inventory in 2013, supplemented by Council's GIS data. The inventory has been updated each year with changes from capital works and condition inspections.

The stormwater asset inventory consists of:

- Condition and dimensional data of pits, headwalls, endwalls and converters (as a group they are referred to as 'pits')
- Condition and dimensional data of open channels
- Condition and dimensional data of closed conduits (pipes and small box culverts)
- Condition, capacity and dimensional data of SQIDs (stormwater quality improvement devices) and rainwater tanks

The following shows a breakdown of each type of stormwater asset, by diameter, material, age and condition.

Pipes

The following tables display the lengths of the pipe categorised by diameter, material and age.

The first table (Table 4) is an analysis of the total and average length of pipes by diameter.

Pipe Diameter (mm)^	Number	Length (m)	Average Length (m)	% by Length (excepting 'unknown')
Unknown	705	14093.3	20.0	--
<150*	29	254.2	8.8	0.53%
150	80	840.7	10.5	1.75%
200	12	87.9	7.3	0.18%
225	88	1022.1	11.6	2.12%
250	40	477.2	11.9	0.99%
300	548	8533.6	15.6	17.74%
375	784	14921.7	19.0	31.02%
400	150	2692.3	17.9	5.60%
450	313	6730.3	21.5	13.99%
500	71	1837.2	25.9	3.82%
525	27	928.3	34.4	1.93%
600	213	5043.1	23.7	10.48%
660	11	336.3	30.6	0.70%
675	2	53.6	26.8	0.11%
700	7	105.2	15.0	0.22%
750	29	772.1	26.6	1.60%
800	4	148.1	37.0	0.31%
825	1	4.9	4.9	0.01%
900	37	1210.5	32.7	2.52%
1000	12	400.9	33.4	0.83%
1050	18	678.8	37.7	1.41%
1085	1	43.1	43.1	0.09%
1200	22	572.4	26.0	1.19%
1350	5	190.2	38.0	0.40%
1500	4	78.5	19.6	0.16%
1800	1	15.6	15.6	0.03%
1900	2	125.3	62.6	0.26%
Total	3216	62197.16	19.3	100%

^ Some pipe diameters recorded as non-standard sizes have been assigned the closest standard size

* Generally, pipes with a diameter less than 150 mm are not considered part of the stormwater network

Table 4 – Pipe length by diameter (as at June 30 2019)

The material of pipes is shown in Table 5. The vast majority of pipes are concrete, with small amounts of vitrified clay and unplasticised polyvinyl chloride (uPVC) (the latter from pipe relining).

Table 6 shows the breakdown of pipes by apparent age (based on circumstantial historical information, such as the construction date of houses). It indicates that the majority of pipes are between 30 and 65 years old and with a smaller portion between 65-120 years old. This fits the general historical development of the area. A portion is also less than 30 years old, which are pipes that have been renewed, upgraded or installed as new assets.

Condition Data

Condition data for stormwater pipes have been improving over time since the first CCTV surveys between 2011-2013. A large percentage of the network has now been surveyed.

Photos of typical defects and pipe cross-sections from CCTV surveys are shown in Figure 2.

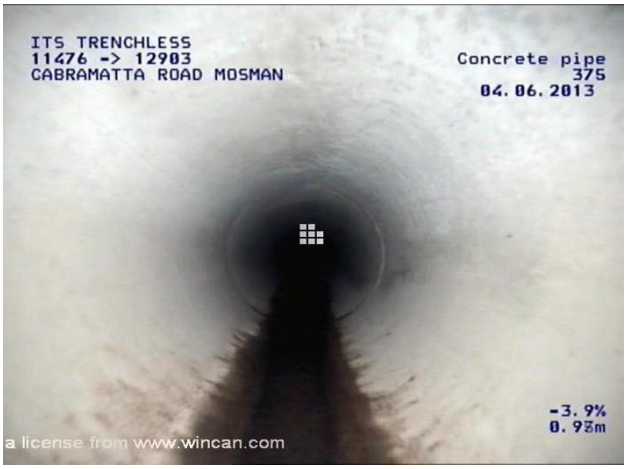
Pipe conditions broken down by pipe diameter are presented in Table 7. For pipe sizes above 900 mm diameter and below 225mm, there is insufficient data to infer a trend. It is clear that all condition 5 pipes are 300, 375 and 450 mm diameter pipes. Condition 4 grades were found in most pipe sizes between 200 and 500mm diameter pipes.

Pipe Material	Number	Length (m)	% by Length (excepting 'unknown')
Unknown	657	13243.0	-
Concrete	2329	46255.1	94.49%
uPVC	165	1890.8	3.86%
Vitrified Clay	31	271.7	0.55%
Other	34	536.6	1.1%
Total	3216	62197.1	100%

Table 5 – Pipe length by material (as at June 30 2019)

Apparent Pipe Age	Number	Length (m)	% by Length (excepting 'unknown')
'New' (<30 years old)	664	13362.4	21.48%
'Recent' (30-65 years old)	1772	31465.53	50.59%
'Ageing' (65-120 years old)	772	17194.61	27.65%
'Old' (>120 years old)	8	174.6	0.28%
Total	3216	62197.1	100%

Table 6 – Pipe length by apparent pipe age (as at June 30 2019)



Condition 1

Condition 2

Condition 3

Condition 4

Condition 5

Condition 5

Figure 2 – Pipe defects/cross sections from CCTV surveys by condition grade

Pipe Diameter (mm)	Number	Length (m)	Condition Grade (percentage by CRC)				
			1	2	3	4	5
Unknown	705	14093.3	0.70%	89.54%	9.61%	0.15%	0.00%
100	29	254.2	14.46%	36.16%	49.38%	0.00%	0.00%
150	80	840.7	16.60%	1.11%	82.29%	0.00%	0.00%
200	12	87.9	0.00%	95.31%	0.00%	4.69%	0.00%
225	88	1022.1	9.29%	89.87%	0.46%	0.39%	0.00%
250	40	477.2	30.40%	33.20%	36.40%	0.00%	0.00%
300	548	8533.6	4.79%	55.14%	38.99%	0.76%	0.33%
375	784	14921.7	4.92%	41.43%	52.56%	0.33%	0.76%
400	150	2692.3	5.56%	20.17%	72.25%	2.02%	0.00%
450	313	6730.3	1.70%	16.55%	78.80%	1.23%	1.73%
500	71	1837.2	0.32%	21.25%	78.12%	0.30%	0.00%
525	27	928.3	0.00%	15.19%	84.81%	0.00%	0.00%
600	213	5043.1	7.57%	89.38%	3.05%	0.00%	0.00%
660	11	336.3	0.00%	100.00%	0.00%	0.00%	0.00%
675	2	53.6	0.00%	100.00%	0.00%	0.00%	0.00%
700	7	105.2	0.00%	89.57%	10.43%	0.00%	0.00%
750	29	772.1	0.00%	100.00%	0.00%	0.00%	0.00%
800	4	148.1	43.11%	56.89%	0.00%	0.00%	0.00%
825	1	4.9	0.00%	100.00%	0.00%	0.00%	0.00%
900	37	1210.5	13.05%	79.14%	7.81%	0.00%	0.00%
1000	12	400.9	1.92%	98.08%	0.00%	0.00%	0.00%
1050	18	678.8	6.46%	78.84%	14.70%	0.00%	0.00%
1085	1	43.1	0.00%	100.00%	0.00%	0.00%	0.00%
1200	22	572.4	18.69%	22.32%	58.99%	0.00%	0.00%
1350	5	190.2	0.00%	38.65%	61.35%	0.00%	0.00%
1500	4	78.5	0.00%	0.00%	100.00%	0.00%	0.00%
1800	1	15.6	0.00%	0.00%	100.00%	0.00%	0.00%
1950	2	125.3	0.00%	91.83%	8.17%	0.00%	0.00%
Total	3216	62197.1					

Table 7 – Condition grade by diameter (as at June 30 2019)

Table 8 shows condition grades by pipe age. There is an increasing proportion of pipes in condition 4 and 5 as they age, which is expected. There appears a significant decline after pipes reach 120 years but as the age has been estimated this trend may not be accurate.

Apparent Pipe Age	Number	Length (m)	Condition Grade (percentage by CRC)				
			1	2	3	4	5
'New' (<30 years old)	664	13362.40	21.11%	77.89%	0.99%	0.00%	0.00%
'Recent' (30-65 years old)	1772	31465.53	0.04%	75.34%	24.16%	0.21%	0.25%
'Ageing' (65-120 years old)	772	17194.61	0.00%	12.66%	86.21%	1.03%	0.11%
'Old' (>120 years old)	8	174.60	0.00%	11.05%	0.00%	0.00%	88.95%
Total	3216	62197.1					

Table 8 – Condition grade by apparent pipe age (as at June 30 2019)

The condition profile of our pipes network is indicated in Figure 3.

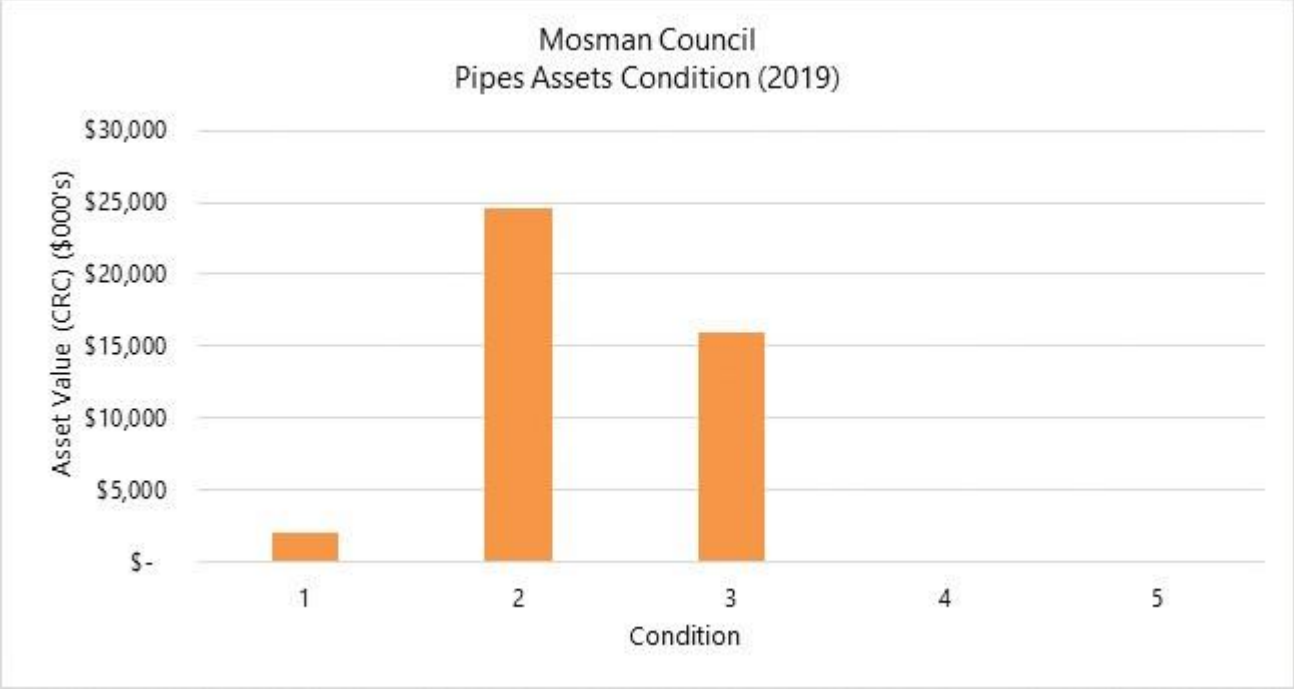


Figure 3 – Condition profile of pipes (as at June 30 2019)

Age Profile

The age data has been approximated based on circumstantial historical information and condition and therefore the accuracy is average. The age profile is shown in Figure 4.

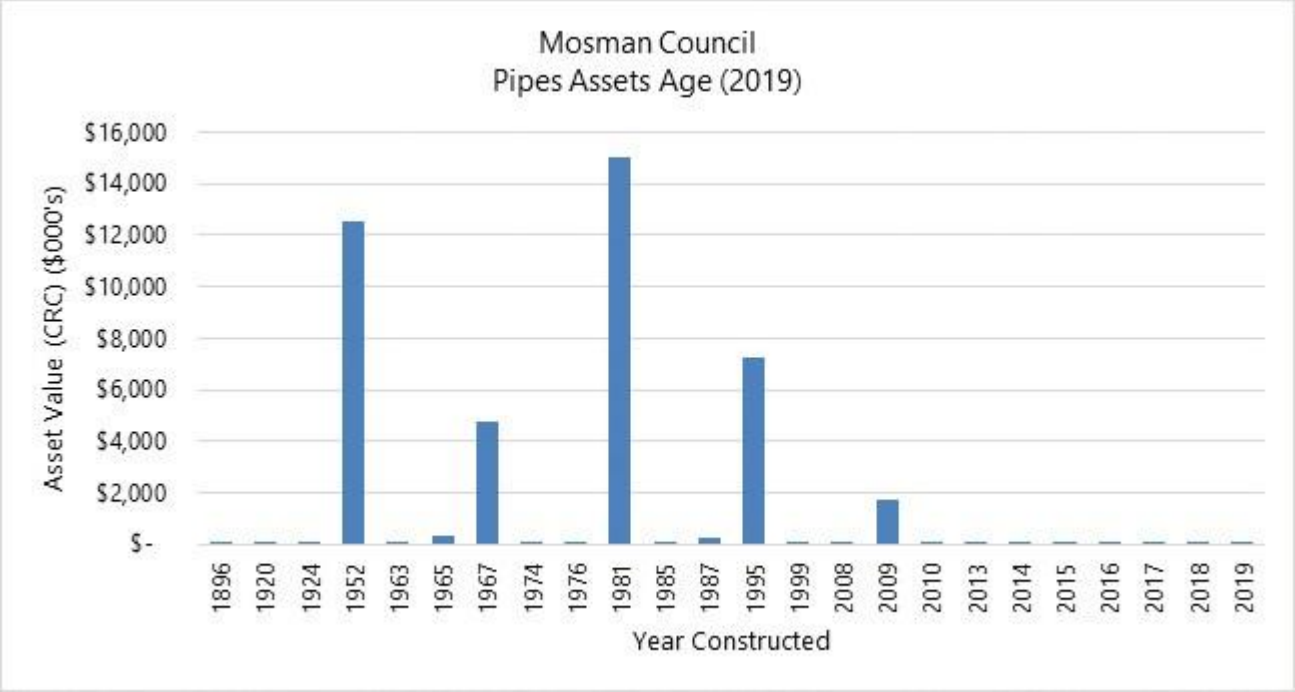


Figure 4 – Age profile of pipes (as at June 30 2019)

Pits, end walls, headwalls, and converters ('pits')

Breakdown of Assets and Condition

All pits, endwalls, headwalls and converters are broadly classified as pits. They are also referred to as nodes. The number of each type of these assets are shown in Table 9.

