

Infrastructure NSW

North West Treatment Hub

Final Business Case

April 2024



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1 About this report

1.1 North West Treatment Hub

This report summarises the final business case (FBC) for the North West Treatment Hub project (the project) undertaken by Sydney Water. There are currently 3 water resource recovery facilities (WRRF) (Rouse Hill, Castle Hill and Riverstone) that service Sydney's northwest. These 3 plants make up the North West Treatment Hub (NWTB). This business case investigates the need to increase capacity at the plants to meet growing population service needs within the northwest regions of Sydney.

More specifically the project aims to:

- ▶ Respond to growth: Service growth in Sydney's northwest to 2056.
- ▶ Optimise value for Money: Provide a least cost, value-for-money wastewater treatment service for Sydney Water's customers that minimises bill impact.
- ▶ Develop an adaptable solution: Incorporate into the solution alternative futures, addressing a range of possible demand scenarios with flexibility to adopt technical innovation.
- ▶ Implement a sustainable solution: To provide sustainable wastewater treatment services for a growing northwestern part of the city.
- ▶ Minimise service disruption: Plan construct, maintain and operate the infrastructure required to deliver the service with minimum disruption to stakeholders.

This business case summary has been prepared by Infrastructure NSW in accordance with NSW Treasury Guidelines for Capital Business Cases.

2 Strategic alignment and context

2.1 Background and context

Sydney Water is a statutory State-Owned Corporation (SOC). Its principal functions include operating and managing the systems for supplying water, managing stormwater and treating and disposing of wastewater, across Greater Sydney, Blue Mountains and the Illawarra. The North West Treatment Hub comprises of 3 WRRFs; servicing the Castle Hill, Rouse Hill and Riverstone catchment areas (see Figure 2).

