

Expenditure review of WaterNSW's Wentworth to Broken Hill Pipeline

Final Report

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Executive Summary

Synergies Economic Consulting (Synergies), with the assistance of Beca, has undertaken an expenditure review of WaterNSW's Wentworth to Broken Hill Pipeline (the WBH Pipeline) for IPART's 2019 Determination.

The review only relates to Separable Portion 1 of the Pipeline, which includes all assets from the intake at Wentworth to the bulk water storage facility at Broken Hill.

Given this is the first price determination for the new WBH Pipeline, our review has focussed on the following matters:

- the procurement process adopted by WaterNSW for the pipeline;
- the key design, construction, operations and maintenance features of the pipeline;
- capital expenditure incurred in the design and construction of the pipeline, which will form its initial regulatory asset base value for pricing purposes; and
- forecast capital and operations and maintenance expenditure for the pipeline for the 2019 determination period (assumed by WaterNSW to be four years).

Assessment approach

Our approach to this expenditure review relies on triangulating various data points to assess whether WaterNSW's proposed capital and operating expenditure can be supported (or not) as being prudent and efficient.

Given that well-designed competitive procurement processes are generally regarded by regulators to lead to efficient service outcomes, this is a main focus of our review. However, we supplement this assessment with several layers of benchmarking analysis. The layers include:

- a top-down, very high-level benchmarking analysis against comparator Australian water pipeline projects to assess the reasonableness of total project cost;
- benchmarking the cost of individual major assets built under the Design and Construct Contract (the D&C Contract) arising from WaterNSW's competitive tender process for the WBH Pipeline; and
- benchmarking the cost of a sample of cost items at a granular level (taken from WaterNSW's Distributed Cost pool, which it proposes to capitalise into the initial regulatory asset base value).



The benchmarking analysis can provide some useful pointers but cannot be considered definitive because of the difficulty of establishing suitable cost comparators and the fact that the WBH Pipeline is not yet operational. We therefore regard it as a cross-check to support the primary basis for drawing conclusions around the efficiency of the design and construction process, which are based on well-designed competitive procurement processes.

Our review findings are summarised below.

WBH Pipeline procurement process

The development of the WBH Pipeline has been procured by WaterNSW using the design-build-operate-maintain (DBOM) procurement model. This model was identified as the optimal one based on external expert advice provided to WaterNSW, including an assessment of risks associated with the design and construction and subsequent operations and maintenance stages of the WBH Pipeline's life.

In conducting an open tender process, WaterNSW provided a detailed output/performance specification for bidders. In doing so, it facilitated competition from bidders in relation to the design and construction of the pipeline. Four domestic/international engineering consortium bidders were short listed for the detailed tender evaluation stage.

The assessment of shortlisted tenders was based on weighted evaluation criteria. Nonprice criteria (design, delivery, commercial solution, value for money) received an aggregate 40% weighting and price received a 60% weighting. The financial capability of bidders was a pass/fail assessment.

In the context of the bidder evaluation process, WaterNSW indicated that design was assessed based on best design at lowest price. Delivery was assessed in regards to a bidder's resources to build the pipeline in a very time-constrained window set by Ministerial Direction. The commercial solution criterion related to the wrap of the he D&C Contract and Operations and Maintenance Contract (the O&M Contract) under the DBOM procurement model, including the 'cleanness' of the contractual relationships with WaterNSW.

Synergies' key findings

We consider that WaterNSW's procurement process for the WBH Pipeline was prudent, such that the lump sum fixed prices emerging from each of the D&C Contract and O&M Contract in relation to the pipeline build and subsequent operation are prudent and



largely efficient, informed by the cost assessment and benchmarking analysis undertaken by Synergies and detailed in the body of this report.

Our efficiency finding reflects the competitive tension that we consider WaterNSW was able to facilitate through its procurement process.

Key pipeline design, construction and operation features

The successful tenderer for the design and construction project phase, the John Holland/MPC Group Joint Venture (JV), commenced construction of the WBH Pipeline on 1 January 2018. It expects construction to extend to January 2019, followed by three months of proof-of-performance testing with pipeline commissioning scheduled for April 2019. By industry standards, this is a quick pipeline build.

Design and construction features

NSW Government Ministerial Directions had an important influence on the design and construction of the WBH Pipeline.

Pipeline design

The Ministerial Direction's requirement for the pipeline to meet peak daily demand of 37.4ML per day was a key prescribed design feature. In addition, Essential Water provided WaterNSW with a peak season demand forecast (December – March), which was to be factored into pipeline size and bulk storage capacity. However, it was left up to tenderers how these requirements should be addressed in the pipeline's design.

The Ministerial Direction that the WBH Pipeline be built along the Silver City Highway provided a good route. The more costly and difficult locations for the pipeline build were in and around the townships of Wentworth and Broken Hill. WaterNSW's nominated extraction point for water near Wentworth was accepted by all short-listed tenderers, with the pipeline skirting around Wentworth residential areas to address Council concerns regarding potential adverse construction impacts. The final delivery point for the pipeline is Essential Water's Mica Street Water Treatment Plant via the bulk water storage facility around 15km outside of Broken Hill.





Optimisation of pipeline size and bulk water storage was the key optimisation in the John Holland/MPC Group JV's design. Compared to other pipeline designs, the successful design uses a smaller diameter pipeline and assumes pumping at a constant rate (27ML/day) but with a larger bulk storage volume. This was the key pipe diameter size versus storage, as well as capex/opex trade-off, in the pipeline design. The large bulk storage facility is intended to allow a flatter pumping profile including less pumping at peak times, reducing electricity costs.

The number of pump stations and pipeline diameter was another important related optimisation decision associated with minimising electricity costs once the pipeline was operating. This was part of an integrated design in relation to minimising whole-of-life life pipeline costs. We understand that Trility, John Holland's O&M Contract JV partner, was involved in design issues, which facilitated optimisation of whole-of-life pipeline costs.

Between the period following award of contract and preparation of WaterNSW's Pricing Proposal, the only material variation to the contract price related to the section of pipeline from the third pump station (Silver City Pump Station) to the bulk storage facility. This 21km section originally, as part of the accepted tender solution, used a 559mm diameter pipeline. However, further design following contract award identified that changing this section to a 762mm diameter pipeline represented a better whole-of-life solution. A variation of approximately \$1.4M was approved for this change in the pipeline diameter. Since WaterNSW's Pricing Proposal was submitted to IPART, a number of additional variations have been made, with a

Other important design features with cost or water quality implications included:

- rubber ringed joints were favoured over welded joints as this was lower cost (this approach was common across all bidders); and
- an internal coating of concrete inside the pipeline was applied during the manufacturing process to improve the chemical balance of water and thereby avoid the need for a conditioning plant.

Construction project management

All pipeline project teams (WaterNSW, John Holland/MPC Group, Trility and Jacobs plus SMEC (the Independent Verifier)) were co-located in Wentworth at the start of the WBH Pipeline's construction, which allowed all design and construction processes and any potential design or construction problems to be resolved early.



In addition, this facilitated project risks being identified and understood from the start of construction, with the John Holland/MPC Group JV facing liquidated damages for late completion of the project.

There has been extensive project progress monitoring and reporting, overseen by the Independent Verifier. SMEC is also responsible for contract compliance, including approving contract variations if WaterNSW and JV cannot agree on the value. WaterNSW has only performed a review role in the construction phase of the project.

No major concerns have arisen regarding the construction of the pipeline, with only two defective work notices lodged, both of which have been resolved.

A Monte Carlo analysis of specific project risks has been undertaken by Advisian (engaged by WaterNSW), including likelihood and consequence, which forms the basis of the P90 contingency estimate in WaterNSW's Pricing Proposal. To this late stage of the project, we understand the reported contingency is within the risk-weighted estimate.

Operations and maintenance features

The O&M Contract will commence once the WBH Pipeline is commissioned in April 2019. The John Holland/Trility Joint Venture is responsible for operations and maintenance of the pipeline for 10 years, with two potential extensions of 5 years.

The two largest direct operating cost components are the fixed lump sum operations and maintenance price emerging from the competitive tender process and the most significant ongoing cost of the pipeline, which is electricity associated with the pumping of water up the pipeline from its intake point at Wentworth.

The residual operating costs relate primarily to management of the O&M Contract through a special purpose vehicle (SPV) that WaterNSW has established, as well as the provision of corporate services to the SPV.

The O&M Contract has an asset replacement plan over 20 years built into it, including periodic refurbishments associated with the pipeline ancillaries (eg pump replacements, electrical equipment).

The 20 year asset handback provision in the O&M Contract is a standard provision under DBOM and such like procurement models. There are strict contractual conditions regarding the condition of the asset upon handover.

There will be a defects liability period of two years as part of the overlapping D&C and O&M Contracts. Special warranties have been sought and obtained for pumps (5 years)



and the bulk storage facility's liner (20 years). These warranties have been passed to WaterNSW so it can enforce them directly as needed.

Synergies' findings

Synergies considers the design and construction and operations and maintenance features of the WBH Pipeline, as embodied in the D&C and O&M Contracts, to be prudent and efficient. The pipeline design incorporates innovative features, including the pipeline diameter and bulk water storage trade-off, which should reduce whole-of-life costs.

We consider the overarching project management of the pipeline's construction to have been of a very high standard, such that it has taken place without any major delays or significant cost overruns and is expected to be completed within the externally imposed tight project timeline.

Energy demand

We have assessed WaterNSW's proposed variable energy demand for the WBH Pipeline (MWh per ML) as being efficient based on a bottom up assessment of the energy required to pump a ML of water through the pipeline (using an independent pipeline energy calculator). We accept that WaterNSW's allowances for evaporation losses, pumping efficiency losses and its contingency margin to cover risks to O&M contractor are prudent and reasonable given the pipeline is not operating yet.

WaterNSW has proposed a fixed energy requirement of MWh per day. From the documents provided by WaterNSW it is not explicit how this estimate has been made. On first principles, any estimate of fixed energy consumption requires some assumptions of the duration of operation of the individual loads, noting that some loads are likely to operate almost constantly (such as ventilation fans and air conditioning) and some operate intermittently (such as cranes and compressors).



Our estimate is MWh per day, which we are recommending as the efficient level of fixed energy demand.

Table ES1 summarises our recommended efficient energy needs for the WBH Pipeline for each year of the 2019 Determination period. The recommended levels have been



calculated based on three sets of water demand forecasts provided by IPART (corresponding to high, median, and low rainfall scenarios at Broken Hill).

	2019-20	2020-21	2021-22	2022-23
Fixed energy demand per day (MWh/day)				
Days in year	366.00	365.00	365.00	365.00
Total fixed energy demand (MWh)				
Variable energy demand per ML (MWh/ML)				
High rainfall scenario				
Water demand (ML)	2,039	2,025	2,008	1,990
Total variable energy (MWh)				
Median rainfall scenario				
Water demand (ML)	4,158	4,144	4,127	4,109
Total variable energy (MWh)				
Low rainfall scenario				
Water demand (ML)	6,007	5,993	5,976	5,958
Total variable energy (MWh)				
Total energy (fixed plus variable)				
High rainfall scenario (MWh)	5,872	5,840	5,810	5,780
Median rainfall scenario (MWh)	9,543	9,512	9,481	9,451
Low rainfall scenario (MWh)	12,746	12,715	12,685	12,655

 Table ES1
 Recommended efficient energy volume

Source: Water demand forecasts from IPART, 29 January 2019

Synergies' expenditure efficiency assessment

As previously noted, we consider that the lump sum prices emerging from the D&C Contract and O&M Contract in relation to the WBH Pipeline construction and its subsequent operation are prudent and efficient. This opinion is supported by the benchmarking analysis we have undertaken regarding total project cost.

We also consider the majority of WaterNSW's proposed Distributed Costs (also referred to as Owner Costs) to be efficient. For those Distributed Costs costs associated with the design and construction of the WBH Pipeline, we have reached this conclusion based on our assessment of:

- the procurement processes it has adopted for various external contracts; and
- our industry knowledge and benchmarking checks applied to a sample of granular individual cost items, including WaterNSW's internal costs.

Some minor reductions have been made to WaterNSW's internal planning costs to reflect our efficiency assessment.



Similarly, for WaterNSW's forecast operations and maintenance costs for the 2019 Determination period, we have assessed most of it to be efficient, subject to a reduction in the forecast fixed energy consumption of the Pipeline, and a reduction in forecast corporate overheads (allocated to the SPV) to reflect our benchmarking assessment of these costs.

Table ES2 presents our summary of WaterNSW's prudent and efficient capital and operating expenditure categories for the proposed, four-year 2019 Determination period. For comparison purposes, we also show WaterNSW's proposed expenditure for

- all three separable portions of the Pipeline; and
- for just Separable Portion 1.

WaterNSW is proposing to pro-rata a share of the Distributed Costs to Separable Portion 1 of the WBH Pipeline, given by the D&C Contract sum for Separable Portion 1 as a proportion of the total D&C Contract value for the entire WBH Pipeline Project.¹ We accept this as a reasonable means of apportioning the Distributed Costs to the initial RAB value. The recommended efficient expenditure levels shown in Table ES2 relate to Separable Portion 1 of the WBH Pipeline Project.

Category	WaterNSW' (Nomi	s proposal nal \$)	Prudent	rudent Efficient Recommended efficient expenditure level for Separable Portion 1		nt expenditure Portion 1
RAB value						
	All 3 Separable Portions Nominal \$	Separable Portion 1 Nominal \$			Nominal \$	2018-19 \$
D&C Contract	\$367,037,000	\$330,052,000	Yes	Yes	\$330,052,000	
Distributed Costs – Independent Verifier	\$5,027,676	\$4,524,908	Yes	Yes	\$4,524,908	\$4,638,031
Distributed Costs – Direct Project Costs (planning)	\$14,500,000	\$13,050,000	Yes	No	\$11,867,972 WaterNSW's actual expenditure on planning as at the end of October 2018 was \$13,186,635.	\$12,164,671

Table ES2: Summary of expenditure review items

¹ The pro-rata share is approximately 90%, given by the D&C Contract value for Separable Portion 1 less the cost of farm offtakes (i.e. \$330,052,000) divided by the total D&C Contract value less the cost of farm offtakes (i.e. \$367,037,000). While we understand that this is WaterNSW's intended means of assigning a share of Distributed Costs to Separable Portion 1, Synergies identified an error in WaterNSW's uplift factors in the pricing model (e.g. a 12% uplift factor was applied to the D&C Contract value to calculate the share of contingency cost applicable to Separable Portion 1. This factor should have been 16%. Conversely, an uplift factor of 16% was applied to calculate the share of remaining Distributed Costs. This factor should have been 12%. The figures presented in Table ES2 are based on the correct uplift factors. This explains why the shares of costs in Table ES2 do not align to those in Table 15 of WaterNSW's pricing submission.



Category	WaterNSW's (Nomii	s proposal nal \$)	Prudent	Efficient	Recommended efficient expenditure level for Separable Portion 1	
					WaterNSW has advised that planning activities had largely ceased by October 2017. We therefore recommend the reported actual expenditure (90% prorated to SP1) be the efficient amount for capitalising into the RAB.	
Distributed Costs – External Contract Costs	\$15,243,999	\$13,719,599	Yes	Yes	\$13,719,599	\$14,062,589
Distributed Costs – Internal Water NSW Costs	\$10,404,016	\$9,363,614	Yes	Yes	\$9,363,614	\$9,597,705
Distributed Costs – Contingency	\$58,465,050	\$52,618,545	Yes	Yes	\$52,618,545	\$53,934,009
Forecast capital ex	xpenditure (2018-	19)				
Asset replacement	2022/23: \$54,000)	Yes	Yes	2022/23: \$54,000	
Land acquisition	2019-20: \$500,00	00	Yes	Yes	2019-20: \$500,000	
Forecast operating	g expenditure (20	18-19)				
O&M Contract	2019/20: \$1,595, 2020/21: \$1,597, 2021/22: \$1586,8 2022/23: \$1,585,	700 200 300 300	Yes	Yes	2019/20: \$1,595,700 2020/21: \$1,597,200 2021/22: \$1,586,800 2022/23: \$1,585,300	
Asset replacement costs	2019/20: \$300 2020/21: \$1,100 2021/22: \$300 2022/23: \$0		Yes	Yes	2019/20: \$300 2020/21: \$1,100 2021/22: \$300 2022/23: \$0	
Electricity payments	N/J	Ą	N/A	N/A	An assessment of the efficient electricity costs of the WBH Pipeline's is beyond the scope of our review. Our assessment of the recommended energy demand of the Pipeline will be supplied to the concurrent review of energy expenditure of the Pipeline and in turn inform the recommended efficient electricity costs of the Pipeline	
SPV audit costs	2019/20: \$100,000 2020/21: \$100,000 2021/22: \$100,000 2022/23: \$100,000		Yes	Yes	2019/20: \$100,000 2020/21: \$100,000 2021/22: \$100,000 2022/23: \$100,000	
SPV contract management costs	contract igement costs 2019/20: \$220,000 2020/21: \$220,000 2021/22: \$220,000 2022/23: \$220,000 2022/23: \$220,000		Yes	Yes	2019/20: \$220,000 2020/21: \$220,000 2021/22: \$220,000 2022/23: \$220,000	
Insurance and land tax	2019/20: \$131,40 2020/21: \$131,40 2021/22: \$131,40 2022/23: \$131,40	00 00 00 00	Yes	Yes	2019/20: \$131,400 2020/21: \$131,400 2021/22: \$131,400 2022/23: \$131,400	



Category	WaterNSW's proposal (Nominal \$)	Prudent	Efficient	Recommended efficient expenditure level for Separable Portion 1
SPV corporate overhead	2019/20: \$475,000 2020/21: \$475,000 2021/22: \$475,000 2022/23: \$475,000	Yes	No	2019/20: \$104,000 2020/21: \$104,000 2021/22: \$204,000 2022/23: \$204,000

Note: D&C Contract expenditure is spread across two years (2017-18 and 2018-19). Synergies has escalated the 2017-18 values to 2018-19 dollars using a forecast CPI of 2.5%. We assume that the budgeted Distributed Costs are dated 2017-18, and thus all nominal values for these costs are escalated to 2018-19 dollars using a CPI of 2.5%

Source: WaterNSW various sources

Farm offtakes

The WBH Pipeline also includes offtakes which are specific locations along the pipeline where water will be supplied to customers using dedicated assets offtake assets. Initially, three offtakes will be constructed to provide supply to four customers as part of water supply agreements negotiated with WaterNSW during the construction phase of the project. Once the pipeline is operational, the O&M Contract allows for additional offtakes to be constructed.

WaterNSW's Pricing Proposal indicates that the cost of the initial three offtakes will be \$89,000 per offtake, which includes an asset component of \$83,333 plus WaterNSW's financing costs. The O&M Contract provides that any further offtakes that are constructed once the pipeline is operational will be treated as a contract variation and costed at \$77,319 per offtake.

Synergies secured two independent, bottom-up assessments of the cost of a farm offtake given the known design specifications set out in WaterNSW's Pricing Proposal, together with a standard set of assumptions where the design specifications lacked definition. Both costings have been developed on the basis of a 'stand-alone' contract, as opposed to being built as part of a larger contract for the entire pipeline project. The independent assessments produce cost estimates, before contingency, that lie in the range of \$87,000 to \$100,000. This lends support to WaterNSW's budgeted cost for the offtakes and suggests that the costs are within an efficient range.



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1 Introduction

Synergies, in partnership with Beca, has been engaged by the Independent Pricing and Regulatory Tribunal (IPART) to undertake an expenditure review of WaterNSW's Wentworth to Broken Hill Pipeline (the WBH Pipeline), which is scheduled to be commissioned in April 2019.

IPART's role is to set prices which reflect the prudent and efficient costs of delivering a utility's monopoly services. Hence, our review is a critical input into the prices that WaterNSW can charge to its customers for the bulk water transportation service delivered by means of the WBH Pipeline once operational.

1.1 Scope of our review

To assist IPART in its price setting task for the water services of the WBH Pipeline, we are required to assess the adequacy, appropriateness and efficiency of WaterNSW's past and forecast levels of operating and capital expenditure on the pipeline.

Our expenditure review contains the following elements:

- operating expenditure: the efficiency of past and proposed expenditure;
- capital expenditure: the prudence and efficiency of past and proposed expenditure; and
- output measures: the proposed operational and service performance measures for the 2019 determination period.

The original scope for Synergies' review was agreed on the basis of our proposal to IPART, together with our response to IPART's request for further particulars on our methodology (which was requested on 6 July 2018 and submitted to IPART on 13 July). In the context of the capital expenditure review we focused our methods exclusively on a process-based review of the contestability of capital program (Attachment A). IPART has since requested we undertake more detailed benchmarking of the capital cost of the WBH Pipeline and individual elements of that cost.

Synergies has therefore undertaken additional 'bottom-up' and 'top-down' analysis of individual components of the pipeline project expenditure as a means of strengthening the evidence base for the capex efficiency assessment. Normally, the benchmarking of efficiency of the construction of infrastructure projects (and in turn, the determination of regulatory asset base (RAB) values) is performed at the end of the construction process



(ie post commissioning), when all relevant costs are able to be brought to account and the full assessment of the circumstances of the construction process can be understood.

This is one of the reasons why a RAB value would not normally be established until after commissioning of a project and that a benchmarking assessment of the construction process would not occur at least until the commissioning process was complete. However, IPART is required to set prices for the WBH Pipeline to apply from 1 July 2019 such that a RAB value is required to be established, notwithstanding uncertainty regarding final project costs.

Box 1 explains IPART's efficiency and prudency tests that have guided our expenditure review.

Box 1. IPART's prudency and efficiency tests

Prudency test

The 'prudence test' assesses whether, in the circumstances existing at the time, the decision to invest in an asset is one that the utility, acting prudently, would be expected to make. In assessing prudence, the consultant should assess both how the decision was made, and how the investment was executed where the asset has been built (ie the construction or delivery and operation of the asset), having regard to information available at the time. In examining forecast expenditure, the prudence test examines the consistency of this expenditure with the utility's longer-term capital expenditure program.

Efficiency test

The 'efficiency test' is used to determine how much of a utility's proposed expenditure (operating and capital) for the upcoming determination period (commencing on 1 July 2019) should be included in the utility's revenue requirement. The efficiency test should examine whether the utility's actual and proposed expenditure represents the best and most cost-effective way of delivering the regulated services.

Use of prudency and efficiency tests

The prudence and efficiency tests are used to determine how much:

- actual capital expenditure in the current determination period, and
- forecast capital expenditure in the upcoming determination period

should be rolled into the regulatory asset base (RAB) for the purposes of calculating allowances for a return on and return of capital, to be recovered from regulated prices.

Data source: IPART

Our expenditure review is limited to assessing what is referred to as Separable Portion 1 of the WBH Pipeline. The other two portions (separable portions 2 and 3) are being constructed for Essential Energy and funded by NSW Treasury, and are therefore outside of scope for this review.²

² The three Separable Portions are being constructed by the John Holland/MPC Group Joint Venture as part of the Design & Construction Contract entered into with WaterNSW.



IPART is concurrently determining the maximum prices to apply from 1 July 2019 for Essential Energy's water and sewerage services supplied to customers in Broken Hill and surrounding areas (Menindee, Sunset Strip and Silverton).

The prices that WaterNSW charges for the bulk water transportation service delivered by the WBH Pipeline will form an important component of Essential Water's future retail water prices. However, a review of Essential Water's forecast expenditure from 1 July 2019 is being undertaken separately to our review of the WBH Pipeline expenditure.³

Further, a large portion of the future operational costs of the WBH Pipeline relates to electricity required for pumping purposes. The review of WaterNSW's forecast energy costs is a separate expenditure review to this one. However, as part of our expenditure review, we are required to assess and recommend the efficient volume of energy per year of the WBH Pipeline for the 2019 determination period (MWh/year).

1.2 Information gathering and on-site visit

In undertaking our verification review, we have relied on:

- a significant amount of written information and documentation that WaterNSW has made available to us;
- information requested directly from and provided to us by WaterNSW's staff;
- publicly available information, including comparisons with relevant organisations; and
- our experience in the water and sewerage industry and in undertaking other similar expenditure review tasks, including in-house data and non-confidential information drawn from cost databases and/or previous water infrastructure projects.

Our general approach to information gathering was to review the initial information provided by WaterNSW and identify any information gaps or questions arising from this information.

³ IPART will determine the length of the 2019 Determination period. WaterNSW has proposed a 4-year determination period from 2019-20 to 2022-23.



The information provision process commenced followed an inception meeting we held with IPART and WaterNSW on 30 August 2018. We then requested and obtained responses to our queries through several formal requests for information (RFIs).

We have also had regard to IPART's Issues Paper for this expenditure review, including the expenditure-related questions in that paper.⁴

1.2.1 On-site visit

On Friday 5 October 2018, WaterNSW hosted a visit by Synergies/Beca to Broken Hill. A series of meetings/teleconferences were held with Synergies/Beca, WaterNSW, John Holland and IPART staff.⁵

Synergies/Beca and WaterNSW had previously agreed on specific WBH Pipeline project roles that we would like to engage with in relation to the pipeline's design and construction, as well as operation and maintenance, including WaterNSW and John Holland roles.

The information that we received as part of the on-site visit formed an important part of our review.

1.3 Report structure

The remainder of our report is structured as follows:

- Chapter 2 summarises important background information regarding the NSW Government's decision to require the WBH pipeline to be built by WaterNSW.
- Chapter 3 provides our assessment of WaterNSW's WBH pipeline procurement process.
- Chapter 4 provides or assessment of the prudency and efficiency of the WBH Pipeline design solution;

⁴ IPART (2018), Murray Review to Broken Hill Pipeline, WaterNSW, Issues Paper, September

⁵ The John Holland MPC Group Joint Venture has been engaged by WaterNSW for the Design & Construction Contract and the John Holland Trility Joint Venture for the Operations & Maintenance Contract regarding the design, build, operation and maintenance of the WBH Pipeline. We review the prudency and efficiency of these contractual arrangements in Chapter 4 of our report.



- Chapter 5 provides our prudency and efficiency assessment of the WBH Pipeline's actual & forecast capex that will form the initial regulatory asset base (RAB) value for the pipeline.
- Chapter 6 provides our prudency and efficiency assessment of WBH Pipeline's forecast opex for the 2019 Determination period.
- Chapter 7 recommends a set of measures for the WBH Pipeline for the 2019 Determination period to enable IPART to track WaterNSW's actual expenditure and service performance relative to its forecast.
- Attachment A contains a summary of the scope of this review and Synergies methodology for conducting the assessment
- Attachment B provides a list of references for the comparator pipelines used for the top-down benchmarking analysis
- Attachment C provides a summary of key details of IPART's energy demand calculator.



2 Background

This expenditure review of the WBH Pipeline is somewhat unusual by normal regulatory standards because the expenditure we are reviewing relates to a totally new water infrastructure asset that is close to but not yet operational. Construction on the pipeline is expected to be completed by December 2018. After construction is completed, pipeline testing will take place to ensure the pipeline is ready to supply water to Broken Hill by April 2019.

The fact that the WBH Pipeline is a new asset stems from prior decisions made by the NSW Government regarding the need to secure the long-term supply of water to the Broken Hill region.

The purpose of this chapter is to provide important background information on the NSW Government's identification of the WBH Pipeline as its preferred option and WaterNSW's primary responsibility to arrange the delivery of this new investment for the State. The impact of several Government Directions to WaterNSW and IPART relating to the WBH Pipeline are also relevant to our expenditure review.

2.1 WBH Pipeline Final Business Case⁶

Of most importance is the Broken Hill Long-Term Water Supply Solution Final Business Case dated 31 March 2016 (the Final Business Case), which incorporates analysis of the full range of options considered by the NSW Government. This options analysis underpinned the Government's decision to invest in a major pipeline infrastructure project to secure water supply for the Broken Hill region in the long term.

A multi-agency Steering Committee was established specifically to provide oversight of the development of the Final Business Case. The Department of Industry – Crown Lands and Water (the then DPI Water), NSW Treasury, Department of Premier and Cabinet (DPC), NSW Department of Planning and Environment (DPE) and Infrastructure NSW (as an Observer) were represented on the Steering Committee.

The Final Business Case was also informed by stakeholder consultation over a 12 month period, including community, business and government stakeholders, through formal consultation forums, workshops, site visits, teleconferences and meetings.

Both the Final Business Case and the Broken Hill Long-Term Water Supply Preliminary Business Case (which was developed in 2015) were subject to the Infrastructure NSW

⁶ Broken Hill Long-Term Water Supply Solution, Summary of the Final Business Case, October 2017



Infrastructure Investor Assurance Framework (IIAF), which provides independent oversight of the State's infrastructure program.

2.2 Investment need and options analysis

The NSW Government's identified investment need was for a secure long-term water supply solution for Broken Hill and Silverton. At the time of the Final Business Case, the water supply solution needed to be operational by October 2018, six months prior to the then expectation of water sources from the short-term water strategy being exhausted.

A Preliminary Business Case identified 19 water supply solution options with the intention of shortlisting those that met the prescribed project objectives (about the long-term secure water supply) and an option's relative capability to provide value for money. The shortlisted options were subject to detailed analysis in the Final Business Case.

The shortlisted options were supported by several feasibility assessments, including water modelling, engineering design and detailed financial and economic analysis.

An economic appraisal, including Cost Benefit Ratio and Net Present Costs calculations, was undertaken. The preferred option that provided the greatest confidence about meeting the project objectives sustainably over the 30 years was the NSW River Murray Western Route Option (which became the WBH Pipeline).