Typical images of pits assets are shown in Figure 5.

Asset Type	Number	Description
Buried Junction*	759	A pit connecting two or more pipes which has had its cover/lid buried by, typically, a road surfacing such as asphalt. Also known as a blind pit.
Converter	125	A structure that acts to transfer gutter flow to piped flow or vice versa.
Headwall/Endwall	268	A structure supporting the inlet (headwall) or outlet (endwall) of a pipe and is open to the environment. Headwalls typically take flows from a natural watercourse or open conduit into a pipe network; endwalls typically release flows from a piped network into a natural watercourse or open conduit.
Junction Pit	417	A pit connecting two or more pipes that does not intake additional stormwater through a surface inlet, and that has a square/rectangular lid and pit.
Kerb Inlet Pit	1542	A pit which forms part of the kerb system and which has a surface inlet for receiving stormwater from gutters. It is usually connected to upstream and downstream pits.
Manhole	65	Similar to a junction pit, but with a circular lid and a circular pit.
Node	16	The junction of two line assets where there is no separate structure – not considered assets themselves, but used for hydraulic modelling purposes.
Surface Inlet Pit	475	A pit with a surface inlet that is not part of a kerb-and-gutter system.
Other	3	These assets form part of another type of asset such as a SQID or footpath.
Total	3670	

* Buried junctions were not condition inspected and either inferred or their existence taken from Council data.

Table 9 – Numbers of pits by type (as at June 30 2019)

Converter

Kerb Inlet Pit

Surface Inlet Pit

Endwall

Junction Pit

Manhole

Figure 5 – Example photos of pit assets

Pits are rated as an average of their components: structure, cover, and lintel. Condition ratings are presented in Table 10.

Generally, pits assets are in good condition. Converters have the most assets in poorer condition and a small number of junction pits, headwalls/endwalls and manholes have a condition 4 or 5 grading. Covers and lintels for pits tend to be in a worse condition than the structure itself.

Pit Type	Condition Grade (percentage by CRC)				
	1	2	3	4	5
Converters	9.3%	79.5%	7.3%	1.6%	2.3%
Headwalls/Endwalls	0.5%	83.3%	15.6%	0.0%	0.6%
Junction Pits	5.1%	82.3%	11.0%	1.6%	0.0%
Kerb Inlet Pits	2.7%	89.1%	8.0%	0.3%	0.0%
Manholes	2.6%	85.8%	10.5%	0.0%	1.1%
Surface Inlet Pits	4.5%	89.2%	6.1%	0.0%	0.2%

^ Converter structures could not be assessed because the lintel covers them and is fixed. Therefore the lintel of the asset is assessed only and is taken as a proxy for their condition of the entire structure

Table 10 – Condition of pit assets by type (as at June 30 2019)

Asset Componentisation

Stormwater pit (node) assets are componentised first by the type of pit (see Table 9). They are then componentised and valued according to their dimensions.

For junction pits, kerb inlet pits and surface inlet pits they are then valued based on length, width and depth. Kerb inlet pits are componentised further into a pit component and a lintel component. The components are added together to get the total pit value.

Headwalls are valued based on the size of the pipe or box culvert outlet. Manholes are valued based on the opening diameter. Converters are valued based on the length of the lintel size inside of the converter.

Condition Profile

Stormwater pits condition ratings are compared to the replacement value in Figure 6. This data is also displayed in Table 10 and indicates that the majority of pits are rated as Condition 2 or 'good'.

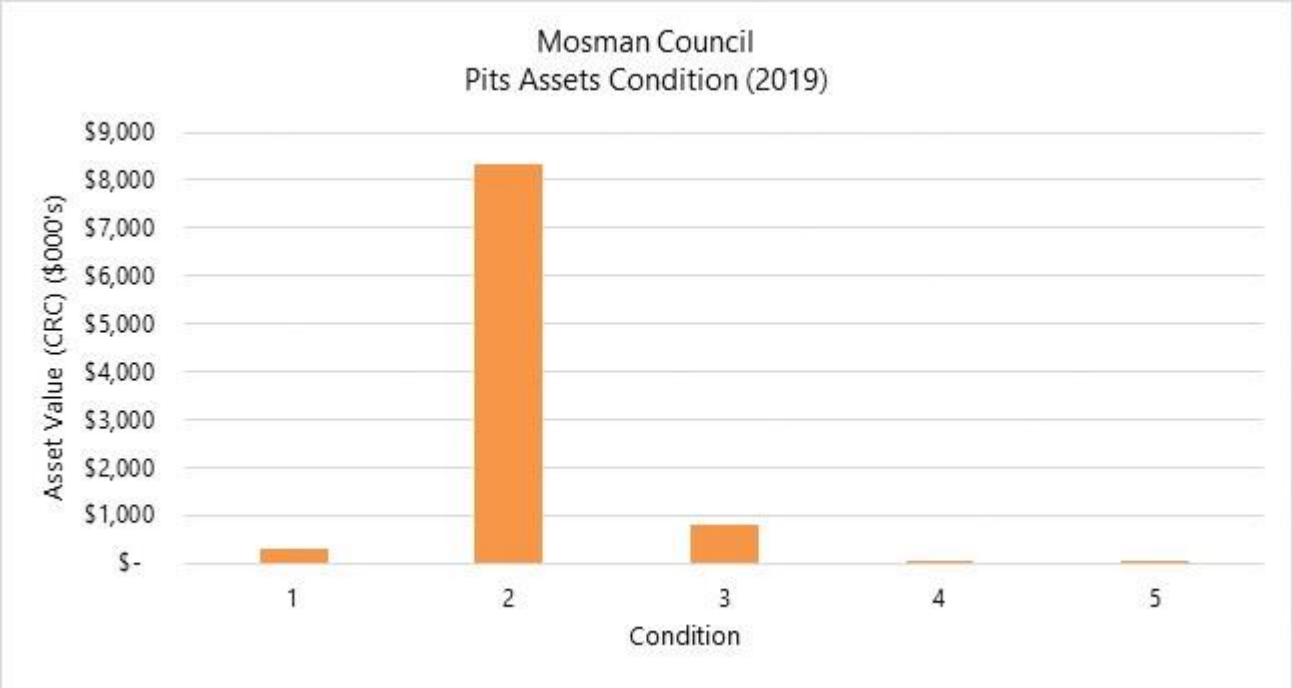


Figure 6 – Condition profile of pits (as at June 30 2019)

Age Profile

The build date data for pits is approximated based on circumstantial historical information and condition.

As the condition of most pits is Condition 2, it was estimated using the pits useful lives, that a large percentage of pits are estimated to be built around the 1980s. The profile is available in Figure 7.

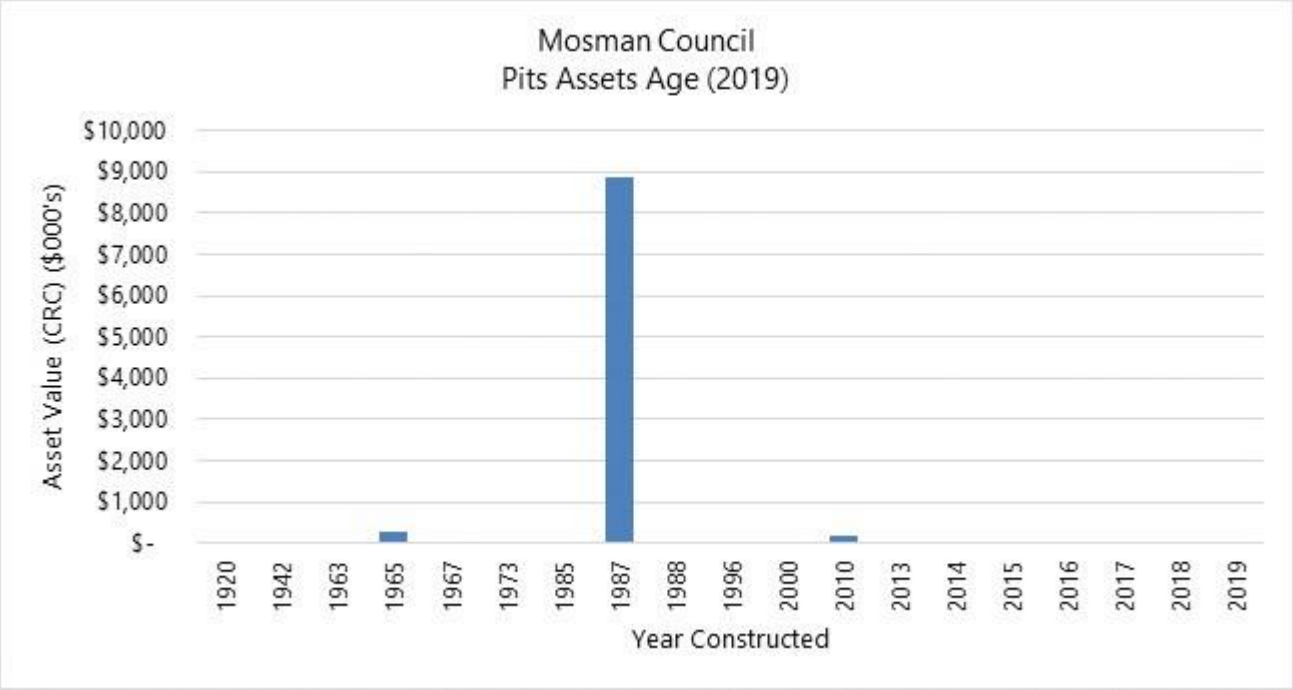


Figure 7 – Age profile of pits (as at June 30 2019)

Open Conduits

Breakdown of Assets and Condition

Open conduits are man-made channels, either lined (typically by concrete) or unlined which convey stormwater. Council has 130 open conduits with a total length of 4,050 metres, varying in size from 30 mm to 1,500 mm.

They are of varying shapes and designs and the vast majority are lined. Examples of open channels are given in Figure 8. The assets number and condition are displayed below in Table 11.

Open Conduit Type	Number	Length (m)	Condition Grade (percentage by CRC)				
			1	2	3	4	5
Grate Over Drain	25	146.1	61.44%	13.78%	24.78%	0.00%	0.00%
Half Round	30	1434.3	11.25%	60.10%	27.96%	0.00%	0.68%
Open Box Drain	56	1854.0	19.74%	47.38%	32.88%	0.00%	0.00%
Unlined	13	487.3	11.64%	0.00%	88.36%	0.00%	0.00%
V-Drain	6	128.6	46.77%	0.00%	53.23%	0.00%	0.00%
Total	130	4050.4					

Table 11 – Open Conduits by type, length and condition (as at June 30 2019)

Figure 8 – Example open conduits

Condition Profile

The condition profile for Council's open conduits, based on inspection, is shown in Figure 9. Most open conduits are between Condition 1-3. The majority are in Condition 2 with a portion in Condition 3. The Condition 3 assets will be monitored.

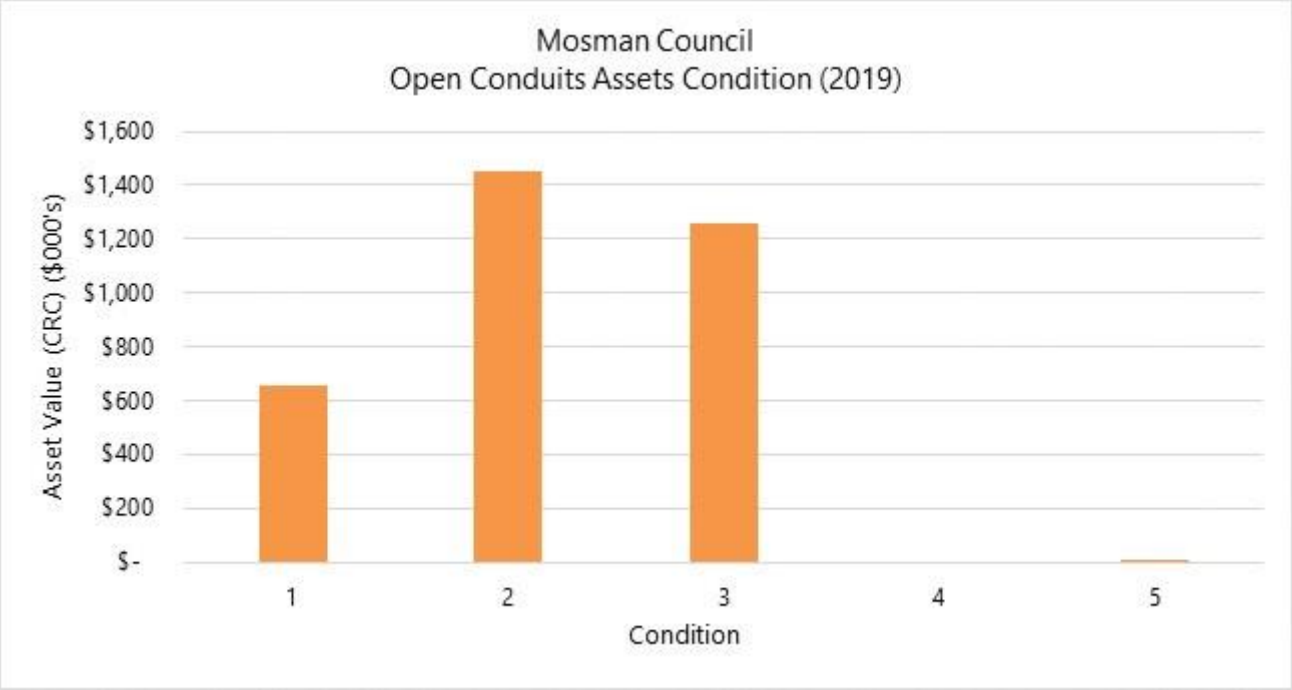


Figure 9 – Condition profile of open conduits (as at June 30 2019)

Age Profile

The age profile displayed in Figure 10 has higher accuracy than the pits and pipes data, however most of the data is still an estimate showing for a large number of assets built in 1920, 1965 and 2010.