Figure 1 Wastewater Catchment areas and growth precincts

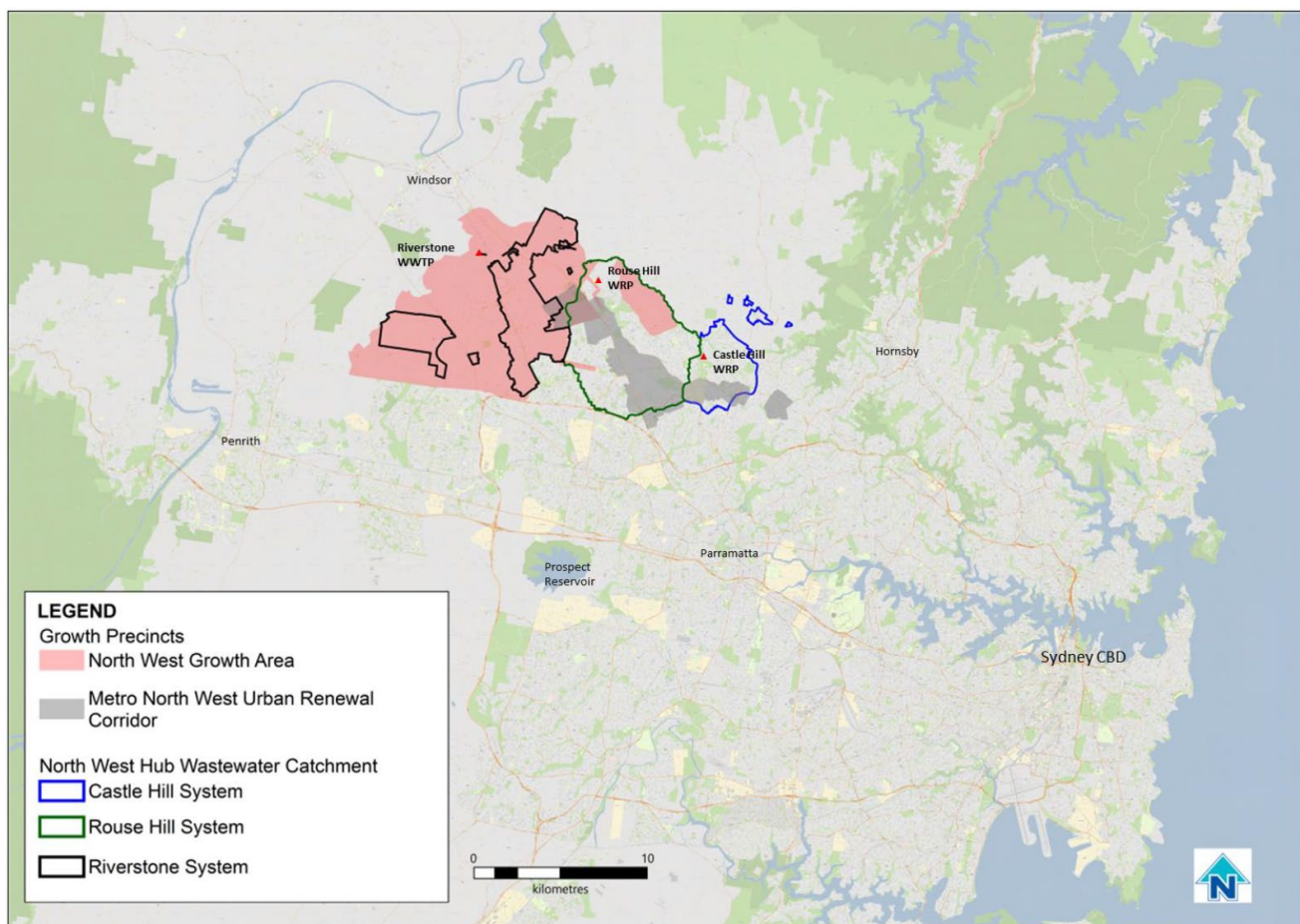


Figure 2 also outlines 2 key growth areas in Sydney's North West (North West Growth Area, NWGA, and Metro North West Urban Renewal Corridor, MNWURC) which overlap these catchment areas. They are expected to put additional pressure on the existing wastewater treatment systems.

Recycled water is produced at the Rouse Hill facility. This means that most of the treated effluent (liquids stream) produced at Rouse Hill WRRF is reused. At Riverstone and Castle Hill, WRRFs is reused on site or discharged. Treated effluent surplus to recycled water demand at Rouse Hill WRRF is also discharged to local creeks that ultimately flow into the Hawkesbury River.

Wastewater treatment also generates sludge (solids stream) as a byproduct that is processed into biosolids which can be safely reused or disposed. Biosolids are processed at both Rouse Hill WRRF and Riverstone WRRF. Biosolids originating from Castle Hill WRRF are processed at Rouse Hill.

2.2 Strategic alignment

Alignment with government strategies & policies

The project positively contributes to the strategic direction and vision of several key government policies and strategies. Table 1 below summarises how the project aligns with key state and regional strategic documents.

