Ordinary Meeting of Council

26 June 2024

UNDER SEPARATE COVER ATTACHMENTS

ITEM 9.7

Item 9.7 Queanbeyan IWCM and QSTP Business Case Update

QUEANBEYAN-PALERANG REGIONAL COUNCIL

Council Meeting Attachment

26 JUNE 2024

ITEM 9.7 QUEANBEYAN IWCM AND QSTP BUSINESS CASE UPDATE

ATTACHMENT 1 QSTP REVISED FINAL BUSINESS CASE - VERSION E

we are insw Infrastructure New South Wales

Final Business Case

Final Business Case

DESIGNED FOR USE IN NSW GOVERNMENT CAPITAL PROJECTS

Queanbeyan Sewage Treatment Plant Upgrade

Queanbeyan-Palerang Regional Council

2 June 2024

Document Information

	Position
Project Name:	Queanbeyan Sewage Treatment Plant Upgrade
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Delivery Agency:	Queanbeyan-Palerang Regional Council
Gateway Review Process:	QPRC Business Case Gate 3

Document Version Control

Project specific document history			
Version	**Amendment**	**Amendment Date**	**Amended by**
A	Draft for QRPC review	2/09/2022	David Perry
B	Initial Issue – Endorsed by Council meeting 9/11/22	24/10/2022	David Perry
C	Revised Issue with editorial corrections	10/11/2022	David Perry
D	Revised with February 2023 pre-tender cost estimate	10/02/2023	David Perry
E	Revised with updated IWCM and 2024 cost estimate	2/06/2024	Simon Boulton

Supporting Documentation

Project-specific documentation (other than this report)			
Version	**Title**	**Amendment Date**	**Amended by**
Rev B	Queanbeyan Sewage Treatment Plant Upgrade Project – Options Selection Report	November 2019	Hunter H2O
Rev C	Queanbeyan Sewage Treatment Plant Upgrade Project – Concept Design Report	October 2020	Hunter H2O
Rev B	Queanbeyan Sewage Treatment Plant Upgrade Project – Concept Design Addendum	April 2022	Hunter H2O
	Queanbeyan Sewage Treatment Plant – Environmental Impact Statement - Revised EIS	April 2022	Arup
	Queanbeyan Sewage Treatment Plant – Environmental Impact Statement – Revised EIS Amendment Report	September 2022	Arup
Rev 3	Integrated Water Cycle Management Strategy and Financial Plan	May 2024	GHD

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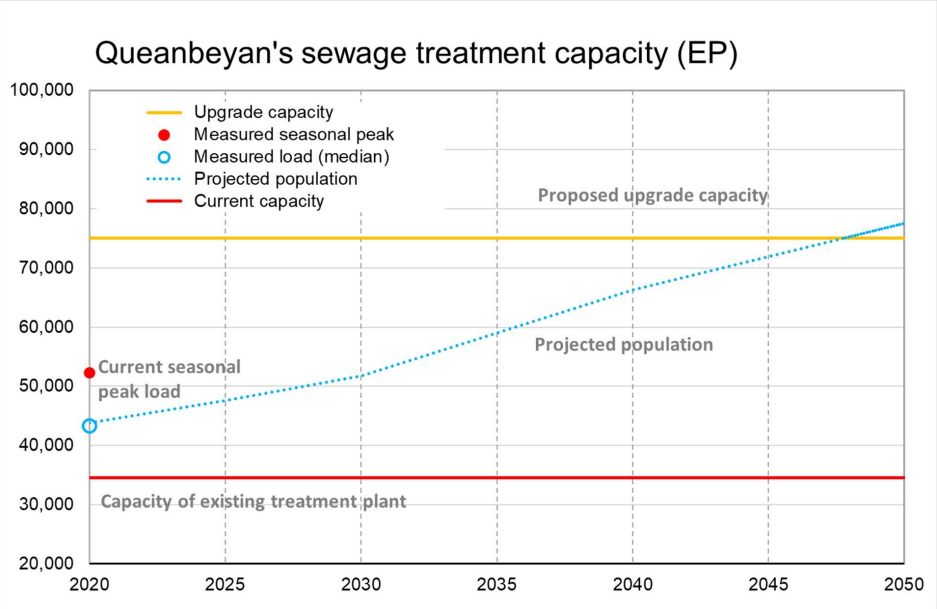
1. EXECUTIVE SUMMARY

Project need

Queanbeyan-Palerang Regional Council (QPRC) is responsible for the management and operation of the Queanbeyan Sewage Treatment Plant (QSTP) that provides treatment to sewage from Queanbeyan prior to discharge into the Molonglo River approximately 9 km upstream of Lake Burley Griffin.

Queanbeyan's existing sewage treatment plant was initially constructed in the 1930's with the most recent major upgrade being completed in the 1980's. The existing treatment plant is overloaded and at the end its service life and needs replacing. Due to its age, the plant is experiencing structural failure, reduced equipment reliability and maintenance issues.



Current sewage inflows exceed the treatment capacity of the existing treatment plant

Queanbeyan's existing sewage treatment plant is overloaded and operating well above its design capacity which limits the ability of the plant to achieve the treatment levels required prior to discharge into the Molonglo River. The existing treatment plant has an assessed capacity to treat sewage from an equivalent population (EP) of 34,500 EP. An assessment of inflow completed in 2019 estimated that the plant was receiving a median load of 43,400 EP and a seasonal peak load of 52,000 EP. The population served by the QSTP is forecast to continue to increase as new and already approved developments connect to sewer. This will increasingly overload the existing STP. An assessment of future needs estimates that the QSTP will be required to treat an equivalent population of 73,000 EP by 2045.

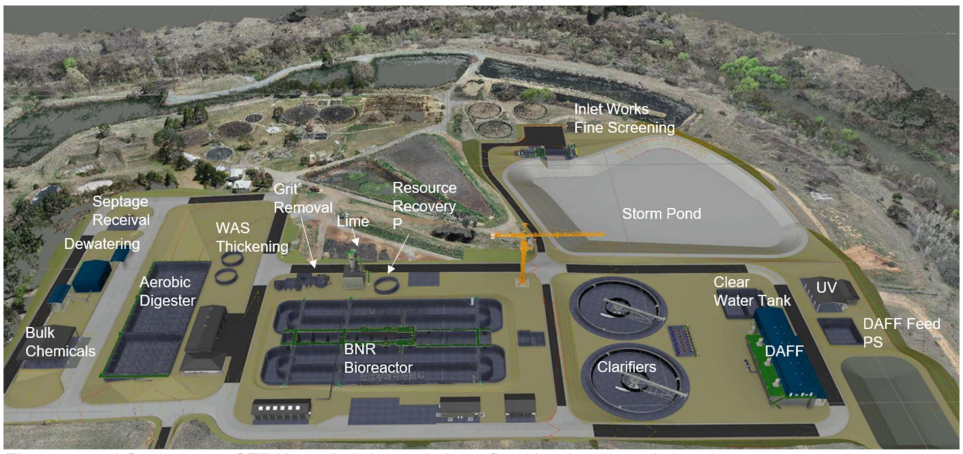
QPRC operates the Queanbeyan STP under the terms of an Environmental Authorisation granted by the EPA under the Environmental Protection Act 1997. During the most recent annual reporting period (2021/22) the effluent discharged into the Molonglo River from QSTP failed to meet the water quality requirements of this authorisation on multiple occasions for thermotolerant coliforms, suspended solids and ammonia.

Continued operation of the existing treatment plant as Queanbeyan's population grows presents an increasing risk that the STP continue to fail to meet the EPA regulatory Environmental Authorisation requirements for effluent discharged to the Molonglo River. The resulting pollution could result in adverse impacts on aquatic species in the Molonglo River and Lake Burley Griffin, environmental prosecution, and substantial reputational damage.

Project description

The Queanbeyan STP upgrade project will replace the existing sewage treatment plant with a modern robust and reliable treatment facility that will provide additional capacity and improve treatment reliability. The upgrade provides 75,000 EP of treatment capacity to support growth and development in Queanbeyan including currently approved development.

The upgrade provides a tertiary treatment standard including filtration and UV disinfection that will improve the quality of the treated effluent discharged into the Molonglo River upstream of Lake Burley Griffin and enable QPRC to continue to meet its regulatory requirements. The treatment plant has been designed to be expandable by 50% to a total of 112,500 EP if required in the future.



The proposed Queanbeyan STP Upgrade is located above flood level on the existing site

The QSTP will be constructed on the existing lease area that is located above the nominated flood level for the site, reducing the risk of damage to assets during flooding. The location enables the existing STP to continue to provide treatment during the construction, testing and commissioning of the new facility, which is estimated to take two years.

Cost and funding

Preliminary cost estimates for the QSTP upgrade have been developed from a risk-based engineering cost estimate during the design phase. The P90 cost estimate for the total project cost including contingency and escalation allowance is $188M as summarised in the table below.

Sub-Project	Budget Request ($ ex. GST))
Construction Costs	136,710,000
QPRC Costs	27,958,000
Base Estimate	**164,668,000**
Contingency for Risks (P90)	14,856,000
Project Estimate (P90)	**179,524,000**
Escalation	8,525,000
Total Outturn Cost (P90)	**188,049,000**

A cost benefit analysis has been conducted to estimate whether the economic benefits generated exceed the project costs. The analysis returned a Benefit to Cost Ratio of 1.2 which supports the project.

Funding for the replacement of the Queanbeyan STP has been considered in QPRC's Integrated Water Cycle Management (IWCM) Plan for Queanbeyan which is the strategic planning instrument that provides a framework for Council to determine long-term strategic planning for water and wastewater management.

The project will be funded through contributions from QPRC's Sewer Fund, Section 64 developer charges, loan funding and government grants as summarised below. QPRC has received a $3M grant from the NSW Government through the Safe and Secure Water Program (SSWP).

Income source	Income source contribution ($)
Sewage fund	68,049,000
Section 64 Developer Contributions	7,000,000
Loan (sewer fund)	110,000,000
NSW Government Safe and Secure Water Program grant	3,000,000
Additional grant funding	0
Total	**188,049,000**

The IWCM includes a financial analysis that assesses the impact of proposed water and sewer capital expenditure programs on the financial position of the Council over a thirty-year period and the impact to the water and wastewater typical residential bill (TRB) to deliver the service. The analysis also considered the forecast cashflow and account balances under funding scenarios including CPI sewer charge rises with no loans, 6.5% sewer charge rises for 5 years with no loans and sewer charge rises 6.5% for 5 years with $110m loans.

The IWCM recommends that that the project be funded by:

- Balance of SSWP grant funding of $0.3M in 2024/25
- Loan funding in the sewer fund of $110M over the two-year period 2025/26 and 2026/27 (i.e. $55M each year)
- Sewer charge increases across two stages: initially annual increases of 6.5% for 5 years followed thereafter by annual rate increases aligned to the consumer price index (CPI)

Project status and next steps

QPRC has completed the detailed design and tender documentation for the upgrade and will be in a position to advertise a call for expressions of interest for construction of the work as early as October 2024 or whenever funding and planning approvals are confirmed. Early vendor engagement has been used to select and establish contracts for the supply and delivery of key equipment packages for the upgrade to minimise procurement delay risks.

A final Environmental Impact Statement for the project has been completed and a development application for the work has been lodged with the ACT Government. Approval for the DA is anticipated to be received by the end of 2024.

The project team will continue to progress work to assist the project becoming ready for construction. Key actions include:

- Seeking additional grant funding contributions from both the NSW and ACT Governments
- Obtaining development approval from the ACT Government
- Progressing discussion with the ACT EPA regarding the operating and licencing requirements for the new facility
- Undertaking further early vendor engagement and tendering for equipment supply for the works
- Progressing early works design, approval and construction for items including power supply upgrade and potable water supply that facilitates construction of the upgrade
- Progressing design and approval of the Mountain Road upgrade including land acquisition of Nimrod Road and part of Mountain Road.
- Confirming client resources for managing the construction phase.

2. DESCRIPTION OF PROBLEM, SERVICE NEED OR OPPORTUNITY

2.1 Background

Queanbeyan-Palerang Regional Council

The Queanbeyan-Palerang Reginal Council local government area is located in the southern tablelands adjacent to Canberra and 250 km southwest of Sydney. The area's population is approximately 64,000 and is expected to grow to around 82,000 by 2036.

Queanbeyan-Palerang Reginal Council (QPRC) is an independent, statutory body responsible for administering its local government area under the Local Government Act 1993 (NSW).

The city of Queanbeyan is located on the ACT boarder, approximately 15 km south-east of Canberra and 10 km from Canberra Airport.

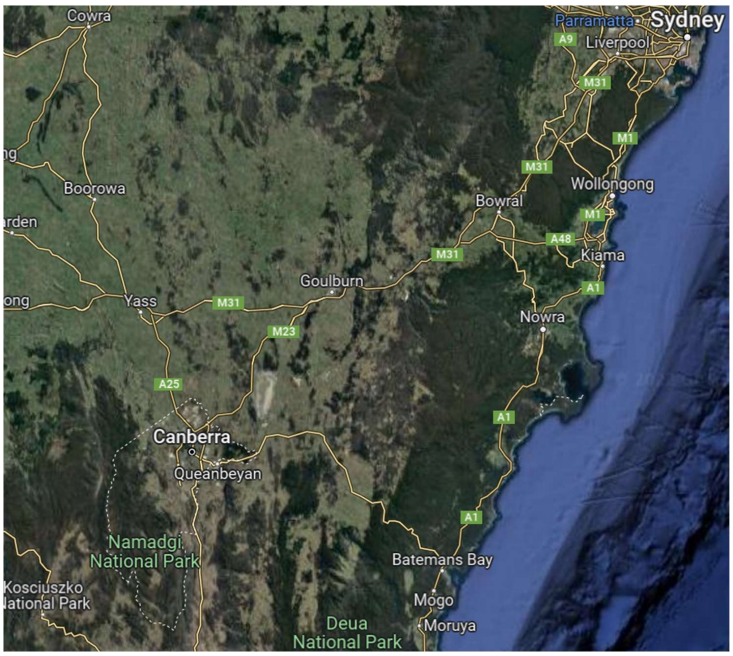


Figure 1: Location of Queanbeyan

Queanbeyan's sewerage treatment system

QPRC is responsible for the management and operation of the sewerage system that serves Queanbeyan. This includes the:

- Queanbeyan sewerage collection network and pumping stations
- Morisset and Jerrabomberra sewerage trunk mains; and
- Queanbeyan sewage treatment plant.

The Queanbeyan sewage treatment plant (QSTP) is located on the banks of the Molonglo River in Jerrabomberra ACT and treats sewage from both Queanbeyan and Oaks Estate in the ACT. Treated effluent from QSTP is discharged to the Molonglo River approximately 9 km upstream of Lake Burley Griffin.

QSTP provides treatment to a catchment that includes urban, light commercial, light industrial and some rural residential properties, including the NSW neighbourhoods of Crestwood, Jerrabomberra, Karabar, Queanbeyan, Queanbeyan East, Queanbeyan West, and Greenleigh, and the ACT suburb of Oaks Estate. The Queanbeyan sewerage collection network includes a gravity collection system with 15 pump stations, approximately 286 km of pipeline and two major trunk mains that convey sewage to the QSTP. Googong Township located about five kilometres south of Queanbeyan has its own water recycling plant and does not contribute to the QSTP.

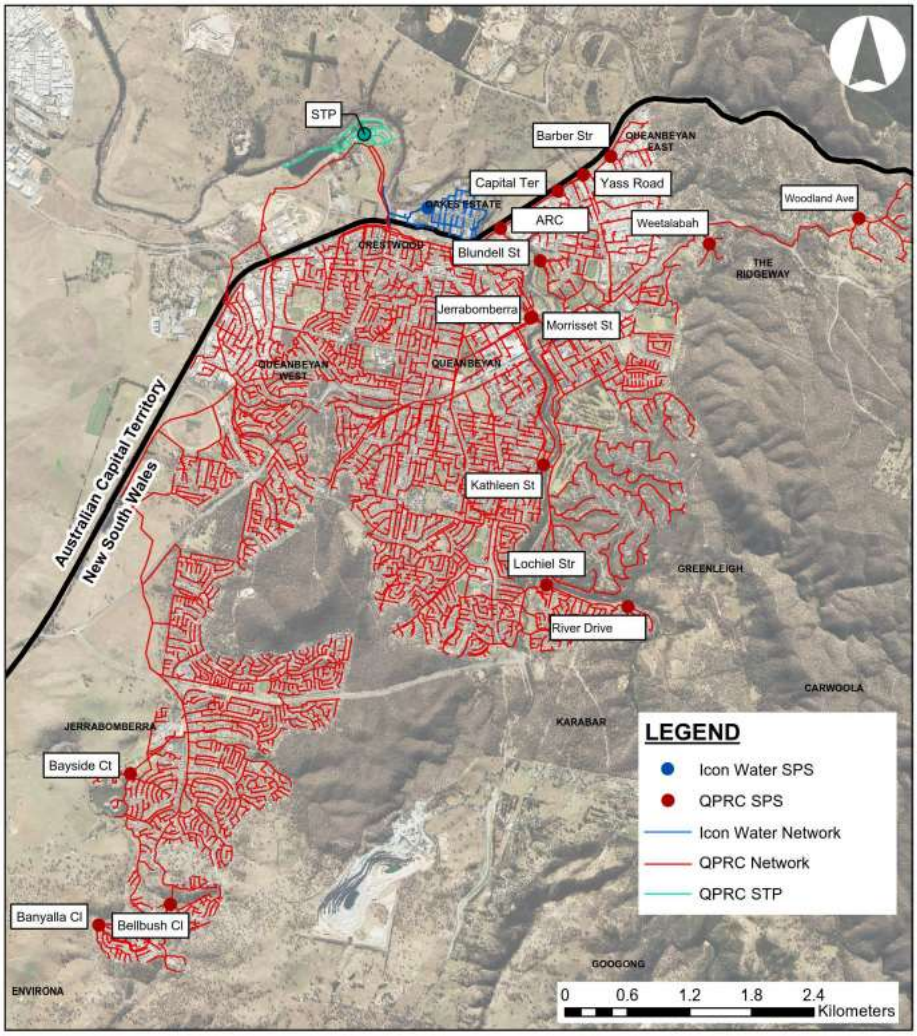


Figure 2: The Queanbeyan sewerage collection network and location of QSTP. QSTP also treats sewage collected from the Icon Water sewage collection network within Oaks Estate.

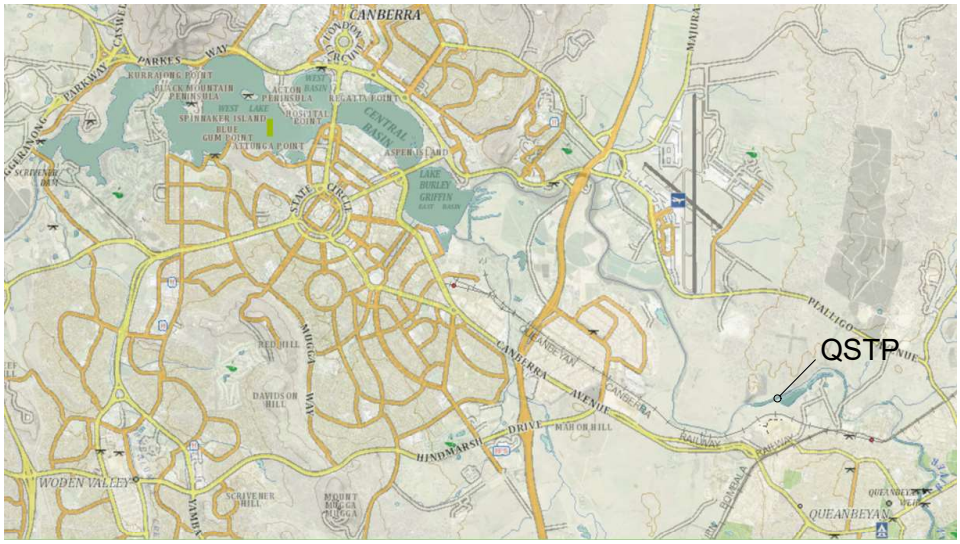


Figure 3: Treated effluent from QSTP is discharged to the Molonglo River approximately 9 km upstream of Lake Burley Griffin.

2.2 Description of Problem, Service Need or Opportunity

Why is the upgrade needed?

Queanbeyan's existing sewage treatment plant is overloaded and operating above its capacity. The QSTP upgrade project is required to provide sewage treatment capacity to support the continued growth and development of Queanbeyan and to provide ongoing protection of the environment.

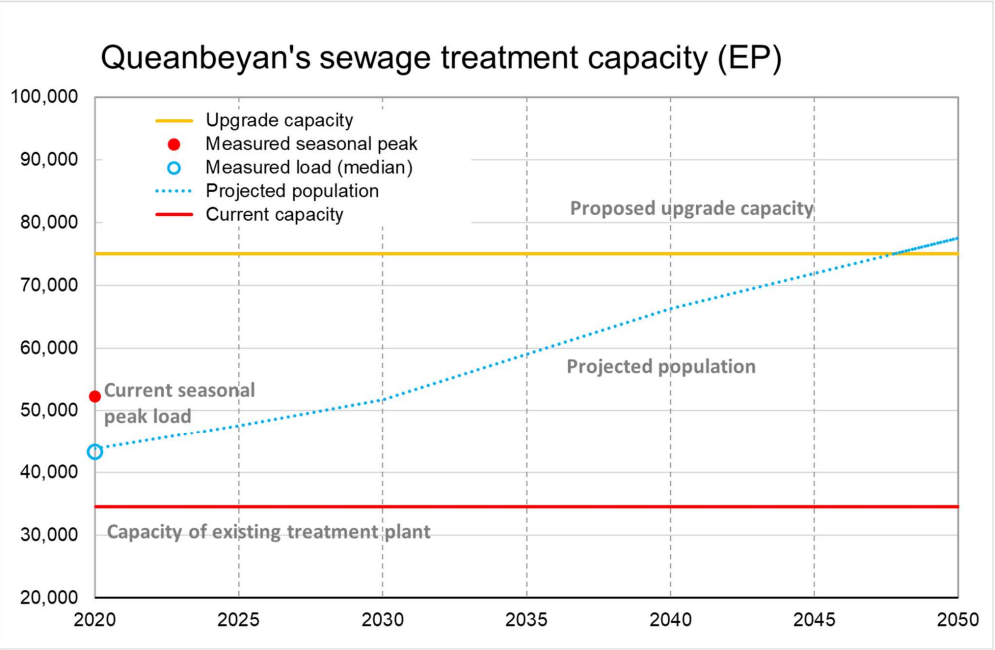


Figure 4: Queanbeyan sewage treatment capacity requirements. Current loads exceed the capacity of the existing treatment plant.

Queanbeyan's existing sewage treatment plant was constructed in the 1930s and was last upgraded in the 1980s. With population growth, the existing treatment plant currently treats sewage from a population that exceeds its capacity.

The capacity of a sewage treatment plant is expressed in terms of an equivalent population (EP):

- The existing treatment plant has an assessed capacity of 34,500 EP
- A 2019 assessment of sewage data estimated that the existing treatment plant receives a median sewage load of 43,400 EP
- Queanbeyan's sewage load varies seasonally with an estimated peak load of 52,300 EP.

An assessment of the future needs undertaken as part of the Integrated Water Cycle Management Plan (IWCM) estimates that the QSTP will be required to service a projected population of 73,000 EP by 2045 and 77,000 EP by 2050.

Queanbeyan's population is projected to grow at a rate of approximately 1.7% per annum. This growth is anticipated to occur as a result of both infill development as well as the extension of the sewage network to new growth areas including South Jerrabomberra, Jumping Creek, Tralee, The Poplars and Environa. These areas are expected to be connected over the next 25 years, with the first allotments in South Jerrabomberra coming on-line in 2022.

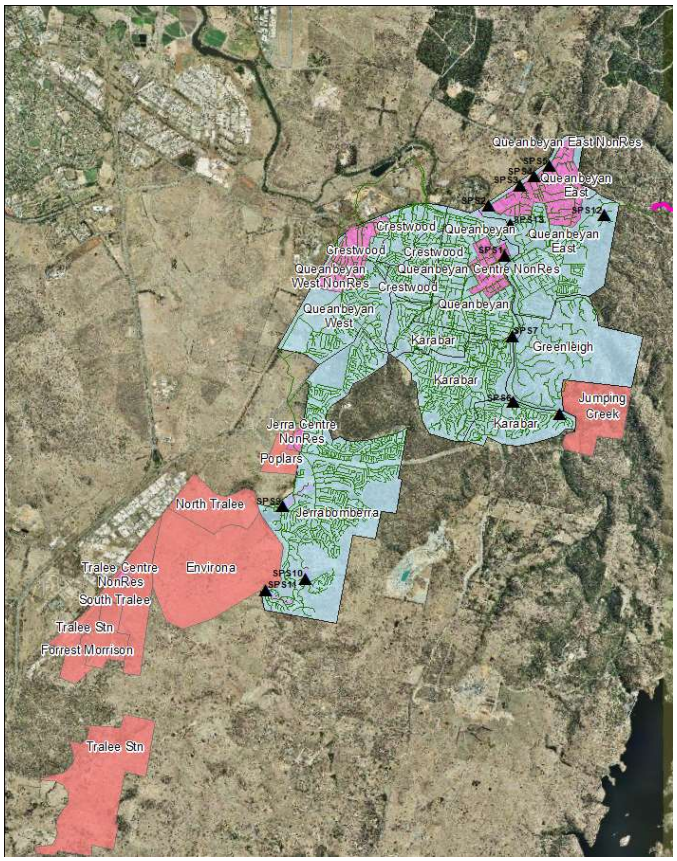


Figure 5: Identified growth areas included in the QSTP Master Plan and IWCM.

Treated effluent from QSTP is discharged to the Molonglo River upstream of Lake Burley Griffin. QSTP has been identified as the only significant point source discharging upstream of the Lake. Ongoing operation of the existing treatment plant presents a risk that the existing treatment systems may be overloaded as a result of either continued population growth, or high flow events, resulting in the discharge of partially treated effluent causing pollution of the Molonglo River and Lake Burley Griffin. This risk of deferring the upgrade is discussed further in the subsequent sections of this chapter.

2.3 Existing Level of Service

Queanbeyan's existing sewage treatment plant

QSTP was initially constructed in the 1930's and has been progressively added to over time with the most recent major upgrade being completed in the 1980's. The treatment plant includes a combination of different technologies from different eras. Parts of the plant, such as the trickling filter process are original and some parts (anaerobic digestion) have been shut down due to asset issues.

The existing treatment assets are at the end of their service life and need replacing. A condition assessment of the STP undertaken in 2015 to inform the Masterplan identified that all stages of the treatment process would be redundant or require significant refurbishment within a 25-year timeframe (GHD, 2016).

While maintenance and works have been regularly undertaken on the QSTP, the plant is no longer fit-for-purpose and is experiencing structural failure, reduced equipment reliability, obsolescence, and maintenance issues.

QPRC operates the Queanbeyan sewage treatment plant under the terms of an Environmental Authorisation granted under the ACT Environmental Protection Act 1997. During the most recent annual reporting periods the QSTP failed to meet the water quality requirements of this authorisation on multiple occasions for thermotolerant coliforms, suspended solids and ammonia. These failures relate to the condition of the current asset and its capacity limitations to treat the flows currently being received.

The maturation ponds are a key asset in achieving effluent quality and there is a risk that these lagoons may fail again as occurred in 2010 due to flooding.

Figure 6: Queanbeyan's existing sewage treatment plant

Process capacity constraints

An engineering assessment of the process capacity of the existing treatment facility is provided in the attached *Queanbeyan Sewage Treatment Plant – Process Capacity Assessment* (Hunter H2O, 2022). The assessment identified that the process capacity of the existing facility is challenged in many areas and continued operation of the existing facility presents a risk of the facility failing to meet the treated effluent quality requirements required by the facilities EPA licence conditions.

Ammonia is an acute toxicant present in treated effluent and can affect many fish and macroinvertebrate species. The ammonia concentration from the QSTP is regulated by ACT EPA based on the condition of the receiving waters. The capacity assessment identified that the treatment processes that remove ammonia are currently at capacity with QPRC's operating data showing evidence that ammonia removal performance is already degrading. There is a reasonable risk that ammonia in treated effluent discharged to the Molonglo River from QSTP may fail to meet the regulatory licence limits required by the EPA as the incoming sewage load on the treatment plant increases further with population growth, or if critical equipment fails or is out of service. This may lead to adverse impacts on aquatic species near the discharge location.

Specific capacity issues identified by the review included:

- Installed aeration is at capacity when stable nitrogen removal is considered
- The activated sludge reactors can just sustain the biomass necessary for ammonia removal. The reactors are not large enough to support further load increases with population growth
- The clarifier system is at capacity and is likely to just be able to reliably treat the peak dry weather flows for the current population. There is insufficient clarifier capacity to treat flows that occur in wet weather. In wet weather the operators will likely need to strategically bypass the activated sludge reactors so the ammonia removal process is not lost as a result of the treatment biomass being washed out from the clarifiers.
- The sludge lagoons which stabilise sludge have a low sludge retention time and may fail to stabilise sludge as loads increase which will increase the risk of odour and return more soluble organic load to the activated sludge plant
- The maturation ponds which provide disinfection are currently meeting the licence with some reserve. However, a significant failure of the upstream secondary treatment process may limit the ability of the maturation ponds to provide required treatment and cause their capacity limit to be reached earlier.
- The maturation ponds are located within the 1 in 100 flood level and could be damaged in flood events. Damage to the maturation ponds during flooding may result in the release of effluent and accumulated sludge to the river. There is a risk that disinfection would limits may not be met if the ponds were damaged, depending on the extent of repairs necessary.
- Provided the maturation ponds are available it is expected phosphorus removal will continue to meet the current EPA licence limits provided the upgrade occurs within 4 years (i.e., by 2026).

In addition to these process capacity constraints, the existing STP is also operating beyond its intended hydraulic capacity. This results in screened sewage routinely bypassing the treatment process during wet weather conditions. Bypassing occurs as a result of higher wet weather flows. Screened sewage is diluted with treated effluent in maturation ponds before discharging to the Molonglo River.

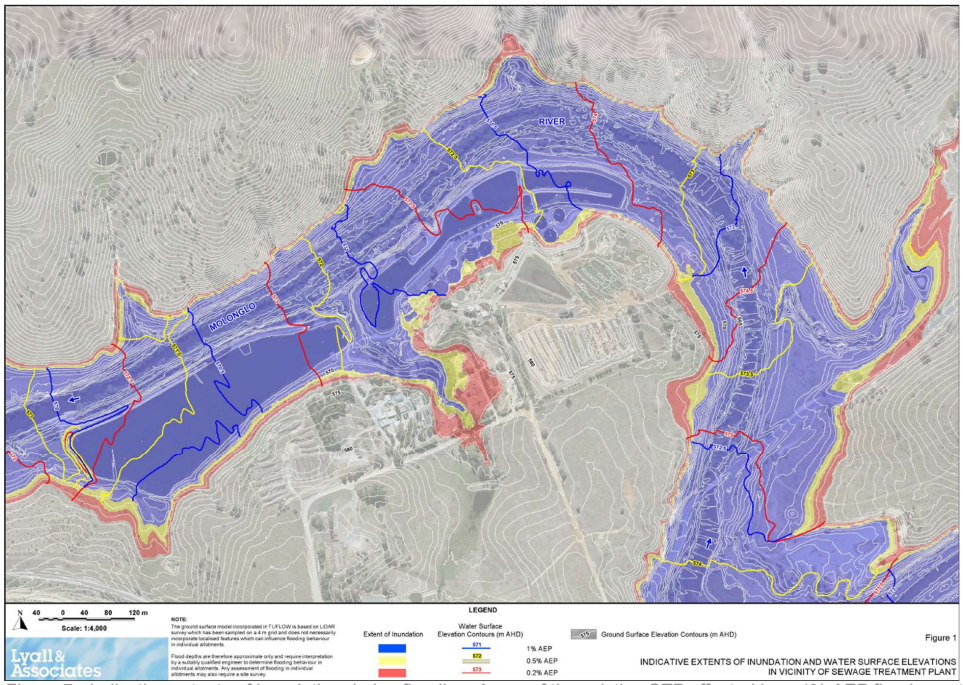


Figure 7: Indicative extents of inundation during flooding. Areas of the existing STP affected by a 1% AEP flood event are shaded blue.

2.4 Consequences of Deferral

Due to the apparent capacity constraints of Queanbeyan's existing sewage treatment plant and the continued population growth within the sewerage service area, the QSTP Upgrade should proceed with some urgency.

Should the QSTP Upgrade be deferred, Queanbeyan's existing sewage treatment plant will continue operating above its capacity in an overloaded state. There will be no sewage treatment capacity available for further population growth within Queanbeyan, or to connect additional development areas to Queanbeyan sewerage network. QPRC may be required to halt future development to prevent further overloading of the existing STP.

Continued operation of the existing treatment plant with continued population growth presents an increasing risk that the STP will fail to provide the level of treatment required to meet the EPA regulatory licence conditions for effluent discharged to the Molonglo River. The resulting pollution could result in adverse impacts on aquatic species in the Molonglo River, environmental prosecution, and substantial reputational damage.

Other impacts of deferring the upgrade:

- Increasing sewage bypassing of treatment facilities during wet weather due to hydraulic capacity constraints as the population continues to grow and sewage flows increase
- Increasing risk of poor effluent quality discharged to the Molonglo River and breaches of environmental operating requirements due to process capacity constraints which limit the ability of the facility to effectively treat nitrogen, phosphorus, solids and pathogens as the population continues to grow and sewage flows increase
- Increasing risk of environmental harm of poorly treated or untreated sewage entering the Molonglo River and Lake Burley Griffin
- Additional sewage treatment capacity is unavailable for areas connected to QSTP and may restrict further growth and development of these areas
- Higher operating costs associated with the poor plant condition and operating constraints
- Continued risk exposure to asset and environmental damage during flood events
- Continued risk of mechanical and electrical plant as these assets are at the end of operating life.

2.5 Previous Studies

Supporting studies

Planning for the QSTP Upgrade has been underway since 1995, when Queanbeyan City Council engaged MWH to report on the capacity of the existing STP and options to upgrade the facility to provide for population growth.

A summary of six planning reports investigating the need to upgrade the Queanbeyan's STP between 1995 and 2011 is provided in the appendices. These investigations have been used as background to support the identification of the preferred upgrade option by the major studies discussed below.

2016 Masterplan for Sewage Treatment Plant Upgrade

In 2014, Queanbeyan City Council engaged GHD to prepare a masterplan for the QSTP Upgrade project that was subsequently published in 2016 (GHD, 2016). The masterplan identified that the preferred for providing sewage treatment facilities for Queanbeyan was to construct of a new 60,000 EP capacity STP on the existing site.

The masterplan study was wide-ranging. It confirmed the need and drivers for the upgrade of QSTP, set out an initial design basis in terms of capacity and water quality objectives and treatment standards, investigated the feasibility of providing treatment of sewage currently treated by Icon Water's Fyshwick STP, and included an assessment of upgrade options. The masterplan study confirmed that the preferred approach was to locate the treatment facility on the existing STP site.

The masterplan discussed three alternatives for the Queanbeyan STP:

- The Base Case - Do Nothing
- Build a new STP
- Restore the STP and expand as needed to provide sufficient capacity.

The Base Case - Do Nothing option was not considered feasible due to the significant environmental and human health impacts associated with not upgrading the existing treatment facility. Risks and consequences of not proceeding with the project have been discussed in section 2.3 and 2.4 of this Business Case.

A condition assessment of existing asset condition was undertaken to inform the option of augmenting the capacity of the existing facility by reusing existing treatment structures. The assessment identified only limited components of the existing STP that could plausibly be used as structures. Many parts of the plants were considered not fit for reuse due to poor condition and being in areas affected by a 100-year average recurrence interval (ARI) flood.

A Multi Criteria Assessment confirmed that building a new STP on the existing site was the preferred option based on whole of life cost, constructability, operability, sustainability, future proofing and community acceptance and affordability. The whole life net present value of costs of the options were similar and in order of $100 M. The option of reusing assets showed no significant capital investment saving compared to the build new options. The selection of treatment technology was not significant to the outcome.

The masterplan was placed on public exhibition in November 2016 for a period of six weeks. Submissions on the masterplan were received from key NSW and ACT regulators, as well as ACT and Region Catchment Management Group, Professor Ian Falconer and Icon Water.

QPRC endorsed the masterplan recommendation to construct a new treatment facility on the existing STP site.

Option Selection, Concept Design and EIS

In 2019, Hunter H2O was engaged as the principal design consultant to prepare the design and tender documentation for construction of the QSTP upgrade.

Under Section 60 of the NSW *Local Government Act* 1993, QPRC requires ministerial approval for the construction or modification of water or sewage treatment works. The selection of treatment technology and development of the Concept Design has been undertaken following the Section 60 approval pathway prescribed by the NSW Department of Planning and Environment (DPE).

The Concept Design development pathway included the following stages:

- Confirmation of capacity requirements and design criteria - Queanbeyan Sewage Treatment Plant Upgrade Project Design Criteria and Assumptions Report (Hunter H2O, 2019)
- Options study and selection of the treatment technology - Queanbeyan Sewage Treatment Plant Upgrade Project Options Selection Report (Hunter H2O, 2019)
- Concept design of the selected option – Queanbeyan Sewage Treatment Plant Upgrade Project Concept Design Report (Hunter H2O, 2020)
- Safety in design review of WHS aspects (including HAZOP and CHAIR principles)
- Environmental Impact Statement (ARUP, 2020)
- Amendment of the proposed concept to address issues raised through the EIS consultation process - Queanbeyan Sewage Treatment Plant Upgrade Project Concept Design Addendum (Hunter H2O, 2022).

Three secondary treatment technology options were developed for the upgrade:

- Oxidation ditch with continuous gravity clarification
- Membrane Bioreactor (MBR)
- Intermittently Decanted Extended Aeration (IDEA).

The 2019 review of capacity requirements and design criteria identified that the upgrade should provide treatment capacity for an equivalent population (EP) of 75,000 and be designed to meet the water quality objectives of the existing Environmental Authorisation licence.

An Options Selection workshop held with NSW DPE reviewed the treatment options using an MCA that considered whole of life cost, effluent quality, operating complexity, maintainability, robustness, power and chemical use. The preferred process for the QSTP upgrade was identified as an oxidation ditch with gravity clarifiers, tertiary granular filter media filter, UV disinfection, aerobic sludge digestion and biosolids dewatering. Further details are provided in the Queanbeyan Sewage Treatment Plant Upgrade Project Options Selection Report (Hunter H2O, 2019)

The treatment process proposed for the upgrade was refined through the development of a Concept Design and Environmental Impact Statement. Consultation with regulators and key stakeholders during this period identified that the treated effluent discharged to the Molonglo River from QSTP would be required to have very low concentrations of phosphorus to minimise the potential impact of the facility on the water quality in Lake Burley Griffin.

Further refinements to the upgrade made to address feedback received from key regulators and stakeholders and the findings of the EIS included:

- Designing the upgrade to enable the treatment capacity to be expanded in the future by an additional 50% from 70,000 to 112,000 EP
- Upgrading the filtration process to a dissolved air flotation filter (DAFF) to further reduce phosphorus in the effluent
- Upgrading the secondary treatment to provide enhanced biological phosphorus removal to reduce the ongoing operating cost of providing low phosphorus in the effluent
- Adding a lime dosing facility and lime clarifier were added to the process to provide enhanced chemical phosphorus removal to further reduce the operating costs associated with producing treated effluent with very low soluble phosphorus concentrations. The phosphorus recovered from the treatment process remains bioavailable for agriculture, providing a benefit to the circular economy.

3. POLICY AND STRATEGIC ALIGNMENT

3.1 Policy Context

The QSTP Upgrade aligns with key policy directions and government priorities/outcomes. The tables below describe the alignment of this project with various Government strategic policies.

Table 1: QPRC strategic policies and alignment

QPRC Policy	Alignment
QPRC Strategic Directions Paper 2017 • Improve infrastructure, with appropriate and well-maintained assets and major projects delivered in growth areas • Deliver quality services which meet community needs, interests and ability to pay	The project is aligned with QPRC's identified strategies by: • Providing essential infrastructure required for the community • Providing sewage treatment with capacity that responds existing and future growth of Queanbeyan • Providing treatment infrastructure that responds to community needs for reliable and sustainable treatment • Affordable wastewater treatment in terms of both capital and operational costs • Improving infrastructure by decommissioning assets at end of life that no longer provide cost effective value.
The Queanbeyan-Palerang Regional Economic Development Strategy Aims to drive economic growth and to deliver a dynamic and globally competitive regional economy. It also focuses on actions to address challenges and opportunities in Regional NSW. Goals to enable regional economic development, include • Strategy 3: Grow the Population and Internal Markets of the Region. This outlines the opportunity to *Provide enabling infrastructure for new industrial and housing developments*	The Project contributes to the delivery of this goal by: • Providing essential wastewater treatment services with capacity to enabling growth for industrial and housing developments • Improving State productivity and creating a stronger regional community by enabling economic activity that would otherwise be constrained by failing wastewater service infrastructure

The Community Strategic Plan 2018-2028 • 3.1.4 We actively promote and implement sound resource conservation and good environmental practice • 3.1.5 We ensure the future planning for the region is well coordinated and provides for its sustainable management • 4.1.3 We plan for and provide for the management of sewage, stormwater and recycled water within the communities of our region • 4.1.4 We actively promote and implement sound resource conservation and good environmental practice for our waste management systems • 4.1.6 We undertake planning to ensure infrastructure is prepared for future growth.	The project contributes to achieving these Service Objectives by: • Improving the reliability of treatment to produce an effluent that minimises impacts to the receiving environment. • Providing treatment capacity based on planning for the region including the ability to expand capacity in the future. • Providing a level of treatment that provides recycled water and is suitable for future expansion as additional recycled water users are identified. • Implementing biological phosphorus removal that minimises chemical use and recovers phosphorus in a form that is biologically available for agriculture. • Producing a biosolids product that is suitable for agricultural reuse as a soil conditioner and source of nutrients. • Identifying climate change risks and implementing climate adaptation measures • Removing the treatment infrastructure from within the 1 in 100 year flood plain

Table 2:: NSW Government strategic policies and alignment

NSW Government Policy	Alignment
The 2017 NSW Government's (Planning and Environment) South East and Tablelands Regional Plan 2036 states the following priorities for QPRC: • Work with the ACT Government to improve road and active transport connectivity and public transport integration; manage water, sewage, waste and renewable energy on a regional scale; plan and collaborate on major contiguous developments; plan for infrastructure requirements to support population growth; and support major events. • Protect and enhance the area's high environmental value lands, waterways and water catchments.	The project is aligned with the identified strategies and their aims to improve waterways and catchments, supply, and security, by providing: • Improved wastewater treatment plant capacity, reliability, and security of supply to enable the community to be more liveable and more attractive for tourism and industry etc. • Affordable wastewater treatment in terms of both capital and ultimately reducing operational costs; and • A high-quality wastewater treatment that more reliably meets relevant EPA and health standards and reduces risks to noncompliance.
The Infrastructure NSW Making it Happen in the Regions: Regional Development Framework includes the following as a priority: • Aligning effort to support growing regional centres.	The Project contributes to the delivery of this priority by: • Providing essential wastewater treatment services with capacity to enabling growth for industrial and housing developments • Improving State productivity and creating a stronger regional community by enabling economic activity that would otherwise be constrained by failing wastewater service infrastructure

The **NSW Regional Development Framework** is the overarching document that "*provides a scaffold for better coordination, decision making and effort on the ground*" for coordinating investment throughout regional NSW. The framework highlights the NSW Governments commitment to regional NSW towns and the infrastructure required to support economic growth. Throughout the NSW Regional Development Framework document there are many themes, commitments, and initiatives which both support regional development, public health, and essential services notably: • "We want to ensure that the people of regional NSW have the best access to essential services and infrastructure in regional Australia." • "All people in regional NSW should and will have access to essential services and infrastructure including hospitals, schools, roads, water, police and emergency services. This is our commitment to ensuring that no one in regional NSW should have to choose between where they live and work and having access to the most essential services."	The Project is aligned with the themes, commitments, and initiatives of the NSW Regional Development Framework by providing regional NSW residents with essential service infrastructure. The essential sewage treatment service infrastructure delivered by the project maintains and improves: • The public health and wellbeing of the Queanbeyan region • Investment and community growth within the Queanbeyan by attracting new industries and businesses. • Economic growth by providing good quality essential services.
The **Infrastructure NSW State Infrastructure Strategy Update 2014** identified an NSW Government strategic objective to "*Ensure that drinking water and wastewater services in all regional NSW towns meet contemporary standards"* In addition, the State Infrastructure Strategy Update 2014 acknowledges that "*A lack of or inadequate water supply and sewerage services are the single most important factors in protecting public health and reducing faecal pollution in receiving waters.".*	The Project contributes to the delivery of the objective by: • Planning for the future, including achieving long-term wastewater treatment capacity, building resilience and redundancy into the wastewater infrastructure in Queanbeyan.
The NSW State Plan identifies Premier and State Priorities for safer communities, building infrastructure, increasing housing supply, creating jobs and encouraging business investment.	The Project contributes to Premier and State Priorities by: • Improving wastewater treatment ability, quality and safety to ensure the safety of the community's health. • Construction of long-term infrastructure assets for the region and local community. • Supporting increasing housing supply in the catchment. • Supporting business investment in new business park developments the catchment. • Supporting the creation of jobs.

Table 3: Federal Government/NCA strategic policies and alignment

Federal Government Policy	Alignment
The National Capital Plan includes the following Principles to achieve its Objectives: • 2.3.1 Sustainability Objective One – Environmental sustainability and open space: – Ecological communities, threatened flora and fauna species, water catchments and water quality will be protected and supported by sustainable resource management. – Development will respect environmental values including water catchments and water quality and ensure resilience to the impacts of climate change. • 2.4.2 Liveability Objective One – Urban Design and Heritage: – New development, including public spaces, should: – exemplify sustainability principles	The project is aligned with the Principles contained in the National Capital Plan by: • Improved wastewater treatment plant capacity, reliability, and security of supply to enable the community to be more livable and more attractive for tourism and industry etc. • Affordable wastewater treatment in terms of both capital and ultimately reducing operational costs; and • A high-quality wastewater treatment that more reliably meets relevant EPA and health standards and reduces risks to noncompliance.
The Lake Burley Griffin Water Quality Management Plan 2011 requires the NCA to implement the following actions arising from the management of pollutants: • Respond quickly to reported events of sewer overflow and implement control measures. • Liaise with relevant regulatory bodies to ensure adequate controls on treated sewer discharges into the river, and for compliance. • The NCA will ensure liaison with the ACT Environment Protection Authority and other ACT authorities with regard to sewage entering the catchment, and compliance with management standards within the catchment.	The project is aligned with the actions contained in the Lake Burley Griffin Water Quality Management Plan by: • Improving the reliability of treatment plant and reducing the occurrence of untreated sewage overflows • Incorporating the issues and concerns raised by the NCA and ACT Government into the level of treatment included in the design.

Table 4: ACT Government strategic policies and alignment

ACT Government Policy	Alignment
The QPRC and ACT Government Letter of Intent around the ACT-NSW Memorandum of Understanding for Regional Collaboration contains the following principles and priorities for engagement: • Optimising best of region outcomes • Pursuing borderless approach to key infrastructure • Sharing information and data to inform planning and policy development and initiatives • Collaboration on policy and planning opportunities to consider management of water, sewage, waste and renewable energy on a regional scale • Understanding the infrastructure requirements to support population growth	The project is aligned with the principles and priorities of the MOU by: • Work was undertaken early in the project with Icon Water to assess the opportunity for a regional sewage treatment plant. • Contribution to the ACT Government's Lake Burley Griffin hydrological model to assess impacts of STP effluent on the receiving environment • Designing a high-quality wastewater treatment that more reliably meets relevant EPA and health standards and reduces risks to noncompliance improving the environmental outcome for the receiving waters in the ACT.
The ACT and Region Catchment Strategy 2016 – 2046 includes the Regional Development Theme with a goal to 'Make human settlement across the ACT and Region resilient and sustainable and ensure that human impacts on downstream catchments are manageable.' The strategy notes that Wastewater and sewage management capacity will continue to be a challenge for a growing region and sewage treatment can be a constraint.	The Project contributes to this Strategy by: • Designing a high-quality wastewater treatment that more reliably meets relevant EPA and health standards and reduces risks to noncompliance improving the environmental outcome for the receiving waters in the ACT. • Supporting increasing housing supply in the catchment. • Developing coordinated approach to provide cost effective infrastructure with greater economies of scale.

3.2 Place Based Considerations

The QSTP Upgrade project provides essential infrastructure that supports Queanbeyan as a connected and prosperous economy. This supports Queanbeyan's position in in the region outlined in the *NSW Planning and Environment South East and Tablelands Regional Plan* with:

- Connections with Canberra for jobs and services
- Access to Canberra Airport as a tourism and export gateway and
- Support of tourism to Kosciusko National Park, ski resorts and Snowy Mountains region.

The project provides treatment capacity to support projects in the QSTP catchment that the NSW Government has committed investment funding:

- The South Jerrabomberra Regional Jobs Precinct located within the Poplars Innovation Precinct
- $23M investment to improve infrastructure within the business park via the Growing Local Economies Fund
- $7.5M investment for water and sewer services (ie pipework to connect into the existing network) to fast track housing development (1,500 lots) in South Jerrabomberra via the Housing Acceleration Fund
- Construction of a new 500 student high school in Jerrabomberra
- $10M towards the $30M regional sports complex to be constructed in South Jerrabomberra via the Regional Sports Infrastructure Fund.

These infrastructure projects drive an increased load on the Queanbeyan STP and have been accounted for in the base case assumptions.

3.3 Principles, Objectives and Critical Success Factors

Project Principles

The project will be delivered in line with the following Principles:

- Overall Project:
  - The STP upgrade will use proven technology that creates an opportunity to enhance water quality in the Molonglo River and Lake Burley Griffin and continue to make this environmental flow available for climate change resilience.
  - Through the creation of the STP we will work to ensure a process for treated water now and into the future, catering for population growth and the expansion of the plant.
  - In a unique collaboration with three jurisdictions, this project will bring several arms of government together to create an upgraded sewage treatment plant catering for a variety of users into the future.
  - The project enables improved resource recovery for biosolids produced from the STP. The proposed technology recovers phosphorus from the wastewater in a from which remains biologically available for use in agriculture. Improvements in biosolids management including reuse of historical biosolid stockpiles will provide a healthier and cleaner environment for our residents now and into the future.
  - We want to secure wastewater treatment needs now and into the future.
- Project costs:
  - We will balance water quality, operator, and cost factors in design.
  - Be transparent and open about costs and funding.
  - Consult stakeholders on the effect of costs on rates and charges and the impact on user charges and fees, especially those residents living outside the Queanbeyan area.
  - We will engage with residents and ratepayers about the impacts on costs and funding for Council in a transparent and honest way. Our aim is to give a complete picture of the impacts on costs.
- Water quality, environment and sustainability:
  - QPRC is committed to an upgraded STP that serves our community well into the future.
  - QPRC will consider environmental impacts during construction and long-term operations, adopting environmental measures along the design journey.
  - The upgraded STP will ensure all environmental standards are met or exceeded.
  - A high level of water quality, the biodiversity of receiving waterways and Lake Burley Griffin recreational activities will be protected. The upgraded STP will enhanced control and resilience over water quality outcomes.
  - We will enhance the riparian environment through extended landscaping options along the Molonglo River corridor after decommissioning the maturation ponds which will be no longer required for treatment. Returning the riparian zone to their natural state as river floodplain ecology.
  - The Golden Sun Moth ecological habitat on the site will be protected.
  - Indigenous and European heritage of the area will be communicated through installation of signage in an area along the river corridor that is accessible to the public.
  - This STP upgrade will seek to achieve an Infrastructure Sustainability rating standard of 65-75 (excellent), ensuring this facility will meet Council's sustainability goals now and into the future.
- Construction and project staging:
  - The design, construction and commissioning of the STP will take place over several years. At each stage of the project, QPRC is committed to sharing information about the regulatory requirements for the project and key decisions.
  - We will work closely with stakeholders and community to minimise impacts from construction of the upgrade STP. We will ensure construction is managed so it's not disruptive, for example staging our work, or notifying you in advance. Some night work may be required during construction. We will provide advance notice and actionable tips to those impacted.
- Long term operations:
  - We are designing with the long term in mind. This facility will be operational for decades to come and is able to be expanded further to extend that lifespan. We consider reliability, maintenance and access aspects when designing key attributes for safe and friendly operations.
  - We seek to mitigate energy costs of the treatment process through designing to minimise energy where possible, selection of energy efficient equipment, and manage energy use through the use of accessible dashboards.

- We will look to design flexibility and agility to change and adapt to and respond during the future.
- We will look to balance and minimise the use and type of chemicals and waste for operations.
- We will develop a cost benefit analysis to provide a best value outcome.

Project Objectives

The objective of the Proposal is to provide a robust, reliable and sustainable STP that protects public health and the environment for future generations. The Proposal will deliver a robust and reliable sewage treatment solution that provides for both immediate and medium term needs whilst pragmatically considering future needs.

The upgrade proposed represents a solution that provides value for money, achieves targeted sustainability and public health outcomes, and would continue to meet regulatory requirements.

The new STP shall meet regulator and stakeholder requirements, and to achieve an Infrastructure Sustainability Council (ISC) rating of 'Excellent'.

QPRC have identified additional benefits of the Proposal, including**:**

- Securing Queanbeyan's sewage treatment needs for future growth
- Improved ability to control the water quality discharged to the environment and to protect public health
- Improved odour and noise outcomes
- Improved workplace health and safety for workers and visitors to the facility
- Providing improved treatment reliability
- Providing improved protection of the treatment plant against flooding and climate change sustainability
- Providing a source of recycled water that can be used for applications such as dust suppression
- Providing a local facility to receive and treat septage waste collected from domestic septic tanks and aerated wastewater treatment systems
- Improved treatment of the biosolids produced by the treatment process to a quality that is suitable for agricultural reuse
- Providing improved treatment of the waste screening and grit materials generated during the treatment process
- Providing improved traffic access to the treatment plant by sealing the access road.

Key Performance Indicators (KPIs)

Critical Success Factors for the project are summarised in the table below.

Table 5: Critical Success Factors

KPIs	Benefit Owner	Measure	Data Source	Metric Type
Meeting Queanbeyan's sewage treatment needs for future population and economic growth	QPRC	Providing sewage treatment for Queanbeyan population to 2048	ABS Census Inflow measurement	Financial
Improved control the water quality discharged to the environment and to protect public health	ACT / NCA	Reduced number of licence exceedances per annum Fewer closures of LBG per annum Fewer algal blooms in LBG per annum	QSTP annual EPA reporting NCA LBG management data	Non-financial

KPIs	Benefit Owner	Measure	Data Source	Metric Type
Improved workplace health and safety for workers and visitors to the facility	QPRC	Reduced LTIs, incidents and near misses	QPRC WHS records	Non-financial
Improved treatment reliability	QPRC	Effluent quality consistently within regulatory limits Reduced maintenance costs No fines for failure of treatment process	QPRC financial records ACT EPA non-compliance records	Financial
Improved protection of the treatment plant against flooding and climate change sustainability	QPRC	Achievement of Excellent ISC rating Zero inundations of treatment processes up to the 1% AEP flood event	Records from flood events	Non-financial
Provision of a source of recycled water that can be used for applications such as dust suppression	QPRC	Recycled water usage	Recycled water usage records	Non-financial
Provision of a local facility to receive and treat septage waste collected from domestic septic tanks and aerated wastewater treatment systems from within the QPRC LGA	Septage tank owners and septage removal operators	Septage receival sales	Septage receival sales records	Non-financial
Improved treatment of the biosolids produced by the treatment process to a quality that is suitable for agricultural reuse	QPRC / third party biosolids users	Quality records of biosolids testing Uptake of biosolids by third parties other than landfill	Biosolids testing and disposal records	
Improved traffic access to the treatment plant by sealing the access road	ACT TCCS	Reduced maintenance costs	ACT TCCS financial records	Financial
Provision of a sustainable sewage treatment solution	QPRC	Achievement of Excellent ISC rating	ISC Rating	Non-financial

KPIs	Benefit Owner	Measure	Data Source	Metric Type
Existing plant does not fail	QPRC	New plant operational prior to failure of existing plant	ACT EPA annual reporting records	Non-financial
New solution is affordable	Rate payers	Rate increases to pay for new plant are affordable	Rate rise data	Financial
		Project delivered within approved budget	QPRC financial records	

3.4 Project Alignment with Principles, Objectives and Critical Success Factors

Table 6: Project work benefits alignment

Policy or Plan	Strategic Objective	Project Alignment			
		A robust and "Best for Region" solution	Represents value for money	Achieves targeted sustainability and public health outcomes	Meets regulatory requirements
QTSP Master Plan	Capacity required for current and future population growth	✓			
	New STP to provide a level of service that conforms to industry best practice for the protection of public health and the environment	✓	✓	✓	✓
	STP design that meets regulator/stakeholder concerns/requirements			✓	✓
	Optimisation of STP design to achieve Infrastructure Sustainability Council of Australia (ISCA) rating of 'Excellent' or 'Leading'.	✓		✓	
QPRC Strategic Directions Paper 2017	Improve infrastructure, with appropriate and well maintained assets and major projects delivered in growth areas	✓	✓		
	Deliver quality services which meet community needs, interests and ability to pay	✓	✓	✓	
Infrastructure NSW South East and Tablelands Regional Plan 2036	Work with the ACT Government to improve road and active transport connectivity and public transport integration; manage water, sewage, waste and renewable energy on a regional scale; plan and collaborate on major contiguous developments; plan for	✓	✓		✓

	infrastructure requirements to support population growth; and support major events				
	Protect and enhance the area's high environmental value lands, waterways and water catchment			✓	✓
NSW Regional Development Framework	People of regional NSW have the best access to essential services and infrastructure in regional Australia	✓		✓	✓
	All people in regional NSW should and will have access to essential services and infrastructure			✓	✓
Infrastructure NSW State Infrastructure Strategy Update 2014	Ensure that drinking water and wastewater services in all regional NSW towns meet contemporary standards	✓		✓	
	A lack of or inadequate water supply and sewerage services are the single most important factors in protecting public health and reducing faecal pollution in receiving waters	✓		✓	
Premier and State Priorities	Priorities for safer communities, building infrastructure and encouraging business investment	✓	✓		

4. PROJECT OPTIONS

4.1 Description of Proposed Project

Overview

The previous studies outlined in section 2.5 identified that the preferred option for the project was to upgrade the QSTP at the existing site.