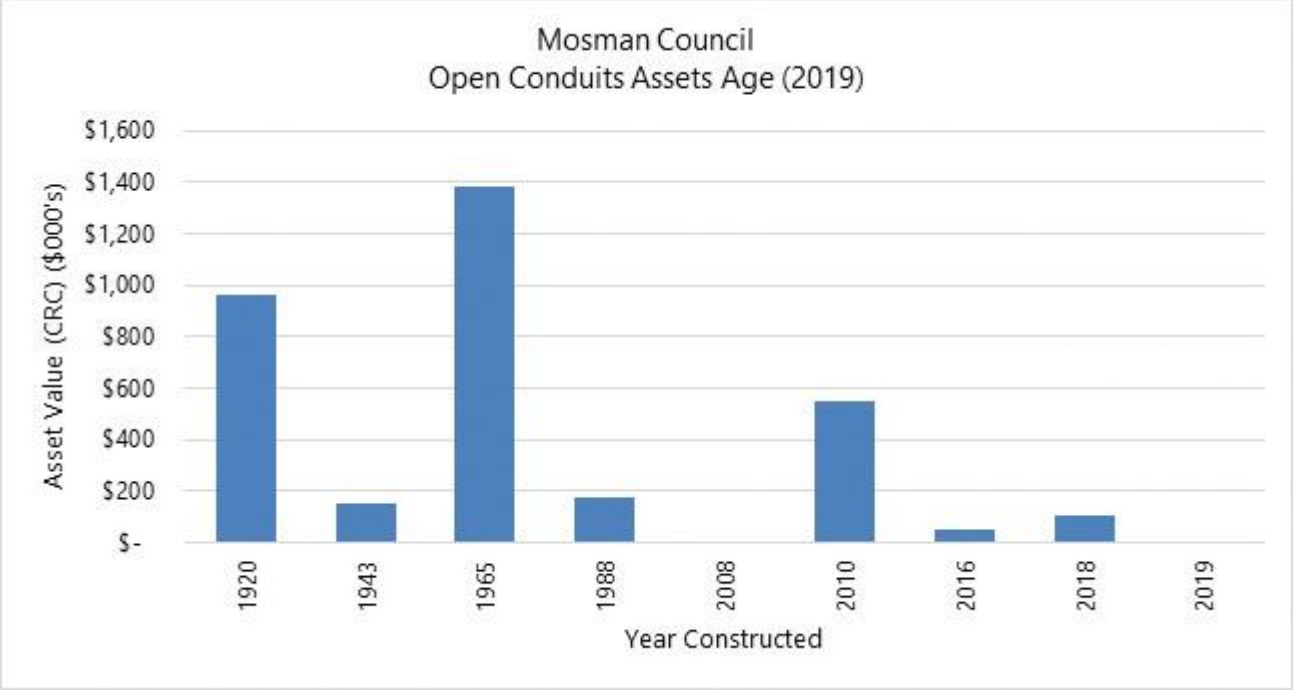


Figure 10 – Age profile of open conduits (as at June 30 2019)

Large Culverts

Large culverts, with a span of greater than 1.8 metres and an open area of greater than 3.0 m^2, are considered to be bridges.

Council has three large culverts (one of which has an intermediate pit, meaning it is broken into two asset IDs). A summary of the information on these culverts is contained in Table 12. One of the three large culverts is in good condition; the other two are in average conditions. Photographs of the three large culverts are given in Figure 11.

Parameter	Location		
	Cowles Rd, Mosman (near Holt Ave intersection)	Bay St, Mosman (between Carrington Ave and Bickell Rd)	Balmoral Beach (near intersection of Raglan St and The Esplanade)
Width (mm)	2300	6450	3750
Height (mm)	1650	1350	950
Length (m)	11.1	31.3	52.4
Condition	3	3	2

Table 12 – Summary of dimensions and condition of large culverts (as at June 30 2019)

Bay St

Cowles Rd

Balmoral Beach

Balmoral Beach

Figure 11 – Large culvert photographs

Small Culverts

Breakdown of Assets and Condition Profile

Council has 193 small culverts (cross-sectional area of less than 3.0 m^2), with a total length of 3,492 metres. A large proportion of these small culverts have been inspected via CCTV.

Council has a good understanding of the condition of the network. Table 13 shows the number of small culverts sorted by their condition rating. The table shows that the majority of assets are sitting at Condition 3 and a smaller percentage at Condition 2. There are 4 small culverts (1%) that are in poor condition that will require renewal in the near future.

Condition Grade	Number of Small Culverts	Length of Small Culverts (m)	% by CRC
1	11	214.3	4.0%
2	34	627.8	14.1%
3	144	2496.0	79.3%
4	4	154.3	2.6%
5	0	0	0%
Total	193	3492.4	100.0%

Table 13 – Condition grading of small culverts (as at June 30 2019)

The % by CRC column in Table 13 is also represented by the condition profile shown in Figure 12.

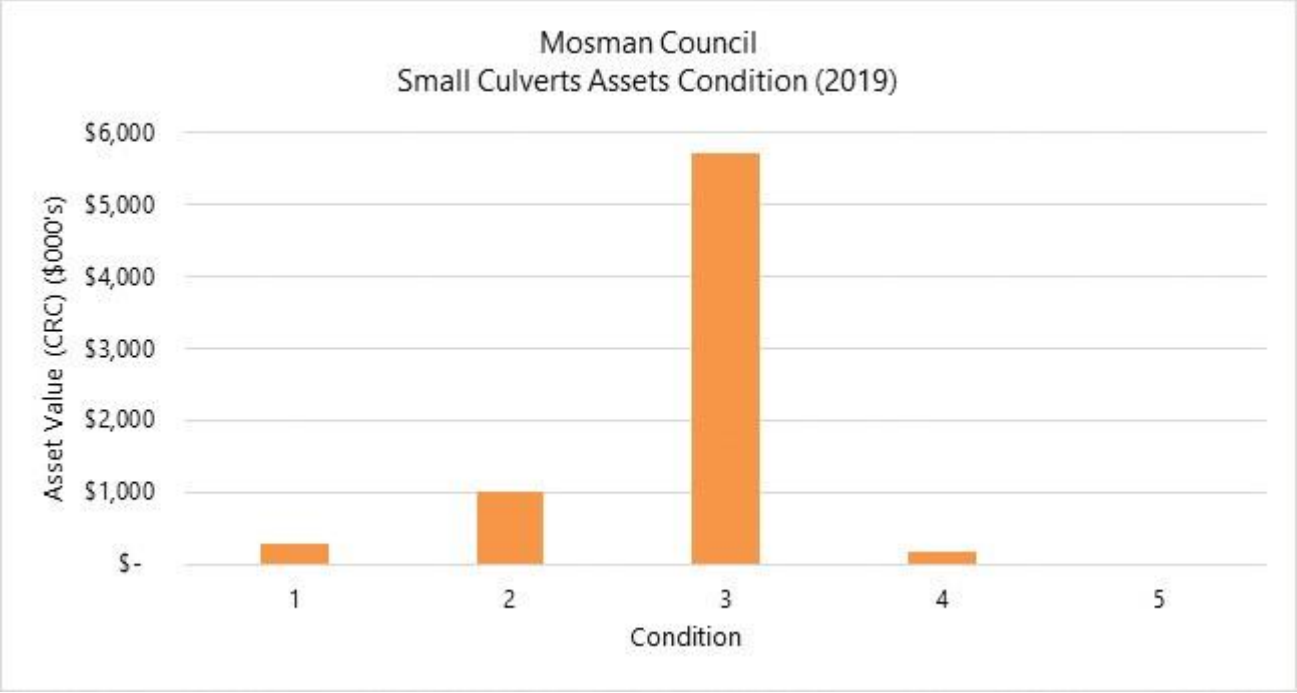


Figure 12 – Condition profile of small culverts (as at June 30 2019)

Photographs showing cross-sections/defects for each of the grades, taken from the CCTV survey, are shown in Figure 13. These are used to inform the condition ratings for each asset.

Condition 1

Condition 2

Condition 3

Condition 4 (manhole visible)

Figure 13 – Culvert defects/cross sections from CCTV surveys

Asset Componentisation

Small culverts are valued by their width and height. In terms of componentisation, the only other separating factor other than dimensions is the material of the asset. The material affects the useful life values of the culverts.

Age Profile

As with previous types of stormwater assets, the age data is not very reliable and is based on approximations. The age profile is displayed in Figure 14.

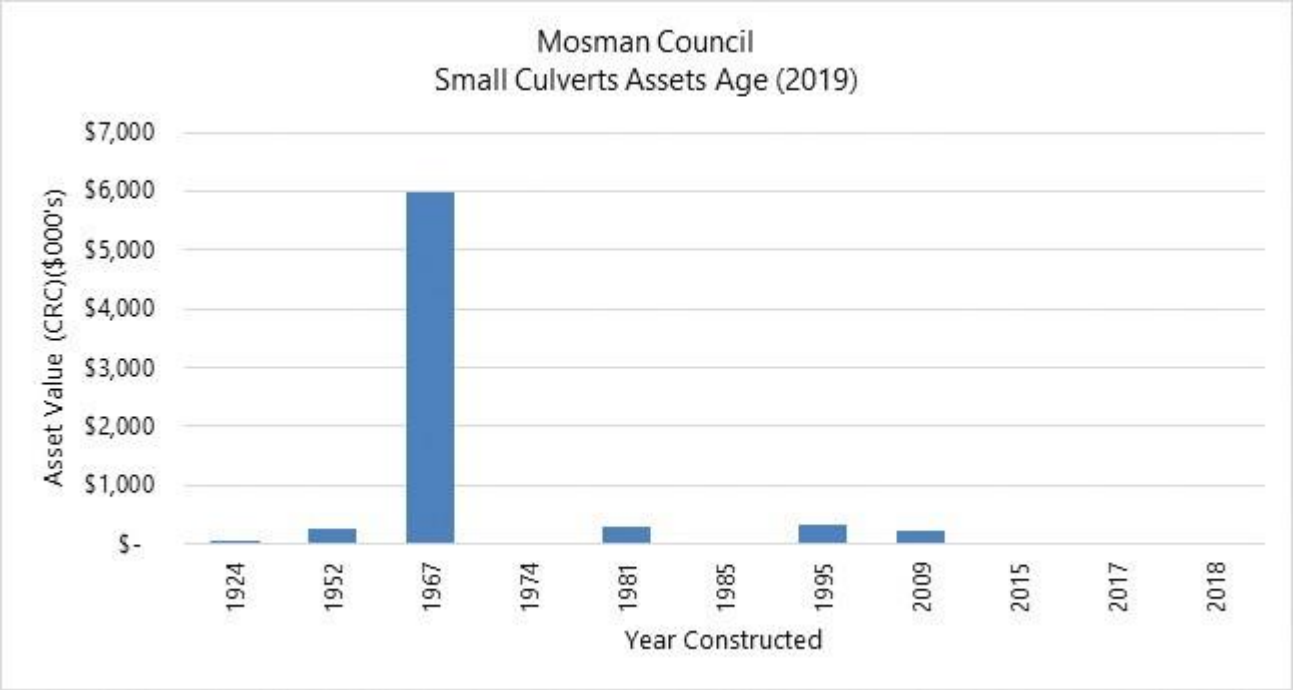


Figure 14 – Age profile of small culverts (as at June 30 2019)

Natural Watercourses

Council has 3214 metres of natural watercourses – drainage routes which have formed naturally. These are connected to the built drainage system via headwalls, pits and endwalls. Council cleans natural watercourses on an as-needed basis. Example natural watercourses are shown in Figure 15.

Natural watercourses are not kept in the stormwater asset register, however, some of these are in the Parks and Open Space Asset Management Plan and are inspected frequently. Adding these assets to our stormwater register is a short term goal for this plan.

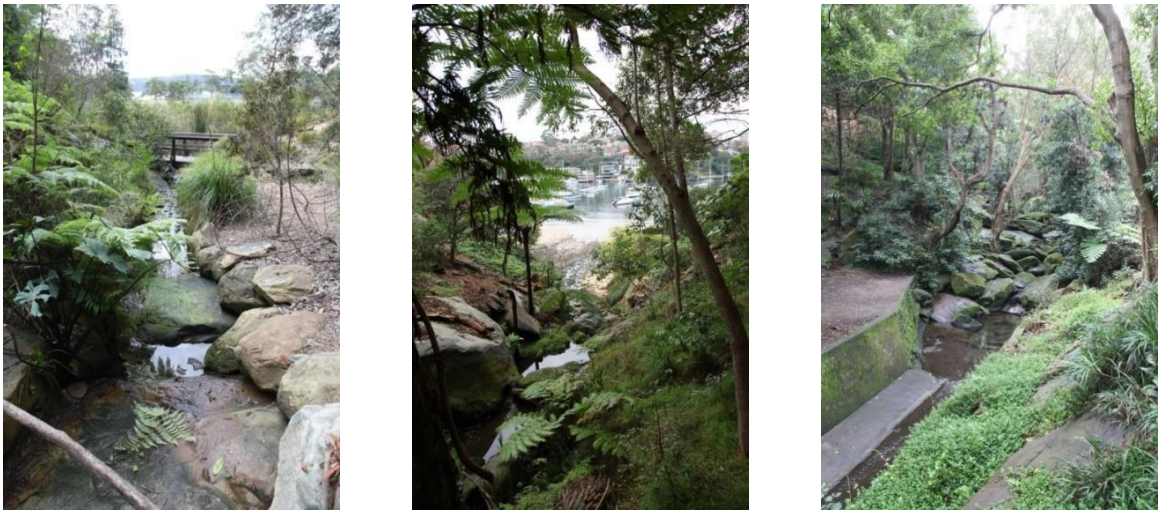


Figure 15 – Example natural watercourses

Stormwater Quality Improvement Devices (SQIDs)

Number of Assets and Condition Profile

Council owns 36 stormwater quality improvement devices (SQIDs), the first installed in 1996. Table 14 shows the breakdown of SQIDs by unit type and their condition rating. SQIDs are rated between Condition 1-3, with the majority in Condition3.