Table 1 Government strategy and policy alignment

Region	Government strategy or policy	NWTH Project alignment
National	Infrastructure Australia 2021 Infrastructure Priority List (Infrastructure Australia, 2021)	The NWTH Project supports Infrastructure Australia's objectives of improving water security and resilience in Greater Sydney by: ▶ increasing the capacity of the wastewater systems in Sydney's North West in order to cater for strong population growth and economic development ▶ upgrading wastewater treatment facilities which will improve their environmental performance which in turn supports cleaner, healthier waterways and reduces their impact on the community ▶ promoting circularity of water use which improves resilience to climate change.
State (NSW)	State Infrastructure Strategy (SIS)	The SIS identifies the following challenges with respect to supporting Sydney's growth to 2056: ▶ Very high levels of wastewater treatment with low nutrient levels and water recycling will be required to protect inland waterways. ▶ Acknowledgement of the regulatory impediments to water recycling for nutrient management, water supply augmentation and realisation of a vegetated 'green' urban form in new development areas. ▶ Increasing stress on existing assets. There is only a limited spare capacity in the existing treatment facilities. Hence, there's only a limited low-cost capacity currently available to accommodate the forecast future growth. The NWTH project will seek to address many of these challenges within Sydney's North West.
	SW Circular Economy Policy Statement (NSW EPA, 2019)	The NWTH Project supports the principles outlined in the NSW Circular Economy Policy Statement. In particular, the NWTH Project will deliver carbon emissions reductions, generate biosolids for agricultural use, provide opportunities to generate renewable energy and enable provision of recycled water to new and existing customers as part of recycled water schemes.
Regional (Greater Sydney)	Sydney Water Strategy (Sydney Water, 2020)	The NWTH Growth Project will help realise Sydney Water's vision, it will enable thriving, liveable and sustainable development in the MNWURC and NWGA. The project will provide a sustainable solution that: ▶ protects the health of local waterways ▶ is energy efficient and maximises resource recovery

Region	Government strategy or policy	Nwth Project alignment
		▶ continues reliable supply of recycled water to existing customers and allows expansion of recycled water supply to new schemes.
	Sydney Regional Environmental Plan (SREP) No 20 – Hawkesbury-Nepean River 1997 (NSW Legislation, 2012)	▶ The NWth Project will improve the environmental performance of the 3 treatment plants and reduce nutrient loads into the Hawkesbury-Nepean River in line with EPA’s Hawkesbury Nepean Nutrient Framework. The project also provides the opportunity to increase the supply of recycled water which can also reduce nutrient loads of wastewater discharged into the Hawkesbury-Nepean River.

3 Project Need

The project need, the problem being addressed and the associated opportunities for the growth components of NWTH project are summarised in Figure 3.

Figure 2 NWTH Project Need, the Problem and Opportunities

Need	Problem	Opportunity
Significant growth in the North West Growth Area and Metro North West Urban Renewal Corridor will create increased demand for wastewater services. Maintain waterway health in the Hawkesbury-Nepean catchment.	Capacity constraints at the existing wastewater treatment plants will result in wastewater demand exceeding capacity. Existing licence non-conformances will worsen with growth and additional non-conformances will occur with the additional flow and load. Tightening of wastewater discharge limits into the Hawkesbury Nepean River system is driving a need to improve treatment plant performance.	Holistically consider wastewater treatment in the North West to drive efficiency, stage investments and maximise the use of installed capacity. Development of a biosolids hub to maximise benefits from cogeneration of electricity from biosolids. Leverage advances in modern technology to embed more efficient and sustainable treatment process.

Service Need

Greater Sydney's population is forecast to grow to approximately 6.6 million in 2036¹. Western Sydney's Growth Areas, in particular in the Metro Northwest Urban Renewal and North West Growth Area are forecast to make a particular contribution to that overall growth. This will be accommodated by more densely populated areas and also by new developments which will require an extension of the wastewater servicing catchment area.

Between 2021 and 2036, the equivalent population (EP) for the 3 north west treatment catchment areas is expected to increase by 112%.

The proposed upgrades to the Castle Hill, Rouse Hill and Riverstone Treatment WRRFs will need to accommodate for this growth. They will also be required to satisfy specific design requirements for managing nutrient discharges from WWTP to the Hawkesbury Nepean River, which were recently updated within the Hawkesbury Nepean Nutrient Framework (see section 4.2).

Problem

Wastewater treatment capacity in each of the 3 north west wastewater catchments is insufficient for the servicing requirements to 2056. Table 2 below highlights the existing capacity of each facility and compares this to the forecast demand. This shows that by 2026 there will be a capacity exceedance of 19.4 ML/d which will increase to 30.7ML/d by 2056.