The QSTP Upgrade will replace the existing sewage treatment plant which is approaching the end of its asset life with a modern treatment facility that provide reliable treatment. The upgrade provides 75,000 EP of treatment capacity allowing for growth and development in Queanbeyan and will improve the quality of the treated effluent discharged into the Molonglo River upstream of Lake Burley Griffin.

The facility has been designed to provide a simple and robust process that provides reliable treatment, removal of nitrogen and phosphorus and treatment of storm flows.

An overview of the process showing major treatment processes is shown below. The treatment facility includes screening and grit removal, storage and return of storm flows, activated sludge providing biological nitrogen and phosphorus removal, gravity clarifiers, tertiary filtration using a dissolved air flotation filter (DAFF) and UV disinfection. Treated effluent is discharged via an on-bank discharge structure adjacent to the Molonglo River.

The project produces recycled water that will be used onsite for process water and hose points. The project includes a recycled water fill point to supply water to tankers for offsite uses such as dust suppression.

Waste sludge produced by the treatment process will be stabilised in an aerobic digester and dewatered with centrifuges to produce a biosolids product that is suitable for reuse. Phosphorus removed from the wastewater is captured in the biosolids in a form that is biologically available for agricultural use.

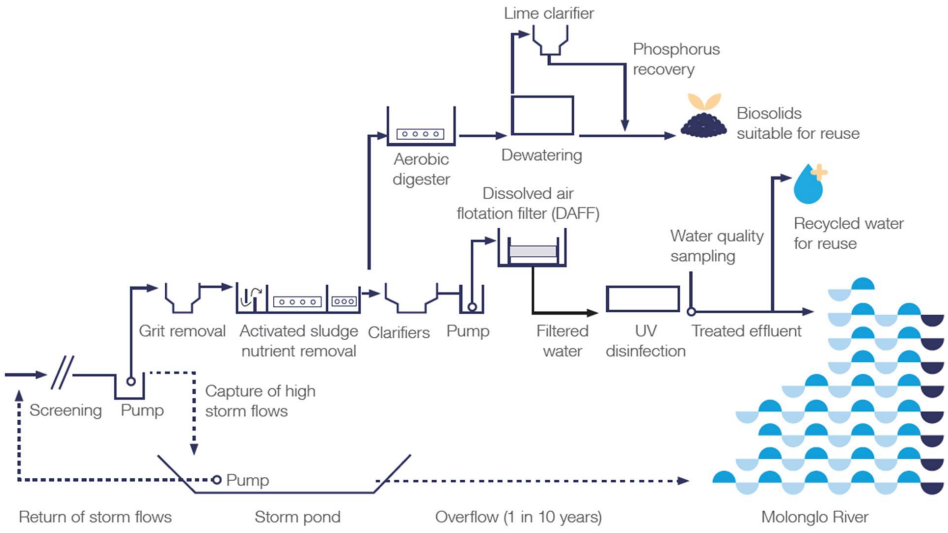


Figure 8: Overview of the proposed QSTP treatment process - the treatment process produces a disinfected effluent with low nitrogen and phosphorus concentrations.

Table 7: Summary of treatment units included in the upgrade

Process stage	Details
Inlet works screening	Band screen – fully automated 5 mm 2-dimensional screening of all flows Collected screenings are washed and dewatered, then stored in skip bins for disposal
Inlet pump station	Lifts screened flow to treatment
Storm pond	30 ML storm pond stores screened flows during storm flow events where the inflow exceeds the treatment capacity. Stored storm flows are returned to treatment during lower flow periods
Grit removal	Grit vortex system – removes grit from the sewage. Grit is washed and dewatered, then stored in skip bins for disposal
Bioreactor	Biological phosphorus removal configured reactor. Anaerobic zones followed by two oxidation ditches and two final aerobic zones. Provides biological nitrogen and phosphorus removal.
Clarification	Two 40 m clarifiers provide settling and clarified effluent. The clarifiers are also designed to provide treatment of storm flows using the solids contact process.
Filter lift pump station	Lifts flow to filtration
Tertiary DAF and filtration	Tertiary treatment dissolved air flotation and granular media filtration using dual coal / sand media – this tertiary treatment removes fine solid particles producing a polished effluent.
Disinfection for river discharge	Ultraviolet (UV) disinfection is provided to the polished final effluent before discharge to the Molonglo River.
Disinfection for Recycled Water	Recycled water receives filtration, UV disinfection and chlorination. Recycled water is suitable for use around site and for offsite uses approved by QPRC.
Aerobic digestion	Waste sludge is thickened and then stabilised using an aerobic digestion process. The process produces a stable biosolids produce that is suitable for reuse.
Biosolids dewatering and handling	Two centrifuges dewater the biosolids. Dewatered biosolids are out-loaded into truck bodies for transport offsite.
Septage receival facility	The STP facility includes a septage receival facility that is designed to receive septage pumped out from domestic septic tanks and domestic aerated wastewater treatment systems. The septage is delivered to site by licenced operators. The facility is not suitable to receive other liquid trade waste.
Recycled water facility	Standpipe facility providing recycled water for approved offsite use

Phosphorus removal

Phosphorus is a key contaminant of concern for the receiving environment of the Molonglo River and Lake Burley Griffin. The treatment process removes phosphorus using a combination of the following processes:

- The bioreactor and clarifier system provides both biological and chemical phosphorus removal to remove the bulk of the phosphorus.
- Lime and ferric dosing systems are dosed at multiple locations to provide enhanced chemical phosphorus removal.
- Dissolved air flotation and dual media filtration (DAFF) provides tertiary filtration to further remove particulate phosphorus and provide effluent polishing to the very low phosphorus concentrations required.

Site arrangement and civil works

The new QSTP will be constructed on the existing lease area to the southeast of the existing treatment process. The selected site location provides a predominantly level area where the new treatment process may be constructed while maintaining operation of the existing STP throughout the construction period.

The location QSTP Upgrade is primarily situated above the nominated design flood level, reducing the risk of damage to major structures, mechanical and electrical equipment during flood events.

Figure 9: Overview of the Queanbeyan STP Upgrade (existing plant in background)

The site layout has been developed in consultation with QPRC and informed by site investigations including survey, services location, geotechnical, ecological, contamination and heritage investigations. Key considerations in development of the layout include:

- Locating the hydraulic grade line and height of structures to ensure bioreactor, clarifiers and UV are positioned at ground level (i.e. top of structure is at handrail height generally) to simplify operation and reduce costs associated with access to elevated structures and lift pumping
- Minimising hydraulic losses of major pipe runs through the treatment process to minimise ongoing operating costs
- Providing adequate space for operation and maintenance access and below ground pipework and electrical conduit service corridors
- Site operation, monitoring and security requirements
- Construction sequencing
- Avoiding disturbance of an area to the south of the site identified as potential habitat for the critically endangered Golden Sun Moth.

Sewage is conveyed to the existing site from the sewerage network through the Jerrabomberra trunk main from the west and the Morisset trunk main from the south. The project includes connecting to these two trunk mains within the site and installing connecting mains to transfer sewage to the new inlet works. The location of the cut-in to the Morisset trunk main has been located outside the identified Golden Sun Moth zone.

The area to the south of the proposed build area is available to be used as the contractor compound during the construction phase. Other areas of the site will be used for stockpiling of excavated material during construction.

Consideration of future expansion requirements

The QSTP upgrade provides a treatment capacity of 75,000 EP. Design of the upgrade has also given consideration to the needs of a future stage 2 upgrade to expand the QSTP treatment capacity by 50% to 112,500 EP. The considerations included in the current project include:

- Consideration of space requirements, hydraulic requirements and connection points of future processes
- Consideration of environmental constraints for the Stage 2 upgrade
- Installing stage 2 capacity now for treatment units that would be difficult to retrofit later such as the inlet works, grit removal and UV disinfection unit hydraulic capacity.

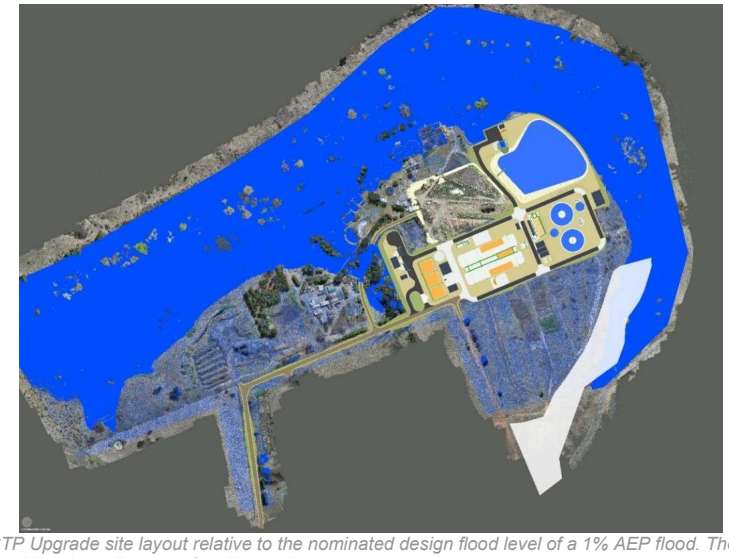


Figure 10: QSTP Upgrade site layout relative to the nominated design flood level of a 1% AEP flood. The design has additionally considered an allowance for climate change.

Decommissioning and removal of Maturation Ponds

The existing treatment plant includes three maturation ponds located on the southern bank of the Molonglo River. The three maturation ponds have an area in the order of 7.6 ha and a volume approaching 200 ML.

The maturation ponds are located within the extents of the 1% AEP flood zone and are at risk of failure during flood events.

The maturation ponds will not form part of the treatment process once the new treatment plant has been constructed and commissioned. As part of the project, the ponds are to be decommissioned, accumulated sludge removed and infilled. Vegetation will be planted in the remediated maturation pond area to extend the Molonglo River riparian zone. QPRC has developed a landscape plan for the area in consultation with the community.

Figure 11: The existing QSTP Site.

Mountain Road upgrade

QSTP is accessed via Mountain Road. The existing access road is unsealed and is in poor condition.

The project includes an upgrade of Mountain Road from the existing intersection with Railway St to accommodate access for larger vehicles and provide suitable road conditions for the increase in operational traffic associated with the upgraded treatment facility.

The key features of the Mountain Road upgrade work are:

- Road widening
- Pavement reconstruction including subsurface drainage
- Construction of swale drainage along the road
- Reconstruction of an existing culvert
- Construction of a cul-de-sac prior to the QSTP entry gate.

The road upgrade work is being developed in consultation with ACT Transport Canberra and City Services (TCCS) and will become their asset.

Power supply upgrade

The power supply authority for the site (Evoenergy) has advised that there is insufficient power supply capacity for the new plant and an upgrade of the high voltage power supply to the site is required. A scope of work for the high voltage power supply has been developed in consultation with Evoenergy. The work required includes:

- Replacement of the existing 11 kV overhead power lines along Mountain Road and across the site with a diverted underground service to provide clear access to the proposed construction areas and safe access for construction vehicles during construction.
- Removal of redundant overhead power lines that cross the existing site.
- Installation of a temporary underground power supply to maintain power supply to the existing QSTP during the construction period.
- Installation of a temporary power supply to the proposed contractor compound area for construction power.

Potable water supply upgrade

Potable water is supplied to the existing STP by a 100mm water main along Nimrod which is owned and operated by Icon Water. Icon Water has advised that there is insufficient water supply pressure at the site to meet ACT firefighting requirements. As part of the project, the potable water main will be upgraded from 100mm to 150mm.

Decommissioning of the existing STP

During commissioning of the new facility, sewage flows will be cut over from the existing STP to the facility. As part of the scope of the project, the existing STP facility is to be decommissioned and made safe. This includes management and removal of residual sludge and grit from the process, cleaning and removal and disposal of mechanical and electrical plant. The scope of the project does not include demolition of the existing STP structures.

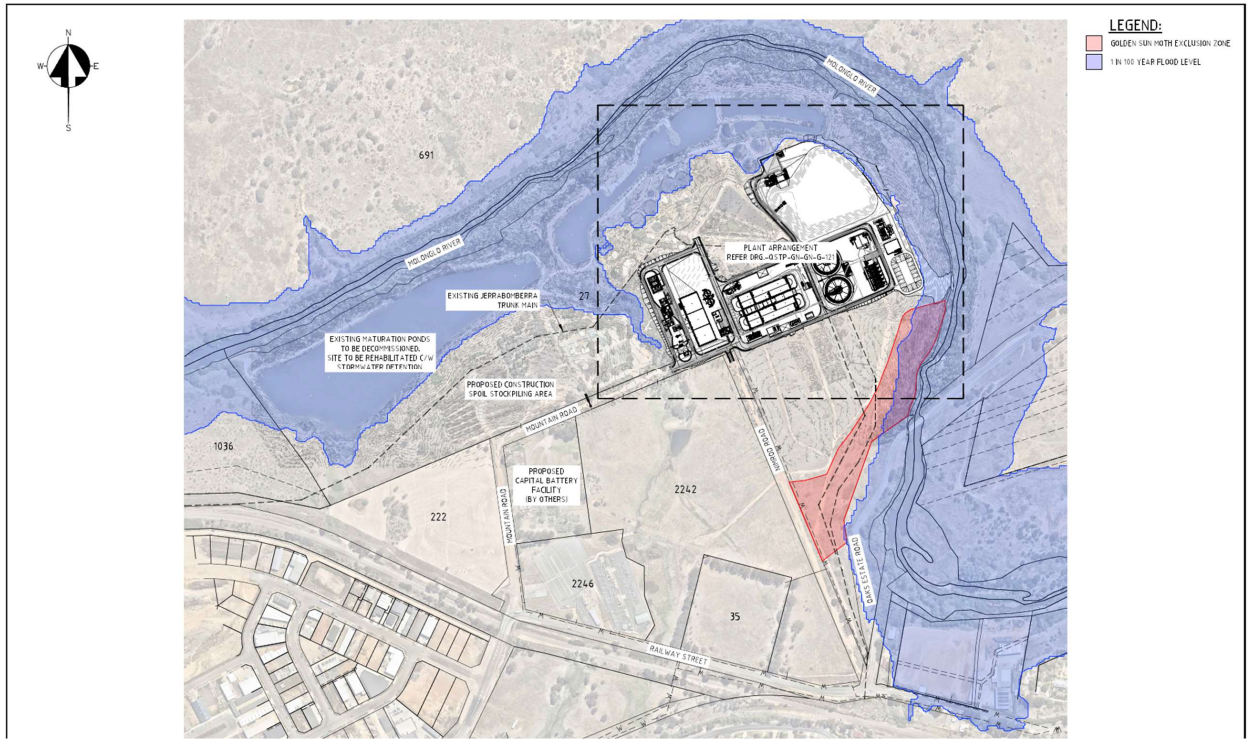
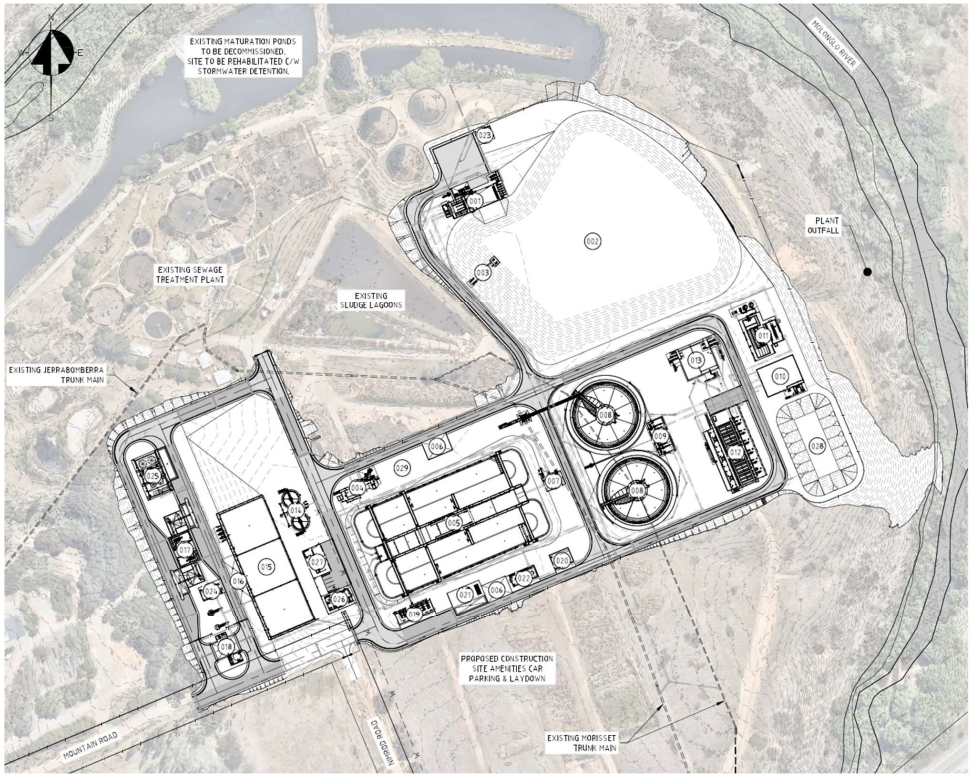


Figure 12: Proposed location for construction of the QSTP upgrade. The location has been selected with consideration of flooding constraints, potential archaeological deposits and endangered Golden Sun Moths.



STRUCTURE LIST	
ITEM NUMBER	DESCRIPTION
001	INLET WORKS
002	STORM POND (30 ML)
003	STORM RETURN PUMPING STATION
004	GRIT REMOVAL FACILITY
005	BIOREACTOR
006	BIOREACTOR AERATION GRID WASH DOWN AREA
007	MIXED LIQUOR SPLITTER
008	CLARIFIERS
009	RAS PUMPING STATION
010	FILTER LIFT PUMPING STATION
011	UV DISINFECTION FACILITY/ELECTRICAL SWITCHROOM
012	DAFF (DISSOLVED AIR FLOTATION FILTERS)
013	DIRTY BACKWASH TANK/CLEAR WATER TANK
014	WAS THICKENERS
015	AEROBIC DIGESTER
016	AEROBIC DIGESTER AERATION GRID WASH DOWN AREA
017	DEWATERING FACILITY
018	SEPTAGE RECEIVAL/RECYCLE WATER FILL STATION
019	BLOWER FACILITY
020	CHAMBERED ELECTRICAL SUBSTATION
021	ELECTRICAL GENERATOR & DIESEL STORAGE
022	MAIN ELECTRICAL SWITCHROOM
023	INLET SWITCHROOM
024	SLUDGE HANDLING SWITCHROOM
025	CHEMICAL DOSING FACILITY
026	AMENITIES
027	WORKSHOP
028	STORMWATER DETENTION BASIN
029	LIME CLARIFIER/LIME SILO

Figure 13: Site arrangement of the QSTP Upgrade

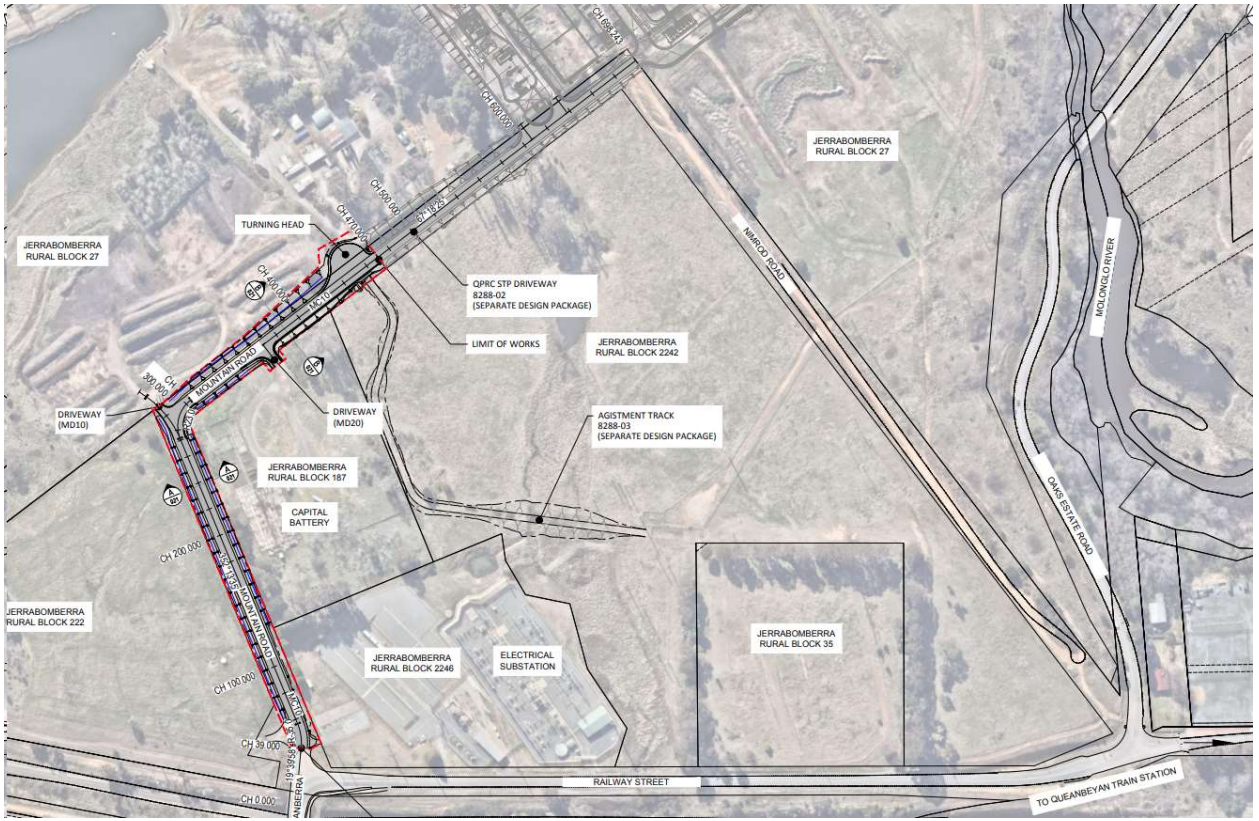


Figure 14: Planned upgrade to the Mountain Road access road to the QSTP

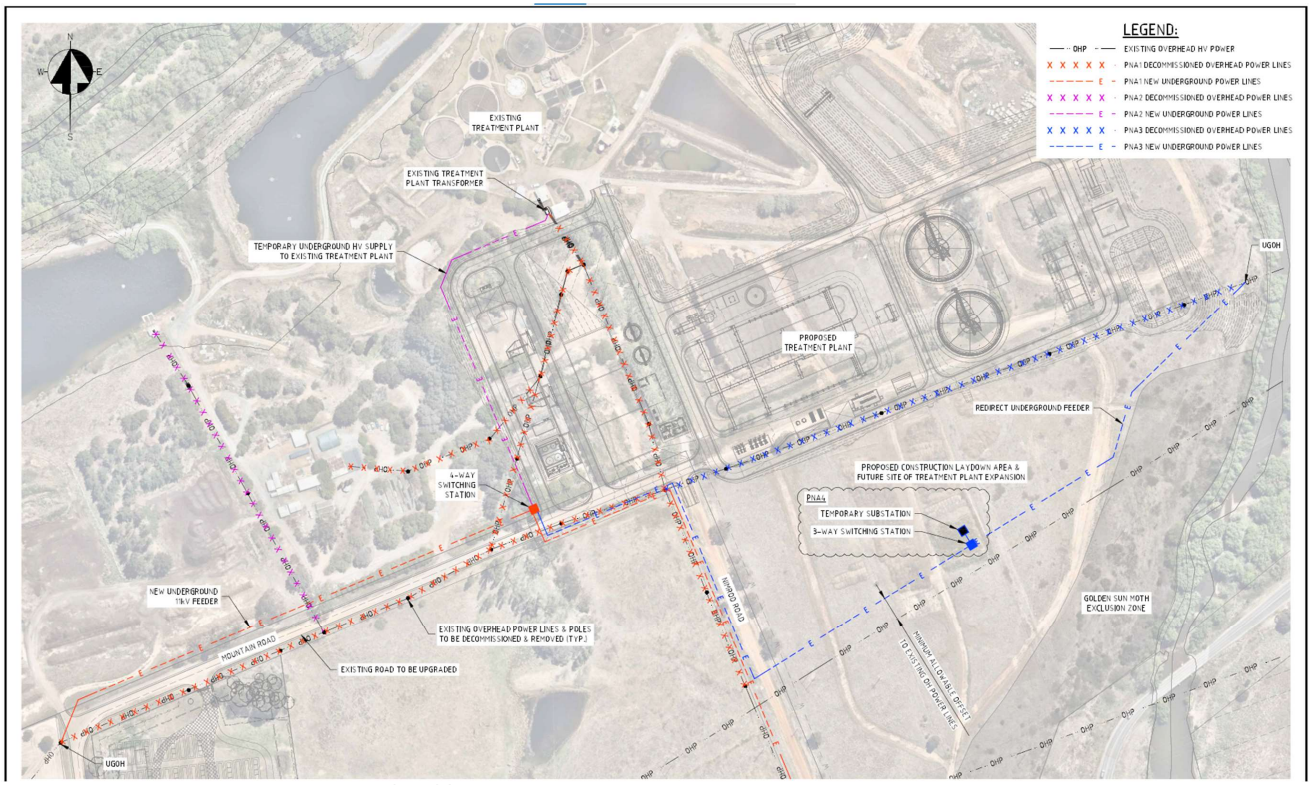


Figure 15: Power supply upgrade requirements of the QSTP Upgrade


Sensitivity: General

4.2 Related Projects and Decisions

The QSTP upgrade project is interrelated to the following government decisions and projects that are being progressed separately.

Development Application Approvals

The QSTP upgrade provides treatment capacity for new connections to the Queanbeyan sewerage system. This additional treatment capacity services new development applications approved by QPRC as well as developments that are already approved but have not yet connected. This includes developments in the South Jerrabomberra area.

STP Site Lease Renewal

The site of the existing and proposed QSTP is Block 27 Jerrabomberra ACT is located in the ACT. QPRC has a 99 year lease on the block that commenced in 1 April 1938 and expires 31 March 2037.

To secure QPRC's investment in the new STP on the site, QPRC has requested a lease extension from the ACT Government. Negotiations on the new lease are ongoing as there are historical boundary survey issues that are being addressed as well as the previous construction of an ACT road across the existing STP site.

Consolidation of Nimrod Road and part of Mountain Road into Block 27 Jerrabomberra ACT

QPRC has made a Direct Sale application to the ACT to close Nimrod Road and part of Mountain Road and consolidate these areas into the existing leased area. If the purchase were to proceed, Nimrod Road would be closed to traffic but would be maintained as an emergency egress and for access to the power supply easement.

The approximate timeframe for consideration of the direct sale application by the ACT Minister for Planning and Land Management is November 2022.

Deregistration of the Maturation Ponds

The two larger maturation ponds at the QSTP site are registered as dams under the ACT Utilities Technical Regulation Act. Prior to decommissioning the maturation ponds, they must be de-registered as dams.

The Utilities (Technical Regulation) (ACT Dam Safety Code) Approval 2018 stipulates the steps to be undertaken to decommission dams, including the requirement to seek approval from the UTR. Information to be provided to the UTR includes details of significant adverse risks to the community during dam decommissioning, and how QPRC will mitigate these risks so as to be acceptable. This may include the preparation of a Dam Safety Emergency Plan or similar.

Once the UTR has approved the proposed methodology, the UTR will delist the dams and remove them from the ACT Dam Register.

Augmentation of the Queanbeyan Sewerage Network

QPRC is preparing an Integrated Water Catchment Management Strategy (IWCM Strategy) to comply with NSW Department of Planning and Environment requirements. The IWCM Strategy will address regional issues relating to provision of sewerage services. Work completed to date on QPRC's IWCM has identified that augmentations to Queanbeyan's sewerage network including an upgrade to the Jerrabomberra trunk sewer will be required as a separate future project.

4.3 Impact and Integration with other Government Assets and Services

The Project will integrate with the existing Queanbeyan sewerage network operated by QPRC and the Oaks Estate sewerage network operated by Icon Water. The project includes works within the site to divert the incoming mains from these networks to the new facility.

As outlined in the project description, the works also integrates with the following assets and service:

- EVO Energy electricity network – the high voltage power supply will be upgraded to supply the new facility as part of the project
- ICON (ACT Government) potable water mains – the water supply will be upgraded as part of the project
- ACT TCCS (Roads ACT) Mountain and Nimrod Roads – Mountain Road will be upgraded as part of the project. Nimrod Road would be closed and incorporated into the leased site.

The project is not expected to impact any other government assets or services.

Plans for mitigating disruption to the service provided by the existing QSTP during the project are discussed in Disruption Management in Section 4.5.

4.4 Enabling or Ancillary Works

Enabling works for the main treatment plant upgrade include:

- The upgrade to Evoenergy's high voltage power supply to the site
- The upgrade of the potable water supply to the site
- The upgrade to Mountain Road
- Relocation of surface artefacts identified as part of aboriginal heritage investigations at the site.

4.5 Disruption Management

The construction of the new QSTP has been planned to ensure minimal impact on the continued operation of the existing STP works. The site for construction of the new facility has been located so that the existing facility can continue to operate during construction. Construction has been staged and planned to ensure the treatment of sewage and compliance with the existing environmental requirements will not be compromised by the construction activities. Construction planning will include preparation of a detailed cut-over plan to ensure continued treatment services during the cut over from the existing facility to the new treatment plant.

Early works will include the relocation of services including a number of power poles along Mountain Road and the power supply to the existing site. These works will be undertaken in order to provide clear site access for construction phase. Disruptions to other customers will be managed by EvoEnergy, in consultation with QPRC.

The Mountain Road upgrade will include road closures and disruptions to traffic. This will be managed by QPRC, in consultation with Transport Canberra & City Services (TCCS). Initial consultation has already occurred with TCCS and this will continue.

As the project develops the project action register will be continually reviewed and revised to capture potential disruptions and associated mitigation/management strategies. The full current extent of expected impacts to current government assets, services and the wider community as a result of the construction of the proposed project together with management strategies are summarised in Table 8.

Table 8: Impacted Stakeholders

Impacted Asset or Stakeholder	Impact	Financial Impact to Stakeholder	Management Strategy
Trunk sewers from sewerage network	Temporary stoppage of flows to the works required at times for essential cut-in work to the network.	Internal cost risk.	Shutdown plans to be developed using temporary pumping, storage and night works as required.
High voltage power supply - EvoEnergy network	Re-alignment of power supply may result in interruptions to supply to Evoenergy customers.	Evoenergy to manage	Evoenergy to manage this impact as they will be engaged to undertake the work.
Power supply to existing STP	Potential interruptions to power supply to existing QSTP	Internal cost risk.	Install new temporary power supply to existing STP. Utilise existing STP back-up generator if required. Ensure adequate diesel supply for back-up generator during cut-over of new temporary power supply.
Mountain and Nimrod Road	Disruption to traffic access. Damage to road surface from construction vehicle movements. (Note there are only three properties accessed via these two roads.)	Cost to reinstate road to pre-construction condition. Cost to implement traffic controls on the road.	Coordinate road works with TCCS and adjoining land users. Provide alternate access for surrounding land users if required. Implement Traffic Management Plan.
ICON Potable Water Main	Water supply to adjacent horse paddock and QSTP during cut-over of new water supply main.	Cost to provide alternative water supply to horse paddock.	Coordinate timing of cut-over with existing STP operations and adjacent horse paddock.
Existing STP Operations	Land currently used for biosolids drying is required to site the new STP. Considerable site land is required for shifting of excavated material.	Internal cost risk.	Relocate existing biosolids. Have backup for off-site disposal in place for biosolids generated during construction.
Capital Battery	Disruption to site access. Road upgrade affects Capital Battery site access. Dust from QSTP works vehicle movements on Mountain Road impacts Capital Battery site.	Nil.	Cross agreement between QPRC and Capital Battery.
ACT Rural Services / Territory Agistment	Impact access to their site.	Potential cost to provide alternate site access.	Provide alternative access to their site if required.
Oaks Estate Residents (ACT) Beard Industrial Estate (ACT)	Noise, dust and odour emitted during construction	Potential cost of addressing complaints.	Construction contractor to prepare and implement a CEMP including ESCP. Undertake site

Queanbeyan Residents (NSW)			surveillance to ensure contractor is implementing the CEMP and controls are effective.
Molonglo River and Lake Burley Griffin	Lake closures for recreational activities and reduced visual amenity due to release of contaminants from the site as a result of construction activities	Loss of economic activity from cancelled events and reduced tourism.	Require contractor to prepare and implement CEMP including WQMP. Undertake site surveillance to ensure contractor is implementing the CEMP and controls are effective. QPRC to continue to maintain and operate the existing QSTP.
Canberra Airport	Cranes required for construction.	Impacted to airport flight schedules.	Obtain Canberra Airport/CASA approval for cranes.

5. COST AND FUNDING

5.1 Budget Request

A pre-tender cost estimate for the QSTP upgrade has been developed using a line item bill of quantities prepared by a quantity surveyor and a Monte Carlo simulation to achieve a risk-based cost estimate for the QSTP Upgrade project. The simulation uses lower and upper bounds that vary depending on the confidence (and risk) levels of each estimated line item. Typical lower bounds for inbuilt contingency are -5% and upper bounds are +15%. For this stage of estimate, a medium to high confidence level has been used.

Using the Monte Carlo simulation, the P90 cost estimate for total project cost is $188M (refer to Table 9) and includes a one-year CPI (3.5%) increase for delays to the project. This value based on engagement of a Principal Contractor to construct the works in the 2024/25 financial year.

Table 9: Total outturn cost estimate summary

Sub-Project	Budget Request ($ ex. GST))
Construction Costs	136,710,000
QPRC Costs	27,958,000
Base Estimate	**164,668,000**
Contingency for Risks (P90)	14,856,000
Project Estimate (P90)	**179,524,000**
Escalation	8,525,000
Total Outturn Cost (P90)	**188,049,000**

Further breakdown of the project cost estimate is provided in Table 11 below.

5.2 Proposed Funding

QPRC Funding sources

Existing Income Streams

Funding for QPRCs sewer operations comes from a dedicated sewerage business of Council. The Business income is from the following sources:

- Sewerage charges – annual fees per sewerage connection
- Developer contributions – Developer charges are up-front charges that QPRC can levy under section 64 of the Local Government Act 1993 to recover part of the infrastructure costs incurred in servicing new development or additions and changes to existing development
- User charges and fees
- Interest.

The income of the sewer fund from the above sources for the 2023-24 financial year was $17m.

We note that the expected income from the sale of recycled water (via the recycled water standpipe) and disposal of septage (via the septage receival facility) would be negligible and have not been included above.

The amount charged for each of the above may be varied by QPRC from time to time to recover the costs required for operation, maintenance, renewal and upgrade of the sewerage system.

The Sewer fund currently holds reserves that have been collected for the purposes of asset replacement, operation and maintenance. The current value of the Queanbeyan sewer fund reserve attributed to the QSTP catchment is $55m (as at start of FY2023/24). The Sewer fund currently holds property in the Queanbeyan CBD that could be sold with the income returned to the Sewer Fund. The reserve does not hold enough funds to cover the entire cost of the project, nor can it expend all of its funds on this project alone. A separate Integrated Water

Cycle Management (IWCM) Plan project is has reviewed the long-term operations cost requirements for the part of the business that sits within the catchment for the QSTP. The IWCM has reviewed the required sewerage charges to meet the projected operation, maintenance, renewal and upgrade costs.

Loan Funding

The Sewer fund can take out and repay loans to cover the cost of works. Loan repayment would be covered by the Sewer fund income streams.

QPRC proposes to utilise loan funding to cover the gap between other funding sources and the CAPEX cost required for the STP upgrade. The source of loan funding for this project would be NSW Treasury Corporation.

There are limits on how much QPRC can borrow based on all of its operations. QPRC's long term financial plan allows for loan funding of $110m for the sewer fund.

External Funding Sources

QPRC was successful in receiving a grant from the NSW Government through the Safe and Secure Water Program (SSWP) in 2019 for the preparation of a Business Case. The SSWP will contribute up to $3M towards the estimated $13.8M cost of this project phase.

Additional grant funding would reduce the size of loans required and reduce the increases require to the sewerage charges. The 2023 adopted Business Case identified a grant funding requirement of $56M. QPRC has sought grant funding through the NSW, ACT and Federal Governments however remains unsuccessful in securing any additional funding. The current grant funding climate remains unfavourable for project funding. Given the urgent need to replace the existing sewage treatment plant the IWCM modelling was updated to not rely on external grant funding. This position acknowledges the need to proceed with the project as soon as possible and that once we enter a construction contract the opportunity for the project to be grant funded will cease.

QPRC is continuing to approach various levels of Government for grant funding opportunities with this project with a view to minimising the impact to sewerage charges. QPRC does not intend to further delay the construction of the new sewage treatment plant to wait for grant funding. Government funding opportunities that are being explored include:

- NSW Government:
    - Safe and Secure Water Program construction funding
- ACT Government:
    - ACT Government contribution through TCCS for the Mountain Road upgrade

CAPEX Funding Allocation

Table 10 outlines the proposed allocation of funding sources for each phase of the project. All costs exclude GST.

Table 10: CAPEX funding allocation across project lifecycle

Project Phase	Budget ($)	Income Source	Income Source Contribution ($)	Phase Status
IDENTIFY	222,000	Sewer fund	222,000	Complete
PLAN – Masterplan, Concept Design and Business Case	7,111,000	Sewer fund	5,461,000	Complete except for business case
		SSWP	1,650,000	
DEVELOP – Reference Design, EIS, DA and Detailed Design	8,375,000	Sewer fund	7,025,000	In progress
		SSWP	1,350,000	
DELIVER – Construction	148,741,000	Sewer fund	31,741,000	Not started
		Section 64 Contributions	7,000,000	
		Loan	110,000,000	
CLOSE	219,000	Sewer fund	219,000	Not started
Contingency	14,856,000	Sewer fund	14,856,000	N/A
Escalation	8,525,000	Sewer fund	8,525,000	
TOTAL	188,049,000		188,049,000	

5.3 Cost Planning, Contingency and Management (P90/50 real and outturn)

A risk-based engineering cost estimate for the QSTP Upgrade Project was developed during the design phase of works. The cost estimate includes both direct and indirect costs, including construction management, contractor profit, project management, commissioning, and project contingency. Sunk costs have been included in QPRCs Costs.

Detailed quantities have been extracted from the detailed 3D model of the proposed upgrade. Costs have been developed using the following primarily first principle methods and the following sources:

- Rawlinson's Construction Handbook 2020 and other first principle estimating tools
- Supplier quotes sourced specifically for the proposed upgrade and this estimate
- Known contract rates and quotes from previous relevant wastewater plant construction projects
- Rates from independent estimator and contractor databases.

Where appropriate, Building Price Indices have been applied to bring rates in line with financially current values. An estimate for electrical, control and instrumentation (ECI) costs have been made using 20% of the total civil and mechanical works which is consistent with a design of this level.

The cost estimate is based on the procurement model indicated by QPRC and assumes that the project will be delivered in Construct Only model by a Principal contractor.

The base cost estimate breakdown is provided in Table 11 below. The estimate includes a one-year delay increase of CPI (3.5%).

Sensitivity: General

Table 11: Base cost estimate breakdown

Item	Costs
CONSTRUCTION COSTS	
STP Upgrade	**$97,116,000**
Bulk Earthworks	$6,470,000
Plant Pipework	$7,377,000
Worklot 1: Inlet Works and Inlet Lift Pumping Station	$4,136,000
Worklot 2: Storm Pond (30ML)	$1,366,000
Worklot 3: Storm Return Pumping Station	$963,000
Worklot 4: Grit Removal Facility	$1,096,000
Worklot 5: Bioreactor	$17,456,000
Worklot 6: Bioreactor Aeration Grid Washdown Area	$205,000
Worklot 7: Mixed Liquor Splitter	$1,720,000
Worklot 8: Clarifiers (incl. Mixed Liquor Chamber)	$5,149,000
Worklot 9: RAS Pumping Station	$692,000
Worklot 10: Filter Lift Pumping Station	$2,335,000
Worklot 11: UV Disinfection Facility/Electrical Switchroom	$3,118,000
Worklot 12: DAFF(Disolved Air Flotation Filters)	$11,666,000
Worklot 13: Dirty Backwash Tank/Clear Water Tank	$729,000
Worklot 14: WAS Thickener	$1,057,000
Worklot 15: Aerobic Digester	$4,767,000
Worklot 16: Aerobic Digester Aeration Grid Wash Down Area	$104,000
Worklot 17: Dewatering Facility	$3,216,000
Worklot 18: Septage Receival/Recycle Water Facility	$423,000
Worklot 19: Blower Facility	$1,057,000
Worklot 20: Chambered Electrical Substation (included in HV upgrade)	$ -
Worklot 21: Electrical Generator & Diesel Storage	$1,719,000
Worklot 22: Main Electrical Switchroom and site power reticulation	$13,693,000
Worklot 23: Inlet Switchroom	$271,000
Worklot 24: Sludge Handling Switchroom	$164,000
Worklot 25: Chemical Dosing Facility	$1,808,000
Worklot 26: Amenities	$442,000

Worklot 27: Workshop	$470,000
Worklot 28: Stormwater Detention Basin	$247,000
Worklot 29: Lime Clarifier/Lime Silo	$1,515,000
Roadworks & Restoration	$1,685,000
Other Works	**$9,942,000**
Mountain Road Upgrade	$2,412,000
Maturation Pond & Sludge Lagoon Decommissioning and Landscaping	$4,988,000
Upgrade of HV Power Supply to Site	$2,542,000
Indirect Costs	$13,481,000
Contractor Margin	$13,683,000
Other Construction Costs	$2,488,000
Total Construction Cost	**$136,710,000**
QPRC PROJECT DELIVERY COSTS	
Investigation, Design and Approvals, Project Management and Construction Management	$27,958,000
BASE ESTIMATE	**$164,668,000**

5.4 Ongoing Maintenance, Operating and Service Costs

Ongoing Operating and Maintenance Costs

The estimated operating costs include chemical purchases, electricity, biosolid costs, and operational labour and laboratory costs.

The power unit rate used of $0.2 / kWh was based on a review of QSTPs existing power costs.

Market rates were used for chemical purchases and biosolids, these included:

- Caustic soda (50%) $395/tonne
- Ferric Chloride $486/tonne
- Polymer $7.25/kg
- Sodium Hypochlorite (12%) $340/tonne
- Lime Slaked $232/tonne
- Biosolids Transport $20/WT
- Biosolids Reuse $85/WT

The estimated maintenance cost is based on a nominal percentage of project costs. Maintenance was set at 3 % of capital cost per year for Mechanical and Electrical, and 0.3 % for Civil.

The operating, maintenance and lifecycle costs are presented in 6.2.

5.5 Commercial Off-set

Opportunities for commercial off-set, beyond development Section 64 contributions, have not been considered for this project as part of this business case.

However, the design of the treatment plant will allow for commercial off-set opportunities to be investigated by QPRC in the future, including:

- Supply of large scale recycled water – subject to financially and regulatorily feasible demand (other schemes have locally failed due to the excessive cost to produce and transport recycled water to end users)
- Supply of biosolids for reuse – subject to sourcing an interested third party.

5.6 Cost Planning and Management

Cost Planning Management

The project cost management is aligned to the delivery stage of the project and QPRCs Project Framework. Under QPRCs Project Framework, project cost are prepared and reviewed as follows:

- Project identification (order of magnitude) – complete
- Strategic options estimate (unit rates) – complete
- Preliminary concept estimate (unit rates) – complete
- Detailed estimate (hybrid unit rates/first principles) – used for this business case
- Pre-tender estimate (hybrid unit rates/first principles) – prepared prior to tendering at completion of detailed design.

A special feature of this project is procurement including early vendor engagement for 3D design and purchase of specialist equipment in advance of the engagement of a Principal contractor. This method of procurement has allowed the designers to work with the equipment suppliers to make the design highly bespoke with lower risk of changes during construction due to the contractor's selection of the equipment varying to the designer's assumptions. The Project currently has nine early vendor engagements executed that have allowed for greater certainty in equipment pricing as the costs are locked in now. The early vendor pricing has been included in the detailed estimate.

QPRC is actively engaged in monitoring actual project costs compared with the project budget. Between the major estimating milestones above and then during construction, QPRC undertakes the two following activities:

1. Monthly progress reporting on project expenditure with a comparison of baseline budget, current budget and actual costs; and
2. Updating the current project budget to incorporate project cost changes through QPRCs change management process.

The final check in QPRCs cost planning is to ensure that the final project costs and ongoing operational costs meet the estimates. This process is undertaken during project closure documented in a project closure report and as part of QPRCs Benefits Realisation Plan discussed further in Section 8.8 of this report.

Contingency Management

The project has adopted a probabilistic risk-based cost estimating approach for capital costs. Risk has been accounted for in the cost estimate through the use of line item ranging and discrete risk events. The contingency has been calculated for varying probabilities via Monte Carlo simulation.

Cost risk events included in the cost estimate are identified through the project risk management processes (described in Section 8.5). The project risk assessment is updated progressively throughout the project and principally at major delivery milestones including Masterplan, concept design, reference design and detailed design. Risks are also identified through the project change procedures. This approach to identifying cost risks means that as the project progresses cost risk are reviewed, removed and added based on the current design and stage of the project. Additionally, throughout the construction phase of the project, the value of contingency can be monitored via the cost risks that remain active.

The contingency is owned by QPRC. Approval to release contingency is done through QPRCs Project Board via monthly progress reporting and financial delegation contract variation approvals processes.

The remaining contingency is reported on via QPRCs monthly project reports.

Milestone Payments

Project lifecycle costs have been projected over a 30 year period in Section 6.5. Detailing these costs allows QPRC to ensure it has secured sufficient funds each financial year to support the project for a 30-year period, with a particular focus on the timing for larger payments.

6. VALUE FOR MONEY ASSESSMENT

6.1 Demand Assessment

The existing STP is estimated to have a design equivalent population (EP) of 34,500 and is currently aged and overloaded.

Hunter H2O developed estimations of sewage loading as part of the Design Criteria and Assumptions Report completed in 2019 which found that the plant was servicing approximately 52,000 EP, with the service population expected to grow to 77,000 by 2050, the sewage load on the QSTP is expected to increase steadily with infill and increased population density. The existing plant is considerably under designed for the current population; the issues associated with this overloading will continue to be exacerbated as the population grows. The plant is also contending with a number of age-related issues. The overloading of the plant and infrastructure issues pose a significant environmental risk to Lake Burley Griffin, as well as a regulatory and reputational risk to QRPC.

The proposed upgrade will have capacity to service 75,000 EP and is not expected to require augmentation or upgrade for at least 15-20 years. The adopted design also allows for future expansion to the treatment train to service up to 112,500 EP.

6.2 Cost Benefit Analysis

A Cost Benefit Analysis (CBA) has been undertaken to estimate whether the economic benefits generated as a result of the new treatment plant exceed the associated project costs. The CBA compares the Project Case, against the Base Case, which represents current condition. This is to capture the impact of avoidance of failure scenarios and other impacts that result from the existing treatment plant continuing to be operated at current capacity.

Benefits and costs are in real terms; a real discount rate has been applied to reflect the long-term social opportunity cost of capital.

Assumptions

The economics modelling approach was compliant with the *Infrastructure Australia (IA) Assessment Framework* as well as the *NSW Safe and Secure Water Program Guidelines*.

Table **12** outlines key assumptions and parameters applied within modelling calculations.

*Table **12**: Key model assumptions*

Element	Value	Unit	Notes / Source
Economic Factors			
Price base	FY2022	*date*	The analysis has been undertaken in real, FY2022 dollars.
Analysis Period	30	*years*	IA Assessment Framework
Escalation factors	Where inputs were not in the price base year, the parameter was escalated to FY2022.	*%*	ABS CPI Sydney (Index Numbers; All groups CPI; Sydney; A2325806K)
Project Timeline Inputs			
Capital costs start date	01 Jan 2024	*date*	QPRC
Construction end date	31 Oct 2026	*months*	QPRC
Operations start date	01 Mar 2026	*date*	Decommissioning of maturation ponds to occur between March– October 2025
Discount rate			
Discount rate	7%	*%*	IA Assessment Framework

Assumptions and limitations

Due to limitations around data availability, and accurately capturing the failure scenarios, there are several failures and impacts that could not be captured within the CBA. These impacts would likely contribute significantly to the economic viability of the project. It should also be noted that the loss of economic growth associated with the Base Case would be substantially larger than the proxy values adopted in this analysis.

Options

Four options were developed and assessed for suitability in the QPRC QSTP Upgrade Project Masterplan (GHD, 2016). A multi-criteria analysis (MCA) was used that tested a variety of weighted criteria to compare the options.

The MCA considered whole of life cost estimates, constructability, operability, sustainability, future proofing, and overall delivery risk. A "Build New" strategy was identified as the preferred option. This is the Project Case within this economic analysis.

Base Case

The Base Case represents a "Do Minimum" scenario in which the existing infrastructure is retained, without alteration, at its design capacity of 34,500 EP.

Project Case

The Project Case involves building a new STP that would service an EP of 75,000. The location of the upgraded plant will be integrated onto the existing site, and the existing plant decommissioned.

Capital and Operating Costs

Capital Costs

A summary of capital costs is shown below in Table **13**. Note that escalation was removed from the costs, and they are therefore expressed in real terms.

*Table **13**: Capital costs (real, $m June 2022) – Source: **QSTP - Engineering Cost Estimate – Rev B.pdf***

Cost Element	Value ($m, 2022)
Direct Construction Costs	103.44
Indirect Costs	13.03
Contractor's Margin	13.22
Client's Costs	29.94
Contingency	14.35
Total Cost (P90)	173.98

Capital costs have been distributed in alignment with the construction period outlined in Table 11.

Operating & Maintenance Costs

The operating (opex) cost profile has been assumed to increase with the projected population growth and the resulting incoming flow. Opex costs as provided are inclusive of the following items:

Operational costs

- Power
- Chemicals
- Biosolids
- Labour
- Laboratory

Major Maintenance

- UV lamp replacement
- UV Service
- Diffuser Membranes
- Blower Filters
- Inlet Works
- Centrifuge - minor

- Centrifuge - major
- Clarifier and WAS Thickener.

Maintenance costs

- Civil
- Mechanical
- Electrical

Lifecycle replacement

- Mechanical

Project benefits

Table **14** summarises the project impacts assessed as part of this economic analysis. This is made up of two main benefit groups:

- **Failure scenarios**: As the current STP is operating beyond capacity, it presents risks around plant failure.
- **Downstream benefits**: These are the impacts to the wider community that are associated with operating the plant at its current capacity.
- **Other benefits**

*Table **14**: CBA Benefits*

Benefit	Description
Failure scenarios	
Plant Capacity Failure	This benefit assesses the avoided cost from the current capacity exceedance as a result of additional population or critical equipment failure. This could lead to release of ammonia into the river which is toxic to aquatic life, and result in significant costs due to the number of fish affected, civil fines and reputational damage.
Maturation Pond Failure	This benefit captures the avoided costs of maturation pond bank failure from flooding events that can result in mass releases to the Molonglo River. The two rainfall events captured for this failure were a 1 in 20-year and a 1 in 100-year event.
Downstream benefits	
Ecology and Biodiversity Protection	This benefit measures the willingness to pay for the prevention of the loss of riverine habitat.
Recycled Water Schemes	This benefit measures willingness to pay to contribute to recycled water to improve environmental outcomes.
Social Cost of Water Borne Disease	This benefit measures the prevention of waterborne diseases. The difference between this cost in the Base Case and Project Case becomes a cost saving used in the CBA.
Economic Growth	To measure this benefit, a proxy has been applied. This has been captured through measuring the Council's inability to approve development and housing growth due to insufficient services. As such council rates and developer charges have been used as a proxy.
Biosolid Value Add	This benefit measures the value through the creation of productive outputs from the treatment facility. Although resulting biosolids from the facility are unlikely to be sold, they represent a productive outcome.
Receiving 10% Water Quality Change	This benefit measures willingness to pay to receive water quality improvement. It was assumed that there would be a moderate improvement in water quality, resulting in an improvement of 10%.
Other	

Benefit	Description
Residual Value	This benefit measures the value of the QSTP at the end of the appraisal period based on the estimated asset life and a straight-line depreciation

Summary Results

Table 15 below summarises the Central Case BCR results using a 7% discount rate.

*Table **15**: Central Case, Summary Table (PV $, millions)*

Item	Summary ($, millions)
Costs (discounted)	
Construction Cost	142.80
Incremental Operational Costs	(12.29)
Benefits (discounted)	
Plant Capacity Failure [Avoided Costs]	11.96
Maturation Pond Failure [Avoided Costs]	12.27
Ecology and biodiversity protection	1.01
Recycled Water Schemes	1.49
Social Cost of Water Borne Disease	79.03
Economic Growth	4.72
Biosolid Value Added	11.19
Residual Value Profile	11.66
Receiving 10% Water Quality Change	22.81
Total (discounted)	
Total Costs	130.51
Total Benefits	**156.13**
Analysis	
NPV	25.62
BCR	1.20

Findings

Over the 30-year appraisal period, the Project Case provided a total benefit value of $156 million against a total cost of $130 million, resulting in a BCR of **1.2** and an NPV of $26 million.

These results should not be taken as an isolated assessment and should be read in conjunction with the case for change outlined in Section 2 to gain a full appreciation of the benefits gained through the upgraded plant.

Sensitivity Analysis

Sensitivity testing was undertaken on key assumptions and inputs to reflect the inherent uncertainty associated with the Project and future conditions.

The table below summarises the sensitivity analysis tests undertaken along with the Central Case results. The analysis indicated that the Project Case returned a BCR of 1 or above under all sensitivity tests except when a discount rate of 10% or benefits of -20% are applied.

*Table **16**: Sensitivity Analysis Results*

Element	NPV ($, millions)	BCR
Central Case	25.62	1.20
Discount Rate (4%)	124.68	1.93
Discount Rate (10%)	(21.65)	0.83
Costs (-20%)	51.72	1.50
Costs (+20%)	(0.48)	1.00
Benefits (-20%)	(5.61)	0.96
Benefits (+20%)	56.85	1.44

Applying a 4% discount rate resulted in the highest BCR with a value of 1.93 while a 10% discount rate gave the lowest BCR value of 0.83.

6.3 Value Management

Value management has been undertaken throughout the lifecycle of the QSTP Upgrade Project, prior to completion of each phase of the Project.

This has included:

- Project challenge review
- Client reviews / operator review.
- DPIE independent review
- Consultation with Suppliers about value management opportunities
- Design of the upgrade allows for a future stage 2 for key structures enabling a longer lifetime.

6.4 Financial Appraisal

Drafting Note:

The financial appraisal in the remainder of this section was prepared as part of the draft Business Case published in September 2022. This has been superseded by QPRC's Integrated Water Cycle Management Strategy and Financial Plan.