SQIDs are routinely maintained, which means they very rarely reach a poor condition. The reason for a lower number of SQIDs being in an excellent condition is due to their age compared to useful life.

		Condition Grade (percentage by CRC)				
SQID Unit Type	**Number**	**1**	**2**	**3**	**4**	**5**
Continuous Deflective Separation Technology (CDS)	21	10.66%	35.05%	54.30%	0.00%	0%
CleansAll	2	20.66%	0.00%	79.34%	0.00%	0%
Ecosol	2	83.72%	16.28%	0.00%	0.00%	0%
NetTech	6	0.00%	0.00%	100.00%	0.00%	0%
Pit with screen	2	0.00%	100.00%	0.00%	0.00%	0%
Sand Filter	3	0.00%	0.00%	100.00%	0.00%	0%
Total	36					

Table 14 – SQID units owned by Council (as at June 30 2019)

The condition profile of all SQIDs is displayed in Figure 16.

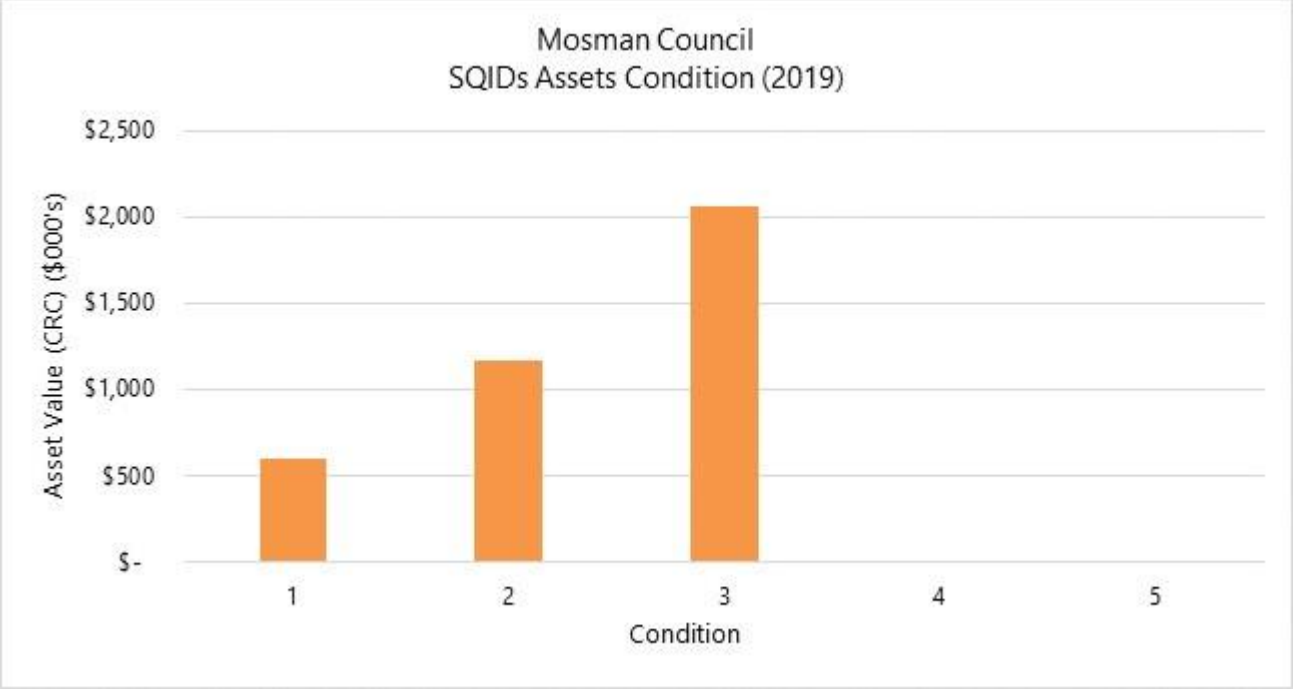


Figure 16 – Condition profile for SQIDs (as at June 30 2019)

NetTech device

Pit with screen being installed

Figure 17 – Example SQID devices

Asset Componentisation

SQIDs are only componentised based on the unit type. For example, the CDS devices have a variety of different models, with each of these having their own unitrate.

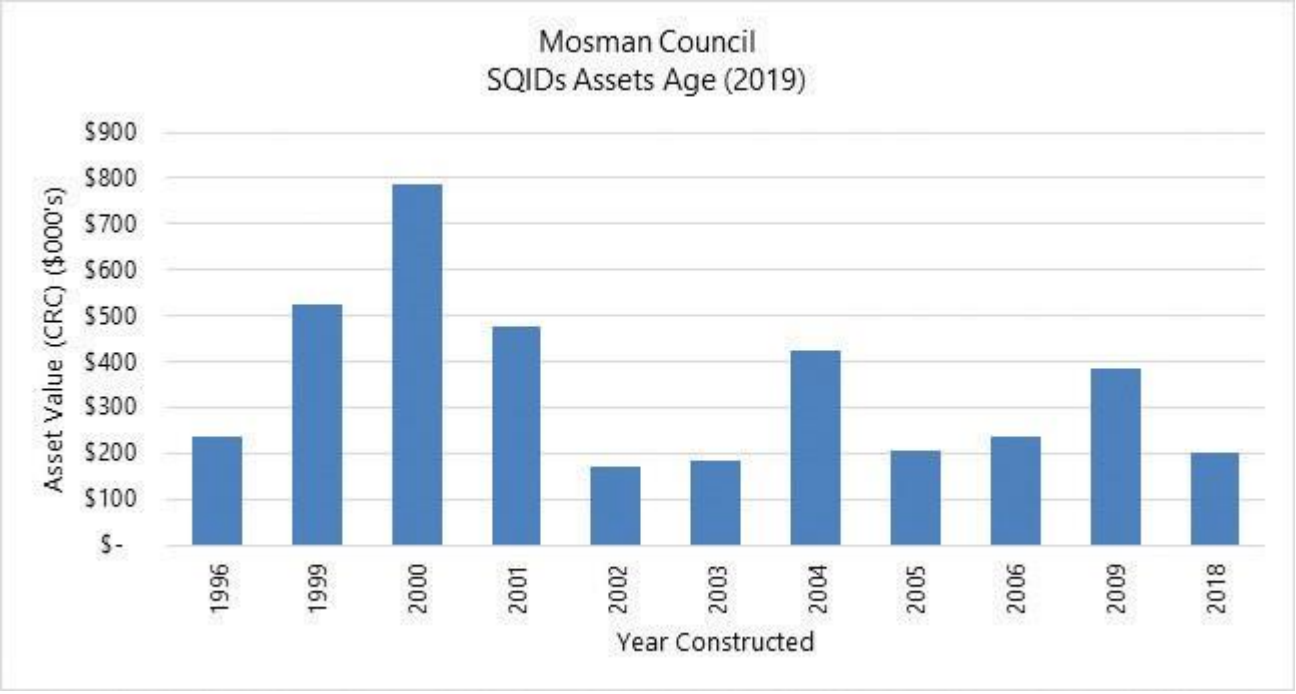


Figure 18 – Age profile of SQIDs (as at June 30 2019)

Rainwater Reuse Tanks

Council owns two rainwater reuse tanks as detailed in Table 15. The Botanic Road system relies on Stormwater being collected in porous underground tanks through suitable fill material and geotextile fabric. The Botanic Road rainwater reuse tank is shown in Figure 19. The Rawson Park system collects stormwater and groundwater in the concrete tank.

Location	Dimensions	Condition
Rawson Park	500 kL	1
Botanic Road	500 kL	2

Table 15 – Details of rainwater reuse tanks (as at June 30 2019)

Installation

Finished state

Figure 19 – Rainwater tank installation and finished state – Botanic Road

Asset Valuation

Useful Lives and Unit Rates

Expected useful lives and unit rates of the different asset types are given in Table 16 and Table 17. They have been estimated from industry standards, external valuations and historical data. The full list of asset useful life and unit rates are held within the Council's Asset Management System.

Valuation Information

Council's stormwater assets are valued as shown in Table 18. Closed conduits form the bulk of the total asset value, with pits having the second-highest value, then SQIDs and open conduits. The total annual depreciation amount gives a rough indication of the average renewals expenditure required to sustain the present asset base.

Asset	Expected Useful Life
Closed stormwater drain (pipe/culvert) – concrete	150
Closed stormwater drain (pipe/culvert) – uPVC	140
Closed stormwater drain (pipe/culvert) – vitrified clay	150
Lined open stormwater drain – any material	150
Unlined open stormwater drain (earthworks)	150
Culvert – any material	150
Headwall/Endwall	150
Manhole	150
Kerb inlet pit	150
Surface inlet pit	150
Junction pit	150
Converter	150
Stormwater quality improvement device (SQID)	80
NetTech	60
Rainwater reuse tank	80

Table 16 – Expected useful lives

Asset	Expected Useful Life
Headwalls	Varies from $568 to $3,860 per unit
Converters	Varies from $824 to $1,083 per unit
Manholes	Varies from $1,341 to $15,587 per unit
Pits	Varies from $1,605 to $16,761 per unit
Lintels	Varies from $1,075 to $5,555 per unit
Pipes (replacement)	Varies from $248 to $6,390 per metre
Pipes (relining)	Varies from $163 to $1,874 per metre
Box culverts	Varies from $595 to $11,040 per metre
Open conduits	Varies from $146 to $6,098 per unit
SQID	Varies from $2,542 to $276,921 per unit
Rainwater reuse tank	Varies from $569,626 to $832,869 per unit

Table 17 – Unit rates for replacement/renewal of assets

Asset Type	Current Replacement Cost ($)	Written Down Value ($)	Annual Depreciation ($)
Closed conduits (pipes and culverts)	$50,919,760	$35,494,581	$339,842
Pits	$9,488,937	$7,485,173	$63,259
Open conduits	$3,369,876	$2,091,420	$22,466
SQIDs	$3,833,328	$3,057,482	$48,211
Rainwater tanks	$1,402,495	$1,230,474	$17,531
Total	$69,014,396	$49,359,130	$491,310

Table 18 – Summary of valuation information (as at June 30 2019)

LIFECYCLE MANAGEMENT PLAN

Lifecycle Strategy

The lifecycle management plan describes how Council plans to manage and operate the stormwater assets at the agreed levels of service (defined in Levels of Service section) while optimising life cycle costs.

The lifecycle of an asset encompasses:

- Identification of its need (including confirming that there is no non-asset solution)
- Selection of the asset solution (according to a set process)
- Installation/construction
- Operation, maintenance and inspection
- Renewal/upgrade
- Disposal

Service Deficiencies & Other Issues

Council's services are generally provided to meet the desired standard. There are instances where the level of service is not being met and will need future investigation and this is detailed in Table 19.

These service deficiencies have been identified by the Council's stormwater engineer. Further research and management are required to properly address these issues.

There are issues concerning underground service providers in the area, such as gas or telecommunications. Some of the service connections have intruded into the stormwater pipe network. Intruding services:

- Reduce the hydraulic capacity of the Council's network, therefore reducing service levels and increasing flooding risks
- Can make cleaning of conduits problematic or impossible, which result in reduced service levels
- Limit the potential to renew pipes by relining, forcing trenched replacement of pipes
- Are often difficult to determine ownership of
- Can require a significant amount of time and effort to resolve with the service provider
- Can hasten the failure of pipes, and in doing so cause damage to road infrastructure

Location	Service Deficiency
Closed and Open conduits	Some of the stormwater network is undercapacity. These may be identified by flood/overland flow studies.
SQIDs	There is budget to generally clean SQIDs twice a year, however a more regular cleaning regime is required to achieve maximum results.
Headwalls	Some headwalls may have opportunities for persons to enter the stormwater network. The extent of this is yet to be fully identified and it is expected a review will be undertaken in the near future

Table 19 – Known Service Performance Deficiencies

Council is currently dealing with these issues on a case-by-case basis. There is the potential to develop a standard process for dealing with these issues, and to establish channels and protocols with other services providers such that problems can be most efficiently resolved. Some examples are displayed in Figure 20. The intrusion of tree roots causes many of the same physical problems as intruding services, and are also an ongoing issue.

Figure 20 – Example service intrusion photos from CCTV survey

Operations, Maintenance and Inspections Plan

Operations Overview & Historical Expenditure

Operations activities are activities that consume resources to ensure the infrastructure asset levels of service are met. For example "running costs" and consumables.

These are day to day operational activities that have no effect on asset condition but are necessary to physically keep the asset operating.

The operational costs that are associated with the stormwater network are the pit cleaning inspections and other minor operational costs. Pits are cleaned of debris on a regular basis to facilitate proper drainage and prevent flooding. The pit cleaning inspections are covered under Mosman's street and gutter cleaning contract during the 2018-2028 period. It states the regularity and budget for cleaning the pits and ascertains whether maintenance of pits is required.

Indicative historical operations costs are displayed in Table 20.

Asset inspections, asset data collection and condition assessment are by definition included in operations costs. However, due to the cost of stormwater CCTV inspections, they are covered as a sub-component of capital expenditure in the Council's budgeting system. To amend this issue, inspections will be included as an operations expenditure in this plan and ignore this delineation.