Table 2 Projected Wastewater Demand Compared to Treatment Plant capacity (ML/d)

WW Catchment	Existing capacity	2021	2026	2036	2046	2056
Castle Hill WRP	6.9	6.1	8.2	10.2	10.6	10.9
Rouse Hill WRP	27.0	28.3	34.7	40.1	40.6	41.0
Riverstone WWTP	25.0	9.5	21.4	33.7	35.7	36.6

¹ Department of Planning Industry and the Environment 2020

WW Catchment	Existing capacity	2021	2026	2036	2046	2056
Total	58.9	44.0	64.3	83.9	86.9	88.6
Overall capacity exceedance across 3 plants		15	-5.4	-25.1	-28.0	-29.6

Performance modelling indicates that effluent wastewater services at Rouse Hill and Castle Hill are breaching, or are likely to breach, several conditions in their respective existing Environmental Protection Licenses (EPLs). This is due to the capacity issues described above. Furthermore, ensuring future compliance with the tighter discharge limits outlined by the Hawkesbury Nepean Nutrient Framework will become increasingly difficult.

The Opportunity

Four major potential opportunities were identified as part of addressing the service need.

1. Given the need to augment capacity at each of the treatment plants that service North West Sydney, there is an opportunity to use a holistic approach to infrastructure planning and service delivery. This can be achieved by evaluating the plants collectively (as the North West Treatment Hub) and developing a whole-of-region solution. As the catchments expand, it is necessary to consider an overall connected system, optimise the system boundaries and plant configurations for achieving efficiencies due to economies of scale.
2. The need to upgrade wastewater treatment plants in Sydney's northwest also provides an opportunity to leverage emerging technological improvements in wastewater treatment. This could generate significant operational cost savings when compared to existing conventional technology currently installed in the 3 treatment plants. Some advanced treatment technologies offer more sustainable and efficient treatment processes, and in some cases work best at scale.
3. The adoption of advanced anaerobic digestion for the treatment of biosolids generated through the wastewater treatment process, provides an opportunity for energy recovery. Growth, along with the collection of solids from the other catchments will make energy recovery more viable at the Riverstone facility which already uses anaerobic digestion. There is further potential to promote the circular economy and increase the project benefits by adding co-digestion capability to biosolids processing. Co-digestion adds imported food waste to anaerobic digesters used for biosolids processing to produce more methane for generation of additional electricity.
4. Whilst the Rouse Hill facility already produces recycled water, there is an opportunity to expand this service offering at Rouse Hill and also to develop this service offering at Riverstone.

4 Project objectives and design

4.1 Objectives

The primary objectives of the NETH project are outlined in Table 3 below.

Table 3 Project Objectives

Objectives	Critical success factors
Respond to growth	▶ Provide wastewater treatment services for an increased population up to 222,000 to 511,000 between 2021 to 2056 (238,000 EP increase by 2036). ▶ Improve plant performance to cater for growth and maintain current nutrient loads.
Optimise value for money	▶ Demonstrate value-for-money through delivery of the lowest cost servicing solution that meets the growth needs of northwest Sydney. ▶ Ensure that the incremental benefits exceed costs for the preferred option. ▶ Stage capital investment to meet need.
Develop adaptable solutions	▶ Adapt to meet variable population growth and demand scenarios. ▶ Respond to the changing aspirations of the community, compliance requirements and new products. ▶ Incorporate innovative and alternate technology options.
Implement sustainable solutions	▶ Comply with EPL requirements. ▶ Pursue opportunities for energy recovery which minimise carbon footprint. ▶ Maintain or enhance waterway health and amenity.
Minimise service disruption	▶ Minimise disruption from construction and operational activities (such as truck movements, odour and noise) to the environment, community, businesses and/or government agencies and councils.