A financial appraisal has been undertaken on the proposed QSTP upgrade. Per arrangements for the existing STP, the project's required revenue will be realised through levying sewage charges on households within QPRC's jurisdiction. The quantum of levies at household level will be determined under a separate analysis being undertaken by QPRC[1]. As such, the financial appraisal herein is focused on determining:

1. The aggregate annual revenue requirement for QSTP to ensure the plant can operate sustainably and without further cash injection throughout its life. The revenue requirement will be used to inform the further determination of levies to be charged to ratepayers, and which is a separate exercise from this business case, and
2. The sustainability of QPRC's proposed financing mix for the QSTP, including quantifying the equity contribution required from QPRC.

Financial vs. economic appraisal

The financial appraisal's focus is on the cash flows and funding / financing need of QSTP. It aims to determine whether the project is financially viable (i.e., that projected revenues are sufficient to cover all costs of the project during the operating phase), and that upfront project funding / financing has been properly considered.

In contrast, the economic appraisal in this business case has a wider focus on societal impacts of the QSTP.

Table 17 below summarises the main differences between the financial and economic appraisals.

Table 17: Comparison of focus of financial vs. economic appraisal

	Economic appraisal	Financial appraisal
Focus	Demonstrate Value for Money and return to society of options – relative to the base case	Demonstrate affordability and funding implications
Perspective	Society	Queanbeyan-Palerang Regional Council
Flows	Benefits and costs in real terms	Revenues and costs in nominal terms
Discount rates	Real discount rate – reflects long term social opportunity cost of capital	Nominal discount rate – reflects the cost of capital of the funding entity

Approach to the financial appraisal

To align with the operating model of the existing QSTP and with QPRC's mandate, the financial appraisal was developed on the assumption of a need for full cost recovery over the assumed life of the plant. In line with existing arrangements, the project sponsor has been assumed to be QPRC.

[1] QPRC is developing the "Integrated Water Cycle Management – Strategy and Financial Plan" with assistance from GHD

Based on the above, the analysis has been centred around developing an understanding of the whole-of-life costs of the QSTP, including their quantum and timing. These costs include upfront capital costs, ongoing operating costs and the periodic costs of refurbishing or replacing any assets and equipment in line with their useful lives. Debt service obligations resulting from QPRC's proposed financing mix were also incorporated.

A fixed annual revenue requirement, which would be subject to CPI adjustment, was determined under a principle of ensuring the project should be breakeven, on a whole-of-life basis, by the end of its useful life. Analysis of resulting annual cash flow was then undertaken and adjustment made to the revenue requirement in each year where the unadjusted project cash flow was negative.

Procurement model

Per the discussion on procurement and delivery strategy as outlined in Section 7 of this business case document, the financial appraisal has been based on the assumption that the QSTP would be delivered as a traditional government project, with QPRC being the responsible agency or project sponsor. Under this approach, it has been assumed that QPRC would retain responsibility for the design, construction, financing, and operations and maintenance of QSTP.

The procurement approach considered in the financial assessment is summarised in Figure 16.

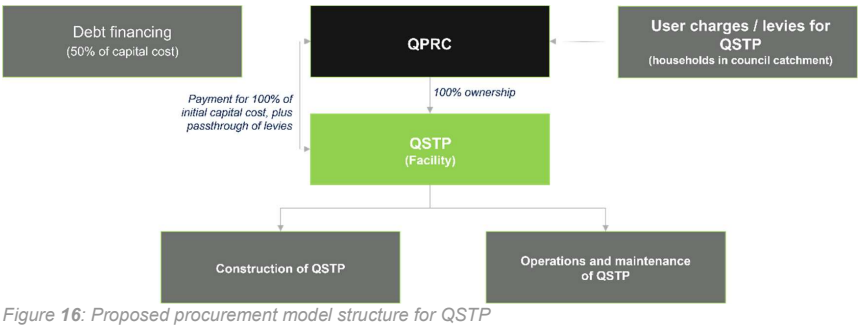


*Figure **16**: Proposed procurement model structure for QSTP*

General assumptions

The following table outlines general assumptions that were used in financial modelling of the project, such as timeline, inflation, discount rate and revenue assumptions. Detailed assumptions for capital and operating costs estimates, and associated contingencies, are outlined in Section 5, with summarised costs shown given below.

The separate IWCM analysis to determine QSTP's impact to household rates will be based on consistent assumptions.

*Table **18**: General financial appraisal assumptions*

Parameter	Value	Source
Weighted Average Cost of Capital (WACC)	5.9%	NSW Treasury 2020-21 Annual Report
Price base year	FY 2022	Current year
Model frequency	Annual (Financial year – 01 July to 30 June)	Assumption
Evaluation period	30-year operational period	Infrastructure Australia Assessment Framework
Inflation	**Revenues:** 2.14% per annum aligned to CPI **Capital and Operating cost:** 2.14% per annum aligned to CPI	NSW CPI (5-yr historical average), Australian Bureau of Statistics

Asset life and depreciation	**Civil works** have an 80-year asset lifetime, depreciated using the straight-line depreciation method. **Mechanical** and **Electrical works** have a 20-year asset lifetime, depreciated using the straight-line depreciation method.	QSTP Engineering Cost Estimate, Hunter H2O
Construction start date	01 Jan 2023	QPRC
Construction end date	31 Oct 2025	QPRC
Operations start date	01 Mar 2025	QPRC
Financing mix	Capital costs to be financed as follows: • 50% financed by debt, to be raised by QPRC, and • 50% financed by equity, to be provided by QPRC and/or state government contributions from NSW and ACT	QPRC, supported by preliminary discussions between QPRC and NSW TCorp
Interest rate on debt	5.5%	QPRC

QPRC has based this business case on financing 50% of capital costs of the project with debt to be procured through TCorp. Equity finance will comprise the remaining 50%. Subject to agreement with the NSW and/or ACT governments for co-contributions (refer Section 5.2), QPRC has access to the following funds to cover the equity requirement, totalling $83.0 million.

*Table **19**: Possible sources of funding for QPRC's equity contribution to QSTP*

Funding type	Value	Source
SSWP Business Case Grant	$3,000,000	QPRC
Section 64 Contributions	$7,500,000	QPRC
QPRC Sewer Fund	$72,500,000	QPRC

Costs

Capital costs

Construction costs and associated contingency adjustments have been derived by QPRC and its engineering consultant and are summarised in Table 20 below. Total construction costs are estimated at $143.4 million in 2022 values. Detailed discussion on the costs, how they were established, and the approach to estimating an appropriate contingency to determine a P90 estimate, is provided in Section 5.3 of this document.

Per analysis undertaken by QPRC and its engineering consultant, the construction period will be from FY2023 to FY2025, and as such construction costs have been escalated at CPI to reflect anticipated nominal capital costs. An adjustment to reflect the high labour and materials costs in the current construction market have been included in base costs outlined in Section 5.3 and CPI was therefore seen as an appropriate escalation factor to apply for the purposes of the financial appraisal.

*Table **20**: Capital and construction cost estimates*

Description	Value	Source / rationale
Direct Construction Costs	$88,880,000	QSTP Engineering Cost Estimate, Hunter H2O
Indirect Costs	$6,990,000	
Contractor's Margin	$5,580,000	

Client's Costs	$26,450,000	
Contingency (11%)	$15,480,000	
Total QSTP Construction Cost (P90) ($, 2022)	**$143,390,000**	
Escalation (@ CPI)	$10,770,000	Arup modelling
Interest During Construction (IDC)	$8,057,000	Arup modelling
Total Capital Cost (nominal $)	**$162,217,000**	

QPRC and its engineering consultant consider that construction costs are expected to be incurred in line with the following spend profile:

- 18% in FY2023
- 35% in FY2024
- 35% in FY2025, and
- 12% in FY 2026.

Goods and Services Tax (GST) has been added to the nominal construction cost of the QSTP.

It has been assumed that 50% of total capital costs would be financed by debt raised by QPRC, which in turn would incur interest charges during the project's construction term and before revenue generation commences. This would give rise to interest during construction (IDC). IDC has been calculated and added to total capital cost. This required an iterative calculation given the circular relationship between capital cost and IDC.

Total capital cost in nominal terms, including inflation and IDC, is expected to be $162.2 million.

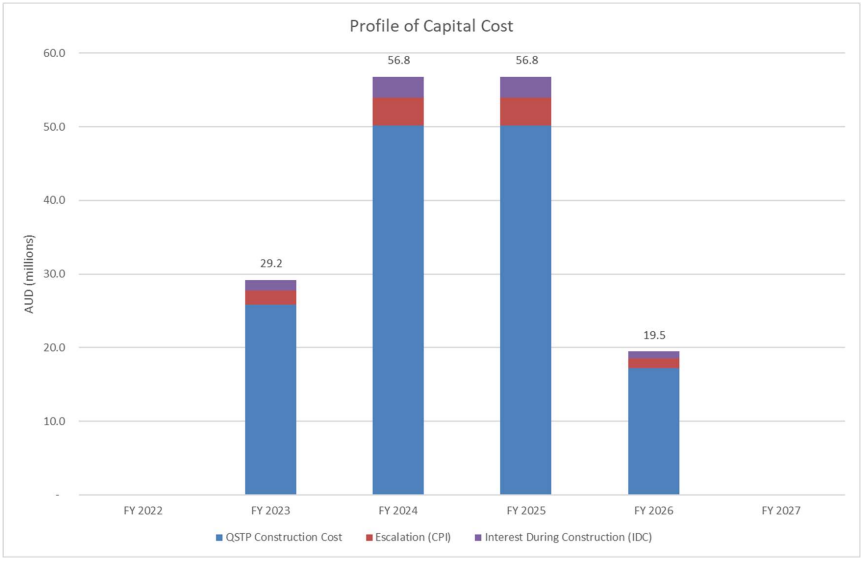


*Figure **17**: Capital cost spend profile*

Operating costs

An operating cost profile has been developed by QPRC and its engineering consultant with cost expected to increase over the operating period, in line with the projected increase in population and the resulting incoming sewage flow to the plant.

A summary of operating cost estimates is presented in Table **21** below. Note that figures in Table **21** reflect costs as at the start of the operating period in 2023, and for the purpose of the financial assessment were escalated at CPI thereafter for the remainder of the 30-year operating period.

*Table **21**: Operating cost estimates ($, 2023)*

Description	Value	Source / rationale
Power cost	$736,852	QSTP Engineering Cost Estimate, Hunter H2O
Chemicals cost	$547,667	
Biosolids cost	$541,452	
Labour cost	$240,000	
Laboratory cost	$250,000	
Civil cost	$168,885	
Mechanical cost	$270,981	
Electrical cost	$352,962	

Figure **18** below shows the anticipated operating cost profile over the 30-year operating term, which has been aligned with anticipated population growth in the QPRC catchment.

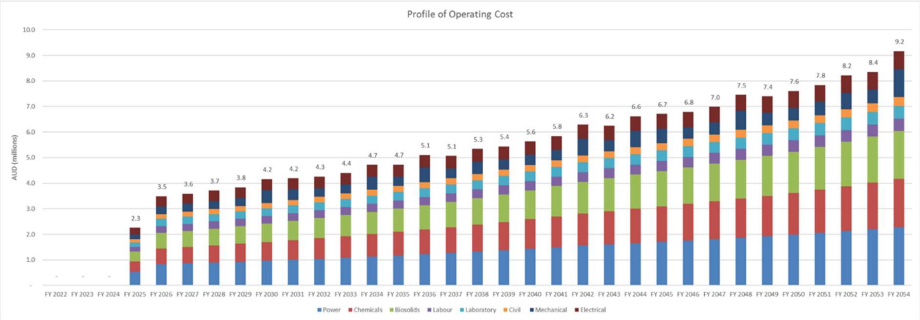


*Figure **18**: Profile of Operating Costs*

Power, Chemicals and Biosolids in aggregate represent approximately 65% of QSTP's total annual operating cost. Operating costs are estimated at approx. $3.5 million in FY2026, the first full year of operations, growing to $9.2m by FY2054 from a combination of cost escalation and growth in underlying population. The aggregate nominal operating cost across the model period is $171.5m.

Lifecycle replacement costs

The equipment and assets that make up the QSTP are anticipated to require periodic replacement at regular intervals. QPRC and its engineering consultant estimate that a series of minor replacement works ranging from every one to seven years will be required as summarised in the top part of Table **22**. In addition, a significant lifecycle cost associated with replacement of mechanical plant will be required in FY2045, around 20 years into the operating term, as shown in the lower part of Table **22**.

*Table **22**: Lifecycle replacement cost estimates ($, 2022)*

Description	Value and frequency	Source / rationale
Lifecycle replacement costs		
UV lamp cost	$151,296 every 6 year(s)	QSTP Engineering Cost Estimate
UV Service cost	$10,278 every 1 year(s)	QSTP Engineering Cost Estimate
Diffuser Membranes cost	$63,920 every 7 year(s)	QSTP Engineering Cost Estimate
Blower Filters cost	$12,656 every 1 year(s)	QSTP Engineering Cost Estimate
Inlet Works cost	$12,877 every 1 year(s)	QSTP Engineering Cost Estimate
Centrifuge – minor cost	$11,000 every 2 year(s)	QSTP Engineering Cost Estimate
Centrifuge – major cost	$31,000 every 5 year(s)	QSTP Engineering Cost Estimate
Clarifier and WAS Thickener cost	$4,800 every 2 year(s)	QSTP Engineering Cost Estimate
Major lifecycle replacement cost		
Mechanical plant replacement cost	$25,277,135 ($ nominal) in FY 2045	QSTP Engineering Cost Estimate

Total lifecycle replacement costs are estimated at $28.7 million across the 30-year operating term, with mechanical replacement reflecting the majority of this, at $25.3 million in FY2045.

CPI escalation has been applied to the above costs in line with estimated timing of spend.

Figure 19 and Figure 20 below show the anticipated spend profile (quantum and timing of spend) for each of the replacement cost items in Table 20.

*Figure **19**: Profile of lifecycle replacement costs*

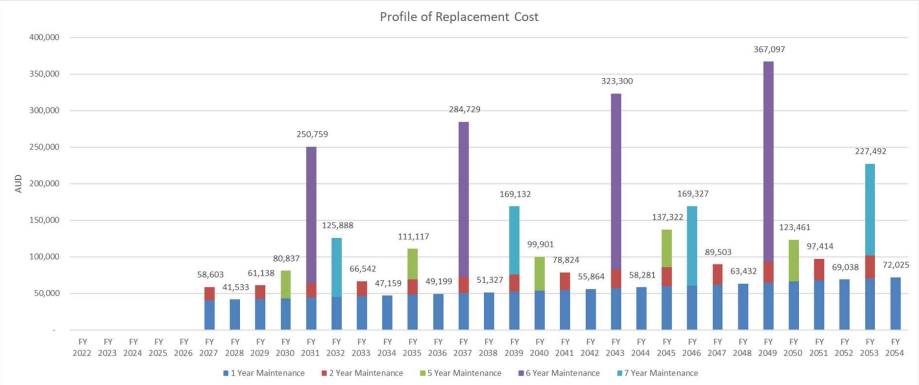


*Figure **20**: Profile of Maintenance Costs*

Sensitivity: General

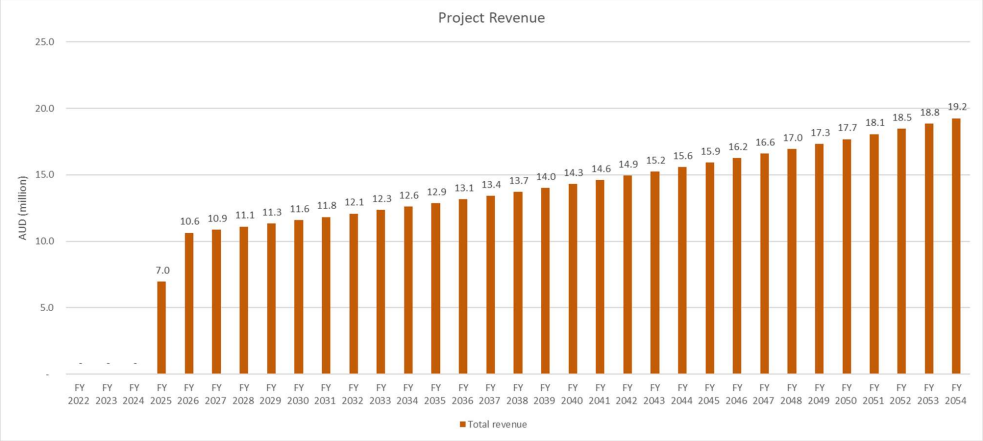
Revenue requirement

The approach to the financial appraisal was to determine the revenue required to cover all costs of the project, including debt service. QPRC has advised no return would be required on its equity contribution.

Therefore, the financial model was used to solve backwards for a year one revenue, that when escalated at CPI over the operating term, would meet all project costs as outlined in the preceding sections, and result in a net cumulative cash position of zero.

Under this scenario, required revenues would be approx. $10.6 million (nominal) in FY2026, being the first full year of operations, escalating to $19.2 million by FY2054. See Figure **21** below.

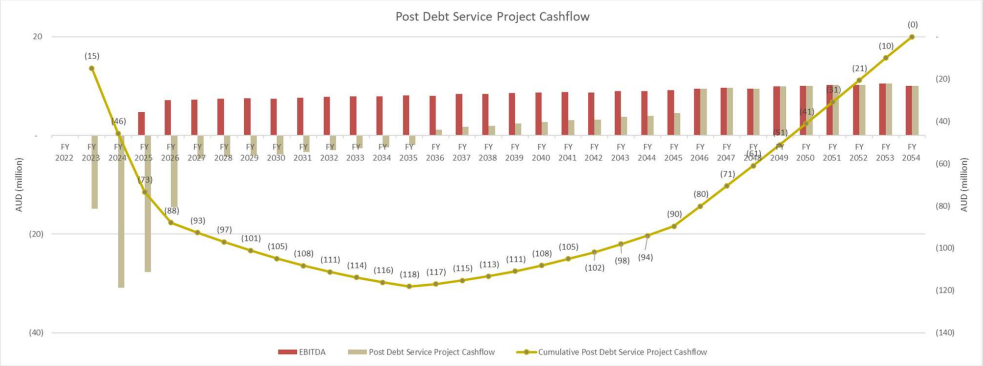
*Figure **21**: Revenue across model period*



However, in looking at year-on-year post debt service cash flows of the project under this revenue scenario, the first several years of the QSTP's operating period would see negative cash flow outcomes which would not be practically sustainable. Figure **22** below demonstrates this.

*Figure **22**: Post debt service nominal and cumulative cash flow*

Sensitivity: General

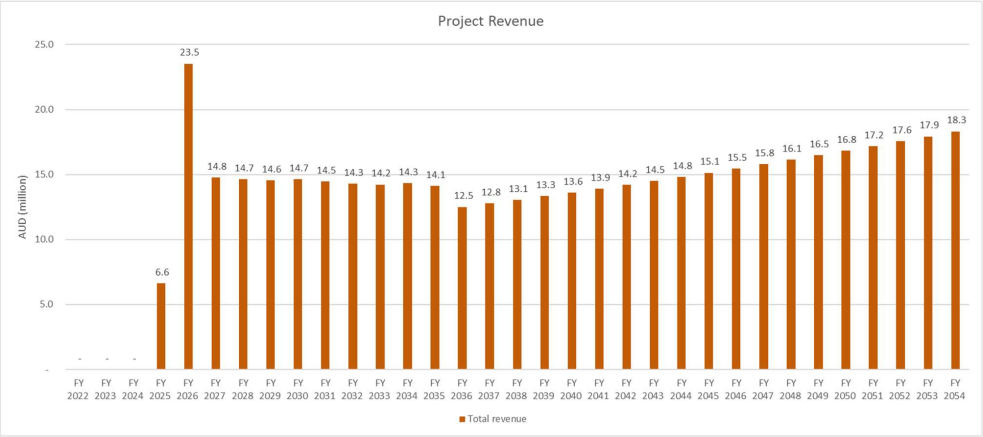


The cumulative negative cash flow during the operating period based on this revenue scenario is anticipated to be approx. $31.9 million. If additional upfront funding was available to the project in this amount (e.g., by way of a capital grant), then no further adjustment to revenue would be required.

In the absence of an upfront grant, an uplift was applied to revenues between FY2025 and FY2035 to ensure a minimum breakeven cash position was achieved across these years.

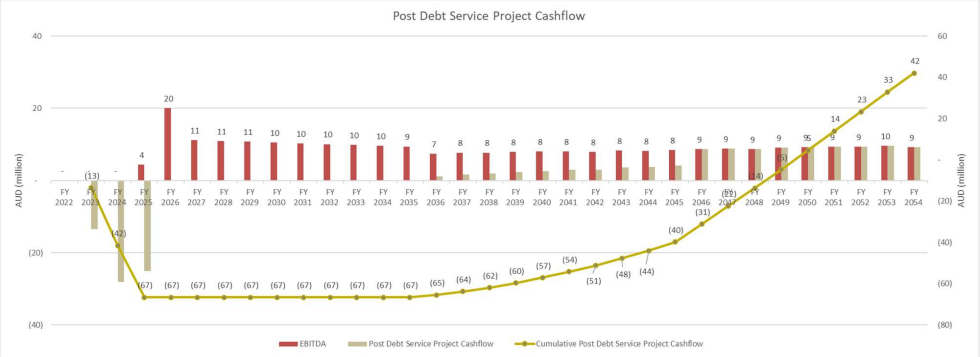
Figure 23 shows the revised required revenue profile after an adjustment is applied to the first 10 years of operations. Unless otherwise financed by QPRC, household levies would likely be higher in the QSTP's first 10 years as a result, then reduce over time as the revenue adjustment is no longer required and as the number of households in the QPRC catchment grows over time.

*Figure **23**: Revenue across model period – uplift across FY2025 and FY2035*



The resulting post debt service cash flow is shown in Figure **24** and demonstrates the project would not generate negative cash flow during the operating period.

*Figure **24**: Post debt service nominal and cumulative cash flow – after applying revenue adjustments in first 10 years*



Given upwards revenue adjustments in the first 10 years of operations, the project would accumulate approximately $42 million of cash by the end of the 30-year operating term. While it would be possible to reduce rates (and therefore project revenue) in the final 10 or so years to achieve an aggregate project cash flow position of zero, it may be prudent to allow the project to generate this anticipated surplus to provide ability to deal with any risk events that may occur, or else to undertake necessary lifecycle upgrades required at or soon after FY2054.

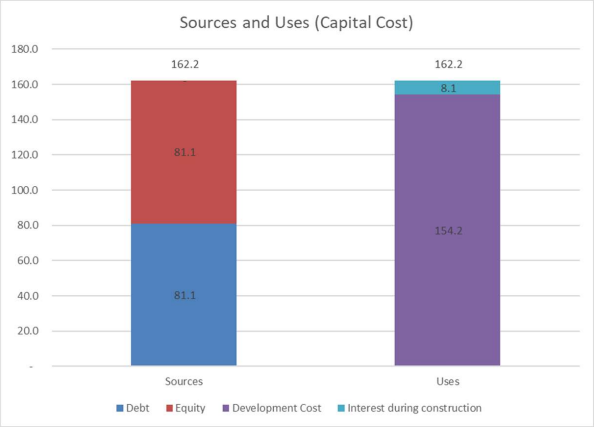
Outcomes of financial appraisal

The total capital cost for this project is estimated at $162.2 million with the equity portion of 50% amounting to $81.1 million.

The project would need to generate aggregate revenues of $449.8 million over its life, realised through levies charged to households in the QPRC catchment, in order to cover all operating expenses, lifecycle replacement costs and debt service obligations.

There may be opportunity to reduce the revenue requirement and resulting household rates. Specifically, in the event funding from the NSW and ACT governments is made available, QPRC would be able to reduce the amount of upfront debt financing employed. This in turn would reduce the associated debt service obligations during the operating term, resulting in lower required revenues and lower rates to households in the QPRC catchment.

*Figure **25**: Sources and uses of financing*



Sensitivity analysis

Due to the early stage of project development, a detailed sensitivity analysis has been completed to understand the impact that uncertainties around the project and its parameters may have.

Table **23** summarises the sensitivity analysis undertaken with respect to the Base Case, as presented above (Figure **24**), and applying a WACC of 5.9%. The analysis demonstrates the project's revenue requirement and funding shortfall are most sensitive to movements in capital costs.

Table 23: Sensitivity analysis ($ nominal, unless otherwise stated)

Sensitivity	Project NPV	FY2025 revenue	FY2026 revenue	Aggregate revenue	Funding shortfall
Central Case	($57.2m)	$6.6m	$23.5m	$449.8m	$0.0m
WACC (+2%)	($67.9m)	$6.6m	$23.5m	$449.8m	$0.0m
WACC (-2%)	($37.7m)	$6.6m	$23.5m	$449.8m	$0.0m
Capital Costs (+20%)	($69.1m)	$7.4m	$27.5m	$505.4m	$14.3m
Capital Costs (-20%)	($45.3m)	$5.9m	$19.6m	$394.1m	$0.0m
Maintenance and Operating Costs (+20%)	($56.8m)	$7.2m	$24.3m	$484.1m	$0.0m
Maintenance and Operating Costs (-20%)	($57.6m)	$6.0m	$22.8m	$415.4m	$0.0m

6.5 Financial Impact Statement

QPRC has prepared an Integrated Water Cycle Management (IWCM) Plan for Queanbeyan. The NSW IWCM strategic planning instrument provides a framework for Council to determine long-term strategic planning for water and wastewater management. The IWCM only addresses the QSTP catchment of the former Queanbeyan City Council (QCC) local government area (LGA) as the Palerang LGA already has separate IWCM strategies.

The IWCM includes a financial analysis to assess the impact of the proposed water and sewer capital expenditure programs on the financial position of the Council over a thirty-year period. The IWCM financial analysis identifies the impact to the water and wastewater typical residential bill (TRB) to deliver the service. The analysis also considered the forecast cashflow and account balances under external funding scenarios for including 0%, 25% and 50%CPI sewer charge rises with no loans, 6.5% sewer charge rises for 5 years with no loans and sewer charge rises 6.5% for 5 years with $110m loans for specific QSTP asset support only.

The IWCM recommends that:

- Balance of SSWP grant funding of $0.3M in 2024/25
- Loan funding in the sewer fund of $110M over the two-year period 2025/26 and 2026/27 (ie $55M each year)
- Sewer charge increases across two stages: initially annual increases of 6.5% for 5 years followed thereafter by annual rate increases aligned to the consumer price index (CPI).
-

A Financial Impact Statement (FIS) for the proposed funding model is displayed figureTable **24** below. This statement aims to ascertain the budget impact for the current financial year and five subsequent forecast financial years. It is based on the impacts to the entire sewer fund.

In interpreting the FIS, the following should be noted:

- All monetary values are escalated (i.e. reflect nominal values)
- 'Future years' are for the period FY2024 to FY2053
- The profile of project costs in forecast years is subject to change in line with actual population growth in QPRC's catchment
- All project costs include contingency and reflect P90 outcomes, and

- Depreciation costs have not been included as this is a non-cash item.

Sensitivity: General

*Table **24**: Financial Impact Statement ($m nominal, reflects P90 costs)*

Sewer Chgare Rise		Year	Open Balance	Transfer to (-) / from (+) Sewer Account	Adjusted Balance 1	Interest Earnt Reserve	Interest Earnt Working	Grant Funding	Adjusted Balance 2	Loans	Repayment	Closing Balance
Adjust here												
4.50%	0	2022/23	0	0	0	0	150,000	1,350,000			0	0
6.50%	1	2023/24	62,000,000	3,528,068	65,528,068	1,965,842	150,000	1,050,000	68,693,910		0	68,693,910
6.50%	2	2024/25	68,693,910	-18,261,123	50,432,787	1,512,984	150,000	300,000	52,395,770		0	52,395,770
6.50%	3	2025/26	52,395,770	-72,920,240	-20,524,469	0	150,000	0	-20,374,469	55,000,000	0	34,625,531
6.50%	4	2026/27	34,625,531	-61,897,828	-27,272,297	0	150,000	0	-27,122,297	55,000,000	-4,795,151	23,082,552
6.50%	5	2027/28	23,082,552	566,874	23,649,426	709,483	150,000	0	24,508,909	0	-9,590,301	14,918,607
3.00%	6	2028/29	14,918,607	10,304,663	25,223,270	756,698	150,000	0	26,129,968	0	-9,590,301	16,539,667
3.00%	7	2029/30	16,539,667	11,144,928	27,684,595	830,538	150,000	0	28,665,133	0	-9,590,301	19,074,832
3.00%	8	2030/31	19,074,832	5,345,724	24,420,556	732,617	150,000	0	25,303,173	0	-9,590,301	15,712,871
3.00%	9	2031/32	15,712,871	11,408,850	27,121,722	813,652	150,000	0	28,085,373	0	-9,590,301	18,495,072
3.00%	10	2032/33	18,495,072	14,142,274	32,637,346	979,120	150,000	0	33,766,467	0	-9,590,301	24,176,166
3.00%	11	2033/34	24,176,166	14,717,350	38,893,516	1,166,805	150,000	0	40,210,321	0	-9,590,301	30,620,020
3.00%	12	2034/35	30,620,020	15,171,423	45,791,443	1,373,743	150,000	0	47,315,186	0	-9,590,301	37,724,885
3.00%	13	2035/36	37,724,885	18,543,654	56,268,539	1,688,056	150,000	0	58,106,595	0	-9,590,301	48,516,294
3.00%	14	2036/37	48,516,294	23,050,068	71,566,362	2,146,991	150,000	0	73,863,353	0	-9,590,301	64,273,051
3.00%	15	2037/38	64,273,051	23,975,443	88,248,494	2,647,455	150,000	0	91,045,949	0	-9,590,301	81,455,648
3.00%	16	2038/39	81,455,648	25,389,897	106,845,545	3,205,366	150,000	0	110,200,911	0	-9,590,301	100,610,610
3.00%	17	2039/40	100,610,610	27,328,464	127,939,073	3,838,172	150,000	0	131,927,246	0	-9,590,301	122,336,944
3.00%	18	2040/41	122,336,944	4,799,050	127,135,994	3,814,080	150,000	0	131,100,074	0	-9,590,301	121,509,773
3.00%	19	2041/42	121,509,773	29,702,303	151,212,075	4,536,362	150,000	0	155,898,438	0	-9,590,301	146,308,136
3.00%	20	2042/43	146,308,136	29,424,302	175,732,439	5,271,973	150,000	0	181,154,412	0	-9,590,301	171,564,111
3.00%	21	2043/44	171,564,111	23,173,372	194,737,483	5,842,124	150,000	0	200,729,607	0	-9,590,301	191,139,306
3.00%	22	2044/45	191,139,306	25,148,332	216,287,638	6,488,629	150,000	0	222,926,267	0	-9,590,301	213,335,966
3.00%	23	2045/46	213,335,966	33,831,765	247,167,730	7,415,032	150,000	0	254,732,762	0	-9,590,301	245,142,461
3.00%	24	2046/47	245,142,461	36,322,559	281,465,021	8,443,951	150,000	0	290,058,971	0	-4,795,151	285,263,821
3.00%	25	2047/48	285,263,821	40,349,609	325,613,429	9,768,403	150,000	0	335,531,832	0	-2,281,436	333,250,397
3.00%	26	2048/49	333,250,397	42,867,780	376,118,176	11,283,545	150,000	0	387,551,721	0	-2,281,436	385,270,286
3.00%	27	2049/50	385,270,286	38,100,945	423,371,231	12,701,137	150,000	0	436,222,368	0	-2,281,436	433,940,932
3.00%	28	2050/51	433,940,932	41,667,665	475,608,597	14,268,258	150,000	0	490,026,855	0	-2,281,436	487,745,419
3.00%	29	2041/52	487,745,419	20,318,414	508,063,833	15,241,915	150,000	0	523,455,748	0	-2,281,436	521,174,312
3.00%	30	2052/53	521,174,312	48,299,244	569,473,556	17,084,207	150,000	0	586,707,762	0	-1,380,658	585,327,104

7. COMMERCIAL ANALYSIS

7.1 Procurement and Delivery Strategy

A Procurement Plan for the project was prepared in June 2020 as part of the PLAN phase of project delivery and has been reviewed as the project progressed. The Procurement Plan considered alternative delivery systems that were suitable for the characteristics and risks of delivering this project. The adopted procurement strategy is summarised in Table 25.

The key features of the procurement strategy are:

- The project will predominantly be delivered using a single contract using a Design – Bid – Build delivery approach.
- A Detailed Design will be prepared to document the project technical requirements and facilitate review by regulatory stakeholders
- The project will be delivered using a Construct Only contract using a Principal Contractor
- Council undertake early engagement with suppliers and award contracts for supply of equipment without installation for key equipment with equipment to be installed by the Principal Contractor
- Council will nominate subcontractors in selected specialist areas to be engaged and managed by the Principal Contractor
- New South Wales Government GC21 General Conditions of Contract will be used for the contract
- Council will invite open Expressions of Interest for the purpose of establishing a list of three prequalified tenderers (with a reserve) who will be invited to tender for the Construct Only contract.
- The prequalified tenderers will participate in an Early Tender Involvement process consisting of a small number of briefing workshops to ensure appropriate allocation of risk (technical and commercial) and address constructability issues.
- Tenders for the Construct Only contract will be evaluated based on price and non-price evaluation criteria.
- Equipment supply contracts will be novated to the Principal Contractor
- Contract supervision and technical support by QPRC and Hunter H2O.

Table 25: Summary of the QSTP procurement strategy

	Item	Adopted Strategy
Design	Contract system	Detailed design and construct only by a principal contractor
	Equipment selection	QPRC will use an early vendor engagement approach to select key equipment for the works: • An open tender will be used to invite tenders for key equipment packages • Equipment suppliers will be engaged using AS 4911 General conditions of contract for the supply of equipment without installation • Suppliers will provide certified equipment data that will be included in the design and operating system for the plant • Equipment supply contracts will be novated to the principal contractor under the construction contract for installation, testing and commissioning.
	General conditions of contract	GC21
Tender	Tendering	2-stage tender with an EOI to establish a panel of prequalified contractors who will be invited to submit tenders for construction of the works.

		A targeted early tenderer involvement (ETI) phase will be held prior to requesting a priced tender. The ETI phase is to assist briefing selected tenderers on the works and to ensure appropriate allocation of technical and commercial risk and address constructability issues.
Construction	Staging / early works	There are opportunities for early work. Identified early works packages that provide advantage to QPRC: • Equipment Supply Packages (noted above) – there is opportunity for QPRC if required to accelerate program by commencing fabrication of key equipment. • Realignment of High Voltage power lines • Installation of upgrade to ICON potable water supply • Removal of existing waste and asbestos from site • Service diversions (water/communications/broadband)
	Subcontractors	Consideration will be given to nominating a limited number of subcontractors where there is overall advantage to the project, for example: • Pre-approval of a panel of concrete providers • Nomination of QPRC telemetry provider panel • Nomination of specialist subcontractors such as protective coatings
	Construction resources	Construction contract supervision, quality control, inspections and engineering support. Training and commissioning support.

Early Vendor Engagement

As part of the procurement strategy, QPRC will use an early vendor engagement approach to select key equipment that will form part of the ungraded sewage treatment plant. This approach gives QPRC control over the selection of equipment that they will own and operate and provides an open and competitive procurement process for equipment suppliers.

As part of the early vendor engagement approach:

- Procurement for key equipment packages will be undertaken in accordance with QPRCs Procurement Policy by either an open tender or Request for Quotation
- QPRC will assess equipment supply tenders and select equipment suppliers
- Equipment suppliers will be engaged by QPRC using AS4911 General Conditions of Contract for the Supply of Equipment Without Installation
- Suppliers will provide certified equipment data for the selected equipment that will be incorporated in the detailed design and operating system for the plant
- Equipment supply contracts will be novated to the principal contractor under the construction contract for installation, testing and commissioning.

The equipment supply packages identified for early vendor engagement are identified in Table 26. QPRC has already entered into several of these contracts.

Table 26: Early vendor engagement equipment supply packages

Proposed Equipment Supply Package	Procurement Method	Status
Screening and screening washing equipment	Open tendering	Contract awarded to Hydroflux Epco Pty Ltd
Grit removal and grit washing equipment	Open tendering	Contract awarded to VoR Environmental Australia Pty Ltd
Bioreactor and digester aeration, mixer systems and air scour blowers equipment	Open tendering	Contract awarded to Xylem Water Solutions Australia Limited
Clarifier equipment	Open tendering	Contract awarded to Hydroflux Epco Pty Ltd
Scum harvester equipment	Open tendering	Contract awarded to VoR Environmental Australia Pty Ltd
UV disinfection equipment	Open tendering	Contract awarded to Xylem Water Solutions Australia Limited
WAS thickener equipment	Open tendering	Contract awarded to Hydroflux Epco Pty Ltd
Chemical dosing skid equipment	Open tendering	Contract awarded to Trility Solutions Australia Pty Ltd
Centrifuge equipment	Open tendering	Contract awarded to GEA Westfalia Separator Pty Ltd
Lime silo and dosing equipment	Open tendering	Not yet advertised
Chemical storage tanks	3 written quotes via formal RFQ process. May be publicly advertised.	Not yet advertised
Diesel storage and conditioning system	3 written quotes via formal RFQ process. May be publicly advertised.	Not yet advertised

8. PROJECT MANAGEMENT

8.1 Project Management, Program and Milestones

Project framework

The Project is being delivered in accordance with QPRC's Project Framework. The Project Framework is consistent with a gateway approach to project delivery with completion of the project in five phases as outlined in Figure 26. The initial phases of Identify and Plan have been completed and work is proceeding on the Develop phase.

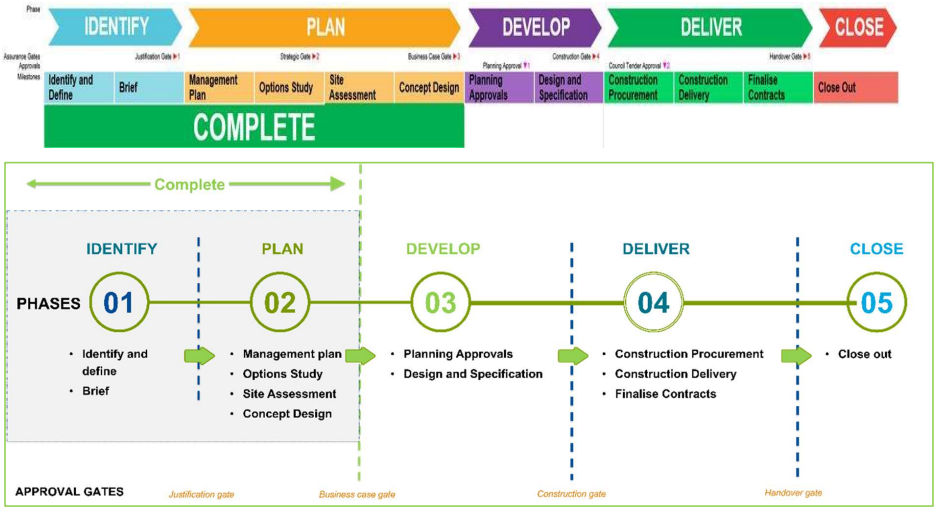


Figure 26: Project stages and progression

Figure 27 provides further details of the current project activities. The project is currently seeking planning approval for the Development Application (DA) and completing detailed design and tender documentation to enable construction tendering to commence.

Sensitivity: General

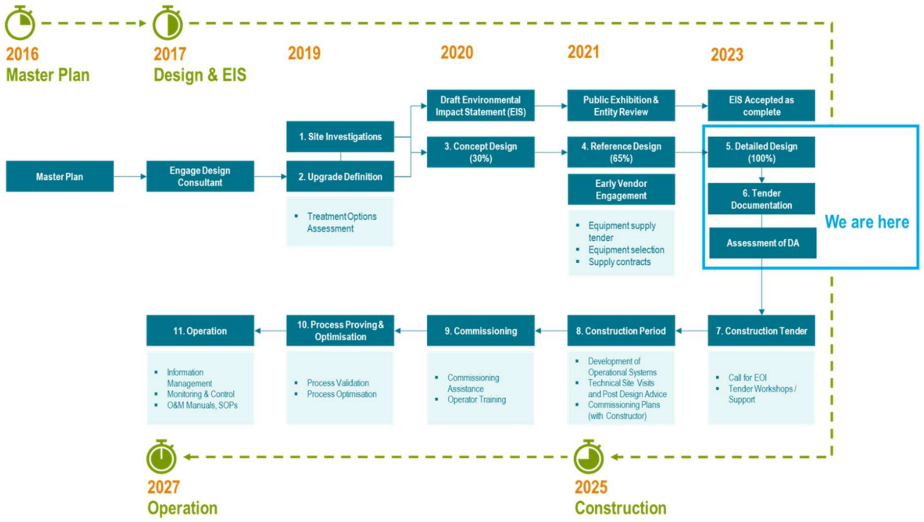


Figure 27: Project Activity Timeline

Milestones

Major project milestones are shown in Table 27.

Table 27: Project milestones

Project Milestones	Target Completion Date	Completion Date
Concept Design complete		Jun 2020
Environmental Impact Statement (EIS) Approval		28 June 2023
Detailed Design and Tender Documentation complete	Dec 2024	
ACT UTR D&C Operating Certificate issued	Jan 2024	
Development Application approval	Dec 2025	
NSW DPE Section 60 approval	Dec 2024	
ISC Design Rating obtained	Dec 2024	
Construction Contract award	Jul 2025	
Plant commissioning complete	Jul 2027	
ACT UTR Provision of Service Operating Certificate issued	Jul 2027	
Maturation pond decommissioning, landscaping and project completion	Jan 2028	
ISC As-built Rating obtained	Mar 2028	

Construction phase resource plan

The construction of the QSTP upgrade will be undertaken by a Principal Contractor. QPRC's Projects and Contracts team will manage the construction phase with contract management and technical support from consultants. QPRC's Utilities team will continue to operate the existing QSTP throughout construction and will participate in training and commissioning of the new facility.

QPRC's resource plan for the construction and commissioning phase is summarised in Table 28.

Table 28: Construction phase resource plan

Role	Tasks	Resource	Timing
Project Management	• Project management • Project reporting • Consultant contract administration • Coordination with Regulators • Coordination of stakeholder and community engagement • Coordination with internal QPRC functions	QPRC QSTP Project Manager	Duration of construction
Principal's Senior Executive	• Input to GC21 contract requirements as required	QPRC Manager, Contracts and Projects	Duration of construction
Principal's Approved Person (PAP)	• Contract management – management of the GC21 contract on behalf of the Principal. • Manage communications, RFI, meetings, issuing instructions, release of hold points • GC21 monthly meeting and minutes • Assessment of payment claims etc. • Progress reporting	QPRC and consultant resources	Duration of construction
Project/Contract Administration Support	• Administration • Record keeping	QPRC and consultant resources	Duration of construction
Site Engineer	• Assist PAP	QPRC and consultant resources	Duration of construction
Site Surveillance	• Site surveillance and records	QPRC and consultant resources	Duration of construction
Survey	• Record construction progress • Review of Contractor survey submissions • Input to works as executed documentation	Consultant / Subcontractor	Duration of construction
Existing STP Operations Liaison	• Coordinate interface with existing operation • Site access to existing STP • Interruptions to service • Input to selected RFI • Review of cut-over plans / commissioning	QPRC – Utilities Team	Duration of construction

Role	Tasks	Resource	Timing
	• Coordination of attendance of operator training • Preparation for asset handover to operations team		
Owner's Engineer	• Site liaison with QPRC contract management • Verification that construction conforms to the design • Change management • Respond to contractor RFI • Clarifications / advice • Attend GC21 monthly meetings • Visual records / dilapidation • Management of ISC data • Review of shop drawings • Witness hold-point inspections • Factory acceptance testing • Site acceptance testing • WAC – As built drawings	Hunter H2O through existing contract	Duration of construction
Testing and Commissioning Decommissioning of existing STP	• Prepare commissioning plan • Witness the testing and pre-commissioning by Contractor • Facilitate proof of performance testing • Assist in process optimisation • Oversight of decommissioning of the STP • Training	Hunter H2O commissioning team QPRC operations staff Contractor resources (leading hand, mechanical, electrical, automation)	Testing and pre-commissioning during construction Commissioning (3-4 month cut-over, commissioning & proof of performance period)

8.3 Project Governance

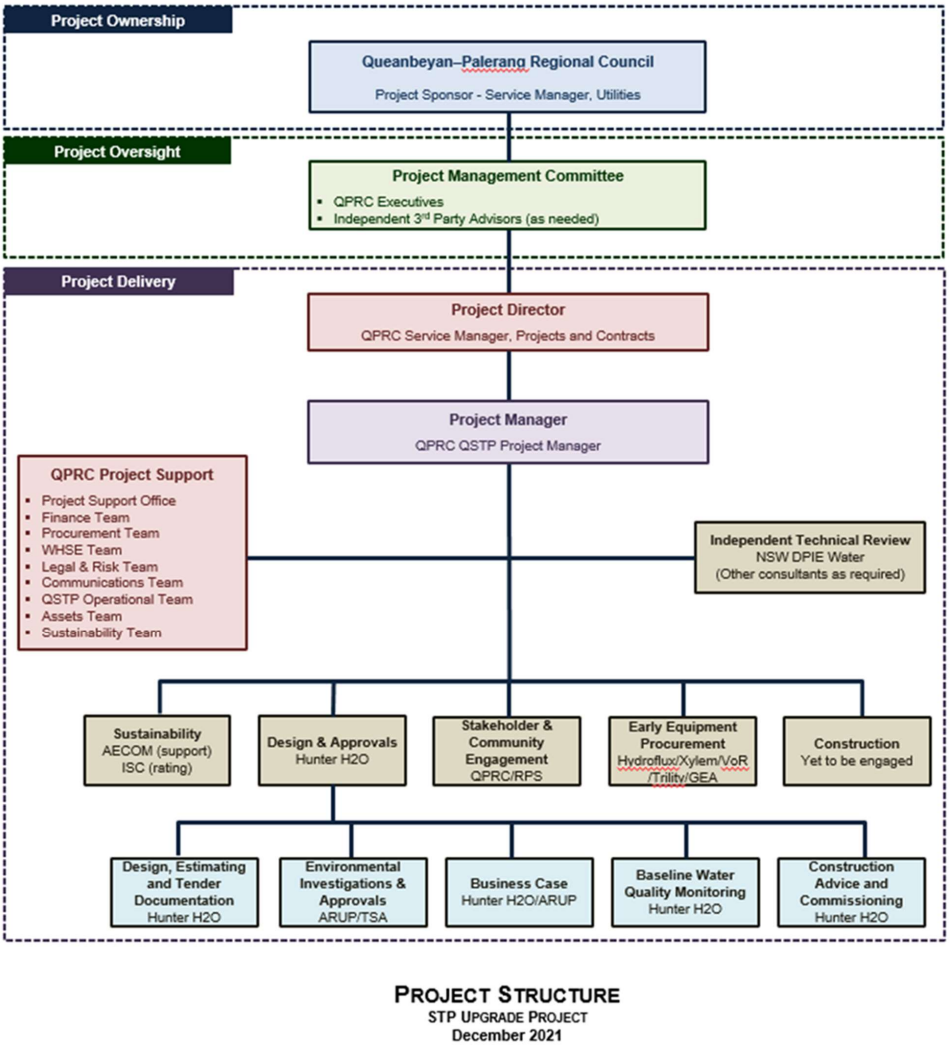


Figure 28: Project governance structure

Figure 28 illustrates QPRC's governance structure for the project.

QPRC's Service Manager Utilities is responsible for the delivery of sewer services including operation and maintenance of the Queanbeyan STP and management of the Queanbeyan sewer fund. The Service Manager Utilities holds the role of Project Sponsor. As Project Sponsor, the Service Manager Utilities is responsible for directing the scope and requirements of the project and approving acceptance of assets within this area.

Project delivery is provided by QPRC's Contracts and Projects service area, who have appointed a Project Director and Project Manager for project delivery.

QPRC has engaged several consultants to assist in delivering the project. These engagements include:

- Hunter H2O to complete the QSTP upgrade design, approvals, technical construction input and commissioning
- AECOM to oversee the ISC design and as-built ratings submissions
- RPS to assist with community engagement.

QPRC will also engage a competent contractor for QSTP upgrade construction.

A Project Management Committee provide oversight of the project including reviewing progress, project issues and changes.

The ACT Utilities Technical Regulation requires QPRC to appoint an Independent Certifier for the project. The NSW Department of Planning and Environment Water Group has agreed to fulfil this role in parallel with their technical review role as part of the NSW Local Government Act Section 60 approval process.

Project roles and responsibilities are further detailed in Table 29.

Table 29: Project roles and responsibilities

Role	Personnel	Responsibilities
Queanbeyan-Palerang Regional Council	Councillors (via Council Meeting)	• Approve budget and funding • Approve engagement of service providers (consultants / contractors) engaged by tender • Approval of dealings in land
Project Management Committee (PMC)	Council Executive	• Reviewing and approving project deliverables where required by the Project Framework • Approve project budget allocation • Approve gateway and hold point release recommendations • Point of escalation for matters raised by Project Director • Resolve issues outside the Project Director's delegated authority
QPRC Project Sponsor	Service Manager – Utilities, Gordon Cunningham	• Endorsing the project scope definition • Endorsing changes to the project scope • Endorsing the Basis of Design • Reviewing deliverables • Liaising with regulators • Approving asset acceptance process (for assets within their control)

Role	Personnel	Responsibilities
QPRC Project Director	Service Manager – Projects and Contracts, Derek Tooth	• Overseeing delivery of the Project in accordance with QPRCs Project Framework and the QPRC Project Sponsor's requirements • Monitoring project performance • Establish project delivery structure and strategy • Establish project goals and KPIs • Facilitate gateway and hold point reviews and recommend release • Approve communications with external stakeholders and community • Approve project expenditures and cash flow • Approve changes to delivery strategy / approach, scope, schedule, budget • Ensure project controls are implemented and maintained (time, cost, quality, risk) • Approve acceptance of project deliverables (on recommendation by Project Manager) • Point of escalation for matters raised by Project Manager • Resolve issues outside the Project Manager's delegated authority

Role	Personnel	Responsibilities
Project Manager	QSTP Project Manager, Simon Boulton	• Delivering the project in accordance with the requirements of the Project Framework and the Project Management Plan • Focal point of all communication • Ensuring that the Project Sponsor, Project Director and PMC are consulted in accordance with the requirements of the Project Framework • Prepare risk-based project budgets and submit for review and approval • Procure service providers as needed • Administer service provider contracts • Ensure service providers comply with Council policies (including Environment, QA, WHS, Sustainability, Procurement) • Undertake audits and reviews in compliance with approved assurance plans • Approve tender evaluation reports and prepare report to Council for resolution • Plan, coordinate, oversee service provider inputs (timetable, cashflow, outputs etc) • Prepare, implement and manage the approved risk management plan • Oversee (as needed) third party technical reviews • Review and recommend endorsement (acceptance) of project outputs • Monitor and report project progress performance to the Project Director • Prepare gateway and hold point release documents • Prepare regulator approval applications / documents • Oversee / coordinate sustainability reviews • Oversee / coordinate stakeholder and community engagement • Ensure project achieves appropriate sustainability outcomes • Ensure project outputs comply with approved objectives and KPIs
Key QPRC Project Support Staff	Sponsor Representative Utilities, Brenden Belcher Sponsor Representative Operations, Victoria Corling Assets Specialist, Andrew Grant Sustainability Project Officer	• Providing speciality support to the team • Reviewing and advising on Design • Reviewing and advising on assets acceptance process • Reviewing and advising on proposed changes in scope • Providing advice from the IWCM to support the project Business Case • Assisting with the provision of information to support the sustainability ratings

Role	Personnel	Responsibilities
Design, Approvals, Technical Construction Input and Commissioning	Hunter H2O	Design consulting services including: • Site Investigations • Basis of Design • Concept Design • Reference Design • Detailed Design • Regulatory Approvals • Tender Documentation • Tender Period Services • Construction Phase Services • Baseline Water Quality Monitoring
Sustainability Rating Authority	Infrastructure Sustainability Council	• Provide Design and As-Built sustainability ratings assessment
Sustainability Rating Support Services	AECOM	• Assist and advise QPRC to obtain Infrastructure Sustainability Council Design and As-Built ratings
Independent Technical Review	NSW DPE, Water - Utilities	• NSW Section 60 approval • Independent Certifier for the ACT Utilities Technical Regulator Design and Construct Operating Certificate
Community Engagement Consultant	QPRC Engagement Team assisted by RPS	• Undertake community engagement activities as directed by the Project Manager • Maintain complaints register • Maintain project website • Provide customer service first point of enquiry • Prepare and assist in implementing the Stakeholder and Community Engagement Plan • Provide progress reports as directed by the Project Manager
Contractor	TBA	• Construct the works, including completing any design, as required • Provide progress reports as directed by the Project Manager

8.4 Asset Ownership and Management Plan

Asset Management

The project is being delivered in accordance with QPRCs Asset Management Policy, Capital Work Projects Asset Information Requirements Directive and Sewerage Asset Management Plan.

The key elements of infrastructure asset management identified in the Sewerage Asset Management Plan are:

- Taking a life cycle approach
- Developing cost-effective management strategies for the long term
- Providing 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.

Additionally, QPRC is giving consideration to the following elements in delivering this project:

- Whole of life costs, including option, equipment and materials selection
- Deconstruction, disassembly and adaptability of infrastructure in the future
- Robustness and reliability
- Compatibility with QPRCs existing fleet
- Ability of QPRC to operate equipment.

The project will produce the following deliverables to assist with management of the assets in the future:

- Decommissioning plan for the existing STP
- Operation and maintenance manuals for the new STP, including operator training
- Work as executed documentation, including an asset schedule and capitalisation costs
- Deconstruction plan for the new STP.

Assets

The asset register in Table 30 shows details of the asset owner, operator and maintainer for all assets delivered through this project. The register also identifies assets that will be retired as a result of the project.

QPRC are the owners, operators and maintainers of the existing QSTP and will be for the proposed QSTP upgrade.

Assets that will be retired as part of the project include the three maturation ponds located within the extents of the 1% annual exceedance probability (AEP) flood zone and are at risk of failure during flood events. The maturation ponds will not form part of the treatment process once the new treatment plant has been constructed and commissioned. As part of the upgrade project, it is proposed that the ponds (and their associated equipment) are decommissioned, and the area remediated to extend the riparian zone along the Molonglo Riverbank.

All current infrastructure associated with the existing STP will also be retired following commissioning of the new STP and deconstructed in a subsequent project. The land made available through the later decommissioning of the existing STP will be earmarked for an additional storm pond during a planned, future plant expansion.

The project impacts assets owned by others, including roads owned by the ACT Government, the electricity network infrastructure owned by EVO Energy and the potable water supply owned and operated by ICON Water.

Table 30: Asset register showing new and retired assets

Asset	Owner	Operator	Maintainer
New or upgraded assets			
Sewage Treatment Plan, including treatment process, roads, buildings, services, utilities and landscaping	QPRC	QPRC	QPRC
HV Electricity Network	Evo Energy	Evo Energy	Evo Energy
Upgraded Mountain Road (road reserve)	ACT Government (TCCS)	ACT Government (TCCS)	ACT Government (TCCS)
Upgraded Mountain Road (within proposed lease boundary)	QPRC	QPRC	QPRC
Nimrod Road (within proposed lease boundary)	QPRC	QPRC	QPRC
200mm potable water main to meter	ICON Water	ICON Water	ICON Water
Retired Assets			
Existing STP, including buildings and treatments processes	QPRC	n/a	n/a
HV electricity network	Evo Energy	n/a	n/a
Electricity supply to existing STP	QPRC	n/a	n/a
100mm potable water main to meter	ICON Water	n/a	n/a

8.5 Stakeholder Management Plan

QPRC has recognised the importance of engaging with its communities to deliver services and infrastructure, and collaboratively plan for the future. The *QPRC Sewage Treatment Plant Upgrade Project Stakeholder Communications and Engagement Plan* (RPS, 2022) has been prepared to set out the strategic approach the communications and public engagement tasks required to support the design, selection and commissioning of the upgraded STP. The plan ensures appropriate information and opportunities to contribute to project outcomes are available at each stage. The plan provides detailed action plans for each stage of the project that describe the audiences, tools, key messages, risks and timetable for delivering communications and engagement activities. The QPRC Community Engagement Team will oversee and approve the development of the detailed action plans. The plan will be revised and updated at critical project milestones to reflect feedback and learning from engagement activities.

Stakeholders

People, organisations and agencies who are directly or indirectly impacted by the project as well as agencies and institutions with regulatory or decision-making roles for the project and are presented in Table 31 and Table 32.