More information on these inspections is covered in the Condition Inspections section.

Year	Historical Annual Operations Expenditure
2015/16	$111,000
2016/17	$122,000
2017/18	$107,000
2018/19	$30,000
Average Annual	$92,000

Table 20 – Historical Operations Expenditure Trends

Maintenance Overview & Historical Expenditure

Maintenance is the regular on-going work that is necessary to keep assets operating, including instances where portions of the asset fail and need immediate repair to make the asset operational again. Maintenance includes reactive, planned and cyclic work activities:

- Reactive - Unplanned repair work carried out in response to service requests and management/supervisory directions. Traditionally, assessment and prioritisation of reactive maintenance is undertaken by Council staff using experience and judgement, within some basic maintenance management frameworks
- Planned - Repair work that is identified and managed through a maintenance management system (MMS) or asset management system (AMS) or through other tools to assist in identifying when individual assets are due for repairs
- Cyclic - Replacement of higher value components/sub-components of assets that is undertaken on a regular cycle

All non-operations works that fall below the capitalisation threshold of $5,000 are considered maintenance.

Historical maintenance expenditure trends are shown in Table 21.

Maintenance varies from year to year, such as from additional works due to the identification of a bad part of the network via CCTV or due to storm events. Increased rain intensity can impact stormwater assets requiring more maintenance. For example, large amounts of rain late in 2018, lead to many reactive maintenance works. For the purposes of predicting future maintenance expenditure, an average value has been determined as displayed in Figure 21.

Year	Historical Annual Maintenance Expenditure
2015/16	$113,000
2016/17	$178,000
2017/18	$75,000
2018/19	$252,000
Average Annual	$154,000

Table 21 – Historical Maintenance Expenditure Trends

Maintenance Methods & Management

The assessment and prioritisation of reactive maintenance are undertaken by the Council staff using experience, judgement and industry standards. There are no documented procedures for maintenance except for SQIDs, however, for operations, the Mosman's street and gutter cleaning contract (2018-2028) provides a schedule of which pits require cleaning which is followed through every year. Council is shifting to having planned maintenance programs, however, due to the unpredictable nature of storm events, reactive maintenance will continue to form a major part of the program.

Maintenance is funded from the Council's operating budget and grants where available.

Maintenance and Operations 10 Year Financial Forecast

Projecting the 10 year financial forecast involves comparing the required maintenance to the budgeted maintenance:

- Required maintenance – Cost of maintenance and operations required to meet minimum levels of service in Mosman. The value is determined via useful life modelling to be 0.33% of the CRC (current replacement cost) for all stormwater assets
- Planned (budgeted) maintenance – Expenditure that Council has budgeted for maintenance and operational works

Figure 21 shows a comparison between the required expenditure for the next 10 years and the planned (budgeted) expenditure for stormwater maintenance and operations.

There is enough planned expenditure to cover the requirements for stormwater. Initially in 2019/20 and 2020/21, Council is expected to spend $85,000 - $90,000 more than the minimum required and in the remaining years of the ten year plan around $60,000 more. Mosman aims to achieve a better standard of service than the minimum to provide higher quality stormwater assets in the LGA. It requires Council spending above the minimum required amount with a portion of the planned expenditure made up of the CCTV inspections to improve our asset management capabilities.

It is assumed that budgeted maintenance expenditure levels will be similar each year. Predicting when more maintenance is required in some years can be as inaccurate as using an average value each year. This is particularly the case for stormwater assets, as maintenance is highly reactive. (For more detail of required and planned expenditure, see Appendix B).

The required maintenance also gradually increases every year. As new assets are installed, the required maintenance/operations slightly increases to cover their costs over time. However, of note, there is no additional increase in budgeted/required expenditure over time due to CPI, as all values are based on 2019/20 dollar values.

Future revisions of this asset management plan will include a more detailed analysis linking required maintenance expenditures with service levels, to set future expenditure.

Expenditure increases in line with the capital works program (in the Capital Works section), meaning that required maintenance expenditure may be reduced in the medium to long term. This will need to be re-assessed as the renewal program gets underway. An increase in capital works funding will have an effect on required maintenance.

Deferred maintenance, i.e. works that are identified for maintenance and unable to be funded are to be included in the infrastructure risk management plan.

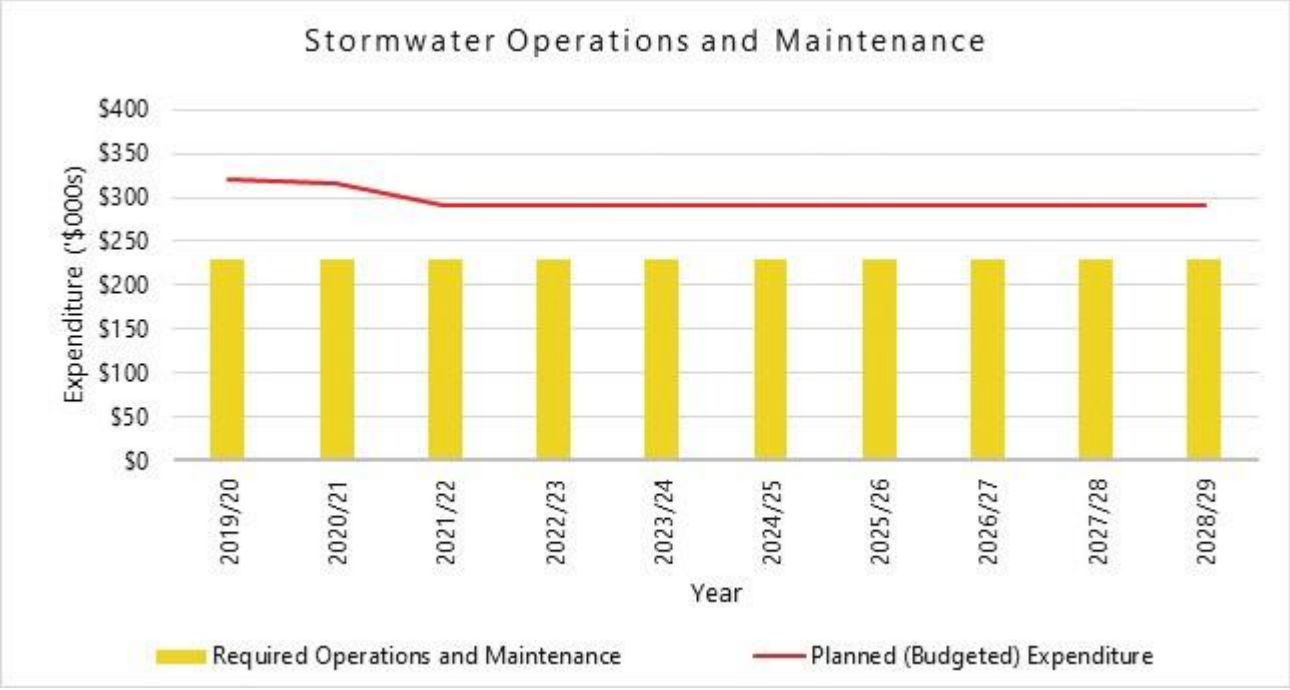


Figure 21 – Planned Operations & Maintenance Expenditure

Standards & specifications

Maintenance and operations work is carried out Maintenance work is carried out in accordance with the following standards and specifications:

- Relevant Australian Standards
- Building Code of Australia
- Natspec/AUS-Spec specifications and guidelines

Inspections Plan

Council has a regular asset inspection program to identify assets in need of remedial work. CCTV is used to inspect the condition of the closed conduit (pipes and small culverts) network and pits. During the CCTV inspections cleaning is also carried out. Where further repairs are required, these are then scheduled into works programs. The planned expenditure for CCTV inspections will be $90,000 in 2019/20, $85,000 in 2020/21 and then $60,000 in the years following this.

Council's engineers also conducts condition inspections of the pits, open conduits and SQID assets. These also occur annually.

There is the possibility of hiring external contractors to assist and their services will need to be included in the operations budget.

The condition inspections are used to support the accumulation of more comprehensive and refined asset data and to understand the deterioration profile of the various assets. As stormwater assets are upgraded or as renewal work is completed, asset inventories will be updated accordingly.

The condition ratings of stormwater assets are updated in the AMS along with any updates from capital works. The AMS has the capability to store condition inspection data that helps to plan where future inspections are required and performing reactive maintenance or capital works.

The inspection programs for each category of an asset are outlined in Table 22. They are recorded as the percentage of assets required for inspection annually.

As per Table 22, the schedule of condition inspections for stormwater assets varies due to the difficulty of inspecting parts of the network.

In terms of CCTV inspections, there are a number of factors that can affect the number of assets that can be inspected annually, including budget, availability and access restraints. At a minimum, it is expected that 3% of closed conduits are inspected annually, with an aim of 5% desirable. This is above the levels of service target on 2.5% annually. When CCTV is used for inspection, any adjoining pits and SQIDs are rated, in addition to the closed conduits.

Council inspections require 20% of pits (nodes) to be inspected annually. Assuming that 5% of pits are inspected via CCTV, then only 15% of pits need to be inspected internally, to meet a target of 20% total per year. SQIDs, however, is set to 20% per year, as it is uncommon for this to be inspected by a CCTV contractor. Open conduits are set for 10% annually. This is due to the fact that these assets have long useful lives and more frequent inspections are unnecessary.

Asset Type	Annual % of Assets Inspected
Council Inspections	
Pits (nodes)	15%
Closed Conduits	0%
Open Conduits	10%
SQIDs	20%
Tanks	Closely monitor over time
CCTV Inspections	
Pits (nodes)	Dependant on amount of closed conduits inspected
Closed Conduits	3-5% (Dependant on budget, availability and access)
SQIDs	Inspected when SQID is upstream/downstream of inspected closed conduit

Table 22 – Required Frequency of Annual Condition Inspections

Capital Works Plan

Capital Works Overview & Historical Expenditure

Capital works are defined by Mosman Council's Capitalisation Threshold as any works valued at $5000 and over. It applies to the renewal or upgrade of the existing assets and the installation of new assets. A description of the three types:

- Renewal: Major work that does not increase the asset's design capacity but restores, rehabilitates, replaces or renews an existing asset to its original service potential. For example, the replacement of a pipe of the same diameter, length and depth
- Upgrade: Work over and above restoring an asset to original service potential often increasing the value of the asset. It also applies to the expansion of an existing asset. An example is replacing a pipe with a pipe of greater diameter to increase capacity, in that part of the network
- New: The installation of a new asset that is not related to an existing asset. For example, installing a new SQID that intersects at one point in the stormwater network

Capital works are reported to the Asset Coordinator on a capitalisation form to update the asset management system (AMS) and provide an accurate record of the work throughout the year. The changes in the AMS then contribute to calculating the replacement value, depreciation and Special Schedule 7 of stormwater assets at the end of each financial year.

Historical expenditure for capital works is captured in our budgeting system. The amount spent is not divided into three types of capital works in detail. Table 23 shows the capital expenditure trends.

Year	Historical Annual Capital Expenditure ($)
2015/16	568,000
2016/17	407,000
2017/18	745,000
2018/19	326,000
Average Annual	512,000

Table 23 – Historical Capital Expenditure Trends

Similar to maintenance/operations, capital expenditure varies from year to year. It is sometimes more cost-effective to replace multiple sections of pits and conduits in one part of the network and in other incidences only one closed conduit may require replacement without replacing adjoining pits.

Projected capital expenditure has been estimated based on historical data.

Capital Works Principles

There are a number of principles used when planning and conducting capital works. They are as follows:

Adopt non-Council asset solutions:

- Conduct a flood study that takes climate change into consideration which reduces the Council's liability for flooding to private property
- Set exclusion zones for development (where modelling shows there is likely to be significant flooding)
- Retain conditions on development applications such that flows from private sites must be attenuated on-site, so that peak loads on Council infrastructure are not increased

For existing assets:

- All condition 5 assets should be renewed/replaced within 3 years (preferably 2)
- Condition 4 assets should be renewed/replaced within 3-5 years
- For cost efficiency, replacement of assets in condition 3 or worse if it coincides with major road works
- Before replacement/renewal, the asset should be inspected to confirm its condition and the need for replacement
- For pipes, investigate other options such as relining
- For culverts, replace with a standard size pipe if a replacement is necessary, and if a pipe is possible, as pipes are generally easier to maintain and repair/renew
- For pits, replace with a prefabricated pit type, which will be cheaper to repair/replace in future
- For headwalls, replace with a prefabricated/standard structure, which will be cheaper to repair/replace in future
- For open channels, replace with a prefabricated/standard structure where visually appropriate

For new assets:

- Engage a consultant for larger projects to determine the optimal solution for the asset

Lifecycle cost process is used for larger projects to prescribe analysis of the lifetime cost of various solutions against expected asset lifetime and factors such as availability of components, aesthetics, reliability, ease of operation, health and safety and environmental considerations.

Renewal/Replacement Plan

Renewals/replacements will be funded from Council's capital works program and grants typically towards the end of their useful life.

The priority for renewing assets is those that are in an 'unsatisfactory' condition, 4 or 5.

Council's is to have no stormwater assets fall into condition 4 or 5 but the reality of restrained resources mean that there will be a small percentage of assets fall into condition 4 each year. Works will be carried out on those assets, as soon as possible.

As of June 30, 2019, the majority of stormwater assets are in a 'satisfactory' condition.

Through the life of the plan, budgeted renewal expenditure requirements have been forecast by the Council's engineers. This is explained in the Asset Renewal 10 Year Financial Forecast.

Renewal Methods and Planning

Renewal intervention typically occurs as the assets approach the end of their useful life, which in most cases is when it reaches the 'unsatisfactory' rating of 4 or 5.

Assets proposed for renewal are inspected to verify accuracy of condition, the remaining life and to develop a preliminary estimate. Verified proposals are ranked by priority and available funds and then are scheduled into the works program.

