

October 2024

# Western Sydney Planning Partnership

## Smart Infrastructure Paper 1 (Baseline Costs)



**OntoIt.**



## **Acknowledgement of Country**

The Western Sydney Planning Partnership acknowledges more than 60,000 years of continuous Aboriginal connection to the land that makes up NSW.

We acknowledge and pay our respects to the traditional custodians of Country within Western Sydney. As part of the world's oldest living culture, the traditional Aboriginal owners and custodians share a unique bond to the Country – a bond forged through thousands of years of travelling across lands and waterways for ceremony, religion, trading, and seasonal migration.

We acknowledge that Western Sydney is home to the highest number of Aboriginal people of any region in Australia and that the primary Aboriginal custodians with obligations for Country and connection to the place for many generations including the Dharug/Darug, Dharawal/Tharawal, Gundungurra/Gandangara, and Darkinjung people.

This paper is delivered in collaboration with Smart Places, Transport for NSW, the Western Sydney Planning Partnership, the eight local government areas that comprise Western Parkland City and Blacktown City Council as part of the Smart Infrastructure Policy Acceleration Program. The Program received a co-contribution of funding through the Smart Places Acceleration Program, a special reservation of the NSW Government's Digital Restart Fund.

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## Table of Abbreviations:

| Abbreviation | Description                                       |
|--------------|---------------------------------------------------|
| AI           | Artificial intelligence                           |
| AMS          | Asset Management System                           |
| BCC          | Blacktown City Council                            |
| BCR          | Benefit-to-Cost Ratio                             |
| BMCC         | Blue Mountains City Council                       |
| CAPEX        | Capital expenditures                              |
| CCTV         | Closed circuit television                         |
| GIS          | Geographic information system                     |
| IPWEA        | Institute of Public Works Engineering Australasia |
| LGA          | Local Government Area                             |
| M            | Metre                                             |
| OPEX         | Operating expense                                 |
| ML           | Machine learning                                  |

|              |                                            |
|--------------|--------------------------------------------|
| <b>QCV</b>   | Quick clip valve                           |
| <b>ROI</b>   | Return on Investment                       |
| <b>SI</b>    | Smart infrastructure                       |
| <b>ST</b>    | Smart technology                           |
| <b>TfNSW</b> | Transport for New South Wales              |
| <b>WIP</b>   | Works Improvement Program                  |
| <b>WSPP</b>  | Western Sydney Planning Partnerships       |
| <b>WSSIM</b> | Western Sydney Smart Infrastructure Manual |



## Executive summary

The Western Sydney Planning Partnership (WSPP) is collaborating with Western Sydney councils to assess the financial costs and benefits of adopting Smart Infrastructure (SI). Three papers will be developed to guide the development of an operational policy on integrating SI into local councils' asset management systems.

This paper is delivered in collaboration with Smart Places, Transport for NSW, the Western Sydney Planning Partnership, the eight local government areas that comprise Western Parkland City and Blacktown City Council as part of the Smart Infrastructure Policy Acceleration Program. The Program received a co-contribution of funding through the Smart Places Acceleration Program, a special reservation of the NSW Government's Digital Restart Fund.

## Scope

This Paper 1 focuses on describing the current asset management system arrangements and the collection of component asset maintenance and renewal financial data for Blacktown City Council's (BCC) stormwater pits and underground pipes asset class and Blue Mountains City Council's (BMCC) irrigation asset class. A high-level maturity assessment was also completed for both councils in line with the Western Sydney Smart Infrastructure Manual (WSSIM) 2023. Following the maturity assessment in Section 2.0, this paper has been broken up into two distinct parts to allow the respective councils to engage with their sections independently.

## Asset Management Systems

This section reviews the quantum of each council's asset class, the systems used and activities to manage these assets.

### BCC

BCC uses multiple systems to manage the drainage asset class and relies on a manual transfer of data due to a lack of integration. To improve efficiency, integrating these systems is essential. Future procurement could mandate integrating contractor inspection results via an API, reducing manual data entry and enhancing value for money. Additionally, using AI inspection results could aid in capital works planning, recommending solutions, and outlining work scopes, thus reducing administrative tasks and improving decision-making.

### BMCC

BMCC uses Microsoft Excel, TechnologyOne, VEMAX Management, and Infor Pathway to manage irrigation assets, but limited integration isolates information. Upgrading TechnologyOne for better integration aligns with BMCC's strategy to improve efficiency and decision-making. An integrated Asset Management System (AMS) with enhanced reporting and accessible water usage information will support this strategy, improve knowledge transfer, and reduce the risk of losing key intellectual property.

## Baseline asset lifecycle costs

This section reviews both council's lifecycle costs to manage both asset classes including the asset management activities identified under the asset management systems section.

### BCC

BCC manages drainage pipes and stormwater pits through condition inspections, costing \$160k for 50km over three years with traditional methods and \$145k for 50km with ML-assisted CCTV inspections. Approximately \$21,337 is spent on quality control and data management. With approximately 25% of BCC's asset base, a better understanding of drainage condition data is crucial for aligning with BCC's financial sustainability strategy. Increasing annual inspections and integrating the AMS will support data-driven renewal planning and help manage aging assets. Continuing ML-assisted CCTV inspections and AMS integration will address key policy issues for local councils.

## **BMCC**

BMCC manages 21 parks across the Blue Mountains, with 12 using manual irrigation that incurs significant costs: \$12,248 for water supply and \$31,200 for labour and vehicle use per average park of 14,200 m<sup>2</sup>. Given the region's spread and the distance from council work locations, implementing smart irrigation could reduce these costs. Upgrading to smart irrigation aligns with BMCC's financial and environmental sustainability goals by cutting expenses, enhancing service levels, and lowering greenhouse gas emissions through reduced vehicle use.

Section 5 of this Paper provides a summary of findings and conclusions.

# 1. Introduction

## 1.1. Background and objectives

Western Sydney Planning Partnership (WSPP) has been working with the nine Western Sydney local councils to develop uniform SI technological design specifications to embed technology in new local infrastructure. To do so, it seeks to develop an operational policy and guidance for the adoption of SI across these councils. It is anticipated that this will be a multi-staged project.

As an outcome of Stage 1 of the project, the Western Sydney Smart Infrastructure Manual (WSSIM) (2023) was aimed to guide councils on the implementation of SI and smart technology solutions. The document draws on NSW Government's Smart Infrastructure Policy and key strategic documents supporting smart places and Smart Western Parkland City.

The WSSIM outlines a five-level maturity framework as shown in the table below:

| Level | Definition             | Description                                   |
|-------|------------------------|-----------------------------------------------|
| 1     | Initial                | Not yet started                               |
| 2     | Partially fulfilled    | Needs are identified but not yet started      |
| 3     | Fulfilled              | Satisfied current needs in a defined manner   |
| 4     | Improving              | Partially started towards future needs        |
| 5     | Sustainably optimising | Continually improving to satisfy future needs |

Table 1 - Smart Infrastructure Maturity Levels (Source: WSSIM 2023)

As a priority, Councils pursuing smart technology and systems should be at 'Level 3 – Fulfilled' in order to take advantage of SI capabilities, and in the medium term be working towards 'Level 4 – Improving' to maximise the value and return on investment (ROI) of smart infrastructure investments.