2.3 Governance and project plan

Based on the evaluation of the shortlisted options, the Final Business Case's recommended procurement option for the preferred option was a D&C contract. It was intended that interested and capable private sector consortia would be provided information about the preferred option's requirements and preliminary engineering feasibility studies, with the objective of the private sector developing a detailed pipeline design and project delivery plan. This approach provided further opportunities for contestability for future operations and maintenance of the pipeline.

The procurement strategy embodied in the Final Business Case was informed by detailed options analysis that included a formal market sounding process with more than 10 private sector respondents. The preferred procurement option was to be revisited following final selection of the proponent to confirm that the evaluation and recommendation of a D&C contract model aligned with the proponent's business model.



The Final Business Case also proposed that the market engagement process be structured under a 'selective request for tender', which was intended to identify suitable prospective private engineering contractors through an 'Expression of Interest' (EOI) process, following which a 'Request for Tender' (RFT) would be issued to a shortlist of prospective engineering market contractors.

The preferred option's timeline adopted by the Final Business Case was based on project timelines at the time, which required a solution to be operational by October 2018. The timeline would be re-visited if significant inflow events occurred at the Menindee Lakes. The operational commencement date for the pipeline was subsequently changed to December 2018 in the Government's November 2016 Direction Notice.⁷

As will be seen in Chapter 3 of our report, the procurement process adopted by WaterNSW closely follows the Final Business Case procurement plan.

2.4 NSW Government's Direction Notices

The NSW Government's preferred option, the WBH Pipeline, was approved for funding in September 2016.

In November 2016, the Minister for Lands and Water made a Direction under s.20P of the *State Owned Corporations Act 1989* to arrange for the construction, operation and maintenance of a pipeline from the Murray River to Broken Hill along the Silver City Highway.⁸

The Final Business Case identified Essential Water as best positioned to own and operate the pipeline. However, further engagement and analysis highlighted insufficient capacity within the organisation to deliver the large-scale water project within the tight project timeline. In contrast, WaterNSW was identified as having a long history of delivering large scale water infrastructure projects on time and within budget.

Consequently, in accordance with the November 2016 Direction, WaterNSW undertook further work to develop the required design and delivery mechanisms, undertook engagement of stakeholders and the community, developed appropriate tender

⁷https://www.parliament.nsw.gov.au/lc/papers/DBAssets/tabledpaper/WebAttachments/70613/Direction%20Wate rNSW.pdf

<u>*https://www.parliament.nsw.gov.au/lc/papers/DBAssets/tabledpaper/WebAttachments/70613/Direction%20WaterNSW.pdf</u>



documentation and undertook the necessary environmental and cultural heritage studies to achieve the required environmental approvals.

In addition, IPART was directed under s.16A of the *Independent Pricing and Regulatory Tribunal Act 1992* to 'include an amount or factor in its methodology representing the efficient cost of complying with the Section 20P Directions.⁹'

The s.16A direction requires IPART to review the 'total efficient cost' of WaterNSW's compliance with s.20P, which includes costs beyond those associated with a typical regulatory review of a utility's opex and capex, including:

- using best endeavours to ensure the WBH Pipeline can supply a daily peak water demand of 37.4 ML;
- using best endeavours to have the WBH Pipeline operating by December 2018;
- substantially using Australian rolled steel for the WBH Pipeline (regardless of the place of manufacture of the pipe in Australia); and
- meeting the minimum targets set in the NSW Infrastructure Skills Legacy Program for the construction of the Pipeline, in consultation with the Department of Industry to the extent possible given the remote location of the project and with relevant targets negotiated through the tender process.

These requirements imposed on WaterNSW are pertinent to the design, construction and ultimately the operation of the WBH Pipeline and hence are directly relevant to our assessment of the prudency and efficiency of WaterNSW's expenditure. Specifically, our prudency and efficiency assessment is focussed on the prudency and efficiency of the decisions made by WaterNSW given its responsibility to deliver the WBH Pipeline project and having regard to the guidance provided by the Government Directions and Final Business Case.

The next chapter of our report assesses WaterNSW's procurement process for the WBH Pipeline.

https://www.ipart.nsw.gov.au/files/sharedassets/website/shared-files/pricing-reviews-water-services-ruralwater-prices-for-waternsw-murray-river-to-broken-hill-pipeline-services-from-1-july-2019/legislativerequirements-prices-for-waternsw-murray-river-to-broken-hill-pipeline-services-from-1-july-2019/section-16aletter-and-direction-the-construction-and-operation-of-the-broken-hill-pipeline-2018-19-april-2018.pdf



3 Assessment of WaterNSW's pipeline procurement process

The purpose of this chapter is to assess the prudency and efficiency of WaterNSW's decisions in relation to the procurement process it implemented for the WBH Pipeline including:

- use of the Design Construct Operate and Maintain (DCOM) procurement model;
- nature of tender process, including market testing, EOI, RFT, bid & evaluation phases, and associated competition implications;
- rationale for separate D&C and O&M contracts; and
- winning tender prices for D&C and O&M contracts.

3.1 IPART Issues Paper Questions

IPART's Issues Paper raised the following questions regarding the procurement process for the pipeline:¹⁰

12. How did the NSW Government's directions impact on WaterNSW's scoping, design and running of the procurement process for the Pipeline?

13. Is procuring the construction of the Pipeline through a design, build, operate and maintenance (DBOM) contract efficient?

14. Did WaterNSW's tender and procurement process for the construction and operation of the Pipeline maximise the potential for competition amongst bidders and ensure prudent and efficient decisions were made?

15. How should we assess the market's response to WaterNSW's request for tender for the construction and operation of the Pipeline and the efficacy of WaterNSW's procurement processes?

We have addressed these questions in our assessment.

3.2 Overview of WaterNSW's procurement process

WaterNSW conducted a procurement process of around 7 months to determine the contractor(s) who would build, operate and maintain the WBH Pipeline. It advised that

¹⁰ IPART (2018), Murray Review to Broken Hill Pipeline, WaterNSW, Issues Paper, September, pp 6-7



there was strict adherence to procurement timeframes given the overarching tight timeframe for pipeline construction, including need to comply with the Ministerial Direction.

Table 2 identifies the key procurement process milestones and dates over the 7 month period, which can be split into four key phases as follows.

- EOI process
- RFT process
- Tender evaluation process
- Contract finalisation.

Table 1 Procurement time line

Milestone	Date
Expression of Interest (EOI) process – 5 April to 28 A	oril 2017
EOI process commences	5 April 2017
EOI process closes	28 April 2017
Request for Tender (RFT) process – 8 June to 29 Aug	ust 2017
RFT process commences through issue of RFT to four shortlisted tenderers	8 June 2017
Briefing meeting with shortlisted tenderers	16 June 2017
Site inspections	22-23 June 2017
Interactive workshops	26 June – 17 August
Interim Tenderer submission of Project Documents ¹¹ departures	24 July 2017
WaterNSW's re-issue of Project Documents	4 August 2017
Closing date for Tenders	29 August 2017
Tender evaluation process – 24 August to 29 Septem	per 2017
Tenderer presentations to Evaluation Committee	4 September 2017
Evaluation Committee decides, based on price and non- price evaluation scores, to enter face-to-face meetings with the two highest ranked shortlisted tenderers	19 September 2017
Notification to four shortlisted tenderers of outcome of evaluation process	21 September 2017
Intensive negotiation period with two highest ranked tenderers	22-26 September 2017
Evaluation Committee recommends Preferred Tenderer (and Reserve Tenderer)	29 September 2017

¹¹ The Project Documents included a detailed Output Specification that set out WaterNSW's key requirements regarding the design and construction of the pipeline.



Milestone	Date
Contract finalisation – 3 October to 17 October 2017	
Clarification questions sent to remaining two shortlisted Tenderers to resolve key outstanding issues	9 October 2017
WaterNSW provides separate revised final drafts of the D&C contract, O&M contract and output specification to the two remaining shortlisted tenderers.	12 October 2017
Closing date for remaining two shortlisted tenderers' contract departures	16 October 2017
Evaluation Committee determines final recommendation for the Preferred Tenderer	17 October 2017
WaterNSW announces engagement of Preferred Tenderer	23 October 2017

On 23 October 2017, WaterNSW announced the John Holland MPC Group Joint Venture (JV) as the successful tenderer for the D&C Contract and the John Holland Trility Joint Venture as the successful tenderer for the O&M Contract.

Both WaterNSW's Pricing Proposal and IPART's Issues Paper provide further details on WaterNSW's procurement process.

3.3 Prudency and efficiency assessment of procurement process

We have assessed the effectiveness and efficiency of the procurement process undertaken by WaterNSW to engage the John Holland D&C and O&M JVs under the following headings:

- EOI process
- Design of the RFT
- Tender evaluation.

3.3.1 EOI process

WaterNSW has argued that the primary purpose of the EOI process was to maximise competition in the subsequent RFT stage of the project by ensuring that all tenderers had the necessary experience and capacity to undertake the project. WaterNSW provided a timeframe of 23 days for EOIs to be submitted.

Ten submissions were received in response to WaterNSW's EOI. The four proponents with the highest evaluation scores were shortlisted to take part in the RFT stage. Three were non-compliant with the EOI terms and conditions, leaving seven tenderers for



detailed evaluation. The four tender proponents with the highest evaluation scores were shortlisted to take part in the RFT stage.

We consider that the relatively large number of responses to the EOI is indicative of a high degree of industry awareness, following the NSW Government's Final Business Case process, such that WaterNSW provided the industry with sufficient advance notice of the project and raised awareness of the project, including key project details and timeframe.

The timeframe for provision of EOI submissions also appears to have been reasonable and facilitated EOI submissions. Further and more importantly, we consider the EOI process also attracted a sufficiently large number of high calibre tenderers to ensure a competitive bidding process for the pipeline project.

3.3.2 Design of the RFT

Choice of procurement model

Based on advice it received from Advisian, WaterNSW chose a DBOM procurement model for the delivery of the WBH Pipeline over its first 20 years, including risks associated with the design and construction and subsequent operations and maintenance stages of the WBH Pipeline's life. To this end, the tender was designed such that the D&C and O&M Contracts would ultimately be awarded to a single tenderer.

This was a fundamentally important decision in the construction of and future operation of the WBH Pipeline. Under the DBOM Model, WaterNSW has engaged the preferred tenderer to design and contract the pipeline for a fixed lump sum price and to subsequently operate and maintain the pipeline for a specific period (20 years maximum) at a fixed price. The preferred tender does not own the pipeline but is contractually licenced to operate and maintain it for a 20 year period. WaterNSW funded the construction of the pipeline.

This can be contrasted with a D&C procurement model, as envisaged in the NSW Government's Final Business Case, where the operations and maintenance component of the pipeline's life would not have formed part of the tender process.

Prudency and efficiency assessment



The DBOM model has been identified as a suitable procurement approach where:¹²

- the purchaser requires some control over the overall design but not the detailed design;
- the scope (including operational elements) is well-defined and relatively impervious to change; and
- whole-of-life efficiencies are a priority or advantage.

We consider that the WBH Pipeline meets these conditions, including the well-defined scope of work based on the Government Directions and WaterNSW's need for some control over the pipeline's design but not the detailed design. It was reasonable for WaterNSW to assume that the engineering construction market had the capability to develop a detailed design for the pipeline.

The following benefits have been identified for the DBOM Model:¹³

- single line of responsibility
- administrative efficiencies
- limited design liability
- certainty of price
- whole of life cost/quality
- operational risk mitigated.

We consider several of these potential benefits to have presented during the design and construction stages of the project, including certainty of construction and future operations and maintenance prices having regard to whole-of-life cost/quality. WaterNSW's contractual arrangements with the preferred tenderer has also delivered the benefit of a single line of responsibility which, on the available evidence, has facilitated the efficiency of the design and construction phase of the pipeline project. We discuss this efficiency issue in detail in Chapter 4 of our report.

Some potential disadvantages of the DBOM Model have been identified including:

• less direct control for the buyer regarding design and post-construction operations

¹² Major Projects Guidance for Local Government, Maddocks and Ernst and Young, p23

¹³ Ibid, p24



- premium built into tender price
- longer tender period
- costs overruns and delays
- reduced pool of tenders.

We do not consider that these potential disadvantages have presented in any significant way in the WBH Pipeline project. In particular, the relatively deep pool of shortlisted tenderers is likely to have removed any premium in the successful tender price. Available evidence to this point also indicates that cost overruns and delays have been minimised on the project. Project contingency is discussed in Chapter 4 of our report.

Tender specifications

WaterNSW provided a detailed Output Specification for the four shortlisted tenderers. However, it has an intent to facilitate competition from bidders in relation to the detailed design of the pipeline.

We consider WaterNSW's intent to encourage competition in the design and construction of the pipeline was prudent recognising that a single optimal design for the pipeline was not identifiable at the start of the procurement process. The tight overarching project timeline could also reasonably be expected to encourage innovation in design and construction from the Australian engineering construction market.

The RFT required shortlisted tenderers to complete a detailed pricing pro-forma including:

- A breakdown of the design and construction cost of the project into pre-defined components.
- Details of design and construction components purchased in a foreign currency and the exchange rates.
- A detailed breakdown of all items comprising the operations and maintenance cost and the flexibility to adjust operating scenarios (e.g. water demand) to test the impact of the scenarios on cost.
- A detailed breakdown of asset replacement costs to be incurred over the life of the project.

Prudency and efficiency assessment



Based on discussions with WaterNSW and our review of the Request for Tender Evaluation Report, we consider its objective to facilitate competition in design and construction of the pipeline having regard to its output specification to have been successful. Similarly, the detailed pricing pro-forma requirements were prudent recognising the very long expected life of the WBH Pipeline and WaterNSW's intention to take control of it after 20 years.

3.3.3 Tender evaluation process

Tender evaluation criteria

WaterNSW conducted a detailed review of the four shortlisted tenderers based on several weighted price and non-price evaluation criteria as follows:

- non-price criteria design, delivery, operations and commercial solution received an aggregate 40% weighting; and
- price received a 60% weighting.

The financial capability of bidders was a pass/fail criterion.

Table 2 presents the assessment criteria and how each was interpreted by WaterNSW.

Criterion	WaterNSW's interpretation of criterion	Weighting
Design	Evaluate need for design to provide a reliable supply to Broken Hill and provide an efficient and cost effective whole-of-life solution including: maintaining asset life through material selection and other design factors having regard to harsh local environment.	15%
Delivery	Evaluate extent to which tender has developed appropriate planning, design and construction management for the project including: capability, capacity and experience of the tenderer; tenders' approach to supporting achievement of required approvals; ensuring certainty of delivery in line with required timeframes; and benefits to local region and broader NSW community.	10%
Operations	Evaluate extent to which tenderer meets operational requirements of the pipeline including approach to: maintain reliable supply; manage water quality risk; maintain asset life and handover requirements; and optimise operational costs through continuous improvements.	10%
Commercial solution	Evaluate extent to which relationship between D&C and O&M entities ensures WaterNSW has a continuing single point of responsibility across both deliver and operational phases of the pipeline project. Assess the nature and extent of proposed departures from draft Project Documents with due consideration to risk allocation between WaterNSW and the tenderer and degree of contract execution risk including risk of delay in achieving contract close.	5%
Financial Capacity	Evaluate tender's financial capacity to deliver the project in its entirety including financial strength and capacity of the tenderer and any parent guarantor to fulfil and bear risk associated with contractual obligations.	Pass/Fail

Table 2 Evaluation criteria



Criterion	WaterNSW's interpretation of criterion	Weighting
Price	Evaluate whole-of-life risk-adjusted cost to WaterNSW including: assessment of price under alternative scenarios and sensitivities; appropriateness of assumptions underpinning price; level of assumed efficient gains over contract term.	60%

Prudency and efficiency assessment

We consider that WaterNSW's selected evaluation criteria are comprehensive in capturing price and non-price variables that are relevant to the WBH Pipeline's D&C and O&M project phases. The practical effect of incorporating non-price criteria in the tender evaluation is that rather than automatically accepting the lowest priced bid, the evaluation process should, in principle, identify the tenderer that provides the most efficient long-term solution for water supply to the Broken Hill region.

The respective weightings of the criteria also appear prudent with price most heavily weighted at 60%, with the D&C phase of the project (design and delivery criteria) receiving a 25% weighting and O&M phase (operations and commercial solution criteria) receiving a 15% weighting. The pass/fail basis of the financial capacity criterion is clearly prudent, with any material concerns about financial capacity to undertake the project justifying a fail assessment.

There are clearly inter-relationships between the price and non-price criteria. The most important inter-relationships between the evaluation criteria are likely to relate to design and price, as well as operations and price. This is primarily because pipeline design will be a primary driver of the tender price, as will the operational commitments that the tenderer makes once the pipeline has been constructed. Hence, there is the potential for poorer design and/or weaker operational commitments to drive down the tender price. Similarly, a gold-plated design and/or strong operational commitments will tend to push up the tender price.

Overall, we think WaterNSW's respective weightings applied to price and non-price criteria was prudent and could reasonably be expected to deliver an efficient procurement outcome.

Tender evaluation committee

WaterNSW established an Evaluation Committee to undertake detailed evaluations of tenders and make recommendations to the WaterNSW Executive, including on a preferred tenderer. Evaluation Sub-Panels were also established to evaluate the specific non-price and price criteria.



We have considered WaterNSW's Request for Tender Evaluation Plan and consider that it establishes a detailed and robust evaluation process, including:

- project objectives
- evaluation principles
- evaluation team responsibilities
- probity and other procedural requirements
- seven step evaluation process, including individual and consensus evaluation steps and basis of recommendation of the preferred tenderer.

Based on available evidence, we consider that WaterNSW adhered to its evaluation plan.

Tender evaluation assessment

Our review of the final Request for Tender Evaluation Report indicates that WaterNSW undertook a two stage evaluation process in accordance with the Request For Tender Evaluation Plan.

The first stage entailed a general confirmation and completion assessment of the shortlisted tenderers' returnable schedules. Several alternative tenders and options were proposed. However, the Evaluation Committee decided not to subject any of them to detailed evaluation primarily because in its view none of the alternatives would deliver improved outcomes relative to the specified project objectives.

The second stage entailed a detailed evaluation of the shortlisted tenders. WaterNSW indicated that the objective of the detailed evaluation was to recommend the tenderer that offers WaterNSW the best value for money having regard to whole-of-life costs.

Prudency and efficiency assessment

We have reviewed the Evaluation Committee's evaluation scores and associated rationale for the four shortlisted tenderers against each of the non-price and price criteria. We consider the Committee's recommendation regarding the preferred tenderer was prudent having regard to the evaluation scores and associated rationales.

WaterNSW also decided to retain a reserve tenderer that would be engaged to the extent any issues were to arise to prevent or materially delay reaching contract close with the preferred tenderer. WaterNSW advised the final two tenderers were not made aware of their status as preferred or reserve tenderer entering into the contract finalisation stage.



We consider this decision and approach to have been prudent given the compressed project timeframe.

Contract finalisation stage

The second stage commenced on 12 October 2017, when WaterNSW provided separate revised final drafts of the D&C Contract, O&M Contract and Output Specification to the two final shortlisted tenderers. These contracts included the relevant tenderers requested departures to the extent they were acceptable to WaterNSW. The Output Specification was based on the original RFT with amendments to incorporate elements of the relevant tenderers' technical solution that were deemed to be of key importance to WaterNSW.

WaterNSW required that the tenderers advise by 13 October 2017 that they accepted the D&C Contract, O&M Contract and Output Specification as drafted or, if not, provide detailed departures. All departures were provided by 16 October 2017 and the evaluation committee then revised the evaluation scores.

Prudency and efficiency assessment

We have reviewed WaterNSW's summary of the contract finalisation stage in its Request for Tender Evaluation Report and consider that the nature of its final contractual negotiations and decision-making regarding choice of preferred tenderer were prudent.

We have considered as highly relevant the tight overarching project timeline for the WBH Pipeline project, as determined by the Government Directions, in forming our prudency opinion.

3.3.4 Tender evaluation outcome

The John Holland Pty Ltd Joint Venture with MPC Group Pty Ltd t/as John Holland MPC Group Joint Venture for the D&C Contract and Trility Pty Ltd t/as John Holland Trility Joint Venture for the O&M Contract was WaterNSW's preferred contractor based on its revised evaluation scores following the contract finalisation stage.

The key outcomes of the tender evaluation process are fixed price D&C and O&M Contracts. WaterNSW has advised that the final contractual documents reflect minimal departures from its requirements, including appropriate risk allocation.



Prudency and efficiency assessment

Based on the materials we have reviewed about WaterNSW's tender evaluation process, which have been summarised above, we have sufficient confidence that the tender evaluation outcome is an efficient one.

3.4 Regulatory precedent regarding reliance on competitive tender outcomes

The standard approach to recovery of capex by a regulated business is for the entity to submit to the economic regulator a forecast of its capex for the next regulatory period. The economic regulator will then assess the prudency and efficiency of the forecast capex, with the approved forecast capex included in the regulated asset base (RAB) for pricing purposes. At the completion of the regulatory period, the RAB is generally rolled forward by including only incurred (not forecast) capex, which may also be subject to an ex post capex efficiency review.

In contrast, there is precedent under Australian regulatory frameworks for economic regulators to deem capex to be prudent and efficient on the basis that it was procured through a well-designed competitive tender process, such that the above standard prudency and efficiency tests of forecast capex are not applied.

We consider this regulatory precedent to be important in the context of the WBH Pipeline given most of the costs associated with its design and construction, as well as future operations and maintenance, have been driven by the outcomes of competitive tender processes administered by WaterNSW that we consider to have been well-designed and executed having regard to good procurement practice. Three examples of this precedent in relation to gas pipelines, port and rail infrastructure are summarised below. The legitimacy of relying on the contestability of procurement for projects to inform the assessment of the efficiency of construction outcomes, has also been recognised by other Australian economic regulators, including the Australian Energy Regulator (AER) and the Queensland Competition Authority (QCA).

3.4.1 National Gas Rules – Part 5 – Competitive Tendering¹⁴

Under the national gas regulatory framework, specific rules apply for gas pipelines that are constructed by means of a tender process and are approved as being a competitive tender pipeline (CTP).

¹⁴ https://www.aemc.gov.au/sites/default/files/2018-09/NGR%20-%20v40%20-%20Part%205.PDF


Under rule 21(1) of Part 5, a person may apply to the AER for approval of a proposed tender process as a competitive tender process if:

(a) the tender is for the provision of pipeline services to or from a specific locality; and

(b) the tender envisages the construction and operation of a new pipeline by the person who submits the successful tender.

The AER must approve any proposed tender process as a competitive tender process if the following requirements are met (rule 22(3)):

- (a) the tender process must be for the provision of pipeline services of the kind described in the application for the tender approval decision; and
- (b) the tender process must be an appropriate mechanism for determining terms and conditions of access having regard to: (i) the national gas objective; and (ii) the requirements of procedural fairness, probity and fair dealing; and
- (c) the specifications contained in the request for tender: (i) must not limit the kind of pipeline services to which access may be sought; and (ii) must not impose conditions or requirements that the AER considers would, or would be likely to, prevent or discourage the submission of any tender that is consistent with the selection criteria; and
- (d) the selection criteria must require the exclusion of a tender from consideration if it does not contain any of the following essential elements for inclusion in a tender:
 - (i) a description of the proposed pipeline; and
 - (ii) a description of the services to be offered; and
 - (iii) the proposed reference services and, for each reference service, the terms and conditions of access, including the proposed reference tariff; and
 - (iv) if the proposed pipeline is a transmission pipeline the proposed queuing requirements; and
 - (v) the proposed extension and expansion requirements; and
 - (vi) the proposed expiry date of the CTP access arrangement (which must fall no more than 15 years from the commissioning of the pipeline).

NSW Central Ranges Pipeline

Central Ranges Pipeline Pty Ltd lodged a proposed access arrangement with the Australian Competition and Consumer Commission (ACCC)/IPART on 23 August



2005, which was approved on 7 December 2005.¹⁵ The arrangement is valid until 1 July 2019.¹⁶

A tender approval request for the transmission component of supply was approved by the ACCC and a request for the distribution component of supply was approved by IPART.

Under sections 1.21 and 3.34 of the then National Gas Code, the pipeline became a covered (regulated) pipeline on 19 May 2014.

As a result of the use of an approved competitive tender process for the pipeline, under section 3.34 of the Code, the tender outcomes regarding costs and prices will not be subject to a regulatory assessment until the revisions commencement date of 1 July 2019 i.e. the competitive tender process was assessed to be prudent and efficient and therefore resulted in tender outcomes that were deemed prudent and efficient without the need for a typical regulatory expenditure review.

3.4.2 Dalrymple Bay Coal Terminal 7X Expansion – QCA Final Decision¹⁷

In January 2006, the QCA approved the DBCT access undertaking, which included a capacity expansion approval process.

Under this approval process, DBCT Management did not submit a forecast capital expenditure program for the relevant regulatory period. Rather, it sought to expand the terminal as and when required and on the basis of the capacity expansion triggers in the Port Services Agreement (the lease agreement with Government for DBCT).

Further, the approved 2006 Access Undertaking provided for the QCA to assess capacity expansion expenditure on an ongoing basis, as the expansions were triggered, rather than once the capital works were completed, subject to DBCT following good procurement practice in managing construction of each capacity expansion. A critical component of the good procurement practice related to ensuring that work packages were structured so as to be contestable.

¹⁵ The AER had not been established in 2005, with the ACCC being responsible for the economic regulation of gas transmission pipelines and IPART for gas distribution networks.

¹⁶ <u>https://www.aer.gov.au/system/files/Final%20Decision.pdf</u>

¹⁷ <u>http://www.qca.org.au/getattachment/1e3051ac-748d-43b9-a07c-601188601dd2/DBCT-2006-Draft-Access-Undertaking.aspx</u>



To this end, a provision was made for regulatory pre-approval of a tender contract management process (TCMP) for capacity expansion works. Provided that the associated tenders were managed and resulting contracts awarded in accordance with the pre-approved TCMP, the QCA committed to incorporate the awarded contract values into the RAB, without an ex post review of the prudency and efficiency of the capex.^{18 19}

In recognition that costs may change after a contract has been awarded, the approved Access Undertaking also provided for the QCA to consider the reasonableness of any contract variations/escalations. DBCT Management was also required to appoint, subject to QCA approval, an independent external auditor to certify that it has complied with the tender process, including in regard to any contract variations/escalations.

The QCA processes for DBCT highlight the extent to which the QCA has been content to rely on robustly contestable procurement processes for informing the assessment of the efficiency of construction projects.

QCA's Final decision on Aurizon Network's 2016-17 capex claim²⁰

In accordance with Schedule E of the 2016 access undertaking, the QCA approved Aurizon Network's 2016-17 capital expenditure claim, valued at \$240,415,754 for inclusion in the RAB. The decision was informed and supported by an independent engineering report from AECOM, which concluded that:

Works that had been competitively tendered have been assessed as prudent because the tender process is assumed to have provided the optimal value for money at that time.²¹

3.5 Summary of our prudency and efficiency assessment

WaterNSW conducted a detailed and robust tender process for the WBH Pipeline within an overarching compressed timeframe for pipeline construction and commissioning.

¹⁸ In addition to the TCMP, any capacity expansions were also required to be consistent with the current Master Plan and applicable laws; a defined trigger for the proposed works (including firm contractual capacity commitments); and standards/specifications of the expansion to not involve any unnecessary works.

¹⁹ <u>http://www.qca.org.au/getattachment/979fa96f-5da0-4532-a812-b6d5193961ab/DBCT-Management-DBCT-Access-Undertaking.aspx</u>

²⁰ <u>http://www.qca.org.au/getattachment/588b7971-7935-432c-b84d-0cd72f6c9c58/QCA%E2%80%94Decision-Notice-on-Aurizon-Network%E2%80%99s-2016%E2%80%9317-C.aspx</u>

²¹ <u>http://www.qca.org.au/getattachment/6a10a3d5-22e8-4a16-a56c-1b56527d68a9/AECOM-Review-of-Aurizon-Network-s-FY17-Capital-E.aspx</u>



This tender process closely followed that set out in the NSW Government's Final Business Case.

We have assessed the prudency and efficiency of the way in which WaterNSW managed the procurement process, which is critical to the D&C and O&M Contracts that are the primary outcomes of the process and that will drive the initial RAB value of the WBH Pipeline and a significant component of its ongoing capital and operating costs.

We consider that WaterNSW's procurement process was prudent and efficient and that the prices revealed in the D&C and O&M Contracts reliably reflect a competitive market outcome. Our findings are consistent with relevant Australian regulatory precedent regarding reliance on the outcomes of competitive tendering processes.



4 Assessment of WaterNSW's WBH Pipeline design solution

The purpose of this chapter is to assess the prudency and efficiency of the WBH Pipeline design arising from the DBOM procurement process discussed in Chapter 3 of our report.

Key issues that we address in this chapter are:

- Efficiency of design, including WaterNSW's guidance to tenderers
- Efficiency of the John Holland JV D&C and O&M tender solutions
- Efficiency of construction process
- Impact of Government Directions on design solution
- Key D&C Contract terms

4.1 IPART Issues Paper questions

IPART raised questions regarding the prudency and efficiency of WaterNSW's WBH Pipeline design having regard to the NSW Government directions as follows:

Q11. How should we assess the prudency and efficiency of WaterNSW's decisions on capital expenditure in light of the NSW Government's directions regarding the Pipeline?

Q16. Is the final design solution of the Pipeline optimal? Are there other factors we should take into account?