4.2 Design Considerations

The proposed upgrades to Castle Hill, Rouse Hill and Riverstone will be explicitly designed to satisfy quality design standards outlined within the Hawkesbury-Nepean Nutrient Framework. This includes:

- ▶ **Limiting nutrient concentrations at good practice levels for existing treatment plants and best practice for any new treatment plant.** EPA considers 'good practice' for existing treatment plants to be a median total nitrogen (TN) concentration of below 6 mg/L and a median total phosphorus (TP) concentration of below 0.1 mg/L in the plant effluent.
- ▶ **Capping total nutrient loads at 'current' levels.** Load caps are assigned on a subzone basis. Within the subzones, each treatment plant discharging to the Hawkesbury-Nepean River, or its tributaries has been assigned allowable load and concentration limits for nitrogen and phosphorus discharged in the effluent.
- ▶ **Allowing trading of nutrient loads between treatment plants and offsetting of treatment plant nutrient loads with other nutrient load reductions** such as a reduction of diffuse nutrients loads in runoff within defined trading subzones.

5 Options identification and assessment

5.1 Final Business Case

The Options that were considered as part of the Strategic Business Case include:

- ▶ Option 1: Wastewater treatment upgrade at each facility with centralised biosolids processing at Riverstone.
- ▶ Option 2: Consolidate Rouse Hill and Castle Hill WRPs, centralised biosolids processing at Riverstone.
- ▶ Option 3: Centralise all facilities to a large new facility for sewage treatment and biosolids processing at Riverstone.

Based on several assessments, Option 1 was considered the preferred option to be carried forward to the FBC as it:

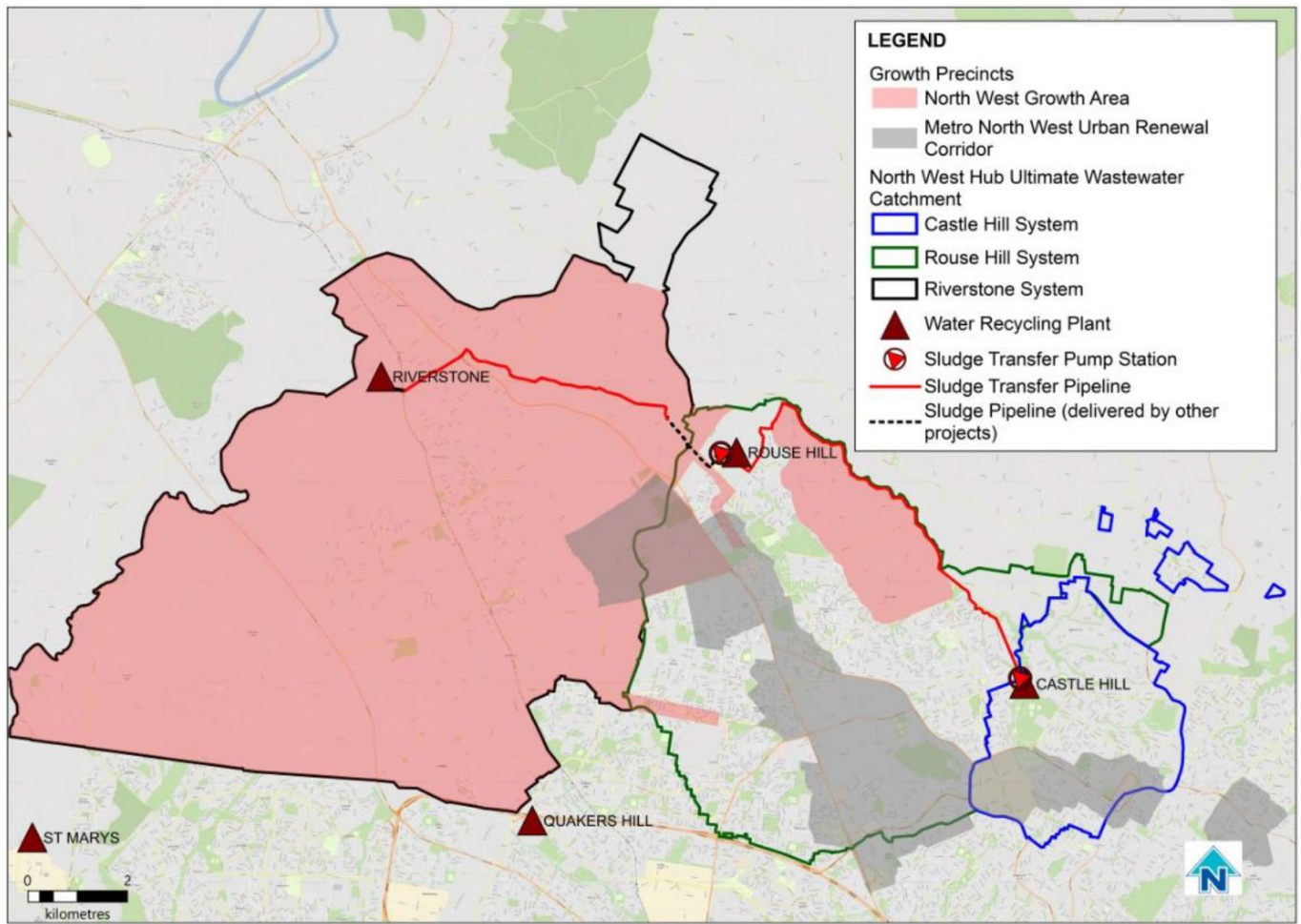
- ▶ is the lowest cost solution to wastewater and recycled water servicing
- ▶ has the most preferable benefit-cost ratio and the only one with BCR above 1
- ▶ has scored highest in the non-cost MCA under all sensitivity conditions
- ▶ maintains waterway values in Cattai Creek
- ▶ consumes the lowest net energy of all options
- ▶ generates an equivalent amount of energy as that of Options 2 and 3 and double that of the Base Case
- ▶ provides the best response to Growth Scope whilst still maintaining compliance.