Renewal will be undertaken using 'low-cost' renewal methods where practical. The aim of 'low-cost' renewals is to restore the service potential or future economic benefits of the asset by renewing the assets at a cost similar to or less than replacement cost.

Deferred renewal, i.e. those assets identified for renewal and not scheduled for renewal in capital works programs are to be included in the risk assessment process in the risk management plan. This is further discussed in the Risk Management Plan section.

Asset Renewal 10 Year Financial Forecast

The 10-year asset renewal financial forecast scenario defines asset renewal requirements to sustain assets to meet the required levels of service.

Projecting the 10 year financial forecast involves the comparison of the required renewal and budgeted expenditure:

- Required renewal expenditure – Renewal expenditure required to meet minimum levels of service in Mosman. This value is determined from the annual depreciation of the stormwater assets. Stormwater assets depreciate at around $491,000 to $493,000 per year, therefore Council is required to spend that amount to address declining assets
- Planned (budgeted) renewal expenditure – Amount budgeted by Council to spend on the renewal of stormwater assets each year. A 10-year capital works program (see Capital Works Program section and Appendix C) includes the works and their estimated budget. The projects are prioritized based on the condition rating, remaining useful life, MOSPLAN or criticality. It also includes the required renewals (i.e. backlog)

Figure 22 shows the comparison between the required expenditure of the next 10 years and the budgeted expenditure for stormwater renewal works. Required and planned expenditure has been calculated in 2019/20 dollar values and therefore is not affected by CPI and other factors.

Figure 22 shows that the minimum required expenditure is being met for almost all the 10 years except for 2019/20 and 2020/21, where there are funding gaps of $136,000 and $392,000 respectively.

Between 2021/22 and 2028/29, Council is projected to spend $48,000 to $58,000 more than the required to offset the funding gaps in the first two years. It is recommended that Council spends above the minimum required amount in order to ensure Council stormwater assets are at a higher quality for our Council area.

Expenditure on stormwater assets can vary from year to year. However, for the purposes of modelling and budget, for those later years, it has been assumed to be an average amount every year.

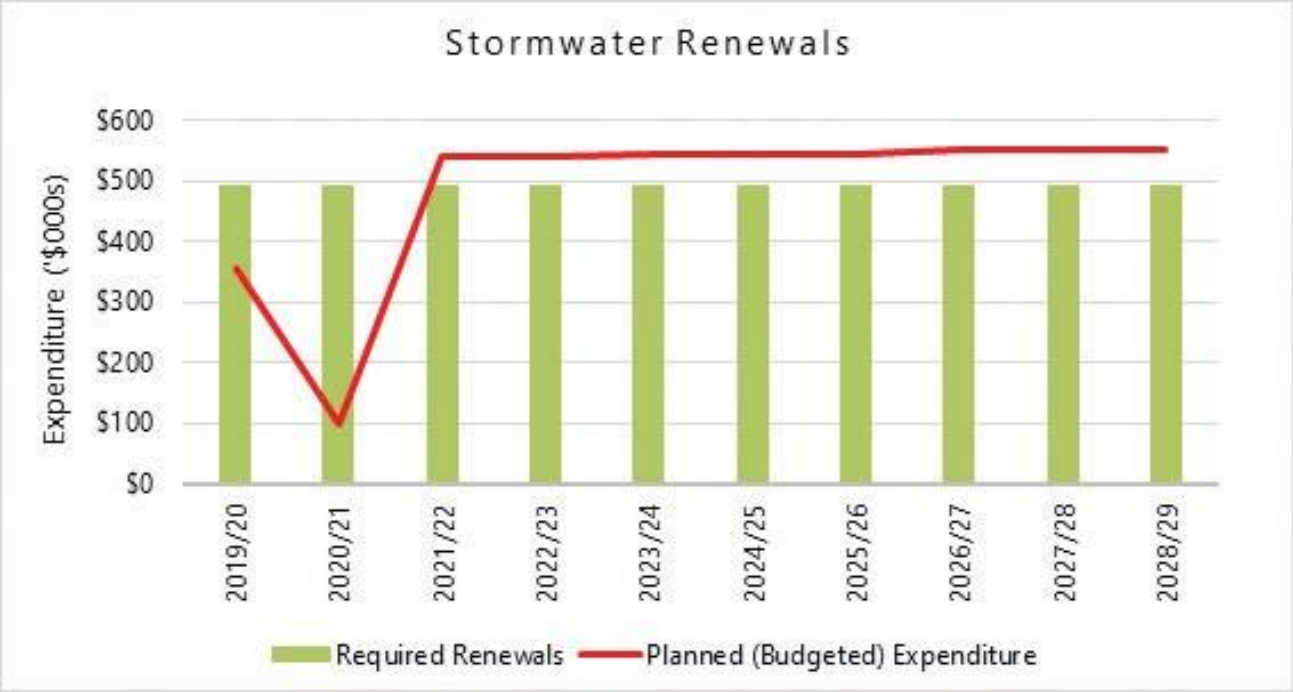


Figure 22 – Forecast 10 Year Renewal Requirements For Asset Sustainability

Expenditure Gap and Backlog Ratio

Table 24 gives a breakdown of planned and required renewal spending and the renewal funding gap per year.

The funding gaps in 2019/20 & 2020/21 result in a small rise in the backlog for those years. However this declines in the following years. Measuring if the backlog is acceptable requires the comparison of two values:

- Backlog Ratio – Measurement of the replacement cost of assets in Condition 4 or 5 (i.e. unsatisfactory condition) divided by the total depreciated replacement value of all stormwater assets. It indicates the percentage of the total stormwater replacement value that needs to be spent to bring the assets back to a satisfactory standard
- Backlog Benchmark – A benchmark of 2.0% or lower is set by the Office of Local Government and indicates that assets are performing well and being renewed in a timely manner.

Council's 10 year backlog ratio is displayed in Figure 23.

Year	Required Renewals ($'000s)	Planned Renewals ($'000s)	Renewal Funding Gap ($'000s)
2019/20	491	355	136
2020/21	492	100	392
2021/22	492	540	0
2022/23	492	540	0
2023/24	492	545	0
2024/25	492	545	0
2025/26	492	545	0
2026/27	492	550	0
2027/28	493	550	0
2028/29	493	550	0

Table 24 – Projected and Current/Planned Renewals and Expenditure Gap ($000s)

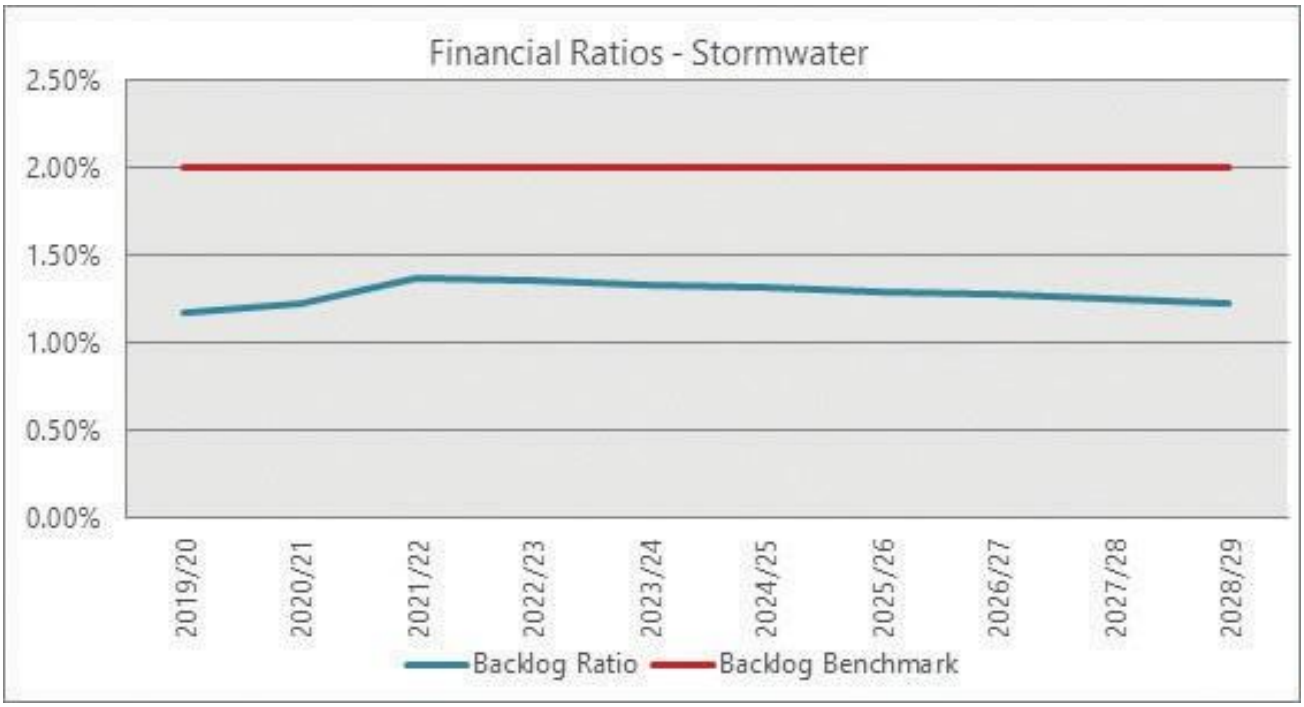


Figure 23 – Forecast 10 Year Backlog Ratio

By the end of the 10 year period, the asset backlog should achieve a ratio of less than 1.5% which is below the 2% benchmark set by the Office of Local Government.

As the required expenditure is linked to the overall depreciation of assets, backlog assets are rarely reduced to zero. Repairing many backlog assets is difficult within one year as additional assets decline to an unsatisfactory condition. Despite this the backlog stays at a similar level over the 10 year period.

Upgrade/New Works Plan

Upgrade works are works that improve an asset beyond its existing capacity and new works create a new asset that did not previously exist.

New assets may be required due to growth, social or environmental needs. Assets may also be acquired at no cost to the Council from private development.

It is common for capital works to consist of upgrades of existing stormwater assets to increase the capacity of the system, e.g. a larger diameter pipe or a pit with a larger volume. New stormwater assets are installed when a need arises. Examples are provided in the Future Demand section. One example where new assets are installed is within a larger project that aims to upgrade an area of Mosman, e.g. Military Rd Streetscape project in 2017/2018.

For modelling purposes, it has been estimated from 2021/22 and onwards that $40,000 a year is required for the upgrade of existing assets and for any new assets. This has been estimated based on the increase in value from new/upgraded assets in historical asset inventories. For 19/20 this amount is equal to $20,000.

Upgrade of existing assets and new assets are all identified from various sources such as strategic plans, Mosman contributions plans, service deficiencies, councillor or community requests, or partnerships with other organisations.

It is likely that there will be even more emerging new works projects over the next few years which will need to be considered in the context of this Asset Management Plan and Council's budget.

New assets and services are funded from Council's capital works program, contributions plans and grants where available. This is further discussed in the Funding Strategy within the Financial Summary section.

Opportunities for implementation of environmental sustainability initiatives will be included in the New Works program or as renewal works when opportunities arise.

Capital Works Program

A draft capital works program is detailed in Appendix C.

The amounts that have been budgeted for the replacement of conduits and pits is based on the overall remaining useful lives, the condition of assets and then the cost of replacing assets. Backlog and the depreciation of assets are also factored into the budget.

Planned replacements or upgrades of assets are listed and budgets allocated for these works. The annual budget in the capital works program indicates the budget required for stormwater assets each year. If there is a need for additional works, funding will have to be sourced from grants or other asset categories.

As detailed in the Improvement Plan in the Plan Improvement and Monitoring section, capital works planning can be improved by creating a system that combines condition ratings, remaining useful life and other factors to indicate where capital works are needed. This process can be calculated automatically using the AMS.

Capital Works Standards and Specifications

Renewal work is carried out in accordance with the following Standards and Specifications:

- Relevant Australian Standards
- Relevant industry guidelines / best practice
- Building Code of Australia
- Natspec/AUS-Spec specifications and guidelines

Disposal Plan

Overview

Disposal includes any activity associated with the disposal of a decommissioned asset including the sale, demolition or relocation. Asset disposal generally occurs during capital works including upgrading stormwater pipes, replacing pit lids and other failed assets. There are instances where the Council may choose to discontinue the service being provided by an asset if its benefit is negligible.

Documentation & Loss on Disposal

Currently, any disposals that occur during a financial year are recorded on a disposal form (related to a capitalisation form where required) which is then reported on at the end of each financial year. The costs of the disposal are included in capital works costs during the replacement/ renewal of the asset. The loss on the disposal of the asset is the value that is lost from an asset that has not yet reached the end of its useful life or is in Condition 5.

Identified Disposals

Disposals identified in the near future include those assets being replaced in the capital works programs in Appendix C.

It has been estimated that a small proportion of assets will be disposed of and not renewed. From historical data, it is estimated that approximately $15,000 per year of assets are disposed of with no renewal. This has been incorporated into the financial modelling and has affected replacement cost and depreciation of stormwater assets.

Other assets that are identified for disposal in the future will be further investigated to determine the required levels of service and see what options are available for alternate service delivery if required. Cashflow projections from any future proposed asset disposals will be developed when necessary and included in future revisions of this AMP.