Stage 2 of the project focuses on developing a policy framework for implementation of SI as part of local government infrastructure across Western Sydney. The documents delivered will inform the development of an operational policy and guidance on how SI should be incorporated into the asset management systems of local councils, including monitoring for benefits realisation and guidance on the collection, storage and analysis of SI data.

**Priority 1 - Improve efficiency and reduce cost of council service delivery.**

**Priority 2 - Improve data for council asset planning & management.**

**Priority 5 - Collecting data for improved strategic planning & decision-making.**

Figure 1 - WSPP priorities

BCC and BMCC have been selected for this pilot project. These are two Western Sydney Councils with distinctly different characteristics. BCC is one of the largest LGAs in Australia and is rapidly growing towards a population of over 600,000 people in the next two decades. The BMCC LGA covers 140,377 hectares,

74% of which comprises National Park, and is a national and international tourist destination. Its long-term focus is on sustaining its unique characteristics.

#### The targeted project benefits are as follows

- Quantification of the likely asset lifecycle costs and benefits accruing at the Western Sydney local council and regional scale from the adoption of SI.
- Development of an approach to monitor asset lifecycle costs and benefits when implementing SI at both a Western Sydney local council and regional scale.
- Development of operational policy/guidance on SI incorporation in council asset management systems.
- Input into the development of a roadmap for implementation of the broader project's SI policy.

This is Paper one that will outline the extant Asset Management Systems (AMS) settings and baseline asset lifecycle costs for the two identified Councils.



#### 1.1.1. Blacktown City Council

Blacktown City is one of the largest LGAs in Australia, with an estimated population of 435,000 (2023) and covers an area of 247,000 hectares. The city is made up of 54 diverse residential suburbs.

'Our Blacktown 2041' is the BCC's Community Strategic Plan that sets the long-term vision for the City. By the year 2041, the population is expected grow by approximately 240,000 people and approximately 100,000 dwellings, making the LGA the second highest growth area in Australia.

The LGA has an infrastructure asset base of \$4.325 billion. The infrastructure assets typically include roads, footpaths, bridges, traffic facilities, drainage, water quality improvement devices, buildings, sporting and recreational facilities, walking tracks, parks and playgrounds.

The expected rapid growth will prompt the expansion of the asset base by another \$1.1 billion over the next five years (Asset Management Strategy 2022-23). Based on the asset management plans, balancing available budget and resources with the projected needs for maintenance of new assets, and the renewal and maintenance of existing assets will present challenges to BCC. This has required BCC to look at new approaches to introduce efficiencies and innovation in asset maintenance.

With the rapid development of the LGA and responding to its climate change policy, BCC seeks to minimise greenhouse gas emissions and build resilience to the impacts of climate change, especially increasing urban heat. Urban heat and heat island effect is where heat (mostly from the sun) is absorbed by building materials and built surfaces such as building facades, road pavements, carparks and hard surfaces such as concrete and then radiated into the surrounding area. This has the possibility to make urban surfaces and buildings up to 10–20°C warmer than surrounding air temperatures during the day and lead to higher evening temperatures. To counter this phenomenon, BCC has introduced a range of urban design treatments aimed at increasing vegetation and reusing urban stormwater runoff towards becoming a water sensitive and water resilient city.

Two asset classes have been chosen by BCC for review by this paper, underground drainage pipes and stormwater pits. These asset classes are inter-connected and are maintained as a collective. They sit under the asset type, drainage. Drainage can be classified as a critical asset. This Paper will review as one of the

case studies, the use of smart technology in CCTV inspection of underground pipes and stormwater pits. This technology is understood to have the capacity to expedite inspection capability for BCC and offer process efficiencies.

### 1.1.2. Blacktown Asset Problem Statement

BCC is a rapidly growing LGA, both in terms of population and an asset base. It currently has a manageable backlog of \$59m in 2022/23, however this will grow to approximately \$475m by 2031/32 due to the increasing age of the assets, additional assets coming online between 2022 and 2032, and a deficit in asset renewal funding (Refer Long Term Financial Plan 2022-2032).

If we were to take stormwater drainage as an example, it amounts to approximately 25% of BCC's asset base. In a proactive condition-based maintenance regime, a typical inspection cycle is 5-7 years and prioritised by criticality. Given the scale of the drainage assets, it would need to inspect approximately 350km of drainage pipe each year. Using traditional inspection methods, BCC would not be able to undertake this task unless it had access to a very large resource pool. This would mean having to shift towards random sampling methods, lower inspection frequency or a reactive maintenance approach of 'fix when broken'.

To respond to the growing maintenance risk of an ageing asset portfolio, coupled with a limited resource base to implement maintenance, BCC will require innovative methods for maintenance activity. BCC proposes to address the management of their growing maintenance backlog against **Priorities 1, 2 and 5**.

**Priority 1** - Improve efficiency and reduce cost of council service delivery.

**Priority 2** - Improve data for council asset planning & management.

**Priority 5** - Collecting data for improved strategic planning & decision-making.

### 1.1.3. Blue Mountains City Council

The City of Blue Mountains is located on the western fringe of the Greater Sydney Region and is one of only two cities in the world surrounded by a UNESCO declared World Heritage National Park Area. With a spectacular environmental setting, the Blue Mountains is home to a community of nearly 80,000 people living in 27 towns and villages located over 100 km of mountainous terrain.

The BMCC LGA covers 140,377 hectares, 74% of which comprises National Park. The Blue Mountains is a nationally and internationally significant visitor destination.

The ribbons of development that extend out along ridgelines, with many properties connecting directly to the surrounding bushland. This proximity places the City at high risk of bush fires and creates a lengthy urban-bushland interface that requires environmental management. The topography of the Blue Mountains poses a considerable challenge for the provision of infrastructure (including renewal and maintenance) within the area, as well as transport access.



‘Sustainable Blue Mountains 2035’ sets BMCC’s long term vision and is the culmination of a journey that began more than 20 years ago. This sets out the roadmap towards sustainability and planetary health, recognising Blue Mountain’s unique privilege and responsibilities as a city surrounded by a World Heritage Area.

Council has an extensive portfolio of physical assets with a value of over \$1.3 billion. Infrastructure assets typically include roads, footpaths, bridges, traffic facilities, drainage, water quality improvement devices, buildings, sporting and recreational facilities, walking tracks, lookouts, visitor facilities, parks and playgrounds. With a tighter fiscal environment and an aging workforce, BMCC will need to adopt new approaches to management of their assets. The asset class chosen by BMCC is irrigation within the asset category of open space recreation. Based on BMCC’s Asset Management Strategy (2022), this asset class is not identified as a critical asset. This paper will review BMCC’s case study for the application of smart irrigation technology to its sports fields. It is understood that this technology will enable full automation of a previously manual system utilising BMCC’s field staff.

#### 1.1.4. Blue Mountains Asset Problem Statement

BMCC expects a tighter fiscal environment over the foreseeable future while aiming to provide acceptable levels of service to the community. A key strategy to address this challenge is to manage the revenue sources more efficiently while achieving value for money through the services.