Table 31: External Stakeholders

Stakeholder	Interests or impacts arising from project
Political	
Federal Member Eden Monaro State Member for Monaro Mayor and Councillors QPRC Funding providers ACT Government	• Progress of the STP project • Management of community feedback and complaints • Ministerial requests relating to the project
Federal Government	
National Capital Authority	• Manages the water surface of Lake Burley Griffin and perimeter areas on National Land such as Commonwealth Park and the Parliamentary Triangle • Manages a comprehensive water quality program to monitor the environmental status of Lake Burley Griffin and advise users about changes in the water quality conditions arising from floods, droughts, elevated bacteria, and algal condition • Treated effluent discharged from QSTP may affect waterways managed by the NCA. • National Capital Plan • Australian Capital Territory (Planning and Land Management) Act 1988 • Commonwealth Places (Application of Laws) Act 1970-1973
Australian Government Department of Climate Change, Energy, the Environment and Water (DCCEEW)	• Custodian of the Environment Protection and Biodiversity Conservation Act 1999, which establishes a requirement for, and a system of, environmental assessment and approval by the Commonwealth government. • Consultation will be determined if there is a significant impact on matters of national environmental significance
State Government (ACT and NSW)	
Environment, Planning and Sustainable Development Directorate (EPSDD)	• Continued engagement in particular reference to the Environmental Impact Statement and Development Application. • Custodians of the Lake Burley Griffin Management Plan 2011 - Also now incorporates previous ACTPLA roles, such as

	governance of the Planning and Development Regulations 2008, the Heritage Act 2004, the Tree Protection Act 2005, and the ACT Territory Plan • EPSD maintains several roles in relation to the management of water, heritage, sustainability, and nature conservation in the ACT • Planning and Development Act 2007 • Planning and Development Regulation 2008 • ACT Territory Plan • Environment Protection Act 1997 • Environment Protection Regulation 2005 • Nature Conservation Act 2014 • Fisheries Act 2000 • Heritage Act 2004 • Lakes Act 1976 • Climate Change and Greenhouse Gas Reduction Act 2010 • Water Resources Act 2007 • Public Unleased Land Act 2013
ACT Utilities Technical Regulator (ACT UTR)	• Technical regulation is provided by the Technical Regulator under the Utilities (Technical Regulation) Act 2014. Technical regulation is concerned with the operation of utility services and the protection and maintenance of their networks. • Issues operating certificates under the Utilities (Technical Regulation) Act 2014.
ACT Environment Protection Authority (ACT EPA)	• Custodian of the Environment Protection Act 1997, which provides for the protection of the environment including heritage, noise, odour, waste, wastewater, air, contaminated sites, hazardous materials and water quality. • Key stakeholder for approval process • Continued engagement and consultation required
NSW Environment Protection Authority (NSW EPA)	• Custodian of the Protection of the Environment Operations Act 1997, which defines and specifies licence conditions. • Continued engagement as stakeholder for operation and activities in NSW.
ACT Waste Regulator	• Continued engagement with regard to operation of the existing composting facility until such time as this operation ceases
ACT Transport Canberra and City Services Directorate (TCCS)	• Continued engagement as stakeholder for the Mountain Road Upgrade and other aspects • Tree Protection Act 2005 • Waste Management and Resource Recovery Act 2016 • Waste Management and Resource Recovery Act 2017 • ACT Waste Management Strategy 2011-2025
ACT Health	• Consultation required as stakeholder • Custodian of the Public Health Act 1997 • Consultation with regard to public health aspects of reuse of recycled water offsite
ACT Economic Development Directorate	• Focus on land release and development, and works to facilitate business development, investment, sporting, tourism and events • Focused on economic performance of ACT and its link to the built environment

	• Consultation is required
NSW Health	• Referral in association with Recycled Water use and Section 60 under the Local Government Act • Continued engagement as stakeholder • Public Health Act 2010 • Local Government Act 1993 • Australian Guidelines for Water Recycling (AGWR) Phase 1, 2006
NSW Department of Planning, Environment and Industry (DPIE), including Crown Lands	• Continued engagement as stakeholder • Environment Protection and Biodiversity Conservation Act 1999 • Approval for modification of a sewage treatment plant under Section 60 of the Local Government Act 1993 • Interests in technical suitability and value for money • Provides terms and limits on approvals and the obligations for the construction of the project • Custodian of the Environmental Planning and Assessment Regulations 2000, which defines the nature of the infrastructure in terms of statutory obligations - Part 4 and Part 5. • Continued engagement as regulator • Local Government Act 1993 • Australian Guidelines for Water Recycling (AGWR) Phase 1, 2006 (if recycled water is produced)
NSW Cross Border Commissioner	• Consultation required due to cross-border nature of the STP Project • The office of the NSW Cross Border Commissioner identifies and helps resolve issues that occur by being located near a state border
Local Councils	
Queanbeyan-Palerang Regional Council	• Design, Construction and operation of the STP • Environmental management plans relevant to QPRC responsibility • Community Engagement Plan – design, construction • The project team management of feedback and complaints
Council committees: First Nations Consultative Committee Environment and Sustainability Advisory Committee	• Design, Construction and operation of the STP • Environmental management plans relevant to QPRC responsibility • Community Engagement Plan – design, construction
Affected Regional Utility Providers	
ActewAGL	• Concerns for network once constructed • Inform and involve in STP Upgrade Project
Indigenous Groups	
Aboriginal and Torres Strait Islander peoples Ngambri and Ngunnawal Local Communities as traditional owners of the land Buru Ngunnawal Aboriginal Corporation	• Management of previously identified heritage sites (if identified) • Management of heritage artefacts (if identified) • Construction and operational impacts on heritage sites (if identified)
Environmental Groups	
Molonglo Catchment Group Queanbeyan Landcare Inc	• Management of flora and fauna in accordance with environmental management plans and protected species management plans

	• Water quality monitoring plans and results • Future construction and operation impact on local flora and fauna
Local Community Groups	
Oaks Estate	• Nearby residents • Potential concerns about impacts such as visual, noise, dust, truck movements • Positive odour reduction as a result of the work
Oaks Estate Progress Association	• Provided comment on Heritage Report
Lake Burley Griffin Users Rowing ACT	• Recreation users of the Lake • Advocates for clean water
Canberra Anglers Association	• Fishing Club based in Canberra • Recreation and advocates for safe water ways
Queanbeyan residents and ratepayers Jerrabomberra Residents Association	• Cost of the project • Protection of water quality • Design construction and operation impacts of the STP e.g., traffic, vibration, visual, amenity, flora and fauna (if any) • Management of Molonglo River and rehabilitation of current site • Continued engagement and consultation are required.
Friends of Jerrabomberra Wetlands	• Collaborate with local residents and conservation, management, heritage, education, Aboriginal and Torres Strait Islander, and recreational groups in the restoration and maintenance of the wetlands.
Capital Woodlands and Wetlands Conservation Trust / Jerrabomberra Wetlands	• Established to ensure the Mulligans Flat Woodland Sanctuary and Jerrabomberra Wetland Nature Reserve are sustainably managed to provide rich and diverse environments for current and future generations • Jerrabomberra Wetlands are near the STP site, therefore • there is potential for the discharge to impact these wetlands
Molonglo Catchment Group	• Molonglo Catchment Strategy 2004-2024 • Umbrella organisation for existing Landcare and other natural resource management organisation who facility and support local groups across the region.
Canberra Ornithologists Group	• Encourage interest in, and develop knowledge of, the birds of the Canberra region. • Promote and coordinate the study of birds and promote the conservation of native birds and their habitats
Waterwatch	• Part of a national community water quality monitoring program that brings together people from all parts of the community to raise awareness, educate, monitor, restore and protect waterways.
Business	
Canberra Airport	• Canberra airport is a key stakeholder, mainly interested in minimising bird strikes to aeroplanes • Communication and engagement is required
Media	
Queanbeyan Age/Chronicle Regional Independent Canberra Times	• STP Project Progress • STP Project Cost

ABC radio and television WIN TV City News Canberra Weekly Other radio channels	• Management of complaints • Design and environmental impacts on the STP project (if any)

Table 32: Internal Stakeholders

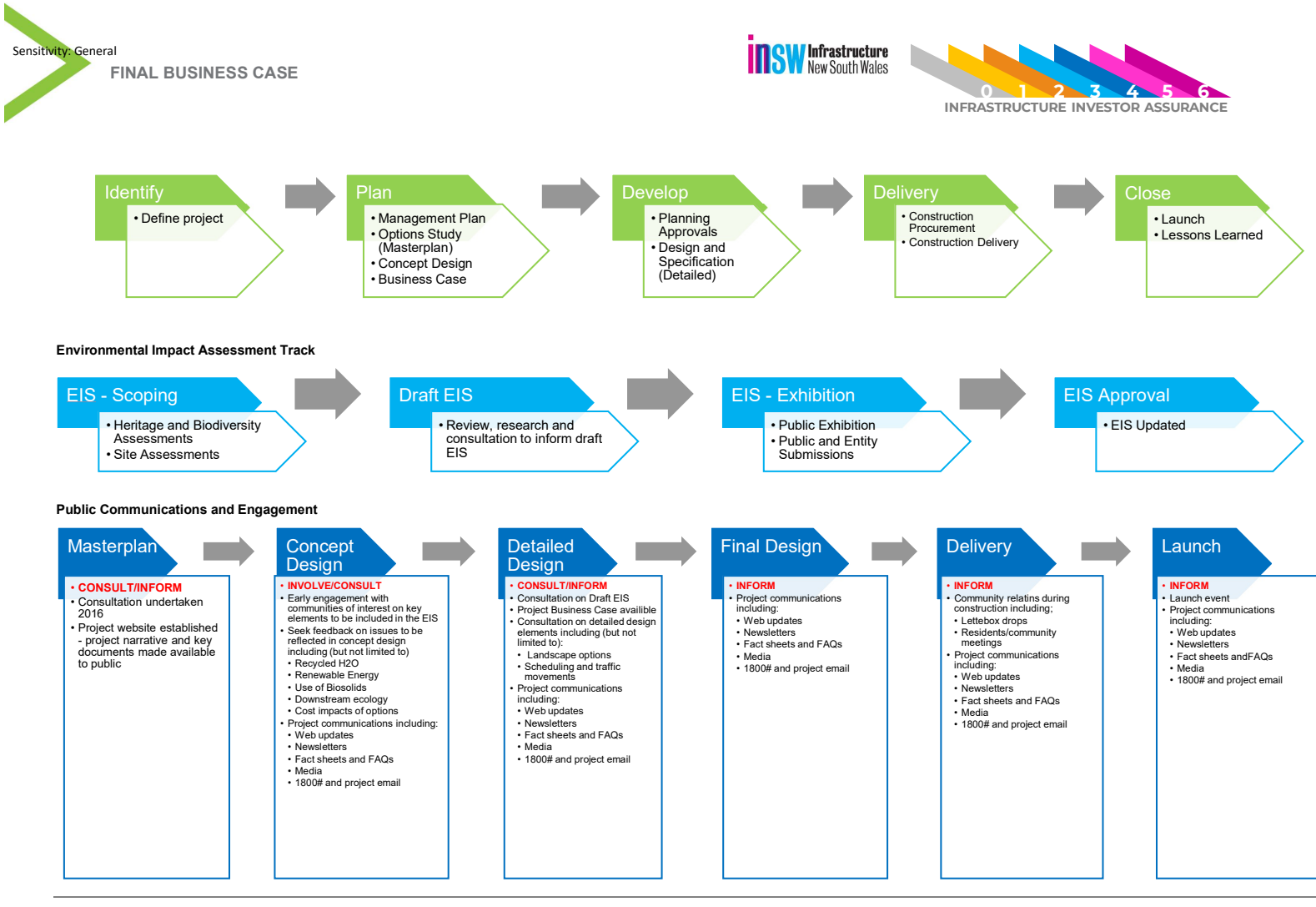
Stakeholder	Interest and responsibilities for the project
QPRC Staff	
Councillors	• Approval of scope & budget in Council's strategic, delivery and operational plans and as proposed in the business case • Progress of the STP (including time, cost and environment) • Acceptance of tenders • Management of community feedback and complaints
Sustainability Officer	• Designs meet ISC sustainability requirements • Progress of the STP (Including time, cost and environment)
Utilities Staff	• Ensure operations comply with relevant regulatory and STP project requirements • Ensure timely notification is provided to the project team/comms team on operational activities • Ensure the team understands their requirements with relation to engaging with the local community, stakeholders and media
Operators	• Ensure operations and training are efficient through transition of services • Be informed and involved of the STP design and construction
Project Support (Various)	• Provide advice and support on technical aspects of procurement, design, construction and operation of the STP project specifically regarding risk, WHS, audit, Environment and Finance
QPRC customer service staff	• Provided with adequate information to respond to simple enquiries (Q&A)
Service Manager, Finance Portfolio General Manager, Organisation Capability	• Responsible for financing of the project, including loans and grant acquittal
Service Manager, Workforce Portfolio General Manager, Organisation Capability	• Responsible for the management of QPRC staff, including the impact the new STP will have on current employees
QPRC staff	• Be informed of progress of the upgrade

Engagement Approach

The communications and engagement activities for the project are based on providing a clear and consistent project narrative and ongoing information is to build a sense of trust amongst stakeholders and the community.

The program diagram below shows the main communications and engagement activities planned for each stage of the project.

Project consultation during formation of the project included consultation during development of the Master Plan and Concept Design. Further consultation activities have been undertaken as part of the Environmental Impact Track which included public exhibition of the project Environmental Impact Statement and targeted engagement with interested stakeholders.


Sensitivity: General
FINAL BUSINESS CASE
Infrastructure New South Wales
0 1 2 3 4 5 6
INFRASTRUCTURE INVESTOR ASSURANCE
Identify
• Define project
Plan
• Management Plan
• Options Study (Masterplan)
• Concept Design
• Business Case
Develop
• Planning Approvals
• Design and Specification (Detailed)
Delivery
• Construction Procurement
• Construction Delivery
Close
• Launch
• Lessons Learned
Environmental Impact Assessment Track
EIS - Scoping
• Heritage and Biodiversity Assessments
• Site Assessments
Draft EIS
• Review, research and consultation to inform draft EIS
EIS - Exhibition
• Public Exhibition
• Public and Entity Submissions
EIS Approval
• EIS Updated
Public Communications and Engagement
Masterplan
• CONSULT/INFORM
• Consultation undertaken 2016
• Project website established - project narrative and key documents made available to public
Concept Design
• INVOLVE/CONSULT
• Early engagement with communities of interest on key elements to be included in the EIS
• Seek feedback on issues to be reflected in concept design including (but not limited to)
• Recycled H2O
• Renewable Energy
• Use of Biosolids
• Downstream ecology
• Cost impacts of options
• Project communications including:
• Web updates
• Newsletters
• Fact sheets and FAQs
• Media
• 1800# and project email
Detailed Design
• CONSULT/INFORM
• Consultation on Draft EIS
• Project Business Case availible
• Consultation on detailed design elements including (but not limited to):
• Landscape options
• Scheduling and traffic movements
• Project communications including:
• Web updates
• Newsletters
• Fact sheets and FAQs
• Media
• 1800# and project email
Final Design
• INFORM
• Project communications including:
• Web updates
• Newsletters
• Fact sheets and FAQs
• Media
• 1800# and project email
Delivery
• INFORM
• Community relatins during construction including;
• Lettebox drops
• Residents/community meetings
• Project communications including:
• Web updates
• Newsletters
• Fact sheets and FAQs
• Media
• 1800# and project email
Launch
• INFORM
• Launch event
• Project communications including:
• Web updates
• Newsletters
• Fact sheets andFAQs
• Media
• 1800# and project email

Key stakeholder issues

Consultation and engagement with stakeholders is ongoing. Table 33 gives a summary some of the key issues raised by stakeholders to date and how they have been integrated into the proposed project. Due to the nature of the project, project stakeholders often have overlapping interests and issues.

Table 33: Engagement approach at each phase of the project

Issue raised	Stakeholder	How this is addressed by the project
• Sewage bypassing treatment during high wet weather flows	• ACT EPA	• Additional storm treatment capability included in the treatment process. • Two-dimensional screening of all flows. • 30 ML Storm Pond included to capture and return storm flows • Solids contact process enables a higher flowrate to be treated.
• A high quality of treated effluent is required due to the receiving environment	• ACT EPA	• Tertiary treatment upgraded to DAFF process to provide higher solids capture and filtration performance.
• The existing maturation ponds are within the flood zone and present a risk of pollution	• ACT UTR • ACT EPA	• Existing maturation ponds to be decommissioned by the project
• Soluble phosphorus is a key pollutant of concern as it is linked to an increased risk of blue green algae in Lake Burley Griffin	• ACT EPA • NCA • ACT Healthy Waterways • ACT & Region Catchment Coordination Management Group • Community representations	• The proposal as outlined in the Draft EIS has been amended with additional processes added to facilitate biological phosphorus removal and enhanced chemical phosphorus removal including phosphorus recovery. • An additional receiving water quality impact assessment study has been completed including modelling of Lake Burley Griffin.
• Wildlife in the area needs to be managed to minimise the risk to aircraft at Canberra Airport	• Canberra Airport	• A wildlife landscaping plan has been prepared in consultation with the community. The proposed landscaping minimises the risk of attracting large birds that may pose a risk to aircraft.

8.6 Project Risk Management

Project risk is being managed in accordance with Council's Risk Management Policy and Directive.

A project risk register has been prepared for the Queanbeyan STP Upgrade Project and has been updated throughout the lifecycle of the Project, at the end of each phase.

Risk Identification and Assessment

Risks were originally identified during the project initial and planning phases and reviewed during the master planning phase.

Following the master planning phase and during the implementation of QPRCs Project Framework, the project team developed a risk breakdown structure which was developed then workshopped on 10 May 2017. From the risk breakdown workshop the risk register, and assessment was reviewed and updated.

A further risk workshop was facilitated at the commencement of the design process on 28 March 2019 and included key internal staff, consultants and the ACT EPA. Following this workshop the risk register and assessment was updated.

The risk register has continued to be reviewed and updated as the project has progressed, with key reviews undertaken at the completion of the concept design, during reference design and during detailed design.

The following risk areas were adopted for the project:

- Scope
- Time
- Quality
- WHS
- Sustainability
- Interdependency
- Regulatory
- Stakeholder
- Environmental
- Site Conditions
- Governance
- Procurement
- Resources
- Financial
- External
- Other.

Assessment of risks has been determined in accordance with QPRC's likelihood and consequence matrix as shown in Figure 29. The likelihood and consequence rating criteria were developed to be project specific.

RISK ASSESSMENT REGISTER MATRIX

LIKELIHOOD	CONSEQUENCE 1 Very Low	2 Low	3 Medium	4 High	5 Very High
1 Rare	Low	Low	Low	Moderate	Moderate
2 Unlikely	Low	Low	Moderate	Moderate	High
3 Possible	Low	Moderate	Moderate	High	High
4 Likely	Moderate	Moderate	High	High	Extreme
5 Almost Certain	Moderate	High	High	Extreme	Extreme

Figure 29: Likelihood consequence risk rating matrix, QPRC Risk Management Directive 2019

As a local government authority, QPRC has an obligation to its stakeholders to ensure that it does not accept high levels of risk that might impact on community wellbeing and amenity, or the ongoing viability of QPRC. Accordingly, QPRC generally has a low appetite for unmitigated risks across all of its day to day operations.

QPRCs risk appetite is documented in the Risk Management Directive and presented below in Figure 30

Risk Rating & Control Approach		
Initial Risk Rating		Control Measure
L	Low	Withinh Council's risk appetite - monitor through in place management and operational controls.
M	Moderate	A decision by the Portfolio Geenral Manager is required on whether to accept the level of risk or implement further controls. Responsibility for managing the risk must be assigned
H	High	A decision by the Portfolio General Manager and Chief Executive Officer is required on whether to accept the level of risk or implement further controls. Responsibility for managing the risk must be assigned including reuiqred frequency for reviewing and updating the risk assessments.
E	Extreme	Critical Risk - The risk level exceeds Council's risk appetite - further treatments are required and risk management strategy must be developed and responsibility for its application assigned.

Figure 30: Risk appetite, QPRC Risk Management Directive 2019

Risks which fall outside of QPRCs risk appetite have been mitigated within the risk assessment until they fall within QPRCs risk appetite.

The risk register is presented in Appendix C.

Implementing Mitigations

The Project Manager will ensure that the planned risk controls are implemented, their effectiveness monitored, and corrective actions taken where the effectiveness of the controls needs improvement.

Reporting

Key risks and emerging issues are reported on monthly to the Project Management Committee.

Review

The risk breakdown structure, risk assessment and control measures will be reviewed and updated in accordance with the schedule given in Table 34.

Table 34: Risk Assessment Review Schedule

Review Schedule	Extent	Responsibility
At the end of each milestone during Plan and Develop Phases	Entire risk register Pass updated risk register to estimating team to update the project contingency	Project Manager
Monthly during Delivery Phase	Review risks with initial ratings greater than medium Review risks with residual ratings greater than medium Add any new risks Pass updated risk register to estimating team to update the project contingency	Project Manager

8.7 Compliance

QPRC are responsible for the following sewerage services:

- Making a sewage network available for connection in areas within NSW
- The collection and conveyance of sewage through the Queanbeyan sewerage network and Morisset and Jerrabomberra Trunk mains
- Treatment and disposal of sewage at the QSTP.

QPRC is regulated under Part 3, Division 2 of the *NSW Local Government Act 1993* for the provision of sewage services including sewage collection, conveyance, treatment and disposal. This applies to QPRC regardless of whether the activities are carried out in NSW or the ACT and includes regulation of the QSTP. This regulation is administered by NSW Department of Planning Industry and Environment (DPIE) and its successors.

Under Section 60 of the *Local Government Act 1993*, QPRC are required to obtain ministerial approval for the construction the QSTP project. The Section 60 approval provides an independent assessment of the proposed works to ensure they are fit for purpose and provide robust, safe, cost-effective and sound solutions that meet public health and environmental requirements. DPIE has been consulted and involved in the review process during the project options, concept design and detailed design stages of the project as required to receive Section 60 approval. DPIE will continue to be involved in the project as required.

QPRC operate the Queanbeyan STP which is located on ACT land in accordance with the terms and conditions of the Crown Lease that was granted to Queanbeyan City Council in 1938 by the Commonwealth Government.

The Utilities Technical Regulator (UTR), under *ACT Utilities (Technical Regulation) Act 2014*, are responsible for granting the Design and Construct operating certificate and the Provision of Service operating certificate for the utility services provided by the Queanbeyan Sewage Treatment Plant provided the application reasonably satisfies Section 46 of the Utilities (Technical Regulation) Act 2014. To meet this requirement QPRC has prepared a Regulatory Plan for the design and construction of QSTP.

QPRC has been granted an exemption from the requirement for a licence in relation to the Utilities Act 2000. QPRC has additional record keeping and reporting requirements as part of the *Utilities (Licencing) Exemption 2021 Disallowable instrument DI2021-24* in relation to this agreement.

The ACT Environmental Authority, under the *Environmental Protection Act 1997*, authorises QPRC to provide treatment of wastewater from Queanbeyan's sewer network and discharge effluent to the Molonglo River in accordance with the Environmental Authorisation 0417 in accordance with the approved Environmental Management Plan. ACT EPA have been consulted during the design process. QPRC will continue to consult with ACT EPA throughout the upgrade process as necessary. The project will prepare a commissioning plan to demonstrate that the new treatment plant process is able to achieve compliance with the environmental authorisation. Once the upgrade is commissioned, QPRC will develop an Environmental Management Plan for the new QSTP in collaboration with ACT NSW.

The NSW Environmental Authority, under the *Protection of the Environment Operations Act 1997 (POEO Act)*, provides environmental regulation of the QSTP network located in NSW. NSW EPA have been consulted during the design process. QPRC will continue to consult with NSW EPA throughout the upgrade process as necessary.

The design and construction will be in accordance with the appropriate Australian Standards, including the following:

- AS1170.1 Permanent, Imposed and other Actions
- AS1170.2 Wind Loads
- AS1170.3 Earthquake Actions in Australia
- AS2159 Piling – Design and Installation
- AS2870 Residential Slabs and Footings
- AS3600 Concrete Structures
- AS3735 Concrete Structures for Retaining Liquids
- AS3700 Masonry Structures
- AS4100 Steel Structures.

All structures for this project are being designed for Importance Level 3 (Wastewater Treatment Facility), in accordance with Table 3.1 of AS/NZS 1170.0:2002: Structural Design Actions – General Principles.

All buildings including prefabricated structures are required to be constructed in accordance with the Building Code of Australia (BCA) and relevant Australian Standards. A deemed to satisfy review of each building design will be undertaken in the reference design phase to establish relevant building classifications and clauses applicable under the BCA. Final BCA compliance and certification responsibility would be included in the Construction Contractors scope by a private certifier for all buildings.

Recycled water treatment and usage will meet the requirements in the NSW Guidelines for Recycled Water Management Systems (NSW Department of Primary Industries, Office of Water, May 2015) and in the Australian Guidelines for Water Recycling (AGWR) (NRMMC, 2006).

All works must be undertaking in compliance with NSW and ACT Work Health and Safety Laws, and QPRCs Health Safety Environmental and Quality Policy. On-site ACT laws apply.

ACT Municipal infrastructure design standards apply to the development and the road upgrade.

Achievement of Infrastructure Sustainability Council target rating of Excellent.

8.8 Change Management

The major changes associated with the project and their management controls are presented in Table 35.

Table 35: Change elements and management controls

Change Element	Management Controls	Responsible Role
New STP processes, operation, maintenance and control software	• Involvement of operation team in design • Plain English functional description • Operator training • Prepare operation and maintenance manual • Engage designer/commissioning team to provide post-handover support	Project Manager
Changes to environmental authorisation (EA) discharge limits, sampling and reporting requirements	• Involvement of operational team in Environmental Authorisation negotiations • Engagement with the EPA to confirm requirements • Operator training	Project Manager
Changes to environmental authorisation requirements during commissioning of the new STP and decommissioning of the existing STP	• Involvement of operational team in Environmental Authorisation negotiations • Engagement with the EPA to confirm requirements • Operator training	Project Manager
Changes to Provision of Service Operating Certificate requirements	• Involvement of operational team in preparation of Regulatory Plan • Engagement with the UTR to confirm requirements • Operator training	Project Manager
Changes to the Operational Environmental Management Plan (OEMP) due to changes to EA and DA conditions	• Involvement of operational team in preparation of the OEMP • Engagement with the EPA to confirm requirements • Operator training	Project Manager
Obligations of the ISC Rating	• Operator training • Embedding the ISC obligations within the O&M manuals and QPRC processes	Project Manager
Changes to landscape	• Include obligations and management practices in OEMP • Prepare landscape management plan • Operator training	Project Manager
Impacts to QPRCs sewer fund	• Undertake a financial analysis to determine the impact of the project on the sewerage fund and the need to increase sewage rates • Engage with the Utilities team, Finance team and assets team • Incorporate the funding model into the IWCM Plan • Develop a business case	Project Manager
Decommissioning of the existing STP	• Develop a decommissioning plan • Involve the operational team in development of the decommissioning plan • Briefing between the decommissioning team and the operational team on the plan	Project Manager

	• Coordinate between the decommissioning team and operational team	
Changes to land boundaries	• Liaise with all impacted stakeholders/adjoining landowners to understand their needs • Update QPRCs records • Include any new assets in asset register • Include new assets in maintenance schedules • Brief operational team on new boundaries and assets	Project Manager
Changes to access roads	• Liaise with all impacted stakeholders/adjoining landowners to understand their needs in design development • Communicate with stakeholders on implementation timeline and impacts • Coordinate with the road authority • Provide as constructed assert data to the road authority	Project Manager
Changes to site access and security	• Liaise with stakeholders who require access to the site to understand their needs during design • Operator training • Brief other stakeholders who require access on the new protocols/systems	Project Manager
Changes to workplace	• Involvement of operational team, security team, digital team, buildings team in preparation of the design to understand needs • Involvement of operational team, security team, digital team, buildings team in set up of the workspaces • Operator training	Project Manager
Changes to power supply	• Involvement of operational team in preparation of the design • Engagement with EVO Energy to confirm requirements • Operator training • Provision of as constructed asset data to EVO Energy • Engagement of suitably qualified maintenance contractors	Project Manager
Changes to potable water supply	• Involvement of operational team in preparation of the design • Engagement with ICON Water to confirm requirements • Operator training • Provision of as constructed asset data to ICON Water	Project Manager
Changes to waste disposal and recycling	• Involvement of operational team, waste team in preparation of the waste and recycling plan • Operator training • Advise existing waste contractors of changes • Engage new waste contractors if required	Project Manager
Changes to operational and maintenance supply needs	• Involvement of operational team in preparation of the design • Operator training • Advise existing supply and maintenance contractors of changes to delivery and maintenance requirements • Engage new supply and maintenance contractors if required	Project Manager

Change to QPRC assets	• Engage with assets team during the design to document asset requirements in contract documentation • Provide record of new, decommissioned and altered	Project Manager

8.9 Benefits Realisation Plan

QPRC has prepared a Benefits Management Plan (BMP) that is consistent with the NSW Government Benefits Realisation Management Framework (2018) and supplements the Project Business Case. The BMP outlines the governance structure, benefits and plan to manage, report on and evaluate benefits.

The key project benefits and dis-benefits have been incorporated onto a Benefits Register and include;

- Benefits:
  - Meeting Queanbeyan's sewage treatment needs for future population and economic growth
  - Improved control over the water quality discharged to the environment and to protect public health
  - Improved odour and noise outcomes
  - Improved workplace health and safety for workers and visitors to the facility
  - Improved treatment reliability
  - Improved protection of the treatment plant against flooding and climate change sustainability
  - Provision of a source of recycled water that can be used for applications such as dust suppression
  - Provision of a local facility to receive and treat septage waste collected from domestic septic tanks and aerated wastewater treatment systems
  - Improved treatment of the biosolids produced by the treatment process to a quality that is suitable for agricultural reuse
  - Improved traffic access to the treatment plant by sealing the access road
  - Provision of a sustainable sewage treatment solution
  - Existing plant does not fail
- Dis-benefits:
  - QPRC will need to raise sewer rates above current levels to pay for the loan.

The benefits register includes details of the metric, data source and measurement targets for each benefit.

The Project Manager will monitor the implementation of the BMP as the project progresses. Tracking of benefits realisation progress will be recorded by the Project manager in the Benefits Register.

The Project Manager will report on implementation of the BMP as part of the monthly project reporting.

The BMP will be reviewed:

- With any review of the Project Management Plan and/or risk management plan
- Following any changes to the project scope
- Prior to completion of works and commissioning of the asset.

8.10 Sustainability

QPRC has a strong commitment to delivering on the principles of ecologically sustainable development and has an extensive legislative and policy framework that highlights this commitment for providing services to its customers. Additionally, QPRC has become a member of the Infrastructure Sustainability Council (ISC) and has committed to pursue Infrastructure Sustainability (IS) ratings under the IS Rating Scheme for the delivery of the Queanbeyan STP Upgrade (the Project). This will drive a culture of sustainable decision-making to benefit the wider Queanbeyan community.

QPRC has adopted the ISC Rating Tool and aims to achieve an "Excellent" Design and As-Built Ratings for the STP with a score in the range of 65 to 75.

To manage this process and ensure that the sustainability objectives are achieved, the project will follow the requirements laid out in the QPRC Queanbeyan STP Upgrade Project Sustainability Management Plan (SMP).

Key Sustainability Targets

Council's Sustainable Design Policy for Council Buildings sets out seven goals. Table 36 outlines project specific targets (and related IS credits) that align with each of the goals. Specific targets are identified related to energy, water and waste goals. Achieving the range of credits required for an Excellent IS rating will support the broader policy goals related to sustainability leadership, reduced operating costs, reduced environmental footprint and increasing sustainability awareness.

Table 36: Sustainability Targets

Goal	Target	Relevant IS Credit
Reduced energy consumption, water use and waste	15% reduction in GHG emissions compared to the base case through modelling (design) and monitoring (construction). 10% reduction in total water use compared to the base case. Opportunities to reuse spoil are identified and implemented, targeting a >80% (by volume) of spoil to be reused. Minimise total waste to landfill through waste avoidance initiatives and prioritisation of reuse and recycling, targeting >40% by volume of office waste to be recycled.	Ene-1 Wat-1 Was-1 Was-2
Demonstrating community leadership in implementing renewable energy and passive solar design	20% substitution of non-renewable energy using renewable energy.	Ene-2
Using alternative water sources and improving stormwater quality	50% substitution of potable water use using non-potable water.	Wat-2
Continued Council growth and development with reduced environmental footprint	Embedding consideration of environmental, social and economic factors when selecting suppliers/services using multicriteria analysis.	Pro-1, Pro-2
Reduced on-going operating and maintenance costs	"Excellent" IS Design and As-Built Rating.	Ene, Wat, Was credits Eco-1 and Eco-2 Sta-3

Sustainability in Design

The design will be completed by HH2O who will produce a fully detailed and documented design to achieve the targeted "Excellent" Design Rating with a score in the range of 65 to 75.

A "Sustainability in Design" workshop (slides and minutes provided in Appendix B) with HH2O was held on 15 May 2019, when the designers were first contracted, to develop sustainability initiatives to be embedded in planning and design.

During detailed design, the design team, with the support of AECOM and QPRC, will develop minimum sustainability requirements to include in the terms of reference for the construction contractor to achieve the As-Built rating. This will include a section on the Construction and Environmental Management Plan requirements as well as materials and equipment specifications.

Sustainability in Procurement

Project procurement will align with QPRC's Procurement Policy and the IS V1.2 criteria for procurement (Pro-1, Pro-2, Pro-3 and Pro-4). HH2O have identified sustainability opportunities with QPRC early in the design process. This

early identification of opportunities has allowed for forward commitment procurement and early identification of supply chains to make more informed, sustainable decisions, particularly when selecting materials.

Decision makers will seek to prioritise local procurement and recycled or environmentally labelled materials where cost effective. Suppliers will be requested to provide details of their sustainability policy and its implementation and should also be compared for social, environmental and financial appropriateness using multi-criteria analysis to select the most sustainable option. Finally, supplier sustainability performance will be monitored for the duration of contract against sustainability targets and non-compliance should be actively managed.

Sustainability in Construction

The main works construction package will be delivered through a Construct Only contract where the Detailed Design is managed by the Owner (QPRC) with early tenderer involvement then Construct by Contractor. This delivery model means that suitable contractors can participate in the design review which should increase the collaboration between designers and the contractors leading to better sustainability outcomes. At the beginning of construction, the SMP will be handed over to the construction contractor to be updated with their input.

Similar to the sustainability in design workshop, a sustainability in construction workshop will allow QPRC and the contractor to identify where key efficiencies can be made in construction methodology. These efficiencies, combined with following the specifications outlined in their contract, will help the contractor achieve the IS As-Built rating. The contractor will need to provide evidence for the IS credits to assist in delivering the As-Built rating.

8.11 Stakeholder Endorsement

Stakeholder endorsements for the project are presented in Table 37.

Table 37: Stakeholder Endorsements

Stakeholder	Related Outcome Interest	Endorsement
NSW Office of Water	NSW Regulator of QPRCs sewerage network under Section 60 of the Local Government Act 1993. Required to approve the project.	
ACT Utilities Technical Regulator	ACT Regulator of QPRCs STP operation under the Utilities (Technical Regulation) Act 2014. Required to issue operating certificate for design and construction, and operation.	
QPRC Councillors	QPRC budget and tendering approval	
ACT Environment Protection Authority	Issues QPRC with an Environmental Authorisation to discharge effluent to the environment in the ACT under the Environment Protection Act 1997	
ACT Transport Canberra and City Services	Asset Owner of Mountain Road which will be upgraded as part of the proposal	
EVO Energy	Owner of the electricity supply network for the STP which requires upgrading and adjustment as part of the proposal	

9. REFERENCES

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10. APPENDIX A – SUMMARY OF PREVIOUS STUDIES

This appendix provides a summary of early planning studies investigating the need to upgrade the Queanbeyan STP.

MONTGOMERY WATSON (JULY 1995) "QUEANBEYAN WPCC FUTURE NEEDS"

In 1995, Montgomery Watson prepared a report outlining upgrade options for the Queanbeyan STP. The following conclusions were drawn for the STP:

- Augmentation may be required to meet increasing populations and possible new discharge limits. Overall, it was highlighted that the STP is most restricted on its ability to meet total nitrogen requirement.
- Hydraulically, it was found that the STP could treat up to an average dry weather flow (ADWF) of up to 10.7ML/d.
- A 4-stage Bardenpho activated sludge process was recommended for long term secondary treatment if a more stringent total nitrogen requirement needs to be met. A stage-wise implementation strategy with interim operation was recommended. Addition of plastic media to the activated sludge plant was identified as a short-term strategy to provide some additional treatment capacity.
- For wet weather flow treatment, it was recommended that a fourth secondary clarifier be provided for peak flows.
- Disinfection of the maturation pond effluent was suggested to reduce the risk of bacteriological problems in wet weather.
- It was further suggested that the disused sludge lagoon could be used for flow equalization.

Finally, three wastewater management strategy / options were investigated, including both centralized and decentralized treatment options. A centralized system was recommended to reduce the number of operating plants and provide a more operable solution. Some on-site package plant could be employed to meet local needs if required.

SKM (DECEMBER 1995) "CRITICAL APPRAISAL OF QUEANBEYAN WPCC FUTURE NEEDS REPORT"

In 1995, SKM conducted a critical appraisal of the Montgomery Watson report based on further information that were available between the two reports. The report provides recommendations on minor, short term upgrades as well as longer term upgrades. It also provides a capacity assessment of the existing plant. The following conclusions were drawn:

- The trickling filters could handle a flow of 3.8 ML/d whilst achieving their original function of nitrification. It is noted that media characteristics and structural integrity of the trickling filters were not discussed.
- It was suggested a reduction of SVI (200 to 100 mL/g) could potentially increase the capacity of the activated sludge plant from 11.2 ML/d to 14.3ML/d. Addition of selector tanks at the head of the activated sludge plant was suggested as a potential measure to improve sludge settleability.

SKM (NOVEMBER 1996) "QUEANBEYAN WPCC WET WEATHER FLOW TREATMENT STRATEGY"

In 1996, QCC commissioned SKM to prepare a position paper on "Wet Weather Flow Treatment Strategy" for Queanbeyan STP. The paper examines treatment strategy to deal with wet weather flow in light of its potential impact on the downstream water quality, namely Molonglo River and Lake Burley Griffin. As part of the report, a number of previous water quality investigations were reviewed. The following conclusions were drawn with regard to the impacts of pollutant loads:

- Phosphorus loads (both diffused and point sources) were identified as the principal cause for eutrophication in Lake Burley Griffin
- Nitrogen (inclusive of nitrogen oxides, total Kjedahl nitrogen and ammonia) have been found to be of secondary concern to phosphorus with respect to limiting algal growth in downstream waterways
- Most of the sediments in Lake Burley Griffin originate from the Molonglo River. Secondary release of phosphorus from sediment, especially after a flood event, was identified as potential cause for eutrophication.

The paper highlighted the following:

- Phosphorus is the key parameter in terms of treatment objective for the STP

- Secondary treatment objectives for the STP include removal of suspended solids and ammonia (as a result of toxicity impact).

As a result of these previous water quality investigations, Queanbeyan STP has gone through a number of phosphorus discharge reduction programs in the 1980's and 1990's. At the time of SKM's study, the effluent phosphorus level was at the very low range of 0.1-0.2 mg/L. It was estimated that Queanbeyan STP contributed less than 4% of the total phosphorus loads to Lake Burley Griffin, of which only 18% of this is due to wet weather bypasses. Bypass events was noted to occur between 5 to 10 times in a year. In fact, water quality monitoring both upstream and downstream of the STP suggested that the STP exerted relatively minor impacts on the river system.

Nonetheless the report went on to assess the benefits of providing extra secondary treatment capacity to handle storm flow of up to 3, 5 and 7 ADWF's. The analysis in the report was hindered by the lack of peak hourly flow data. It was concluded that there is a diminished return in providing treatment exceeding 3 to 5 ADWF's. Treatment of flows up to 3 average dry weather flow (ADWF) was suggested to be a reasonable target to minimize the impact of wet weather bypasses.

Overall this paper highlights the importance of phosphorus removal for the STP and the importance of a critical assessment (based on hourly data) of the peak hydraulic capacity of the secondary treatment system, especially with regard to the solids and hydraulic capacity of the secondary clarifiers.

MWH (December 2008) "Queanbeyan Sewage Treatment Plant Future Needs Study"

In 2007 QCC commissioned MWH to prepare a report of the Queanbeyan STP Future Needs to cater for population growth to 40,000EP within the next 20 years. The report examined the existing STP treatment capacity and condition. The report recommended a number of upgrades to the existing facility be considered, including decommissioning and replacement of several existing processes, the installation of new additional processes and the expansion fo some existing processes to cater for a future inflow of 11.6ML/day for a 40,000EP population and full treatment of up to 3 time the average dry weather flow (ie 34.8ML/day) . It also recommended further studies be undertaken and a concept design be prepared to finalise details of the upgrade works.

Hunter Water Australia (HWA) (May 2010) "Queanbeyan STP Options Report"

In 2010 HWA were engaged to review the recommendations of the MWH 2008 report and explore other options. The report identified that the MWH strategy would only provide QPRC minor additional capacity and improved effluent quality whilst relying on ageing infrastructure.

The report recommended in order to assess "value for money" the MWH option be further developed and costed. It should then be assessed against modern technology full activated sludge plants designed for a high level of nitrogen as well as phosphorus removal. All options should be assessed against a common set of criteria which includes life cycle cost and a range of non-financial criteria relevant to QCC.

Hunter Water Australia (August 2011) "Queanbeyan Sewage Treatment Plant Upgrade Options Assessment Summary Report"

In 2011 HWA were engaged to undertake an upgrade options assessment. Building on HWAs 2010 report, this report reviewed the upgrade drivers, developed the MWH proposed upgrade solution and compared it via a multicriteria analysis against other upgrade options.

The report identified a preferred upgrade for Queanbeyan STP comprises of the following components;

- Abandonment of the existing inlet works and construction of a new inlet works facility
- Either expansion of the existing sludge drying beds or construction of new mechanical dewatering infrastructure (to be determined during subsequent design stages)
- A MBR activated sludge process using best biological design principles with combined biological/chemical phosphorus removal, single sludge stream and aerobic sludge digestion.

The preferred upgrade was recommended to provide treatment for 43,780 EP population and up to 3 x ADFW in the secondary process with inlet works capacity of 5.5 x ADWF.

GHD (September 2016) "Queanbeyan Sewage Treatment Plant Upgrade Project: Masterplan for Sewage Treatment Plant Upgrade"

In 2014 QCC engaged GHD to prepare a Masterplan for Sewage Treatment Plant Upgrade. The Masterplan provided a more detailed rand current review of sewage treatment needs in the Queanbeyan and the surrounding areas, providing an update of both the current population and future population growth aligned with more recent planning documents. The Masterplan sets out the design basis for proceeding with the upgrade of the STP, including consideration of:

- Best for region solution including future growth
- Existing and future sewage infrastructure
- Sustainability, including environmental constraints, water quality and solids management
- Approvals
- Treatment technologies
- Upgrade options:
  - Option 1 - Build new (existing STP fully decommissioned)
  - Option 2 - Build new and reuse existing components where feasible
  - Option 3 - Renew existing and augment

Multi Criteria Analysis (MCA) was undertaken of the options considered for 60,000 EP capacity (including growth predicted within 10-15 years). Six criteria were used being:

- Cost (NPV 50 yrs)
- Constructability, including quality, environmental and safety risks, timeframe for completion, likelihood of exceeding discharge licence conditions and extent of temporary works.
- Operability, including potential for increase in operating costs, ability to operate, WHS for operational staff, extent of autonomy and remote capability.
- Sustainability, including impact on environment, ability to reuse effluent and biosolids and ability to capture gas and resource recovery.
- Future Proofing, including achieving licence, increasing capacity and accommodating unexpected increases in flows or influent quality.
- Community Acceptance and Affordability, including impact on rates and QPRC financial position and QPRC reputation.

The criteria were weighted via a workshop which resulted in the following weightings for the selected criteria below.

Table 38: MCA criteria weighting

Table 12-2 MCA Criteria Weighting

Criteria	Weighting
Cost	14%
Constructability	4%
Operability	15%
Sustainability	13%
Future Proofing	17%
Community Acceptance and Affordability	37%

The criteria were then scored by the participants of the workshop with results and ranking as shown below.

Table 39: MCA results and rank

Table 12-3 MCA Results and Rank

Criteria	Options					
	Option 1A	Option 1B	Option 2A	Option 2B	Option 3A	Option 3B
Cost	4.9	4.9	4.8	4.9	5.0	4.9
Constructability	4.3	4.3	2.7	2.7	2.3	2.3
Operability	4.3	4.0	3.3	3.0	3.3	3.0
Sustainability	4.3	4.3	4.0	4.0	4.0	4.0
Future Proofing	3.7	4.3	3.7	4.3	3.7	4.3
Community Acceptance and Affordability	3.7	3.7	2.7	2.7	2.2	2.2
Normalised Score	99	100	83	85	79	80
Rank	2	1	4	3	6	5

The MCA normalised scores indicate that Options 1A and 1B are difficult to separate and represent the preferred options. Options 2A and 2B similarly have close scores but are clearly separated in their ranking at 3rd and 4th and Options 3A and 3B also have close scores and are 5th and 6th in their ranking. The sub options of A and B based on the process selection can be seen to have no impact on the selection of the upgrade approach.

The sensitivity of the MCA outcome was then tested for the following criteria weighting scenarios:

- All criteria equally weighted
- Each criterion in turn considered the most important with 50% weighting and all other criteria with 10% weighting each.

Irrespective of the scenario selected above, the Options 1A and 1B always ranked the highest indicating that the selection is not particularly sensitive to the weightings adopted for the various criteria.

The “Build New (existing STP fully decommissioned)” upgrade approach was adopted by QPRC as the preferred option for concept design and planning approvals.

Hunter H2O (December 2019) “Queanbeyan Sewage Treatment Plant Upgrade Project Design Criteria and Assumptions Report”

In 2019 Hunter H2O were engaged by QPRC to undertake design work for the proposed new Queanbeyan STP based on the preferred option from the Masterplan. Design work commenced with a review of the design criteria and assumptions which are documented in this report. Critically, a significant review of the EP projections was undertaken. The EP review identified that given the expected completion timeframe for the project of 2024 that there would only be 6 more years before 60,000 EP would be reached and a further upgrade would be required. The report recommended proceeding with concept design for the project based on a 75,000 EP population providing for population projects 15 years after the plant is constructed.

Hunter H2O (November 2019) “Queanbeyan Sewage Treatment Plant Upgrade Project Options Selection Report”

In 2019 Hunter H2O as part of their design engagement with QPRC prepared an options selection report. This report identified the various treatment options available and compared them via a multi criteria analysis that considered whole of life cost, effluent quality, operability / complexity, maintainability, robustness, power and chemical use. Primarily, three secondary treatment options were developed for the upgrade for comparison:

- Oxidation ditch with continuous gravity clarification
- Membrane Bioreactor (MBR) and
- Intermittently Decanted Extended Aeration (IDEA).

The preferred secondary treatment process selected for the Queanbeyan STP upgrade is an oxidation ditch with gravity clarifiers, tertiary granular media filter, UV disinfection, aerobic sludge digestion and sludge dewatering. The plant will be configured to adopt full biological phosphorus removal in future.

Key benefits of the selected process are:

- High ammonia removal to meet regulatory requirements
- Potential high total nitrogen removal or high nitrate production if required to protect Lake Burley Griffin
- Good treatment of storm flows
- Simple and robust process with many examples of successful implementation
- Multiple suppliers are available to provide replacement parts and equipment servicing
- Fewer chemicals are required than an MBR option and the same number of chemicals required as the IDEA option.

11. APPENDIX B - QUEANBEYAN SEWAGE TREATMENT PLANT – PROCESS CAPACITY ASSESSMENT

12. APPENDIX C – PROJECT RISK REGISTER

QUEANBEYAN-PALERANG REGIONAL COUNCIL

Council Meeting Attachment

26 JUNE 2024

ITEM 9.7 QUEANBEYAN IWCM AND QSTP BUSINESS CASE UPDATE

ATTACHMENT 2 IWCM STRATEGY AND FINANCIAL PLAN - REV 5 - MAY 2024

Integrated Water Cycle Management

Strategy and Financial Plan

Queanbeyan-Palerang Regional Council

30 May 2024

→ The Power of Commitment

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			Name	Signature	Name	Signature	Date
S4	0	M Wannecke, C West, S Gu	W van Lint		G Pincombe		15/06/22
S4	1	I Lun	C West		G Pincombe		15/07/22
S4	2	C West	I Lun		G Pincombe		22/07/22
S4	3	W van Lint	C West		G Pincombe		16/10/22
S4	4	C West	G Pincombe	On file	G Pincombe	On file	25/10/22
S4	5	W van Lint	C West	On file	C West	On file	30/05/24

→ The Power of Commitment

Executive summary

This report is subject to, and must be read in conjunction with, the limitations set out in section 1.2 and the assumptions and qualifications contained throughout the Report.

Queanbeyan Palerang Regional Council (Council) has stewardship for provision of water and wastewater services for Queanbeyan Local Government Area. The NSW Integrated Water Cycle Management (IWCM) strategic planning instrument provides a framework for Council to determine long-term strategic planning for water management.

Council has recently undertaken the required analysis and prepared the IWCM Issues Paper (AECOM, 2019 and 2020). Council has also undertaken a strategic review of its water and wastewater services. These reviews considered the current and future water and wastewater infrastructure to identify feasible scenarios for the IWCM strategic plan. The issues identified covered general, water supply, sewerage, and stormwater system issues.

Following the development of this Issues Paper, Council engaged GHD to undertake a review of the water supply system and Hunter H_2O to prepare a review of the sewerage system.

The issues relating to sewerage services, as outlined in QPRC's supplementary report (AECOM, 2020), are:

1. Queanbeyan sewage treatment plant (STP) hydraulic capacity will be exceeded by 2025
2. The Community based Level of Service requirements needs to be revised and documented in future Asset Management Plans (strategic, tactical and operational)
3. Existing STP needs to be operated and maintained to continue to meet discharge license conditions until the new STP is commissioned
4. Design options and timing of potential upgrades for Morisset SPS needs to be reviewed as part of the Queanbeyan STP Upgrade Project
5. Lack of detailed knowledge of capacity constraints may lead to additional augmentation work required to meet acceptable service standards
6. Sewer model is not up to date and not calibrated
7. Sewer network asset condition assessments needs to be improved

Items 1 and 3 are being addressed as part of the STP Upgrade project and a summary of the master planning, options assessment and concept design have been drawn from Hunter H_2O (2021). Items 2 and 7 are being addressed by Council in parallel with the IWCM strategy development. Discussions regarding Items 4, 5 and 6 in Hunter H_2O (2021) are reproduced in this document.

Following the analysis undertaken for the water system, by GHD, the critical upgrade option to be considered for the current network is a duplication of the Jerrabomberra Reservoir. It was also recommended that further work to improve the model be undertaken including development and calibration of an operational model. It was also noted that there would be benefit in undertaking further investigation into the current system to confirm the chlorine levels and provide additional chlorine dosing if areas are found to be deficient.

It was determined through this process that there is only one feasible scenario for each of water and sewerage.

The preferred scenario for water supply is continued supply of bulk treated water from Icon Water. The preferred scenario for wastewater is the upgrade of the Queanbeyan STP.

Based on the above scenarios, analysis of financial modelling was undertaken. This modelling utilised financial information provided by Council, including water and sewer fund status, review of assets remaining life, cost estimates for proposed works, including the STP upgrade and operational costs.

Financial analysis was undertaken to assess the impact of the proposed capital expenditure programs on the financial position of the Council over a twenty-year period. The analysis considered the forecasted cashflow and account balances under external funding (grant and loan) scenarios.

QPRC is facing a more significant capital expenditure program for sewer infrastructure, with a growth/ enhancement program of in excess $160m in the four years, whereas the water capital funding relates mainly to the $20m required for the duplication of the Jerrabomberra Reservoir.

Table 1 Recommended Water funding scenario.

Year	Open Balance	Transfer to/from Sewer Account	Adjusted Balance 1	Interest Earnt Reserve	Interest Earnt Working	Grant Funding	Adjusted Balance 2	Loans	Repayment	Closing Balance
2023/24	42,221,000	-1,961,937	40,259,063	1,207,772	150,000	0	41,616,835		0	41,616,835
2024/25	41,616,835	889,240	42,506,075	1,275,182	150,000	0	43,931,257		0	43,931,257
2025/26	43,931,257	5,519,623	49,450,880	1,483,526	150,000	0	51,084,407		0	51,084,407
2026/27	51,084,407	-30,457,024	20,627,382	618,821	150,000	0	21,396,204		0	21,396,204
2027/28	21,396,204	6,602,399	27,998,603	839,958	150,000	0	28,988,561		0	28,988,561
2028/29	28,988,561	7,067,823	36,056,384	1,081,692	150,000	0	37,288,076		0	37,288,076
2029/30	37,288,076	5,410,286	42,698,362	1,280,951	150,000	0	44,129,313		0	44,129,313
2030/31	44,129,313	8,836,668	52,965,981	1,588,979	150,000	0	54,704,960		0	54,704,960
2031/32	54,704,960	8,447,937	63,152,897	1,894,587	150,000	0	65,197,484		0	65,197,484
2032/33	65,197,484	9,579,494	74,776,978	2,243,309	150,000	0	77,170,288		0	77,170,288
2033/34	77,170,288	9,635,911	86,806,198	2,604,186	150,000	0	89,560,384		0	89,560,384
2034/35	89,560,384	6,921,150	96,481,534	2,894,446	150,000	0	99,525,980		0	99,525,980
2035/36	99,525,980	11,407,781	110,933,762	3,328,013	150,000	0	114,411,774		0	114,411,774
2036/37	114,411,774	9,226,587	123,638,361	3,709,151	150,000	0	127,497,512		0	127,497,512
2037/38	127,497,512	-1,393,772	126,103,741	3,783,112	150,000	0	130,036,853		0	130,036,853
2038/39	130,036,853	13,238,287	143,275,140	4,298,254	150,000	0	147,723,394		0	147,723,394
2039/40	147,723,394	13,901,054	161,624,448	4,848,733	150,000	0	166,623,182		0	166,623,182
2040/41	166,623,182	11,996,144	178,619,326	5,358,580	150,000	0	184,127,905		0	184,127,905
2041/42	184,127,905	4,448,386	188,576,291	5,657,289	150,000	0	194,383,580		0	194,383,580
2042/43	194,383,580	11,927,263	206,310,843	6,189,325	150,000	0	212,650,169		0	212,650,169
2043/44	212,650,169	15,213,396	227,863,564	6,835,907	150,000	0	234,849,471		0	234,849,471
2044/45	234,849,471	15,248,316	250,097,787	7,502,934	150,000	0	257,750,721		0	257,750,721
2045/46	257,750,721	11,086,131	268,836,852	8,065,106	150,000	0	277,051,957		0	277,051,957
2046/47	277,051,957	8,259,266	285,311,224	8,559,337	150,000	0	294,020,560		0	294,020,560
204748	294,020,560	18,524,387	312,544,947	9,376,348	150,000	0	322,071,296		0	322,071,296
2048/49	322,071,296	-3,861,914	318,209,382	9,546,281	150,000	0	327,905,663		0	327,905,663
2049/50	327,905,663	4,682,173	332,587,836	9,977,635	150,000	0	342,715,471		0	342,715,471
2050/51	342,715,471	-2,928,716	339,786,756	10,193,603	150,000	0	350,130,358		0	350,130,358
2051/52	350,130,358	16,368,324	366,498,682	10,994,960	150,000	0	377,643,643		0	377,643,643
2052/53	377,643,643	7,212,725	384,856,368	11,545,691	150,000	0	396,552,059		0	396,552,059

The table above shows the preferred scenario and is based on:

- ✓ No grant funding sought
- ✓ No additional loans sought
- ✓ Annual rate increases aligned to consumer price index (3.0%)

Table 2 ***Recommended Sewer funding scenario.***

Sewer Chgare Rise		Year	Open Balance	Transfer to (-) / from (+) Sewer Account	Adjusted Balance 1	Interest Earnt Reserve	Interest Earnt Working	Grant Funding	Adjusted Balance 2	Loans	Repayment	Closing Balance
Adjust here												
4.50%	0	2022/23	0	0	0	0	150,000	1,350,000			0	0
6.50%	1	2023/24	62,000,000	3,528,068	65,528,068	1,965,842	150,000	1,050,000	68,693,910		0	68,693,910
6.50%	2	2024/25	68,693,910	-18,261,123	50,432,787	1,512,984	150,000	300,000	52,395,770		0	52,395,770
6.50%	3	2025/26	52,395,770	-72,920,240	-20,524,469	0	150,000	0	-20,374,469	55,000,000	0	34,625,531
6.50%	4	2026/27	34,625,531	-61,897,828	-27,272,297	0	150,000	0	-27,122,297	55,000,000	-4,795,151	23,082,552
6.50%	5	2027/28	23,082,552	566,874	23,649,426	709,483	150,000	0	24,508,909	0	-9,590,301	14,918,607
3.00%	6	2028/29	14,918,607	10,304,663	25,223,270	756,698	150,000	0	26,129,968	0	-9,590,301	16,539,667
3.00%	7	2029/30	16,539,667	11,144,928	27,684,595	830,538	150,000	0	28,665,133	0	-9,590,301	19,074,832
3.00%	8	2030/31	19,074,832	5,345,724	24,420,556	732,617	150,000	0	25,303,173	0	-9,590,301	15,712,871
3.00%	9	2031/32	15,712,871	11,408,850	27,121,722	813,652	150,000	0	28,085,373	0	-9,590,301	18,495,072
3.00%	10	2032/33	18,495,072	14,142,274	32,637,346	979,120	150,000	0	33,766,467	0	-9,590,301	24,176,166
3.00%	11	2033/34	24,176,166	14,717,350	38,893,516	1,166,805	150,000	0	40,210,321	0	-9,590,301	30,620,020
3.00%	12	2034/35	30,620,020	15,171,423	45,791,443	1,373,743	150,000	0	47,315,186	0	-9,590,301	37,724,885
3.00%	13	2035/36	37,724,885	18,543,654	56,268,539	1,688,056	150,000	0	58,106,595	0	-9,590,301	48,516,294
3.00%	14	2036/37	48,516,294	23,050,068	71,566,362	2,146,991	150,000	0	73,863,353	0	-9,590,301	64,273,051
3.00%	15	2037/38	64,273,051	23,975,443	88,248,494	2,647,455	150,000	0	91,045,949	0	-9,590,301	81,455,648
3.00%	16	2038/39	81,455,648	25,389,897	106,845,545	3,205,366	150,000	0	110,200,911	0	-9,590,301	100,610,610
3.00%	17	2039/40	100,610,610	27,328,464	127,939,073	3,838,172	150,000	0	131,927,246	0	-9,590,301	122,336,944
3.00%	18	2040/41	122,336,944	4,799,050	127,135,994	3,814,080	150,000	0	131,100,074	0	-9,590,301	121,509,773
3.00%	19	2041/42	121,509,773	29,702,303	151,212,075	4,536,362	150,000	0	155,898,438	0	-9,590,301	146,308,136
3.00%	20	2042/43	146,308,136	29,424,302	175,732,439	5,271,973	150,000	0	181,154,412	0	-9,590,301	171,564,111
3.00%	21	2043/44	171,564,111	23,173,372	194,737,483	5,842,124	150,000	0	200,729,607	0	-9,590,301	191,139,306
3.00%	22	2044/45	191,139,306	25,148,332	216,287,638	6,488,629	150,000	0	222,926,267	0	-9,590,301	213,335,966
3.00%	23	2045/46	213,335,966	33,831,765	247,167,730	7,415,032	150,000	0	254,732,762	0	-9,590,301	245,142,461
3.00%	24	2046/47	245,142,461	36,322,559	281,465,021	8,443,951	150,000	0	290,058,971	0	-4,795,151	285,263,821
3.00%	25	2047/48	285,263,821	40,349,609	325,613,429	9,768,403	150,000	0	335,531,832	0	-2,281,436	333,250,397
3.00%	26	2048/49	333,250,397	42,867,780	376,118,176	11,283,545	150,000	0	387,551,721	0	-2,281,436	385,270,286
3.00%	27	2049/50	385,270,286	38,100,945	423,371,231	12,701,137	150,000	0	436,222,368	0	-2,281,436	433,940,932
3.00%	28	2050/51	433,940,932	41,667,665	475,608,597	14,268,258	150,000	0	490,026,855	0	-2,281,436	487,745,419
3.00%	29	2041/52	487,745,419	20,318,414	508,063,833	15,241,915	150,000	0	523,455,748	0	-2,281,436	521,174,312
3.00%	30	2052/53	521,174,312	48,299,244	569,473,556	17,084,207	150,000	0	586,707,762	0	-1,380,658	585,327,104

The table above shows the preferred sewer funding scenario, based on the following:

- ✓ Sewer charge to initially increase at 6.5% through to 2027/28 and then reduce to 3.0% from 2028/29.
- ✓ Fund opening balance at $62m.
- ✓ Loan funding of $110m over the two-year period 2025/26 and 2036/27.
- ✓ No new grant funding, $0.3m balance of previous funding application
- ✓ Major capital expenditure programs (2023/24 dollars) are;
    - 2024/25 $25.5m (Part QSTP upgrade construction).
    - 2025/26 $70.7m (Part QSTP upgrade construction)– 2025/26
    - 2027/27 $63.1m (Part QSTP upgrade construction)– 2026-27
- ✓ Average residential bill in 2024/25:
    - Water $1,395.58, forecasted to increase at 3.0% per annum.
    - Sewer $885.16, forecasted to increase by 6.5% per annum through to 2027/28 and then reducing to an annual increase of 3.0%.