The 3 core components of the proposed solution include:

- ▶ The upgrade of the wastewater treatment facilities at Rouse Hill, Castle Hill and Riverstone to treat wastewater from respective catchments to cater for the future population growth in North West Sydney up to 2056.
- ▶ The increase in supply of recycled water to the existing Rouse Hill Recycled Water Scheme, allowing for forecast future population growth up to 2056.
- ▶ The centralised biosolids treatment facility for NWTH at Riverstone WRRF, to maximise resource recovery and energy generation capacity as well as produce biosolids for beneficial use in agricultural markets.

Figure 4 provides an overarching view of the proposed new wastewater catchment boundaries, as well as the plant locations and the potential new sludge transfer pipeline alignments.

Figure 3 NWTH Catchment boundaries, Plant Locations and Proposed Sludge Transfer Pipeline Alignment



Financial Structure

Sydney Water will finance the project's initial capital investment through a combination of developer charges, debt and equity, in line with the existing Capital Management Policy, as agreed with NSW Treasury. The debt and ongoing project costs will be recovered through regulated revenue from customer tariffs and developer charges as set by IPART.

Stakeholder Engagement

Engagement on this project commenced as early as 2018 and marked the beginning of messaging informing the local community and key stakeholders that Sydney Water would be taking a new approach to wastewater management.

Future stakeholder engagement includes:

- ▶ Early notification of landowners impacted by pipeline alignments during concept design planning.
- ▶ Public display to inform community and stakeholders of assessed impacts and benefits of preferred solution and request feedback from state and local government organisations.
- ▶ Respond to feedback to environmental assessment.

6 Cost and Economic evaluation

6.1 Evaluation

The Cost Benefit Analysis (CBA) was undertaken in accordance with NSW Government Guide to Cost-Benefit Analysis (TPP17-03) and the NSW Government Business Case Guidelines (TPP18-06).

The following benefits were quantified as part of the economic evaluation:

- ▶ Avoided Base Case Implementation Capital and Operating Costs.
- ▶ Reduced greenhouse gas emissions.
- ▶ Reduced urban traffic congestion resulting from a reduction in truck movements.
- ▶ Reduced air pollution.
- ▶ Reduced noise pollution.