We address these questions in the remaining sections of this chapter.

4.2 Overview of the WBH Pipeline capital works

As previously noted, WaterNSW has awarded a D&C Contract to the John Holland/MPC Group Joint Venture. The scope of the physical works being constructed is summarised in Table 3.

Component	Description
Intake	Screened intake to abstract water from the Murray River at Wentworth
Pipeline	An initial 8.75 km of polyethylene pipe between the screened intake and TPS1, followed by a mild steel cement

Table 3Key physical pipeline assets



Component	Description
	lined rubber ring jointed pipeline to convey the low salinity water from TPS1 for a distance of 241km to Bulk Water Storage facility adjacent to Broken Hill.
Pump Stations	Three transfer pump stations to convey the water via the pipeline from the Murray River to the Bulk Water Storage facility.
Bulk Water Storage facility	A lined earthwork Bulk Water Storage facility to provide the function of balancing flows that are pumped from the Murray River, prior to further pumping that ultimately delivers low salinity raw water to the Mica Street Water Treatment Plant in Broken Hill.
Offtakes	The WBH Pipeline also includes offtakes which are specific locations along the pipeline where water will be supplied to customers using dedicated assets offtake assets.

Source: WaterNSW

WaterNSW prepared an Output Specification which was included as part of the RFT documentation provided to shortlisted tenderers. The Output Specification detailed specific requirements that had to be adopted for the design and construction of the WBH Pipeline and was written in such a way that shortlisted tenderers had the flexibility to consider options and develop what they considered to be the most cost-effective solution.

The Output Specification included a table of water demands that the system is required to supply, as set out in Table 4.

Demand	Volume	Description/Definition
Peak Season (December – March) Peak Flow	3,708ML for the peak season	The maximum volume that Essential Water will extract from the Broken Hill Delivery Point over the peak season
Peak Day Demand	37.4ML per day	The maximum volume of water that Essential Water will extract from the Broken Hill Delivery Point over any Day
Peak Week Demand	226.4ML per week	The maximum volume of water that Essential Water will extract from the Broken Hill delivery Point over any week
Peak Month Demand	927.4ML per month	The maximum volume of water that Essential Water will extract from the Broken Hill delivery Point over any month
Peak Annual Demand	7,586.6ML per Year	The maximum volume of water that Essential Water will extract from the Broken Hill delivery Point over any year
Minimum Demand	56.0ML per Week (based on an average of 8.0ML per Day)	The minimum volume of water that Essential Water must extract from the Broken Hill Delivery Point over any week (excluding during a shutdown or Force Majeure Event). The minimum

Table 4 Key requirements of WaterNSW's Output Specification



Demand	Volume	Description/Definition
		demand will be delivered at the minimum flow rate

Note: WaterNSW and Essential Water have yet to agree contractual supply/demand arrangements for the pipeline. Therefore, the references to 'will' and 'must' in the right hand column of the table should be seen in that context. Source: WaterNSW

The derivation of the demands was prepared by a specialist consultant and used historical consumption data that was provided by Essential Water.

A more detailed description of the main components of the system is provided below:

4.2.1 Intake point of WBH Pipeline

The river intake and associated River Pump Station has the following features:

- Screens to minimise entry of debris and also including a compressed air system to backwash and clean the screens
- Pipelines to convey flow to a submersible pump station
- A wet well submersible pump station

4.2.2 WBH Pipeline characteristics

The pipeline comprises the following:

- 630mm OD HDPE pipeline from the RPS Transfer Pump Station 1 at CH8.75km
- 762mm OD MSCL (mild steel cement lined) pipeline from Transfer Pump Station 1 to the Bulk Water Storage facility located at CH249km. The flanged connection located immediately downstream of the flowmeter on the Bulk Water Storage outlet is the defined Broken Hill Delivery point.

4.2.3 Pumping Stations

The pumping and pipeline system uses three pump stations to deliver low salinity raw water to the Bulk Storage facility. The River Pump Station is located at the Murray River Intake as detailed above, and two transfer pump stations are located at the following distances along the pipeline:

- Transfer Pump Station 1 at CH8.75km
- Transfer Pump Station 3 at CH228km



Note that the original design concept as detailed in the RFT documents included a Transfer Pump Station 2 at CH101.25km. However, this pump station was found not to be required and was omitted form the scope of work. The background to this decision is described in more detail below in this report.

4.2.4 Bulk Water Storage Facility

The Bulk Water Storage facility comprises two uncovered cells with a combined capacity of 720ML. The total volume is made up of:

- a 552ML balancing storage to balance peak season inflow and demands and allow for dead storage and evaporation losses
- a 168ML reserve storage to provide emergency volume (3 days of Peak Day Demand, 112.3ML) and volume sufficient to manage supply system outages (1.5 days of Peak Day Demand, 56ML).

Each cell will have an inflow and outflow pipe so that they can be operated independently, as well as cross connections to enable flow between them. The cells are also able to be isolated from the main pipeline which enables the Bulk Water Storage facility to be bypassed. The general arrangement of the Bulk Storage facility is as shown below:



4.2.5 Customer offtakes from WBH Pipeline

Three 100mm diameter offtakes are being incorporated into the system to enable a supply of water to be provided to customers along the pipeline route. Initially, three offtakes will be constructed to provide supply to four customers as part of water supply agreements negotiated with WaterNSW during the construction phase of the project.



Once the pipeline is operational, the O&M Contract allows for additional offtakes to be constructed.

Each offtake will include a strainer, an actuated open/closed value, a pressure reduction valve to limit pressure in the offtake pipeline and a flow restriction device to limit flow to each offtake to 1ML per day. A flow meter will measure instantaneous and totalised flow, and isolation valves will be included to allow access for maintenance. In addition, backflow prevention is included to prevent water from the offtake entering the supply pipeline.

The flow meter and actuated valve will be connected to the control system via telemetry to enable measurements and records of the flow supplied through each offtake, operational control of the actuated valves and sending instrument and control signals to the SCADA system. Controls and instrumentation will be powered via small scale solar connections.

4.3 Prudency and efficiency assessment of the WBH Pipeline design

The following sections step through the key design features of the WBH Pipeline to assess their prudency and efficiency having regard to the NSW Minister's Directions.

4.3.1 Intake for WBH Pipeline

Options for types of intake were identified as part of the concept design that was completed prior to the issue of the RFT. Options were subject to a multi-criteria assessment (MCA) analysis and a preference was identified.

The requirement for low salinity water in the Minister's direction meant that the offtake needed to be in the Murray River. Two suitable options for locations of Murray River offtake were identified and then assessed as part of the concept design that was completed prior to the issue of the RFT.

The solution adopted by the contractor was to retain the intake in the same location as detailed in the original concept that was detailed in the RFT documents. The primary reason for this decision was that to shift the location of the intake would require additional land purchase and additional approvals, and the time taken to obtain these would have put the overall completion date at significant risk.



Prudency and efficiency assessment

The river intake is a necessary component of the scheme. The Ministerial Directive required water to be abstracted from the Murray River and pumped to Broken Hill. We consider leaving final selection of type of intake to the contractor to be a prudent and efficient process.

The John Holland JV's design solution is prudent and efficient.

4.3.2 Bulk water storage facility location

In the planning phase of the project a number of sites were considered for the bulk water storage facility as a long list of options. A multi criteria analysis assessment narrowed the options down to a shortlist for further analysis.

The site selected is located approximately 15km south of Broken Hill and was an outcome of the site selection process. As part of the tender design the contractor had the option to configure the storage basin to account for natural topography and the specific volume and operational requirements.

Prudency and efficiency assessment

The bulk water storage facility is an essential feature of the scheme. The contractor had the ability during the tender phase of the project to optimise the design in order arrive at a cost effective outcome.

The John Holland JV's design solution is prudent and efficient.

4.3.3 Pipeline and bulk water storage sizing

The optimum pipeline and Bulk Water Storage configuration for system from the Murray River intake to the Bulk Water Storage facility was selected to provide the lowest whole-of-life cycle cost outcome. During the tender design phase of the project the supply pipeline diameter and Bulk Water Storage capacity combined with location of the transfer pumping stations were optimised to achieve a system with lowest life cycle cost.



Options analysis

Several options were investigated including different pipe material, diameters, number of transfer pump stations, and bulk water storage volumes. These options were shortlisted to 2 configurations which were:

- Configuration 1: Supply pipeline capacity of 37.4ML/day with 200ML Bulk Water Storage at CH249, with 200ML being assessed as the minimum volume required to meet specific operational requirements
- Configuration 2: Supply pipeline capacity of 27ML/day with 720ML Bulk Water Storage at CH249. The 720ML capacity includes 200ML (minimum volume) plus an additional 520ML of storage to enable flow balancing between 27ML/d inflow and peak season demands up to 37.4ML/d Peak Day Demand

Both configurations include allowance for makeup of evaporation losses from an open Bulk Water Storage. It was considered that a 600ML storage would satisfy the water balance for Configuration 2, but at this capacity the Bulk Water Storage facility would need to be fully covered. The cost of increasing the size of the storage to account for evaporative losses was considerably more favourable than procuring, installing and maintaining a covered bulk storage system.

The selection of the optimum system configuration (for Separable Portion 1) involved assessment of each configuration as follows:

- Hydraulic analysis to determine the operating pressure based on each pipe size
- The optimal number of Transfer Pump Stations in the same locations identified in the Request for Tender (RFT)
- Estimating the capital cost of pipelines, pump stations, balancing tanks, Bulk Water Storage and power supply
- The volume/size of the Bulk Water Storage considering the relative impacts of evaporation, algae management, available area, geotechnical issues for each option
- Estimating the major operating cost of power electricity consumption for each configuration
- The availability and timing consideration of the nearest power source
- Net Present Value (NPV) analysis of capital and operating costs to determine the lowest 'Whole of life' cost in today's dollars.



The trade-off between a smaller diameter pipe with a lower capital cost but higher operating costs (pumping power), compared to a larger diameter pipe with a higher capital cost and lower operating cost, demonstrated that the smaller diameter pipeline upstream of the Bulk Water Storage combined with the 720ML Bulk Water Storage had the lowest capital and whole of life costs. Hence Configuration 2 was adopted as the preferred pipeline and Bulk Water Storage configuration.

Following confirmation of the preferred configuration for the pipeline and Bulk Water Storage, an optimisation was carried out to determine the supply pipeline diameter. This assessment considered the following options for the MSCL supply pipeline diameter for the 220km from Transfer Pump Station 1 to Transfer Pump Station 3:

- MSCL OD 914 PN35
- MSCL OD 813 PN35
- MSCL OD 762 PN35
- MSCL OD 711 PN35.

A spreadsheet based on the hydraulic model for the preferred configuration was used to confirm that the pipeline operating pressure for the different pipe sizes would not exceed the 3.5MPa (PN35) pipe pressure rating. This was on the basis that the operating pressure would need to be limited to the PN35 rating of readily available pipeline valves, flanges and fittings. Higher rated fittings would be "specials" and could materially impact cost and project delivery.

Based on this pressure limit, the number and location of pumping stations were checked. This confirmed that TPS2 (CH101.25) could be designed out, resulting in significant cost savings that would be required to construct an additional pump station and connect the associated power supply infrastructure at this location.

In the optimisation process of the preferred option, the NPV of capital and operating costs for the range of acceptable pipeline diameters and associated pumping stations, Bulk Water Storage and balancing tanks were estimated and compared. Based on the analysis, it was found that Configuration 2, that is OD711 MSCL PN35 pipe with 720ML BWS, offered the lowest life cycle cost of all options. However, subsequent detailed discussions with the pipe supplier revealed that OD762 is the more efficient pipe diameter to manufacture and deliver, and in addition the expected savings for an OD711 pipeline were significantly less than anticipated.

As a result, OD762 MSCL PN 35 pipe was selected as preferred on the following basis:



- an OD711 pipeline could not be constructed within the required timeline using predominantly Australian rolled steel, which was the primary reason for the decision to use OD762 diameter pipe;
- a predominately OD711 pipeline would require an additional pump station and an extra 26km of electrical transmission line;
- the concept design using a predominately OD711 pipeline was less robust than the one using OD762 pipeline, and the risk of needing system changes during the detailed design was considerably less than that of a 711 pipeline.

For the 21km section from Transfer Pump Station 3 to the Bulk Water Storage facility, a 559 diameter pipeline was selected and included in the accepted tender. It was thought that the smaller pipeline could be used for this section due to the relatively short distance and manageable static lift (height difference).

However, following contract award and further design work, it was considered that the design could be further optimised by increasing the diameter of this section to OD762. Although, this change increased the capital cost by 1.4M, an NPV analysis over 20 years showed the reduction in power costs more than compensated for the increase.

Pipeline Material

The RFT documents included the requirement that the pipeline was to be substantially made from Australian rolled steel as per the Ministerial Direction.

This contractor's accepted tender included the use of PE (polyethylene) pipe for the first 8.75km to Transfer Pump Station 1. This selection was on the basis that the ground conditions and the construction of a number of river crossings (by Horizontal Directional Drilling or similar method) favoured the use of polyethylene pipe. The remainder of the pipeline was to be constructed from mild steel cement lined (MSCL) pipe. This configuration of pipe materials complied with the Ministerial Direction.

Prudency and efficiency assessment

The Bulk Water Storage facility is an essential requirement of the pipeline build and also required in order to comply with the Government Directions.

The Output Specification that was provided to shortlisted tenderers defined performance outcomes. This enabled tenderers the freedom to assess multiple options as part of ultimately arriving at their preferred pipeline and Bulk Water Storage configuration. Based on our review of the documentation provided, it is clear that



significant optimisation was carried out in order to determine John Holland JV's preferred arrangement.

The John Holland JV's design solution is considered to be prudent and efficient.

4.3.4 Transfer Pump Stations

The original concept design included four pump stations (for Separable Portion 1) as follows:

- River (intake) Pump Station (RPS)
- Transfer Pump Station 1 (TPS1) at CH 8.75km (at the potential conditioning plant)
- Transfer Pump Station 2 (TPS2) at CH 101.25km
- Transfer Pump Station 3 (TPS3) at CH 228km

As detailed above, during the optimisation assessment to determine the pipeline diameter and Bulk Storage capacity, it was concluded that the Transfer Pump Station 2 could be eliminated, resulting in a considerable project saving.

Site selection was a process commenced by NSW Public Works, prior to WaterNSW having responsibility for delivery of the project. NSW Public Works selected four initial sites along the route. Then in July 2017, during the tender process, the tenderers were asked to nominate their preferred locations for pump stations. These were then rationalised by WaterNSW, taking into account comments from Wentworth and Broken Hill Councils and to ensure ongoing competitive innovation from the tenderers. Noting the REF requirements, this resulted in one additional location being added to the original four.

Surveys of these five locations commenced on 29 August 2017 and the Review Environmental Factors under the Environmental Planning and Assessment Act 1979 (NSW) was determined on 25 October 2017. The contractor required four of the five sites, and the final approvals for those four sites were received in December 2017.

Prudency and efficiency assessment

The need for the River Pump Station and Transfer Pump Stations is a clear requirement of the project. It is noted that in the planning phase, i.e. prior to the issuing of the RFT to shortlisted tenderers, that the concept design available at that time included four pump stations to deliver water to the Bulk Water Storage facility.



During the optimisation of the pipeline and Bulk Water Storage configuration (as described above) the contractor was able to eliminate a transfer pump station (i.e. Transfer Pump Station 2 in the concept design) resulting in considerable cost savings, including the cost of providing power to the original transfer Pump Station 2 site.

There was no assessment made regarding the option of changing the locations of the transfer pump stations since a change in location would have required new approvals to be obtained. The need to obtain new approvals would have put the compressed time for project completion at considerable risk.

The John Holland JV's design solution is prudent and efficient.

4.3.5 Water quality

The tenderer's design enabled elimination of the potential water conditioning plant. Sedimentation and biofilm build-up are to be managed by more frequent pigging of the pipeline (pigging points have been incorporated) as necessary based on monitoring of the pipeline. Instead of chemically treating the water to reduce leaching of cement lining, a protective seal coating (bitumen paint to AS3750.4) has been used. This coating is applied during the manufacture of the pipeline. Burying most of the pipeline will also assist maintain water quality.

Prudency and efficiency assessment

The need to consider water quality is an essential requirement of the project. The Government Direction requires that low salinity raw water is pumped to Broken Hill. The time taken for the water to reach the Bulk Water Storage facility is 3.5 days and during this time there are potential adverse water quality impacts.

During the tender period the contractor investigated options for addressing water quality and provided detailed commentary as part of its tender. A key aspect of this assessment was the decision to apply a seal coat to the internal lining of the pipeline to prevent leaching of the cement lining and this was a factor in the contractor's decision not to incorporate a water conditioning plant (which was identified as a potential requirement in the concept design) into the final solution. The decision not to include the conditioning plant is a cost saving for the project.

The John Holland JV's design solution is prudent and efficient.



4.3.6 Customer offtakes

RM Consulting Group (RMCG) was engaged by WaterNSW to advise on the extent to which the provision of the new piped water supply, as well as servicing Broken Hill, could also provide opportunities to promote commercial activity along the length of the pipeline.

Engagement with potential offtake customers commenced in May 2017 when RMCG met with landholders at Coombah Station as part of a project to determine what additional customers were potentially available to connect to the pipeline. In July 2017, landholders were contacted by phone to gauge interest in having access to an offtake and the information gathered was fed into the tender process. By this stage, 14 potential offtake customers were identified.

In December 2017, a teleconference was held with eight of the potential offtake customers to explain the general approach to determining prices through an IPART pricing determination and to discuss potential locations of the offtakes. Landholders were then surveyed on their potential uses of the pipeline.

Following WaterNSW's analysis of pricing options, in late April 2018, a meeting was held to discuss a range of pricing approaches with eight of the potential customers. WaterNSW presented a Capacity to Pay (CTP) analysis and associated proposed offtake prices. Customer feedback was that the prices presented were too high and beyond customers' CTP.

Ownership arrangements for the pipeline and offtake assets were also discussed with potential customers.

In early May 2018, a survey was provided to all 14 potential customers to determine how many would be willing to commit to the offtakes at a maximum price of \$14,000 per annum (which included 10ML of water delivery), less than that presented in the CTP analysis.

This resulted in four customers confirming interest in the pipeline using three offtakes. One offtake customer will receive access to an offtake close to the bulk water storage facility as part of the agreement with WaterNSW to purchase land from that offtake customer to locate the storage facility. To accommodate these customers, offtakes will be constructed at three locations.

WaterNSW and three offtake customers (excluding the customer who will receive access as part of the land acquisition deal) entered into a Letter of Intent with respect to the



construction of the offtakes at two locations. The main features of the Letter of Intent include:

- the letter will only bind the offtake customers if IPART determines a price of less than \$14,000 (per offtake outlet) in real terms per annum inclusive of 10ML per annum of water delivery for the 2019 to 2023 period;
- the parties will enter into a formal water supply agreement to enable provision of water after commissioning; and
- use of the WBH Pipeline will be prioritised to service the Broken Hill township.

Prudency and efficiency assessment

The scenario to provide water to customers outside of Broken Hill is not a mandatory requirement of the WBH Pipeline scheme.

However, in the context of providing an incremental service to the broader community near the pipeline's route, the inclusion of the offtakes has merit. This is providing there is no detrimental effect on the supply to Broken Hill. However, this potential risk has been addressed in the development of the criteria for the offtakes and, in particular, the offtake agreements will specify that the use of the pipeline will be prioritised to service the Broken Hill township.

The process for implementation of the offtakes went through an engagement process with the community and then with a shortlist of parties who had expressed interest. The outcome of this process has been the development of an offtake arrangement that is expected to benefit both WNSW and the offtake customers.

The John Holland JV's design solution is prudent.



5 Assessment of efficiency of WBH Pipeline actual and forecast capex

The purpose of this chapter is to assess the prudency and efficiency of WaterNSW's total WBH Pipeline expenditure, which will form the initial RAB value for the pipeline.

The analysis has been undertaken based on best available information provided to Synergies by WaterNSW and a range of other industry sources that contain comparative benchmarks.

Reflecting the atypical nature of this expenditure review, most capex we have assessed relates to costs incurred on the design and construction of the WBH Pipeline. However, given construction of the pipeline is yet to be completed, the costs proposed by WaterNSW are a mix of actual and forecasts.

In addition to expenditure that will underpin the initial RAB value, WaterNSW has proposed a small capex forecast for the 2019 Determination period (less than \$1.0M) associated with land acquisition and very small-scale asset replacement.

Our efficiency analysis has the following elements:

- a high-level overview of the WBH pipeline costs, by component, as submitted by WaterNSW in its pricing submission;
- top-down analysis of total project cost, benchmarked against comparable Australian pipeline projects;
- benchmarking analysis of individual assets within the pipeline project (using best available information and suitable benchmarks where they exist);
- benchmarking analysis of the project's Distributed Costs (also referred to as 'Owner Costs') using targeted sampling of a number of cost items within the Distributed Cost pool; and
- benchmarking of the proposed capex for customer offtakes.

5.1 **IPART Issues Paper questions**

IPART raised the following question regarding the prudency and efficiency of WaterNSW's expenditure on the WBH Pipeline as follows:

Q17. Is WaterNSW's proposed capital expenditure on the Pipeline and offtakes, including contract variations, distribution and contingency costs, efficient?



We address this question in the remaining sections of this chapter.

5.2 Context for our benchmarking analysis

Chapter 3 of our report focussed on the contestability of the WBH Pipeline procurement process, which is a commonly used technique by regulators for determining the efficiency of costs.

In this section we use economic benchmarking techniques to further test the efficiency of the WBH Pipeline costs, while recognising the inherent limitations of benchmarking in a situation where the pipeline is not yet complete and commissioning processes are still underway.

Synergies has undertaken benchmarking analysis at the request of IPART, which sought additional 'bottom-up' and 'top-down' analysis of individual components of the pipeline project expenditure as a means of corroborating or otherwise the evidence base for the capex efficiency assessment.

Normally, the benchmarking of efficiency of the construction of infrastructure projects (and in turn, the determination of RABs specifically) is performed at the end of the construction process (ie post commissioning), when all relevant costs are able to be brought to account and the full assessment of the circumstances of the construction process can be understood. In the case of the WBH Pipeline, this is not possible as IPART is required to set prices, commencing 1 July 2019.

We provide this context as it highlights the challenges of determining a RAB prior to all costs being finalised. Indeed, it is only in unusual circumstances that immediately after commissioning such an investigation will occur.

Whilst the formal incorporation of assets into a RAB may occur as at the commissioning date, it is not uncommon for the final value to be subject to variations that may still be outstanding at the time of commissioning. This may be as final invoices and reconciliations remain outstanding or because more significant uncertainties remain outstanding (particularly if there are construction disputes that arise concerning aspects of the construction process that are not resolved at the time of commissioning). In essence, the determination of a RAB value (and the efficiency with which a facility has been constructed) is not attempted until there is a robust basis to substantiate its value in the context of the entirety of the project.

In the case of the WBH Pipeline, most but not all costs are known. Benchmarking provides a useful gauge for evaluating the efficiency of activities and expenditures that



have been finalised but is less robust for evaluating outturn costs relating to project implementation activities that are still in progress.

IPART's current review process has fundamentally examined budgeted costs midway through the project (following substantial completion of construction but with further construction works, including commissioning works, to be undertaken). Any number of issues (whether latent or not) could arise between now and project commissioning that affect the out-turn costs for the project relative to the costs that were anticipated (and which have underpinned our analysis). It is important to keep this in mind when interpreting the benchmarking analysis that follows.

We are unaware of the outturn costs of the project, how they may vary from the budget, the extent of the contingency that will be required, and importantly the reason why any of these divergences occur. There is some information available to inform this assessment pending commissioning of the pipeline. However, in the context of this assessment, and without knowledge of the extent of contingencies that are required, we have focused our assessment on the budgeted costs, noting that analysis of this type, and critically at this time, can only be indicative.

It is important that any definitive attempt to assess the efficiency of the construction process (to the extent that it is deemed necessary to be undertaken given the contestability principles that have underpinned procurement), is performed ex post (when all relevant costs and circumstances are known) rather than ex ante (as is the nature of the current review).

5.3 Component costs of the WBH Pipeline project

For the purpose of this efficiency review we have adopted WaterNSW's 'current approved budget' expenditure, which sums to a total project cost of \$441,318,589 in 2018/19 dollars (inclusive of a contingency of \$59,926,676, also in 2018/19 dollars).

Table 5 provides a high-level breakdown of this cost across three major component categories.

The value of the D&C Contract for Separable Portion 1 of the project is \$335,087,000 (\$2018/19), which includes assets from the water intake at Wentworth to the bulk water storage around 15km outside of Broken Hill.



Table 5 Major cost categories (\$2018-19)

Category	Nominal \$	\$2018-19
D&C Contract (Separable Portion 1 of the WBH Pipeline, excluding farm offtakes) ¹	\$330,052,000	\$335,087,000
Distributed Costs (also referred to as 'Owner Costs') – for all three Separable Portions	\$45,175,691	\$46,305,083
Contingency – for all three Separable Portions	\$58,465,050	\$59,926,676
Total project cost	\$433,692,741	\$441,318,589

Note: (1) D&C Contract expenditure is shown in Table 15 of WaterNSW's Pricing Proposal to be spread across two years (2017-18 and 2018-19). We escalate the 2017-18 values to 2018-19 dollars using a forecast CPI of 2.5%. In the case of Distributed Costs and contingency, all budgeted expenditure proposed by WaterNSW is assumed to be dated 2017-18, and thus the nominal value for these costs is escalated to 2018-19 dollars using a CPI of 2.5%

Source: WaterNSW: (1) WBH Pipeline RAB Breakdown.xls (2) Distributed Costs Actuals to Date.xls (3) Tables 15 and 18 of WaterNSW's Pricing Proposal.

In addition to this expenditure, \$46,305,083 of Distributed Costs (\$2018/19) has been budgeted for the Project. This value of Distributed Costs relates to all three separable portions of the WBH Pipeline Project. WaterNSW is proposing to pro-rata a share the Distributed Costs to Separable Portion 1 of the pipeline, in proportion to the D&C Contract sum for Separable Portion 1 relative to the total D&C Contract value for the entire WBH Pipeline Project.²² We accept this as a reasonable means of apportioning the Distributed Costs to the RAB.

Our efficiency assessment that follows has been conducted on the total Distributed Costs for all three separable portions. It is outside the scope of this review to assess the individual cost shares assigned to Separable Portions 2 and 3.

The \$59.9M contingency allowance represents 16% of the D&C Contract for all three separable portions of the WBH Pipeline. As previously noted, it is too early to tell whether, and if so, how much, of this contingency will be realised in the completion of the project.

²² The pro-rata share is approximately 90%, given by the D&C Contract value for Separable Portion 1 less the cost of farm offtakes (i.e. \$330,052,000) divided by the total D&C Contract value less the cost of farm offtakes (i.e. \$367,037,000). While we understand that this is WaterNSW's intended means of assigning a share of Distributed Costs to Separable Portion 1, Synergies identified an error in WaterNSW's uplift factors in the pricing model (e.g. a 12% uplift factor was applied to the D&C Contract value to calculate the share of contingency cost applicable to Separable Portion 1. This factor should have been 16%.



5.3.1 Further cost breakdown

Table 6 provides a further breakdown of project costs (in nominal values) from WaterNSW's current approved budget. Note that the total of \$375,228,014 shown in the table excludes the contingency (and thus differs from the total shown in Table 5).

Table 6Breakdown of total WBH Pipeline Costs by main components excluding contingency and
farm offtakes (\$ Nominal)

			Owner Costs			
	D&C Contract	WaterNSW Planning Stage	WaterNSW External (implementation)	WaterNSW Internal (incl o'heads)	TOTAL	% of total
Design and investigation			3,488,086			%
Planning		14,500,000			14,500,000	3.9%
Project management				10,404,016		%
Materials and construction						%
Independent verification			5,027,676		5,027,676	1.3%
Other ¹			11,755,913		13,782,913	3.5%
TOTAL	330,052,323	14,500,000	20,271,675	10,404,016	375,228,014	
% of total cost	88.0%	3.9%	5.4%	2.8%		100%
lote: 1. The						

Source: WaterNSW spreadsheets: (1) WBH Pipeline RAB Breakdown.xls; and (2) Distributed Costs Actuals to Date.xls

Key observations from this breakdown are as follows:

- Most of the total pipeline project cost will be incurred under the D&C Contract (88%), with Owner Cost (WaterNSW) accounting for the other 12%.
- While WaterNSW has taken responsibility for some design functions (at a cost of \$3.5M), most of the design was performed under the D&C Contract (at a cost of \$1000), reflecting WaterNSW's preferred Design Build Operate Maintain (DBOM) procurement model for the pipeline.
- The design component is more commonly undertaken by the Owner, as opposed to being part of a construction contract, thus resulting in a disproportionately low Owner Cost for the WBH Pipeline when benchmarked against other major water infrastructure projects.
 - Owner costs typically form around 20% to 30% of total capital for pipeline projects, noting that it is inevitable that project specific factors will affect this range, including the nature of the project and the precise delineation between contractor costs and owner's costs (and risks). For example:



- The Townsville Water Security Taskforce²³ has recently developed cost estimates for a number of pipelines to augment the water supply for Townsville. In this study, the share of owner cost relative to total capital was found to be 21% and included project management, engineering, land acquisition, and environmental management)
- In the case of the TCC Haughton River Pipeline (2016), Owner Costs constituted around \$60M out of a total construction value of \$111M, representing a cost share of 54%
- US evidence also supports this range²⁴
- If we adjust WaterNSW's Owners Cost by shifting the design component out of the D&C Contract and into the Owner Cost, then the share of Owner Cost as a proportion of capital construction increases to 24%, which puts it within the typical range.²⁵ Even if the entire contingency is utilised, the share of Owner Cost remains 'within range' at 28%.
- The two major cost components are Materials and Construction (2%) and Project Management (2%).
 - Most of the project management was performed under the D&C Contract (\$ M), but the amount spent by WaterNSW on project management was not insignificant at around \$10M.
 - Benchmarking performed by our engineering partners indicate that project management costs are reasonable when compared to similar water infrastructure projects of this size and complexity.
- WaterNSW planning, project management and overhead costs make up 6.7% of the total WBH Pipeline project costs.