Table 3 ***Summary of water and sewerage charges for selective financial years***

	Sewer		Water		
	Rate increase	Charge	Rate increase	Charge	Typcal Residntial Bill
2023/2024	6.50%	$831.14	3.00%	$1,354.93	$2,186.07
2024/2025	6.50%	$885.16	3.00%	$1,395.58	$2,280.74
2025/2026	6.50%	$942.70	3.00%	$1,437.45	$2,380.14
2026/2027	6.50%	$1,003.97	3.00%	$1,480.57	$2,484.54
2027/2028	6.50%	$1,069.23	3.00%	$1,524.99	$2,594.21
2028/2029	3.00%	$1,101.31	3.00%	$1,570.74	$2,672.04
2029/2030	3.00%	$1,134.35	3.00%	$1,617.86	$2,752.20
2030/2031	3.00%	$1,168.38	3.00%	$1,666.39	$2,834.77
2031/2032	3.00%	$1,203.43	3.00%	$1,716.38	$2,919.81
2032/2033	3.00%	$1,239.53	3.00%	$1,767.88	$3,007.41
2033/2034	3.00%	$1,276.72	3.00%	$1,820.91	$3,097.63
2034/2035	3.00%	$1,315.02	3.00%	$1,875.54	$3,190.56
2035/2036	3.00%	$1,354.47	3.00%	$1,931.81	$3,286.27
2036/2037	3.00%	$1,395.10	3.00%	$1,989.76	$3,384.86
2037/2038	3.00%	$1,436.95	3.00%	$2,049.45	$3,486.41
2038/2039	3.00%	$1,480.06	3.00%	$2,110.94	$3,591.00
2039/2040	3.00%	$1,524.47	3.00%	$2,174.26	$3,698.73
2040/2041	3.00%	$1,570.20	3.00%	$2,239.49	$3,809.69
2041/2042	3.00%	$1,617.31	3.00%	$2,306.68	$3,923.98
2042/2043	3.00%	$1,665.82	3.00%	$2,375.88	$4,041.70
2043/2044	3.00%	$1,715.80	3.00%	$2,447.15	$4,162.95
2044/2045	3.00%	$1,767.27	3.00%	$2,520.57	$4,287.84
2045/2046	3.00%	$1,820.29	3.00%	$2,596.19	$4,416.48
2046/2047	3.00%	$1,874.90	3.00%	$2,674.07	$4,548.97
2047/2048	3.00%	$1,931.15	3.00%	$2,754.29	$4,685.44
2047/2048	3.00%	$1,989.08	3.00%	$2,836.92	$4,826.00
2049/2050	3.00%	$2,048.75	3.00%	$2,922.03	$4,970.78
2050/2051	3.00%	$2,110.22	3.00%	$3,009.69	$5,119.91
2051/2052	3.00%	$2,173.52	3.00%	$3,099.98	$5,273.50
2052/2053	3.00%	$2,238.73	3.00%	$3,192.98	$5,431.71

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Appendices

1. Introduction

1.1 Purpose of this report

Queanbeyan-Palerang Regional Council (Council) have completed the first stage of the Integrated Water Cycle Management (IWCM) strategy for Queanbeyan: the IWCM Issues Paper (AECOM, 2019), including the Issues Paper Supplementary Report (AECOM, 2020). These documents have identified several issues for the water supply and sewerage network.

Council, together with their consultants, has also identified the available options for water and wastewater. This report brings the identified options together to present the recommended scenarios for the IWCM strategy and the water and wastewater typical residential bill (TRB) for those scenarios.

The outputs of this report will be used by Council to further develop the IWCM strategic implementation and planning into the future.

This report only addresses services in Queanbeyan and adjacent urban areas as an IWCM report has already been prepared and approved for Bungendore, Braidwood and Captains Flat.

1.2 Scope and limitations

This report has been prepared by GHD for Queanbeyan-Palerang Regional Council and may only be used and relied on by Queanbeyan-Palerang Regional Council for the purpose agreed between GHD and Queanbeyan-Palerang Regional Council as set out in section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than Queanbeyan-Palerang Regional Council arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring after the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer section 1.3 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

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

GHD has prepared the financial assessment set out in section 7 of this report (“IWCM analysis”) using information provided by Council or reasonably available to the GHD employee(s) who prepared this report; and based on assumptions and judgments made by GHD and as agreed with Council.

The financial assessment has been prepared for the purpose of determining the water supply and wastewater typical residential bill (TRB) as required under the IWCM process and must not be used for any other purpose.

The financial assessment is a preliminary estimate only. Actual prices, costs and other variables may be different to those used to prepare the financial assessment and may change. Unless as otherwise specified in this report, no detailed quotation has been obtained for actions identified in this report. GHD does not represent, warrant or guarantee that the typical residential bill can or will be the same or less than the financial analysis.

Where estimates of potential costs are provided with an indicated level of confidence, notwithstanding the conservatism of the level of confidence selected as the planning level, there remains a chance that the cost will be

greater than the planning estimate, and any funding would not be adequate. The confidence level considered to be most appropriate for planning purposes will vary depending on the conservatism of the user and the nature of the project. The user should therefore select appropriate confidence levels to suit their particular risk profile.

1.3 Assumptions

Separate sets of assumptions were made for the water (GHD, 2021) and wastewater (Hunter H_2O, 2021) reports. Additional assumptions relevant to the financial modelling of the systems have also been made for this report. These assumptions are summarised below.

1.3.1 Water

The assumptions made in GHD (2021) while undertaking the water system assessment included the following:

– The water network model provided by QPRC was suitable for use as the basis for this assessment.
– Demands for 2050 growth scenario are correct.
– The capital works for Googong will be sized, designed, and constructed by the developer to suit the development pattern. This is independent of the Queanbeyan water supply network.
– The infrastructure to supply the Tralee development has been design and constructed by the developer to suit the demands.

1.3.2 Wastewater

The Design Criteria and Assumptions Report was prepared by Hunter H2O in 2019 and summarised in Hunter H2O (2021). The report outlines the design criteria and assumptions that were used as the basis for the development of upgrade options and subsequent concept and reference designs. The design criteria and assumptions in the report were presented to QPRC at a Design Basis Workshop in June 2019 and were adopted as the basis for proceeding with the upgrade project. The noted assumptions include:

– The Queanbeyan STP adopted EP projections to 2038 and adopted flow and temperature assumptions.
– Googong township is sized, designed, and constructed by the developer to suit the development pattern. This is independent of the Queanbeyan sewerage network and therefore was excluded from this IWCM strategy and financial plan.
– The connection of a new regional pump station to the existing system via the Tralee SPS.
– The inclusion of a developer funding new SPS servicing the Jumping Creek development area.
– A review of historical inflows to STP data, which concluded that the catchment had moderate infiltration during wet weather.

1.3.3 Financial modelling

Assumptions used in the financial modelling have been included in Section 7.

2. Developing the IWCM Strategy

In accordance with the requirements of the NSW IWCM process, Council has considered the elements of the IWCM checklist as presented below.

2.1 Queanbeyan – description of existing systems

2.1.1 Water

Treated bulk water is supplied to Queanbeyan by Icon Water, which is the water service provider responsible for providing potable water supply to the ACT. Treated bulk water is transferred to Queanbeyan from Icon Water's Mt Stromlo Water Treatment Plant (located in the ACT) and Googong Water Treatment Plant (located in NSW) via two bulk water supply 'offtakes' to end users in Queanbeyan. A service level agreement is in place to manage this supply.

2.1.2 Wastewater

The sewerage system in the study area is predominantly a gravity reticulation system, comprising over 282 km of pipelines and 15 pumping stations. The reticulated network services the majority of Queanbeyan and Jerrabomberra, except for some semi-rural outer suburbs (e.g., The Ridgeway) where decentralised septic systems are used. The reticulated sewerage network transfers sewerage to the Queanbeyan Sewage Treatment Plant (STP), located to the north of Queanbeyan, within the ACT, on the south bank of the Queanbeyan River. The Queanbeyan STP is operated by Council. The treatment plant discharges to Molonglo River in accordance with ACT Environment Protection Authority (EPA) licence conditions. Downstream of the STP the Molonglo River drains into Lake Burley-Griffin.

2.1.3 Stormwater

The stormwater system for Queanbeyan comprises a reticulated system that drains via gravity into the Queanbeyan River, which in turn flows into Lake Burley-Griffin. Stormwater from Jerrabomberra and future development areas to the south of the city drain into Jerrabomberra Creek, which feeds the Jerrabomberra Wetlands and Lake Burley-Griffin.

2.2 Issues identified

A final draft version of the IWCM Issues Paper for Queanbeyan was prepared by AECOM in late 2019 (AECOM, 2019). The issues identified in this Paper have been presented here.

2.2.1 Water

The AECOM (2019) IWCM Issues Paper identified that a review of the Queanbeyan bulk water system was required. The objectives of this review included the establishment of future capital work projects, the provision of scenario planning, and the provision of order of magnitude costs.

GHD (2021) drew on the issues identified in AECOM (2019) as a basis and considered other relevant planning studies and reports to identify and analyse upgrade options for the potable water supply services for Queanbeyan.

2.2.2 Wastewater

Following AECOM (2019), QPRC submitted a Supplementary Report to DPIE in May 2020 that summarised the most recent 30-year water demand and sewage loading projections and provided a brief description of the issues that QPRC will address as part of the IWCM Strategy. Hunter H_2O (2021) subsequently described the feasibility review of options and options assessment for the identified IWCM issues related to the Queanbeyan sewerage system.

The issues relating to sewerage services, as outlined in QPRC's supplementary report (AECOM, 2020), are:

1. Queanbeyan STP hydraulic capacity will be exceeded by 2025
2. The Community based Level of Service requirements needs to be revised and documented in future Asset Management Plans (strategic, tactical and operational)
3. Existing STP needs to be operated and maintained to continue to meet discharge license conditions until the new STP is commissioned
4. Design options and timing of potential upgrades for Morisset SPS needs to be reviewed as part of the Queanbeyan STP Upgrade Project
5. Lack of detailed knowledge of capacity constraints may lead to additional augmentation work required to meet acceptable service standards
6. Sewer model is not up to date and not calibrated
7. Sewer network asset condition assessments needs to be improved

Items 1 and 3 are being addressed as part of the STP Upgrade project and a summary of the master planning, options assessment and concept design have been drawn from Hunter H2O (2021). Items 2 and 7 are being addressed by Council in parallel with the IWCM strategy development and were excluded from Hunter H2O (2021). Discussions regarding Items 4, 5 and 6 in Hunter H2O (2021) are reproduced in this document.

2.2.3 Stormwater

The following items were identified as issues for the stormwater system.

1. There is up to 2 GL/year of extra stormwater discharge that could be captured (under average rainfall) as potable water offset when considering projected future water demand.
2. There is a large nutrient contribution from stormwater which could be managed to offset wastewater loads.

2.3 Assess strategic options

An evaluation of the options for the provision of water and wastewater to Queanbeyan and adjacent urban areas has been undertaken. The findings of these assessments are provided in this report from section 4 onwards.

2.4 Financial modelling

A financial assessment for the preferred scenario has been undertaken and this is presented in Section 7.

3. Population, demands and growth

To prepare the IWCM strategy, consideration needs to be given to the population that the strategy will serve into the future and where infrastructure will be required to service this population. Below is an outline of the growth areas, populations and demands determined for this IWCM strategy.

3.1 Growth areas

Council has identified the location of future developments affecting water and wastewater services for Queanbeyan as shown in Figure 1 below.

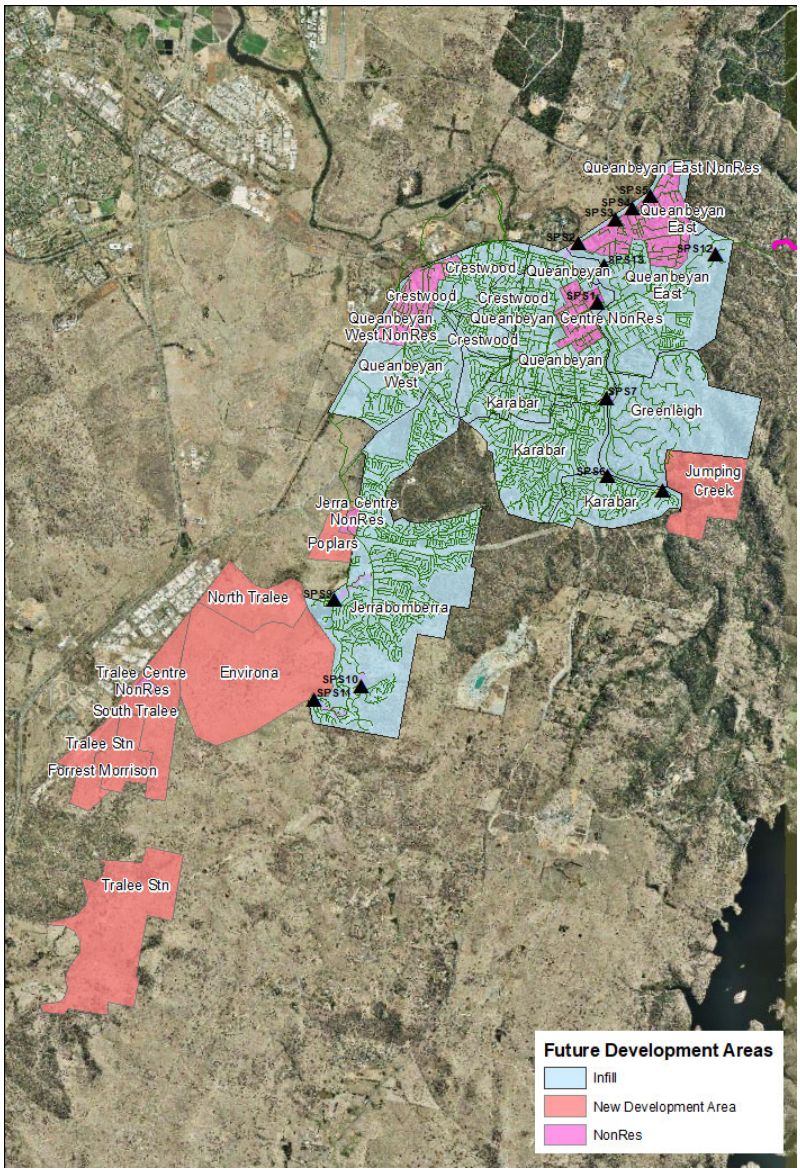


Figure 1 Future development areas

3.2 Population projections

The population projections that were included in the IWCM Issues Paper are presented in Figure 2. These projections didn't make allowance for the growth areas of South Jerrabomberra and Jumping Creek.

Table E1 Residential and Non-Residential Projections (Cumulative)

Queanbeyan IWCM	Forecast Year					
	2016	2021	2026	2031	2036	2050[2]
Residential Population	41,952	42,584	43,874	45,690	46,931	46,931
Residential Dwellings[1]	17,374	17,985	18,650	19,443	20,094	20,094
Non-residential (employment) Area, Ha	163	200	211	231	245	283
Non-residential (recreational) Area, Ha [3, 4]	UNK	3	13	26	26	26

Notes:
1. Dwellings assumed to represent low, medium and high density from private and non-private dwellings
2. There are no projections available for development areas beyond 2036 hence for the 2050 planning horizon there is no further growth assumed (as agreed with QPRC)
3. Existing (2016) recreational land area unknown (data not available)
4. Additional future recreational development (2021-2050) assumed to represent Public Open Space

Figure 2 Population projections (Queanbeyan IWCM Issues Paper, AECOM, 2019)

3.3 Demand projections

Investigations into demand projections have been included in previous documents. When preparing the water supply strategy, GHD was provided with the EP projections for future developments used by Hunter H_2O in their sewerage network analysis for consistency. For 2050, there is an EP of 77,521 which, when adopting a scaling factor of 0.88 (based on previous population to EP ratios), equates to a population of approximately 68,000 and a peak day demand (PDD) for water of 36.5 ML/d.

The stormwater discharge volumes are shown in Figure 3.

Table E4 Projected Stormwater Discharge (2050)

Future Land Use (2050)	2050 Area (Ha)	Stormwater (GL/yr)	Total Suspended Solids (Tonne/yr)	Total Phosphorus (Tonne/yr)	Total Nitrogen (Tonne/yr)
Industrial	207	1.1	89	0.2	1.2
Commercial	95	0.5	76	0.1	1.2
Residential	3,190	9.6	1,297	2.3	17.7
Parkland and Open Space	88	0.2	17	<0.1	0.3
Forest	2,460	<0.1	23	<0.1	1.1
Rural residential	13,461	8.5	742	1.3	14.0
Total Study Area	**19,500**	**19.8**	**2,245**	**4.0**	**35.4**

Notes:
1. No stormwater discharge is expected from the existing local quarry (55 Ha) therefore it is not featured in Table E4.

Figure 3 Projected stormwater discharge volumes (Queanbeyan IWCM Issues Paper, AECOM 2019)

4. Water supply scenarios

4.1 Existing water supply

4.1.1 Service level agreement

The current Queanbeyan bulk water supply is from Icon Water's network under a Service Level Agreement. Table 4 summarises the connections and supply from the Icon Water network, noting the following naming conventions:

– Offtake – a branch main off an Icon Water asset. It may have multiple supply points.
– Supply point – the meter on a line supplying a reservoir
– Limit of supply responsibility – a valve located on the Council side of the supply point that demarcates the limit of respective ownership for Council and Icon Water.

Table 4 Queanbeyan supply from Icon Water

Offtake	Supply Point	Description	Offtake Maximum Supply – Case 1	Offtake Maximum Supply – Case 2	Offtake Maximum Supply - Case 3
1	Jerrabomberra	Supply line to Jerrabomberra Reservoir	20 ML/d	27 ML/d	33 ML/d
	Tralee	Supply line to Tralee Low Level Reservoir			
2	East Queanbeyan	Supply line to East Queanbeyan Reservoir	7 ML/d	14 ML/d	17 ML/d
3	Googong Potable	Supply line to Googong Potable Water Reservoir	2.5 ML/d	2.5 ML/d	2.5 ML/d
	Googong Recycled	Supply line to Googong Recycled Water Storage Tank at WRP			
4	Kendall Avenue	Connection to facilitate emergency supply in the event of catastrophic incident on Googong Bulk Supply Main	To meet agreed emergency supply rates.		

Case 1 – Maximum off-peak daily demand where only Stromlo WTP is in operation. Off-peak is defined as the winter months

Case 2 – Maximum peak daily demand. Both Googong and Stromlo WTP in operation

Case 3 – Maximum daily demand where total Queanbeyan daily demand exceeds 41 ML/d and Icon have excess supply capacity

An overview of the Queanbeyan network is shown in Figure 4. Note that the locations of the Offtakes are not shown accurately. A water system supply schematic is shown as Figure 5.

Whilst Googong is not covered in this document or the Queanbeyan IWCM it is worth noting that Googong currently exceeds the maximum demand of 2.5 ML/d. The reservoirs supplying Googong have a combined capacity of 5.9 ML, with a further 8 ML of storage planned to be added in the next two years.

Based on the current consumption data for Queanbeyan, and the forecast peak day demand of 36.5 ML/d in 2050, the demand is within the limits nominated in the current Service Level Agreement. It is however recommended that the Service Level Agreement be reviewed in line with the recommendations made in the Queanbeyan IWCM Issues Paper (AECOM, 2019).

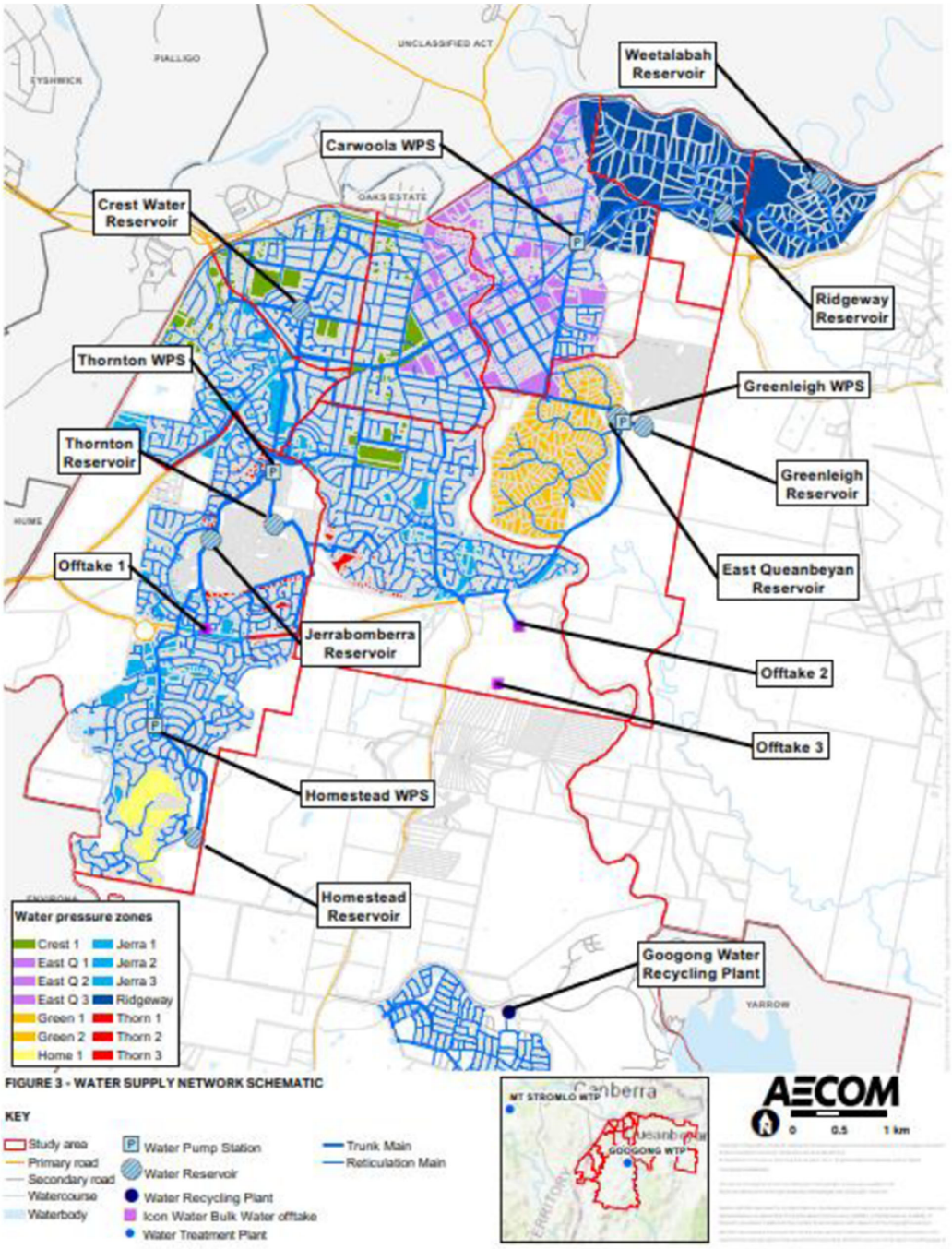


FIGURE 3 - WATER SUPPLY NETWORK SCHEMATIC

Figure 4 Water supply network layout (Queanbeyan IWCM Issues Paper, AECOM, 2019)

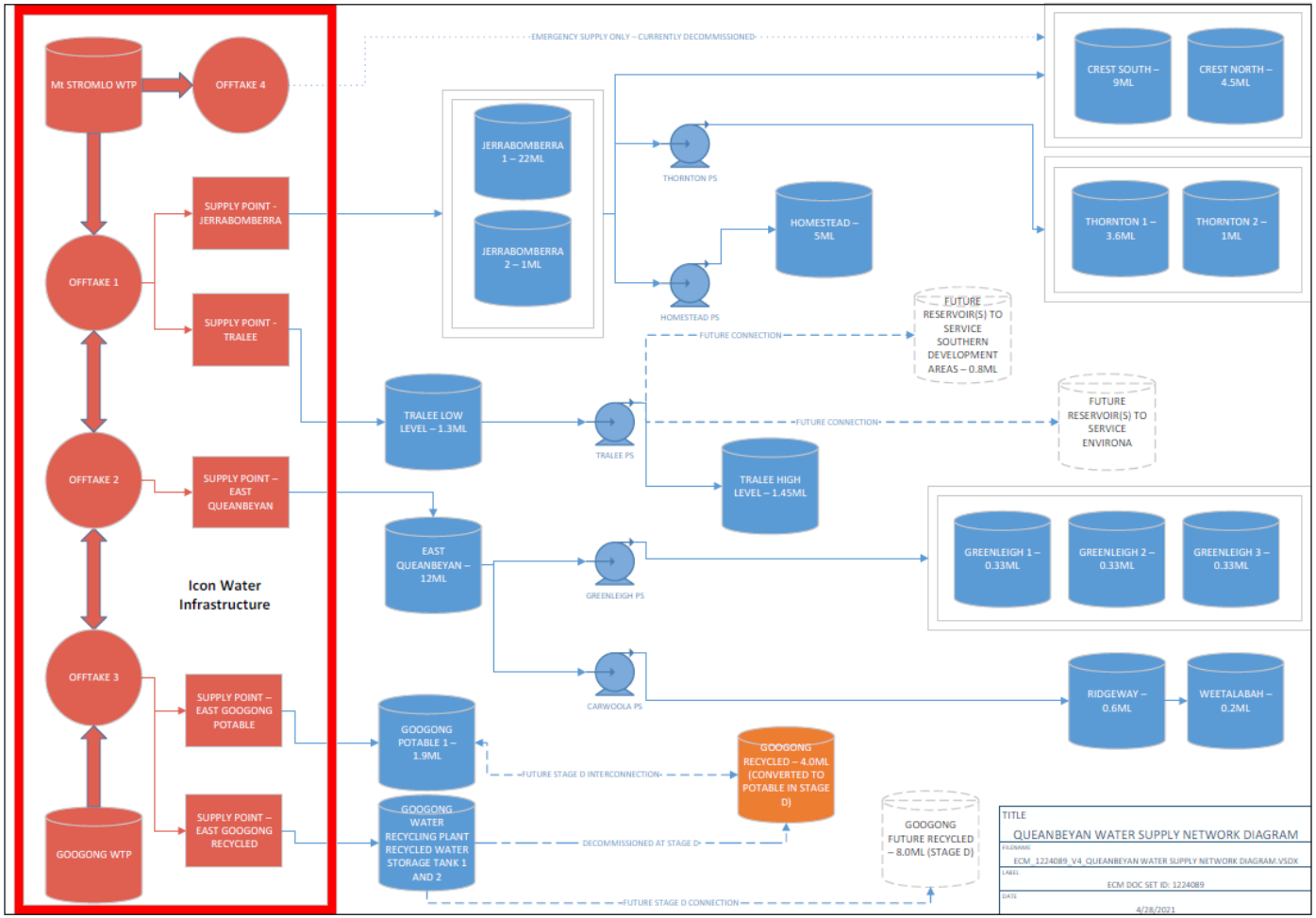


Figure 5 Water supply system schematic

There are currently no recycled water schemes or plans for one in Queanbeyan or Jerrabomberra.

QPRC also hold Water Access Licences (WAL) issued under the Water Management Act 2000 to extract either groundwater or water from Queanbeyan River for irrigation. Further details are included in the *Queanbeyan IWCM Issues Paper* (AECOM, 2019).

4.1.2 Water quality management

With reference to the ADWG, the safety of water in public health terms is determined by the microbial, physical, chemical, and radiological quality of the water. Microbial quality is typically the most important issue. Effective disinfection of water using chlorine is the main treatment process used to achieve safe microbial quality in drinking water for Queanbeyan. In addition, maintaining chlorine residual in the water supply network and ultimately up to the customer taps is also recommended to minimize contamination risk.

The ADWG states "*When operating a distribution system, it is important to understand the difference between effective disinfection and maintaining a disinfectant residual. The water is effectively disinfected when the required C.t value has been achieved. After effective disinfection, enteric pathogens should not reappear within the distribution system, unless there is a failure in the integrity of the system. Therefore, unless there is a barrier breach within the distribution system the water should remain safe to drink even in the absence of adequate disinfectant residual. Barrier breaches could include such things as ingress, backflow, loss of pressure within the distribution system, or contamination within post-treatment storage tanks".*

From GHD corporate experience and with reference to the ADWG Chlorine fact sheet, the typical ranges for total and free chlorine in reticulation networks are as follows:

– Between 0.2 mg/L and 0.6 mg/L of total chlorine considering odour threshold
– Between 0.1 mg/L and 0.4 mg/L free chlorine

Given most of the time Queanbeyan is supplied with water from the Stromlo WTP, a significant distance away, there is a re-chlorination point owned by Icon Water and operated by Council to maintain a chlorine residual in the reticulation network. It is understood however that Council do not currently operate the re-chlorination system. There is only a dosing point at Offtake 2 and none at Offtake 1. It is understood that Council manually dose chlorine into the reservoirs.

Sampling is undertaken by Council within its network. The location of the sampling sites in Queanbeyan is shown in Figure 6. The light blue dots are current water sampling sites, and the dark blue ones are sampling sites no longer in use (GHD, 2021).

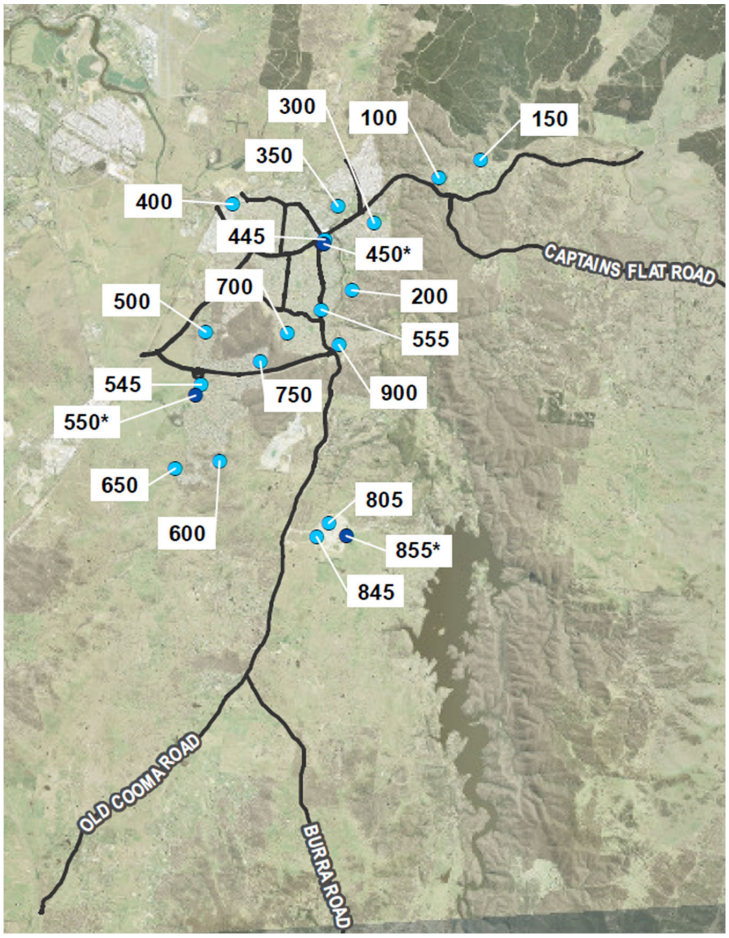


Figure 6 Chlorine residual sampling sites

4.1.3 Chlorine residuals

Figure 7 to Figure 10 show the sample values for free and total chlorine at the various sampling points in the reticulation network based on the data provided by Council. The typical range is shown as a light blue block on the charts. The data indicates that there is more chlorine in the water than would be typically expected which may result in customer taste and odour complaints.

Additional commentary from Council operations staff is that:

1. There are locations within the network where there is zero chlorine residual.
2. Within the network there are several dead ends and currently there are no regular operation plans that include flushing of these sections of the network.
3. Anecdotally there have been no customer complaints related to taste and odour.

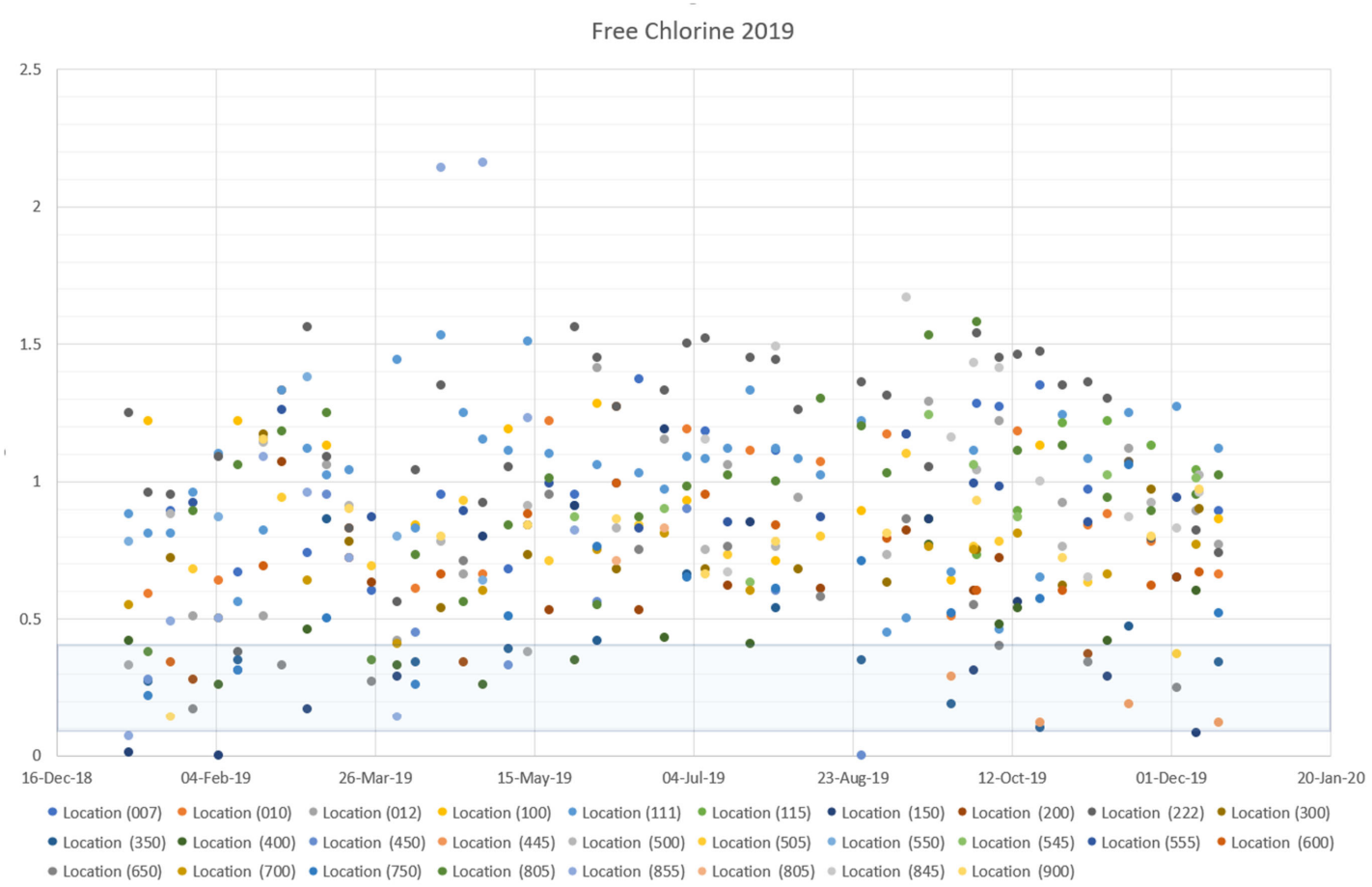


Figure 7 *Free chlorine (mg/L) 2019*

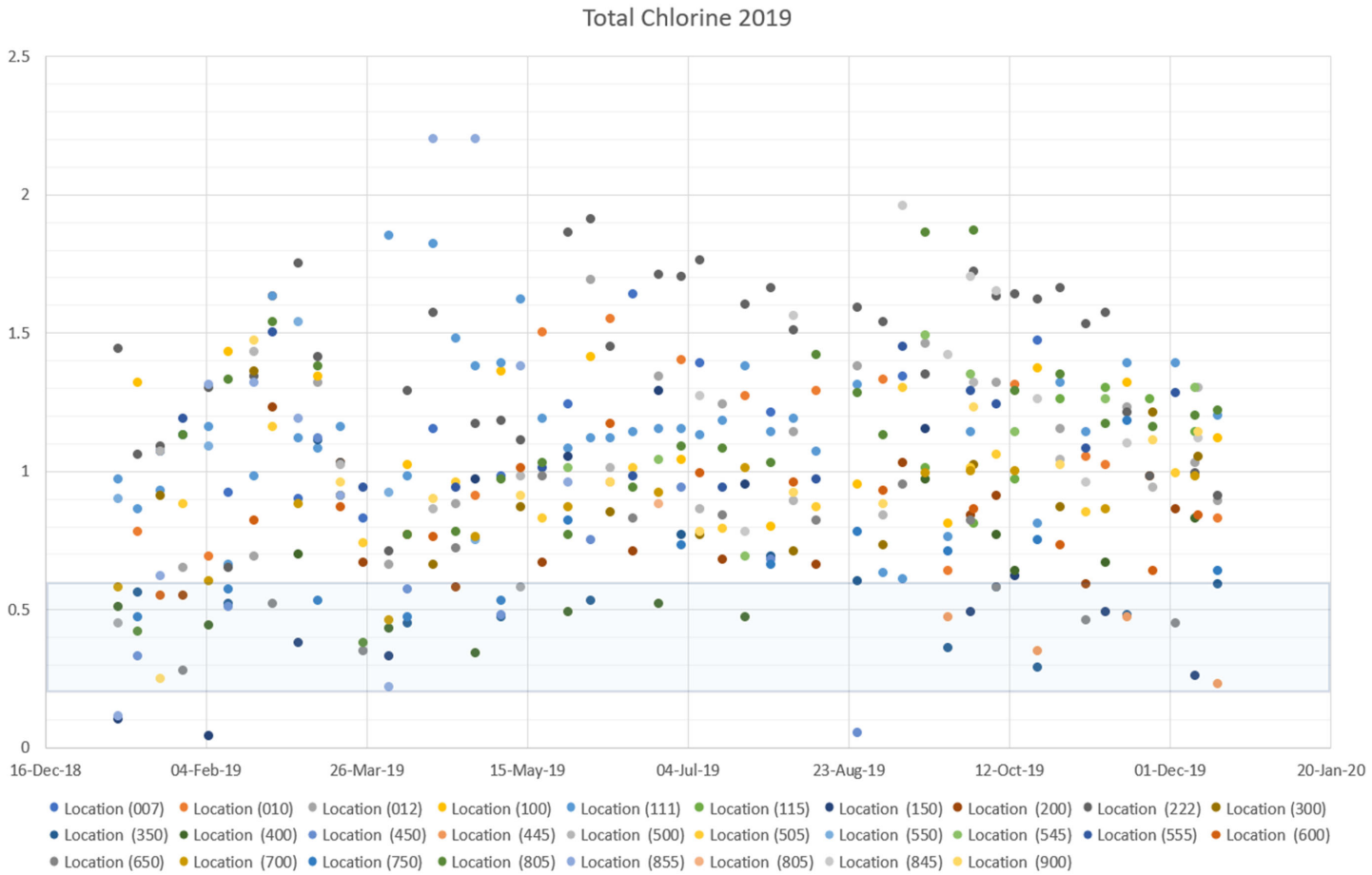


Figure 8 Total chlorine (mg/L) 2019

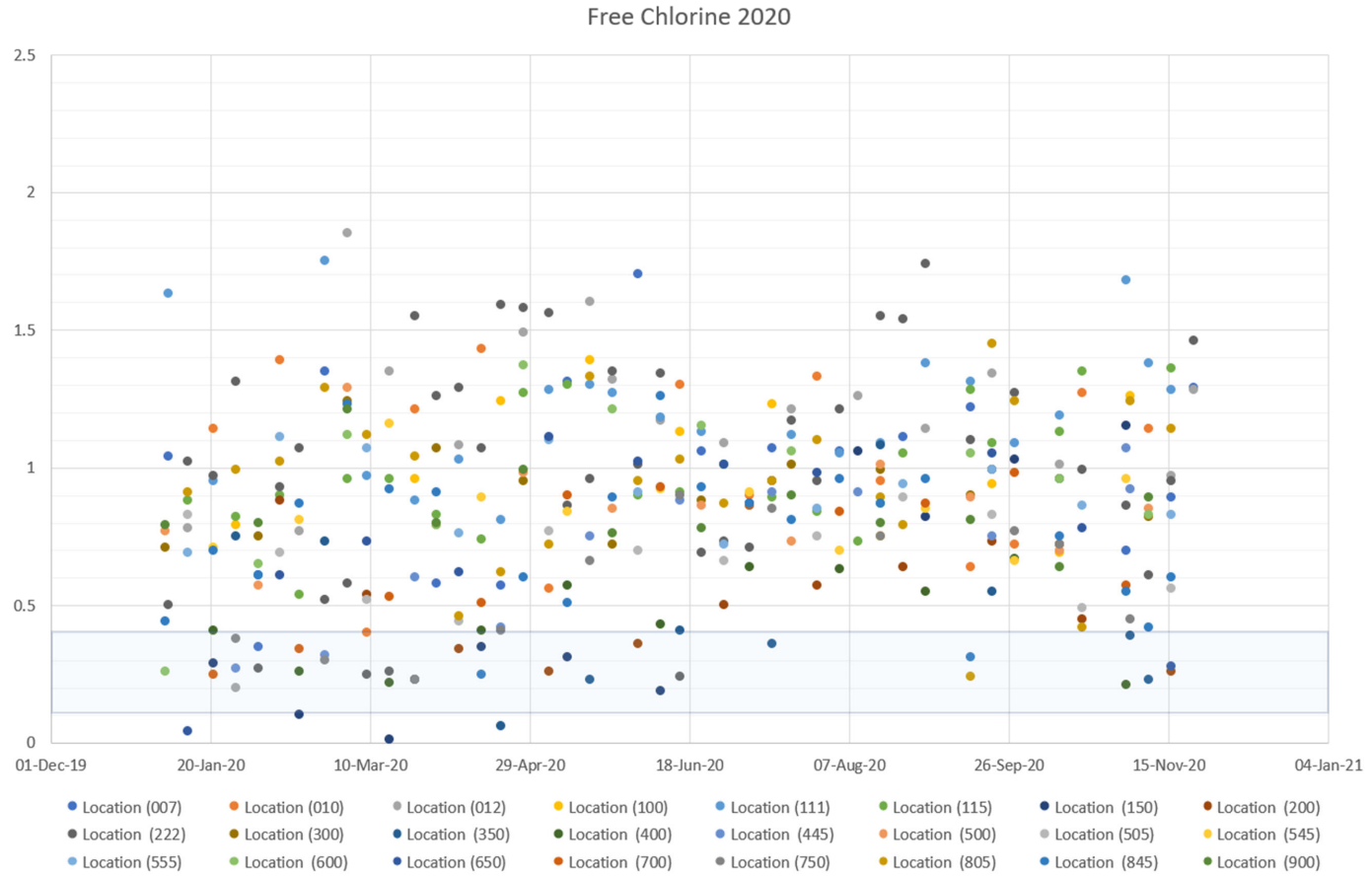


Figure 9 *Free chlorine (mg/L) 2020*

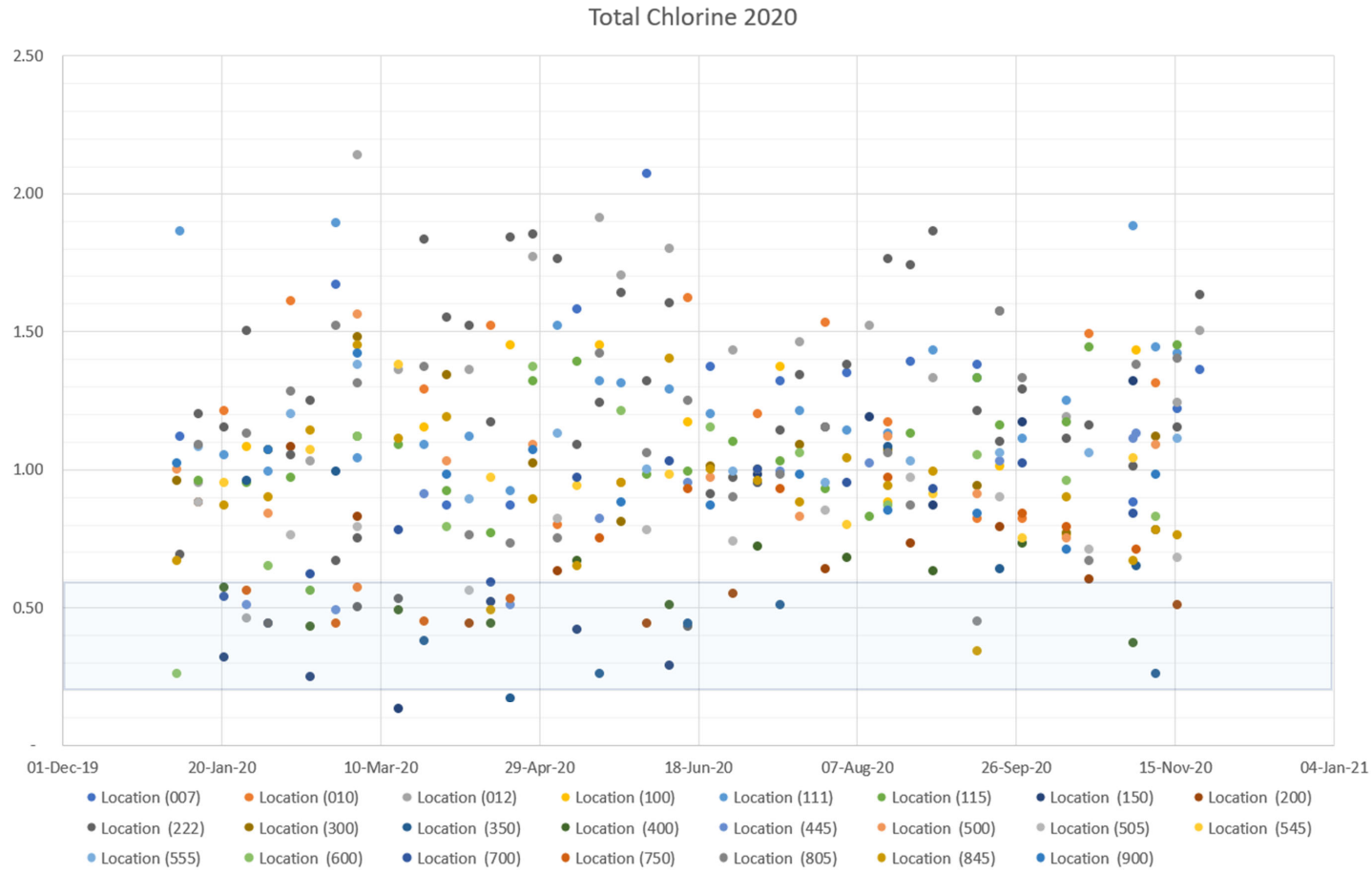


Figure 10 Total chlorine (mg/L) 2020

4.2 Demand analysis

4.2.1 Objectives

A demand analysis of the water system was performed through hydraulic modelling. The objectives of the hydraulic modelling included:

1. Assess the capacity of the trunk water supply network considering:
    a. Ability of reservoirs to meet demand conditions
    b. Ability of Icon Water offtakes to supply the service reservoirs
    c. Ability of supply network if any of the reservoirs are offline
2. Determine upgrade requirements.

4.2.2 Model scope

The water supply option developed by GHD (2021) included the following requirements about the modelling:

– A dynamic extended period simulation of the flows to be undertaken
– Network model to include pipes that distribute water to the service area and service reservoirs i.e. greater than DN250
– Model to include reservoirs, hydraulic structures, pump stations, rising mains connected to the water supply trunk system.

The modelling has been undertaken using Bentley's WaterCAD CONNECT Edition Update 3 (10.03.01.08).

Council provided a copy of the existing model that has been used as the basis for modelling undertaken. On review of the model and agreed with Council, the model was not skeletonised to include only the trunk infrastructure.

4.2.3 Modelling parameters

The modelling parameters adopted based on IWCM Issues Paper (AECOM, 2019) include:

– Annual average water demand 233 L/cap/day
– PDD = 2.3 ADD
– Ratio of the Peak Day to Average Day = 2.3
– Ratio of the Peak Day to Peak Week (7-day average) = 1.4

The following criteria are the conditions against which the hydraulic performance of the network was assessed:

– Reservoir capacity - Maintain a minimum of 2/3 PDD storage volume
– Pump stations - Pump Duty (extracted from middle value in pump curve) exceeds downstream PDD of the supply zone
– Trunk mains – Pipe velocity to be less than 2 m/s

4.2.4 Existing model

A high-level review was performed by GHD upon receipt of the existing model from Council. The condition and status of the model is summarised in the following sub sections.

4.2.4.1 Demands

The average daily demand and peak day demand of the existing model are shown in Table 5.

Table 5 Existing model demands

	Flow supplied (ML/d)	Flow demanded (ML/d)
Average daily demand	10.55	9.62
Peak day demand	24.26	22.12

4.2.4.2 Pipe details

After a review of the pipe data of the existing model, the following items were noted:

- There are 6,870 pipe elements in the model and 81 of which are inactive.
- Pipes were modelled using nominal diameter and not internal diameter.
- User-defined lengths were used in the model except for 39 pipes that have model-scaled lengths.
- Hazen Williams Roughness Coefficient (C) was used to account for the friction loss in pipes. It is noted that a constant C value was adopted for each pipe material, thus the age of the pipes was not considered. Table 6 shows the C values used in the model for different pipe materials.

Table 6 Hazen Williams coefficient, C

Pipe Material	Number of Pipes in the Model	Hazen Williams Coefficient (C)
Asbestos Cement (AC)	3,044	130 (1 pipe with C=90)
Cast Iron Cement Lined (CICL)	625	130
Ductile Iron (DI)	36	130, (2 pipes with C=90 and 1 pipe with C=120)
Ductile Iron Cement Lined (DICL)	2,963	120
PVCU	45	130
Steel	1	90
Unknown Pipe Material	156	90

4.2.4.3 Reservoirs

The existing model has two major offtakes, 1 and 2, that are represented by fixed-head reservoirs. The model also consists of thirteen service reservoirs that are represented as tanks. It is observed that some of these service reservoirs are inactive and not connected to the network. Table 7 summarises the details of the service reservoirs contained within the existing model. Note that some of the modelled reservoir volumes do not match the volumes nominated in Figure 5 water supply schematic. These differences have been noted but did not make material difference to the results and recommendations.

Table 7 Reservoir conditions

Reservoir	Existing model condition
Crest North / Tank 1	Inactive and not connected to the network. Storage volume is added to Crest South / Tank 2.
Crest South / Tank 2	Volume: 13.50 ML @ 7.68 m depth BWL: 636.12 mAHD
East Queanbeyan	Volume: 12.0 ML @ 8.50 m depth BWL: 661.50 mAHD
Greenleigh 1	Volume: 0.99 ML @ 5.0 m depth BWL: 687.50 mAHD
Greenleigh 2	Inactive and not connected to the network. Storage volume is added to Greenleigh 1.
Greenleigh 3	Inactive and not connected to the network. Storage volume is added to Greenleigh 1.
Homestead	Volume: 4.50 ML @ 6.0 m depth

Reservoir	Existing model condition
	BWL: 736.50 mAHD *Note: Network schematic nominates 5 ML volume*
Jerrabomberra 1	Volume: 23.60 ML @ 9.25m depth BWL: 674.25 mAHD *Note: Network schematic nominates 22 ML volume*
Jerrabomberra 2	Inactive and not connected to the network. Storage volume is added to Jerrabomberra 1.
Ridgeway	Volume: 0.77 ML @ 16.88 m depth BWL: 721 mAHD Combined inlet and outlet. *Note: Network schematic nominates 0.6 ML volume*
Thornton 1	Inactive. Storage volume is added to Thornton 2.
Thornton 2	Volume: 4.90 ML @ 5.0 m depth BWL: 739.88 mAHD *Note: Network schematic nominates total 4.6 ML volume*
Weetalabah	Volume: 0.27 ML @ 7.59 m depth BWL: 730.51 mAHD Combined inlet and outlet *Note: Network schematic nominates 0.2 ML volume*

4.2.4.4 Pumping stations

The existing model includes five pumping stations. Four pump stations are active whilst Water Pump Station 19 is set as inactive. Pump definitions are available in the model however it is observed that there are extra / redundant pump definitions that are not used in the model. Table 8 provides a summary of the pump station information as included in the model.