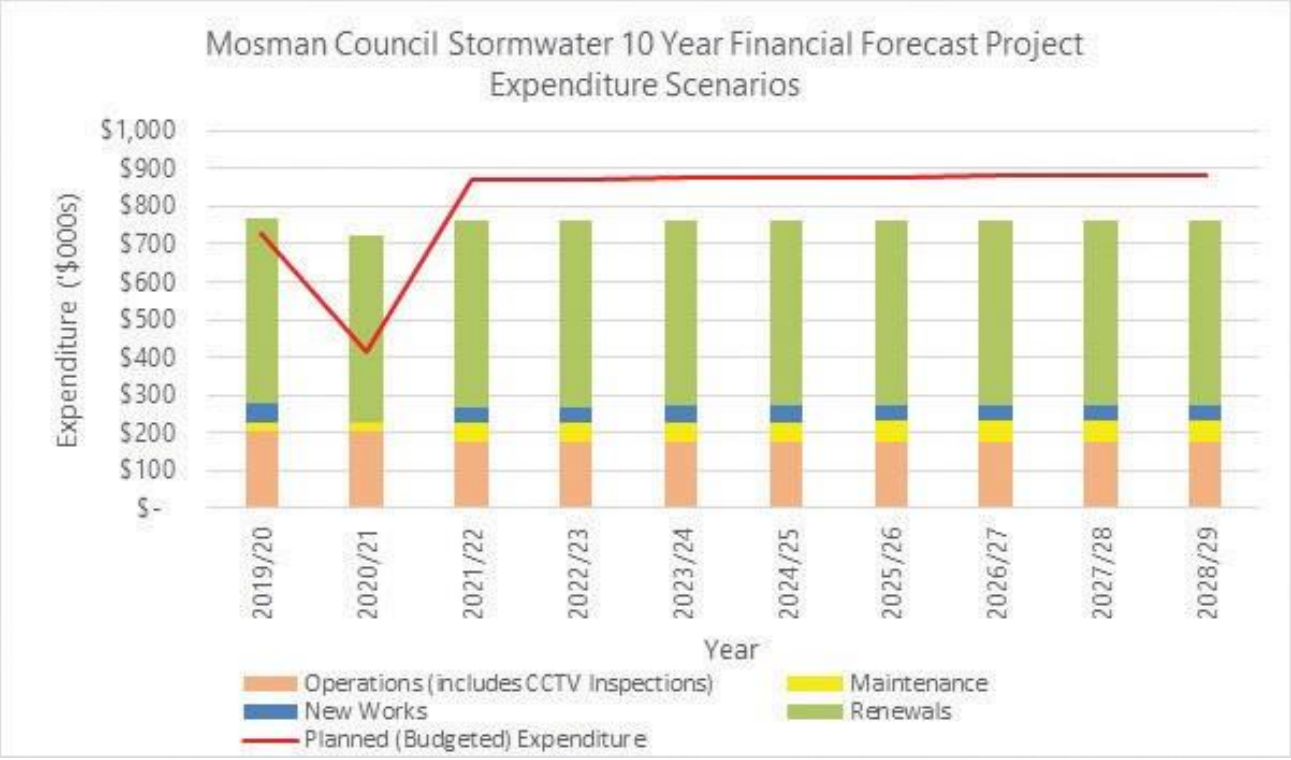
FINANCIAL SUMMARY

The financial projections summarised in this section will be improved as further information becomes available on desired levels of service and current and future asset performance.

Maintenance and renewal are funded from general revenue, as well as from other sources such as the Mosman Contribution's Plan and grants.

Financial Statements and Projections

The 10-year financial projections are shown in Figure 24 for planned operating (operations and maintenance) and capital expenditure (renewal and new works i.e. upgrade/ new assets). Operating and capital projections are detailed in the 10 Year Lifecycle Financial Forecasts table in Appendix B.



* Note that all costs are shown in 2019/20 dollar values

Figure 24 – Planned Operating and Capital Expenditure

Sustainability Modelling

There are two key high-level indicators for financial sustainability that have been considered in the analysis of the services provided by stormwater assets, these being long term life cycle costs and medium-term costs over the 10-year financial planning period.

A 10-year financial indicator is also used to provide an indicator of financial sustainability. An indicator value of 1.0 indicates that the current funding provided is equal to the required lifecycle funding estimates. An indicator of less than 1.0 indicates a funding gap.

Long Term – Life Cycle Cost

Life cycle costs (or whole of life costs) are the average costs that are required to sustain the service levels over the longest asset life. Life cycle costs include maintenance, operations and asset consumption (annual depreciation). The annual average life cycle cost for the services covered by stormwater assets is $739,000 pa (assuming overall average stormwater asset life of 145 years).

Life cycle costs can be compared to the life cycle expenditure to give an indicator of sustainability in service provision. Life cycle expenditure includes planned operations, maintenance plus capital renewal expenditure. The annual average life cycle expenditure is $794,000 pa.

A gap between life cycle costs and life cycle expenditure gives an indication as to whether present consumers are paying their share of the assets they are consuming each year. The purpose of this Stormwater AMP is to identify levels of service that the community needs and can afford and develop the necessary long term financial plans to provide the service in a sustainable manner.

Medium Term – 10 Year Financial Planning Period

This AMP identifies the estimated maintenance, operations and capital expenditure required to provide an agreed level of service to the community into a 10-year financial plan to provide the service in a sustainable manner.

This may be compared to existing or planned expenditure to identify any gap. A gap is generally due to increasing asset renewal requirements.

Given that long term modelling over the life of an asset can at times produce inaccuracies due to assumptions, it is considered the medium-term sustainability should be more heavily relied on.

Summary

A summary of the long and medium term sustainability of all Stormwater assets is shown in Table 25.

Long Term		Medium Term	
Life Cycle Cost[1]	$739,000 pa	Required Expenditure[3]	$722,000 pa
Life Cycle Expenditure[2]	$794,000 pa	Current (Budgeted) Expenditure[4]	$778,000 pa
		Funding Gap	($56,000) pa
		10 Year Financial Indicator[5]	1.08

Table 25 – Long and Medium Term Financial Sustainability (as of 30 June 2019)

[1] Required maintenance, operations and depreciation ('sustainable' assets case) over the average useful life of all stormwater assets (averaged per annum).

[2] Budgeted operations, maintenance and renewal expenditure over the average useful life of all stormwater assets (averaged per annum).

[3] Required maintenance, operations and renewal ('sustainable' assets case) expenditure over the 10 year financial period (averaged per annum).

[4] Budgeted operations, maintenance and renewal expenditure over the 10 year financial period (averaged per annum).

[5] Medium term budgeted expenditure per annum divided by medium term required expenditure per annum. A financial indicator of 1.0 indicates that the current funding provided is equal to the required funding estimates. A financial indicator of less than 1.0 indicates a funding shortfall.

Funding Strategy

Projected expenditure detailed in the Lifecycle Financial Forecasts in Appendix B is to be funded from the Council's operating and capital budgets. The funding strategy is detailed in the Council's 10-year long term financial plan.

Capital works, operations and maintenance are funded from general funds, loans and a variety of income sources, including:

- Contributions plan
- Stormwater levy

If funding needs are not met, achieving the financial strategy will require additional funding from a combination of:

- Investigation and implementation of alternative funding sources
- Review and rationalisation of specific service areas identified as potentially being over-serviced
- Re-allocation of income where appropriate
- Additional grant funding from higher levels of Government, such as RMS
- Review of contributions plans

Valuation Forecasts

Asset values are forecast to increase as additional assets are added to the asset stock from construction and acquisition by Council and from assets constructed by developers and others and donated to Council. Identified in this asset management plan, there is forecast to be a small number of new/upgraded assets added to the stock.

The depreciated replacement cost (fair value -current replacement cost less accumulated depreciation) will vary over the forecast period depending on the rates of addition of new assets, disposal of old assets and consumption and renewal of existing assets. Forecast of the assets' depreciated replacement cost is based on current projected asset renewal funding levels.

Key Assumptions Made in Financial Forecasts

This section details the key assumptions made in the Asset Management Plan. It is presented to enable readers to gain an understanding of the levels of confidence in the data behind the financial forecasts.

Key assumptions made in this Asset Management Plan are:

- Financial forecasts are based on providing defined Levels of Service
- Council will endeavour to fully fund required asset renewal requirements into the future
- Capital renewal programs are designed to maintain the service potential of existing assets
- Operations and maintenance costs are based largely on historical expenditure and assume there will be no significant increase in the cost of providing these services except when new assets are installed
- Financial forecasts are based on 2019/20 dollars with the inherent assumption then that costs will increase in the future in line with consumer price index (CPI). For operations and maintenance, it has been assumed that costs will increase at a rate slightly above CPI i.e. additional 1% pa. (This may not be the case as material costs and/or salaries and wages, for example, may increase (or decrease) at alternative rates). No sensitivity analysis has been carried out at this stage to identify how this may impact costs in the future

Accuracy of future financial forecasts may be improved in future revisions of this Asset Management Plan by the following actions:

- More detailed review of asset unit rates and useful lives at an asset group or asset type level
- Better forecasting of when assets are required to be renewed rather than estimating an average over 10 years
- Better alignment with Council's Community Strategic Plan and Long Term Financial Plan
- Improved understanding regarding and development of Levels of Service
- Improved understanding of Demand Forecasting and future required new works/ upgraded assets
- Refining/developing long term operational programs for works and services (at least 10 years) in addition to the capital works programs
- More advanced strategic analysis of the data and information particularly considering Levels of Service, asset capacity and performance and demand
- Understanding and analysing the many financial and economic influences which may potentially impact the cost of provision of services (sensitivity analysis)

RISK MANAGEMENT PLAN

Council's broad risk management approach is covered in the Strategic Risk Review and the Asset Management Strategy. The standard procedure includes the following:

- Risk identification
- Risk analysis
- Risks evaluation
- Risk treatment
- Monitoring and review
- Communication

The implementation of an effective asset management plan is integral in assisting Council to manage the risks and liabilities of infrastructure assets.

The stormwater asset management plan covers a number of risk management procedures including:

- Routine inspection and maintenance regimes
- Prioritisation of maintenance and capital works to support the delivery of Council services
- Long term asset renewal program and required funding estimates
- Key responsible staff for stormwater assets
- High quality data on the useful life and condition of assets

Stormwater receives a relatively low number of complaints compared with the extent of the network and they generally coincide with large storm events. The high costs of underground CCTV inspections means that it is likely no more than 5% of stormwater assets are inspected each year, however it is a targeted routine inspection regime for catchments where issues have been identified.

A risk assessment covering the common risks in stormwater assets is summarised in Table 26.

Description of Risk	Previous Risk Rating	Risk Planning	Risk Treatment	New Risk Rating
General defects	Medium	Inspections and routine maintenance	Replace aged and/or damaged infrastructure, cleaning and clearing out of debris as a part of routine maintenance	Low
Flooding	High	Inspections and assessment	Investigate, prioritise and plan works. Seek advice from expert stormwater consultants if necessary	Medium
Pit defects	Medium	Regular inspection of pits and grates	Routine maintenance and cleaning	Low
Pipe defects	Medium	Targeted CCTV inspections	Investigate, prioritise and plan works. Seek advice from expert stormwater consultants if necessary	Low
Hazards & emergency	High	Regular monitoring during storm events	Road closure or set up exclusion zone if necessary. Clear communication through signage. Assistance with from Rapid Response, Rangers and SES	Medium
Construction risks	Medium	CTMP, barriers, insurance and WHS site plan	Review traffic plan and construction management plans. Prior to construction, contractor insurances are to be submitted. Check on site to ensure construction works are carried out in a safe manner	Low
WHS and environmental protection	Medium	Appointment of suitable contractor, clear contract conditions	Selection of contractors will entail their compliance with WHS and Environmental requirements. Regular audits will be undertaken to ensure work is compliant with WHS and Environmental standards.	Low
Reputation/ Political risks	Medium	Communication plan	Communicate the benefits of the AMP to the community and ensure works programs are well planned	Low

Table 26 – Risk and Treatment Plan

ASSET MANAGEMENT PRACTICES

Accounting/Financial Systems

Council's financial system is Civica Authority and its budgeting system is Powerbudget.

Financial reporting must comply with the requirements of the Local Government Act 2003, relevant Australian Accounting Standards, Local Government Code of Accounting Practice and Financial Reporting and Local Government Accounting Manual.

The value of the Mosman stormwater assets is reported in the financial records and valuations are carried out when necessary due to changes in the market.

The financial system is managed by the Council's Finance and Information Services Division. The following are responsible for the financial system:

- Chief Financial Officer
- Accountant Finance and Strategy

Asset Management and Geographic Information Systems

Council is using the asset management system known as AssetFinda and the geographic information system (GIS) known as MapInfo.

This asset management system contains information about all stormwater assets including quantities and financial information. It is the primary source of data for these assets, which is updated regularly. The system contributes to the end of financial year reporting and the stormwater asset inventory is constantly maturing due to increasing data confidence. This includes more accurate data in relation to construction dates, condition, cost and past performance. These improvements have been brought on by regular inspections of the stormwater assets and the revaluation in 2018/2019.

GIS is linked to the asset management system. The majority of stormwater assets have associated GIS features and contains all attributes sourced from AssetFinda.

Accountability for the operation and management of the asset management system and GIS is corporate and requires input from the technical, operational and financial areas of Council.

Information Flow Requirements and Processes

The key information flows into this asset management plan are:

- The asset register data on the extent, size, age, value, remaining life of the network
- The unit rates for categories of assets, materials and works
- The adopted service levels
- Projections of various factors affecting future demand for services
- Correlations between maintenance and renewal, including an understanding of asset deterioration
- Data on new or upgraded assets acquired by Council

The key information flows from this AMP are:

- The assumed Works Program and trends
- The resulting budget, valuation and depreciation projections
- The asset useful life analysis

These impact the Resourcing Strategy (Long Term Financial Plan), Strategic Business Plan, annual budget and departmental business plans and budgets.

It is essential to incorporate records of inspections, maintenance and capital works activities into the asset management system to maintain their currency and to permit analysis of performance for the development of predictions of future performance.

Standards and Guidelines

Relevant standards and guidelines include:

- NSW Local Government Act 1993
- Australian Accounting Standards (AASB 13 & AASB 116)
- Building Code of Australia 2019
- MOSPLAN
- Mosman Council's Standard Drawings
- IPWEA, 2015, 'International Infrastructure Management Manual'
- IPWEA, 2015, 'Australian Infrastructure Financial Management Manual'
- DLG - Code of Accounting and Reporting Practice
- DLG - Integrated Planning and Reporting Manual and Guidelines
- AUS-SPEC/Natspec - documentation sets which assist Councils with works and maintenance management and contracts
- AS/NZS/ISO 31000:2018 Risk Management – Principles and Guidelines

PLAN IMPROVEMENT AND MONITORING

Performance Measures

The effectiveness of this Asset Management Plan can be measured in the following ways:

- The degree to which the required cashflows identified in this Asset Management Plan are incorporated into Council's Resourcing Strategy, Council's long term financial plan and Strategic Management Plan
- The degree to which adopted organisation 1 to 10-year detailed works programs, budgets, business plans and organisational structures take into account the 'global' works program trends provided by the asset management plan
- Community acceptance including Levels of Service and risk management plan

For stormwater assets, performance measures for operations and maintenance have been identified and are shown in Table 27.