²³ https://www.watersecuritytownsville.org.au/

²⁴ Similar owner cost shares have been reported in the international literature. The Southern Nevada Water Authority Cost estimating guide adopts an owner share of 25% (see http://forestry.state.nv.us/Hearings/past/Spring%20-%20Cave%20%20Dry%20Lake%20and%20Delamar%20Valleys%202011/Exhibits/SNWA%20Exhibits/SNWA_Exh _194_Cost%20Estimating%20Guide.pdf).

The Texas Water Development Board Unified Costing Model Guide advises that owner costs should typically be in the order of 30% of capital for pipeline projects (see

http://www.twdb.texas.gov/waterplanning/rwp/planningdocu/2016/doc/current_docs/project_docs/20130530 _UnifiedCostingModel_UsersGuide.pdf.)

²⁵ This is calculated as follows:



5.4 Top down economic benchmarking of WBH Pipeline

The purpose of this high level benchmarking is to establish, in the context of a contestable procurement process, whether the WBH Pipeline is an outlier in terms of likely outturn capital costs relative to similar projects.

As the majority of Australian water pipelines are not subject to formal regulatory oversight, there is very limited information available concerning the establishment of RABs for these assets. The data on pipeline costs was identified from a variety of publicly available sources.

Separable Portion 1 of the Wentworth to Broken Hill (WBH) Pipeline is 249km with a budgeted cost of \$375M (nominal) – that is, \$330M for the D&C Contract and \$45M of Distributed Costs. This portion of the project includes all assets from the Murray River intake at Wentworth to the bulk storage facility near Broken Hill but excludes the remaining 21km section of pipeline to the water treatment plant, which is outside scope of the expenditure review.

WaterNSW has also budgeted for a 16% contingency at P90. To the extent that this contingency is fully drawn upon, the cost of the total project could increase to \$434M (again for Separable Portion 1). Given the commissioning process is not complete and the extent to which the contingency sum will be drawn upon is unknown at present, we have benchmarked the project with and without the P90 contingency sum. We do not know the outturn costs of the WBH and these will not be known for some time. As such, we have presented both the budgeted costs for the project, as well as the budgeted costs for the project plus a P90 contingency.

The cost of the WBH Pipeline on a per kilometre basis is \$1.51 million per km (without contingency). If we allow for the full contingency, the upper bound cost of the Pipeline is \$1.74 million per km.²⁶ These are costs/km and do not relate in any way to the volume of water moved. The technical relationship between total pipeline construction cost, diameter and length is discussed in the next section.

²⁶ Calculated by dividing the Pipeline cost by the 249km length of Separable Portion 1.



5.4.1 Comparable projects

We have used 13 comparable water pipeline projects in Australia for the benchmarking analysis (Table 7 below).²⁷ Synergies has inflated all project costs to 2018 dollars using the ABS Producer Price Index²⁸ and converted the costs to a per kilometre basis.

The comparator pipelines have been identified based on our industry knowledge, publications and general internet searches. The pipelines vary from 200mm diameter up to 1,750mm diameter and vary from 16km to 218km in length. This indicates the large diversity of Australian water pipelines. The pipelines in our sample also vary by type of construction material, including mild steel cement lined (MSCL), ductile iron pipe (DICL) and high density polyethylene (HDPE). Additionally, the comparator projects vary in terms of construction material, number of pumps, geographic remoteness and other factors that potentially influence cost per kilometre.

By way of comparison, Separable Portion 1 of the WBH Pipeline is 249km, with a pipeline diameter of 760mm, and is mostly MSCL (with the exception of the first 8.75km of pipe from the water intake, which is HDPE).

Project	Year	Cost	PPI	Cost 2018	Diameter	Length	Unit cost
		\$ million	index	\$ million	mm	km	\$ million/km
Harvey Water Pipe Project - WA	2009	74.5	95.5	87.4	600	174	0.50
Chiltern to Wodonga Pipeline - Vic	2009	2.7	95.5	3.2	300	16	0.20
Casterton to Coleraine Pipeline	2010	5	96.5	5.8	200	29	0.20
Sugarloaf Pipeline - Vic	2010	625	96.5	726.4	1750	70	10.38
Hamilton- Grampians Pipeline - Vic	2010	30	96.5	34.9	375	52	0.67
Moruya to Deep Creek Dam Pipeline - NSW	2009	15	95.5	17.6	600	29	0.61
Gosford and Wyong city council Mardi-Mangrove Link Project - NSW	2010	65	96.5	75.5	1100	19	3.98
Murrumbidgee to Googong Pipeline - NSW	2011	140	98.9	158.8	1000	12	13.23

Table 7 Pipeline cost and construction years

²⁷ Only three of the pipelines are subject to regulatory price controls, these being the Hamilton-Grampian pipeline, the Casterton-Coleraine pipeline and the Sugarloaf Pipeline (each are regulated by the Essential Services Commission)

²⁸ We have adopted this index as a superior alternative to CPI (see ABS cat 6427.0 Producer Price Indexes, Australia: Table 17. Output of the Construction industries, subdivision and class index numbers for ANZSIC 3109 – "Other Heavy and Engineering Construction")



Project	Year	Cost	PPI	Cost 2018	Diameter	Length	Unit cost
		\$ million	index	\$ million	mm	km	\$ million/km
Connors Rivers Dam to Moranbah Pipeline project - Qld	2010	508	96.5	590.4	1500	133	4.44
Toowoomba Pipeline alliance - Qld	2009	187	95.5	219.5	762	38	5.78
Split Rock Dam to Barraba pipeline NSW	2011	19.66	98.9	22.3	225	27	0.83
Burdekin Moranbah Pipeline - Qld	2007	270	86.5	349.8	750	218	1.60
Haughton Pipeline Stage 1 - Qld	2018	248	112.1	248.0	1800	35.6	6.97
Haughton Pipeline Stage 2 - Qld	2018	238	112.1	238.0	1800	33.4	7.13
WBH Pipeline (without contingency)	2018	375	112.1	375.0	750	249	1.51
WBH Pipeline (with contingency)	2018	434	112.1	434.0	750	249	1.74

Source: Consolidation of material from various documents. See Attachment B for key references.

Whilst many factors contribute to cost/km, we know from the technical literature that pipeline diameter is one of the most influential factors because this affects:

- the quantity of material used in the production of pipe (which increases at an increasing rate with pipe diameter); and
- the volume of soil that must be excavated in installing the pipe in a trench (which also increases at an increasing rate with pipe diameter).

Figure 1 summarises these technical relationships. The relationships are non-linear and suggest that the quantity pipe material increases exponentially with pipeline diameter. In the case of trench excavation volumes, the curve is less steep, but still increases at an increasing rate with pipe diameter.





Figure 1 Stylised relationship between pipe diameter, pipe weight and trench excavation volumes for MSCL pipes

Trench excavation Volume (m3/m; LHS) Steel Pipe (min 4.2Mpa test pressure; RHS)

Given the importance of pipeline diameter, we conduct the benchmarking analysis by identifying a functional relationship between \$/km and pipe diameter using the 13 comparator pipelines. In this way, the effect of pipeline diameter on unit cost is controlled for as a variable in the analysis.

While the benchmarking analysis provides an indication of how the WBH Pipeline cost compares to other projects (after adjusting for pipeline diameter), it remains indicative as it is not possible to effectively control for operating environment factors associated with individual pipelines including:

- pipeline construction material
- number of pumping stations required and relevant duty (flow and pumping head) of each station
- operational risk profile adopted in pipeline design (eg degree of redundancy in number of pumps in each station in terms of duty stand-by pumps)
- terrain through which the pipeline is constructed
- excavation conditions
- availability of bedding material
- land acquisition costs



- speed of the construction process
- remoteness of the pipeline.

These factors are likely to contribute to the variation in costs between pipelines that are not already accounted for through pipeline length and diameter.

5.4.2 Specifying benchmark cost curves

The aim of the analysis is to assess where the WBH Pipeline lies on the \$/km cost curve. We examined four functional forms as candidate benchmark cost curves:

1. **Linear:** The cost per kilometre (c_i) increases in direct proportion with the diameter (d_i) . This functional form is included for reference purposes as it is the simplest possible form but based on the above findings, has a limited theoretical basis. Formally:

$$c_i = \beta_0 + \beta_1 d_i$$

2. **Log-linear**: The cost per kilometre (c_i) increases exponentially with the diameter (d_i) . This form most directly aligns to the exponential relationship between pipeline diameter and the quantity of construction materials required and volume of trench evacuation. Formally:

$$\ln(c_i) = \beta_0 + \beta_1 d_i \Leftrightarrow c_i = e^{\beta_0 + \beta_1 d_i}$$

3. **Log-Log**: The cost per kilometre (c_i) increases exponentially with the logarithm of the diameter (d_i) . Measuring the diameter on a logarithmic scale places less emphasis on the differences in the diameter leading to slower growth than the log-linear function. This form also aligns to the exponential relationship between pipeline diameter and the quantity of construction materials required and volume of trench evacuation. Formally:

$$\ln(c_i) = \beta_0 + \beta_1 \ln(d_i) \Leftrightarrow c_i = e^{\beta_0 + \beta_1 \ln(d_i)}$$

4. **Linear-Log**: The cost per kilometre (c_i) increases in line with the logarithm of the diameter (d_i) . This functional form implies economies to scale, i.e. that the economic cost per km decrease with the diameter of the pipe. This functional form is contrary our priors for the cost curve, as it contradicts the known technical relationships referred to above. We include this form in the analysis as its rejection provides comfort that the economic costs are driven by technical attributes. Formally:

$$c_i = \beta_0 + \beta_1 \ln(d_i)$$



Table 8 presents summaries of regression analyses for the four tested functional forms. It shows the coefficient estimates and their statistical significance measures by the t-test (lower p-values indicate higher significance) and the model specific quality of fit as measured by the adjusted R² (higher value indicates better fit) and the F-test (lower p-values indicate higher significance). The table shows that the Log-Log model fits the data best. As the Log-Log model also aligns well with the technical perspective of the nature of pipeline costs with diameter, we will use it as the functional form of the cost benchmark curve.

Functional form	Co	pefficient	t-test (p-value)	R ²	F-test (p-value)	Observations
Linear	β0	-0.59	0.71	0.47	0.0038	13
	β ₁	0.01	0.00			
Log-Linear	β ₀	-1.23	0.01	0.66	0.0002	13
	β ₁	0.00	0.00			
Log-Log	β ₀	-10.25	0.00	0.73	0.0001	13
	β ₁	1.66	0.00			
Linear-Log	β ₀	-22.02	0.01	0.48	0.0036	13
	β ₁	3.96	0.00			

Table 8 Regression summaries

Note: Rounded values

Source: Synergies modelling

5.4.3 How the WBH Pipeline compares to the benchmark

The previous section established that a function with a Log-Log form fits the comparator data best. The estimated benchmark cost curve was specified as:

$$c_i = e^{-10.25 + 1.66 \ln(d_i)}$$

The points described by this curve can be interpreted as the empirically efficient per kilometre cost for a given diameter of pipe. This means per kilometre cost estimates on or close to this line are likely to meet Australian best practice standards. Those below are likely to exceed them and projects showing unit costs above the line could be inefficient²⁹.

Figure 2 plots the benchmark cost curve, the underlying comparator observations, and the per kilometre construction cost estimate for the WBH Pipeline with and without contingency.

²⁹ This is not definitive as other factors such as location, climatic conditions etc that were not explicitly modelled might also play a role.



Based on the benchmark cost curve, the per kilometre construction cost of a 750mm pipe is \$2.03 million per kilometre. This compares to a WBH Pipeline cost (without contingency) of \$1.51 million per kilometre.

Thus, the per kilometre cost of separable portion 1 of the WBH Pipeline benchmarks at 34% below the curve (without contingency). Even if the full contingency is drawn on, the cost of the WBH Pipeline remains below the benchmark (17% lower).

Figure 2 Benchmark cost curve and where the WBH Pipeline lies on the curve



In our view, the primary consideration for the assessment of the prudency and efficiency of capex for the construction of the WBH Pipeline turns on the contestability of the procurement process which we addressed in Section 3.

In this context, it is clearly premature to attempt to benchmark the final cost of the construction of the WBH Pipeline because its outturn cost is currently unknown. However, the high level benchmarking of pipeline construction costs for similar pipelines in Australia suggests that the WBH Pipeline is unlikely to be an outlier in terms of outturn capital costs relative to similar projects based on the information available to date.

In other words, the high level quantitative analysis corroborates our view that the contestable procurement process that WaterNSW pursued appears likely to ultimately result in an outturn capital cost that conforms to efficient cost expectations, so long as final contingency allowances are reasonable.



Indeed, so long as final contingency allowances are reasonable, the outcome of the high level quantitative analysis, which did not adjust or make allowance for the remoteness of the location and the speed with which the pipeline has been constructed, further underscores this finding.

5.5 Benchmarking efficiency of D&C Contract costs

Table 9 summarises the pipeline construction costs by asset class. This data has been taken from the D&C Contract for Separable Portion 1.

The pipeline from river intake to the bulk water storage facility accounts for % of the total cost, most of which is for materials and installation (equating to a cost of per linear metre when averaged across the entire 249km length of Separable Portion 1).³⁰

	\$ nominal	% of total
River intake structure		
Pipeline asset		
Transfer pump stations		
Bulk water storage		
Project and construction management		
Farm offtakes (6 offtakes)		
Contract variation		
Total	330,552,323	100%

Table 9 Construction costs – Separable Portion 1 of the WBH Pipeline (nominal \$)

Source: WBH Pipeline RAB Breakdown.xls. (Note on offtakes - WaterNSW's written pricing submission is proposing 3 offtakes, but the D&C contract incorporated 6 offtakes)

5.5.1 **Comparator pipeline projects**

For our efficiency assessment of individual pipeline assets, we have drawn on four comparator Australian water pipelines, as presented below in Table 10. This source of information has been supplemented with unit costs from industry price lists - e.g. cost of steel pipe and HDPE membrane liner for the bulk storage.

³⁰ Given by dividing the cost of the pipeline asset () by 249km



Pipeline	Technical specifications
Haughton Pipeline Duplication	Currently under construction. Will supply water from the Haughton River to the Ross River Dam in Townsville.
	 36km of Glass fibre Reinforced Plastics (GRP) pipe with dimension of DN1800 Pipeline designed to transport 234 ML/d Four pumps (1900 kW each)
Southern Regional Water Pipeline Alliance	 100km DN 1000, Mild Steel Cement Lined (MSCL)
Western Pipeline Alliance	 100km DN 1000 GRP DN1450 MSCL
Woleebee Creek to Glebe Weir (WC2GW)	120kmDN 900 MSCL

Table 10 Comparator pipelines and key leatures	Table 10	Comparator	pipelines	and key	/ features
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Source: Project Support database (projectsupport.com.au)

5.5.2 Benchmarking findings

Table 11 summarises how the component costs for each of the WBH Pipeline assets compare to industry benchmarks, as drawn from the comparator pipelines. In undertaking this analysis at IPART's request, we note the importance of recognising the lump sum nature of the D&C Contract for the total WBH Pipeline build, rather than a series of individual procurement contracts for individual pipeline assets.

We find that all the component costs are reasonable based on available benchmarks. Importantly, the cost of the MSCL sections of pipeline, by far the largest asset component of the D&C Contract, appears to be priced below the industry benchmark. The benchmarking analysis substantiates the finding that the competitive tender process used for the D&C Contract has resulted in an efficient price for the WBH Pipeline.

Component	Technical Specifications	Budget Cost (\$)	Equivalent unit cost	How the cost compares to industry benchmarks
River intake structure. Water intake equivalent of 27 ML/day.	2 x 90kW duty pumps and 1 x 90kW standby		N/A	Reasonable The Haughton River pump station uses 4 x 1900 kW pumps to transport 234 ML/day. Total Cost of pumps and dry well was \$22m. Based on the lower volumes of the Broken Hill pipeline, a reasonable cost for the pump station would be 25% to 30% of the Haughton. This equates to a cost range of \$5.5M to \$7.7M.
Pipeline from river intake structure to transfer pump station (supply and install)	8.75km of 630mm diameter high density polyethylene pipe (HDPE).		\$972/metre	Reasonable The industry benchmark cost for installation and supply of HDPE

 Table 11 Component benchmarking of the RAB (nominal \$)



Component	Technical Specifications	Budget Cost (\$)	Equivalent unit cost	How the cost compares to industry benchmarks
	Part of the pipe was installed using horizontal direct drilling (HDD), which is more expensive than trenching.			pipe (using trenching) is about \$750-\$800/m The higher cost for the WBH Pipeline (i.e. \$972/m) could be explained by the use of HDD installation at river crossings and areas where it is difficult to open trench. The cost of HDPE pipe installed using HDD is about \$3000/m.
				Tender design report for WBH Pipeline (p. 38 table 8-5) shows two river crossings up to CHN 8.75. If we allow 200m per crossing this equates to 400m x \$3000/m = \$1.2m, this would imply that the remaining 8350m is supplied and installed using trenching at a cost of \$7.3m.
Remaining pipeline	240.25km of MSCL pipe,		\$727/metre	Below industry benchmark
sections (x3) with a total length of 240.25km – supply and install. • Section 1 is 92.5km	760 OD. Trencher and dedicated dozer for installation			Industry benchmark for the WC2GW is around \$468/m for pipeline installation, but this excludes the supply of materials.
 (transfer station 1 to transfer station 2) Section 2 is 126.75km (transfer station 2 to transfer station 3) 				Pipeline supply cost, based on Steel Mains price list, is \$415/m for an OD762 MSCL pipe delivered to a peri-urban destination.
 Section 3 is 21km (transfer station 3 to bulk water storage) 				Total benchmark cost for supply and installation is \$883/m.
Transfer pump stations (x2)	Transfer station 1: 3 x 520kW duty pumps and 1 x 520kW standby (combined capacity of 2,080kW) Transfer station 3: 3 x 315kW duty pumps and 1 x 315kW standby (combined capacity of		\$6.1M per station	Reasonable Industry benchmark cost for 2000kW capacity = \$6 million (includes pump plus installation; civil, pipework, mechanical and electrical). Industry benchmark cost for 1300kW capacity = \$5 million Typical cost of a 1ML balance tank
	1260kW) 1 ML balance tank at each station			is \$450,000.
Bulk water storage	station Two pond storages of		\$14.839/MI	Reasonable
Buik water storage	552ML and 168ML (total of 720ML).		¢,000,	A single 600ML unlined storage was constructed as part of the
	Total footprint of the storages = 209,120m ²			Burdekin to Moranbah pipeline in 2006 for a cost of \$5 million. If this is escalated at 2% pa this
	2mm HDPE membrane liner			converts to a 2018-19 value of \$6.3 million.
				To this value, we must add the cost of a membrane liner (supply and installation) and account for the fact that two, not one, storages



Component	Technical Specifications	Budget Cost (\$)	Equivalent unit cost	How the cost compares to industry benchmarks
				have been constructed for the WBH Pipeline. Typical cost of HDPE membrane liner (materials only) is \$5.00/m ² , which would produce an aggregate cost of \$1 million.
Project and construction management See table below for an itemised breakdown of this component.			% of D&C Contract cost	Reasonable See itemised assessment below for further details.
Farm offtakes (6 offtakes)			\$83,333 per offtake	Reasonable See the results of two, independent bottom-up assessments in separate section below.
Total		329,025,323		

Source: WBH Pipeline RAB Breakdown.xls (Note on offtakes – WaterNSW's written pricing submission is proposing 3 offtakes, but the D&C contract incorporated 6 offtakes)

5.6 **Project construction and management costs**

Project construction and management under the D&C Contract accounts for **\$** M, or **%** of total contract value³¹. In order to assess the efficiency of this sum, we have benchmarked a number of the larger cost items contained within this category. The complete list of items is summarised in Table 12 below.

All sub-components are reasonable when benchmarked against costs of similar projects. In the case of design, this cost (at around % of D&C Contract value, or % M) benchmarks slightly above similar infrastructure projects where the design component is typically 6% of total construction value for less complex design tasks. There is, however, precedent for higher design costs. For example, in the case of the Southern Regional Water Pipeline Alliance, the design component comprised approximately 8.8% of total construction value.

Table 12	Project and Construction	Management	expenditure	(nominal S	\$)
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Sub-component	Budget cost (\$)	% of total D&C Contract	How this cost compares to industry benchmarks
Project preparation and planning (Early phase works)	\$3,637,557	1.0%	Reasonable The early phase works will include camp locations, survey, materials sourcing,

³¹ We use a total D&C contract value of \$365,760,434 (which covers all three Separable Portions)



Sub-component	Budget cost (\$)	% of total D&C Contract	How this cost compares to industry benchmarks
			logistics which would normally occur after contract award with a specialist team. Consider this is a reasonable cost.
Project and construction	\$44,809,192	12.3%	Reasonable
management			This figure benchmarks reasonably well against the 120km Woleebee Creek to Glebe Weir pipeline (WC2GW) which was constructed by MPC in 2013 as a 'Construct Only' contract. The cost of project and construction management in that contract was 16.3%.
Site facilities and amenities	\$19,547,273	5.3%	Reasonable
			These costs generally include all set up and running costs including camp, offices, superintendent. On the WC2GW project this was 11.6% of construction contract value.
Mobilisation	\$14,332,873	3.9%	Reasonable
			Mobilisation costs are often hard to benchmark as contractors on most occasions "front end load" these costs. Will include laydown areas, camps. equipment mobilisation etc. On WC2GW this was 1.7% of construction contract value.
			In the case of the WBH Pipeline, we were advised by WaterNSW that in order to meet a December 2018 timeline to complete the Pipeline, early commitments had to be made with respect to entering into a pipe supply contract, and procurement of pumps and mobilisation of construction camps. This may have contributed to the higher-than-usual mobilisation costs.
Demobilisation	\$4,196,111	1.1%	Reasonable
			Considered reasonable. On WC2GW this was 1.5% of construction contract value.
Subtotal	\$86,523,007	22.5%	Taken collectively, the above components represent 26% of the D&C contract value. These costs can range from 20% to 35%. On the WC2GW pipeline the sum of these components was 35%, which included 7.5% construction risk and off-site overheads.
Design	\$26,656,208	7.3%	Reasonable
			Design costs are typically around 6% of contract for a project that is not complex. However, there is precedent for higher design costs. For example, in the case of the Southern Regional Water Pipeline Alliance, the design component comprised approximately 8.8% of total construction value.
Hydrotesting	\$1.684.227	0.5%	Reasonable



Sub-component	Budget cost (\$)	% of total D&C Contract	How this cost compares to industry benchmarks
Commissioning and Performance Testing	\$909,389	0.2%	Hydrotesting, Commissioning and Performance testing is typically around 2% of contract cost, so the 0.79% reported for the Broken Hill pipeline is reasonable.
Final documentation	\$135,000	0.04%	Reasonable
TOTAL	\$115,907,831	31.7%	

Source: Data from D&C contract costs contained in WBH Pipeline RAB Breakdown.xls

5.7 Distributed Costs (Owner Costs)

5.7.1 Background

WaterNSW's Pricing Proposal states that the pool of Distributed Costs is established by identifying all internal and external costs required to deliver the pipeline in accordance with the Government Direction issued to construct, operate and maintain the WBH Pipeline.

WaterNSW also notes that most of these costs can be capitalised under accounting principles, being necessarily incurred in the creation of an asset which provides economic value. Some of the expenditure is categorised under accounting principles as opex. However, given there is no IPART Determination yet in place for the WBH Pipeline these cost elements are unfunded. Consequently, WaterNSW proposes that the costs be capitalised into the RAB (as a Distributed Cost).

We agree that the owner costs associated with the design and construction of the WBH Pipeline should be recognised if they are prudent and efficient. We note that several of the Distributed Costs are forecasts and as such should not form part of the initial RAB value. However, we understand that IPART's RAB roll-forward process, as applied to WaterNSW's regulated services, is such that at the end of the 2019 Determination period, it will only add to the WBH Pipeline's RAB actual prudent capex incurred on the pipeline over the period, including on Distributed Costs.

To assist IPART, WaterNSW has indicated that it will disclose the most recent set of actual Distributed Cost data to IPART, as close as possible to the start of the 2019 Determination period (possibly in March or April 2019).

Given the above factors, we have assessed the prudency and efficiency of the data in Table 13 over page, which presents a breakdown of the Distributed Costs by category taken from WaterNSW's Pricing Proposal.


5.7.2 Distributed Cost breakdown

The total pool of Distributed Costs approved Distributed Costs (as at end of October 2018) that has been budgeted by WaterNSW for the WBH Pipeline project is \$45,675,691. This breaks down into three broad categories, as follows:

- Planning stage (direct costs) equate to \$14,500,000, which represents 32% of the Distributed Cost pool or 4.0% of total WBH Pipeline project cost;
- External costs (implementation and including Independent Verification) equate to \$20,271,675, which represents 34% of the Distributed Cost pool or 4.2% of total WBH Pipeline project cost; and
- Project Management (internal WaterNSW costs) equate to \$10,404,016, which represents 23% of the Distributed Cost pool or 2.8% of total WBH Pipeline project cost.

Table 13 presents a granular breakdown of cost items within each of the above categories. External contracts let during the planning stage comprise the highest single cost item (at 26% of total Distributed Costs), followed by Aboriginal Heritage assessments (13%) and Independent Verification (11%).

Item	Cost for all 3 Separable Portions (\$)	% of total Distributed Costs	% of total D&C Contract cost ¹
Planning Stage (Direct Costs)			
External Contracts	11,785,000	26.1%	3.2%
Internal Costs	2,715,000	6.0%	0.7%
External Costs			
Aboriginal Heritage	6,019,676	13.3%	1.6%
Design and Construction Management	3,488,086	7.7%	1.0%
Communications	1,723,069	3.8%	0.5%
Legal, Commercial Advisers	669,840	1.5%	0.2%
Support Contractors/Consultants/Suppliers	1,016,728	2.3%	0.3%
Insurance	1,261,600	2.8%	0.3%
Property (excludes land acquisition)	550,000	1.2%	0.1%
Other fees and licenses	515,000	1.1%	0.1%
Independent Verification	5,027,676	11.1%	1.4%
Project Management (Internal Costs)			
WaterNSW internal staff	2,076,333	4.6%	0.6%
Term employment contractors	3,977,617	8.8%	1.1%

 Table 13 Distributed costs breakdown (\$ nominal)



Item	Cost for all 3 Separable Portions (\$)	% of total Distributed Costs	% of total D&C Contract cost ¹
WaterNSW operational expenses	1,972,974	4.4%	0.5%
WaterNSW overheads	2,377,092	5.3%	0.6%
TOTAL	45,175,691	100%	12.3%

¹ WBH Pipeline D&C Contract for all three separable portions, excluding contingency

Source: WaterNSW spreadsheet, Distributed Costs Actuals to Date.xls

5.7.3 Direct Project Costs (planning)

WaterNSW has provided information relating to the make-up of the Direct Project Costs, which comprise a mix of external and its internal costs. Our assessment regarding prudency and efficiency is detailed in Table 14 below.

Distributed Cost – Direct Project Costs (planning)	Prudency and efficiency assessment
External costs	
Project Management - Contractors	The incurrence of costs in relation to project management tasks is prudent for a construction project of this scale.
	WaterNSW engaged several experienced contractors including TBH Consulting, RMCG, and CF Group covering engineering environmental and project management skill sets. Most of the support contractors were also used for the construction stage of the project.
Approvals	The incurrence of costs in relation to WaterNSW gaining relevant approvals for the pipeline was prudent and essential to expediting the construction phase of the project. It appears that these costs were primarily driven by legislation requirements, including gaining Aborigine Heritage permits and land access rights.
	WaterNSW was required to work closely with the Public Works Authority (PWA) in relation to gaining the relevant approvals. A competitive tender process was undertaken by PWA to engage an external contractor to assist with this task.
Planning	The incurrence of costs in relation to stakeholder consultation tasks is prudent for a construction project of this scale and given the associated community and political sensitivities.
	WaterNSW engaged an experienced communications consultant via an open tender process in accordance with is good procurement practice.
Transaction Management	Transaction costs relate to the procurement process for the pipeline and development of the D&C and O&M Contracts. The skill sets acquired were legal, commercial, probity and cost estimation.
	We consider the capability of the selected service providers to be strong.
Design & environmental approvals	The incurrence of costs in relation to design and environmental approvals is prudent for a construction project of this scale. We understand the design costs relate to the pipeline's Output Specification, a critical input to the tender process.
	WaterNSW engaged a highly experienced principal engineer regarding this type of infrastructure project for the project's design role via an open tender process.
Internal costs	•
Early Procurement	WaterNSW advised that this expenditure primarily relates to the 50km of steel pipe

project. We consider this action to be prudent given the compressed project time line.