Table 8 Pumping station conditions

Pump station	Pump definition	Elevation	BEP Max. Flow (L/s)
Water Pump Station 1 (Homestead)	Water Pump Station 1	615.50	70.41
Water Pump Station 3 (Thornton Tank)	Water Pump Station 3	668.00	236.70
Water Pump Station 6 (Greenleigh)	Water Pump Station Greenleigh	640.00	53.33
Water Pump Station 8 (Ridgeway/ Carwoola)	Water Pump Station 8	598.09	44.69
Water Pump Station 19	N/A	0	N/A

In addition to the above water pump stations there is a water pump station at Tralee servicing the new development areas. This is not currently included in the model and has not been reviewed as part of this study.

4.2.4.5 Zone and control valves

The existing model contains seven zones namely Homestead, Thornton, Ridgeway, Crestwood, East Queanbeyan, Greenleigh and Jerra Park. This does not have an effect to the model results as zones are only used to group the elements physically.

The model consists of three types of control valves namely general-purpose valve (GPV), check valve (CV) and pressure release valve (PRV). From a high-level review of the model, several GPVs are closed and some PRVs and CVs are inactive, which can greatly affect the network, thus further investigation, beyond the scope of this engagement is needed to understand the purpose of these control valves in the model. Table 9 summarises the details of the control valves contained within the existing model. For the investigation, it has been assumed that the model reflects the true status of the valves.

Table 9 Control valve conditions

Valve Type	Number of Elements in the Model	Existing Model Condition
General-purpose Valve (GPV)	1,495	88 GPVs are closed
Pressure Release Valve (PRV)	9	3 PRVs are inactive
Check Valve (CV)	3	All are inactive 2 CVs are not connected to the network

4.2.5 2050 Peak day demand scenario

The 2050 base case scenario adopted the 2050 planning horizon along with a peak day 24-hour period. The adopted 2050 demand was 36.5 ML/d as per the adopted populations in the sewerage analysis (refer section 3.3).

As agreed with Council, the demands within the existing WaterCAD model were scaled such that the total system demand was equal to the Queanbeyan network peak day demand of 36.5 ML/d, including Tralee and Environa.

The location of connection point for Jumping Creek will be a new dedicated supply line constructed along Ellerton Drive, connecting to the network near the East Queanbeyan Reservoir (based on Jumping Creek water alignment sketches dated April 2020, provided to GHD). The connection point to the Poplars was assumed based on its proximity to the existing network. The demand for infill and non-residential areas were applied as a global multiplier to the existing network.

The supply to Tralee and Environa will be via a new supply line from Offtake 1. This line will supply a new low-level reservoir, that in turn feeds a high-level reservoir.

As noted in Table 5 (Section 3.4.1), the existing WaterCAD model has a PDD of 22.12 ML/d. This means that there is a 14.38 ML/d variance between the demand in the existing model and the projected demand for 2050 EP. This variance was distributed based on the projected EP of each area, and the computed demands were used in the model. The projected demand in 2050, distributed to future development areas, is detailed in Table 10.

Table 10 Projected 2050 future development EP and PDD

Future development area	Additional EP	% of total	Demand in ML/d	Service reservoir
Jumping Creek	960	2.9	0.41	Greenleigh 1– 100%
Tralee	4,040	12.0	1.73	Tralee Low Level & Tralee High Level
Tralee Station	10,800	32.1	4.61	Future reservoir– size unknown
The Poplars	2,160	6.4	0.92	Jerrabomberra– 100%
Environa / Robin	6,000	17.8	2.56	Future Reservoir– Environa – 100%
Infill – Crestwood	559	1.7	0.24	Crest South/ Tank 2– 100%
Infill – Jerrabomberra	67	0.2	0.03	Jerrabomberra 1– 100%
Infill – Karabar	214	0.6	0.09	Jerrabomberra 1– 75% Thornton– 25%
Infill – Queanbeyan	739	2.2	0.31	East Queanbeyan– 75% Crest South/Tank 2– 25%
Infill – Queanbeyan East	586	1.7	0.25	East Queanbeyan – 100%
Infill – Queanbeyan West	125	0.4	0.05	Jerrabomberra– 75% Crest South/ Tank 2– 25%
Non-Res	7,428	22.1	3.17	Crest South/ Tank 2– 10% East Queanbeyan – 50% Jerrabomberra 1– 40%

Future development area	Additional EP	% of total	Demand in ML/d	Service reservoir
TOTAL	33,678	100	14.38	

However, based on the drawing “Potable Water Supply Concept” for South Tralee dated February 2020 that was provided to GHD (see Figure 11), South Tralee will have an independent supply point from Offtake 1. Thus, the demands for South Tralee were assumed to be excluded from Queanbeyan water supply network.

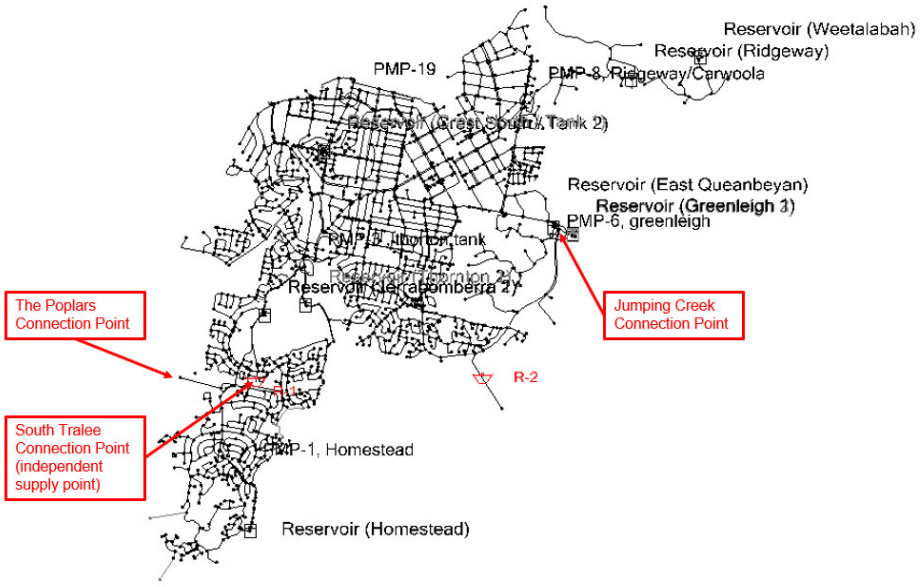


Figure 11 Connection points for future developments

4.2.5.1 Changes to the original model

Before running the 2050 PDD scenario, changes were made to the model to fix a model validation error. In the model provided to GHD, the trunk main that supplies Jerrabomberra 1 reservoir from offtake 1 was initially set to be closed, thus causing Jerrabomberra 1 reservoir to reach its emptying point. Similarly, the upstream and downstream pipes of Water Pump Station 1-Homestead were closed causing it to be isolated from the network. To correct these errors, the initial setting of these pipes was changed to “open”.

In addition, the sizes of the trunk mains were also update from nominal diameter to actual internal diameter. Table 11 shows the changes in the pipe sizes.

Table 11 Pipe size updates

Pipe type	Diameter in existing model (mm)	Adopted internal diameter (mm)
DICL	250	264.80
	300	322.40
	375	401.40
	450	479.90
AC	250	231.00
	300	279.40

	375	370.40
	450	444.00
	600	586.80

Lastly, the labels of offtakes 1 and 2 have been switched to match Figure 5 Water Supply System Schematic.

4.2.5.2 Pipe velocity results

Under the 2050 PDD scenario, the DN375 trunk main that extends from the offtake to East Queanbeyan reservoir has a velocity of 2.63 m/s. The total length of this trunk main is 2.88 km. All other trunk mains have a velocity of less than 2 m/s.

In the existing model maximum day scenario, the DN375 trunk main has a velocity of 2.53 m/s. Figure 12 below shows the location of this trunk main.

While this velocity is high, it does not appear to impact on the ability of the network to maintain supply to East Queanbeyan reservoir (see further results and discussion below). Notwithstanding this finding, high pipe velocities are associated with other risk factors, such as pipe scouring and water hammer.

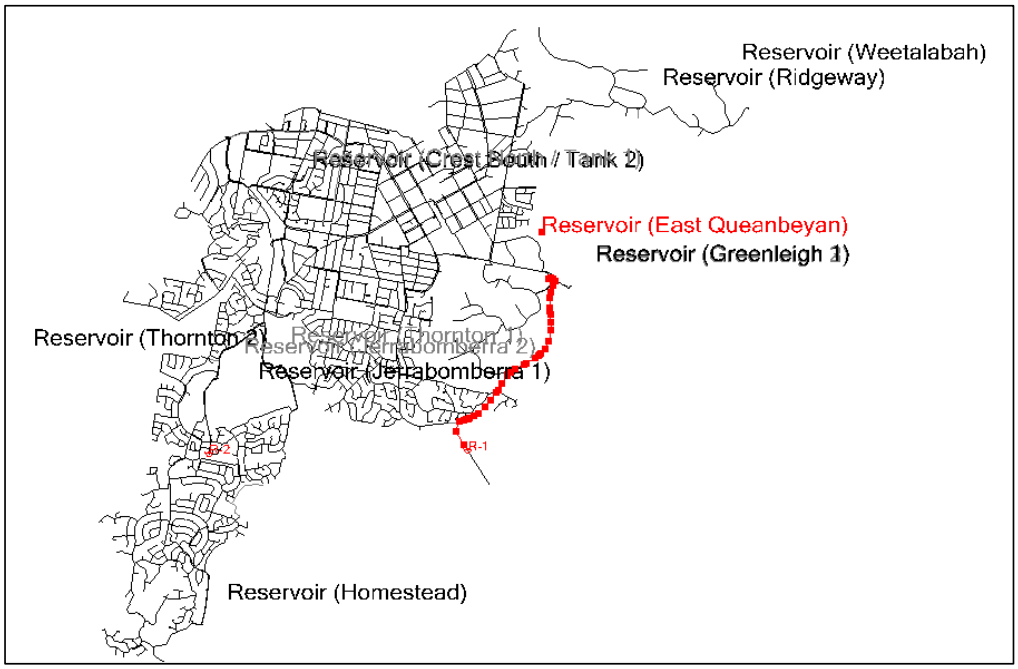


Figure 12 DN375 trunk main location

4.2.5.3 Reservoir storage

On a 24-hour period simulation under 2050 PDD scenario, Greenleigh 1, Jerrabomberra 1, Thornton 2 and Weetalabah reservoirs are observed to reach a storage level that is less than 67% of its capacity.

Table 12 shows a comparison of the lowest percentage of storage experienced by the active reservoirs under existing model PDD scenario and 2050 PDD scenario. Figure 13 shows the percentage over the 24 hour simulation period.

Table 12 Reservoirs storage

Reservoir	Lowest Percentage of Storage Under Existing Model PDD Scenario	Lowest Percentage of Storage Under 2050 PDD Scenario
Crest South/ Tank 2	82.0 %	82.0 %
East Queanbeyan	79.9 %	79.7 %
Greenleigh 1	57.7 %	57.5 %
Homestead	83.3 %	83.3 %
Jerrabomberra 1	83.2 %	62.9 %
Ridgeway	92.0 %	91.8 %
Thornton 2	48.4 % *	48.4 % *
Weetalabah	47.3 % *	47.3 % *
* Reservoir starting level based on model provided. Both reservoirs fill to 100% over 24 hr period		

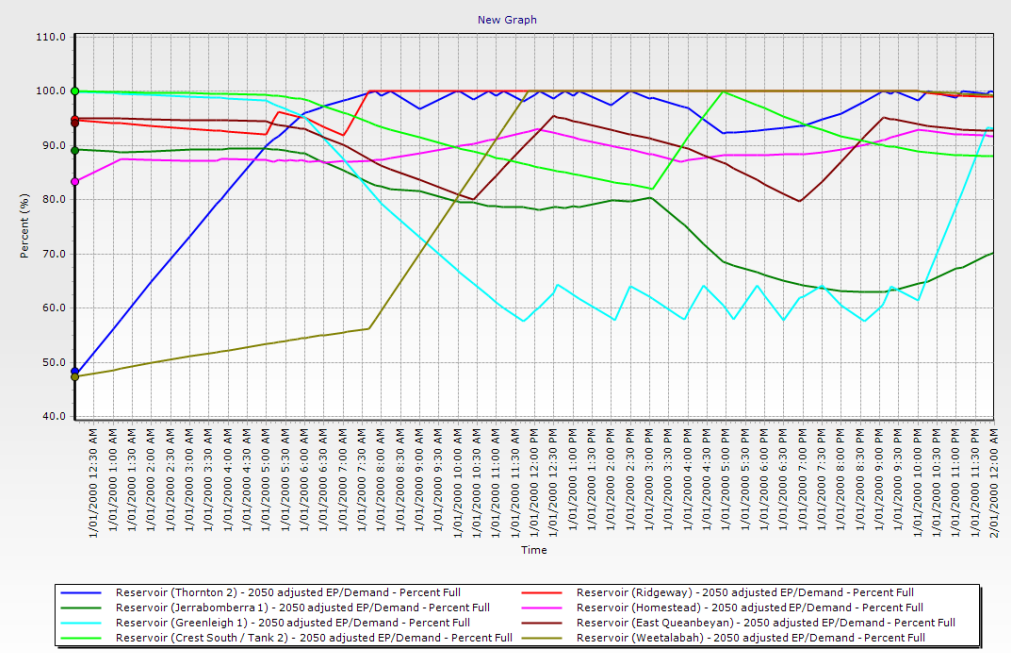


Figure 13 Reservoir storage percentage full

From the table and figure above, Greenleigh 1, Jerrabomberra and Homestead reach a level lower than 67% of their storage capacity on both present day and future 2050 PDD scenarios. Jerrabomberra 1 reservoir storage falls to 62.90% under the 2050 PDD scenario.

While the above reservoirs fail the criteria used for the purposes of this investigation, purely from worst-case security of supply perspective, the reservoir performance is deemed adequate. The figures below show that these reservoirs, except for Jerrabomberra 1 and Homestead, recover 70% to 100% of their capacity by the end of the 2050 PDD scenario.

Appendix A shows the graphs of Greenleigh 1, Jerrabomberra 1, Thornton 2 and Weetalabah reservoirs for the 24-hour simulation as well the behaviour of Jerrabomberra 1 reservoir during a 7-day simulation.

4.2.5.4 Water pumping stations performance

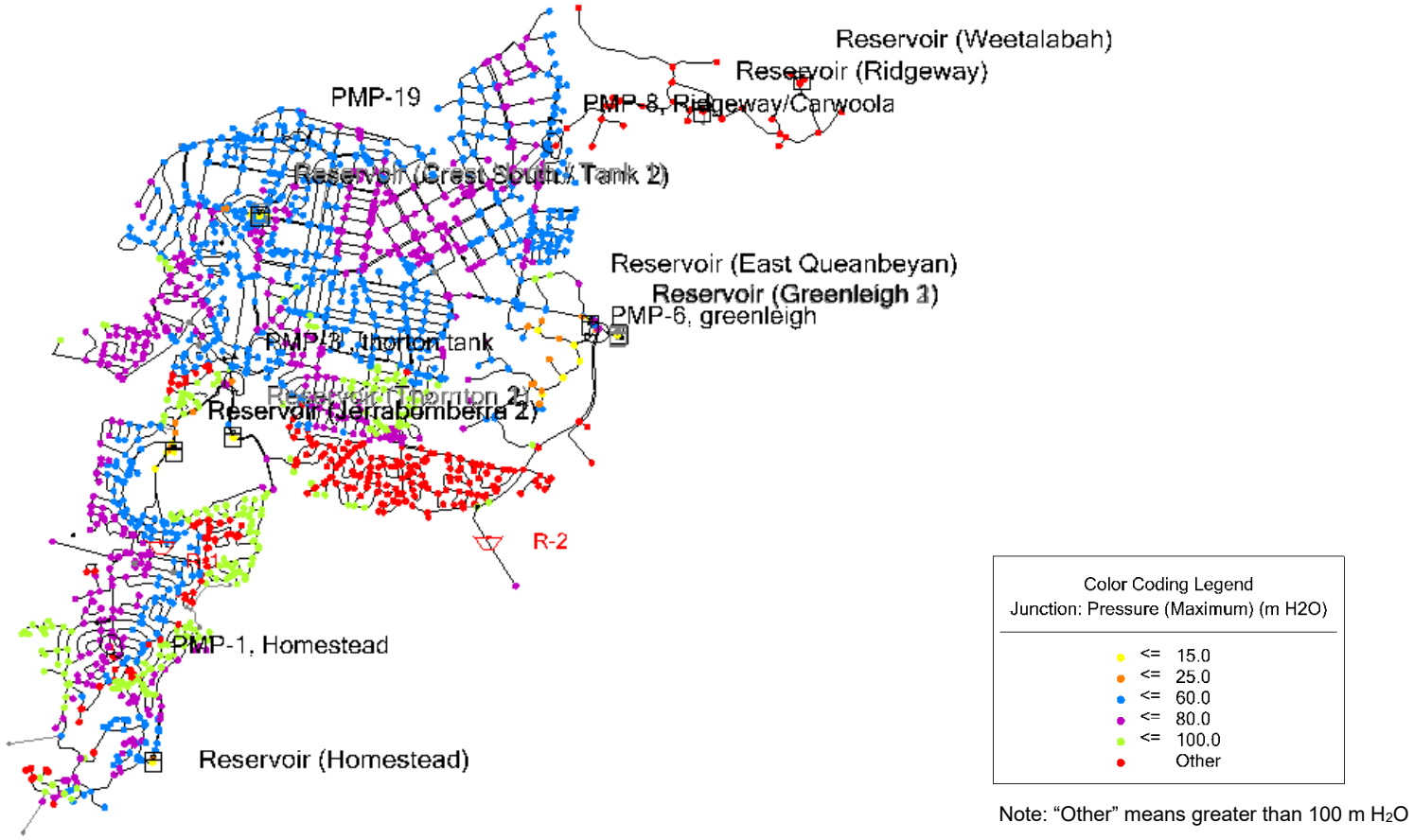
During 2050 PDD scenario, three out of four water pumping stations are operating at flows that are significantly less than their best efficiency points (BEP), as detailed in Table 13. Given that the 2050 PDD scenario contains no changes to reservoir operating levels, this may be an indication that the existing pump selections are unsuitable for their current purpose. More detailed investigations, involving a review of existing pump curves and operating pressures, would be required to confirm if there are any issues with pumping.

Table 13 Pump flows

Pump Station	BEP Max. Operating Flow (L/s)	Max. Flow at 2050 PDD Scenario (L/s)
Water Pump Station 1 (Homestead)	70.41	44.41
Water Pump Station 3 (Thornton Tank)	236.70	121.67
Water Pump Station 6 (Greenleigh)	53.33	53.75
Water Pump Station 8 (Ridgeway/ Carwoola)	44.69	33.28
Water Pump Station19	N/A	N/A

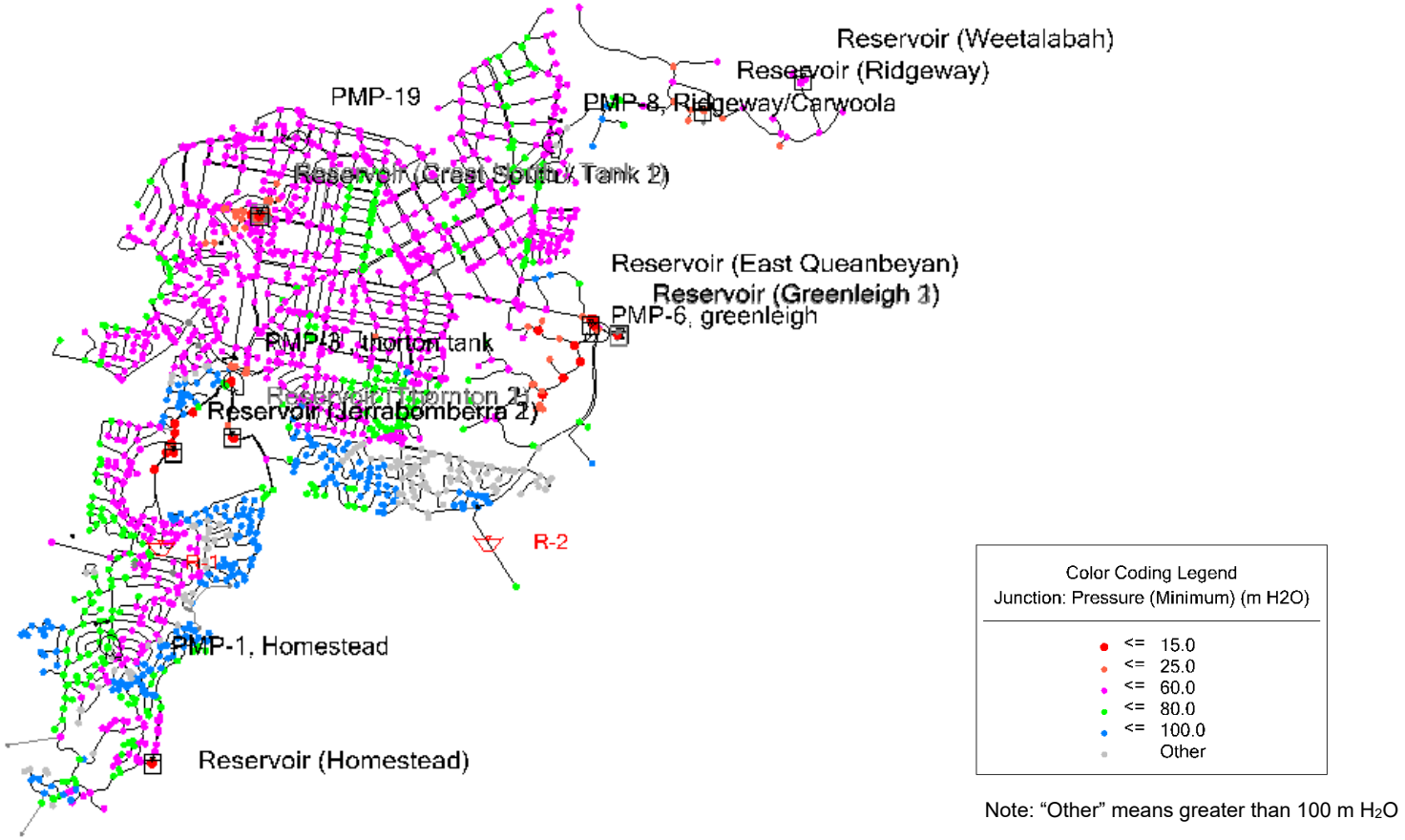
4.2.5.5 System Pressures

Figure 14 and Figure 15 show the maximum and minimum pressures in the network under 2050 PDD scenario.



Note: "Other" means greater than 100 m H_2O

Figure 14 Maximum pressure plot



Note: "Other" means greater than 100 m H_2O

Figure 15 Minimum pressure plot

4.2.6 Stress tests

To further assess the performance of the network during possible worse case scenarios, GHD performed the following stress tests:

1. Global increase in demand by 20%
2. Taking offtake 1 offline
3. Taking offtake 2 offline
4. Taking Jerrabomberra 1 reservoir offline

4.2.6.1 Global increase in demand by 20%

If the actual demand became greater than the projected 2050 peak day demand, GHD globally scaled up the 2050 peak day demand by a factor of 1.20 and assessed the network performance against the modelling parameters. The 20% increase in demand is envisaged to allow for some increased per capita consumption as well as unplanned growth. The percentage full estimates for the reservoirs over the course of a day, with the increased demand, are presented in Figure 16.

With the 20% increase in demand, the following results are noted:

– Like the 2050 PDD scenario results Greenleigh 1, Thornton 2 and Weetalabah reservoirs still have storage below 67%.
– Jerrabomberra 1 reservoir's storage dropped to 42.40%. Refer to Table 14 for the summary of reservoir storage results.
– The DN375 trunk main that extends from the offtake to East Queanbeyan reservoir has a velocity of 2.63 m/s. All other trunk mains have a velocity less than 2 m/s.
– Pump 6 Greenleigh slightly exceeded maximum operating point.

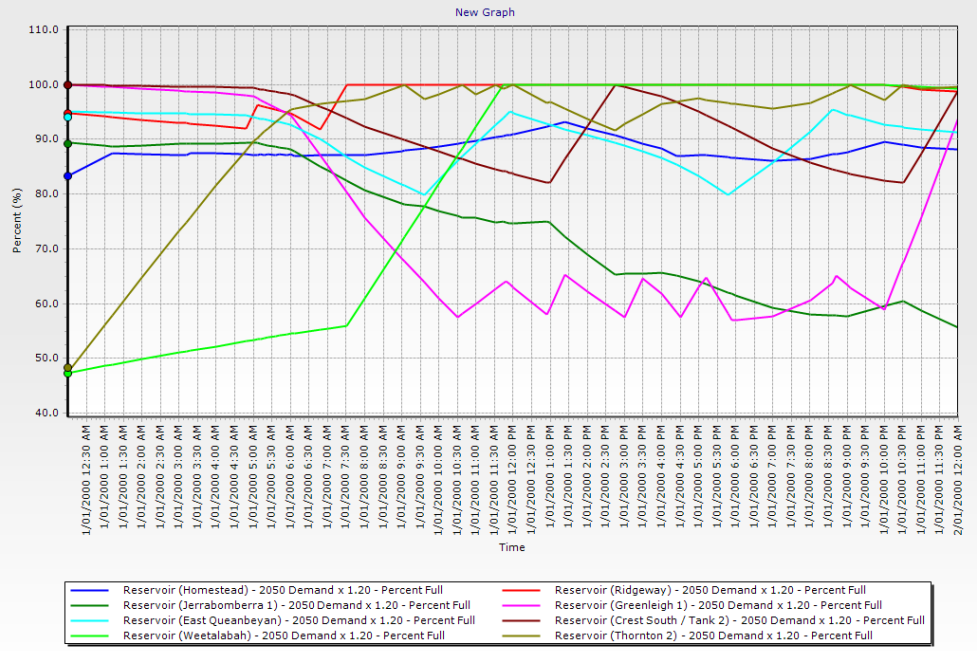


Figure 16 Reservoir percentage full global increase on demands

4.2.6.2 Offtake 1 is offline

Offtake 1 supplies Jerrabomberra 1 reservoir whilst Jerrabomberra 1 supplies three other smaller reservoirs (Greenleigh 1, Homestead, and Crest South Tank 2 reservoirs). In this scenario, since Offtake 1 is offline, the demand from the catchments of all these four reservoirs will need to be catered by the available storage in Jerrabomberra 1. The percentage full estimates for the reservoirs over the course of a day, with Offtake 1 offline, are presented in Figure 17.

At the end of the 24-hour period, the results are summarised as:

– Like the 2050 PDD scenario results Greenleigh 1, Thornton 2 and Weetalabah reservoirs still have storage below 67%.
– The results show that even if Jerrabomberra 1 is offline, Homestead reservoir can still get enough supply and maintain high storage. Refer to Table 14 and Figure 17 for the summary of reservoir storage result.
– The DN375 trunk main that extends from the offtake to East Queanbeyan reservoir has a velocity of 2.63 m/s. All other trunk mains have a velocity less than 2 m/s.
– Water Pump Station 6 Greenleigh slightly exceeded maximum operating point.

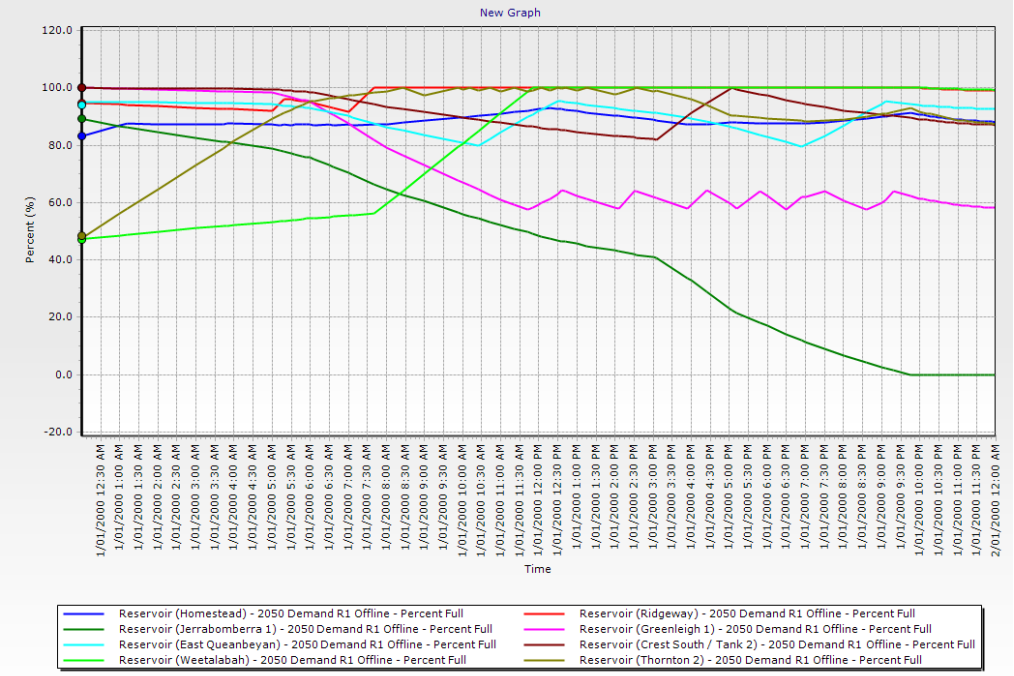


Figure 17 Reservoir percentage full Offtake 1 offline

4.2.6.3 Offtake 2 is offline

In this scenario, Offtake 2 is set as inactive, thus no supply is coming to East Queanbeyan reservoir. It is assumed that the supply to Greenleigh 1, Ridgeway and Weetalabah reservoirs will solely depend on what is stored in East Queanbeyan reservoir. The percentage full estimates for the reservoirs over the course of a day, with Offtake 2 offline, are presented in Figure 18.

At the end of the 24-hour period, the results are noted to be:

– Like the 2050 PDD scenario results Greenleigh 1, Thornton 2, Weetalabah and Jerrabomberra 1 reservoirs still have storage below 67%.

– East Queanbeyan reservoir's storage dropped to 43.5%. This is an expected result since East Queanbeyan reservoir supplies three subsequent reservoirs. Refer to Table 14 for the summary of reservoir storage results.
– Since Offtake 2 is offline, there is no flow for the DN375 trunk main that supplies East Queanbeyan reservoir. All other trunk mains have a velocity less than 2 m/s.
– Maximum flow at Water Pump Station 6 Greenleigh drops to 29.5 L/s.

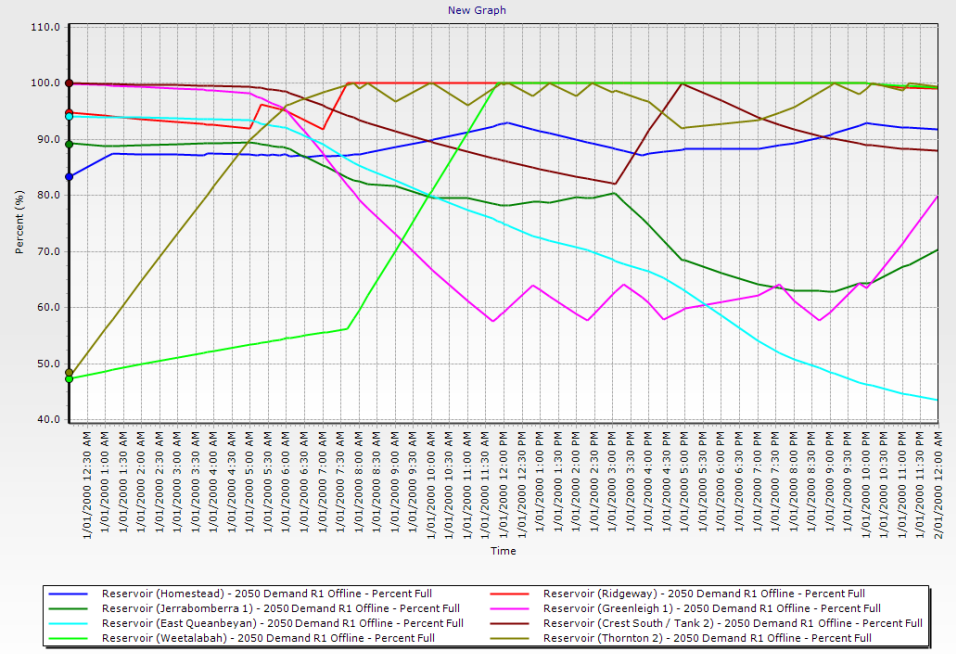


Figure 18 Reservoir percentage full Offtake 2 offline

4.2.6.4 Jerrabomberra 1 reservoir is offline

Since Jerrabomberra 1 is known to be in poor condition and it has the largest downstream supply zone, it plays a particularly crucial part in the network to ensure security of supply. This stress test scenario assessed the network performance when Jerrabomberra 1 becomes offline for at least 24-hour period. The minimum storage estimates for the reservoirs under this scenario are shown in Table 14, and the maximum flow estimates at the water pump stations are shown in Table 15. The operational observations from this scenario are summarised as follows:

– When Jerrabomberra 1 is offline, two of its subsequent reservoirs (Crest South Tank and Thornton 2) will reach their emptying point. Crest South Tank 2 will be empty after operating for 19 hours whilst Thornton 2 will be empty after approximately 12 hours of operation. Also, Homestead reservoir's storage dropped to 37.6%.
– The DN375 trunk main that extends from the offtake to East Queanbeyan reservoir has a velocity of 2.63 m/s. All other trunk mains have a velocity less than 2 m/s.
– Water Pump Station 6 Greenleigh slightly exceeded maximum operating point.

Given that there is a potential that Jerrabomberra 1 reservoir can be taken offline for three days, a separate run was made to check the condition of the network during this event. The results of this run can be summarised as follows:

– East Queanbeyan maintains 68.6% storage, Ridgeway maintains 87% storage and Weetalabah maintains 47.3% storage.
– All reservoirs downstream of Jerrabomberra 1 will be empty. Greenleigh reservoir will be the last to be emptied after operating for 1 day and 21 hours.

Table 14 Reservoir storage under stress test scenarios

Reservoir	Lowest percentage of storage using 2050 PDD x 1.20 (%)	Lowest percentage of storage when 1 is offline (%)	Lowest percentage of storage when 2 is offline (%)	Lowest percentage of storage when Jerrabomberra 1 is offline (%)
Crest South / Tank 2	82.0	82.0	82.2	0 (empty)
East Queanbeyan	79.8	79.9	43.5	79.9
Greenleigh 1	57.0	57.5	57.5	26.5
Homestead	83.3	83.3	83.3	37.6
Jerrabomberra 1	42.4	0 (empty)	62.9	Offline
Ridgeway	91.7	91.8	91.8	87.0
Thornton 2	36.9	48.4	48.4	0 (empty)
Weetalabah	47.3	47.3	47.3	47.3

Table 15 Pump flows under stress test scenarios

Water Pump Station	Max. Flow using 2050 PDD x 1.20 (%)	Max. flow when 1 is offline (L/s)	Max. flow when 2 is offline (L/s)	Max. flow when Jerrabomberra 1 is offline (L/s)
Water Pump Station 1 (Homestead)	44.4	44.4	44.4	26.7
Water Pump Station 3 (Thornton)	121.6	121.6	121.7	0.03
Water Pump Station 6 (Greenleigh)	53.8	53.8	29.5	53.9
Water Pump Station 8 (Ridgeway/ Carwoola)	33.3	33.3	33.3	33.4

4.2.6.5 Jerrabomberra 1 reservoir is offline under 2050 ADD

2050 average day demand was calculated by dividing the peak daily demand, which is 36.5 ML/d by a factor of 2.3 resulting to a demand of 15.90 ML/d. GHD derived the ADD of Tralee, Environa and The Poplars based on the PDD in Table 16 and added them in the existing “average day” demand in the existing model.

Table 16 Reservoir storage using 2050 ADD

Reservoir	Lowest percentage of storage when Jerrabomberra 1 is offline (%)
Crest South/ Tank 2	85.6
East Queanbeyan	79.9
Greenleigh 1	59.2
Homestead	83.3
Jerrabomberra 1	Offline
Ridgeway	92.0
Thornton 2	48.4
Weetalabah	47.3

To assess the severity of the effect of having Jerrabomberra 1 reservoir offline, a separate check was performed using 2050 ADD. Under this scenario, the results can be summarised in the following items:

– East Queanbeyan, Ridgeway, Thorton, Weetalabah and Homestead, reservoirs have maintained similar storage as compared 2050 PDD scenario.
– Crest South Tank 2 storage has jumped to 85.6% storage and Greenleigh 1 has increased to 59.2%.
– Similar to other scenarios, the DN375 trunk main that extends from the offtake to East Queanbeyan reservoir has a velocity of 2.63 m/s. All other trunk mains have a velocity less than 2 m/s.
– Water Pump Station 6 Greenleigh slightly exceeded maximum operating point.

4.2.7 Conclusion of hydraulic modelling

Overall, the network performance under the different scenarios is acceptable except for the scenario where Jerrabomberra 1 reservoir is offline. It is evident that having Jerrabomberra 1 offline has the worst effect in the network in terms of maintaining sufficient supply to the community. The East Queanbeyan reservoir is also identified as a critical asset in the network.

Based on the WaterCAD model, at 2050 PDD scenario, the combined demand of the downstream supply zones of Jerrabomberra 1 and its subsequent reservoirs comprises 75% of the total demand in the network. Jerrabomberra 1 reservoir is known to be in poor condition and cannot be taken offline without triggering service continuity risks due to insufficient by-pass assembly. To lessen the risk of supply interruption, the following recommendations can be considered.

– Duplication of Jerrabomberra reservoir.
– In the event the Jerrabomberra 1 is offline, GPVs installed at reticulations linking Crest South Tank 2 and East Queanbeyan reservoir supply zones can be opened. There are at least 15 GPVs that could link these supply zones given that East Queanbeyan reservoir has a capacity to supply a portion of its adjacent supply zone. Below is a list of GPVs that can be explored for this option. Note however, given the limited understanding of the network and location and status of valves this is unlikely to be a viable option.

Valve	ID number in Model
GPV	3033, 3349, 4097, 3353, 3906, 3679, 27460, 4036, 3723, 3038, 396, 3061, 2794, 27757, 2934

– Construct by-pass assembly to allow Offtake 1 to directly supply Pump 1 Homestead, Pump 3 Thornton and Crest South Tank 2 when Jerrabomberra is offline.
– Building an interconnecting pipeline between Offtake 1 and Offtake 2.

4.3 Water service extension

4.3.1 Option identification

Previous planning studies have considered the options available for the upgrading of Queanbeyan's water supply. These previous studies include:

– Queanbeyan STP Upgrade Masterplan, GHD Pty Ltd, 2016
– Queanbeyan IWCM Situational Analysis, AECOM Pty Ltd, 2019
– Queanbeyan IWCM Issues Paper, AECOM Pty Ltd, 2019
– Queanbeyan IWCM Issues Paper Supplemental Report, QPRC, 2020
– Queanbeyan STP Upgrade Concept Design Report, HunterH_2O Pty Ltd, 2020
– Queanbeyan Sewer Model Revised Augmentation Strategy, HunterH_2O, 2022

The options considered from the noted previous studies can be summarised as follows:

1. Provision of a fourth connection from the Icon Water Stromlo to Googong Bulk Supply Main
2. Duplication of the Jerrabomberra Reservoir
3. Duplication of the East Queanbeyan Reservoir
4. Rationalisation of other service reservoirs, in particular Crest Reservoirs, Greenleigh Reservoirs
5. Installation of additional chlorination facilities

6. Renegotiation of tighter water supply targets with Icon Water

Regarding Item 6, it is unclear if this is about quantity, quality, or both.

4.3.2 Infrastructure upgrades

Following the analysis undertaken, the proposed infrastructure upgrades include:

– Duplication of Jerrabomberra Reservoir. Based on GHD cost curves, a high-level cost estimate for a 20 ML steel reservoir would be in the order of is $10 million. This includes upgrades to access roads.

In addition, further investigation to be undertaken regarding:

– Additional reservoir at East Queanbeyan
– Recommissioning the Kendall Avenue connection to provide emergency supply only in the event of a major event affecting Offtake 1 and Offtake 2
– Installation of chlorination infrastructure at appropriate locations in the network, likely to be at Jerrabomberra and East Queanbeyan reservoirs.
– Possibility of decommissioning Crest Reservoirs
– Upgrades for WHS access for all reservoirs

4.3.3 Recommendations

Following the analysis undertaken to date, the critical upgrade option to be considered for the current network is a duplication of the Jerrabomberra Reservoir.

It is also recommended that further work to improve the model be undertaken including development and calibration of an operational model. This is a considerable project given the limited data available and understanding that significant ground truthing survey and field measurements will be required.

In addition to this, given the chlorine residual data analysed to date and commentary from Council, there would be benefit in undertaking further investigation into the current system to confirm the chlorine levels and provide additional chlorine dosing if areas are found to be deficient.

4.4 Preferred water supply scenario

Based on the above analysis the preferred water supply scenario is to continue to supply water to Queanbeyan and adjacent urban areas as bulk treated water from Icon Water whilst also undertaking the duplication of Jerrabomberra Reservoir.

5. Wastewater management scenarios

5.1 Queanbeyan sewage treatment plant

As identified in the IWCM Issues Paper (AECOM 2019), the capacity of the existing Queanbeyan STP is anticipated to be exceeded by 2025. There are also risks associated with the operation of the existing plant in terms of work health and safety and reliability. To address this, Council is currently undertaking an upgrade project for the Queanbeyan STP. The existing STP will need to continue operation until the STP upgrade project is complete.

5.2 Existing sewerage systems

5.2.1 Morisset St SPS

Morisset Street sewage pump station (SPS) is Council's largest sewer pump station. It receives gravity inflows from around 1/3 of the Queanbeyan sewerage network. It also receives pumped inflows from seven upstream sewage pump stations (River Drive, Lochiel Street, Kathleen Street, Weetalabah 1, Weetalabah 2, Regent Drive and Blundell Street).

Since the preparation of the IWCM Issues Paper (AECOM 2019), both a capacity review and condition assessment of the Morisset St SPS have been undertaken and the outcomes of each of these assessments are provided in this section.

Capacity Assessment

The Morisset St SPS Capacity Review was undertaken by Hunter H2O in 2019. The hydraulic capacity of the Morisset SPS pumps and discharge rising main from the Morisset SPS to the Morisset trunk sewer manhole was assessed. The key outcomes of the assessment were:

1. The existing Morisset SPS pumps are prone to ragging and blockage. It was recommended that QPRC progressively replace the pumps with Flygt N-Series pumps each selected for an individual duty point of 435 L/s @ 34 m. The preliminary system investigation showed that this requirement can be achieved by a Flygt NP 3312/835-670 pump with 565 mm impeller and 250 kW motor. The replacement pumps should be fitted with a 4901 flushing valve. This replacement may be achieved by a factory refurbishment of the existing pumps or a complete replacement (Hunter H2O, 2019).
2. The existing rising main is suitable for flow rates up to the design horizon and will not require augmentation to meet the required capacity (Hunter H2O, 2019).

In 2020, the pump station was refurbished with the new pumps as described in Item 1 above. The pumps were selected to be capable of a combined duty/ assist duty performance of 870 L/s at 34 m. These new pumps provide sufficient capacity for projected loadings beyond 2050. The pump controls have also been updated so they rotate duty between all pumps. There are no additional capacity related upgrades for the SPS and rising main prior to 2050.

Condition Assessment

A visual condition assessment of the Morisset SPS and the discharge manhole on Carinya Street was completed by Hunter H2O in April 2020.

The Morisset SPS was in good overall condition. The assessment identified some concerns that should be monitored/maintained over time to ensure continued reliable performance. This included coating deterioration, odour control and sewage sludge build-up (Hunter H2O, 2020).

The discharge manhole was in reasonable condition. It was noted that the step irons are in poor conditions and should be either removed or replaced with stainless items (Hunter H2O, 2020).

The condition assessment recommended additional coating inspection within 5 years and potential review of H_2S levels within the structure. Council will reinspect the pump station in 5 years, and revaluate the need for relining, which may be required in 10 years.

5.2.2 Sewerage network

At the time of the Issues Paper preparation, Council did not have an up-to-date model of its sewerage system. A trunk main model was developed in 2019 as part of the STP Upgrade project to evaluate whether there was sufficient capacity in the Jerrabomberra and Morisset trunk main for existing and future loadings. The trunk main modelling identified potential capacity constraints in both trunk mains that would be exacerbated under projected future loadings. It was recommended that a more detailed network model be developed to better assess capacity constraints and develop a staged upgrade strategy.

A detailed hydraulic model was developed in 2020. The model was not initially calibrated and capacity analysis undertaken by Hunter H_2O was based on the theoretical model. The model was calibrated in late 2021.

Existing Loadings Capacity Assessment

Capacity limitations were identified where the HGL rises to within 0.5 m of the ground surface (based on theoretical peak wet weather loadings) and are shown in Figure 19.

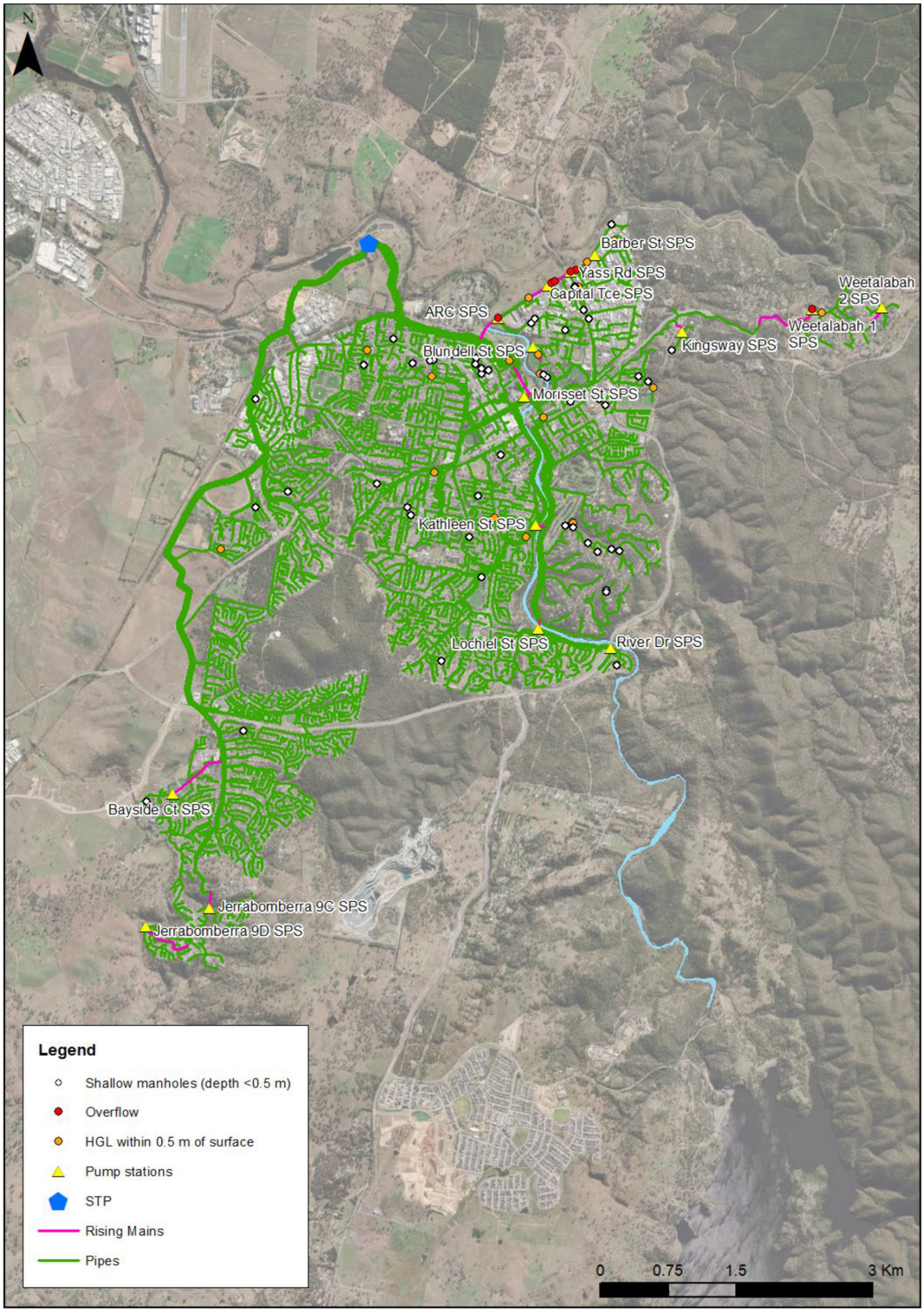


Figure 19 Existing system capacity constraints (existing loadings) (HunterH_2O, 2022)

The hydraulic modelling identified that there are parts of the network that have insufficient capacity under existing peak wet weather flow conditions. The locations with capacity constraints are:

– The DN600 Jerrabomberra trunk main downstream of W34
– The DN750 Morisset trunk main downstream of the Morisset St SPS rising main discharge point
– Sections of the DN375 trunk main (parallel to the DN750 Morisset trunk main) downstream of F15
– Sections of the DN300 gravity main between Stomaway Road and Ross Road
– Sections of the DN300/375 between Sorrell Place and Malcolm Road immediately upstream of Kathleen St SPS and sections of DN150 between Kenneth Place and Dane Street

Future Loadings Capacity Assessment

Models were also developed to represent future loadings conditions in 2025 (+5 years), 2030 (+10 years), 2040 (+20 years) and 2050 (+30 years). The adopted future loadings from new development areas and infill development are summarised in Table 17, along with their proposed method for connection to the existing sewerage system.

Table 17 Future development areas EP and timing

Development area	Additional EP					Servicing notes
	Total	2020-25	2025-30	2030-40	2040-50	
Jumping Creek	960	960	0	0	0	Requires new SPS
Tralee	4,040	1082	2030	927	0	Requires new SPS
Tralee Station	10,800	0	0	5,400	5400	Requires new SPS
The Poplars	2,160	0	0	2,160	0	Gravity connection via sewer extension
Environa / Robin	6,000	0	0	2,626	3,374	Gravity connection via sewer extension
Infill - Crestwood	559	112	224	224	0	Infill
Infill - Jerrabomberra	67	13	27	27	0	Infill
Infill - Karabar	214	43	85	85	0	Infill
Infill - Queanbeyan	739	148	296	296	0	Infill
Infill - Queanbeyan East	586	117	234	234	0	Infill
Infill - Queanbeyan West	125	25	50	50	0	Infill
Non-Residential development	7,428	1,238	1,238	2,476	2,476	Infill or gravity connection via sewer extension

Loadings from new development areas and infill development were assigned to downstream trunk mains and the system capacity was assessed for future loading condition.

Capacity limitations (where the HGL rises to within 0.5 m of the ground surface) are shown in Figure 20 (based on theoretical peak wet weather loadings). There is also insufficient pump capacity at ARC SPS (SPS 2) and Weetalabah (SPS 14).

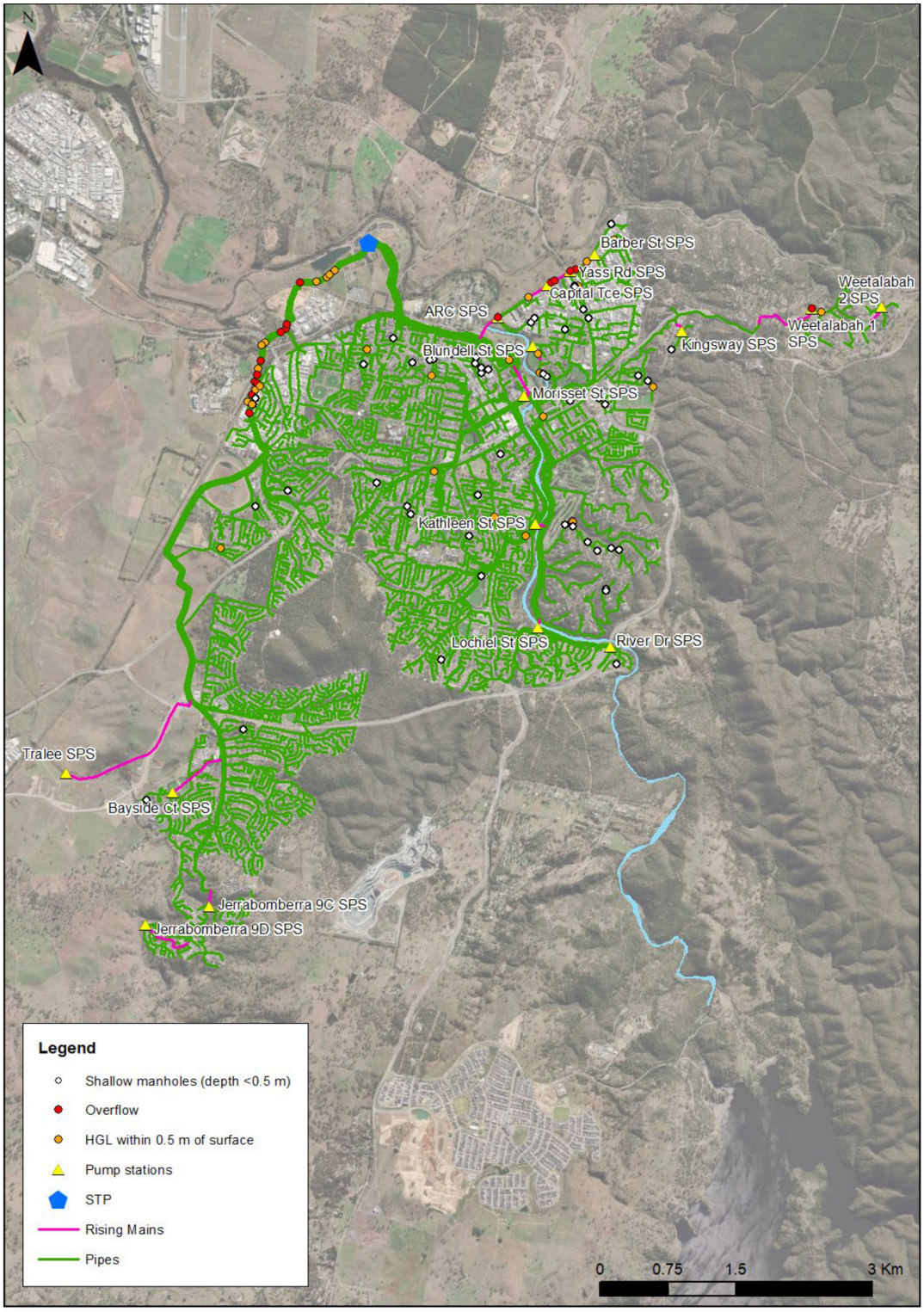


Figure 20 *Existing system capacity constraints under peak wet weather flow conditions (2050 loadings)*

5.3 Wastewater service extension

5.3.1 Feasibility review of options for non-build measures

Before consideration is given to the capital works upgrades that are required to address the identified IWCM Issues, non-build measures – including sewer inflow and infiltration (I&I) reduction and various operational / management improvements – firstly need to be considered. This section provides an overview of the non-build measures that have been considered in the development of the inputs to the IWCM strategy.

A detailed assessment of the current levels of I&I into the sewerage system has not been undertaken at this stage. High volume of I&I was not identified as an IWCM issue but the potential for I&I reduction has been considered as part of options review and assessment.

Council has collected flow monitoring data in the sewerage systems over the past five years and is planning to calibrate its model of the Jerrabomberra subsystem in 2020/2021, and the Morisset subsystem in 2021/22. Following model calibration, Council will be in a better position to quantify the levels of I&I into the system and consider a targeted program for I&I reduction.

Council has previously implemented a pipe relining program with approximately 10% of pipes relined, the majority of which are in the Morisset subsystem. An overview of the extent of the pipe relining is provided in Figure 21. The effectiveness of the pipe relining to reduce I&I has not been monitored. Anecdotal information from Council has indicated that there have been no marked changes in I&I volumes because of the pipe relining program, and that the key benefit of the relining program has been to extend the life of the existing sewers and defer renewals.