Furthermore, BMCC has an aging workforce with 19.5% of the workforce will be over 60 years of age and 46% of the workforce will be over 50 years of age by 2030 (Resourcing Strategy 2022-32). The ability to transfer knowledge within the workforce will be crucial to the future success of BMCC.

It is clear the current approach to managing assets needs to be challenged, with innovative methods employed to help address fiscal challenges and mitigate the loss of knowledge with an aging workforce.

## 1.2. Scope and Methodology

### 1.2.1. Scope of this Paper

The scope of this paper is to outline the extant AMS settings and identify the baseline asset lifecycle costs. This includes:

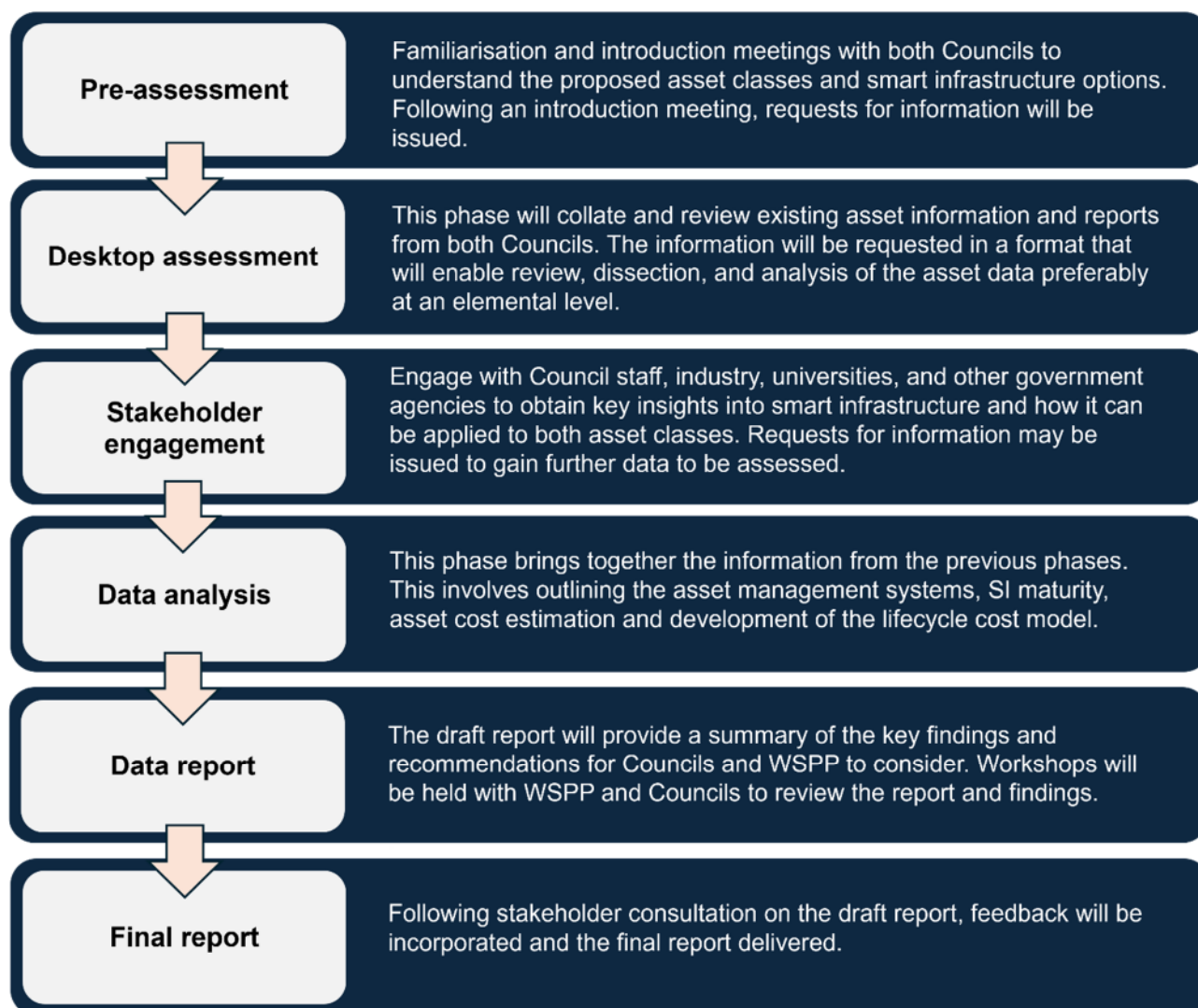
**Describing the current AMS arrangements for BCC and BMCC with focus on selected asset classes**

**Collecting financial data from participating councils on total and component asset maintenance and renewal costs for selected asset classes**

Though not within the scope of WSPP's brief, the Paper will also assess, each Council's SI maturity against the WSSIM SI maturity framework to gain insights on each Council's journey towards the identified maturity of Level 3 – Fulfilled and any foreseeable challenges.

### 1.2.2. Methodology

In order to outline the baseline asset lifecycle cost identification for both asset classes, the following methodology will be adopted:



## 1.3. BCR Principles

A Benefit-to-Cost Ratio (BCR) is a financial metric used to evaluate the economic worthiness of a project by comparing the benefits it will deliver to the costs it will incur, a BCR greater than 1 suggests that a project's benefits outweigh its costs. The primary objectives of using a BCR is to assess the viability of implementing SI projects for both Councils.

### 1.3.1. Blacktown City Council

The BCR assessment will compare the traditional condition inspection regime of the nominated asset classes of drainage pipes and stormwater pits as the base case against a machine learning (ML)-assisted CCTV Inspection regime for the alternative case. The benefits of utilising ML-assisted CCTV Inspection will be assessed against the increased cost of upgrading BCC's Asset Management Systems to better utilise the data produced.

### 1.3.2. Blue Mountains City Council

The BCR assessment will consider a 'like to like' irrigation system renewal as the base case and a smart irrigation system upgrade for the alternative case. The benefits of installing SI will be assessed including the reduction of BMCC labour and vehicle usage against an increased cost to install the smart irrigation.

## 1.4. Source of data and information

Through consultation with both Councils, industry partners, education partners and other Government agencies, a wide array of information was obtained to assist in the development and analysis of both Councils' asset management systems and costs.

Appendix A - Source of data and information outlines the data sources used throughout this paper.

## 1.5. Assumptions

In developing this paper, we have relied on documents and information provided by each Council, interviews with representatives of Councils and other stakeholders. We have assumed that this information is accurate and there is no cause for us to use third party verification methods.



## 2. Maturity assessment

As noted in section 1.1, to take full advantage of SI, councils need to be at 'Level 3 – Fulfilled' against the WSSIM maturity levels. While a maturity assessment of councils is not a requirement for this project, each of the councils has been requested to undertake a self-assessment based on the template provided in the WSSIM to inform this project and the projected journey by each Council to get to 'Level 4 – Improving', towards maximising the value and ROI.