6.2 Outcomes of the Analysis

The CBA results are summarised in Table 6 below. At a 7% discount rate, the preferred option returns a 1.04 BCR and positive Net present value (NPV).

Table 4 CBA Results summary² (\$ million, 2020/21, to 2056)

Option appraisal	Criteria	Option 1
Economic appraisal ([7.00%] real discount rate)	NPV (\$ million)	\$62.7 million
	BCR	1.04
Economic appraisal ([3.00%] real discount rate)	NPV (\$ million)	\$80.0 million
Economic appraisal ([10.00%] real discount rate)	NPV (\$ million)	\$56.0 million

² Using P90 costs

7 Deliverability

7.1 Procurement

The recommended procurement strategy to deliver the NWTH project is for the first investment tranche to be delivered as a program alliance with progressive budgets. The second investment tranche is to be delivered as geography packaged design and construction.

7.2 Timeframe

At the time of the business case, Stage 1 of the project was intended to commence construction in late 2023 and be completed by 2028. Stage 1 includes: the Castle Hill and Rouse Hill Pipelines, Stage 1 liquid upgrades for all 3 facilities and the Biosolids upgrades.

Stage 2 liquid upgrades for Rouse Hill and Riverstone were estimated to begin construction between 2030 and 2031 and complete construction by 2034.

7.3 Key risks and mitigation

The top project risks and mitigations that were identified within the FBC are summarised in Table 7.

Table 5 Key risks and mitigations

Key Risk	Mitigation details
Interfacing projects	Ongoing coordination and planning of interfacing projects. Early contractor engagement to seek to plan outcomes together, using Sydney Water's existing relationships and drawing on its Asset Integration Team.
Interfacing contracts – RDC, compliance, growth, renewals	Seek to engage early with contractors to plan outcomes together. Contract documentation to stipulate that onus is on each contractor to verify and take ownership of existing works' design and construction.
Latent conditions – brownfield sites, quality of existing WAE documents	Desktop environmental constraints analysis completed. DBYD and service locators. Existing drawings to be compiled and assessed. Appropriate risk allowance in risk-based cost estimate. Contract form specific on how latent conditions are monitored.
Condition of existing assets – accuracy and completeness of existing asset condition for intended purpose	Review asset register and program investment plans across the 3 sites to identify planned renewals. Undertake a comprehensive asset condition assessment during further design processes.
High level of market demand for wastewater contractors and staff	Test market attractiveness and appetite with market sounding. Assess and align the project risk profile with the market appetite. Limit transaction complexity and costs. Adapt lessons from recent projects.
Cost pressure and supply constraints on basic commodities	Utilise Shared Purchasing. Locally source materials. Appropriate risk allowance in risk-based cost estimate.
COVID-19	COVID safe plans. Schedule and productivity allowances.

8 The Infrastructure NSW view

Consistent with the NSW Government's Infrastructure Investor Assurance Framework, Infrastructure NSW routinely assesses business cases and provides advice to government on the efficacy of their findings.

Based on the forecast population demand figures, there is a clear service need for the project to proceed. The preferred project option responds directly to the regulatory requirements of the EPA relating to the management of nutrient discharge into local waterways for the Hawkesbury Nepean Catchment. The risk of not responding to the service need is that the waste generated in the catchment, that cannot be managed by existing facilities, will need to be transported to other facilities at considerable cost.

The anticipated benefits have been well quantified, and the NWTH is the solution that is most likely to deliver those benefits. The preferred option delivers net economic benefits to the state.

The FBC is robust and supported by significant early development of reference design, the planning pathway, a well-developed delivery staging strategy and program and a well-advanced market engagement process.

Infrastructure NSW has concluded that the Project is being effectively developed and delivered in accordance with the government's objectives.