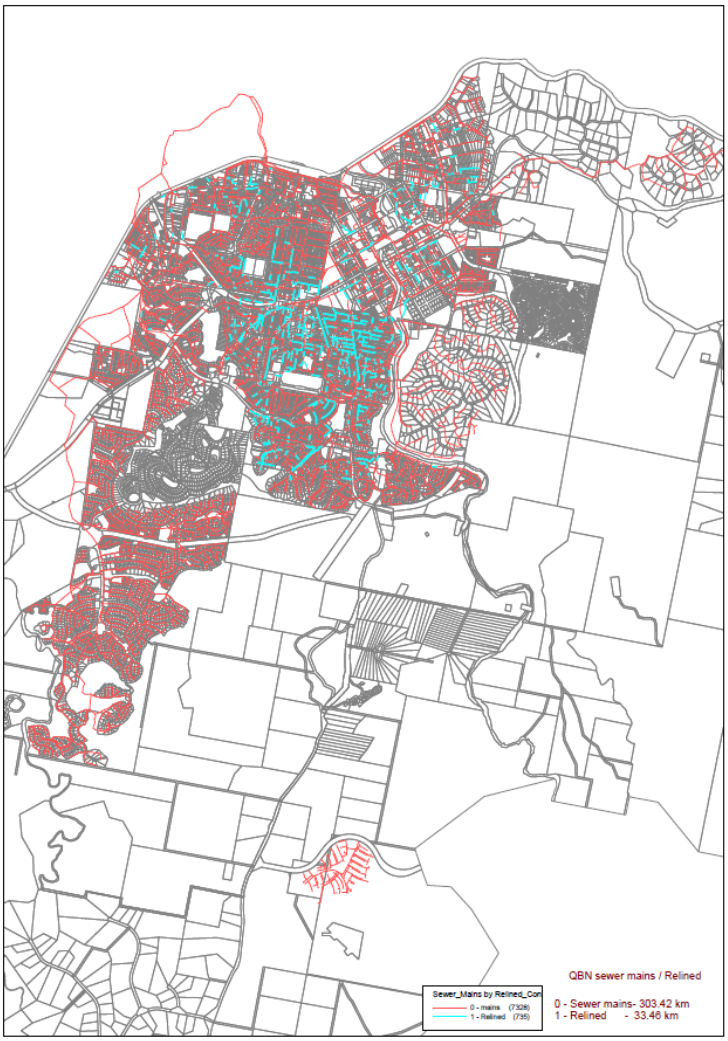


Figure 21 Relined pipes

A review of historical flow data (inflows to the STP) was undertaken by Hunter H2O as part of the design criteria and assumptions development for the STP upgrade project. The analysis found that there was a weak correlation between flow and 3-day rainfall, and that plant inflow does not significantly increase above dry weather values for low to moderate rainfall events less than 40 mm over three days (Hunter H2O, 2019). The analysis indicated that the highest flow over the period of analysis was up to 9 times average dry weather flow (ADWF), and a peak wet weather flow (PWWF) of 9 ADWF was adopted for the upgrade design. It was concluded that overall, the catchment looks like typical NSW catchments with moderate infiltration in wet weather (Hunter H2O, 2019).

A high-level assessment of the levels of ground water infiltration (GWI) in the catchment was also undertaken as part of this feasibility review to determine whether further investigation of rehabilitation works is warranted. Data from the flow gauges was analysed to assess if there is an excessive groundwater infiltration problem in the catchment. The analysis was based on the method described in the Water Services Association of Australia "Management of Wastewater System Infiltration and Inflow Good Practice Guide" and summarised below:

$GWI_1 = GWI_{(80\% \text{ of minimum flow})} / ADWF$

If GWI_1 is greater than 20%, it is an indicator that GWI, or base flow, is higher than expected.

Estimates of GWI_1 during dry weather for each flow gauge catchment WWTW catchment are provided in Table 18.

Table 18 Groundwater Infiltration Estimates

Flow Gauge	Subsystem	GWI_1 (%)	Notes
PFM_G01	Jerrabomberra	21%	
PFM_G02	Morisset	10%	
PFM_G03	Jerrabomberra	19%	
PFM_G04	Morisset	20%	
PFM_G05	Morisset	45%	
PFM_G06	Morisset	21%	
PFM_G07	Morisset	21%	
PFM_G08	Morisset	19%	
PFM_G09	Morisset	23%	Data unreliable; overnight flows less than 1 L/s
PFM_G10	Morisset	20%	
PFM_G11	Jerrabomberra	15%	

The analysis indicated that GWI is either within acceptable ranges or only marginally higher within the Jerrabomberra subsystem and most flow gauge catchments in the Morisset subsystem. Rehabilitation works to reduce groundwater infiltration within these catchments is not expected to have enough benefit to justify the cost of the works.

The only flow gauge catchment with high levels of GWI is PFM_G05, which is located near the Morisset St SPS. Its contributing catchment is part of the Morisset St SPS catchment. Further analysis of I&I levels during the model calibration phase is recommended to better define the extent of the problem. More targeted monitoring may also be required to better identify hotspots.

The above information suggests that inflow and infiltration volumes are not excessive, and the benefits of increased I&I reduction measures may be limited. It is recommended that Council reviews the need for additional I&I reduction measures following sewer model calibration.

5.3.2 Wastewater treatment options

This section describes the options assessment for the STP upgrade. Development in the ACT that may impact the STP upgrades in the future has not been considered at this stage, due to the uncertainty about the timing and extent of such development. The timing of these developments are unlikely to be within the 30-year horizon of this IWCM.

The IWCM Issues Paper Supplementary Report (QPRC, 2020) summarised the issues related to the Queanbeyan STP, that are being addressed by Council in parallel with the IWCM Strategy development. The issues related to the STP are:

– Queanbeyan STP hydraulic capacity will be exceeded by 2025
– Existing STP needs to be operated and maintained to continue to meet discharge license conditions until the new STP is commissioned.

Several studies have informed the development of the STP concept to date, including:

– Masterplan for Sewage Treatment Plant Upgrade (GHD, 2016)
– Queanbeyan Sewage Treatment Plant Upgrade Project Design Criteria and Assumptions Report (Hunter H2O, 2019)
– Queanbeyan Sewage Treatment Plant Upgrade Project Design Options Selection Report (Hunter H2O, 2019)
– Queanbeyan Sewage Treatment Plant Upgrade Project Concept Design Report (Hunter H2O, 2020)
– Queanbeyan Sewage Treatment Plant Upgrade Environmental Impact Statement (Arup, 2020)

A summary of the outcomes from these previous studies is provided in this section, along with a brief summary of the proposed timeframe for completion of the STP upgrade.

5.3.3 Feasibility review of wastewater treatment options

The Masterplan for Sewage Treatment Plant Upgrade (GHD 2016, referred to as the Masterplan in this document) discussed three alternatives for the Queanbeyan STP:

1. Do Nothing
2. Build a new STP, using restored parts of the existing facility
3. Restore the STP and expand as needed to provide sufficient capacity.

The 'Do Nothing' option was not considered feasible due to the significant environmental and human health impacts (ARUP, 2020). A condition assessment was undertaken to investigate the option of reuse of parts of the existing facility. The assessment identified only limited components of the existing STP that could plausibly be used as structures, and not necessarily for their current process unit operations (ARUP, 2020). Many parts of the plant were considered not fit for reuse due to poor condition and being affected by the 100-year average recurrence interval (ARI) flood level.

Six build options were compared and are summarised in Table 19.

Table 19 QSTP upgrade options considered in the Master Plan

Option	Build strategy	Treatment technology
1A	Build New all process units and equipment, completely abandon the existing plant	BNR (Biological Nutrient Removal)/ CAS (Conventional activated sludge process)
1B	Build New all process units and equipment, completely abandon the existing plant	BNR/ MBR (Membrane process)
2A	Build New main process units and reuse some process units from the STP	BNR/ CAS
2B	Build New main process units and reuse some process units from the STP	BNR/ MBR
3A	Renew main QSTP process units & augment with new additional process units	BNR/ CAS
3B	Renew main QSTP process units & augment with new additional process units	BNR/ MBR

Data Source - Queanbeyan STP Upgrade Environmental Impact Statement

A Multi-Criteria Analysis (MCA) indicated that Options 1A and 1B were the preferred options. The MCA considered cost, constructability, operability, sustainability, future proofing and community acceptance. The "Build New" option was adopted as the basis for future planning.

5.3.4 Assessment of STP upgrade options

This section provides an overview of the development of the design criteria for the STP upgrade and the more detailed options assessment that was undertaken following the Masterplan.

5.3.4.1 STP upgrade design criteria and assumptions

The Design Criteria and Assumptions Report (Hunter H2O, 2019) set out the design criteria and assumptions that were used as the basis for the development of upgrade options and subsequent concept and reference designs. The design criteria and assumptions in the report were presented to QPRC at a Design Basis Workshop in June 2019 and were adopted as the basis for proceeding with the upgrade project. This section contains a summary of the design criteria and assumptions.

Population, size and flow

A significant review of EP projections from the STP Masterplan was undertaken with consideration given to the likely timeframe for the plant to be operational (2023/24) and QPRC's preference to have at least 15 years between upgrades. The adopted EP projections are summarised in Table 20.

Table 20 Queanbeyan STP Adopted EP Projections

Year	Projected EP	Growth Rate	Additional connection from Jumping Creek & Tralee	Total
2019	52,300			
2025	57,706	1.65%		
2038	71,832	1.70%	5,000	76,832
Ultimate				150,000

Data Source - Queanbeyan STP Upgrade Design Criteria and Assumptions Report

Following a review of data and inputs, the criteria shown in Table 21 were adopted for the design basis.

Table 21 Adopted Sewage EP, flow and temperature design summary

Parameter	Value	Units	Notes
EP Stage 1	75,000	EP	Increased from masterplan to account for higher measured load determined, increased current growth and future likely developments
Stage 2 EP	112,500	EP	
ADWF Flow loading	230	L/EP/day	200 L/EP day measured. Additional allowance as sewer may degrade over time and increase infiltration
Design ADWF	17.25 (Stage 1)	ML/d	34.5 ML/day ultimate with future upgrade
PDWF	1.35 (Stage 1)	ML/hr	Based on measured 95 %ile of 1.88 x average
PWWF	155.25 (Stage 1)	ML/d	Note one event of 9 ADWF was recorded
PIF	1,797	L/s	Set equal to PWWF.
Bioreactor and Sewage Temperature	12 – 24	°C	Operating temperature range

Data Source - Queanbeyan STP Upgrade Design Criteria and Assumptions Report

Influent and Effluent Quality

Influent quality data was analysed, and it was noted that it was generally typical of predominantly domestic sewage (Hunter H2O, 2019).

The ACT EPA advised that the current licence conditions will apply to the new plant (as at 9 September 2019). However, there are two issues with the licence which are difficult to comply with: Total Dissolved Solids (TDS) and ammonia limits. The treatment process cannot remove salt. As it is not practical or economic to remove salt to meet a TDS limit, an approach where the design was optimised to minimise salt addition was therefore proposed (Hunter H2O, 2019). Higher ammonia concentrations occur during wet weather bypass events. The design uses storm storage to balance wet weather flows and greatly reduce frequency of bypass events.

Biosolids

The upgrade is proposed to include a digestion process to achieve a biosolids stabilisation grade B suitable for Restricted use 2 applications under the current NSW EPA Biosolids Guidelines.

5.3.4.2 STP options selection

The Options Selection Report (Hunter H2O, 2019c) provided details on the treatment options that were selected for the STP upgrade, and the reasons for the selection.

Three secondary treatment options were developed for the upgrade for comparison:

– Oxidation ditch with continuous gravity clarification
– Membrane Bioreactor (MBR)
– Intermittently Decanted Extended Aeration (IDEA)

An Options Selection workshop was used to present and score each option using an MCA that considered whole of life cost, effluent quality, operability/complexity, maintainability, robustness, power and chemical use (Hunter H2O, 2019). The workshop was attended by stakeholders from the Department of Planning, Industry and Environment (DPIE) who agreed to the option selected as part of the Section 60 approval process for the STP upgrade.

The preferred secondary treatment process for the STP upgrade was an oxidation ditch with gravity clarifiers, tertiary granular filter media filter, UV disinfection, aerobic sludge digestion and sludge dewatering. It was noted that the plant would be configured to adopt full biological phosphorous removal in the future.

The key benefits of the selected process are:

– High ammonia removal to meet regulatory requirements
– Potential high total nitrogen removal or high nitrate production if required to protect Lake Burley Griffin
– Good treatment of storm flows
– Simple and robust process with many examples of successful implementation
– Multiple suppliers are available to provide replacement parts and equipment servicing
– Fewer chemicals are required than an MBR option and the same number of chemicals are required as the IDEA option.

5.4 Preferred wastewater scenario

5.4.1 STP Upgrade Preferred Option

The preferred option for the STP Upgrade is described in the Concept Design report (Hunter H2O, 2020a) and the Concept Design Addendum (Hunter H2O, 2022), to inform the preparation of the Business Case and Environmental Impact Statement (EIS). A Concept Design workshop was attended by DPIE, who gave approval for the concept to be used as the basis for the EIS and detailed design. The concept design also formed the basis for further design development prior to inviting tenders for the construction of the works. An overview of the concept design is provided in this section, based on the concept design as of October 2020.

The Queanbeyan STP Upgrade proposes the construction of a new treatment plant complete with screening and grit removal, a continuous oxidation ditch activated sludge process with gravity clarifiers, tertiary filtration, and UV disinfection. Waste sludge produced by the treatment process will be stabilised in an aerobic digester and dewatered; producing a biosolids product that is suitable for reuse. Treated effluent will be discharged via an on-bank discharge structure adjacent to the Molonglo River. Infrequent overflows from the Storm Pond will discharge at the same location (Hunter H2O, 2020).

An overview of the process showing major treatment processes is shown in Figure 22.

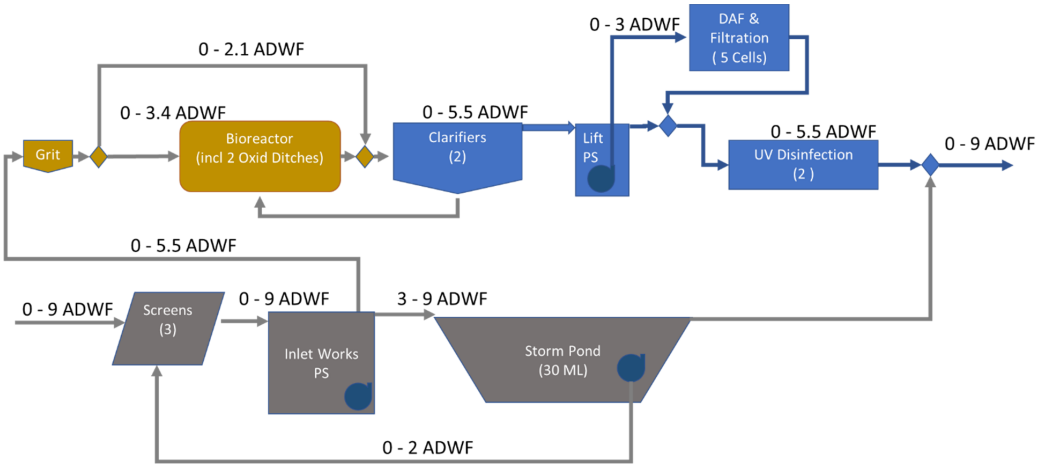


Figure 22 STP Upgrade – Proposed process configuration overview (Hunter H2O, 2020)

The design has been developed to provide a simple and robust process that provides reliable removal of nitrogen and phosphorus and treatment of storm flows (Hunter H2O, 2020).

The new STP will be constructed on the existing lease area to the south east of the existing treatment process. The site location provides a predominantly level area where the new treatment process may be constructed while maintaining operation of the existing STP. An overview of the site arrangement is provided in Figure 23.

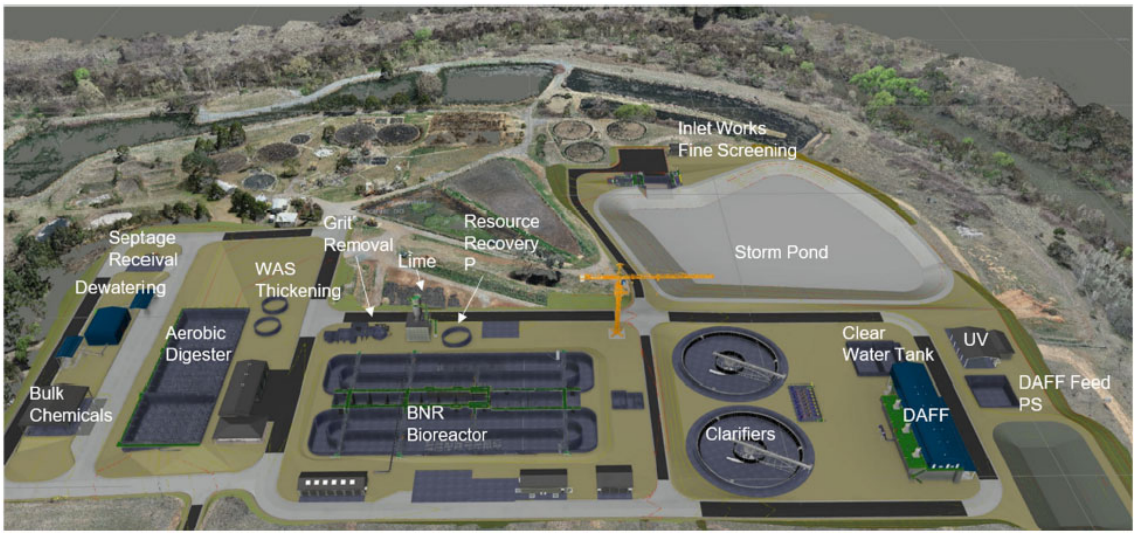


Figure 23 Overview of the Queanbeyan STP upgrade (existing plant in foreground) (Hunter H2O, 2022)

Development of the upgrade layout has considered the potential future requirements of the site. The site arrangement leaves space for a future stage 2 upgrade to expand the treatment capacity by 50% to 112,500 EP. Consideration to the needs of the future upgrade has been given as part of the hydraulic design, site layout and the process sizing of some aspects of the treatment facility which would be difficult to upgrade at a later date, such as the inlet works and grit removal facilities (Hunter H2O, 2020).

Effluent management

The STP currently discharges treated effluent to the Molonglo River. Treated effluent from the upgraded plant will be discharged via an on-bank discharge structure located adjacent the Molonglo River (Hunter H2O, 2020).

Initially recycled water from the upgraded plant will be used onsite as well as being provided to water tankers for offsite uses such as dust suppression. The tertiary treatment will produce a high quality of treated effluent that will support future reuse opportunities (Hunter H2O, 2020).

5.4.1.1 STP upgrade costs

A cost estimate for the project was prepared in conjunction with the Reference Design. This estimate is being updated as the design progresses. The current estimate for the total project cost including the STP upgrade, maturation pond decommissioning and Mountain Road upgrade is in the order of $188M.

5.4.1.2 STP upgrade – project timeline

The current timeline for the STP upgrade is summarised in Table 22.

Table 22 Key milestones for STP upgrade project

Milestone	Current estimate
Draft EIS	Complete (October 2020)
Final EIS	June 2023
Detailed design complete	September 2024
Contract award	May 2025
Construction	May 2025 – Nov 2027
Decommissioning of maturation ponds	Nov 2027

5.4.2 Assessment of sewerage network options

This section describes the developed augmentation strategy for the sewerage network. The existing Morriset St SPS is described in section 5.2.1, and the sewerage network is described in section 5.2.2.

This section describes the options assessment for the network upgrades. Development in the ACT that may impact the existing sewerage network in the future has not been considered at this stage due to the uncertainty about the timing, extent, and connection point. The timing of these developments is unlikely to be within the 30-year horizon of this IWCM.

The IWCM Issues Paper Supplementary report (QPRC, 2020) summarised the issues related to the sewer network:

– Design options and timing of potential upgrades for Morisset SPS needs to be reviewed as part of the Queanbeyan STP Upgrade Project
– Lack of detailed knowledge of capacity constraints may lead to additional augmentation work required to meet acceptable service standards
– Sewer model is not up to date and not calibrated

Since the IWCM Issues Paper development, a capacity and condition assessment of the Morisset St SPS has been completed. A theoretical model of the sewerage system has also been developed and used to determine a preliminary upgrade strategy. Model calibration was completed in late 2021 (HunterH2O, 2022).

Augmentation strategy methodology

Capacity limitations were identified where the HGL rises to within 0.5 m of the ground surface. Options to increase the hydraulic capacity at these locations were investigated. This usually involved augmentation of the system by adding parallel mains. All proposed augmentations were modelled and costed as parallel pipes i.e. the existing pipes would be maintained in operation. If this is not feasible, replacement pipes of larger diameter may be required.

Sewage pumping station capacity was assessed by comparing the current pump duty with the projected peak wet weather flow. Augmentations have been recommended where the capacity of the duty pumps (or duty/assist pumps depending on the station arrangement) is less than the peak wet weather inflow.

A staged augmentation strategy was developed to address the capacity constraints and allow for capacity for future connections in the catchment. The upgrades described in this section have been based on the theoretical model and will need to be refined following the development of the calibrated model.

Preliminary cost estimates were developed and for the proposed upgrades. The pipeline cost estimates are based on the latest rates for sewer mains provided as part of the current revaluation process. Sewage pump station cost estimates are based on the NSW Reference Rates Manual (Department of Primary Industries Office of Water, 2014). The estimates include:

– Survey, Investigation, Design and Project Management (SID) costs; the SID component can vary from 5% to 20% depending on the complexity of the project. An allowance of 10% of the project cost was applied for the pipeline cost estimates and 15% for the sewage pump stations
– Total preconstruction contingencies includes: an allowance for uncertainty in the scope of work, uncertainty in the costs to be applied and uncertainty in site conditions. An allowance of 30% of the contract rate was applied to the cost estimates to account for the high level of uncertainty at this preliminary planning stage
– Total preconstruction contingencies accounts for factors beyond the control of the designers or constructors, such as industrial issues, adverse weather, availability of labour and materials and extensions of time due to unforeseen circumstances. A contingency allowance of 20% of the contract rate was applied for all estimates.

Augmentation strategy overview

An overview of the proposed augmentation strategy is provided in Figure 24.

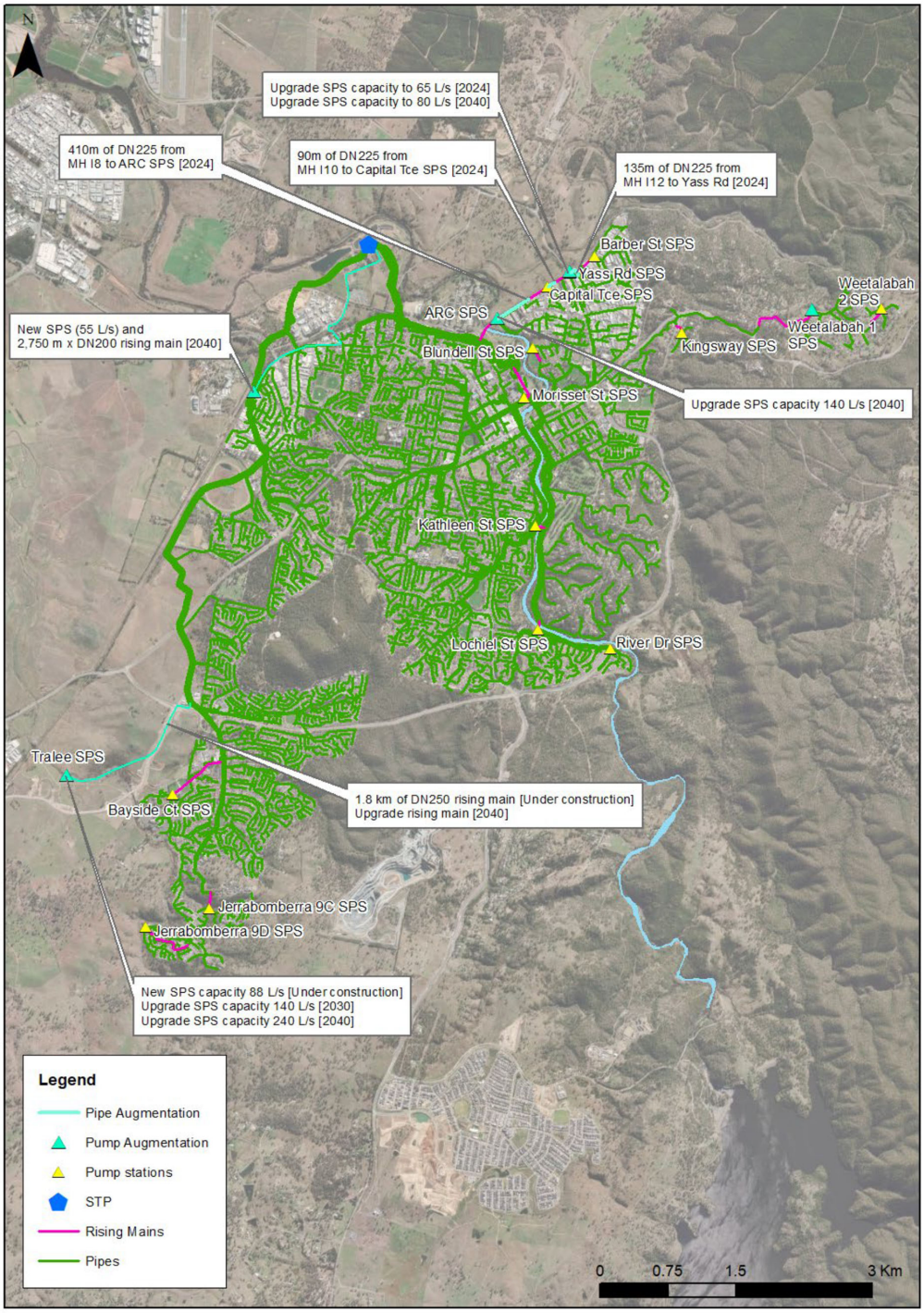


Figure 24 Augmentation strategy overview

Jerrabomberra subsystem augmentation strategy

The main capacity constraint in the Jerrabomberra subsystem is the Jerrabomberra trunk main. There are no capacity constraints in other parts of the system and all existing sewage pump stations have sufficient capacity for the additional projected loadings from infill development.

Augmentations required to increase system capacity are summarised in Table 23 along with their estimated capital cost and anticipated timing. For augmentations where modelling shows an existing capacity constraint, a timing of 2024 was adopted to reflect the likely timeframe required for project investigation, design, and construction.

Table 23 Sewerage network– staged augmentation strategy for the Jerrabomberra subsystem

Timing	Description	Estimated capital cost
Under Construction	New Tralee SPS – 88 L/s capacity and 1,800m x DN250	Developer funded
2024 (part of STP upgrade)	Jerrabomberra trunk-main diversion/replacement - 225 m x DN900 gravity main from W1 to the new inlet works	$462,000
2030	Upgrade Tralee SPS – 140 L/s capacity and upgrade rising main	Developer funded
2040	Upgrade Tralee SPS – 240 L/S capacity and upgrading rising main	Developer funded
2040	New SPS (55 L/s) and 2,750 x DN200 rising main	$4,170,000
	Total	$4,632,000

Sections of the Jerrabomberra trunk main within the STP site are known to leak and contain asbestos and would need to be replaced. Further analysis to determine the preferred route for the trunk main upgrade is required subject to field investigations. Alternatively, construction of a new SPS and rising main instead of the proposed trunk main augmentation, would provide more flexibility on the proposed pipeline route and may be a more cost-effective solution depending on the outcomes of the field investigations. Initially, upgrade of W26 to W1 was proposed, however, further modelling showed that this was not critical at this stage and will be subject to further investigation.

A new regional SPS will be required to service future developments in Tralee which do not drain via gravity to the existing sewerage system. Based on advice provided by Council, the new Tralee SPS will initially have a capacity of 88 L/s and discharge into the existing system at W76. The Jerrabomberra trunk main between the connection point and W61 has sufficient capacity for both existing and future connections up to 2030.

From around 2030, the projected peak flow from developments in the area will exceed 88 L/s. The SPS would either require an upgrade or replacement to increase station capacity to 270 L/s by 2030. The increased inflows could trigger augmentation of the Jerrabomberra trunk main downstream of the SPS discharge point from manhole W76 to W26. Further investigation is required to verify upgrade needs of this main. An alternative option for connecting the SPS further downstream and diverting flows from existing SPSs (SPS 9, 10 and 11) to reduce the loadings on sections of the Jerrabomberra trunk main could be assessed following development of the calibrated model. It is also noted that servicing the Tralee Station development area will require at least one additional SPS. It has been assumed that this SPS will connect to the existing system via the Tralee SPS, but the sizing and costing of the additional SPS(s) has not been considered at this stage.

An additional upgrade would be required for the Tralee SPS (beyond 2030) to accommodate the ultimate projected loadings of 470 L/s. Additional parallel rising main(s) will also be required with the proposed future pump upgrade. A summary of the regional infrastructure required to service large development areas is summarised in Table 24. Cost estimates have not been included as the infrastructure will be developer funded.

Table 24 Proposed Capacity and Timing for New Tralee SPS

Description	Timing
New Tralee SPS - 88L/s capacity and rising main 1,800 m x DN250	Under construction
Upgrade Tralee SPS to 140L/s capacity and upgrade rising main	2030
Upgrade Tralee SPS to 240L/s capacity and upgrade rising main	2040

Morisset subsystem augmentation strategy

The main capacity constraint in the Morisset subsystem is the Morisset trunk main. Other smaller upgrades are also required including two pump station upgrades.

Augmentations required to increase system capacity are summarised in Table 25 along with their estimated capital cost and anticipated timing. Upgrades required to alleviate existing system capacity constraints have been sized with sufficient capacity for future projected loadings. The ARC pump station upgrade has been costed as a replacement SPS. For the Woodland Ave SPS upgrade, the modelling indicated that the Woodland Ave SPS needs to be upgraded from 5 to 6 L/s. A cost has not been included for this upgrade as further investigation would be required to confirm what flow rate the SPS operates at and whether the upgrade could be achieved by impeller or pump replacement.

Table 25 Sewerage network– staged augmentation strategy for the Morisset subsystem

Timing	Description	Estimated Capital Cost
2024 (part of STP upgrade)	Morisset trunk-main diversion/replacement - 410 m x DN900 gravity main from F52 & F6 to the new inlet works	$1,854,960
2024	Upgrade Yass Rd SPS – 65L/s capacity	$636,480
2024	90 m x DN225 gravity main from MH10 to Capital Tce SPS	$62,400
2024	135m x DN225 gravity main from MH12 to Yass Rd SPS	$94,640
2024	410m x DN225 gravity main from MH18 to ARC SPS	$286,000
2030	Upgrade ARC SPS – 140 L/s capacity	$1,960,000
2040	Upgrade Yass Rd PS – 80 L/s capacity	$759,200
	Total	$5,653,680

A new SPS will be required for the Jumping Creek development area. It is assumed that this SPS will be developer funded and it has therefore not been included in the augmentation strategy. An allowance for the loadings from the new SPS was included in the modelling in the Morisset St SPS catchment.

6. Asset management

QPRC undertook a revaluation of the Water and Sewer Asset registers in August 2021. The restated asset register has been used to determine the 'assumed' asset replacement regime for existing assets. The replacement program was combined with the enhancement and growth profiles to establish the 20 year capital expenditure program applied to the funding and debt analysis.

6.1 Sewer Assets

Sewer Asset register had a WDBV of $64.7m as of 30th June 2023, consisting of 8,331 individually identified assets in the Asset Register. remaining useful life ranging from 1 to 75 years.

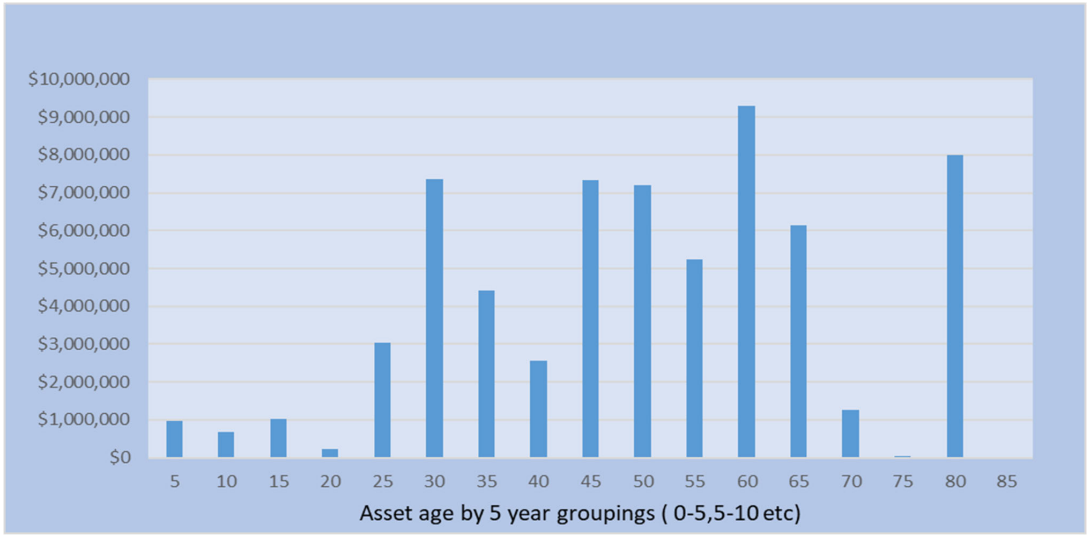


Figure 25 Sewer Assets - Remaining useful life (Years)

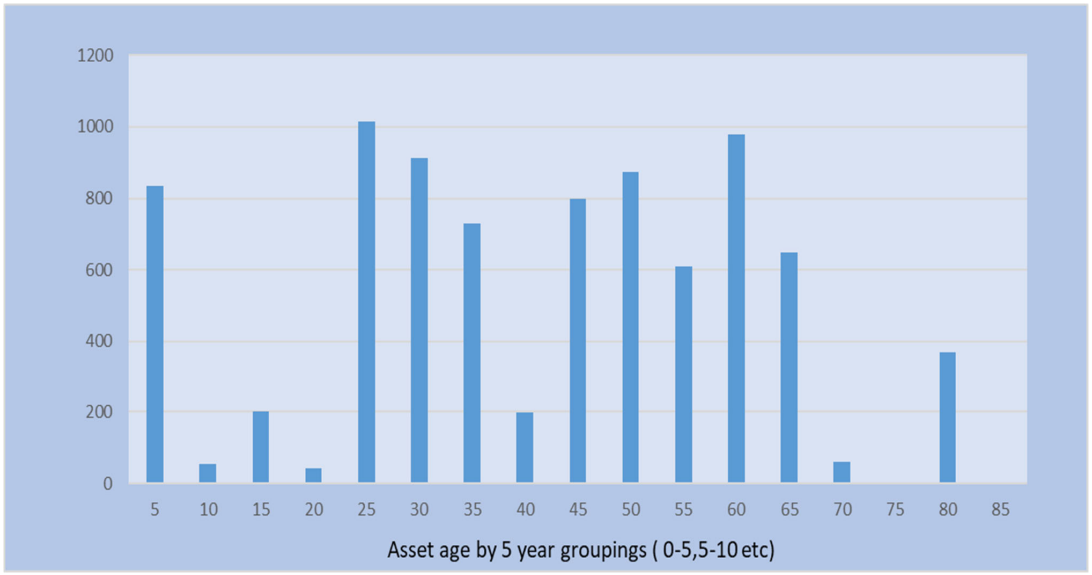


Figure 26 Sewer Assets - Written Down Book Value ($)

Table 26 Sewer Asset Register Summary

SEWER ASSET SUMMARY						Percentage Changes
	Year	Open Bal	Capex	Depn	WDBV	With Capex
1	2023/2024	64,754,090	2,116,402	2,213,916	64,672,088	-0.13%
2	2024/2025	67,258,971	27,281,880	2,304,664	92,466,225	37.48%
3	2025/2026	96,164,874	97,102,213	2,288,225	190,980,735	98.60%
4	2026/2027	198,619,964	73,878,478	3,779,818	268,720,621	35.29%
5	2027/2028	279,469,446	14,180,977	4,812,094	288,849,331	3.36%
6	2028/2029	300,403,304	387,300	5,233,470	295,558,243	-1.61%
7	2029/2030	307,380,573	161,460	5,461,715	302,111,493	-1.71%
8	2030/2031	314,195,952	4,198,403	5,617,818	312,786,703	-0.45%
9	2031/2032	325,298,171	680,495	5,929,695	320,052,283	-1.61%
10	2032/2033	332,854,374	378,619	6,200,555	327,042,842	-1.75%
11	2033/2034	340,124,556	879,500	6,421,560	334,590,470	-1.63%
12	2034/2035	347,974,089	1,252,927	6,697,044	342,568,664	-1.55%
13	2035/2036	356,271,411	2,800,681	6,901,379	352,170,713	-1.15%
14	2036/2037	366,257,542	0	7,260,250	359,004,928	-1.98%
15	2037/2038	373,365,125	381,663	7,536,685	366,210,104	-1.92%
16	2038/2039	380,858,508	0	7,853,058	373,009,932	-2.06%
17	2039/2040	387,930,329	324,971	8,149,404	380,106,098	-2.02%
18	2040/2041	395,310,342	13,711,693	8,304,969	400,721,425	1.37%
19	2041/2042	416,750,282	787,203	9,048,840	408,491,651	-1.98%
20	2042/2043	424,831,317	2,114,120	9,307,982	417,701,589	-1.68%
21	2043/2044	434,409,653	10,788,787	9,655,153	435,610,062	0.28%
22	2044/2045	453,034,465	10,958,248	10,057,261	453,950,744	0.20%
23	2045/2046	472,108,774	3,906,554	10,498,937	465,527,094	-1.39%
24	2046/2047	484,148,178	2,693,045	10,939,607	475,907,991	-1.70%
25	2047/2048	494,944,311	1,494,392	11,433,044	485,113,066	-1.99%
26	2047/2048	494,944,311	1,494,392	11,433,044	485,113,066	-1.99%
27	2049/2050	532,748,390	8,203,043	12,305,827	528,671,972	-0.77%
28	2050/2051	549,818,851	6,161,201	12,719,068	543,443,618	-1.16%
29	2051/2052	565,181,362	30,330,800	13,045,438	582,489,146	3.06%
30	2052/2053	605,788,712	4,019,287	13,899,370	595,935,194	-1.63%

Note: Capex includes growth/enhancement assets as well as replacement of existing assets at their assumed 'end of useful' life;

- ✓ New capital expenditure - $211.9m
- ✓ Replacement capital expenditure - $110.8m

6.2 Water Assets

Water Asset register had a WDBV of $82.7m as of 30th June 2024, consisting of 2,877 individually identified assets, with remaining useful life ranging from 1 to 100 years.

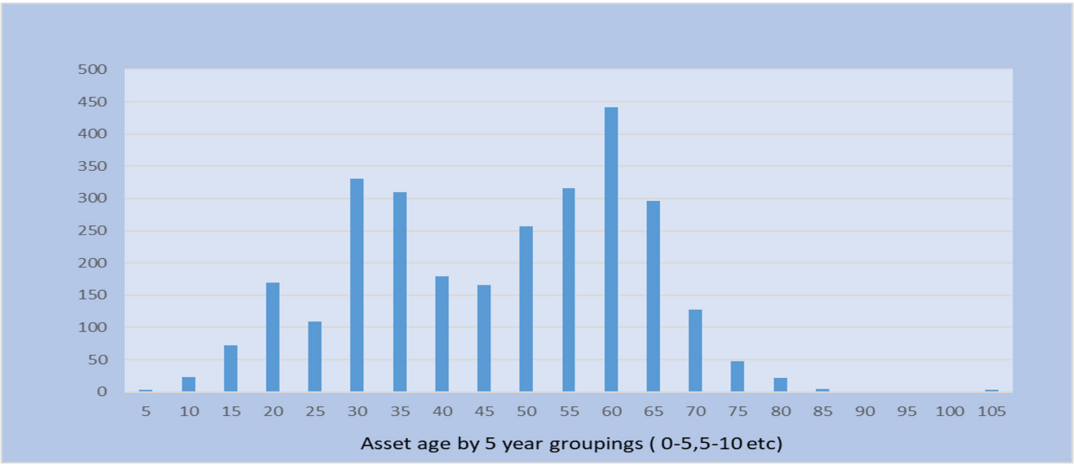


Figure 27 Water assets - remaining useful life (years)

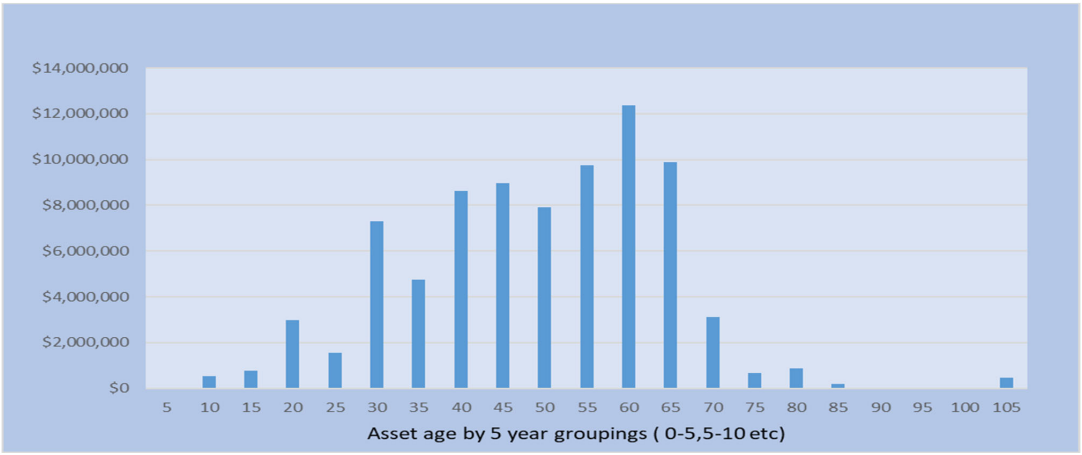


Figure 28 *Water asset WDBV - remaining useful life (yrs)*

Table 27 *Water Asset Register Summary*

ASSET SUMMARY						*Percentage Changes*
	Year	Open Bal	Capex	Depn	WDBV	With Capex
1	2023/2024	82,686,695	7,030,400	2,291,217	87,425,878	5.73%
2	2024/2025	90,922,913	3,937,024	2,382,865	92,478,332	1.71%
3	2025/2026	96,177,466	99,779	2,474,854	93,803,533	-2.47%
4	2026/2027	97,555,674	36,905,356	2,571,127	131,895,291	35.20%
5	2027/2028	137,171,102	142,121	2,670,925	134,642,298	-1.84%
6	2028/2029	140,027,990	0	2,787,616	137,308,716	-1.94%
7	2029/2030	142,801,065	1,376,466	2,808,980	141,368,550	-1.00%
8	2030/2031	147,023,293	0	3,015,085	144,024,130	-2.04%
9	2031/2032	149,785,095	855,024	3,092,635	147,549,246	-1.49%
10	2032/2033	153,451,216	214,651	3,251,079	150,414,788	-1.98%
11	2033/2034	156,431,380	0	3,391,561	153,065,855	-2.15%
12	2034/2035	159,188,490	3,927,808	3,475,909	159,640,388	0.28%
13	2035/2036	166,026,004	0	3,668,312	162,391,572	-2.19%
14	2036/2037	168,887,235	2,765,463	3,753,962	167,996,765	-0.53%
15	2037/2038	174,716,635	13,253,490	3,801,978	184,168,148	5.41%
16	2038/2039	191,534,874	0	4,126,352	187,408,522	-2.15%
17	2039/2040	194,904,863	0	4,291,406	190,631,992	-2.19%
18	2040/2041	198,257,271	1,772,431	4,436,684	195,704,154	-1.29%
19	2041/2042	203,532,320	9,129,432	4,491,330	208,200,738	2.29%
20	2042/2043	216,528,768	3,122,866	4,788,212	214,866,333	-0.77%
21	2043/2044	223,460,986	514,818	4,994,305	218,994,087	-2.00%
22	2044/2045	227,753,850	1,183,890	5,206,353	223,761,249	-1.75%
23	2045/2046	232,711,699	5,177,203	5,230,581	232,781,236	0.03%
24	2046/2047	242,092,486	9,673,316	5,497,263	246,269,770	1.73%
25	2047/2048	256,120,561	203,807	5,866,174	250,479,697	-2.20%
26	2048/2049	260,498,885	23,417,964	5,806,513	278,130,774	6.77%
27	2049/2050	289,256,005	14,737,427	6,168,111	297,871,693	2.98%
28	2050/2051	309,786,561	22,402,531	6,293,023	325,906,023	5.20%
29	2051/2052	338,942,264	4,306,453	6,816,849	336,467,762	-0.73%
30	2052/2053	349,926,473	14,106,379	6,925,466	357,160,572	2.07%

Note: Capex includes growth/enhancement assets as well as replacement of existing assets at their assumed 'end of useful' life.

7. Adopted IWCM scenarios

7.1 Adopted scenarios

Based on the information presented above there is only one feasible scenario each for water and wastewater. As such the financial analysis has been prepared on this basis.

Table 28 Sewer Capex - Growth & Enhancement

Sewerage Capex by project			
FY	Description	Amount ($)	Asset Life
2023/24	Part QSTP Upgrade (spent to date) - current total estimated QSTP CAPEX is $155M	15,087,395	
2023/24	Part QSTP Upgrade construction	1,854,961	80
2024/25	Part QSTP Upgrade construction	24,546,948	80
2025/26	Part QSTP Upgrade construction	70,666,137	80
2026/27	Part QSTP Upgrade construction	63,114,735	80
2027/28	Part QSTP Upgrade construction	111,391	80
2027/28	QSTP demolition	10,000,000	80
2025/26	Barber St SPS	1,458,080	50
2025/26	Capital Terrace STP	706,160	50
2027/28	Yarra Road STP 65Lcapacity	636,480	50
2040/41	Yarra Road STP 80L capacity	759,200	50
2024/25	Gravity Main DN 225- MH10 to Yass Road SPS	62,400	50
2024/25	Gravity Main DN 225- MH12 to Yass Road SPS	94,640	50
2030/31	ARC SPS	2,218,320	50
2024/25	Gravity Main DN 225 - MH 18 to ARC SPS	286,000	50
2040/41	Jerrabombera New SPS	4,690,400	50
2024/25	QSTP pond maintenace work (treated s OPEX)	1,714,844	
	Total Sewerage Infrastructure CAPEX (excl spent to date)	**198,008,091**	
	Total Infrastructure CAPEX (water + sewerage) excl spent todate	**238,008,091**	

Table 29 Water Capex - Growth & Enhancement

Water Capex by project			Est
FY	Description	Amount ($)	Life
Pre 2020/21			
2022/23			
2023/24	Water supply safety upgrade works	6,500,000	20
2024/25	Water supply chlorination upgrade works	2,000,000	20
2024/25	Water supply safety upgrade works	1,500,000	20
2026/27	Jerrabomberra Reservoir Duplication	20,000,000	80
2026/27	Water supply chlorination upgrade works	3,000,000	20
2026/27	Water supply safety upgrade works	7,000,000	20
	Total Water Infrastructure CAPEX	**40,000,000**	

7.2 Financial analysis

Financial analysis was undertaken to assess the impact of the proposed capital expenditure programs on the financial position of the Council over a twenty-year period. The analysis considered the forecasted cashflow and account balances under several alternative external funding options, assuming that external funding support would be available (modelling tests for 0%, 25%, and 50% and for specific asset support only). Grant funding was assumed to be available for the QSTP upgrades ($132.8m) over two years. Given the nature and the size of the Water capital expenditure, it was assumed that no request would be made for Water asset expansion.

7.2.1 Modelling Parameters

Table 30 summarises the key parameters adopted in the financial model as the base assumptions.

Table 30 Summary of general parameters adopted in the financial model

General Parameters		
Staff cost increase		2.50%
Inflation (CPI)		3.00%
Residential houses (growth_		0.50%
Vacant land (growth)		0.00%
Units (growth)		2.00%
Capital Cost Escalation		4.00%
Persons per household	#	2.60
Icon Bulk Water price re QPRC price		83.00%
(Mark up of 20.48% on the purchase price of bulk water)		

Table 31 Equivalent Tenancies Forecast – Water/Sewer

Wastewater		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
		2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34	2034/35	2035/36	2036/37	2037/38	2038/39	2039/40	2040/41	2041/42	2042/43	2043/44	2044/45	2045/46	2046/47	2047/48	2048/49	2049/50	2050/51	2050/52	2050/53
	Connection Forecast																														
	Residential	15,569	15,569	15,569	15,569	15,569	15,569	15,569	15,569	15,569	15,569	15,569	15,569	15,569	15,569	15,569	15,569	15,569	15,569	15,569	15,569	15,569	15,569	15,569	15,569	15,569	15,569	15,569	15,569	15,569	15,569
2.60	Residential Growth	589	785	942	1,098	1,254	1,410	1,566	1,994	2,421	2,848	3,276	3,703	4,131	4,558	4,986	5,413	5,840	6,178	6,515	6,853	7,190	7,528	7,865	8,203	8,540	8,878	9,215	9,215	9,215	9,215
2.60	Infill	132	176	247	317	388	458	528	564	599	634	669	705	740	775	810	846	881	881	881	881	881	881	881	881	881	881	881	881	881	881
9.00	Industrial/Non Residential	1,544	1,579	1,606	1,634	1,661	1,689	1,716	1,744	1,771	1,799	1,826	1,854	1,881	1,909	1,936	1,964	1,991	2,019	2,046	2,074	2,101	2,129	2,156	2,184	2,211	2,239	2,266	2,266	2,266	2,266
	Total	17,834	18,109	18,363	18,617	18,871	19,126	19,380	19,870	20,360	20,850	21,340	21,831	22,321	22,811	23,301	23,791	24,281	24,646	25,011	25,376	25,741	26,106	26,471	26,836	27,201	27,566	27,931	27,931	27,931	27,931
	Residential growth	1.26%	1.26%	1.00%	1.00%	1.00%	1.00%	1.00%	2.75%	2.75%	2.75%	2.75%	2.75%	2.75%	2.75%	2.75%	2.75%	2.75%	2.17%	2.17%	2.17%	2.17%	2.17%	2.17%	2.17%	2.17%	2.17%	2.17%	0.00%	0.00%	0.00%
	Industrial Growth	2.28%	2.23%	1.74%	1.71%	1.68%	1.66%	1.63%	1.60%	1.58%	1.55%	1.53%	1.51%	1.48%	1.46%	1.44%	1.42%	1.40%	1.38%	1.36%	1.34%	1.33%	1.31%	1.29%	1.28%	1.26%	1.24%	1.23%	0.00%	0.00%	0.00%

Water		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
		2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34	2034/35	2035/36	2036/37	2037/38	2038/39	2039/40	2039/41	2041/42	2042/43	2043/44	2044/45	2045/46	2046/47	2047/48	2048/49	2049/50	2050/51	2050/52	2050/53
	Connection Forecast																														
	Residential-Existing	16,402	16,402	16,402	16,402	16,402	16,402	16,402	16,402	16,402	16,402	16,402	16,402	16,402	16,402	16,402	16,402	16,402	16,402	16,402	16,402	16,402	16,402	16,402	16,402	16,402	16,402	16,402	16,402	16,402	16,402
2.6	Residential Growth	589	785	942	1,098	1,254	1,410	1,566	1,994	2,421	2,848	3,276	3,703	4,131	4,558	4,986	5,413	5,840	6,178	6,515	6,853	7,190	7,528	7,865	8,203	8,540	8,878	9,215	9,215	9,215	9,215
2.6	Infill	132	176	247	317	388	458	528	564	599	634	669	705	740	775	810	846	881	881	881	881	881	881	881	881	881	881	881	881	881	881
9.0	Indust/Non Residential	1,598	1,633	1,660	1,688	1,715	1,743	1,770	1,798	1,825	1,853	1,880	1,908	1,935	1,963	1,990	2,018	2,045	2,073	2,100	2,128	2,155	2,183	2,210	2,238	2,265	2,293	2,320	2,320	2,320	2,320
	Total	18,721	18,996	19,250	19,504	19,758	20,013	20,267	20,757	21,247	21,737	22,227	22,718	23,208	23,698	24,188	24,678	25,168	25,533	25,898	26,263	26,628	26,993	27,358	27,723	28,088	28,453	28,818	28,818	28,818	28,818
	Residential growth	1.43%	1.41%	1.32%	1.31%	1.29%	1.28%	1.27%	2.57%	2.52%	2.46%	2.40%	2.35%	2.30%	2.25%	2.21%	2.16%	2.12%	1.52%	1.49%	1.47%	1.45%	1.43%	1.41%	1.39%	1.37%	1.35%	1.33%	0.00%	0.00%	0.00%
	Industrial Growth	2.20%	2.15%	1.69%	1.66%	1.63%	1.60%	1.58%	1.55%	1.53%	1.51%	1.48%	1.46%	1.44%	1.42%	1.40%	1.38%	1.36%	1.35%	1.33%	1.31%	1.29%	1.28%	1.26%	1.24%	1.23%	1.21%	1.20%	0.00%	0.00%	0.00%

Based on development sites forecasts and uptake rates

Note – Residential development includes Jumping Creek, Tralee, Tralee Station, The Populars and Environ /Robin.