### 2.1. Blacktown City Council

As indicated in Table 2, which is a high level category assessment of SI maturity, while BCC has made fair progress on Target 1 (Level 3) in some categories and sub-categories, it's maturity has not yet reached a consistent Level 3. BCC has indicated they are progressing towards achieving Target 1 (Level 3).

| Category                                   | Meets maturity level 3 (Yes/No)                            |
|--------------------------------------------|------------------------------------------------------------|
| Smart City - Vision and Strategy           | Yes                                                        |
| Smart Infrastructure - Vision and Strategy | No (some elements integrated into broader strategic plans) |
| Business Process                           | No                                                         |
| Data                                       | Yes (TechnologyOne upgrade)                                |
| Technology                                 | Yes (has access to vendor technology)                      |
| People                                     | No                                                         |
| Overall Organisational Direction           | No (assessment limited to within City Assets Directorate)  |

Table 2: BCC Maturity status at a category level

It should be noted that the broader SI ecosystem is still evolving, and these targets can be considered aspirational at this early stage.

### 2.2. Blue Mountains City Council

As indicated in Table 3, which is a high level category assessment of SI maturity, while BMCC has engaged in a number of smart technology initiatives and has made fair progress on Target 1 (Level 3) in some categories and sub-categories, it's maturity has not yet reached a consistent Level 3. BMCC has indicated they are progressing towards achieving Target 1 (Level 3).

| Category                                   | Meets maturity level 3 (Yes/No) |
|--------------------------------------------|---------------------------------|
| Smart City - Vision and Strategy           | No                              |
| Smart Infrastructure - Vision and Strategy | No                              |
| Business Process                           | No                              |
| Data                                       | Yes (TechnologyOne upgrade)     |

|                                         |                                                                                |
|-----------------------------------------|--------------------------------------------------------------------------------|
| <b>Technology</b>                       | Yes (broad rollout of technology across Recreation, Aquatic & Cemeteries area) |
| <b>People</b>                           | No                                                                             |
| <b>Overall Organisational Direction</b> | No (assessment limited to within Recreation, Aquatic & Cemeteries area)        |

*Table 3: BMCC Maturity status at a category level*

It should be noted that the broader SI ecosystem is still evolving, and these targets can be considered aspirational at this early stage.

### 3. Part A – Blacktown City Council

#### 3.1. Asset Management Systems

##### 3.1.1. Summary of Drainage Assets

A summary of asset classes and quantities within the asset type, drainage is shown in Table 4: BCC Drainage asset classes and quantities below. The value of drainage is approximately 25% of the total value of all assets owned, managed and maintained by BCC, hence it is a significant asset type. It is also a critical asset.

| Asset Class                          | Quantity    |
|--------------------------------------|-------------|
| Underground pipes                    | 1,358 km    |
| Stormwater pits                      | 49,450 pits |
| Pollution control devices            | 346 devices |
| Waterways/channels                   | 204 km      |
| Water sensitive urban design devices | 177 devices |

Table 4: BCC Drainage asset classes and quantities (June 2023)

As shown in

Figure 2, all of the responsibilities for the drainage asset class sit within the City Assets Directorate, under the Director City Assets. Within this directorate the following sections are key to the efficient delivery, maintenance and management of assets, including:

- Asset Planning and Support, who are responsible for asset planning, health inspections, asset systems management and reporting, and coordinating the works improvement program
- Asset Design, who are responsible for floodplain studies, assist in the investigation of drainage assets and the design of drainage assets
- Civil Asset Maintenance, who are responsible for the delivery of asset maintenance on drainage assets
- Asset Construction, who are responsible for the delivery of capital projects including renewals, upgrades and extensions

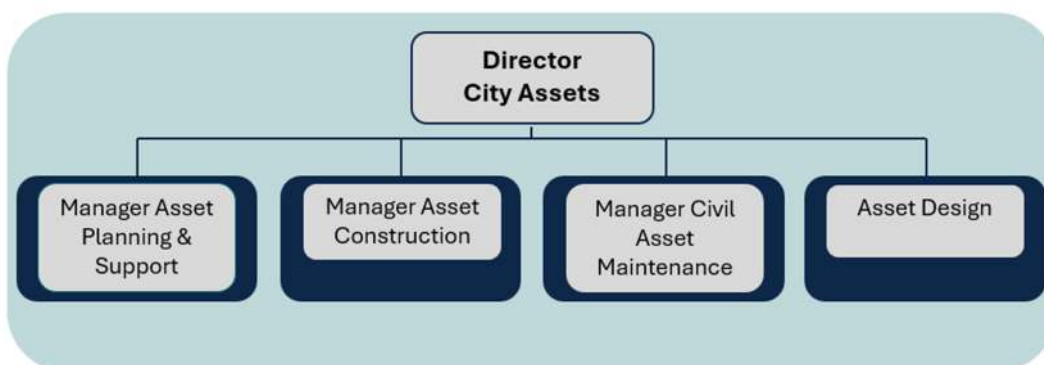


Figure 2: BCC Organisation Chart

## Basis of backlog

As noted in section 1.1.2, the current total estimated asset maintenance backlog is \$59m and is estimated to grow to \$475m by 2031/32. BCC utilises the Predictor module within Brightly to manage and forecast the drainage asset backlog. Given that 25% of the total assets are drainage assets, we have assumed the current drainage backlog is approximately \$15m and will grow to approximately \$119m by 2031/32. The backlog is estimated primarily based on an age-based analysis and limited condition data captured through inspections.

## Asset Condition

The Stormwater Pits and Underground Pipe asset condition data was not available and has not been assessed as part of this paper.

### 3.1.2. Asset Management Systems

The BCC asset management system comprises a collection of systems including TechnologyOne, Brightly, ArcGIS and TRIM. Figure 3 shows the modules of each AMS and the integration with other AMS's. BCC predominantly utilises Brightly for forward planning, monitoring service criteria and the management of the asset class valuation. TechnologyOne is utilised to manage workorders raised for maintenance works including community complaints which are initiated in TechnologyOne customer request system. TechnologyOne also captures the asset valuation as an output from Brightly. Both Brightly and TechnologyOne utilise GIS information from ArcGIS, which can be considered the primary source of information amongst the AMS.