Table 14 WaterNSW's Direct project costs (Planning)



Distributed Cost – Direct Project Costs (planning)	Prudency and efficiency assessment
Project and Contract Management – WNSW staff	WaterNSW advised that these costs relate to early stage Project Board, contract management, running costs and corporate overheads. We consider the costs to be prudent being reflective of a significant up-front commitment of time to the project.
	WaterNSW's reported October 2018 cost data for this category indicates a significant under-spend relative to the approved budget (around 40% under). Given this category appears to relate primarily to early stages of the pipeline project (with later stage costs captured primarily under the Internal Project cost category assessed below), we have adjusted the costs to reflect the monthly spending profile up to October 2018. We have applied this monthly amount over the 20 month duration of the pipeline design and construction phases.

Source: WaterNSW

5.7.4 External contract costs

The make-up of external Distributed Costs is assessed in Table 15, including our prudency assessment.

Distributed Cost – External Contract Costs	Prudency assessment
Aboriginal Heritage Salvage Program and Archaeological Study	The construction phase of the project required input into aboriginal heritage aspects, including Aboriginal Cultural Heritage Assessment and Aboriginal Heritage Impact Permit Salvage Program works. This is especially in view of the location and length of the pipeline. Similarly, archaeological input was necessary. We recognise the high sensitivity associated with these activities, which we consider to be prudent.
	The costs associated with these activities include a novated external contract from the PWA to complete the Review of Environmental Factors (REF) phase of the project. A competitive tender process was undertaken by PWA.
	WaterNSW retained PWA's external contractor post-REF to undertake further cultural heritage works.
	The location and length of the pipeline suggests a large scope of cultural heritage related works. Proponents have limited discretion over these costs, particularly for time-sensitive projects.
Independent verification	WNSW has advised that the selection of the Independent Verifier was arrived at as the outcome of a rigorous competitive tendering process that involved the following components:
	A Request for Tender (RFT) for the Independent Verifier for Murray to Broken Hill Pipeline Project (the Project) was issued to 3 tenderers, with two proponents lodging proposals to WaterNSW.
	Committees were established to undertake the evaluation of the Independent Verifier tenders. The Tender Evaluation Committee, which comprised of four voting members, conducted the overall evaluation (Technical and Commercial) of the tenders. Advisory Committee that comprised of a member each from WaterNSW legal Team, External Legal Advisors and External Commercial Advisor and provided report/advice on the unweighted criteria of the RFT evaluation.
	The Tender Evaluation Committee members individually undertook scoring of the tenders using a predefined scoring system for all Non-Price Evaluation Criteria. Once WaterNSW representatives received the individual scoring on non-price criteria, price information was then distributed to the Tender Evaluation Committee for their assessment.
	The purpose of the Tender Evaluation Committee was to shortlist the Independent Verifiers tenderers (not select the Preferred Tenderer) and present the outcome to the DBOM contractor(s) for it to then select the preferred Independent Verifier. The outcome of the process was that a tripartite agreement between the contractor, WaterNSW and the Independent Verifier was signed.

Table 15 External costs incurred by WaterNSW



Distributed Cost – External Contract Costs	Prudency assessment
	We consider the appointment of an Independent Verifier role for the project reflects good procurement practice and, amongst other things, is likely to have facilitated the compressed overarching project timeframe to be met during the design and construction phase of the project, including reducing the potential for project delays and/or disputes.
	Hence, the inclusion of an Independent Verifier function is considered prudent. The process of seeking competitive tenders from the marketplace is good procurement practice and the tender evaluation process adopted was rigorous.
External consultants, contractors and suppliers	The scope of this item covers input from a range of external advisors including design coordination, provision of contract management staff, land purchase and leasing advice, scheduling advice and project Board member attendance. All these items are considered as being appropriate for this project and hence are judged to be prudent.
	Upon request, WaterNSW provided details regarding the process for procuring services to undertake this work. The information provided by WaterNSW indicated that most projects within this external cost category were subject to competitive tender or select tender processes. Only one external consultancy, for project management/programming, was subject to a single select process. According to WaterNSW this was due to the service provider's recognised expertise in the field.
	Based on our experience, the procurement processes used by WaterNSW were appropriate.
Community consultation	The scope of this item is the provision of community consultation services to inform the community and stakeholders about the project.
	We consider this activity is prudent given it is an important component of the delivery of a project of this size and its community sensitivity.
	WaterNSW advised that the process for procuring services to undertake this work was by select tender involving four service providers.
Legal and commercial advisors	This item includes the provision of legal advice for the project, project cost estimating (including with respect to the contingency allowance) and financial modelling input. We consider that these items are prudent and necessary for a project of this nature.
	WaterNSW advised that the process for procuring services to undertake this work was by select tender involving four service providers. We consider the capability of the service providers selected to be strong.
Insurance	This item relates to insurance cover for material damage, public liability and professional indemnity the project.
	We consider this expenditure is prudent as it is taking proactive steps to assist in achieving the Government Direction regarding completion of the project.
	WaterNSW has advised that it used the Construction Specialists Division of iCare, which is the only specialist in NSW insuring major projects, for its pipeline construction insurance. It also advised that the use of iCare avoids several costs of a private insurance broker, including brokerage fees/commissions and State taxes.
Property costs	This item covers the cost of leasing property along the pipeline route, property survey costs, and costs associated with minimising landholder disruption. We consider this work is a typical component of a project of this nature.
	WaterNSW advised that it used a select tender process involving three service providers for procuring the services to undertake this work.
Fees and licenses	This item covers the cost of fees and licenses for the project and the cost of an overarching peer review of the project by INSW.
	Most of the expenditure relates to the INSW review, which we understand is a NSW Treasury-mandated review for significant projects. In other words, the cost is beyond WaterNSW's control.
	The residual expenditure on fees and licenses relates to costs associated with the acquisition of titles, encumbrances and lease registration and as such is considered prudent

Note: Cost details have been obtained from the WaterNSW Pricing Submission Spreadsheet **Source:** WaterNSW



5.7.5 Internal WaterNSW Costs

The make-up of WaterNSW's project costs post planning stage are assessed in Table 16 below, including our prudency assessment.

Table 16 WaterNSW's internal project costs

Distributed Cost – Internal Costs	Prudency and Efficiency Comment
Project Management - WaterNSW staff for delivery	We recognise the prudency of WaterNSW incurring project management costs given the need for a very close working relationship with John Holland JV and the independent verifier on the project given its tight timeline for completion.
	WaterNSW has advised that these costs reflect its project management team ie project director, commercial manager, community and stakeholder manager and project support officer.
Term Employment Contractors	WaterNSW has provided a detailed breakdown of these costs, which relate to specific senior project roles, such as Area and Project Managers. The identified project roles are consistent with an infrastructure project of this kind.
WaterNSW Overhead Recovery	Operational overheads include the cost of providing support services (IT infrastructure, IT technical support, finance and legal support, safety and environment support, etc). Corporate overheads comprise the office of the Chief Executive, corporate systems, regulatory strategy, and HR support
	We recognise the need for a share of operational and corporate overheads to be allocated to this project. It is prudent for a project of this size to utilise a share of indirect resources over the planning and construction phase of the project.
	We had expected that WaterNSW would be able to demonstrate how it has drawn resources from the overhead pool that is part of the wider WaterNSW business, and the allocators used to apportion these resources to the WBH Pipeline project. This level of transparency would give us confidence that the proposed overhead expenditure is efficient. However, WaterNSW has advised that the budgeted overhead expenditure was calculated as a 10% mark up on its direct project management costs, plus a 10% mark up on external costs over the implementation phase (excluding Independent Verification).
	While this method produces an overhead amount for the project that appears reasonable relative to benchmarks (see section 5.7.9), the 10% is an arbitrary value and greater confidence would be engendered if WaterNSW was to use a formal cost allocation method that assigns overheads according to causal drivers (e.g. in proportion to direct FTEs) and provided stronger evidence around the demands that a particular project activity placed on overhead services.
Project Management - Running Expenses	We understand running expenses relate to travel, accommodation, fuel, site office set- up and running costs. We consider these costs to be prudent.
	Assuming a project management phase from late October 2017, when the John Holland MPC Group JV was appointed, through to project completion in April 2019, WaterNSW's cost estimate averages at around \$110,000 per month.

Source: WaterNSW

5.7.6 Efficiency of Distributed Cost items

We have assessed a sample of items from the pool of Distributed Costs to support our efficiency assessment. The cost items selected for the analysis are summarised in Table 17. The selected sample represents a total value of \$26.4M, or 58% of the total pool of Distributed Costs, by value.



The sample equals 7% of the total WBH Pipeline cost (before considering the contingency).

In principle, as cost identifiers become more granular, project specific definitions inevitably become more idiosyncratic. Definitions and cost allocations will vary from project to project. This in turn undermines the efficacy of attempting to benchmark these costs at a granular level. Accordingly, significantly lower weight should be placed on the outcomes of benchmarking individual cost line items, particularly when costing outcomes benchmark favourably for cost elements defined at a more aggregated level.

ltem	Description	Cost for all three separable portions (\$)	% of total Distributed Costs	% of total D&C Contract cost	Assessment against comparable benchmark
Planning Stage (D	irect Costs)	1			1
Approvals (external contract)	Includes environmental approvals, Aboriginal heritage permits, land access management, and PWA. This was delivered through an external contract.	2,294,875	5.1%	0.6%	Reasonable Difficult to benchmark approvals, as this cost is very project- specific. The cost is considered reasonable in both relative and absolute terms.
Planning (external contract)	This cost item consists of consultation costs incurred during the planning stage of the project. This was delivered through an external contractor (KJA). Also includes cost of implementing step system processes (project management) and other incidental cost. For example meeting rooms and workshop facilitation costs.	727,794	1.6%	0.2%	Reasonable Difficult to benchmark a project item of this size, which forms a very small portion of total project cost. Items of this nature are very project- specific. The cost is considered reasonable in both relative and absolute terms.
Design (external contract)	During the planning stage GHD was responsible for the following design works: (1) Review of current information and finalise new concept designs (2) Development of request for tender and evaluation of tenders (D&C contract) (3) Environmental planning approvals. [The D&C contract did not include any costs during planning stage].	2,749,199	6.1%	0.7%	Reasonable See section 5.7.8 for further details.
Internal Costs	This item comprises two components: (1) \$2,650,000 for contract management. This relates to internal cost incurred by WaterNSW during the planning stage of the	2,715,000	6.0%	0.7%	Reasonable See section 5.7.7 for further details.

 Table 17 Efficiency assessment of a sample of WaterNSW cost items (\$ nominal)



Item	Description	Cost for all three separable portions (\$)	% of total Distributed Costs	% of total D&C Contract cost	Assessment against comparable benchmark
	project. Cost includes employee cost (based on timesheets), running cost for travel and accommodation and corporate overhead.				
	(2) Project Board cost of \$65,000 during the planning stage of the project				
External Costs (Im	plementation stage)				
Design and Construction Management	(1) GHD Contract valued at \$3,196,579 for coordination of the design with the contractor and provide construction management staff.	3,488,086	7.7%	1.0%	Reasonable See section 5.7.8 for further details.
	(2) Engagement of a GHD contractor (\$291,517) to obtain environmental permits.				
Communications	Stakeholder engagement performed by communications consultant, KJA	1,723,069	3.8%	0.5%	No suitable benchmarks available, as communications are very project-specific.
Legal and commercial advice	Engagement of KPMG, Allens Linklaters, and Advisian	669,840	1.5%	0.2%	0.5% to 1% of total Distributed Cost
Land access advice	Engagement of land access advisors (LAMS)	400,000	0.9%	0.1%	Relatively low value reflects much of pipeline construction was in road reserve
Insurance	Insurance - Material Damage and Public liability.	1,261,600	2.8%	0.3%	Generally, around 1% of contract value
Project Manageme	nt (Internal Costs)				
WaterNSW internal staff	WaterNSW project management team - project director, commercial manager, community and stakeholder manager and project support officer.	2,076,333	4.6%	0.6%	Total internal project management costs represent 2.8% of the pipeline construction value. This compares
WaterNSW operational expenses	Travel, accommodation, fuel, site office set up and running costs	1,972,974	4.4%	0.5%	favourably to major rail projects (in which the Owner typically incurs management
WaterNSW External term contractors	Contract staff engaged by WaterNSW to assist with project management (OHS, SCADA, Commissioning, engineering and environmental consulting etc.	3,977,617	8.8%	1.1%	costs equal to 3 – 4 % of construction cost) – see Transport and Main Roads Project Cost Estimating Manual 2017
WaterNSW overheads	WaterNSW shared services. See section below table for further details.	2,377,092	5.3%	0.6%	Based on past water projects, Owner management costs can range from 1% to 15% of project value depending on level of supervision and contract management. For a



Item	Description	Cost for all three separable portions (\$)	% of total Distributed Costs	% of total D&C Contract cost	Assessment against comparable benchmark
					large pipeline project these can be at the lower end.
TOTAL		26,433,479	58.5%	7.2%	

Source: WaterNSW spreadsheet, Distributed Costs Actuals to Date.xls

Further details in support of the above assessment are set out below.

5.7.7 Internal costs – Planning Stage

We asked WaterNSW about the \$2,650,000 incurred on project and contract management over the planning phase of the project.

WaterNSW responded by providing a tabulated summary of the range of staff inputs and functions over the planning stage (see Table 18). This information assists to demonstrate the services provided by WaterNSW under this cost item and the daily rates of individual officers that were used to establish a build-up of costs. We are satisfied that the services provided by WaterNSW staff over the planning stage are prudent and the costs are reasonable.

Staff position	Function	Daily rate
Project director	Overall achievement of the project objectives	
Director – Major Projects (30%)	Overall achievement of the project objectives	
Commercial Manager Major Projects (30%)	Monitor and support the contracts administrator, maintain compliance with procurement and finance procedures and legislation, provide commercial advice on contract issues, evaluate tender submissions, review of commercial reports.	
Communication & stakeholder Manager (30%)	Provide direction on community consultation, ensure the community consultation complies with WaterNSW objectives, oversee any project consultation, communication oversight of any incident or public issue, stakeholder communication advice	
Business Support Officer (30%)	Processing of invoices, amendment of purchase orders, staff travel arrangements to/from site and other administrative tasks.	
Project Support Officer	Project administration support and coordination.	Not provided
Procurement	Managing the procurement process including preparation of tender documents, evaluation of tenders, tender recommendation reports, including the D&C contract and IV contract.	Not provided
Environment / land acquisition	Advising and coordinating environmental approvals and land access agreements, communicating with landholders, negotiating construction licenses with	Not provided

Table 18 Breakdown of internal WaterNSW staff inputs over the planning stage



	landowners, reinstatement of properties on completion of works.	
Design support	Technical overview of GHD preparing performance specification for request for tender, provide technical review of detail design to ensure it meets WNSW requirements	
Legal support	Provide legal advice to the WaterNSW PDT on all matters related to the agreements (including contract interpretation and claims management).	
Environmental Adviser		
Manager Economic Regulation	Participation in tender process (e.g. advice on form of contracts, evaluation stage)	
Miscellaneous	Overall achievement of the project objectives	Not provided

5.7.8 Design and Construction Management (GHD)

We asked WaterNSW how the \$3.5M of Design and Construction Management costs differed to the costs incurred as part of the D&C Contract and the costs incurred by WaterNSW as part of the planning stage (i.e. Consultants/Design Planning - \$2,749,199). WaterNSW's responded as follows:

During planning stage

GHD was responsible for the following design works: (1) Review of current information and finalise new concept designs (2) Development of request for tender and evaluation of tenders (relating to the pipeline's D&C Contract) (3) Environmental planning approvals. We do not consider that these activities duplicate any John Holland/MPC Joint Venture (JHMPC JV) planning-related costs.

During implementation stage

JHMPC JV was responsible for producing the detail design as part of its lump sum tender bid under the DBOM procurement model. By comparison, GHD was responsible for the following works:

- Review of John Holland JV detail design
- Design support during construction
- Construction site surveillance
- WHS & environmental audit
- Environmental planning approvals



- Final report
- Geotech & contamination survey
- HV route REF and Power REF
- HV route assessment and survey
- Concept options and MCA workshops Pooncarie water supply options
- AHIP logistics support
- Salvage support
- Field survey of hollow bearing trees.

Synergies concludes that this delineation of tasks between GHD and the JHMPC JV demonstrates that the functions of each design team were different and that duplication is unlikely.

5.7.9 WaterNSW Overheads

Overheads constitute operational and corporate costs that are not directly attributable to projects. Operational overheads include the cost of providing support services (IT infrastructure, IT technical support, finance and legal support, safety and environment support, etc). Corporate overheads comprise the office of the Chief Executive, corporate systems, regulatory strategy, and HR support.

The overheads assigned to a project should reflect only the increase in indirect operational costs and corporate costs incurred that are a direct result of proceeding with a project and that have not been directly costed to the project, nor that have been recovered through prices for other services.

WaterNSW has proposed a budgeted overhead amount of \$2,377,092 for capitalising into the RAB. We have been advised by WaterNSW that this has been calculated as a 10% mark up on its budgeted project management costs³² (internal staff, term employment contractors, and operational expenses) and 10% mark up on external costs over the implementation phase of the project³³ (excluding the cost of Independent Verification).

³² These costs sum to \$8,026,924

³³ These costs sum to \$15,743,999



We understand that an amount for overheads has also been incorporated in the proposed \$2,650,000 for WaterNSW's internal planning costs, but the overhead component of this budgeted expenditure has not been identified separately. Our focus is therefore on whether the \$2.4M of overhead associated with the implementation phase of the WBH Pipeline project is efficient.

It is prudent for a share of operational and corporate overheads to be allocated to this project. However, we had expected that WaterNSW would be able to demonstrate how it has drawn resources from its wider pool of corporate and indirect operating resources and allocated these overheads across its direct activities/inputs to the WBH Pipeline project using appropriate allocators/drivers. This level of transparency would enable us to make a full assessment of the proposed overhead amount and enable us to make a judgement on whether the proposed expenditure is efficient.

WaterNSW's simple approach of applying a 10% mark up to direct costs is arbitrary and inconsistent with the typical practice of using a full cost allocation methodology that identifies and uses appropriate drivers to allocate indirect costs to a project.³⁴ That being said, the proposed overhead amount for the project appears reasonable relative to benchmarks for a capital project of this size and complexity.

Synergies has applied a very high level, top-down assessment of whether WaterNSW's overhead costs are reasonable. Based on experience, external costs would be expected to attract only a small corporate overhead of say 5%, while internal resources might attract up to 100% (an upper bound limit). If these rates were adopted, then the actual overheads should not exceed \$5.9M. This calculation is shown in Table 19 below.³⁵ We have also done a calculation based on a lower overhead rate of 30% for internal direct costs. This results in an overhead of \$3.0M.

External costs	Cost (\$)	Overhead (5% mark-up on direct cost)
External contracts – planning stage	11,785,000	589,250

Table 19Overhead rates

³⁴ WaterNSW has advised Synergies that is has used a cost allocation model for calculating its 'actual' overhead amount but is unable to provide the model to Synergies as it is currently in draft form and is pending approval from the Executive Team.

³⁵ In this worked example, we have included a number of items in the external cost base that were not included in WaterNSW's proposal (for the purpose of calculating their proposed overhead). This includes the direct cost of external contractors engaged during the planning phase and the Independent Verification contract. We have also classified term employment contractors as an external cost and thus attracting a lower overhead compared to full employees of WaterNSW.



External costs	Cost (\$)	Overhead (5% mark-up on direct cost)
External contracts – implementation stage	20,271,675	1,013,584
Term employment contractors – project management	3,977,617	198,881
Subtotal	36,034,292	1,801,715
Internal costs	Cost (\$)	Overhead (100% mark-up on direct cost)
Project management – WaterNSW internal staff	2,076,333	2,076,333
Project management – WaterNSW operational expenses	1,972974	1,972,974
Subtotal	4,049,307	4,049,307
TOTAL	40,083,599	5,851,022

The range of \$3.0M to \$5.9M suggests that WaterNSW's overhead amount of \$2,377,092 is not excessive but it is not possible to express a firm view on the reasonableness of the budgeted overhead expenditure with the information at hand.

The benchmarking of overheads is not straightforward. Whilst the definition of an indirect cost (or overhead) is widely accepted, in practice:

- every project is different in terms of:
 - the mix of materials, labour, internal and external sourcing
 - the overhead intensity associated with each of these inputs
- every business is different in terms of its approach to allocating cost directly to project cost items as opposed to overhead.

In order to thoroughly benchmark these costs a detailed cost driver analysis should be undertaken. It is most likely that efficient overhead will be influenced by the total project value, reliance on internal resources and project complexity. Factors specific to the WBH include:

- the top-down assessment of total Owner Cost (of which overheads are one element) shows that Owner Costs comprise 24% of construction value, which lies within the typical range for water pipeline projects (that is, if overheads were excessive, we would have expected this ratio to be out of range);
- the WBH Pipeline project has characteristics that lend itself to requiring a relatively high level of corporate overhead input i.e. it has a high public profile, many



interested stakeholders, it was required to be built quickly and is located in a remote location; and

based on our assessment of the material WaterNSW has provided, WaterNSW appears to have allocated a relatively high proportion of internal costs to project-specific cost categories (e.g. management and planning) where these costs are causally but indirectly connected to the WBH Pipeline. An alternative approach (which would tend to increase overhead allowances) would be to treat these indirect costs as overheads.

In summary, it is not feasible to express a firm view on the reasonableness of the budgeted overhead expenditure. Nevertheless, our preliminary view, based on the values calculated using above overhead ratios and the information we have at hand, is that it is feasible that the budgeted overhead of \$2.4M is sufficiently low that it is unlikely to be materially excessive.

5.7.10 Distributed Costs – Contingency

We note that the full amount of the project contingency has not been expended. The WaterNSW Pricing Proposal states that the status with respect to any residual contingency will be updated prior to the Final Determination (refer Section 10.3 of Pricing Proposal).

Prudency and efficiency assessment

The inclusion of a contingency is standard practice for major construction projects and is considered prudent.

The contingency sum WaterNSW presents in its Pricing Proposal was derived by external specialist advisers who undertook a risk-based assessment to arrive at a risk-adjusted contingency sum. This process of deriving the contingency sum is considered to be efficient.

We also consider that WaterNSW's intention to provide an update of the contingency value at project completion is appropriate. Only the final value of the contingency should be assessed for the purpose of determining whether the final value should be incorporated in the initial RAB value for the WBH Pipeline.



5.8 Customer offtake capital costs

WaterNSW's Pricing Proposal indicates that the cost of the initial three offtakes will be \$89,000, which includes an asset component of \$83,333 per offtake, plus WaterNSW's financing costs for all three offtakes of \$17,000.³⁶ In response to a question we submitted to WaterNSW, it advised that the individual offtake asset cost of \$83,333 is sourced from the detailed budget costings underpinning the D&C Contract.

In contrast, the O&M Contract provides that any further offtakes that are constructed once the pipeline is operational will be treated as a contract variation and costed at \$77,319 per offtake.

While the misalignment in the offtake costs in the D&C and O&M Contracts is somewhat surprising given John Holland is a party to both contracts, we consider the cost range of \$77,319 – \$83,333 for individual offtakes to be reasonable given our industry knowledge. However, IPART has requested that we provide further substantiation on the efficient cost for an offtake on the WBH Pipeline.

Synergies secured two independent, bottom-up assessments of the cost of a farm offtake given the known design specifications set out in WaterNSW's Pricing Proposal (i.e. Figure 7 of the proposal and Section 5.4) and information contained in the tender documentation for the D&C contract. However, since the design specifications in the tender documentation lack definition, the costs prepared by the assessors represent "concept level" estimates (reflecting the detail of the information provided) and should be interpreted as having an accuracy range of +/-30% to +/-50%.

Further, owing to the lack of definition around design, several assumptions were made around the construction details, as follows:

- assumed that all valves contained in a reinforced concrete chamber complete with a lid;
- chamber dimensions taken as 3m long x 1.5m wide x 1.0m deep; and
- overall length from stub flange off the main pipeline to the flange for the customer connection is nominally 5 metres (and the 3m long chamber is within this overall 5m length).

³⁶ WaterNSW (2018), Pricing Proposal to the Independent Pricing and Regulatory Tribunal, Regulated Prices for the Wentworth to Broken Hill, p 55



The results of these assessments are presented in Table 20 below. Both costings have been developed on the basis of a 'stand alone' contract, as opposed to being built as part of a larger contract for the entire pipeline project.

Assessment 1	\$ cost per offtake
Material cost	59,200
Construction & installation	27,500
Preliminaries/indirect costs (15%)	13,000
Subtotal	99,700
Contingency (35%)	34,900
TOTAL	134,600
Assessment 2	
Supply and installation	65,000
Overheads/indirect costs (35%)	22,750
Subtotal	87,750
Contingency (7.5%)	6,581
TOTAL	94,331

Table 20 Independent assessments of farm offtake construction costs

The independent assessments produce cost estimates, before contingency, that lie in the range of \$87,000 to \$100,000. This lends support to WaterNSW's budgeted cost for the offtakes and suggests that the costs are within an efficient range. Indeed, the costs appear to be on the low side, particularly if contingencies are allowed for.

Assessment 1 makes allowance for a 35% contingency, reflecting the inherent uncertainty around design specifications. This increases the total cost of a farm offtake to \$134,600. Assessment 2 adopts a lower contingency of just 7.5% - as assessor 2 based their analysis on a known design scope (as per assumptions above), and thus only allowed for residual uncertainty for uncontrollable/unforeseen factors. If we apply the same 7.5% contingency to Assessment 1, the total cost of an offtake becomes \$107,178.

5.8.1 Land acquisition offset

WaterNSW's Pricing Proposal notes that one customer will receive access to one of the initial offtakes without being required to make the \$89,000 capital charge for an initial offtake. This forms part of a land acquisition agreement with WaterNSW associated with the siting of the WBH Pipeline's bulk water storage facility.³⁷

³⁷ WaterNSW (2018), Pricing Proposal to the Independent Pricing and Regulatory Tribunal, Regulated Prices for the Wentworth to Broken Hill, p 31



In response to a question, WaterNSW advised us that it chose to negotiate this land agreement with the relevant landholder rather than use its compulsory land acquisition powers.

We assess the prudency and efficiency of the bulk water storage facility in section 4.3.2 and 4.3.3 and have no concerns regarding its location in terms of the pipeline scheme. Ultimately, the location of this facility was a matter for the John Holland/MPC Group JV as part of its design of the pipeline. WaterNSW's role was to facilitate the acquisition of the required land.

The only issue of concern that we can see regarding this land agreement, which has also been raised by IPART, is its lack of transparency and underlying cost. To address this concern, WaterNSW provided Synergies with an expert compensation report prepared by JLL that it has commissioned, which establishes an estimate of the appropriate value of compensation for the landholder associated with the land acquisition. This includes values for the land that has been acquired, associated disturbance associated with the construction of the bulk water storage facility on the land and decrease in value of the land adjoining the acquired land due to the existence of the storage facility. In providing this report, WaterNSW also advised that the land acquisition arrangement is still subject to commercial negotiation between WaterNSW and the landholder.

Based on the additional information provided by WaterNSW, we are satisfied regarding the size of the underlying land acquisition costs and consider that this is appropriately a matter to be resolved between WaterNSW and the landholder, with no adverse implications for future users of the WBH Pipeline.

In addition, there are wider aspects of this voluntary and commercial arrangement that support it being accepted as efficient expenditure. A non-compliant landholder would have considerable leverage in its negotiations over land compensation, particularly given the tight timeframe for completion of the WBH Pipeline project, as required by the Ministerial Direction. Complying with the Ministerial Direction placed a premium on the time that WaterNSW had in acquiring all relevant land, including for the bulk water storage facility. Accordingly, reaching a swift agreement with the relevant landholder benefitted the project both in terms of avoiding delay to the pipeline construction process which would otherwise have been a material risk factor for the project. Moreover, the arrangement avoided the transactions costs involved in pursuing compulsory acquisition processes.

Accordingly, the benefits the project secured through the offtake arrangement, both in terms of the avoided cost of compulsory acquisition, and more importantly, averting



delays to WaterNSW acquiring all necessary land quickly given the project's tight timeframe, we consider its actions to have been prudent and efficient.

5.9 Financing costs

Financing costs (often referred to as interest during construction (IDC)) refer to the financing charges incurred during the creation or acquisition of assets such as property, plant, and equipment. It is the interest expense that is incurred during the period before when the asset begins to produce revenue. Such financing charges are capitalised into the asset's capital base.

In a regulatory context, any such financing charges should be assessed to be prudent and efficient before incorporation into the RAB value.

5.9.1 WaterNSW's approach³⁸

WaterNSW has calculated the financing costs it has incurred during the planning and construction phases of the WBH Pipeline project by applying the IPART-approved real post tax WACC to a monthly expenditure profile for the project provided by the John Holland JV (including an uplift for distributed costs).

WaterNSW argues the WACC is the appropriate rate by which to compute the financing costs, as it represents the sum of weighted average returns expected from the two types of financing arrangements that have been utilised for the WBH Pipeline – debt and equity.

It has applied the following WACCs to calculate the financing costs of the pipeline:

- real post tax WACC of 4.5% for costs incurred from August 2017 through to mid-January 2018 based on IPART's August WACC 2017 update; and
- real post tax WACC of 4.3% for costs incurred from February 2018 through to mid-June 2019 based on IPART's February WACC 2018 update.