Residential infill includes Crestwoo, Jerrabomberra, Karabar, Queanbeyan, Queanbeyan East and Queanbeyan West,

Table 32 ***Water Financial Statement***

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Financial Statement	**2023/24**	**2024/25**	**2025/26**	**2026/27**	**2027/28**	**2028/29**	**2029/30**	**2030/31**	**2031/32**	**2032/33**	**2033/34**	**2034/35**	**2035/36**	**2036/37**	**2037/38**	**2038/39**	**2039/40**	**2040/41**	**2040/41**	**2040/41**	**2040/41**	**2040/41**	**2040/41**	**2040/41**	**2040/41**	**2040/41**	**2040/41**	**2040/41**	**2040/41**	**2040/41**
Income																														
Rates and Annual Charges	6,679,459	6,980,818	7,286,432	7,604,101	7,934,272	8,277,409	8,633,994	9,108,097	9,602,877	10,119,145	10,657,747	11,219,559	11,805,486	12,416,472	13,053,492	13,717,559	14,409,721	15,057,240	15,730,642	16,430,896	17,159,008	17,916,019	18,703,007	19,521,090	20,371,426	21,255,212	22,173,692	22,838,903	23,524,070	24,229,792
User Charges and Fees	433,517	474,528	441,135	455,668	470,803	480,450	481,917	498,139	509,056	518,863	528,713	540,771	551,734	562,710	573,993	585,654	597,209	605,950	617,119	628,258	639,260	650,117	661,524	672,993	684,548	696,245	708,161	711,201	721,040	730,437
Water Consumption	15,303,709	15,156,521	15,453,353	15,496,195	15,552,475	15,612,893	15,725,918	15,974,091	16,087,479	16,215,754	16,361,622	16,516,096	16,646,832	16,782,197	16,919,557	17,054,920	17,185,573	17,231,873	17,342,379	17,446,129	17,541,922	17,628,935	17,726,319	17,820,430	17,912,149	18,002,884	18,094,609	17,957,518	17,991,790	18,011,700
Developer Contributions																														
Infill (based on 2004 DSP)	250,561	258,078	425,312	438,072	451,214	464,750	478,693	246,527	253,923	261,540	269,386	277,468	285,792	294,366	303,197	312,293	321,662	0	0	0	0	0	0	0	0	0	0	0	0	0
Developer - 5 years)	871,508	871,508	693,109	693,109	693,109	693,109	693,109	1,897,173	1,897,173	1,897,173	1,897,173	1,897,173	1,897,173	1,897,173	1,897,173	1,897,173	1,897,173	1,497,867	1,497,867	1,497,867	1,497,867	1,497,867	1,497,867	1,497,867	1,497,867	1,497,867	1,497,867	1,497,867	0	0	0
Total Income	23,538,753	23,741,452	24,299,342	24,687,144	25,101,873	25,528,612	26,013,631	27,724,028	28,350,507	29,012,475	29,714,642	30,451,067	31,187,017	31,952,918	32,747,413	33,567,598	34,411,338	34,392,930	35,188,007	36,003,151	36,838,057	37,692,937	38,588,718	39,512,381	40,465,989	41,452,209	42,474,328	41,507,622	42,236,900	42,971,929
Expenditure																														
Employee Expenses	856,832	858,089	859,237	860,371	861,492	862,601	863,696	865,785	867,829	869,831	871,793	873,715	875,600	877,450	879,265	881,047	882,796	884,077	885,340	886,588	887,820	889,037	890,239	891,427	892,600	893,760	894,906	894,906	894,906	894,906
Materials and contracts	1,717,364	1,728,714	1,736,275	1,755,644	1,786,534	1,804,346	1,823,821	1,846,364	1,869,724	1,891,146	1,913,497	1,936,588	1,959,821	1,983,021	2,006,678	2,030,673	2,054,900	2,079,382	2,104,195	2,129,306	2,154,704	2,180,404	2,206,417	2,232,739	2,259,373	2,286,325	2,313,600	2,341,200	2,369,128	2,397,390
Internal Charges	2,808,417	2,800,394	2,832,163	2,882,589	2,915,818	2,943,473	2,980,316	3,018,465	3,053,454	3,088,895	3,126,341	3,163,942	3,201,403	3,239,500	3,278,280	3,317,405	3,356,921	3,396,967	3,457,515	3,478,518	3,520,005	3,561,999	3,604,494	3,647,492	3,691,002	3,735,034	3,779,591	3,824,678	3,870,304	3,916,474
Operational	819,488	1,378,420	860,974	316,794	324,714	332,832	950,354	349,682	358,424	367,384	1,049,013	385,983	395,633	405,523	1,157,914	426,053	436,704	447,622	1,278,121	470,283	482,040	494,091	1,410,806	519,104	532,082	545,384	1,557,266	572,994	0	0
Bulk Water Supply(Icon)	12,242,967	12,125,216	12,362,682	12,396,956	12,441,980	12,490,315	12,580,734	12,779,273	12,869,983	12,972,603	13,089,297	13,212,877	13,317,465	13,425,758	13,535,646	13,643,936	13,748,458	13,785,499	13,873,903	13,956,904	14,033,538	14,103,148	14,181,056	14,256,344	14,329,719	14,402,307	14,475,687	14,386,014	14,393,432	14,409,360
Depreciation & Amortisation	2,291,217	2,382,865	2,474,854	2,571,127	2,670,925	2,787,616	2,808,980	3,015,085	3,092,635	3,251,079	3,391,561	3,475,909	3,668,312	3,753,962	3,801,978	4,126,352	4,291,406	4,436,684	4,436,684	4,436,684	4,436,684	4,436,684	4,436,684	4,436,684	4,436,684	4,436,684	4,436,684	4,436,684	4,436,684	4,436,684
Disposal of waste	25,223	24,354	26,607	26,458	26,815	27,223	27,958	27,791	28,133	28,470	28,790	29,003	29,314	29,617	29,911	30,198	30,504	30,809	31,114	31,423	31,736	32,052	32,371	32,693	33,018	33,347	33,679	34,014	34,352	34,694
Total Expenditure	20,761,507	21,298,053	21,154,794	20,809,939	21,028,278	21,248,404	22,035,859	21,902,445	22,140,182	22,469,408	23,470,292	23,078,018	23,447,548	23,714,830	24,689,672	24,455,662	24,801,690	25,061,040	26,046,873	25,389,705	25,546,527	25,697,415	26,762,067	26,016,483	26,174,479	26,332,842	27,491,413	26,470,490	25,998,806	26,089,509
Net cashflow from Operations	5,068,463	4,826,264	5,619,402	6,448,331	6,744,520	7,067,823	6,786,752	8,836,668	9,302,961	9,794,145	9,635,911	10,848,958	11,407,781	11,992,050	11,859,719	13,238,287	13,901,054	13,768,575	13,577,818	15,050,129	15,728,214	16,432,206	16,263,334	17,932,582	18,728,194	19,556,051	19,419,599	19,473,815	20,674,777	21,319,104
Capital Expenditure																														
Replacement Capex	0	0	99,779	405,769	142,121	0	1,376,466	0	855,024	214,651	0	3,927,808	0	2,765,463	13,253,490	0	0	1,772,431	9,129,432	3,122,866	514,818	1,183,890	5,177,203	9,673,316	203,807	23,417,964	14,737,427	22,402,531	4,306,453	14,106,379
Growth Capex	7,030,400	3,937,024	0	36,499,587	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net cashflow from Operations	-1,961,937	889,240	5,519,623	-30,457,024	6,602,399	7,067,823	5,410,286	8,836,668	8,447,937	9,579,494	9,635,911	6,921,150	11,407,781	9,226,587	-1,393,772	13,238,287	13,901,054	11,996,144	4,448,386	11,927,263	15,213,396	15,248,316	11,086,131	8,259,266	18,524,387	-3,861,914	4,682,173	-2,928,716	16,368,324	7,212,725
Opening Balance	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000
Transfer to Reserve/Transfer from Loa	-1,961,937	889,240	5,519,623	-30,457,024	6,602,399	7,067,823	5,410,286	8,836,668	8,447,937	9,579,494	9,635,911	6,921,150	11,407,781	9,226,587	-1,393,772	13,238,287	13,901,054	11,996,144	4,448,386	11,927,263	15,213,396	15,248,316	11,086,131	8,259,266	18,524,387	-3,861,914	4,682,173	-2,928,716	16,368,324	7,212,725
Net Water Fund ($5m Required Balance)	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000
Cashflow																														
	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000
	23,538,753	23,741,452	24,299,342	24,687,144	25,101,873	25,528,612	26,013,631	27,724,028	28,350,507	29,012,475	29,714,642	30,451,067	31,187,017	31,952,918	32,747,413	33,567,598	34,411,338	34,392,930	35,188,007	36,003,151	36,838,057	37,692,937	38,588,718	39,512,381	40,465,989	41,452,209	42,474,328	41,507,622	42,236,900	42,971,929
	-20,761,507	-21,298,053	-21,154,794	-20,809,939	-21,028,278	-21,248,404	-22,035,859	-21,902,445	-22,140,182	-22,469,408	-23,470,292	-23,078,018	-23,447,548	-23,714,830	-24,689,672	-24,455,662	-24,801,690	-25,061,040	-26,046,873	-25,389,705	-25,546,527	-25,697,415	-26,762,067	-26,016,483	-26,174,479	-26,332,842	-27,491,413	-26,470,490	-25,998,806	-26,089,509
	2,291,217	2,382,865	2,474,854	2,571,127	2,670,925	2,787,616	2,808,980	3,015,085	3,092,635	3,251,079	3,391,561	3,475,909	3,668,312	3,753,962	3,801,978	4,126,352	4,291,406	4,436,684	4,436,684	4,436,684	4,436,684	4,436,684	4,436,684	4,436,684	4,436,684	4,436,684	4,436,684	4,436,684	4,436,684	4,436,684
	10,068,463	9,826,264	10,619,402	11,448,331	11,744,520	12,067,823	11,786,752	13,836,668	14,302,961	14,794,145	14,635,911	15,848,958	16,407,781	16,992,050	16,859,719	18,238,287	18,901,054	18,768,575	18,577,818	20,050,129	20,728,214	21,432,206	21,263,334	22,932,582	23,728,194	24,556,051	24,419,599	24,473,815	25,674,777	26,319,104
	7,030,400	3,937,024	99,779	36,905,356	142,121	0	1,376,466	0	855,024	214,651	0	3,927,808	0	2,765,463	13,253,490	0	0	1,772,431	9,129,432	3,122,866	514,818	1,183,890	5,177,203	9,673,316	203,807	23,417,964	14,737,427	22,402,531	4,306,453	14,106,379
	-1,961,937	889,240	5,519,623	-30,457,024	6,602,399	7,067,823	5,410,286	8,836,668	8,447,937	9,579,494	9,635,911	6,921,150	11,407,781	9,226,587	-1,393,772	13,238,287	13,901,054	11,996,144	4,448,386	11,927,263	15,213,396	15,248,316	11,086,131	8,259,266	18,524,387	-3,861,914	4,682,173	-2,928,716	16,368,324	7,212,725
	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000

Table 33 Sewer Financial Statement

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	20	25	30
Financial Statement	**2023/24**	**2024/25**	**2025/26**	**2026/27**	**2027/28**	**2028/29**	**2029/30**	**2030/31**	**2031/32**	**2032/33**	**2033/34**	**2034/35**	**2035/36**	**2036/37**	**2037/38**	**2040/41**	**2040/41**	**2040/41**
Income																		
Rates and Annual Charges																		
Residential	13,816,325	14,926,024	16,108,700	17,382,061	18,752,900	19,563,722	20,406,316	21,556,162	22,756,632	24,009,730	25,317,533	26,682,196	28,105,952	29,591,120	31,140,102	39,310,466	48,812,576	58,090,024
Industrial	3,298,439	3,573,929	3,858,284	4,164,505	4,494,234	4,689,868	4,893,196	5,104,502	5,324,082	5,552,244	5,789,303	6,035,589	6,291,442	6,557,214	6,833,270	8,381,514	10,249,600	12,129,312
Grants Contribution - Operating																		
Grants Contribution - Capital																		
DSP Revenue - infill	0	76,963	126,834	130,639	134,558	138,595	142,753	73,518	75,723	77,995	80,335	82,745	85,227	87,784	90,418	0	0	0
DSP Revenue - Developments Areas	0	361,199	295,879	304,755	313,898	323,314	333,014	938,869	967,035	996,046	1,025,927	1,056,705	1,088,406	1,121,058	1,154,690	1,056,861	1,225,192	0
Other Revenue	10,682	10,839	10,761	10,761	10,761	10,780	10,765	10,767	10,768	10,770	10,768	10,768	10,769	10,769	10,768	10,768	10,768	10,768
Interest & Investment Revenue																		
Total Income	17,125,446	18,948,953	20,400,457	21,992,721	23,706,351	24,726,280	25,786,044	27,683,817	29,134,241	30,646,785	32,223,866	33,868,003	35,581,796	37,367,945	39,229,248	48,759,608	60,298,136	70,230,104
Expenditure																		
Employee Expenses	1,809,820	1,822,837	1,870,087	1,903,096	1,943,508	1,981,702	2,021,985	2,064,842	2,107,524	2,151,478	2,196,069	2,241,606	2,287,978	2,335,260	2,383,445	2,635,959	2,912,801	3,209,027
Materials and Services	7,521,341	7,875,803	7,943,790	8,144,350	8,290,351	8,465,261	8,631,998	8,817,334	8,998,541	9,186,681	9,376,873	9,571,403	9,769,364	9,971,270	10,177,007	11,255,211	12,437,292	13,702,140
Operational	2,139,204	218,545	393,928	1,947,161	1,707,495	1,574,239	1,811,481	2,322,496	1,921,800	1,771,819	2,038,838	2,613,990	2,163,003	1,994,198	2,294,730	3,311,324	3,083,926	978,531
Depreciation (from Schedule)	2,213,916	2,304,664	2,288,225	3,779,818	4,812,094	5,233,470	5,461,715	5,617,818	5,929,695	6,200,555	6,421,560	6,697,044	6,901,379	7,260,250	7,536,685	9,307,982	11,433,044	13,899,370
Revaluation decrement/impairment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Disposal of Assets/Waste	10,611	11,011	10,679	17,465	17,146	13,117	14,192	15,860	17,029	15,914	15,235	16,653	17,116	17,148	16,960	18,692	20,116	21,874
Total Expenditure	13,694,892	12,232,861	12,506,709	15,791,890	16,770,594	17,267,788	17,941,370	18,838,350	18,974,591	19,326,447	20,048,576	21,140,697	21,138,839	21,578,127	22,408,827	26,529,168	29,887,179	31,810,943
Net cashflow from Operations	5,644,470	9,020,757	10,181,974	9,980,650	11,747,851	12,691,963	13,306,389	14,463,285	16,089,345	17,520,893	18,596,850	19,424,350	21,344,335	23,050,068	24,357,106	31,538,423	41,844,001	52,318,531
Capital Expenditure																		
Re scheduling of 2025/25 replacement capex over next 8 years to faciltate a	0	0	-16,000,000			2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000					
Replacemet Capex	261,441	1,292,292	18,328,877	2,882,985	1,607,488	387,300	161,460	4,198,403	680,495	378,619	879,500	1,252,927	2,800,681	0	381,663	2,114,120	1,494,392	4,019,287
Growth Capex	1,854,961	25,989,588	78,773,336	70,995,493	12,573,489	0	0	2,919,158	0	0	0	0	0	0	0	0	0	0
Net cashflow from Operations	3,528,068	-18,261,123	-70,920,240	-63,897,828	-2,433,126	10,304,663	11,144,928	5,345,724	13,408,850	15,142,274	15,717,350	16,171,423	16,543,654	23,050,068	23,975,443	29,424,302	40,349,609	48,299,244
Opening Balance	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000
Transfer to Reserve/Transfer from Loan	3,528,068	-18,261,123	-70,920,240	-63,897,828	-2,433,126	10,304,663	11,144,928	5,345,724	13,408,850	15,142,274	15,717,350	16,171,423	16,543,654	23,050,068	23,975,443	29,424,302	40,349,609	48,299,244
Net Water Fund ($5m Required Balance)	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000
Cashflow																		
Opening Balance	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000
Revenue	17,125,446	18,948,953	20,400,457	21,992,721	23,706,351	24,726,280	25,786,044	27,683,817	29,134,241	30,646,785	32,223,866	33,868,003	35,581,796	37,367,945	39,229,248	48,759,608	60,298,136	70,230,104
Expenditure	-13,694,892	-12,232,861	-12,506,709	-15,791,890	-16,770,594	-17,267,788	-17,941,370	-18,838,350	-18,974,591	-19,326,447	-20,048,576	-21,140,697	-21,138,839	-21,578,127	-22,408,827	-26,529,168	-29,887,179	-31,810,943
Depreciation	2,213,916	2,304,664	2,288,225	3,779,818	4,812,094	5,233,470	5,461,715	5,617,818	5,929,695	6,200,555	6,421,560	6,697,044	6,901,379	7,260,250	7,536,685	9,307,982	11,433,044	13,899,370
	10,644,470	14,020,757	15,181,974	14,980,650	16,747,851	17,691,963	18,306,389	19,463,285	21,089,345	22,520,893	23,596,850	24,424,350	26,344,335	28,050,068	29,357,106	36,538,423	46,844,001	57,318,531
Capital Expenditure	2,116,402	27,281,880	81,102,213	73,878,478	14,180,977	2,387,300	2,161,460	9,117,561	2,680,495	2,378,619	2,879,500	3,252,927	4,800,681	0	381,663	2,114,120	1,494,392	4,019,287
Transfer	3,528,068	-18,261,123	-70,920,240	-63,897,828	-2,433,126	10,304,663	11,144,928	5,345,724	13,408,850	15,142,274	15,717,350	16,171,423	16,543,654	23,050,068	23,975,443	29,424,302	40,349,609	48,299,244
Closing Balance	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000

7.3 Water & Sewer Accounts (Reserve & Loan)

QPRC operate two major fund accounts for the funding of their water and sewer infrastructure:

– Water/Sewer 'Working' Accounts – internal account which is used as a 'clearing account' between the income from water/sewer operations and the debt/repayments required to be made from time to time to ensure that the accounts are maintained according to the Council's guidelines.

– Water/Sewer Loan Accounts – comes into play when the internal operating cashflow plus grant funding is insufficient to match the capital expenditure needs to undertake the required capital expansion program. Rarely applied for water, as QRPC does not operate water treatment plants. The proposed sewer expansion program indicates that, besides grant funding, QPRC will need to seek loan funding post the upgrading of the QSTP in 2022/24.

7.4 Account Balances

7.4.1 Water

The capital expenditure program for water is $40m, with $20m in 2026/27.

	Open Balance	Transfer to/from Sewer Account	Adjusted Balance 1	Interest Earnt Reserve	Interest Earnt Working	Grant Funding	Adjusted Balance 2	Loans	Repayment	Closing Balance
2023/24	35,109,000	-1,961,937	33,147,063	994,412	150,000	0	34,291,475		0	34,291,475
2024/25	34,291,475	889,240	35,180,715	1,055,421	150,000	0	36,386,136		0	36,386,136
2025/26	36,386,136	5,519,623	41,905,759	1,257,173	150,000	0	43,312,932		0	43,312,932
2026/27	43,312,932	-30,457,024	12,855,908	385,677	150,000	0	13,391,585		0	13,391,585
2027/28	13,391,585	6,602,399	19,993,984	599,820	150,000	0	20,743,804		0	20,743,804
2028/29	20,743,804	7,067,823	27,811,627	834,349	150,000	0	28,795,976		0	28,795,976
2029/30	28,795,976	5,410,286	34,206,262	1,026,188	150,000	0	35,382,450		0	35,382,450
2030/31	35,382,450	8,836,668	44,219,118	1,326,574	150,000	0	45,695,691		0	45,695,691
2031/32	45,695,691	8,447,937	54,143,628	1,624,309	150,000	0	55,917,937		0	55,917,937
2032/33	55,917,937	9,579,494	65,497,431	1,964,923	150,000	0	67,612,354		0	67,612,354
2033/34	67,612,354	9,635,911	77,248,265	2,317,448	150,000	0	79,715,713		0	79,715,713
2034/35	79,715,713	6,921,150	86,636,863	2,599,106	150,000	0	89,385,969		0	89,385,969
2035/36	89,385,969	11,407,781	100,793,750	3,023,813	150,000	0	103,967,563		0	103,967,563
2036/37	103,967,563	9,226,587	113,194,150	3,395,824	150,000	0	116,739,974		0	116,739,974
2037/38	116,739,974	-1,393,772	115,346,202	3,460,386	150,000	0	118,956,589		0	118,956,589
2038/39	118,956,589	13,238,287	132,194,876	3,965,846	150,000	0	136,310,722		0	136,310,722
2039/40	136,310,722	13,901,054	150,211,776	4,506,353	150,000	0	154,868,129		0	154,868,129
2040/41	154,868,129	11,996,144	166,864,273	5,005,928	150,000	0	172,020,202		0	172,020,202
2041/42	172,020,202	4,448,386	176,468,587	5,294,058	150,000	0	181,912,645		0	181,912,645
2042/43	181,912,645	11,927,263	193,839,908	5,815,197	150,000	0	199,805,106		0	199,805,106
2043/44	199,805,106	15,213,396	215,018,501	6,450,555	150,000	0	221,619,056		0	221,619,056
2044/45	221,619,056	15,248,316	236,867,372	7,106,021	150,000	0	244,123,393		0	244,123,393
2045/46	244,123,393	11,086,131	255,209,524	7,656,286	150,000	0	263,015,810		0	263,015,810
2046/47	263,015,810	8,259,266	271,275,077	8,138,252	150,000	0	279,563,329		0	279,563,329
204748	279,563,329	18,524,387	298,087,716	8,942,631	150,000	0	307,180,347		0	307,180,347
2048/49	307,180,347	-3,861,914	303,318,433	9,099,553	150,000	0	312,567,986		0	312,567,986
2049/50	312,567,986	4,682,173	317,250,159	9,517,505	150,000	0	326,917,664		0	326,917,664
2050/51	326,917,664	-2,928,716	323,988,948	9,719,668	150,000	0	333,858,617		0	333,858,617
2051/52	333,858,617	16,368,324	350,226,940	10,506,808	150,000	0	360,883,749		0	360,883,749
2052/53	360,883,749	7,212,725	368,096,474	11,042,894	150,000	0	379,289,368		0	379,289,368

Figure 29 Water fund balances.

Modelling Assumptions

- ✓ Water fund has an open balance of $42.2m
- ✓ Pricing is based on the BAU pricing regime/mix.
- ✓ Rate increase have been assumed to be aligned to CPI growth (2.5%) and will be held at that rate across the analysis period.
- ✓ Capital cost is anticipated to increase at 1.0% in excess of CPI (3.0+1.0%)
- ✓ With a balance increasing over the 20-year period, no grant funding.
- ✓ No additional loans sought.

7.4.2 Sewer

QPRC is facing a more onerous capital expenditure program for sewer infrastructure, with a growth/enhancement program of in excess $190m in the four years.

Table 34 Scenario 1 Charge increase a 3.0%, No Loans

Sewer Chgare Rise		Year	Open Balance	Transfer to (-) / from (+) Sewer Account	Adjusted Balance 1	Interest Earnt Reserve	Interest Earnt Working	Grant Funding	Adjusted Balance 2	Loans	Repayment	Closing Balance
Adjust here												
4.50%	0	2022/23	0	0	0	0	150,000	1,350,000			0	0
3.00%	1	2023/24	62,000,000	2,965,611	64,965,611	1,948,968	150,000	1,050,000	68,114,579		0	68,114,579
3.00%	2	2024/25	68,114,579	-19,457,102	48,657,477	1,459,724	150,000	300,000	50,567,202		0	50,567,202
3.00%	3	2025/26	50,567,202	-78,824,829	-28,257,628	0	150,000	0	-28,107,628	0	0	-28,107,628
3.00%	4	2026/27	-28,107,628	-66,593,649	-94,701,276	0	150,000	0	-94,551,276	0	0	-94,551,276
3.00%	5	2027/28	-94,551,276	-1,010,118	-95,561,394	0	150,000	0	-95,411,394	0	0	-95,411,394
3.00%	6	2028/29	-95,411,394	6,572,810	-88,838,584	0	150,000	0	-88,688,584	0	0	-88,688,584
3.00%	7	2029/30	-88,688,584	7,252,141	-81,436,443	0	150,000	0	-81,286,443	0	0	-81,286,443
3.00%	8	2030/31	-81,286,443	1,243,499	-80,042,944	0	150,000	0	-79,892,944	0	0	-79,892,944
3.00%	9	2031/32	-79,892,944	9,088,125	-70,804,819	0	150,000	0	-70,654,819	0	0	-70,654,819
3.00%	10	2032/33	-70,654,819	10,593,631	-60,061,188	0	150,000	0	-59,911,188	0	0	-59,911,188
3.00%	11	2033/34	-59,911,188	10,931,002	-48,980,187	0	150,000	0	-48,830,187	0	0	-48,830,187
3.00%	12	2034/35	-48,830,187	11,137,200	-37,692,987	0	150,000	0	-37,542,987	0	0	-37,542,987
3.00%	13	2035/36	-37,542,987	12,250,993	-25,291,993	0	150,000	0	-25,141,993	0	0	-25,141,993
3.00%	14	2036/37	-25,141,993	17,487,994	-7,653,999	0	150,000	0	-7,503,999	0	0	-7,503,999
3.00%	15	2037/38	-7,503,999	18,132,553	10,628,554	318,857	150,000	0	11,097,411	0	0	11,097,411
3.00%	16	2038/39	11,097,411	19,254,349	30,351,760	910,553	150,000	0	31,412,313	0	0	31,412,313
3.00%	17	2039/40	31,412,313	20,887,957	52,300,270	1,569,008	150,000	0	54,019,278	0	0	54,019,278
3.00%	18	2040/41	54,019,278	-1,929,107	52,090,171	1,562,705	150,000	0	53,802,876	0	0	53,802,876
3.00%	19	2041/42	53,802,876	22,675,034	76,477,910	2,294,337	150,000	0	78,922,247	0	0	78,922,247
3.00%	20	2042/43	78,922,247	22,086,030	101,008,277	3,030,248	150,000	0	104,188,525	0	0	104,188,525
3.00%	21	2043/44	104,188,525	15,511,760	119,700,285	3,591,009	150,000	0	123,441,294	0	0	123,441,294
3.00%	22	2044/45	123,441,294	17,150,584	140,591,878	4,217,756	150,000	0	144,959,634	0	0	144,959,634
3.00%	23	2045/46	144,959,634	25,484,609	170,444,243	5,113,327	150,000	0	175,707,571	0	0	175,707,571
3.00%	24	2046/47	175,707,571	27,612,229	203,319,800	6,099,594	150,000	0	209,569,394	0	0	209,569,394
3.00%	25	2047/48	209,569,394	31,261,826	240,831,220	7,224,937	150,000	0	248,206,156	0	0	248,206,156
3.00%	26	2048/49	248,206,156	33,387,736	281,593,893	8,447,817	150,000	0	290,191,709	0	0	290,191,709
3.00%	27	2049/50	290,191,709	28,213,285	318,404,994	9,552,150	150,000	0	328,107,144	0	0	328,107,144
3.00%	28	2050/51	328,107,144	31,483,374	359,590,519	10,787,716	150,000	0	370,528,234	0	0	370,528,234
3.00%	29	2041/52	370,528,234	9,828,595	380,356,829	11,410,705	150,000	0	391,917,534	0	0	391,917,534
3.00%	30	2052/53	391,917,534	37,494,730	429,412,264	12,882,368	150,000	0	442,444,632	0	0	442,444,632

Table 35 *Scenario 2 5 year charge increase at 6.5%, balance at 3.0%, No loans*

Sewer Chgare Rise		Year	Open Balance	Transfer to (-) / from (+) Sewer Account	Adjusted Balance 1	Interest Earnt Reserve	Interest Earnt Working	Grant Funding	Adjusted Balance 2	Loans	Repayment	Closing Balance
Adjust here												
4.50%	0	2022/23	0	0	0	0	150,000	1,350,000			0	0
6.50%	1	2023/24	62,000,000	3,528,068	65,528,068	1,965,842	150,000	1,050,000	68,693,910		0	68,693,910
6.50%	2	2024/25	68,693,910	-18,261,123	50,432,787	1,512,984	150,000	300,000	52,395,770		0	52,395,770
6.50%	3	2025/26	52,395,770	-76,920,240	-24,524,469	0	150,000	0	-24,374,469	0	0	-24,374,469
6.50%	4	2026/27	-24,374,469	-63,897,828	-88,272,297	0	150,000	0	-88,122,297	0	0	-88,122,297
6.50%	5	2027/28	-88,122,297	2,566,874	-85,555,423	0	150,000	0	-85,405,423	0	0	-85,405,423
3.00%	6	2028/29	-85,405,423	10,304,663	-75,100,761	0	150,000	0	-74,950,761	0	0	-74,950,761
3.00%	7	2029/30	-74,950,761	11,144,928	-63,805,832	0	150,000	0	-63,655,832	0	0	-63,655,832
3.00%	8	2030/31	-63,655,832	5,345,724	-58,310,108	0	150,000	0	-58,160,108	0	0	-58,160,108
3.00%	9	2031/32	-58,160,108	13,408,850	-44,751,258	0	150,000	0	-44,601,258	0	0	-44,601,258
3.00%	10	2032/33	-44,601,258	15,142,274	-29,458,984	0	150,000	0	-29,308,984	0	0	-29,308,984
3.00%	11	2033/34	-29,308,984	15,717,350	-13,591,633	0	150,000	0	-13,441,633	0	0	-13,441,633
3.00%	12	2034/35	-13,441,633	16,171,423	2,729,789	81,894	150,000	0	2,961,683	0	0	2,961,683
3.00%	13	2035/36	2,961,683	17,543,654	20,505,337	615,160	150,000	0	21,270,497	0	0	21,270,497
3.00%	14	2036/37	21,270,497	23,050,068	44,320,565	1,329,617	150,000	0	45,800,182	0	0	45,800,182
3.00%	15	2037/38	45,800,182	23,975,443	69,775,625	2,093,269	150,000	0	72,018,894	0	0	72,018,894
3.00%	16	2038/39	72,018,894	25,389,897	97,408,791	2,922,264	150,000	0	100,481,054	0	0	100,481,054
3.00%	17	2039/40	100,481,054	27,328,464	127,809,518	3,834,286	150,000	0	131,793,804	0	0	131,793,804
3.00%	18	2040/41	131,793,804	4,799,050	136,592,853	4,097,786	150,000	0	140,840,639	0	0	140,840,639
3.00%	19	2041/42	140,840,639	29,702,303	170,542,942	5,116,288	150,000	0	175,809,230	0	0	175,809,230
3.00%	20	2042/43	175,809,230	29,424,302	205,233,533	6,157,006	150,000	0	211,540,539	0	0	211,540,539
3.00%	21	2043/44	211,540,539	23,173,372	234,713,910	7,041,417	150,000	0	241,905,328	0	0	241,905,328
3.00%	22	2044/45	241,905,328	25,148,332	267,053,660	8,011,610	150,000	0	275,215,269	0	0	275,215,269
3.00%	23	2045/46	275,215,269	33,831,765	309,047,034	9,271,411	150,000	0	318,468,445	0	0	318,468,445
3.00%	24	2046/47	318,468,445	36,322,559	354,791,005	10,643,730	150,000	0	365,584,735	0	0	365,584,735
3.00%	25	2047/48	365,584,735	40,349,609	405,934,344	12,178,030	150,000	0	418,262,374	0	0	418,262,374
3.00%	26	2048/49	418,262,374	42,867,780	461,130,154	13,833,905	150,000	0	475,114,058	0	0	475,114,058
3.00%	27	2049/50	475,114,058	38,100,945	513,215,004	15,396,450	150,000	0	528,761,454	0	0	528,761,454
3.00%	28	2050/51	528,761,454	41,667,665	570,429,118	17,112,874	150,000	0	587,691,992	0	0	587,691,992
3.00%	29	2041/52	587,691,992	20,318,414	608,010,406	18,240,312	150,000	0	626,400,718	0	0	626,400,718
3.00%	30	2052/53	626,400,718	48,299,244	674,699,962	20,240,999	150,000	0	695,090,961	0	0	695,090,961

Table 36 Scenario 3 5 years of 6.5% increases, balance at 3.0%, Loans of $110m

Sewer Chgare Rise		Year	Open Balance	Transfer to (-) / from (+) Sewer Account	Adjusted Balance 1	Interest Earnt Reserve	Interest Earnt Working	Grant Funding	Adjusted Balance 2	Loans	Repayment	Closing Balance
Adjust here												
4.50%	0	2022/23	0	0	0	0	150,000	1,350,000			0	0
6.50%	1	2023/24	62,000,000	3,528,068	65,528,068	1,965,842	150,000	1,050,000	68,693,910		0	68,693,910
6.50%	2	2024/25	68,693,910	-18,261,123	50,432,787	1,512,984	150,000	300,000	52,395,770		0	52,395,770
6.50%	3	2025/26	52,395,770	-72,920,240	-20,524,469	0	150,000	0	-20,374,469	55,000,000	0	34,625,531
6.50%	4	2026/27	34,625,531	-61,897,828	-27,272,297	0	150,000	0	-27,122,297	55,000,000	-4,795,151	23,082,552
6.50%	5	2027/28	23,082,552	566,874	23,649,426	709,483	150,000	0	24,508,909	0	-9,590,301	14,918,607
3.00%	6	2028/29	14,918,607	10,304,663	25,223,270	756,698	150,000	0	26,129,968	0	-9,590,301	16,539,667
3.00%	7	2029/30	16,539,667	11,144,928	27,684,595	830,538	150,000	0	28,665,133	0	-9,590,301	19,074,832
3.00%	8	2030/31	19,074,832	5,345,724	24,420,556	732,617	150,000	0	25,303,173	0	-9,590,301	15,712,871
3.00%	9	2031/32	15,712,871	11,408,850	27,121,722	813,652	150,000	0	28,085,373	0	-9,590,301	18,495,072
3.00%	10	2032/33	18,495,072	14,142,274	32,637,346	979,120	150,000	0	33,766,467	0	-9,590,301	24,176,166
3.00%	11	2033/34	24,176,166	14,717,350	38,893,516	1,166,805	150,000	0	40,210,321	0	-9,590,301	30,620,020
3.00%	12	2034/35	30,620,020	15,171,423	45,791,443	1,373,743	150,000	0	47,315,186	0	-9,590,301	37,724,885
3.00%	13	2035/36	37,724,885	18,543,654	56,268,539	1,688,056	150,000	0	58,106,595	0	-9,590,301	48,516,294
3.00%	14	2036/37	48,516,294	23,050,068	71,566,362	2,146,991	150,000	0	73,863,353	0	-9,590,301	64,273,051
3.00%	15	2037/38	64,273,051	23,975,443	88,248,494	2,647,455	150,000	0	91,045,949	0	-9,590,301	81,455,648
3.00%	16	2038/39	81,455,648	25,389,897	106,845,545	3,205,366	150,000	0	110,200,911	0	-9,590,301	100,610,610
3.00%	17	2039/40	100,610,610	27,328,464	127,939,073	3,838,172	150,000	0	131,927,246	0	-9,590,301	122,336,944
3.00%	18	2040/41	122,336,944	4,799,050	127,135,994	3,814,080	150,000	0	131,100,074	0	-9,590,301	121,509,773
3.00%	19	2041/42	121,509,773	29,702,303	151,212,075	4,536,362	150,000	0	155,898,438	0	-9,590,301	146,308,136
3.00%	20	2042/43	146,308,136	29,424,302	175,732,439	5,271,973	150,000	0	181,154,412	0	-9,590,301	171,564,111
3.00%	21	2043/44	171,564,111	23,173,372	194,737,483	5,842,124	150,000	0	200,729,607	0	-9,590,301	191,139,306
3.00%	22	2044/45	191,139,306	25,148,332	216,287,638	6,488,629	150,000	0	222,926,267	0	-9,590,301	213,335,966
3.00%	23	2045/46	213,335,966	33,831,765	247,167,730	7,415,032	150,000	0	254,732,762	0	-9,590,301	245,142,461
3.00%	24	2046/47	245,142,461	36,322,559	281,465,021	8,443,951	150,000	0	290,058,971	0	-4,795,151	285,263,821
3.00%	25	2047/48	285,263,821	40,349,609	325,613,429	9,768,403	150,000	0	335,531,832	0	-2,281,436	333,250,397
3.00%	26	2048/49	333,250,397	42,867,780	376,118,176	11,283,545	150,000	0	387,551,721	0	-2,281,436	385,270,286
3.00%	27	2049/50	385,270,286	38,100,945	423,371,231	12,701,137	150,000	0	436,222,368	0	-2,281,436	433,940,932
3.00%	28	2050/51	433,940,932	41,667,665	475,608,597	14,268,258	150,000	0	490,026,855	0	-2,281,436	487,745,419
3.00%	29	2041/52	487,745,419	20,318,414	508,063,833	15,241,915	150,000	0	523,455,748	0	-2,281,436	521,174,312
3.00%	30	2052/53	521,174,312	48,299,244	569,473,556	17,084,207	150,000	0	586,707,762	0	-1,380,658	585,327,104

Figure 30 Sewer Funding Summary

Note: A reduction of the rate increase in 2027/28 from 6.5% to 4.0% would still cater for a positive transfer from the Working Account to the Fund Account. The transfer in 2027/28 would reduce from $566,874 to $21,166.

The table above shows the preferred sewer funding scenario, based on the following:

- ✓ Sewer charge to initially increase at 6.5% through to 2027/28 and then reduce to 3.0% from 2028/29.
- ✓ Fund opening balance at $62m.
- ✓ Loan funding of $110m over the two-year period 2025/26 and 2036/27.
- ✓ No new grant funding, $0.3m balance of previous funding application
- ✓ Major capital expenditure programs;;
  - $24.5m – 2024/25
  - $70.7m – 2025/26
  - $63.1m – 2026-27
- ✓ Average residential bill is forecasted at $829 in 2023/24, increasing by 6.5% pa through to 2027/28 and then increasing at 3.0% pa.

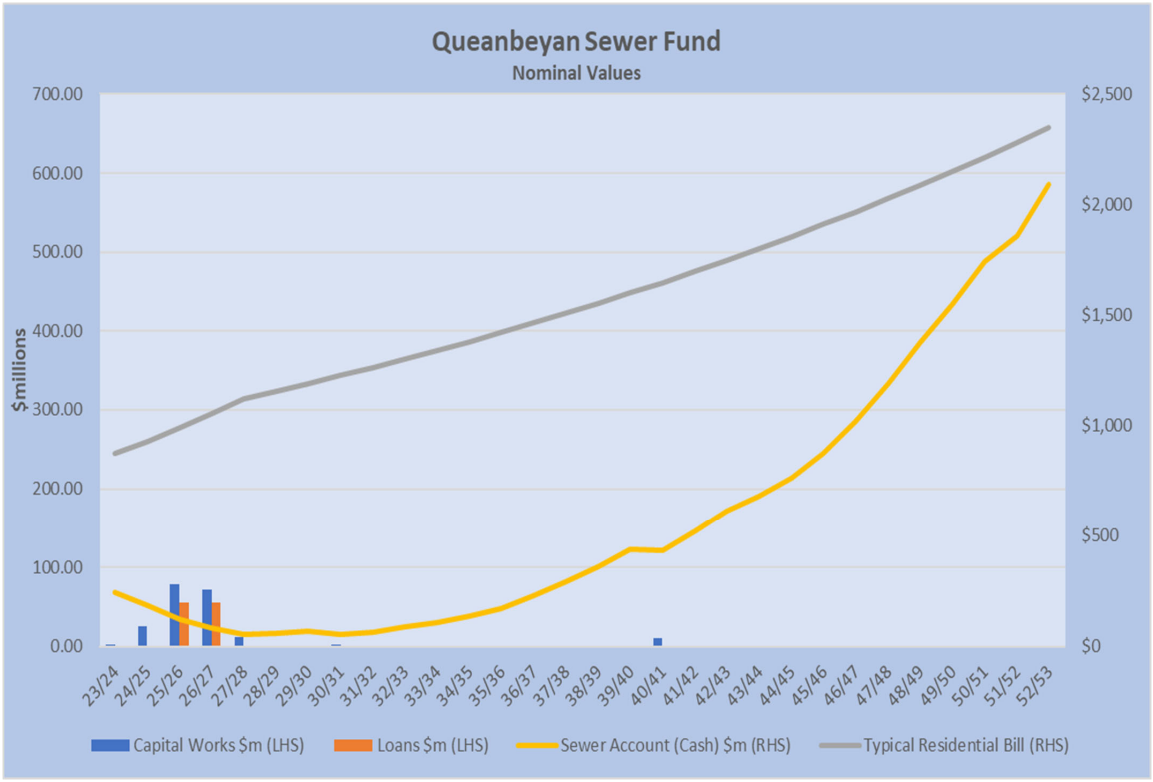


Figure 31 Sewer Fund Overview.

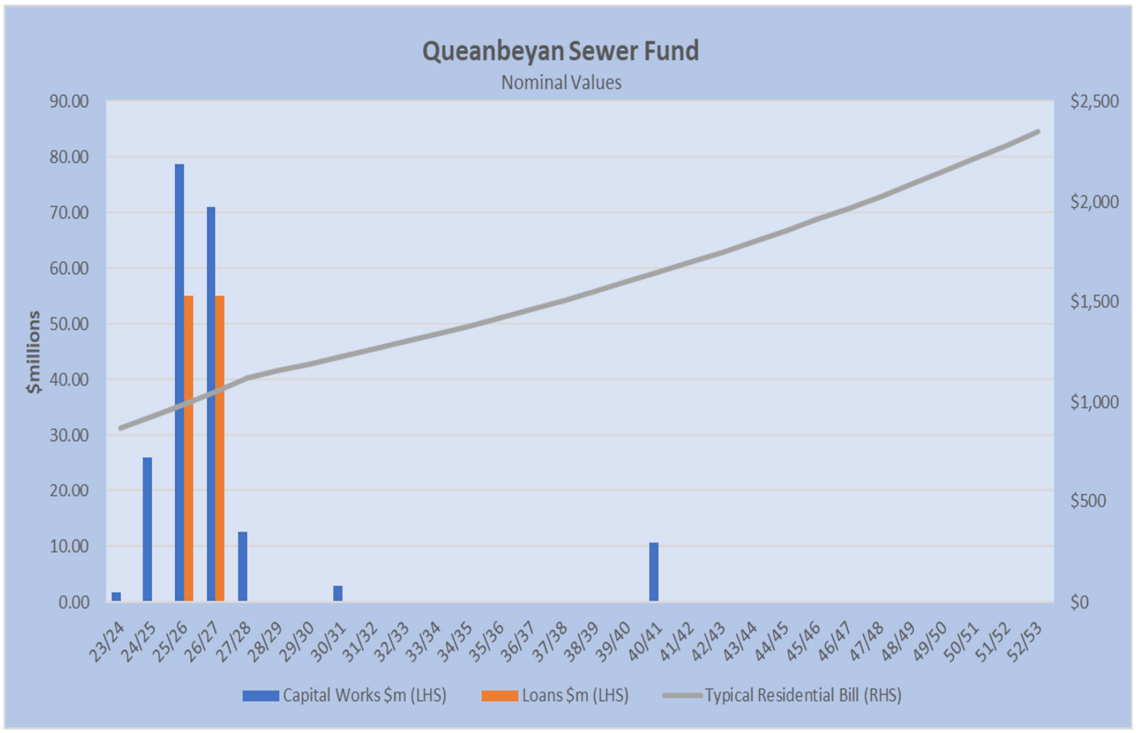


Figure 32 Capital Works c/f Loans, Typical Residential Bill

7.5 Typical residential bills

The forecasted 'typical' residential bill is based on a BAU pricing regime, both in terms of how QPRC charge their users and how they QPRC is charged for labour, goods, and services, and in particular the pricing regime with Icon Water for the supply of bulk water. Based on the existing data and the recommended funding scenarios, the 'typical' residential bill is by 3.0% per annum for water and initially by 6.5% for sewer, reducing to 3.0% per annum post 2027/28.

Table 37 Typical residential bill values

	Sewer		Water		
	Rate increase	Charge	Rate increase	Charge	Typcal Residntial Bill
2023/2024	6.50%	$831.14	3.00%	$1,354.93	$2,186.07
2024/2025	6.50%	$885.16	3.00%	$1,395.58	$2,280.74
2025/2026	6.50%	$942.70	3.00%	$1,437.45	$2,380.14
2026/2027	6.50%	$1,003.97	3.00%	$1,480.57	$2,484.54
2027/2028	6.50%	$1,069.23	3.00%	$1,524.99	$2,594.21
2028/2029	3.00%	$1,101.31	3.00%	$1,570.74	$2,672.04
2029/2030	3.00%	$1,134.35	3.00%	$1,617.86	$2,752.20
2030/2031	3.00%	$1,168.38	3.00%	$1,666.39	$2,834.77
2031/2032	3.00%	$1,203.43	3.00%	$1,716.38	$2,919.81
2032/2033	3.00%	$1,239.53	3.00%	$1,767.88	$3,007.41
2033/2034	3.00%	$1,276.72	3.00%	$1,820.91	$3,097.63
2034/2035	3.00%	$1,315.02	3.00%	$1,875.54	$3,190.56
2035/2036	3.00%	$1,354.47	3.00%	$1,931.81	$3,286.27
2036/2037	3.00%	$1,395.10	3.00%	$1,989.76	$3,384.86
2037/2038	3.00%	$1,436.95	3.00%	$2,049.45	$3,486.41
2038/2039	3.00%	$1,480.06	3.00%	$2,110.94	$3,591.00
2039/2040	3.00%	$1,524.47	3.00%	$2,174.26	$3,698.73
2040/2041	3.00%	$1,570.20	3.00%	$2,239.49	$3,809.69
2041/2042	3.00%	$1,617.31	3.00%	$2,306.68	$3,923.98
2042/2043	3.00%	$1,665.82	3.00%	$2,375.88	$4,041.70
2043/2044	3.00%	$1,715.80	3.00%	$2,447.15	$4,162.95
2044/2045	3.00%	$1,767.27	3.00%	$2,520.57	$4,287.84
2045/2046	3.00%	$1,820.29	3.00%	$2,596.19	$4,416.48
2046/2047	3.00%	$1,874.90	3.00%	$2,674.07	$4,548.97
2047/2048	3.00%	$1,931.15	3.00%	$2,754.29	$4,685.44
2047/2048	3.00%	$1,989.08	3.00%	$2,836.92	$4,826.00
2049/2050	3.00%	$2,048.75	3.00%	$2,922.03	$4,970.78
2050/2051	3.00%	$2,110.22	3.00%	$3,009.69	$5,119.91
2051/2052	3.00%	$2,173.52	3.00%	$3,099.98	$5,273.50
2052/2053	3.00%	$2,238.73	3.00%	$3,192.98	$5,431.71

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Hunter H_2O. (2020a). Queanbeyan Sewage Treatment Plant Upgrade Project Concept Design Report.

Hunter H_2O (2021). Queanbeyan IWCM – sewerage options assessment (final draft), 22/07/2021

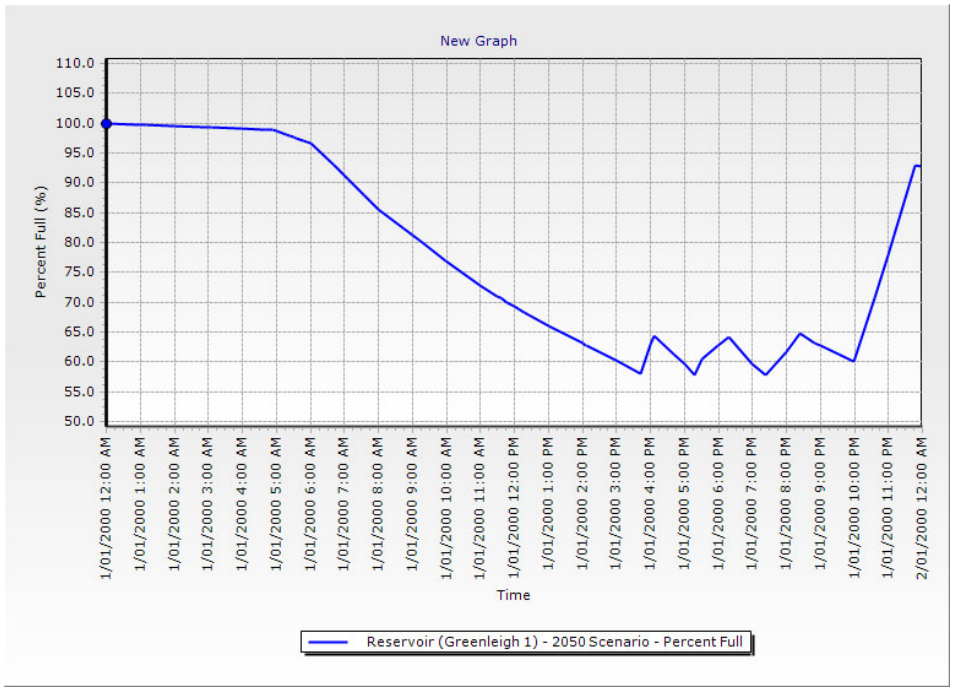
Hunter H_2O (2022) Queanbeyan Sewer Model Revised Augmentation Strategy Queanbeyan Palerang Regional Council

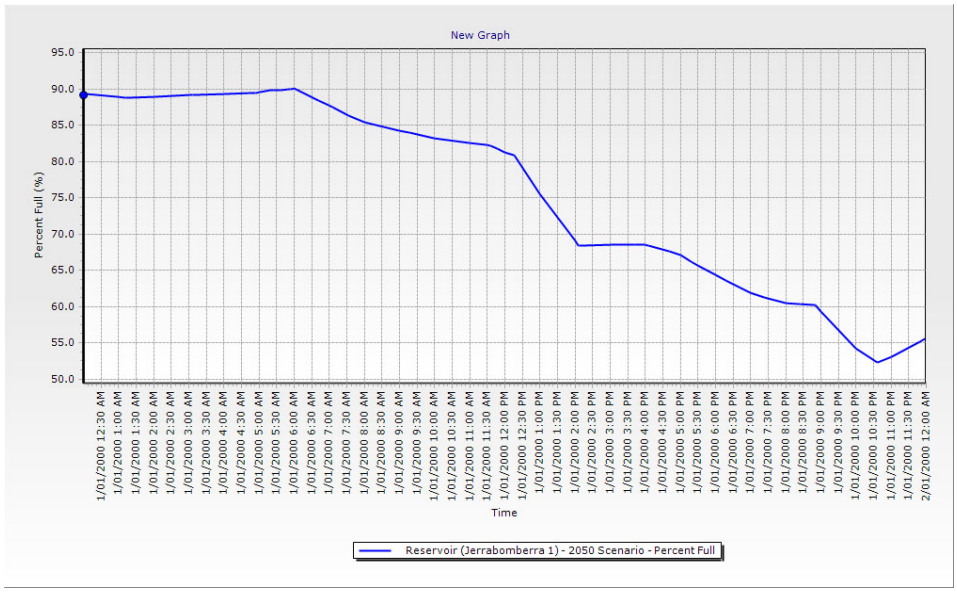
QPRC (2020). Queanbeyan IWCM Issues Paper Supplementary Report

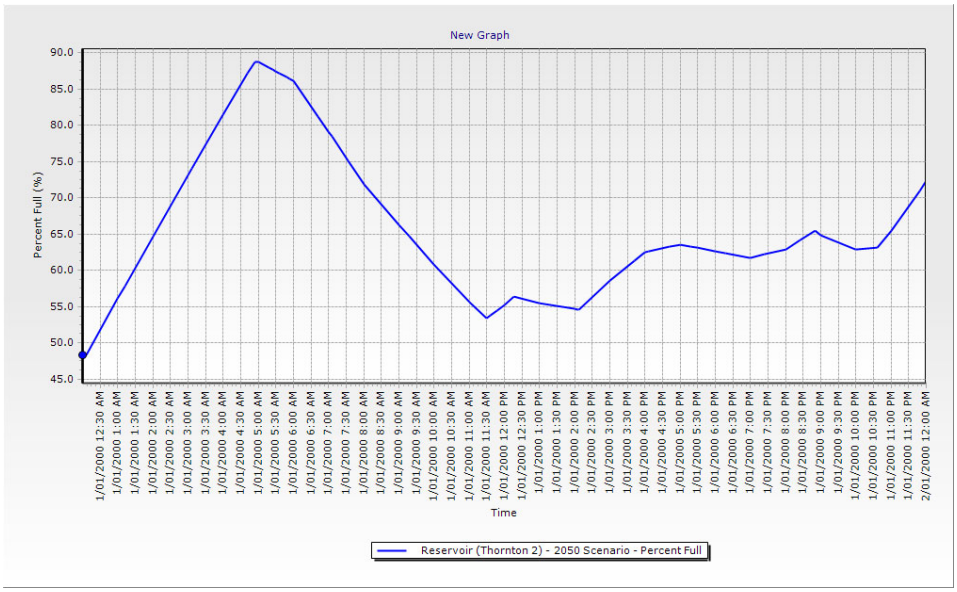
Appendices

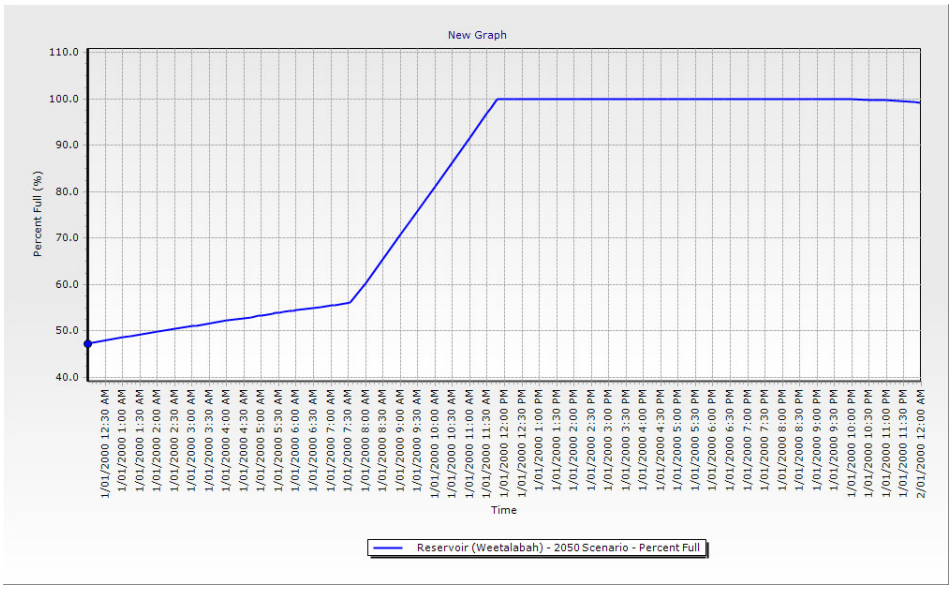
Appendix A

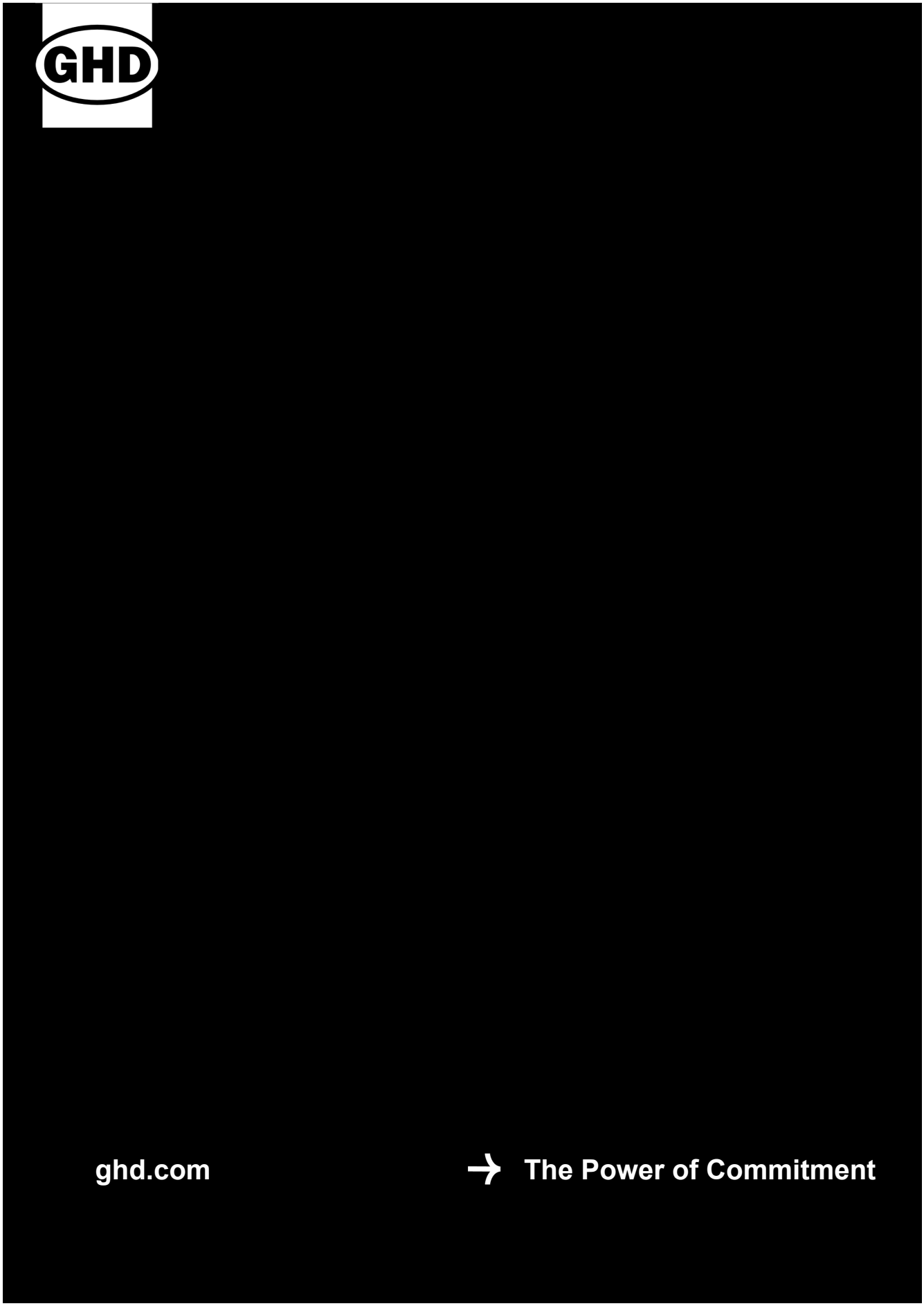
Percent full graphics of reservoirs


New Graph
Percent Full (%)
110.0
105.0
100.0
95.0
90.0
85.0
80.0
75.0
70.0
65.0
60.0
55.0
50.0
1/01/2000 12:00 AM
1/01/2000 1:00 AM
1/01/2000 2:00 AM
1/01/2000 3:00 AM
1/01/2000 4:00 AM
1/01/2000 5:00 AM
1/01/2000 6:00 AM
1/01/2000 7:00 AM
1/01/2000 8:00 AM
1/01/2000 9:00 AM
1/01/2000 10:00 AM
1/01/2000 11:00 AM
1/01/2000 12:00 PM
1/01/2000 1:00 PM
1/01/2000 2:00 PM
1/01/2000 3:00 PM
1/01/2000 4:00 PM
1/01/2000 5:00 PM
1/01/2000 6:00 PM
1/01/2000 7:00 PM
1/01/2000 8:00 PM
1/01/2000 9:00 PM
1/01/2000 10:00 PM
1/01/2000 11:00 PM
2/01/2000 12:00 AM
Time
Reservoir (Greenleigh 1) - 2050 Scenario - Percent Full


New Graph
Percent Full (%)
95.0
90.0
85.0
80.0
75.0
70.0
65.0
60.0
55.0
50.0
Time
Reservoir (Jerrabomberra 1) - 2050 Scenario - Percent Full


New Graph
Percent Full (%)
90.0
85.0
80.0
75.0
70.0
65.0
60.0
55.0
50.0
45.0
Time
Reservoir (Thornton 2) - 2050 Scenario - Percent Full


New Graph
Percent Full (%)
110.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
Time
Reservoir (Weetalabah) - 2050 Scenario - Percent Full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