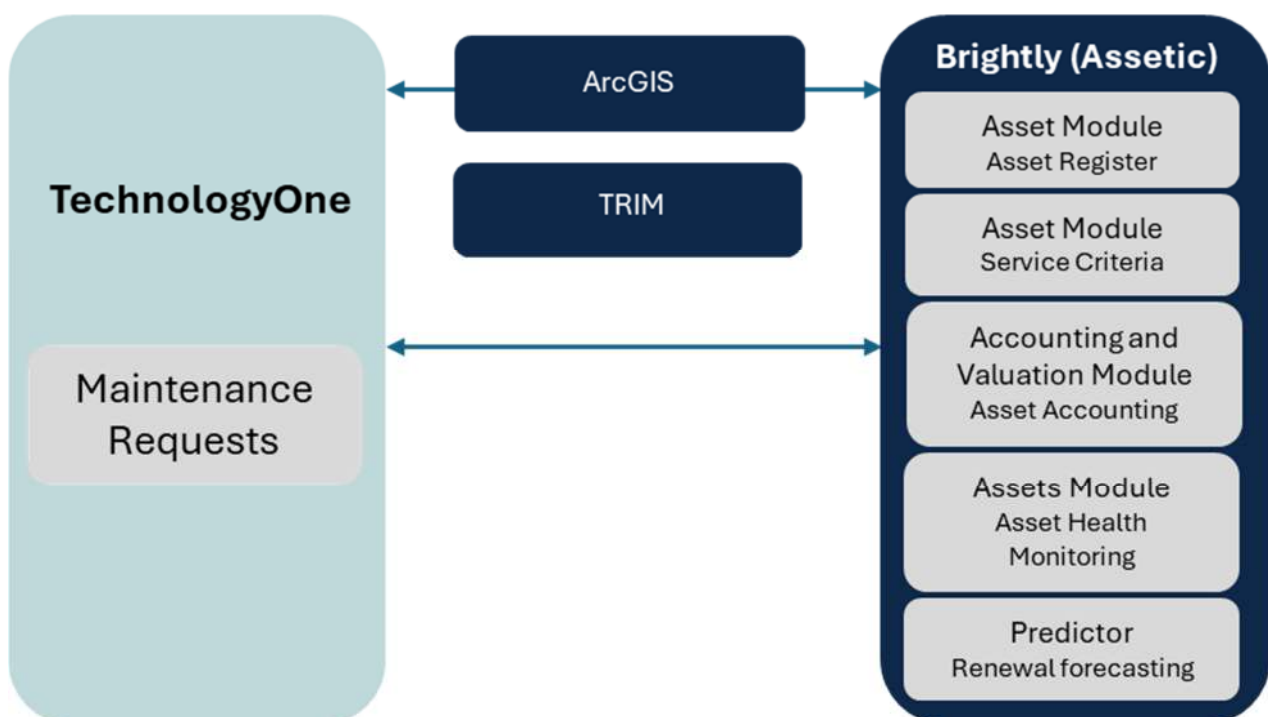


Figure 3: BCC Asset Management Systems overview

Figure 4 below is an ArcGIS output of the stormwater pits and underground pipe network in the LGA, with blue identifying the part of the network which has been inspected utilising either a traditional CCTV technology or smart technology (AI). The areas identified in green are yet to be inspected.

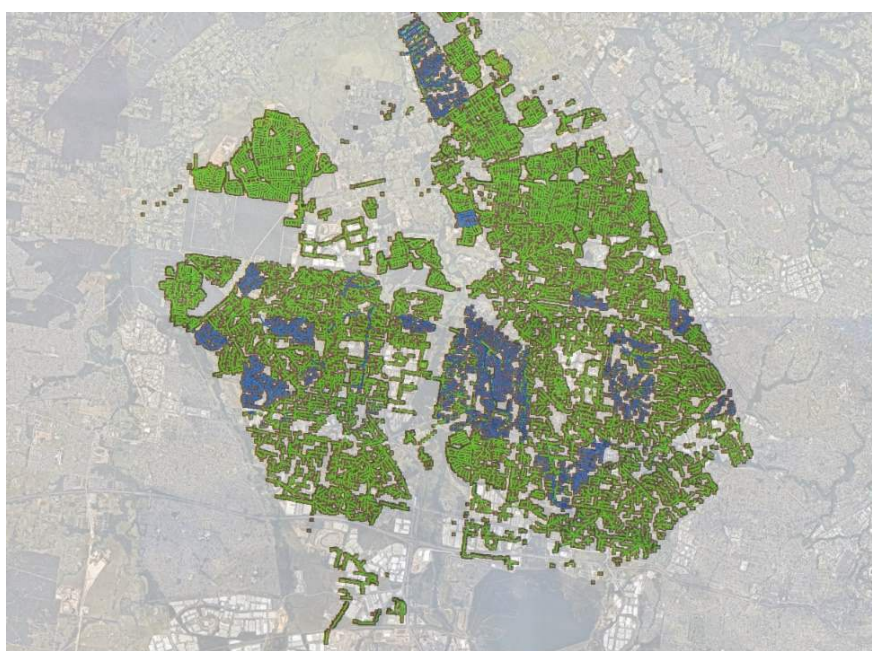


Figure 4: ArcGIS output of the BCC Stormwater Pits and Underground Pipe Network

### 3.1.3. Asset Management Activities

BCC undertakes a range of asset management activities to manage their stormwater network, as seen in Table 5 below. These activities undertaken by BCC align with Institute of Public Works Engineering Australasia (IPWEA) glossary of terms.

| Asset Management Activity                                                | Description                                                                                                                                                                                                                                 |
|--------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Planned maintenance</b>                                               | Programmed cleaning of stormwater pits and underground pipes<br>Programmed stormwater pits and underground pipes inspections                                                                                                                |
| <b>Unplanned maintenance</b>                                             | Unplanned cleaning of stormwater pits and underground pipes<br>Unplanned inspections of stormwater pits and underground pipes<br>Repair of drainage structures lintels and grates                                                           |
| <b>Works improvement program - Planned maintenance and capital works</b> | Major patching of stormwater pits and underground pipes<br>Lining of pipes<br>Replacement of stormwater pits and underground pipes<br>Upgrades of stormwater pits and underground pipes<br>Removal of stormwater pits and underground pipes |

Table 5: BCC stormwater pits and underground pipes activities

## Asset Inspections

BCC inspects approximately 50kms of stormwater pit and underground pipe networks annually for both planned and unplanned inspections. The Asset Planning and Support team determine which part of the network will be inspected annually. BCC currently has a contract with Total Drainage Group, who subcontract to VAPAR to undertake ML-assisted CCTV inspections. Following an inspection, the VAPAR online platform function provides BCC with a recommended treatment (if required), the asset condition and service scores. The inspection information contains: the asset ID, the length of inspection, defects, the material, pipe diameter and location. This information is provided to BCC via a csv file. This data is uploaded to Brightly to capture the asset condition and asset valuation. ArcGIS is also updated to reflect the completion of an inspection. BCC utilises full time tertiary students and contractors to manage and enter asset data within their asset management systems. As Figure 4 shows, BCC has completed inspections for a limited percentage of their network equating to approximately 170km of their 1358km drainage network.

Paper 2 will further describe the technical details of the stormwater pit and underground pipe inspections.

## Planned and Unplanned Maintenance

BCC undertakes planned and unplanned maintenance of stormwater pits and underground pipe utilising internal resources as a result of community feedback or through inspection reports. The management of these maintenance activities is completed through TechnologyOne.

## Planned maintenance and Capital Works

In order to manage BCC's stormwater pits and underground pipe renewal backlog, an annual Works Improvement Program (WIP) incorporating planned maintenance and capital works activities as listed in Table 5 is delivered. The annual WIP is developed utilising the 'selection criteria and scoring of projects' document to assist in prioritising the annual works, which includes the following criteria:

- Grant funded
- Flooding type
- Cost effectiveness (flooding only)
- Community safety/Amenity improvement
- Environmental improvement.
- Risk mitigation - Mandatory

The development of the annual WIP is completed in consultation with the Civil Asset Maintenance, Asset Design and Asset Construction teams. BCC outsources the delivery of the WIP through works contracts.