WaterNSW does not appear to have included any costs associated with raising the debt and equity funding required to finance construction of the pipeline, which serves to lower its claimed total financing costs.

³⁸ WaterNSW (2018), Pricing Proposal to the Independent Pricing and Regulatory Tribunal, Regulated Prices for the Wentworth to Broken Hill, p 54



The resulting proposed financing costs for the WBH Pipeline to be incorporated in the opening RAB value are as follows:³⁹

- 2017/18 \$4,351,000
- 2018/19 \$17,681,000.

5.9.2 Synergies' assessment

Financing costs (often called interest during construction (IDC)) are the economic costs borne by an infrastructure owner during the construction phase of a new major infrastructure asset, where the owner only begins to secure a return on the investment after the construction period ends.

The financing cost is the opportunity cost to the infrastructure owner of investing funds over the construction period when no return is received on the invested funds, being the return it could expect to earn from making an alternative investment. It is therefore part of the full economic cost of constructing the asset to provide the service.

Hence, we consider the incurrence of financing costs in the design and construction of the WBH Pipeline to be prudent expenditure. The efficiency of WaterNSW's proposed financing costs will depend on the way in which this expenditure has been estimated, which will reflect the following factors:

- the length of the construction period for the accrual of financing costs, recognising the compounding nature of the calculation;
- the monthly distribution of the cash outlays throughout the construction period; and
- the WACC value(s) applied.

Each of these factors is addressed below:

Length of construction period

WaterNSW has calculated its financing costs over the period from August 2017 to June 2019, which covers the planning and construction project phases. Around 20% of the financing costs were incurred in 2017/18 and the remainder is expected to be incurred

³⁹ In addition, there are separate financing costs associated with the installation of three offtakes of \$3,000 in 2017/18 and \$17,000 in 2018/19.



in 2018/19. This profile of expenditure appears reasonable given the WBH Pipeline's project timeline, including the commencement of construction in January 2018.

Monthly expenditure profile

WaterNSW indicates that its financing costs were calculated based on a monthly cash outflows profile. We consider this level of granularity of cash outflows to be reasonable from an accounting perspective and likely to be broadly representative of cash outflows for a construction project. We see no reason for a more granular expenditure profile (eg weekly).

WACC values applied

We consider WaterNSW's use of the IPART-approved WACCs to estimate its financing costs to be appropriate. This is consistent with Australian regulatory precedent.

WaterNSW has applied two different post tax real WACC values over the period from August 2017 to June 2019, aligned to IPART's August 2017 and February 2018 WACC Updates. This approach assumes that the cost of debt and equity funding for the project changed marginally over the construction period (including due to market sensitive WACC parameters, such as the risk free rate and debt margin).

An alternative to applying two different WACCs over the WBH Pipeline's construction period would be to use a single WACC estimate determined at the date of the first major drawdown of cash outlays for the project. This approach assumes that the required total amount of funding for the project is committed at its commencement at a fixed WACC.

We consider either approach to be reasonable in the context of the WBH Pipeline. Further the difference between the two WACC estimates that WaterNSW has applied over the construction is not material (0.2 percentage points). Consequently, we see no reason to reject WaterNSW's approach.

However, we have some concerns about the use of real post tax WACC estimates in the estimation of WaterNSW's financing costs. In our view, the cash outlays on the project will have been incurred in nominal dollar not real dollar terms. Hence, unless WaterNSW has converted the monthly cash outlays into real dollars, it should apply a nominal WACC in estimating financing costs. It is not clear from WaterNSW's Pricing Proposal whether this is the case or not. In other words, the cash outlays and WACC need to be aligned in either real or nominal dollar terms.

We consider the use of a post-tax WACC estimate to be appropriate given financial markets generate returns which are post-tax in nature and WaterNSW's required rate of



return for all its investments, including the WBH Pipeline, is expressed in post-tax rather than pre-tax terms.

Conclusion

Synergies considers that the underlying assumptions used by WaterNSW for its financing cost estimates for the WBH Pipeline are prudent, subject to confirmation that it has matched in dollar terms its monthly cash outlays and WACC estimates.

Synergies has not reviewed WaterNSW's monthly financing cost calculations to ensure correct application of the underlying assumptions. We recommend that IPART undertake this review.

5.10 Asset lives

Our TOR for this expenditure review require that we review the appropriateness of asset lives that WaterNSW has used to calculate regulatory depreciation in its Pricing Proposal and recommend adjustments if appropriate.

5.10.1 WaterNSW's proposed asset lives

In its Pricing Proposal, WaterNSW has proposed a single asset life of 80 years for the WBH Pipeline. This is at odds with the tender design report, which adopts a 100 year life for the pipes.⁴⁰ In our view, the tender design specified a 100 year life for the purpose of guiding bidders, as opposed to setting out a preferred asset life for the purpose of an initial regulatory asset base value to be used for pricing purposes. Our assessment that follows is therefore based on the appropriateness of WaterNSW's proposed 80 year asset life for all WBH Pipeline assets, and whether an 80 year life for the pipe itself is appropriate.

WaterNSW advances that its proposed adoption of an 80 year life for all assets is based on regulatory precedent observed in IPART/ACCC rural valley determinations. It considers the WBH Pipeline to be a rural valley asset.

WaterNSW has advised that its proposed method of assigning a single economic life to the pipeline should be compared with the practices of water authorities/regulators in other states of Australia, as per the analysis in a referenced Deloitte Access Economics

⁴⁰ Murray to Broken Hill Pipeline, Tender Design Report, table 4-2, page 14



(DAE) report.⁴¹ It should also be compared to the ATO's ruling on the assignment of an economic asset life for tax purposes.

5.10.2 Synergies' assessment

We do not consider that an asset life of 80 years is appropriate for all asset classes associated with the WBH Pipeline. This is because the pipeline has several major asset classes with widely different asset lives, including the pipeline itself, pumping stations, supervisory control and data acquisition (SCADA) system and bulk water storage facility.

To apply a single asset life of 80 years across all these major asset classes will mean that certain assets with relatively short lives will continue to be depreciated long after they have been replaced.

There may be circumstances where such deferral of depreciation can be justified on economic grounds, including if a new asset is expected to be under-utilised in its early years with demand for its services growing over time. In such a situation, deferral of depreciation means that the return of capital of the asset can be shared more equitably between current and future users compared to a more rapid capital return, which would be borne primarily by current users. However, this is not the situation facing the WBH Pipeline, which we consider will be fully utilised from its operational commencement.

Given WaterNSW's advice, we reviewed the DAE report that it referenced. This report compared the asset classes and associated asset lives proposed by the then State Water (now WaterNSW) with similar asset classes of different water service providers, as approved by economic regulators, including IPART and the ACCC.

DAE also indicated that its proposed asset lives had strong regard to the median asset life used by the other water service providers and with the effective lives of depreciating assets recommended by the ATO. DAE's proposed asset lives for WaterNSW and accepted by the ACCC are presented in Table 21.

Table 21	Asset	lives	for	WaterNSW

Asset class	Asset life
Dams	100
Other Storages	80
Meters	15

⁴¹ Deloitte Access Economics (2013), Final report - asset lives for State Water's 2014 pricing proposal, For the Australian Competition and Consumer Commission, December



Asset class	Asset life
IT systems	6
Vehicles	5
Buildings	60
Office equipment	10
Plant and machinery	25
Pipelines	80

Source: Deloitte Access Economics

In light of the above factors, we do not consider that a single asset life of 80 years is appropriate or consistent with Australian water regulatory practice. Rather, we consider that depreciation of the WBH Pipeline should be based on the asset classes and associated asset lives presented in Table 22.

Asset class	Asset life				
Pipeline	80				
Bulk water storage facility	80				
Buildings	60				
Plant and machinery (including pumping stations and river intake)	25				

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Based on WaterNSW's detailed breakdown of D&C Contract costs, the pipe, pumping stations, bulk water storage facility and building assets are the most significant asset classes.

As discussed in section 5.6 of our report, the Project and Construction Management cost item accounts for around **Construction** of the WBH Pipeline's lump sum value (\$329). This value will need to be allocated across the major asset classes.

The meters and vehicle asset classes previously utilised in the DAE report have not been identified under the D&C Contract. The office equipment asset class is also very difficult to identify in the cost breakdown.

An indicative asset breakdown to show the relative sizes of the major asset classes by dollar value and percentage of the total D&C Contract value, including the allocation of the project and management costs across the assets, is as follows:

- Pipeline –
- Plant and Machinery, including pumping stations (but excluding associated buildings) –



- Bulk Water Storage Facility –
- Buildings ⁴²

The project and management cost allocator we have used is the percentage of each individual major asset class value as a proportion of the total D&C Contract value (Separable Portion 1 only) excluding project and management costs.

Once greater certainty is known regarding WaterNSW's final Distributed Costs and contingency costs, these should be added to the major asset class values, with indexation also applied. WaterNSW's Pricing Proposal indicates that it will provide IPART with an update of actual contract variations and residual contingency costs closer to the finalisation of IPART's 2019 Determination.

5.11 Forecast capex for the 2019 Determination

WaterNSW's Pricing Proposal identifies two forecast capex items for the 2019 Determination:

- asset replacement costs as part of the general ongoing maintenance of the assets, which consists mainly of highway turnout points, bulk storage cell and batteries ('around' \$54,000 in \$2018-19) this cost is sourced from the O&M Contract; and
- cost of land acquisition ('around' \$500,000 in \$2018-19).

5.11.1 Prudency and efficiency assessment

The newness of the WBH Pipeline should minimise the need for capex in the early years of its life. WaterNSW's capex forecast for the 2019 Determination period is consistent with this view.

WaterNSW has advised that the land/easements are still to be acquired and will allow it to access the pipeline for operational and maintenance purposes once operational. We consider this land acquisition to be necessary and prudent action.

The underlying assumption for its forecast land acquisition cost is 5 lots at \$100,000 per lot, reflecting assumptions about the number of impacted properties, type of acquisition (easement or acquisition), size of lot and location. WaterNSW has indicated that it

⁴² These asset class components, including the allocated Project and Construction Management costs, plus D&C Contract variations, sum to \$330,051,993.



intended to either acquire easements for the pipeline or purchase the land, so that its rights are registered on title. It has indicated a preference to enter into agreements with landholders for the purchase or grant of easements.⁴³

Based on our industry knowledge and understanding of land values along the WBH Pipeline, we consider WaterNSW's forecast capex for the 2019 Determination period to be efficient.

5.12 Prudency and efficiency summary

Our assessment of the prudency and efficiency of the expenditure that will underpin the initial RAB value of the WBH Pipeline is summarised in Table 23 below.

Category	Prudent	Efficient	Comments		
RAB value					
D&C Contract	Yes	Yes	Prudency – Ministerial Directive issued requiring WNSW to undertake the project Efficiency – key components of the WBH Pipeline have had significant options assessments undertaken. Top down benchmarking of the total pipeline cost indicates that the D&C Contract price is efficient, reflecting WaterNSW's competitive procurement process for the pipeline's design and construction.		
Intake for pipeline	Yes	Yes	Prudency – the intake on the Murray River is a required system component Efficiency – the process for choosing the intake point for the pipeline was efficient.		
Bulk Water Storage Location	Yes	Yes	Prudency – the Bulk Water Storage is a required system component Efficiency – multiple locations were considered, and in addition the contractor had flexibility to configure the facility		
Pipeline and Bulk Water Storage Sizing	Yes	Yes	Prudency – the pipeline and Bulk Water Storage are required system components Efficiency – considerable optimisation undertaken by the contractor during the tendering period to identify their most cost effective solution		
Transfer Pump Stations	Yes	Yes	Prudency – the transfer pump stations are required system components. Efficiency – location of pump stations not assessed due to potentially adverse impacts on contract completion date. Optimising by the contractor resulted in the elimination of one transfer pump station resulting in a significant cost saving.		

Table 23 Forecast capex prudency and efficiency summary

⁴³ WaterNSW (2018), Pricing Proposal to the Independent Pricing and Regulatory Tribunal, Regulated Prices for the Wentworth to Broken Hill, p 40



Category	Prudent	Efficient	Comments
Water Quality	Yes	Yes	Prudency – water quality was a key requirement to address. Efficiency – options were assessed for addressing potentially adverse water quality impacts. A key decision was to apply a seal coating to the internal lining of the pipe to minimise cement leaching. The assessment of water quality considerations led to the decision that a water conditioning plant was not required.
Customer offtakes	Yes	Yes	Prudency – the inclusion of offtakes is not an essential requirement for the pipeline design and construction. However, inclusion of the offtakes is considered to provide a beneficial community outcome providing that water supply to Broken Hill is not adversely affected. This has been addressed. Efficiency – a process of community engagement was undertaken followed by discussions with potential customers. Costs associated with the offtakes are not included in the revenue requirement.
Distributed Costs – Independent Verifier	Yes	Yes	Prudency – establishment of independent verifier role for the project reflects good procurement practice and amongst other things, is likely to have facilitated tight timeframes being met during the construction phase of the project. Efficiency – we consider this expenditure is efficient based on a competitive tender process.
Distributed Costs – Direct Project Costs (planning)	Yes	No	Prudency – WaterNSW as purchaser of the D&C and O&M Contracts from the engineering construction market, was required to undertake significant up-front work establishing an efficient procurement process, working closely with tenderers during the intensive procurement phase and subsequently with the preferred tenderer finalising D&C issues. Efficiency – we consider most of this expenditure is efficient, subject to minor adjustment to internal costs to reflect reported October 2018 cost data, which is moderately under-budget. WaterNSW's actual expenditure on planning as at the
			end of October 2018 was \$13,186,635 (compared to a budgeted expenditure of \$14,500,000). WaterNSW has advised that planning activities had largely ceased by the end of October 2017. We therefore recommend the reported actual expenditure (after adjusting to 2018-19 dollars) to be the efficient amount for capitalising into the RAB.
Distributed Costs – External Contract Costs	Yes	Yes	Prudency – all external cost categories have been assessed to be required for a project of this type and consequently assessed to be prudent. Efficiency – we consider this expenditure is efficient based on a series of competitive tender processes used to engage external contractors and our benchmarking of a sample of cost items.
Distributed Costs – Internal Water NSW Costs	Yes	Yes	Prudency – it was prudent for WaterNSW to closely manage the project given its size and strategic importance to the State, reflected by the Government Directions. Efficiency – assessed as reasonable/not excessive based on a very high-level benchmarking evaluation.



Category	Prudent	Efficient	Comments
Distributed Costs – Yes Contingency		Yes	Prudency – a contingency provision is conventional practice in major construction projects. A rigorous approach was taken to identifying, assessing and monitoring project risks, including a risk-adjusted final forecast cost estimate prepared by Advisian.
			Efficiency – the final contingency value will not be known until project completion. However, the P90 basis of the forecast contingency estimate, which is relatively small for the project size, and current expectation at a late stage in the project that the forecast contingency will not be exceeded, provide a preliminary indication that it is efficient.
Land acquisition	Yes	Yes	Prudency – WaterNSW has advised that the land/easements are to be acquired to allow it to access the pipeline for operational and maintenance purposes once it is constructed, which we consider is prudent. Efficiency – the land acquisition costs are efficient.



6 Assessment of Broken Hill Pipeline's forecast opex for the 2019 Determination period

The purpose of this chapter is to assess WaterNSW's forecast opex for the 2019 Determination.

Reflecting the atypical nature of this expenditure review, we have assessed several historical cost categories associated with the new pipeline build that could be classified as opex but that WaterNSW has proposed to capitalise into the RAB (we assessed those cost categories in Chapter 5 of our report). This chapter assesses the balance of opex.

6.1 **IPART Issues Paper questions**

IPART raised several questions regarding the prudency and efficiency of WaterNSW's as follows:

Q7. Is WaterNSW's proposed expenditure on operation and maintenance of the Pipeline, under its operating and maintenance (O&M) contract terms, efficient?

Q8. Is WaterNSW's proposed expenditure on corporate overheads to operate the Pipeline efficient?

Q9. Is WaterNSW's proposed expenditure on special purpose vehicle (SPV) contract and audit costs to fulfil the statutory requirements efficient?

Q10. Are there other considerations we should take into account when determining the prudent and efficient costs of operating the Pipeline?

We have addressed these questions in our prudency and efficiency assessment of WaterNSW's forecast opex for the 2019 Determination period.

6.2 WaterNSW's proposal

WaterNSW has proposed average annual forecast opex of \$5.036 million for the 2019 Determination period.

Forecast opex for the WBH pipeline is primarily comprised of:

- the cost of electricity for the pumps to propel the water up the pipeline (50%) to the bulk water storage facility;
- fixed operation and maintenance costs incurred under the O&M Contract (32%); and



• corporate labour and overhead costs associated with the SPV and WaterNSW.

Table 24 presents WaterNSW's forecasts for the four year period from 2019/20 to 2022/23.

Cost category	2019/20	2020/21	2021/22	2022/23	Total	Average
Operations & maintenance (direct)	1,595.7	1,597.2	1,586.8	1,585.3	6,365.0	1,591.2
Asset replacement	284.0	1,138.0	284.0	0.0	1,707.0	427.0
Electricity	2,706.2	2,587.6	2,331.0	2,514.7	10,139.6	2,534.9
SPV audit	100.0	100.0	100.0	100.0	400.0	100.0
SPV contact management	220.0	220.0	220.0	220.0	880.0	220.0
Insurance & land tax	131.4	131.4	131.4	131.4	525.7	131.4
SPV overhead	475.4	463.7	437.0	455.1	1,831.2	457.8
Total	5,229.0	5,101.1	4,806.5	5,006.5	20,143.1	5,035.8

Table 24 Forecast opex (\$2018/19, \$000)

Source: WaterNSW

6.3 Overview of the WBH Pipeline operational & maintenance regime

The direct operations and maintenance costs associated with the WBH Pipeline are to be provided solely by the John Holland/Trility JV under a contractual arrangement with WaterNSW (the O&M Contract).

6.3.1 Scope of the O&M Contract

The O&M Contract that has been awarded to the John Holland/Trility JV is for the operation and maintenance of Separable Portion 1 from the D&C contract, i.e. the WBH Pipeline from the Murray River intake to the Broken Hill Delivery Point, which is a point on the outlet pipeline from the Bulk Storage facility.

The O&M Contract's term comprises an initial 10-year period as well as options, for WaterNSW, to extend the O&M contract for up to two consecutive periods of 5 years after the initial period expires (i.e. 10+5+5).

This term structure is noted by WaterNSW as providing the following advantages over shorter term alternatives:



- shorter O&M terms typically have reduced maintenance and lifecycle obligations relative to longer terms and therefore weaken the incentive for the contractor to design and build an asset which minimises whole of life costs;
- a longer O&M term increases the aggregate value of the O&M contract and therefore is likely to attract greater market appetite and competition;
- the longer the total term of the contract, the greater price certainty WaterNSW will have (where the price is locked in at a time where competition is greatest, i.e. during the tender for the DBOM contract)
- a longer initial O&M term provides operators with a greater time period over which to recover their bid costs and the longer total term (taking into consideration the optional extensions) means that any re-tender costs associated with the contract are deferred for longer for both parties involved.

6.3.2 Operations & maintenance activities

The operation and maintenance activities comprise the routine operation and servicing of the components that make up the WBH Pipeline including

- Murray River Intake System: which includes mechanical, electrical, and controls components associated with the inlet screens, including the compressed air backwash system and the River Pump Station.
- Transfer Pump Stations: which includes mechanical, electrical, and controls components associated with these pumping installations.
- Pipeline: which primarily includes air valves, scour valves, isolation valves and the cathodic protection system.
- Bulk Water Storage: includes minor aeration equipment and valves.

The broader operation and maintenance responsibilities of the John Holland/Trility JV include:

- developing, implementing and maintaining a Water Quality Management Plan, such as temperature, PH, and salinity;
- developing, implementing and maintaining an Incident Management Plan in line with WaterNSW's requirements;



- developing, implementing and maintaining management plans covering project operations and maintenance requirements for health, safety, environment and quality;
- monthly reporting requirements providing sufficient detail for WaterNSW to assess performance and compliance with the requirements of the contract, in line with WaterNSW's Operating Licence;
 - the reporting requirements are extensive and include quantity, quality, volumes, energy usage, hydraulic performance, asset management, incident reporting, KPI reporting, fuel usage;
- communications and day-to-day operational issues, including direct communication with Essential Water and billing WaterNSW in accordance with the O&M contract;
- asset management and maintenance, developing, implementing and maintaining an asset management system and asset data requirements, planned/routine maintenance, reactive and unplanned maintenance and other general maintenance services;
- meeting Water NSWs operational performance requirements including:
 - ensuring specified system availability and meeting return-to-service periods
 - meeting operational demand forecasts provided by Essential Water
 - meeting water quality thresholds at the specified interfaces
 - meeting defined safety and environmental performance indicators
 - continuous monitoring of system performance efficiency and ongoing corrective action if performance does not meet requirements
 - continuous monitoring of system leakage or losses and ongoing corrective action if performance does not meet requirements.
- maintaining the water supply system including:
 - regular maintenance and checks to minimise rates of equipment/component failures, particularly unplanned failures that will impact on the ongoing system availability;
 - scheduled replacement of equipment;
 - reactive maintenance and replacement within specified return-to-service periods;



- regular checks on all equipment/components to ensure ongoing system availability;
- regular auditing of maintenance systems and processes to ensure maintenance activities are being carried out in accordance with an accredited maintenance management system; and
- recording of maintenance activities and associated costs to enable WaterNSW to demonstrate prudent and efficient maintenance management practises to relevant regulators;
- arranging for an annual independent audit in conjunction with WaterNSW, which
 must cover the following matters: financial payments, water volumes, water
 quality, health and safety, maintenance, asset management and other matters as
 required under the O&M contract.

With respect to water quality, the approach arising from the design provides for:

- no chemical dosing of any kind;
- use of a seal coat on the interior of the pipeline to enhance asset life and prevent any pH impacts from cement lining leaching and calcium carbonate precipitation potential; and
- use of a passive system to ensure algae management and dissolved oxygen parameters are met during typical operation, and mechanical aeration systems utilised throughout atypical water quality events to ensure superior whole-of-life outcomes.

To meet the delivered water quality requirements for dissolved oxygen in the bulk water storage, aeration and mixing will be implemented at the inlet to the bulk water storage. Aeration of inflows and mixing in each storage cell will:

- dissolve sufficient oxygen into the water to overcome dissolved oxygen depletion in the source water and mitigate risks of further depletion with at least 3.5 days detention in the pipeline (the minimum time it will take for water to be conveyed from the Murray River to the bulk water storage);
- prevent potential stagnant areas forming in the bulk water storage and reduce short circuiting; and
- reduce the risks associated with potential storage stratification in calm weather.



It may also assist in stripping volatile compounds from the water before it enters the bulk water storage facility, which provides some additional operational flexibility in managing water quality.

The design includes nine pigging facilities along the pipeline to enable effective and environmentally acceptable removal of biofilm growth and sediments. There is some potential for relatively small volumes of solids to settle in the balancing tanks at each pump station and therefore provision has been made to safely access and clean the tanks.

6.4 Assessment of forecast opex for 2019 Determination period

6.4.1 Operations and maintenance / O&M Components

Operation and maintenance fixed cost

WaterNSW has proposed average annual forecast direct operations and maintenance costs of \$1.591 million for the 2019 Determination.

These forecast costs are associated with the O&M Contract between WaterNSW and the John Holland/Trility JV and reflect the outcome of the procurement process discussed in Chapter 3 of our report.

Prudency and efficiency assessment

The requirement for a core team to provide the necessary operations and management input is a requirement of the pipeline system and is prudent.

Further to our view that the procurement process for the WBH Pipeline was prudent and efficient, we consider that the competitive tension it generated has resulted in direct operations and maintenance costs for the pipeline that are largely efficient, subject to our recommendations on the efficient energy demand of the Pipeline and ongoing overhead costs.

Asset replacement

The O&M Contract has an asset replacement plan over 20 years built into it, including periodic refurbishments associated with the pipeline ancillaries (eg pump replacements, electrical equipment).

Details of our assessment are provided below.



6.4.2 Asset replacement

The process for asset maintenance and replacement is described in the Asset Management Plan (AMP) developed by the John Holland/Trility JV. This appears to be a comprehensive document and sets out methods that account for risk and whole-of-life cost in determining when to replace assets. The John Holland/Trility JV is required to implement and maintain an Asset Management Information System that complies with ISO55000.

Asset replacement cost forecasts for 20 years operation are included in the O&M Contract and are scheduled for the year in which the replacement occurs. This is a nominal amount of operating expenditure, which covers planned asset replacement reflecting the cost profile bid by the John Holland/Trility JV in its tender.

WaterNSW advises that over the O&M contract term, the John Holland/Trility JV will be paid based on the lower of actual asset replacement costs incurred and the cumulative asset replacement cost profile bid by the John Holland/Trility JV in its tender (adjusted for indexation). The WaterNSW Pricing Proposal states that this mechanism ensures that the John Holland/Trility JV is held accountable to its O&M bid price⁴⁴.

Prudency and efficiency assessment

The need for inclusion of an asset replacement mechanism in the O&M Contract is considered an essential requirement. We note that this is also consistent with sound and accepted engineering process for a contract of this nature.

However, we have some reservations about the approach for this item. We consider that the mechanism does not particularly incentivise the John Holland/Trility JV to strive to achieve lower replacement prices than have been included in the tender. We consider that a mechanism that provided a shared cost of savings would provide a better incentive.

The solution is considered prudent, but possibly not the most efficient mechanism that could have been put in place.

We consider the quantum of the forecast asset replacement costs for 2019 Determination period of an average annual cost of \$400 is efficient and reflective of the newness of the pipeline.

⁴⁴ WaterNSW (2018), Pricing Proposal to the Independent Pricing and Regulatory Tribunal, Regulated Prices for the Wentworth to Broken Hill, p75



6.4.3 Asset condition at end of O&M term

The Output Specification includes requirements relating to the hand-back at the end of the operating term. This includes providing records of the maintenance that has been undertaken and a requirement to provide a Handback Management Plan.

In addition, the Output Specification requires that the pipeline and associated facilities must have a residual life at the end of the term that meets the following requirements:

- For assets where the minimum design life extends more than five years past the end of the term, the assets must have a residual life equivalent to at least the remaining design life; and
- Other assets must have a residual life of at least five years.

Prudency and efficiency assessment:

The inclusion of specific end-of-term asset condition requirements is considered an essential requirement. We note that this is also consistent with sound and accepted engineering practice for a contract of this nature.

The inclusion of asset condition requirements that extend beyond the O&M Contract's term provides an incentive for the John Holland/Trility JV to efficiently manage the condition of the assets prior to hand-over and minimise WaterNSW's long-term operations and maintenance costs.

6.4.4 WaterNSW options for the end of an operating term

In the lead up to the end of year 10 and year 15 of the O&M Contract, WaterNSW will market test the existing O&M price and, if the existing price is considered to be above the market rate, WaterNSW has the following options under the O&M Contract:

- end the contract (i.e. do not extend the contract) and retender the O&M Contract; or
- negotiate with the John Holland/Trility JV to reduce prices in line with the market testing and then extend the contract based on the revised prices.

Both of the options above will result in a realignment of the O&M price with that of a competitive market price. The market testing and re-tender (if required) would be commenced in time to allow for a smooth transition between contract terms.



Alternatively, if the market testing indicates that the existing O&M prices are in line with the market or lower, WaterNSW can extend the contract on the existing prices contained in the O&M Contract.

In addition, at any time during the term, where WaterNSW determines that its current O&M price is above the market rate (via market testing or otherwise), it has the ability to terminate the O&M contract and re-tender. Given a decision to terminate, WaterNSW will be liable to pay for the John Holland/Trility JV's demobilisation and other reasonable and unavoidable costs it directly incurred as a result of termination and a pre-determined amount representing loss of opportunity and loss of profit of the John Holland/Trility JV.

Prudency and efficiency assessment:

The inclusion of a mechanism to market test the operations and maintenance cost is consistent with sound business practice under out-sourced asset management and operations contracts of this kind.

However, we have reservations with the mechanism proposed and consider that it may not represent an efficient approach. We consider that the market is unlikely to respond positively, especially in view of the significant cost of tendering, to a scenario whereby WaterNSW can negotiate with the John Holland/Trility JV in order to seek a lower price. We suggest that a more efficient mechanism would be to undertake an open tender process.

The solution is considered to be prudent but we have reservations regarding the efficiency of the mechanism that has been out in place.

6.4.5 Efficiency saving factor and efficiency sharing mechanism

Efficiency factor

Efficiency sharing mechanism

The O&M Contract also incorporates two separate mechanisms whereby any efficiency gains will be shared on a 50/50 basis between the JV and WaterNSW as follows:



- any benefits greater than \$100,000 realised from any discrete changes that improve the operating efficiency of the pipeline (the efficiency benefit sharing mechanism); and
- any energy cost savings realised by the John Holland Trility JV, calculated as contracted energy payments made by WaterNSW less actual energy costs incurred by John Holland Trility JV (the electricity saving sharing mechanism).

Under the Efficiency Benefit Sharing Scheme, the John Holland/Trility JV can propose an efficiency benefit initiative to WaterNSW for consideration. The O&M Contract establishes a detailed process for the preparation and consideration of efficiency initiatives. If an efficiency initiative proceeds and results in an actual saving (ie a financial benefit) then WaterNSW is entitled to receive 50% of the savings in accordance with the agreed mechanism for sharing.

In contrast, the energy efficiency mechanism will operate on an annual basis in a more formulaic manner.