Refer to the Council's Asset Management Strategy for more information regarding asset management status and maturity.

Performance Measure	Performance Target	Current Performance
Spending on operations and maintenance as a percentage of asset replacement cost in past year	0.5%	0.36%
Ratio of planned to unplanned maintenance spend in past year	1:1	2:1
Material is removed from SQIDs each year (in tonnes)	Clean twice per year, monitor for additional cleans	Yes, 118 tonnes (2017/2018)
Percentage of pits cleaned as per the yearly pit cleaning program	90%	90%

Table 27 – Operations and maintenance key performance indicators

Improvement Plan

Council will continually be developing and improving its knowledge, systems and processes and strategies to ensure it is providing the level of asset management necessary to competently, responsibly and sustainably manage the community's assets now and into the future.

Council has a number of short to medium (1-4 years) to longer-term goals (4 to 10 years). In the short to medium-term, the Council aims to improve further in how asset management is conducted. Rather than using straight-line approaches to depreciation, further improvement can involve using a condition or consumption-based depreciation approach to generate a deterioration profile that is tailored to the asset. More of these improvements are highlighted in Table28.

Longer-term goals include further achieving "advanced" asset management practice in a range of asset management areas including key areas of asset knowledge, strategic asset planning and operations, maintenance and works processes.

Action	Priority	Timeline
The determination of remaining useful lives via condition inspection to better inform of the useful lives of assets	High	2021/22
Use of AMS to assist with calculating asset life cycle costs and to assist further with planning asset renewals and scheduling maintenance	Medium	2024/25
The implementation of short and long useful life particularly for pipe assets (relining and full replacement)	Low	2022/23
Identify natural watercourses from the parks and open space asset inventory that need to be recorded in the stormwater inventory	Low	2022/23

Table 28 – Asset management improvement plan

Council's current status of Stormwater assets are:

- Comprehensive revaluation of stormwater completed in April 2019 including verification of asset location, attributes and condition data for stormwater assets
- Renewals, new works, operations, maintenance, cost, utilisation and performance data for all assets collected and recorded on an ongoing basis
- Condition inspection processes in place (for pits, SQIDs and open conduits)
- Further improvements in the asset management system to display more information about capital works and providing details such as renewal dates, upgrade reasoning, partial renewals and disposals
- Stormwater asset data is all available via the asset management system and all end of year financial reporting is done through the software
- Spatial data is available for all stormwater assets within GIS (MapInfo) which is used for the spatial location of these assets
- Annual CCTV inspections which provide more information about the condition of pipes and box culverts and verify the accuracy of our stormwater spatial data
- Removal of all residual values from stormwater pipes
- Basic demand forecasting and demand management considerations are taken in the stormwater AMP
- Comprehensive 10-year asset works programs developed
- Basic integration of asset long term financial forecasts into organisation long term financial planning and resourcing strategies
- Asset management development linked strongly with MOSPLAN

Monitoring and Review Procedures

This Asset Management Plan is to be reviewed and updated at least every 4 years (standard Council term) and as a minimum should be aligned with the review of Council's Community Strategic Plan and Delivery Program.

The assets values, data and modelling that informed this plan were done prior to the ramifications of the COVID-19 pandemic being known. Due to these circumstances, in 18 months time a review and update will take place to account for changes.

Under normal circumstances, every 2 years there will be a minor review and the plans will be amended to recognise any changes in service levels or budget and resources during this time. The capital works program may need modification due to these changes.

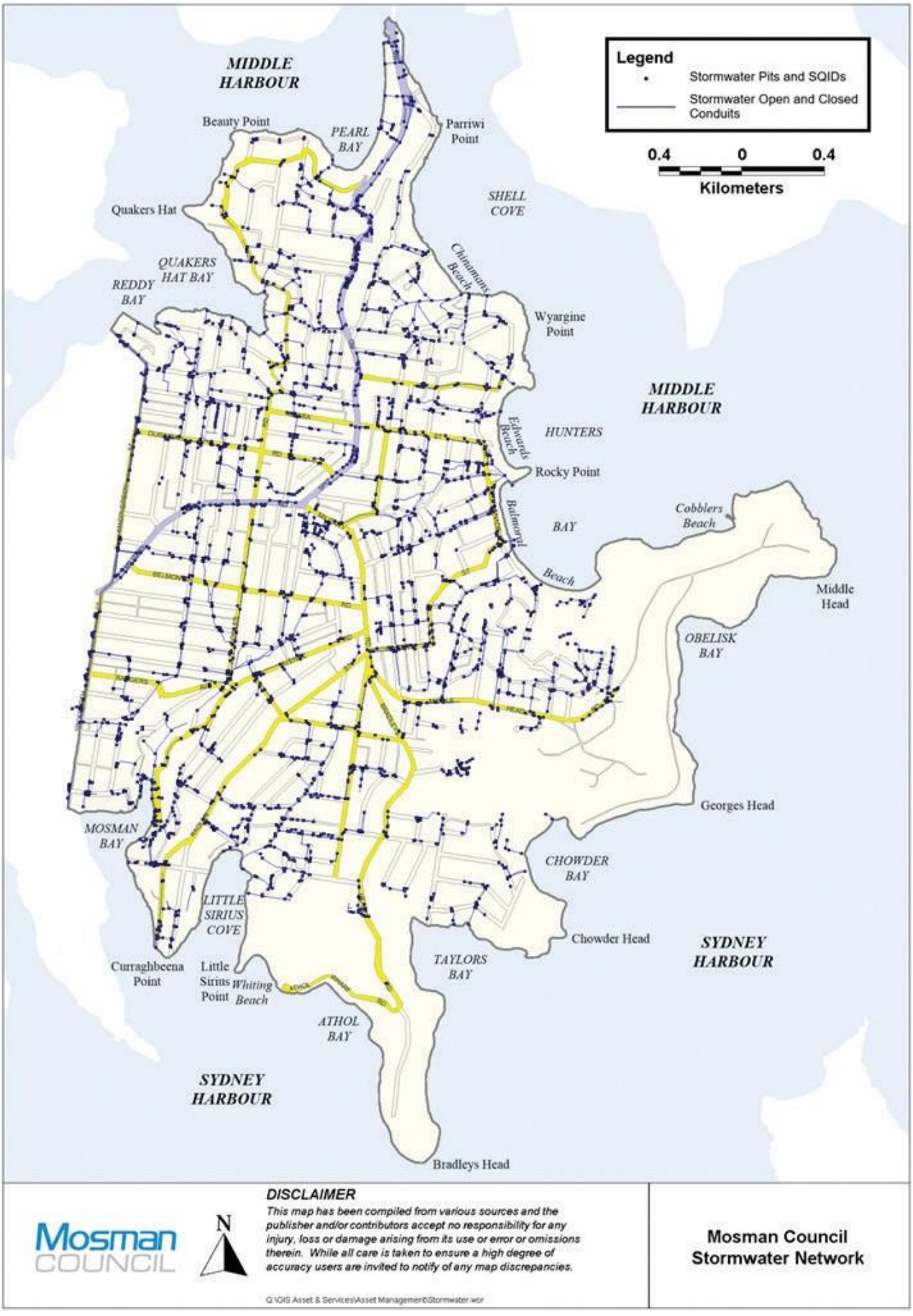
REFERENCES

- Mosman Community Strategic Plan (MOSPLAN)
- Mosman Council Asset Management Policy
- Mosman Council Asset Management Strategy
- Integrated Planning and Reporting Guidelines for local government in NSW - Planning a sustainable future 2013
- IPWEA, 2015, 'International Infrastructure Management Manual', Institute of Public Works Engineering Australia, Sydney, www.ipwea.org.au
- IPWEA, 2015, 'Australian Infrastructure Financial Management Manual', Institute of Public Works Engineering Australia, Sydney, www.ipwea.org.au
- AS/NZS/ISO 31000:2018 Risk Management – Principles and Guidelines
- .idcommunity, 2018, Mosman Municipal Council – community profile, .idcommunity, <http://profile.id.com.au/mosman>
- Photography by Ben Williams Photography, 2020

APPENDICES

APPENDIX A

STORMWATER NETWORK MAP


Legend
Stormwater Pits and SQIDs
Stormwater Open and Closed Conduits
0.4 0 0.4
Kilometers
MIDDLE HARBOUR
Beauty Point
PEARL BAY
Parriwi Point
SHELL COVE
Quakers Hat
QUAKERS HAT BAY
REDDY BAY
Chinamans Beach
Wyargine Point
MIDDLE HARBOUR
HUNTERS
Edwards Beach
Rocky Point
Balmoral Beach
BAY
Cobblers Beach
Middle Head
OBELISK BAY
Georges Head
MOSMAN BAY
CHOWDER BAY
LITTLE SIRIUS COVE
Chowder Head
SYDNEY HARBOUR
Curraghbeena Point
Little Sirius Point
Whiting Beach
TAYLORS BAY
ATHOL BAY
SYDNEY HARBOUR
Bradleys Head
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This map has been compiled from various sources and the publisher and/or contributors accept no responsibility for any injury, loss or damage arising from its use or error or omissions therein. While all care is taken to ensure a high degree of accuracy users are invited to notify of any map discrepancies.
Mosman COUNCIL
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Mosman Council
Stormwater Network

APPENDIX B

STORMWATER ASSETS 10 YEAR LIFECYCLE FINANCIAL FORECASTS

Stormwater Assets 10 Year Operational and Capital Forecasts (in 2019/20 dollar values, $000s)

	2019/ 2020	2020/ 2021	2021/ 2022	2022/ 2023	2023/ 2024	2024/ 2025	2025/ 2026	2026/ 2027	2027/ 2028	2028/ 2029
	1	2	3	4	5	6	7	8	9	10
Annual Depreciation	491	492	492	492	492	492	492	492	493	493
Planned Expenditure										
Operations	117	117	117	117	117	117	117	117	117	117
Maintenance	114	114	114	114	114	114	114	114	114	114
CCTV Inspections *	90	85	60	60	60	60	60	60	60	60
New Work	50	0	40	40	40	40	40	40	40	40
Renewals	355	100	540	540	545	545	545	550	550	550
Total	726	416	871	871	876	876	876	881	881	881
Required Expenditure ("Sustainable" Assets Case)										
Operations	117	117	117	117	117	117	117	117	117	117
Maintenance	23	28	53	53	53	53	53	54	54	54
CCTV Inspections *	90	85	60	60	60	60	60	60	60	60
New Work	50	0	40	40	40	40	40	40	40	40
Renewals	491	492	492	492	492	492	492	492	493	493
Total	771	721	761	761	762	762	762	763	763	763

* CCTV Inspections are included as capital works in Council's budgeting system, however the expenditure instead is to be included as an operations cost for the purposes of the asset management plan

APPENDIX C

STORMWATER DRAFT CAPITAL WORKS PROGRAM 2019/20–2028/29

Year	Stormwater Asset Type	Works Description	Estimated Cost ($)
2019/2020	Closed and Open Conduits	Renewals/Upgrades/Replacements	$300,000
2019/2020	Closed and Open Conduits	Inspections	$90,000
2019/2020	Pits/Nodes	Renewals/Upgrades/Replacements	$105,000
2020/2021	Closed and Open Conduits	Renewals/Upgrades/Replacements	$50,000
2020/2021	Closed and Open Conduits	Storm Response and Investigations	$85,000
2020/2021	Pits/Nodes	Renewals/Upgrades/Replacements	$50,000
2021/2022	Closed Conduits	Inspections	$60,000
2021/2022	Closed and Open Conduits	Renewals/Upgrades/Replacements	$450,000
2021/2022	Pits/Nodes	Renewals/Upgrades/Replacements	$140,000
2022/2023	Closed and Open Conduits	Renewals/Upgrades/Replacements	$450,000
2022/2023	Closed and Open Conduits	Inspections	$60,000
2022/2023	Pits/Nodes	Renewals/Upgrades/Replacements	$140,000
2023/2024	Closed Conduits	Inspections	$60,000
2023/2024	Closed and Open Conduits	Renewals/Upgrades/Replacements	$450,000
2023/2024	Pits/Nodes	Renewals/Upgrades/Replacements	$140,000
2024/2025	Closed and Open Conduits	Renewals/Upgrades/Replacements	$450,000
2024/2025	Closed and Open Conduits	Inspections	$60,000
2024/2025	Pits/Nodes	Renewals/Upgrades/Replacements	$140,000
2025/2026	Closed Conduits	Inspections	$60,000
2025/2026	Closed and Open Conduits	Renewals/Upgrades/Replacements	$450,000
2025/2026	Pits/Nodes	Renewals/Upgrades/Replacements	$140,000
2026/2027	Closed and Open Conduits	Renewals/Upgrades/Replacements	$450,000
2026/2027	Closed and Open Conduits	Inspections	$60,000
2026/2027	Pits/Nodes	Renewals/Upgrades/Replacements	$140,000

Year	Stormwater Asset Type	Works Description	Estimated Cost ($)
2027/2028	Closed Conduits	Inspections	$60,000
2027/2028	Closed and Open Conduits	Renewals/Upgrades/Replacements	$450,000
2027/2028	Pits/Nodes	Renewals/Upgrades/Replacements	$140,000
2028/2029	Closed and Open Conduits	Renewals/Upgrades/Replacements	$450,000
2028/2029	Closed and Open Conduits	Inspections	$60,000
2028/2029	Pits/Nodes	Renewals/Upgrades/Replacements	$140,000

AS ET MANAGEMENT PLAN 2020-29

STORMWATER

Mosman COUNCIL