## 3.2. Baseline asset lifecycle costs

As outlined in section 1.3.1, the BCR assessment will compare a traditional inspection against a ML-assisted CCTV Inspection. Section 3.1.3, outlines asset inspections in further detail including the tasks required to undertake an inspection. Table 6 below outlines the operational costs associated with traditional inspections. Labour costs have been assumed as opposed to actual rates.

| Item                                    | Unit cost               | Yearly cost and assumptions                                                                         | Cost basis                                                                                                                                                                |
|-----------------------------------------|-------------------------|-----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Traditional CCTV inspection cost</b> | \$3.20 per linear metre | <b>\$160,000</b> (based on costs for CCTV Service based on contractor rates. Assumed 50km per year) | External cost per linear metre for completing Stormwater pits and underground pipe inspection. A minimum length per day and quantum per year is mandated in the contract. |

| Item                           | Unit cost        | Yearly cost and assumptions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Cost basis                                                                                              |
|--------------------------------|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| <b>Council Systems Manager</b> | \$200/hour/staff | <b>\$21,337</b> (based on the following: <ul style="list-style-type: none"> <li>Quality control: estimate that Council engineer will watch 20% of the videos and reports for QA.</li> <li>Data extraction: estimate of 5 mins per inspection report to extract summary data.</li> <li>Data preparation and upload: 8 hours to quality control by Council Engineer, 15% error rate for asset mapping and 10 mins to correct &amp; 4 hours for data format verification and bulk upload by systems manager.)</li> </ul> | Internal hourly cost for a systems manager responsible for the Council's AMS                            |
| <b>Council Engineer</b>        | \$140/hour/staff |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Internal cost for an experienced civil engineer responsible for stormwater asset management             |
| <b>Junior Officer</b>          | \$100/hour/staff |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Internal cost for a junior officer or engineer supporting stormwater asset management and data analysis |

Table 6: BCC manual irrigation costs

Each variable relating to the baseline costs has been outlined in detail below, noting labour costs have been assumed as opposed to actual rates.

CCTV inspection cost:

- A unit rate per metre of \$3.20 has been used based on feedback from BCC's procurement team for a traditional CCTV inspection.

Labour cost:

- A unit rate of \$200/hour for a council systems manager has been adopted based on knowledge of typical labour rates charged to councils.
- A unit rate of \$140/hour for a council engineer has been adopted based on knowledge of typical labour rates charged to councils.
- A unit rate of \$100/hour for a junior officer has been adopted based on knowledge of typical labour rates charged to councils.
- An allowance has been made for quality control of CCTV received from clients. This includes the time taken to watch CCTV to verify the accuracy of reports by a council engineer based on 50kms of CCTV inspections per year.
- An allowance has been made to extract data from inspection reports to assist with planning of future remediation works by a council engineer based on 50kms of CCTV inspections per year.
- An allowance has been made for data preparation and uploading the CCTV outputs into BCC's AMS by a systems manager and council engineer based on 50kms of CCTV inspections per year.

## 4. Part B – Blue Mountains City Council

### 4.1. Asset Management Systems

#### 4.1.1. Summary of Irrigation Assets

BMCC operates and maintains 21 sports parks throughout the region. The parks vary in size ranging from small parks of ~1,350m<sup>2</sup> to large parks of ~34,000m<sup>2</sup>, including both rectangular and oval shaped fields. The average size park is approximately 14,200m<sup>2</sup>.

Within the parks, there is approximately 27km<sup>1</sup> of irrigation. 12 of the 21 parks have manually operated irrigation systems, with the remaining nine parks having made an investment in smart irrigation technology.

| Sports Park name              | Park type   | Size (m <sup>2</sup> ) | Irrigation type | Recreation type                               |
|-------------------------------|-------------|------------------------|-----------------|-----------------------------------------------|
| <b>Blackheath Oval</b>        | Oval        | 1,350                  | Manual          | 1 cricket/AFL oval                            |
| <b>Blaxland Oval</b>          | Rectangular | 2,171                  | Smart           | 2 football pitches                            |
| <b>Browtown Oval</b>          | Oval        | 2,664                  | Manual          | 1 cricket/AFL oval                            |
| <b>Bureau Park</b>            | Oval        | 7,356                  | Manual          | 1 cricket/AFL oval, dog park. Not operational |
| <b>Glenbrook Oval</b>         | Oval        | 4,619                  | Smart           | 1 cricket/AFL oval                            |
| <b>Glenbrook Park</b>         | Oval        | 6,810                  | Manual          | 1 cricket/AFL oval                            |
| <b>Gloria Park</b>            | Oval        | 10,617                 | Smart           | 1 cricket/AFL oval                            |
| <b>Katoomba Falls Reserve</b> | Oval        | 12,671                 | Manual          | 2 cricket/AFL oval                            |
| <b>Katoomba Showground</b>    | Oval        | 12,350                 | Manual          | 1 cricket/AFL oval                            |
| <b>Knapsack Park</b>          | Rectangular | 16,311                 | Smart           | 2 football pitches                            |
| <b>Lapstone Oval</b>          | Oval        | 14,066                 | Smart           | 1 cricket/AFL oval                            |
| <b>Lawson Oval</b>            | Rectangular | 7,385                  | Manual          | 1 football pitch                              |
| <b>Leura Oval</b>             | Oval        | 8,275                  | Manual          | 1 cricket/AFL oval                            |
| <b>Lomatia Park</b>           | Oval        | 11,612                 | Manual          | 1 cricket/AFL oval                            |
| <b>Melrose Park</b>           | Oval        | 12,910                 | Manual          | 1 cricket/AFL oval. Not operational           |
| <b>Murray Park</b>            | Oval        | 8,046                  | Manual          | 1 cricket/AFL oval                            |
| <b>Peter Carrol Field</b>     | Oval        | 17,727                 | Manual          | 1 cricket/AFL oval                            |
| <b>Pitt Park</b>              | Rectangular | 34,237                 | Smart           | 4 football pitches, 1 sports park             |

<sup>1</sup> Open Space and Recreation Asset Management Plan 2023, page 27

|                         |             |        |       |                    |
|-------------------------|-------------|--------|-------|--------------------|
| <b>Summerhayes Park</b> | Rectangular | 27,581 | Smart | 4 football pitches |
| <b>Tom Hunter Park</b>  | Oval        | 16,796 | Smart | 1 cricket/AFL oval |
| <b>Warrimoo Oval</b>    | Rectangular | 22,646 | Smart | 2 football pitches |

Table 7: BMCC recreational parks

Given the varying topography and temperature range of the Blue Mountains area, the way parks are managed differ throughout the region. For example, the type of grass used, the frequency and volume of watering varies throughout the Blue Mountain region.

Sport parks generally receive an annual renovation in springtime. Following the renovation, sports parks receive heavier water use to improve the condition of the parks.

As shown in Table 7, irrigation systems installed in BMCC's sports fields are either manual or smart systems. Both systems typically operate once a day in the early morning hours, four times a week for approximately five minutes per station.