Having regard to the achievement of any operational efficiencies during the O&M Contract term, WaterNSW makes the relevant point that:

the infrastructure is new and so the operational rhythm and demand for its services is untested and at this stage it is not possible to determine operational efficiencies of the infrastructure until it is in situ and operational for a number of years. This makes forward looking decisions early on in its operation undesirable.⁴⁵

Prudency and efficiency assessment

The inclusion of mechanisms both to impose and encourage efficiency gains is considered sound engineering practice and consistent with the intent of efficiency incentive schemes established by economic regulators.

However, the efficiency sharing factor of **1**% per annum will impose only a very modest downward effect on the WBH Pipeline's direct operations and maintenance costs over time.

In contrast, the efficiency sharing mechanism whereby the John Holland/Trility JV can propose an efficiency benefit in regards to the overall operation and maintenance costs

⁴⁵ WaterNSW (2018), Pricing Proposal to the Independent Pricing and Regulatory Tribunal, Regulated Prices for the Wentworth to Broken Hill, p 45


of the pipeline and subsequently share this with WaterNSW, could provide a relatively strong financial efficiency incentive for the John Holland/Trility JV.

The key issue that arises from this efficiency sharing mechanism is the way in which the benefits of any gains arising for it are shared with water consumers. This is because, in the absence of any efficiency gain sharing mechanism being applied to WaterNSW (by IPART), then any such efficiency gains will be retained by John Holland/Trility JV and WaterNSW for the contract term.

Given electricity costs are the single largest opex item for the WBH Pipeline (discussed in the next section of our report), we support the inclusion of the electricity cost sharing mechanism in relation to these costs in the O&M Contract. Effectively, this sharing mechanism will provide a 'true-up' for any difference between the payments that WaterNSW is required to make under the O&M Contract and the electricity costs actually incurred by the John Holland Trility JV. This reflects the fact that while the contractual payments WaterNSW will be making over the contract term are a function of what we have found to be a competitive tender process, as a new water pipeline there nevertheless remains some uncertainty about how it will operate, including its ongoing consumption of electricity.

Overall, we consider the above efficiency mechanisms have improved the character of the O&M Contract. For the 2019 Determination, given it is the first for a new pipeline constructed through a competitive tender process, we see merit in IPART establishing a an efficiency sharing mechanism applied to WaterNSW to ensure that any efficiencies arising under the contractual general efficiency sharing mechanism are shared between WaterNSW and its customers after a reasonable retention period to create sufficient incentive for WaterNSW to work with the John Holland Trility JV to identify operational efficiencies.

We also note that the existence of the efficiency mechanisms should not be taken to mean that the fixed O&M Contract price is inefficient. As discussed in section 5.4.1, we consider that the competitive tension associated with the procurement process for the O&M Contract has resulted in direct operations and maintenance costs for the pipeline



that are largely efficient, subject to our recommendations on the efficient energy demand of the Pipeline and ongoing overhead costs.

6.4.6 Shut-down, standby and restart payments

WaterNSW's pricing submission outlines the proposed shutdown, standby and restart payments that will apply for the WBH Pipeline. These proposed payments are set out in Table 25.

	Temporary (< 30 days)	Short term (30 to 90 days)	Long term (> 90 days)
Shutdown payment (per event)	\$1,142.66	\$2,302.03	\$11,962.43
Restart payment (per event)	\$571.33	\$1,151.02	\$10,222.32
Standby payment (per day)	\$4,241.63	\$4,149.72	\$4,056.76

 Table 25
 Shutdown, standby and restart charges to Essential Water (2018-19 \$)

Source: WaterNSW pricing submission, Table 36, page 88

We note that the daily standby payment ranges from \$4,056.76 to \$4,241.63 (depending on the duration of shutdown, with the higher daily payment being for a temporary shutdown lasting less than 30 days). We assess the proposed standby payments as being reasonable, as they are of a similar order of magnitude to the fixed operating and maintenance charge proposed under the O&M contract, which is \$4,372 per day (that is the annual O&M charge of \$1.596M divided by 365 days). It is to be expected that the contractor would require a sum equal (or near to equal) this amount while the pipeline is in standby mode so as to recover fixed O&M costs.⁴⁶

Given that we assess the annual O&M charge to be efficient, it follows that the proposed standby payments are also efficient (using the logic set out above).

The 'per event' shutdown and restart payments presented in Table 25 increase with duration of the shutdown period. It appears that the payments have been designed to serve as a penalty to discourage Essential Water from requesting a shutdown, particularly for long periods of time. Synergies has been unable to link these charges to the estimated costs of a shutdown or restart, but we regard the payments to be reasonable 'in principle' because the WBH Pipeline has been designed to operate continuously, so deviations from this mode will inevitably reduce the efficient use and operation of the Pipeline.

⁴⁶ The O&M Contract makes provision for a portion of the annual fixed O&M charge (minus the asset replacement costs) to be rebated to Essential Water in the event that the pipeline is in shutdown/standby mode. The size of the rebate is to be prorated based on the number of days in which the pipeline is in standby model. This ensures that Essential Water is not charged twice.



6.5 Electricity consumption

As noted in Chapter 1 of our report, as part of our expenditure review, we are required to assess and recommend the efficient volume of energy per year (MWh/year) for the WBH Pipeline over the 2019 Determination period.

However, the review of all other aspects of WaterNSW's forecast energy costs is subject to a separate concurrent expenditure review being undertaken for IPART.

6.5.1 Review methodology

Synergies, in partnership with Beca, have reviewed all documents and spreadsheets made available by WaterNSW that relate to their proposed energy requirements for the WBH Pipeline. We also reviewed the water demand forecasts (or load profile) for the Pipeline, upon which the energy requirements were calculated.

Our assessment involved the following steps:

- review all relevant documentation and record qualifications and assumptions
- identify the relevant electricity energy consuming assets
- examine and compare the water demand forecasts contained in documents from GHD and WaterNSW
- assess the efficiency of Water NSW's proposed variable energy demand (MWh per ML of water), as calculated by the Trility Demand Calculator (and cross checked against the estimates produced by IPART's energy demand calculator);
- assess the basis for the fixed electricity demand forecasts (i.e. energy required whether the pumps are running or not); and
- assess the efficiency of the total, annual energy demand volumes and the proposed peak electricity requirements.

The findings of this assessment are summarised below.

6.5.2 Identification of relevant assets

The energy consuming station assets identified for purposes of conveying the water to meet the sales volume and energy forecast consist of the following:

• River Murray Pump Station (RMPS) – the River Pump Station



- Wentworth Pump Station (WPS) Transfer Pump Station 1
- Silver City Pump Station (SCPS) Transfer Pump Station 3
- Bulk Water Storage (BWS)

Each of the above are contained in the provided Trility Demand Calculator spreadsheet.

6.5.3 GHD and WaterNSW water demand forecasts

Water demand forecasts for Broken Hill are an important variable as this 'load' on the pipeline will influence the total and peak energy requirements (and hence electricity expenditure) to operate the pumps.

Water NSW engaged GHD to make water consumption projections for the Pipeline. Two demand profiles were made, each of which used different scenario assumptions. The first projection was based on a 20-year history of data and results in a steady decline in demand, from a total of 5,162 ML in 2019 to a total of 4,152 ML in 2027.

The second projection (shown in Table 26) was based on a 10-year history of data and results in a moderate increase in demand, from a total of 6,284 ML in 2019 to a total of 6,723 ML in 2027. These projections include an assumed 400ML per annum for farm offtake consumption.

Consumption (ML per calendar year)	2019	2020	2021	2022	2023	2024	2025	2026	2027
Broken Hill	5,884	5,939	5,994	6,049	6,104	6,158	6,213	6,268	6,323
Offtakes	400	400	400	400	400	400	400	400	400
Total	6,284	6,339	6,394	6,449	6,504	6,558	6,613	6,668	6,723

 Table 26
 GHD Projected annual consumption met by the WBH Pipeline

Source: GHD Advisory, GHD Report for WaterNSW - Projection of water demand for the Broken Hill Pipeline Section 4.2.1 Table 5

WaterNSW considers GHD's second projection is the more likely trend due to the following:

- the lifting of a downward price effect on demand; and
- a return to more typical annual rainfall conditions (from the high rainfall periods of 2010-2011 to lower rainfall).

Both above factors will result in an increase in demand per domestic dwelling.

WaterNSW has taken GHD's forecast and made some minor changes:



- The linear regression of the historical data applied by GHD has been revised by WaterNSW such that the relationship now accounts for the variability of demand dependent on the weather conditions
- WaterNSW has reduced the farm offtake demand to 30ML (for the three offtake outlets), down from the 400ML assumed by GHD.

WaterNSW's revised forecast is provided in Table 27.

Table 27 Projected annual consumption met by the Broken Hill Pipeline – projected from 10-yr history (Water NSW)

Consumption (ML per calendar year)	2019	2020	2021	2022	2023	2024	2025	2026	2027
Broken Hill	5,650	5,700	5,750	5,800	5,850	5,899	5,949	5,999	6,049
Offtakes	30	30	30	30	30	30	30	30	30
Total	5,680	5,730	5,780	5,830	5,880	5,929	6,079	6,029	6,079

Source: WaterNSW; Murray to Broken Hill Pipeline Project – DBOM Contract Number: 05120E70 Revision E Volume 1 of 2 (Section 15.1.1 GHD Forecast Page 71)

The Contractor has made its energy demand calculations based on the load figures presented in Table 28, which appear in the Trility Calculation Spreadsheet.

Table 28	Trility Con	sumption	(ML pe	er calendar	year)
			(····		j j

Consumption (ML per calendar year)	2019-2020	2020-2021	2021-2022	2022-2023
Total	5,913	5,969	6,022	6,078

Source: D7 20180415 W2BH BWS outflow Energy kVA Demand Calculator V2_150418

IPART is presently reviewing the projected load profile of the pipeline and will present a final view on water demand forecasts in its Final Report.

6.5.4 Assessment of the Trility Demand Calculator

The model used by WaterNSW for determining its proposed energy requirements for a given load profile is the Trility Demand Calculator (an Excel-based energy demand model for the pipeline).

We reviewed the Trility Calculator to assess whether the inputs it uses align with contractual requirements. Further, we sought to understand how the Trility Calculator has modelled the underlying relationship between water transported and energy usage.



We found that the initial version of the Trility Calculator supplied by WaterNSW⁴⁷ does not contain details of how the underlying relationship between water transported and energy usage had been determined as key cells in the spreadsheet were 'hard coded' as opposed to containing formulas. Further, some of the input assumptions underpinning the calculations were not transparent. This made it impossible to reach a conclusion about the reasonableness of the outputs of the Calculator and, in turn, the prudency and efficiency of the proposed electricity demand.

Synergies subsequently requested a



We have therefore based our assessment on the initial version of the Trility Calculator, together with the following documents, which were provided to Synergies on 10 January 2019:

- Simplified Pumping Energy Calculator sm.xlsx
- Memo Clarification of Electricity Payment for IPART v3.pdf
- Maximum demand summary.xlsx



In the interim period between receiving the initial Trility Demand Calculator and the above later explanatory materials, including Simplified Pumping Energy Calculator, IPART developed its own energy demand calculator as a means of verifying the energy forecasts proposed by WaterNSW for delivering the assumed volume of water (i.e. the

⁴⁷ D7 20180415 W2BH BWS outflow Energy kVA Demand Calculator V2_150418.xlsx



forecast load) to Broken Hill via the Pipeline. We were asked by IPART to assess the reasonableness of the model methodology, including water engineering formulas, and assumptions used in the IPART calculator (see Attachment C for details of IPART's model).

We have reviewed the methodology and assumptions in the IPART energy calculator and have concluded that the model provides a satisfactory basis for deriving an energy consumption forecast for a given volume of water transported.

The variable energy requirement calculated using the IPART model is **M** than that estimated by the Trility calculator (i.e. 1.31 MWh per ML as opposed to **M**Wh per ML, respectively). Synergies investigated the reasons for this difference and found that the is a sound explanation for the Trility number being higher. In fact, by making several (plausible) adjustments to the input assumptions of the IPART calculator, the variable energy demand increases from 1.31 to 1.46 MWh per ML. The following adjustments were made:

- Increased the height of the static head at the intake, such that the lift is increased from 5 metres to 9 metres⁴⁹;
- Increased the pipe roughness to reflect 'fouled conditions' as the pipes age, as opposed to using a roughness equating to that of clean pipes (as was assumed by IPART)⁵⁰;
- Lowered the pump and motor efficiencies to reflect details in the relevant JHJV tender returnable schedule. The IPART calculator uses a motor efficiency of 100% for the intake pumps, which is theoretically not possible. We adjusted this to 91.7% based on the motor efficiency stated in the datasheet for the intake pumps;
- Included an energy allowance of 1.5% for 'fittings losses' (the IPART calculator had made no allowance for fittings losses); and

⁴⁹ WaterNSW has assumed a static lift of 9m for the Intake PS, compared to IPART's 5m allowance. In our opinion, a static lift of 9m would not be unreasonable at this location and IPART should consider revising the static lift allowance in their calculator to 9m

⁵⁰ The nominal friction coefficient has been updated to 0.03mm for HDPE pipe and 0.30mm for MSCL pipe to account for a fouled pipe condition. We note that Section 4.7 Hydraulic Design of the Murray to Broken Hill Tender Design Report (IA154700 | Rev 1 Rev: A, BH20) states pipe roughness for 'clean' and 'fouled' pipe, and WNSW's Memo Clarification of Electricity Payment for IPART v3.pdf states that "The John Holland MPC Joint Venture (D&C Contractor) design team nominated the variable energy consumption of the pump stations at design flow rates, allowing for aged pipe conditions"



• Included a % allowance for electricity used by ancillary systems associated with the intake and transfer pumps such as motor cooling/service water and compressors for valve actuation.

We believe that these adjustments and allowances are reasonable.

In addition to the above, we have factored in an energy allowance for risk factors. These comprise:

- a safety margin of 5% to allow for allow for additional energy losses (other than friction) or changes in elevation which may become apparent as the design progresses; and
- consistent with WaterNSW's Pricing Proposal, a contingency of % (of which % is a risk margin for inefficiencies in pumping relative to theoretical values, while % is for evaporative losses in the bulk water storage).

With these risk allowances added in, the total variable energy demand becomes MWh/ML, which is not materially different to that submitted by WaterNSW in January 2019 in response to a request for information.⁵¹

Given that the pipeline is not yet operational, we assess these risk margins are prudent and the assumed levels not unreasonable. The energy demands estimated for the Pipeline are modelled outputs, and there is likely to be a large number of variables that are subject to some degree of uncertainty, whose true value/performance will not be known until the Pipeline has been in operation for a period of time. That being said, the allowance for evaporative losses does appear to be at the upper end and may warrant further scrutiny. We have not been able to make a formal assessment of this assumption as there is no transparency around how WaterNSW has determined the evaporative losses.

Another consideration that has not factored into our calculations but is likely to have been taken into account by Trility, is a commercial risk premium for the fact that the Contractor is taking on the water consumption risk, as it will incur the actual electricity cost, which may be higher than the agreed payment rates in the contract. That is, if consumption in a given period is higher than what is expected, the pipeline operator

⁵¹ We note that WaterNSW's Pricing Proposal proposes a variable energy demand of MWh/ML but the original O&M contract used a higher variable energy demand because it was formulated prior to the approved contract variation relating to use of a larger diameter pipe in one section of the pipeline (the adoption of a larger diameter pipe reduces the amount of energy required to transport water)



may need to operate the pumps continuously instead of being able to take advantage of off-peak electricity, thus resulting in an elevated electricity cost.

Based on the above calculations and rationale, we assess WaterNSW's latest proposed variable energy demand of **MWh** per ML as being efficient. Our recommended energy demand of the Pipeline, which will be supplied to the concurrent energy review of the Pipeline, is based on this amount. We note that this amount is lower than the contracted amount in the O&M contract.

6.5.6 Fixed energy demand

In addition to variable energy demand, the Pipeline will have a fixed requirement for electricity irrespective of whether the volume of water pumped. WaterNSW has proposed a fixed energy requirement of MWh per day⁵².



Table 29 provides a comparison of our estimates to those of WaterNSW.

Table 29	Fixed energy	demand for	or the	WBH	Pipeline

	WaterNSW proposed (MWh per day)	Synergies recommended (MWh per day)
River Murray Offtake Pump Station		
Wentworth Pump Station (TPS1)		
Silver City Pump Station (TPS3)		

⁵² From WaterNSW, Memo Clarification of Electricity Payment for IPART v3.pdf, 11 December 2018



	WaterNSW proposed (MWh per day)	Synergies recommended (MWh per day)
Bulk Water Storage		
Total		

Source: WaterNSW proposed is sourced from Memo Clarification of Electricity Payment for IPART v3.pdf, 11 December 2018

6.5.7 Efficient maximum demand

WaterNSW has proposed a maximum variable energy demand for the WBH Pipeline of kVA (adjusted down from kVA in the original O&M contract). The maximum variable energy demand is invariant across the four year determination period.

Based on documents provided by WaterNSW, we understand that this figure was derived as follows:

- For each pump station the O&M contractor asked the designers (Jacobs) to nominate both the normal operating demand (in kVA) and the maximum demand when a pump station (or aerator) is started (in kVA).
- For the purpose of the calculation it was assumed that the starting demand would persist for ten minutes and after this the normal operating demand would continue.
- Demand is measured in half hour blocks and the Maximum Demand can occur at any time of day. That is, it could occur in peak, off-peak or shoulder periods.
- The maximum demand estimated for each pump station is then summed to give a total maximum demand across the entire Pipeline.
- A % contingency has been added to the above figure to take account of the risk that O&M contractor takes on 'the toll' i.e. the schedule of Maximum Variable Demand

Synergies assesses this calculation process as being reasonable. Further, on the basis that we have assessed WaterNSW's variable energy demand estimate as efficient, we accept that the proposed maximum variable demand of **kVA** is efficient⁵³.

⁵³ We assess that the **KVA** maximum demand figure is reasonable for all pricing periods of peak, off-peak and shoulder, as per the O&M Contract.



6.5.8 Recommended efficient energy demand

Table 30 summarises our recommended efficient energy needs for the WBH Pipeline for each year of the determination. The recommended levels have been calculated based on three sets of water demand forecasts provided by IPART (corresponding to high, median, and low rainfall scenarios at Broken Hill).

	2019-20	2020-21	2021-22	2022-23
Fixed energy demand per day (MWh/day)				
Days in year	366.00	365.00	365.00	365.00
Total fixed energy demand (MWh)				
Variable energy demand per ML (MWh/ML)				
High rainfall scenario				
Water demand (ML)	2,039	2,025	2,008	1,990
Total variable energy (MWh)				
Median rainfall scenario				
Water demand (ML)	4,158	4,144	4,127	4,109
Total variable energy (MWh)				
Low rainfall scenario				
Water demand (ML)	6,007	5,993	5,976	5,958
Total variable energy (MWh)				
Total energy (fixed plus variable)				
High rainfall scenario (MWh)	5,872	5,840	5,810	5,780
Median rainfall scenario (MWh)	9,543	9,512	9,481	9,451
Low rainfall scenario (MWh)	12,746	12,715	12,685	12,655

Table 30 Recommended efficient energy volun	able 30	ole 30 Red	commended	efficient	energy v	olume
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Source: Water demand forecasts from IPART29 January 2019

The unit values and calculations underpinning the recommendations in Table 30 are as follows:

- A. Efficient level of fixed energy demand is MWh per day
- B. Total fixed energy demand in a year is given by 'A 'multiplied by 365 days (except for 2020-21, which is a leap year and has 366 days)
- C. Annual water demand in ML per year (IPART's forecasts, which assume that 100% of the demand in Broken Hill is met by the Pipeline)
- D. Efficient level of variable energy demand is MWh per ML
- E. Total annual variable energy demand (MWh) is given by 'C' multiplied by 'D'



F. Total fixed plus variable energy demand in a year (MWh) = B + E

6.5.9 SPV audit costs

WaterNSW advises that it has reporting obligations under the Annual Report (Statutory Bodies) Act 1984, the SOC Act, the Government Sector Employment Act 2013, the Public Finance and Audit Act 1983 and the Public Finance and Audit Regulation 2010.

In light of this, WaterNSW's auditing of the SPV on an annual basis is prudent, including because of the related but third party nature of the SPV arrangement.

Based on our industry experience, an annual forecast audit cost of \$100,000 is efficient.

6.5.10 SPV contract management costs

We consider WaterNSW incurring costs in relation to managing the O&M Contract, primarily ensuring compliance by the John Holland/Trility JV of the requirements of the contract, is prudent.

We understand these costs relate to one and a half full time equivalent staff who are solely dedicated to the contract management task, which appears reasonable. An annual forecast cost of \$220,000 for this number of FTEs is efficient.

6.5.11 Insurance and land tax costs

Insurance

WaterNSW advises that the SPV will utilise WaterNSW's current insurance cover with iCare for its infrastructure and property assets, with an estimated premium of 'around' \$120,000 per annum for the pipeline. The insurance will cover property, public liability, directors' and officers' liability and statutory liability.⁵⁴

We consider that insurance risk categories identified by WaterNSW are prudent to insure. Extension of its current insurance cover to the WBH Pipeline is also prudent.

We sought further information from WaterNSW on the basis of its insurance forecast for the 2019 Determination period. WaterNSW advised that its forecast is based on advice from iCare and reflects the allocation of 3.6% of WaterNSW's total property insurance

⁵⁴ WaterNSW (2018), Pricing Proposal to the Independent Pricing and Regulatory Tribunal, Regulated Prices for the Wentworth to Broken Hill, p 83



for 2018/19 to the pipeline based on the percentage of the WBH Pipeline to WaterNSW total asset value (\$457,560/\$12,715,243). We consider the basis WaterNSW's insurance forecast is reasonable.

An annual forecast insurance cost of \$120,000 is efficient.

Land tax

WaterNSW indicates that the SPV is expected to incur land tax payable on the land owned by the SPV, calculated on 2% of the value of the land acquired. Land tax is a legislative obligation, so this cost is unavoidable.

WaterNSW has provided us with the basis of the 2% land tax assumption, which is referred to as the premium land threshold under the *Land Tax Management Act 1956* and applies where the value of land held by an entity exceeds \$3,846,000. WaterNSW advises that the WBH Pipeline's SPV will be treated as a related party and as such land acquired for the WBH Pipeline will be captured under the premium land threshold that already applies to WaterNSW's land holdings.

An annual forecast land tax forecast of \$11,400 for the 2019 Determination period implies a land value of \$570,000, which appears reasonable so we consider the forecast cost to be efficient.

We note that WaterNSW is yet to acquire the required land. Hence, it is open to IPART to update this land tax forecast between the release of IPART's Draft and Final Reports if WaterNSW acquires the required land.

6.5.12 WaterNSW's corporate overhead costs

WaterNSW's proposal⁵⁵

WaterNSW indicates that the management function of the SPV (including shared services) is entirely outsourced to WaterNSW. In its view, the services are required for the management and good governance of the SPV including:

- corporate risk management
- corporate governance including Executive/Board oversight

⁵⁵ WaterNSW (2018), Pricing Proposal to the Independent Pricing and Regulatory Tribunal, Regulated Prices for the Wentworth to Broken Hill, pp 81-83



- economic regulation
- legal
- shared services
- human resources
- billing
- customer service
- management accounting and reporting
- supporting infrastructure, such as property and IT support
- due diligence.

WaterNSW advises that the forecast average annual corporate overhead cost of \$457,800 for the delivery of the above services to the WBH Pipeline in the 2019 Determination period has been calculated by applying a 10% overhead rate to total operating expenditure of the SPV (excluding the overhead component).

Further, WaterNSW has indicated that this corporate overhead reflects an allocation process that starts with WaterNSW's gross overhead for its whole business, which includes the following:

- Operational overheads: which include business unit costs which cannot be directly attributed to projects or assets (i.e. shared services such as Legal, Finance and Commercial, Information and Communications Technology)
- Corporate overhead: which refers to service business unit costs such as Chief Executive, Corporate Systems, Regulatory Strategy, People, Capability and Transformation.

After the 10% share of the gross overhead is apportioned to the SPV, the balance of the overhead (net overhead) is then apportioned across WaterNSW's business segments, including other IPART-regulated water services it provides (ie rural valley, Greater Sydney and Water Assets Management Corporation (WAMC)) and non-core special projects.

WaterNSW argues that the proposed corporate overhead cost for the SPV has been set to reflect a benchmark (i.e. market) charge in providing management and shared services



to a client. That is, in its view, the prudent and efficient costs of management for the required WBH Pipeline services.

Prudency and efficiency assessment

In simple terms, we consider there are three ways in which a corporate overhead cost could be calculated for the WBH Pipeline:

- a 'ground up' estimate based on the assumption the WBH Pipeline is a stand-alone entity;
- an external benchmark-driven overhead cost, such as the 10% mark-up on direct costs proposed by WaterNSW for the WBH Pipeline; and
- an overhead cost allocated using WaterNSW's Cost Allocation Methodology, which is applied to allocate corporate overhead/joint costs across all its services (ie including the rural valley, Greater Sydney and WAMC).

We consider the decision to provide corporate services to the SPV rather than requiring the SPV to be responsible for all these services (ie operate on a stand-alone basis) is prudent, particularly given the related party nature of the SPV arrangement.

However, the corporate overhead that WaterNSW proposes to apply to the WBH Pipeline is a benchmarked rather than 'ground up' or allocated cost estimate. We have concerns that the 10% mark-up on direct WBH Pipeline costs is somewhat arbitrary. In particular, we are concerned that the Operating and Management Agreement precedent that WaterNSW refers to in applying this mark-up approach often includes profit margins as well as corporate overheads.⁵⁶

WaterNSW has advised us that there is no profit margin built into the overhead assigned to the WBH Pipeline. However, as discussed in section 5.7.9 of our report, our main concern with WaterNSW applying a 10% mark up to direct costs is its arbitrary nature and inconsistency with a full cost allocation methodology.

In this regard, it is not clear to us why the WBH Pipeline should be segmented from the rest of WaterNSW's business. Rather, we consider that the WBH Pipeline's corporate overhead cost should reflect a share of WaterNSW's business-wide gross overhead based on its Cost Allocation Methodology. Assuming that the cost allocators in the Cost

⁵⁶ These outsourcing agreements are often entered into between utilities and services providers, with the latter engaged to provide operating, maintenance and asset management services to the utility.



Allocation Methodology are soundly based, the WBH Pipeline should receive an appropriate share of an efficient gross overhead pool previously approved by IPART.

In contrast, WaterNSW has argued that the WBH Pipeline will attract a lower overhead rate under the 10% benchmark service fee rather than under the 'fully absorbed' overhead methodology. WaterNSW has advised that applying this methodology would result in an overhead allocation of around \$1,300,000 per annum based on an overhead rate of approximately 27% applied to the total opex of the WBH Pipeline. WaterNSW has advised this allocation is based on a totex (capex plus opex) cost allocator such that the gross corporate overhead is allocated across all core operational projects based on each project's totex relative to WaterNSW's totex.

We consider that both the \$457,800 and \$1,300,000 per annum overhead estimates appear somewhat high and need to be tested.

We are aware of the use by other entities of the totex cost allocator that WaterNSW generally applies to allocate its corporate overheads. A similar allocator is direct spend, where corporate overheads are allocated to business lines/services based on the proportion of direct expenditure each has to the entity's total direct expenditure.

Other frequently-used allocation bases for corporate overheads include asset value, revenue and FTEs. A simple weighted average of each of these allocators would result in an allocator of around 10%, consistent with WaterNSW's benchmark, although we consider this weighted allocator would be better applied to WaterNSW's gross overhead rather than the SPV's direct costs.⁵⁷

Regardless, based on the corporate services WaterNSW intends to provide to SPC over the 2019 Determination period and recognizing these services are additional to the direct SPV contract management costs noted above, we consider an annual average base corporate spend of \$104,000 is efficient. We have based this estimate on an assumption that WaterNSW's corporate service areas will spend 20% of every week of the year providing services to the SPV. We have assumed an hourly rate of \$250 per hour, which is a blended rate assumption recognising the wide range of staff roles and levels of seniority that will be involved in the provision of corporate services to the SPV. We have used the sample of WaterNSW's internal charging rates presented in Table 19 of our report as a guide to this blended rate. We consider both the total hours and hourly rate assumptions to be reasonable by erring towards the upper end of a possible range.

⁵⁷ The revenue allocator is 10.2%, asset allocator is 19.7% and FTE allocator 0.9%. A simple weighted average is around 10.0%



Further, recognising that there will be additional one-off costs associated with WaterNSW's preparation of a pricing proposal for the 2024 Determination period, we consider an additional \$100,000 overhead cost in years 3 and 4 of the 2019 Determination period to be efficient based on our knowledge of regulatory proposal costs for infrastructure of this size.

We note that our recommendation of efficient costs will mean that WaterNSW has an efficient base overhead allowance to manage the O&M Contract and supply corporate services to the SPV of \$324,000 per annum, or \$1,296,000 over the 2019 Determination period. An additional \$200,000 for WaterNSW's 2024 pricing proposal costs is also considered to be efficient, making a total forecast corporate overhead of \$1,496,000 for the 2019 Determination period. We consider this will provide WaterNSW with a reasonable opportunity to recover its corporate overhead costs associated with the WBH Pipeline.

Informed by Synergies' assessment of an efficient overhead allocation, we understand that IPART will reallocate overhead expenditure in WaterNSW's other determinations (i.e. Rural, Greater Sydney, and WAMC) to reflect the portion of overheads that will be apportioned to the WBH Pipeline.