Figure 5: BMCC Irrigation Maintenance Responsibility

As shown in Figure 5, the responsibility for these assets sits within the Sports and Recreation Services Directorate. All asset management activities are undertaken and managed within the Program Leader's team.

## Irrigation Systems

Manual irrigation systems contain irrigation componentry connected to mains water supply and requires a resource to operate the system. The manual irrigation systems can either be a manual controller or Quick Coupling Valve system.

A smart irrigation system contains an irrigation controller capable of connecting to the internet through web-based software and to a smartphone, tablet, or computer application. The application has the capability to operate according to a set program of the user's choice.

### Basis of backlog

BMCC utilises Microsoft Excel to manage and forecast the irrigation asset backlog. The BMCC irrigation asset class has a replacement cost of \$3.6m based on 27km of irrigation (Blue Mountains City Council Open Space AMP), which forms the basis of the backlog.

### Asset Condition

The irrigation asset condition data was not available and has not been assessed as part of this paper.

#### 4.1.2. Asset Management Systems

BMCC utilises Microsoft Excel, TechnologyOne, VEMAX Management and Infor Pathway to manage the irrigation asset class. Figure 6 outlines the use and integration of each AMS. BMCC utilise Microsoft Excel for renewal planning, managing condition data and for the asset register. VEMAX Management is utilised for maintenance management including raising work orders for maintenance requests. Infor Pathway captures customer complaints and interacts with VEMAX Management to link customer complaints to maintenance works undertaken. TechnologyOne captures financial information for the irrigation asset class.

BMCC are currently undergoing a transition to incorporate the EAM implementation module within TechnologyOne to better manage the irrigation asset class. It is anticipated this process will take approximately 12 months to occur.

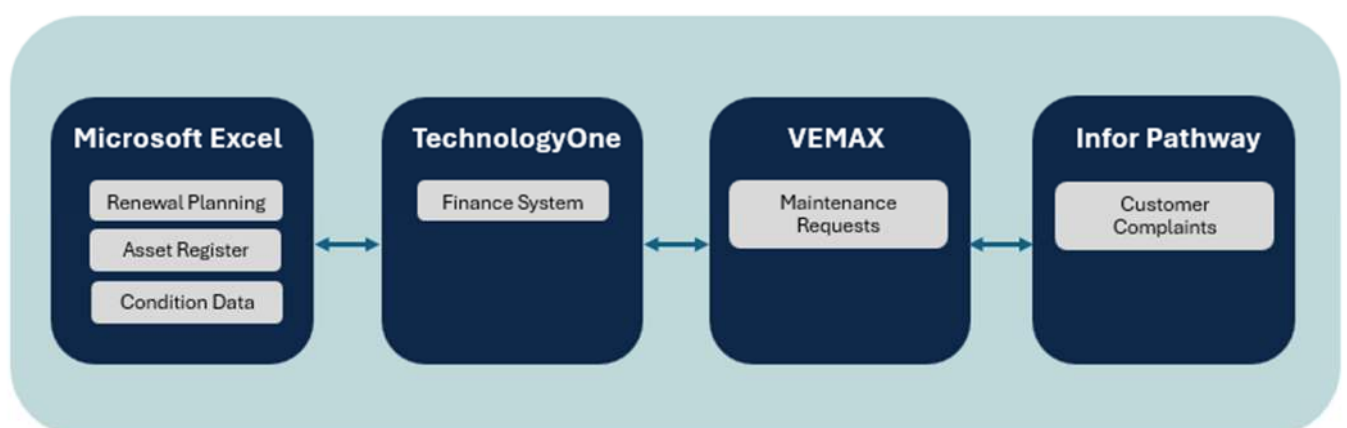


Figure 6: BMCC Asset Management Systems overview

#### 4.1.3. Asset Management Activities

BMCC undertakes a range of asset management activities to manage their irrigation network, as shown in Table 8.

| Asset Management Activity | Description                                                                                                       |
|---------------------------|-------------------------------------------------------------------------------------------------------------------|
| Planned maintenance       | Programmed above ground irrigation inspections                                                                    |
| Unplanned maintenance     | Unplanned irrigation component repair or replacement maintenance<br>Unplanned above ground irrigation inspections |
| Planned maintenance       | Planned replacement of component irrigation                                                                       |
| Planned upgrades          | Planned upgrade of irrigation systems                                                                             |

Table 8: BMCC Asset Management activities

#### Asset Inspections

BMCC undertake monthly inspections for all irrigated recreational parks. The scope of inspections is limited to visual components of the irrigation system and excludes in ground pipes and componentry.

#### Planned and unplanned Maintenance

BMCC undertake asset maintenance following planned inspections or on an unplanned basis.

#### Asset Renewals/Upgrades

BMCC undertake asset renewals/upgrades once a recreational park's irrigation system is assessed as at end of life. The annual budget allocated to renew/upgrade irrigation assets is approximately \$0.78m (Open Space and Recreation Asset Management Plan 2023). BMCC undertake maintenance activities in-house with Hunter Industries supplied components.

Paper 2 will further describe the technical details of the irrigation upgrades.

#### Asset Operations

For manual irrigation systems, labour and a vehicle are required to travel to the parks and operate the irrigation system. Smart irrigation systems are automated systems with watering schedules built into a pre-determined schedule. Weather stations are incorporated into the smart irrigation system which utilise a local weather forecast to determine whether to water a park based on the probability of rain. BMCC have programmed their smart irrigation system to by-pass a watering cycle if the probability of rain on a given day exceeds 40%.



## 4.2. Baseline Asset lifecycle costs

As outlined in section 1.3.1, the BCR assessment will compare a like for like irrigation renewal against a smart irrigation upgrade. Section 3.1.3, outlines the asset operations in further detail including the tasks required to water sports fields. See Table 9 for the listing of costs for manual irrigation.

| Item                     | Unit cost                   | Yearly cost                                                                                          | Cost basis                                                                                                           |
|--------------------------|-----------------------------|------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| <b>Water supply cost</b> | \$0.86/m <sup>2</sup> /year | \$12,248 (based on the average BMCC sports field 14,200m <sup>2</sup> )                              | Cost of supplying potable water for the recreational parks                                                           |
| <b>Labour cost</b>       | \$75.00/hour/staff          | \$31,200 (based on an estimate of four hours labour per week for two council officers and a vehicle) | Cost of two BMCC employees to water the recreational parks with manual irrigation                                    |
| <b>Vehicle cost</b>      | \$82.00/day                 |                                                                                                      | All-inclusive vehicle cost to transport BMCC employees between each of the recreational parks with manual irrigation |

Table 9: BMCC manual irrigation costs

Each variable relating to the baseline costs has been outlined in detail below, noting labour costs have been assumed as opposed to actual rates.

Water supply cost:

- Google earth was utilised to measure the area for each of the 21 parks across BMCC. From this data set an average size of 14,200m<sup>2</sup> was established.
- Base water cost information was provided by BMCC for five parks containing smart irrigation on a quarterly basis varying between 2021 to 2024.
- The information was then transformed to a cost per m<sup>2</sup>, then averaged to provide a figure of 0.69m<sup>2</sup>/year.
- A 25% increase in water usage due to an inefficient irrigation design compared to a smart irrigation system has been assumed to arrive at a total unit cost of \$0.86m<sup>2</sup>/year for manual irrigation systems.

Labour cost:

- A unit rate of \$75/hour has been utilised based on knowledge of typical labour rates charged to councils.
- Four hours per week to operate the 12 manual sites for two resources has been assumed based on BMCC feedback.

Vehicle cost:

- A vehicle cost of \$82/day has been utilised based on BMCC feedback.



## 5. Findings and Conclusion

### 5.1. Maturity against the Smart Infrastructure Manual

The WSSIM notes that for councils to take full advantage of implementing SI, they need to achieve a Level 3 maturity and to maximise the value of SI, a Level 4 maturity is required. Given the unique circumstances of each council, the benefits and journey of achieving a Level 3 or 4 maturity will vary by council.

This paper identifies that both councils are still progressing towards a Level 3 maturity. The paper suggests that both councils undertake a detailed maturity assessment in accordance with WSSIM to identify the current gaps. Following the completion of the maturity assessment, both councils would need to develop a roadmap with actions on how to achieve a higher level of maturity.

BCC would need to complete this assessment prior to commencing a needs assessment for the expansion of TechnologyOne across their AMS, so that they can align with the best practise recommendations from the WSSIM to integrate SI throughout their AMS. Implementing automation with their AMS has the potential to marginally reduce labour costs and reduce errors from manual data entry.

BMCC is in the process of expanding their usage of TechnologyOne. This process is likely to take place over the next 12-18 months. Through the expansion of TechnologyOne, BMCC is seeking to centralise the information gathered across all directorates to improve information consistency and allow potential benchmarking against other councils. BMCC would need to undertake the SI maturity assessment prior to commencing a needs assessment of TechnologyOne to enable them to incorporate and integrate best practise recommendations from the WSSIM to achieve a higher SI maturity level.

### 5.2. Current AMS arrangements

Both councils use a number of discrete AMSs containing different features and functions to manage the respective asset classes. This also appears consistent with other councils, where multiple systems are used to manage their asset classes. This can stem from limited funding to upgrade to an integrated AMS, legacy software still being in place, or the systems being fit for purpose to address the current needs. However, as asset classes grow in quantum and complexity, they become more costly to operate and manage, and councils need to explore innovative approaches to manage their networks efficiently and cost effectively.

#### Blacktown City Council AMS

BCC currently uses TechnologyOne, ArcGIS, TRIM, and Brightly to manage the drainage asset class. Due to the inability to integrate between the different systems used, resources are required to manually transfer data to manage the drainage asset class.

There is an opportunity through appropriate contractual requirements, during the next procurement of this service to require the integration of a contractor's inspection results into BCC's asset management system through an Application Programming Interface (API) solution. This will result in reduced person hours to transfer data between systems and achieve priorities outlined by WSPP.

There is also an opportunity to integrate the results from the AI inspections to assist with capital works planning. This could include providing a prepopulated BCC branded template that can be appended to a work order request. This will result in reduced administration work and improved decision making for the drainage asset engineer.

#### Blue Mountain City Council AMS

BMCC currently use Microsoft Excel, TechnologyOne, VEMAX Management and Infor Pathway to manage the irrigation asset class. The systems have limited integration, resulting in information being managed in isolation. There is an opportunity to ensure information to manage the irrigation asset class is easily accessible through the upgrade in TechnologyOne.

This aligns with BMCC's knowledge management strategy through improved efficiencies and effective decision making as part of their sustainability measures. This strategy is measured by achieving more efficient knowledge capture including improved integration of systems, resulting in better reporting and decision making. Having an integrated AMS with improved reporting capabilities and assessable water usage information will help BMCC achieve their knowledge management strategy. This will also assist in the ability to transfer knowledge throughout the organisation and reduce the risk of losing key intellectual property that exists within BMCC.

### 5.3. Baseline asset lifecycle cost

#### 5.3.1. Blacktown City Council baseline asset lifecycle cost

BCC undertakes condition inspections to manage their drainage pipes and stormwater pits. The cost to undertake 50km of traditional inspections to manage the network is \$160k over a three-year period, at a rate of \$3.20 per linear metre. Through tested procurement exercises, the cost to undertake a ML-assisted CCTV inspection is \$2.90 per linear metre. It is estimated approximately \$21,337 is spent on quality control, data extraction and data preparation and uploading to AMS.

It is noted that BCC's backlog of which drainage assets make up 25%, will continue to grow due to assets reaching end of life and an increased asset portfolio. In particular, BCC has a limited understanding of the condition of their drainage asset class due to the small percentage of drainage network having been inspected. To align with BCC's long-term financial sustainability strategy of balancing the community's expectations for services with their capacity to pay for the infrastructure assets used to provide the services, a greater understanding of the drainage network is required. Increasing the percentage of annual inspections completed along with an integrated AMS will assist BCC in being able to make data driven decisions to determine optimal renewal planning.

Through productive solutions such as ML-assisted CCTV inspection, BCC will also be able to inspect more of their network and manage the risk of an increasing and aging asset class. It is suggested that BCC do continue to undertake ML-assisted CCTV inspections, while integrating their AMS as identified in section 5.2. This will assist BCC in achieving priority 1 of the policy problems that local councils are seeking to address through SI.

#### 5.3.2. Blue Mountains City Council baseline asset lifecycle cost

BMCC manage 21 parks throughout the Blue Mountains region. 12 of these parks have manual irrigation, requiring manual labour and the use of a vehicle to manage these parks. For an average park of 14,200 m<sup>2</sup>, approximately \$12,248 is spent on water supply costs and \$31,200 is spent on labour and vehicle costs.

Due to the unique geographical nature of the Blue Mountains region, the sports parks are spread throughout the region, some distance from council's work locations. Through the implementation of SI, there may be an opportunity to upgrade the remainder of the parks through implementing smart irrigation to reduce the labour and vehicle costs.

This aligns with both BMCC's financial and environmental sustainability goals by reducing costs, providing acceptable levels of service to the community for their sports fields and contributing to the reduction in greenhouse gas emissions through reduced vehicle usage.



6. Appendices



## **6.1. Appendix A - Source of data and information**

### **6.1.1. Blacktown City Council**

- Blacktown resourcing strategy
- Asset database
- Example of a traditional inspection method
- Example of an AI inspection method
- GIS mapping of BCC network
- Interviews with BCC staff

### **6.1.2. Blue Mountains City Council**

- BMCC resourcing strategy 2022-2032
- BMCC operational plan 2023-2024
- BMCC delivery program 2022-2026
- Commercial irrigation installation information
- Open Space and Recreation Asset Management Plan 2023
- Asset database
- Hunter industries
- Interviews with BMCC staff

### **6.1.3. Transport for NSW**

- Western Sydney Smart Infrastructure Manual – March 2023

### **6.1.4. SIMPaCT**

- Project overview
- Project blueprint
- Project roadmap

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