6.6 Prudency and efficiency assessment summary

Our assessment of the prudency and efficiency of the opex component of the WBH Pipeline is summarised in Table 31 below.

Category	Prudent	Efficient	Comments
O&M Contract	Yes	Yes	Prudency – WaterNSW procured the WBP Pipeline using a DBOM Model that we consider is fit-for-purpose for the pipeline. The Operations and Maintenance component of operating costs is established in the O&M Contract, which is the outcome of what we consider to be an efficient procurement process.
			Efficiency – we consider the forecasts costs are efficient because they reflect the outcome of a competitive tender process.
Asset replacement costs	Yes	Yes	Prudency: we consider the asset replacement costs reflect prudent asset management practice. Efficiency: the forecast asset replacement costs for the 2019 Determination period are specified in the O&M Contract and judged to be efficient.
Electricity payments	NA	NA	The prudency and efficiency of electricity payments is outside of scope for the Synergies review. As noted earlier in the report, the review of the Pipeline's efficient energy costs is being undertaken by another party, and

 Table 31 Forecast opex prudency and efficiency summary



Category	Prudent	Efficient	Comments
			will be informed by the efficient energy load recommended by Synergies
SPV audit costs	Yes	Yes	Prudency – annual auditing of the SPV is prudent given the related but third party nature of the SPV arrangement.
			audit cost of \$100,000 is efficient.
SPV contract management	Yes	Yes	Prudency – the incurrence of costs in relation to managing the O&M Contract is prudent.
costs			Efficiency – we understand these costs relate to one and a half full time equivalent staff, which appears reasonable. An annual forecast cost of \$220,000 for this number of FTEs is efficient.
Insurance and land tax	Yes	Yes	Prudency – insurance is a prudent cost to incur and land tax is a legislative obligation.
			Efficiency – we have assessed the underlying assumptions of the annual forecast insurance and land tax costs of \$131,400 and consider them to be efficient.
SPV overhead	Yes	No	Prudency – the incurrence of WaterNSW's indirect overhead costs in relation to managing the O&M Contract is prudent, recognising the need for senior management time in overseeing the operations of a significant new asset under a third party contractual arrangement, as well as to provide corporate services to the SPV.
			Efficiency – we do not consider an annual average forecast SPV (corporate) overhead cost of \$457,800 is efficient.
			Based on industry knowledge and external benchmarking cross-checks, we consider an annual average base spend of \$104,000 is efficient. Recognising the additional one-off costs associated with WaterNSW's preparation of a pricing proposal for the 2024 Determination period, we consider an additional \$100,000 in years 3 and 4 of the 2019 Determination period to be efficient.



7 **Proposed output measures for 2019 Determination**

The TOR for our expenditure review of the WBH Pipeline required us to propose output measures (also often referred to as performance indicators) for the 2019 Determination period, if appropriate.

Any such performance indicators would allow WaterNSW's stakeholders to review the performance of the WBH Pipeline over time, recognising that it is a new asset with the important overriding objective of providing a secure long-term supply of water to the Broken Hill region.

However, there are a wide range of performance indicators that IPART already collects annually from NSW public water utilities and licensees under the *Water Industry Competition Act 2006* (WIC Act), including WaterNSW. This is complemented by auditing of licence compliance. Consequently, we see a need to avoid duplicating existing performance indicators that WaterNSW is reporting to IPART. Rather, we see merit in proposing a small set of performance indicators associated with IPART's administration of its 2019 Determination for the WBH Pipeline.

WaterNSW has not proposed to report any performance indicators for the WBH Pipeline in the 2019 Determination period.

7.1 **IPART's approach to performance reporting**

IPART requires the water utilities it regulates to report against performance indicators to monitor or assess a utility's performance and analyse performance trends. In addition to IPART's performance indicators, NSW water utilities may also report on the National Water Initiative (NWI) indicators currently administered by the Bureau of Meteorology.⁵⁸ The IPART performance indicators are published on its website annually.⁵⁹

IPART also requires water utilities whose price it regulates to submit Annual Information Returns on expenditure and service performance matters relating to the relevant price determination. This allows IPART to track the actual performance of the water utility compared to the approved forecasts for the determination period.

⁵⁸ <u>http://www.bom.gov.au/water/npr/</u>

⁵⁹ This reporting of performance indicates is separate to compliance licence compliance reporting.



7.1.1 2018 review of performance indicators

In 2018, IPART undertook a review of its performance indicators for NSW water utilities to ensure that the information being collected was useful and delivering a net public benefit, such that the benefits derived from reporting on performance indicators outweighed the water utilities' costs of collecting information to report against the indicators.⁶⁰

As part of this 2018 review, IPART reduced the number of performance indicators to 27 (previously 121) to remove unnecessary red tape without compromising the quality of its regulatory oversight.⁶¹

7.1.2 Performance areas monitored by IPART

IPART's performance monitoring of NSW water utilities falls within the following four key performance areas:

- Water quality and quantity
- Assets, including service interruption, water pressure and wastewater overflows
- Environmental management
- Customers, including customer services and satisfaction.⁶²

We have used these areas as a guide for our proposed performance indicators for the WBH Pipeline for the 2019 determination period.

7.2 Selection criteria for output measures

IPART has identified the following criteria to assess whether a performance indicator is necessary:⁶³

- Is there a regulatory purpose for the performance indicator?
 - the information collected should be of direct importance to IPART's regulation of the utility.

⁶⁰ IPART (2018), Review of water utility performance indicators, June

⁶¹ IPART (2018), ibid, p 1

⁶² IPART (2018), ibid, p 16

⁶³ IPART (2018), ibid, p 22



- Does the performance indicator align with the desired outcome?
 - the information collected through the indicator has a direct correlation with the outcomes that the indicator is intended to measure.
- Do the benefits of the information outweigh the costs of collecting the information?
 - assessment of whether the absence of information regarding the utility's performance against the desired outcome impacts on the ability to measure that performance (the cost consideration) or provides benefits to IPART or a user of the utility's services (the benefit consideration).
- Is the information currently collected through other means?
 - the information will not be collected where the utility is already required to provide reliable information relating to the desired outcome under another regulatory framework.
- Is the performance indicator consistent with SMART criteria?
 - the chosen indictor is Specific, Measurable, Achievable, Relevant and Timebound.

Synergies has also used these criteria to propose a small set of performance indicators for the WBH Pipeline relating to IPART's 2019 determination.

7.3 **Proposed performance indicators**

Under the O&M Contract for the WBH Pipeline, the John Holland/Trility Joint Venture is accountable to WaterNSW for a wide range of operational and service performance obligations. However, compliance with and reporting against these obligations are a contractual matter between the two parties rather than a publicly available performance measure.

In light of this, Synergies considers that there is merit in WaterNSW reporting a small number of performance indicators for the WBH Pipeline as part of its Annual Information Returns to IPART in relation to the following performance areas:

- Revenue
- Expenditure
- Water quantity
- Assets, including service interruption.



The performance measures we have proposed relate to what we consider are the most important aspects of the performance of the WBH Pipeline to stakeholders, including the NSW Government, IPART and users of the pipeline (ie water consumers in the Broken Hill region and customers with dedicated water offtakes along the pipeline's route).

We consider that water quality is also likely to be an important issue for the WBH Pipeline, particularly water quality in the bulk water storage facility, which will affect costs associated with Essential Water's Mica Street water treatment plant. Blue green algae has been specifically identified as a risk factor for the WBH Pipeline. However, we understand that IPART does not require water utilities to report on water quality performance indicators. Instead it monitors water quality performance through compliance monitoring, which includes self-reporting, public disclosure of information, and audits.⁶⁴

7.3.1 Revenue

Given that the WBH Pipeline will most likely be subject to a price cap form of regulation and that the volume of water to be transported by the pipeline is uncertain, we consider that WaterNSW should report actual revenues in relation to:

- the pipeline's water transportation service
- offtake revenues.⁶⁵

We also see merit in the reporting of revenues earned by WaterNSW from the imposition of shutdown, restart, and standby charges. This reporting will cover the main revenue streams of the pipeline.

7.3.2 Expenditure

Given the fixed lump sum nature of the O&M Contract, there are components of the WBH Pipeline's expenditure that will not vary over the 2019 Determination. In particular, the direct operations and maintenance component of opex. Further, forecast capex for the 2019 Determination is small and unlikely to vary materially from forecast.

⁶⁴ IPART (2018), ibid, p 8

⁶⁵ WaterNSW has proposed to apply a price cap to its pipeline services and this is the form of regulation usually applied by IPART to the water utilities it regulates.



The primary and most important expenditure variable that is likely to diverge from forecast over the 2019 Determination period is electricity costs. Expenditure on other smaller categories (eg corporate overhead and insurance and land tax) may also vary from forecast.

For completeness in terms of understanding the expenditure profile of the new pipeline, we consider that WaterNSW should report annually each of the capex and opex items in section 4.7 and Table 15 of this report respectively.

7.3.3 Water quantity

We consider the delivery of raw water to the bulk water storage facility and ultimately to Essential Water's Mica Street water treatment plant in Broken Hill to be the key performance measure for the WBH Pipeline given its overriding purpose. It is also of most relevance to the operating and capital expenditure that IPART will approve for the 2019 Determination period.

In light of this, our proposed water quantity performance measures are as follows:

- Monthly volume of water delivered to the bulk water storage facility.
- Monthly volume of water in the bulk water storage facility relative to total capacity of the facility.
- Monthly volume of water delivered to Essential Water.
- Monthly volume of water delivered to offtakes.

We understand this data will already be reported to WaterNSW by the John Holland/ Trillity JV as part of the O&M Contract's reporting arrangements.

7.3.4 Assets

We understand that WaterNSW is required to provide IPART with an annual compliance and performance report with respect to WaterNSW's performance regarding service interruptions. There are not any existing service interruption performance indicators required by the WaterNSW Reporting Manual.⁶⁶

Given the newness of the WBH Pipeline, we consider that IPART is likely to want to understand whether the pipeline performs in line with WaterNSW's requirements, as

⁶⁶ IPART (2017), Review of water utility performance indicators, p 41



reflected in the O&M Contract, including because it may have expenditure implications in future determination periods.

Our proposed asset performance measures in relation to the reliability of performance of the pipeline are as follows:

- Energy usage by pump station at off-peak, shoulder and peak times each month (measured in kWh).
- Number, type and size (in dollar terms) of efficiency initiatives effected under the O&M Contract's efficiency benefit sharing scheme.
- Electricity savings (defined as the John Holland Trility JV's actual electricity costs minus electricity payments made by WaterNSW to the JV) that are made under the O&M Contract's electricity saving sharing mechanism.
- Frequency of times in which the WBH Pipeline is placed in shutdown and standby modes.

Given it is the largest single operational cost category for the WBH Pipeline, we consider that WaterNSW should report on the energy consumed by the pipeline to allow comparison with the volume of water delivered. This will allow IPART to understand whether one of the key performance variables of the pipeline is in line with WaterNSW's operational requirements.

As discussed, in section 5.4.5 of our report, we consider it will be important for IPART to track the operating efficiency performance of WaterNSW/John Holland Trility JV over time. We also identified the operation of the efficiency benefit sharing scheme specified in the O&M Contract as the primary efficiency incentive mechanism under the contract. However, the O&M sharing scheme requires commitment on both parties to be effective. For this reason, we consider that the outcomes under this sharing scheme should be monitored.

The O&M Contract specifies circumstances in which the WBH Pipeline can be placed in shutdown and standby modes (as noted above there are payments associated with these modes of operation). We consider that reporting on these two modes of operation will provide important insights into the operation of the pipeline that complements information on the normal operational mode as represented by quantity of water delivered by the pipeline.



7.4 Recommendation

We recommend that WaterNSW be required to report to IPART in relation to a small number of relevant water quantity and asset output measures in the 2019 Determination period as part of its Annual Information Returns. This reporting will enable IPART to monitor the revenue, expenditure, operational and service performance features of the pipeline relative to the assumptions and forecasts underpinning its 2019 Determination.

We consider the proposed performance indicators relate to data that will be reported under the contractual relationship between WaterNSW and the John Holland Trility JV. As a result, it should minimise the reporting burden on WaterNSW while allowing IPART access to information that is important in its administration of the 2019 Determination and beyond.

A Review scope – Synergies' methodology

This attachment contains the method and scope of Synergies' expenditure review for the WBH Pipeline. It was submitted to IPART on 13 July and accepted as part of our contracted deliverables.

Requested Services	Synergies-Beca approach and identified issues
Task 1: a strategic review of the utility's long term investment plans and asset management systems and practicesThe consultant is required to review the utility's long term investment plan (minimum of 10 years) so that the medium term (ie, proposals for the next 5 years) can be considered in the constant of its longer term plane.	Our assessment of WaterNSW's submission will consider matters raised in the Final Business Case, plus opportunities identified previously in the report by RMCG entitled " <i>Murray to Broken Hill pipeline: Analysis of potential opportunities</i> ". In addition, key aspects of pipeline procurement, design and construction will be considered based on the experience of our review team.
 the context of its longer term plans. The consultant must provide advice on: a) Whether the longer-term capital investment strategy is the most efficient, and whether processes supporting this including procurement processes, whole of life cycle planning and assessment of capital and operating expenditure trade-offs are best-practice and therefore likely to result in prudent and efficient investment decisions. For Project B, the consultant must assess the procurement process undertaken by WaterNSW to engage the contractors who will build, operate and maintain the Pipeline. b) The key supply-side assumptions that are driving expenditure (eg, asset replacements, environmental requirements, licensing standards (where relevant)), including comment on whether these assumptions are reasonable and how they have been considered and tested by the utility. 	In doing so, Beca will utilise their specific knowledge of the 270km Murray River to Broken Hill Pipeline (the Pipeline) that was obtained during their time as a member of one of the unsuccessful teams that submitted a tender for the design and construction of the project. The following will be investigated as part of Task 1 <u>Asset management planning and strategy</u> We understand that John Holland was awarded the contract by WaterNSW to design, build and maintain the Pipeline at a total project cost of \$467m. John Holland will then partner with TRILITY for the operations and maintenance of the Pipeline under a fixed price 20-year contract with WaterNSW for the sum of \$107.3m. In this context, we will assess whether WaterNSW and/or its Joint Venture Partners
 c) The consistency of the utility's proposed 5-year capital expenditure program with its longer term program of capital expenditure, and implications and risks associated with the 5-year program for the longer term program. d) The robustness of systems for linking asset management decisions with current and future levels of service and performance requirements, including customer service and environmental outcomes. e) The way in which the utility manages the risks associated with asset failure or underperformance. f) Any particular concerns or issues relating to the utility's process for determining and prioritising future infrastructure expenditure and asset management decisions. 	has developed a robust and comprehensive asset management plan for the new pipeline and associated assets, and that this management plan meets industry best practice standards for a capital project of the scale of the Pipeline. This will include an assessment of the asset strategies and plans that have been developed for the Pipeline, including the way WaterNSW proposes to manage potential risks such as asset failure, or the pipeline and pumps not meeting their design specifications. We will evaluate the extent to which risk contingencies have been allowed for, and how WaterNSW proposes to share the cost of these contingency provisions between customers and itself. Procurement processes We will assess the efficiency and effectiveness of procurement process undertaken by WaterNSW to engage John Holland and TRILITY. Each of the elements of procurement will be examined separately as follows:

Industry awareness - Demonstration that WaterNSW provided the industry with advance notice of the project and raised awareness of the project including key drivers and selection criteria
Industry briefings – we expect WaterNSW would have undertaken specific industry briefings to alert the market with the aim of attracting high calibre bid teams.
 Delivery mechanism - Alternative delivery mechanisms considered and that the selection of the design and construct (D&C) delivery mechanism was arrived at after the evaluation of a number of options.
Expression of interest (EOI) – Was EOI process followed? Was the criteria for selection of shortlisted bidders clearly established? What arrangements were put in place for the EOI evaluation process? How many bidders were selected to submit tenders?
Reference design - Was reference design included? Was reference design followed by bidders?
Tender and tender evaluation – We will evaluate WaterNSW's interaction with bid teams, including whether tender designs were compared against reference design, whether smart solutions and/or alternatives were offered, WaterNSW's degree of confidence that the specified completion date of December 2018 will be met, and whether alternative offers were submitted and how they were evaluated.
Integration of Broken Hill pipeline asset with existing WaterNSW operations
Upon completion of the pipeline and associated assets, it will be important that WaterNSW implements asset management strategies and plans for operating and maintaining the Pipeline assets and ensuring they are operated efficiently within its broader water supply network. We will evaluate the extent of this forward planning and how well the new assets have been integrated into WaterNSW's business. This assessment will be a critical input into the degree of confidence that can be placed
in WaterNSW capital and operating cost forecasts for the Pipeline.

Task 2: A detailed review of the utility's past and proposed operating expenditures	Review of past opex
(including energy) and capital expenditures	For Project B, our review of past operating expenditures will be limited to the expenditures (forecast) incurred over the period of construction of the Pipeline and
Enciency of past operating experionure.	associated assets, primarily late 2017 to end-2018. We expect these expenditures
	to be relatively small compared to the Pipeline's capital costs.

Th of 20 foi	le consultant must assess, report and provide recommendations on the efficiency past operating expenditure (ie, for the period of construction for Project B. As 18-19 is the year in which the review is undertaken, the expenditure will be a recast value)	Syne attrik appr Revi	ergies and Beca will also review any past expenditures to ensure they are directly butable to the provision of regulated services and/or if indirect in nature have been ropriately allocated to the Pipeline.
In	undertaking this task the consultant must:	Wate	erNSW's proposed opex is expected to mostly relate to pipeline and pump
 Review the variations in operating expenditure from what was a previous price determination and, where assessed as material, con reasons for this variation including the extent to which these v justified. 	Review the variations in operating expenditure from what was allowed in the orevious price determination and, where assessed as material, comment on the	maintenance, repairs, asset monitoring, systems management, and energy costs involved in pumping.	
	justified.	We focu	will examine the internal consistency of WaterNSW's proposal, with a specific s on whether the proposed forecast operating expenditure aligns with what we
ь)	Assess the extent to which the operating expenditure incurred since the previous price determination has delivered the service standards on which the expenditure allowance was based.	woul Pipe will t	Id expect for a newly constructed pipeline (and related assets) of the size of the line (i.e. have sufficient capacity to meet peak daily demand of 37.4 ML). There be several components to this analysis:
c)	Advise whether the operating expenditure directly relates to the provision of regulated services.	•	Benchmarking – Beca will use their existing knowledge to review WaterNSW's proposed costs against relevant pipeline projects or components of projects that Beca has been involved in.
a)	expenditure as opposed to shifting costs within the regulated business.		Potential for cost reductions/savings – we will assess whether there are any
Ef	ficiency of proposed operating expenditure	areas where WaterNSW could make cost savings without level of service to customers.	areas where WaterNSW could make cost savings without adversely affecting level of service to customers.
Th of th	e consultant must assess, report and provide recommendations on the efficiency proposed operating expenditure for the 2019 determination period. In undertaking is task the consultant must:	•	Catch-up or ongoing efficiency adjustments – given this is a new capital build, catch-up efficiency adjustments are unlikely to be relevant. However, there may be scope for on-going efficiency gains in opex. We will examine WaterNSW's
a) op ex	Provide recommendations as to the efficiency of the utility's proposed level of perating expenditure and provide annual estimates of the level of operating penditure that is required to efficiently supply the regulated monopoly services.		proposed opex forecast to assess whether it incorporates efficiency improvement over time and is reasonable based on appropriate industry benchmarks.
b) ab as ex	Estimate the utility's potential for cost reductions and make recommendations out efficiency gains. If proposed expenditure in an area of operations is assessed inadequate, specification and quantification of the recommended additional spenditure is required.	•	Procurement of maintenance and monitoring services – we will examine WaterNSW's outsourced operations and maintenance contract between WaterNSW and John Holland/TRILLITY to assess what services are covered under these arrangements and the associated underlying cost risk sharing
c) the the	Identify the potential for and recommend efficiency savings to be achieved within e operating expenditure budget, and provide evidence and reasoning to support e recommended savings.	existence or not of contingencies and efficiency incentives in recognise WaterNSW may claim confidentiality regarding thi However, we consider that at a minimum, we will need suf	existence or not of contingencies and efficiency incentives in the contract. (We recognise WaterNSW may claim confidentiality regarding this O&M contract. However, we consider that at a minimum, we will need sufficient access to
d) co	Advise on the appropriateness of direct costs and allocation of shared operating osts (including overheads) attributed to the regulated water business.		relevant contractual provisions to address the above issues).
e) pr fo	Provide an opinion on the cost effectiveness and efficiency of the utility's ocurement processes in relation to operation services provided by third parties r water and sewerage functions.		

 f) Provide a recommendation on the efficient benchmark volume of energy (MWh/year) for each year of the 2019 determination period. g) Identify any consequential impacts on capital expenditure (ie increased or reduced costs) based on the assessment of operating expenditure. h) Where appropriate, have regard to productivity benchmarking analysis. The consultant should have regard to opportunities for efficiency savings and the potential for recommending catch-up and ongoing efficiency adjustments as necessary. 	Benchmark energy requirements Energy for operating the pumps will be a major operating cost driver for the Pipeline. The efficiency and prudency of these costs will be examined in detail in Project C – "energy expenditure review". However, the nature of pumping demand will be the primary driver of these energy costs and this will be assessed as part or Project B. specifically, we will assess the extent to which the forecast demand profile for the Pipeline is efficient and/or could be made more efficient. Cost allocation – shared operating costs We will assess WaterNSW's cost allocation methodology to understand the basis of the amount of costs that will be allocated to the Pipeline's cost base and make recommendations on whether the resultant cost allocator and resulting cost shares are reasonable, based on our experience with other regulated network businesses. While directly attributable costs should be relatively straightforward to assess, we consider the largest sensitivity will arise from the basis and size of allocation of WaterNSW's overhead (indirect) costs to the Pipeline.

 'eview of WaterNSW's capital expenditure Assess the reasonableness of WaterNSW's capital program as a whole, within the context of its long-term plans and the assumptions underlying them, including the scale, scope and planning of the entire capital expenditure program and identify ny consequential impacts on operating expenditure (ie, increased or reduced osts) of this capital expenditure. Undertake a detailed investigation into the actual outcomes and project planning or WaterNSW's capital projects above a \$5 million materiality threshold (to b greed with IPART). Advise on the appropriateness of the cost allocation method used to allocat operating costs to capital projects. Review the appropriateness of the asset lives used to calculate regulator reduced of the appropriateness of the utility's pricing proposal, and recommen elements if a specific the section. 	 We will assess whether the past and forecast capital expenditure relating to the Broken Hill pipeline was (is) prudent and efficient. This will involve the following investigations: Tender design factors Tender design and detailed design during construction to demonstrate consideration of various key technical matters and that, where appropriate, options/alternatives have been considered including: Route selection: Extent of compliance with Ministerial Direction for the Pipeline's alignment to be generally along the Silver City Highway Rd easement Consideration given to minimising expensive crossings; road, rail, streams/rivers
adjustments if appropriate. e) Review the allocation of any common capital costs between the regulated business and other parts of the business and assess whether there has been any inappropriate allocation of common capital costs	 Sufficient geotechnical investigations undertaken to minimise risk of adverse impacts from poor ground conditions Route selection has taken construction duration into account – i.e. avoidance of route options that add significant construction time and cost.

Past capital expenditure	Materials selection:
The consultant must assess, report and provide recommendations on the prudence and efficiency of past capital expenditure. For Project B, this is includes the capital expenditure during the period of construction. In undertaking this task the consultant	 Options for internal lining considered
	 Options for external coating considered
must:	 Corrosion potential addressed.
a) Report on the actual capital expenditure values (by program) for each year of the current determination period	Design flow:
b) Assass the extent to which the expenditure approved in the last price	Demonstration of design to achieve 37.4 ML per day
determination (for the current determination period) has delivered the service	Inter-stage pumping – hydraulic analysis undertaken to determine number
standards and outcomes on which the expenditure was based.	and location of boost pump stations, taking into account range of pipeline diameters and internal lining materials
c) Provide a recommendation on the prudence and efficiency of each utility's capital expenditure for the period of construction for Project B. Note that prudence	Potential to deliver increased flows in the future has been considered.
should be assessed against identified drivers, and variations from capital	■ Transients:
d) Becommond a value for any conital expenditure considered imprudent or	Transients analysis undertaken
inefficient, for the period of construction.	 Surge mitigation incorporated into design of pipeline.
e) Where appropriate, have regard to productivity benchmarking analysis	■ Service life
Proposed capital expenditure	Design to comply with specified asset service life requirements.
The consultant must assess, report and provide recommendations on the prudence	 Operational considerations:
and efficiency of proposed capital expenditure for the 2019 determination period. In undertaking this task the consultant must:	Scour valves and air valves – locations and access for maintenance
a) Report on the proposed capital expenditure values (by program) for each year.	Isolation valves in main line – operations input taken into account
b) Provide a recommendation on the prudence and efficiency of the utility's proposed capital expenditure program and provide (for each year) reasoned	 Pipeline cleaning – inclusion of entry and exit chambers/facilities for pipeline pigging.
estimates of the level of capital expenditure that the consultant considers efficient	Construction factors
a) Identify the notential for officiency savings to be achieved by the utility within its	A number of construction-related factors will be reviewed to examine their bearing on
c) identify the potential for efficiency savings to be achieved by the utility within its capital expenditure program over the next determination period and provide evidence and reasoning to support the proposals.	overall project capital cost including:
	Primary and sub-contractor selection
d) Where appropriate, have regard to productivity benchmarking analysis	Quality compliance
	Progress monitoring and reporting
	Risk monitoring

Commissioning readiness
Progress monitoring and reporting
Quality compliance
Variations awarded/anticipated
Contract price monitoring and status
Risk monitoring
Compliance with Ministerial Directions regarding labour and steel.
Relationship between capex and opex
Design and construction decisions for the new Pipeline and associated assets are likely to have a significant influence on future operating costs. We will assess whether WaterNSW has taken explicit account of these capex/opex relationships in its expenditure forecasts.
Cost allocation
Given that the Pipeline and associated assets form one component of WaterNSW's business, it will be important to understand how WaterNSW has allocated common operating costs (e.g. corporate overheads) and common capital costs to the Pipeline. We will assess the cost allocation methodology, including allocators, proposed by WaterNSW and make recommendations on whether the resultant cost shares are reasonable, based on our experience with other regulated network businesses.
Our starting position on costs allocation is that the common cost allocation to the Pipeline should be small given the relatively small size of the Pipeline and its customer base compared to WaterNSW's total assets and customers.
Asset life assumptions
We will assess the appropriateness of WaterNSW's asset life assumptions for the Pipeline, pumps and water treatment facilities – in particular whether these are reasonable having regard to water industry standards and for the purpose of calculating regulatory depreciation.

Task 3: A review of performance against past output measures and to propose new output measures for the next determination period if appropriate	Given the Pipeline is newly constructed, our intention will be on proposing a small set of output measures for the next determination period focused on:
The consultant must:	 delivered water relative to capacity (utilisation measure)
a) Review performance of WaterNSW against its output measures over the current	reliability of service
determination period (where relevant). Where output measures have not been achieved, provide comment on the reasons for this.	availability of service
 b) Recommend a set of new output measures for the utility's proposed operating and 	customer service eg complaints handling.
capital expenditure program, for the upcoming determination period.	

B Comparator pipelines – source references

HARVEY WATER PIPE PROJECT - WA

http://www.iplex.com.au/iplex.php?page=101

CHILTERN TO WODONGA PIPELINE - VIC

https://www.pipeliner.com.au/2016/03/16/water-pipelines-drought-proofing-down-under/

CASTERTON TO COLERAINE PIPELINE

https://www.pipeliner.com.au/2016/03/16/water-pipelines-quenching-australias-thirst/

SUGARLOAF PIPELINE - VIC

http://www.twe.net.au/project/sugarloaf-pipeline

https://www.holcim.com.au/sites/australia/files/documents/Humes_Jseries_Sugarl oaf.pdf

HAMILTON- GRAMPIANS PIPELINE - VIC

https://www.pipeliner.com.au/2016/03/16/water-pipelines-quenching-australias-thirst/

MORUYA TO DEEP CREEK DAM PIPELINE - NSW

https://www.pipeliner.com.au/2010/07/06/water-flowing-through-the-moruya-to-deep-creek-dam-pipeline/

GOSFORD AND WYONG CITY COUNCIL MARDI-MANGROVE LINK PROJECT – NSW

https://cdn.centralcoast.nsw.gov.au/sites/default/files/Mardi_Mangrove_Link_Com memorative_Booklet.pdf

CONNORS RIVERS DAM TO MORANBAH PIPELINE PROJECT - QLD

https://www.statedevelopment.qld.gov.au/assessments-and-approvals/connors-river-dam-and-pipelines.html

https://www.statedevelopment.qld.gov.au/resources/project/connors-river-dam-pipelines/connors-river-dam-eis-executive-summary.pdf - Cost

TOOWOOMBA PIPELINE ALLIANCE - QLD

https://www.water-technology.net/projects/toowoomba-pipeline/

SPLIT ROCK DAM TO BARRABA PIPELINE NSW

https://www.northerndailyleader.com.au/story/1757374/barraba-project-dam-in-focus-for-pipeline/ - Diameter

https://www.governmentnews.com.au/pipeline-narrows-for-designers/ Cost and length

BURDEKIN MORANBAH PIPELINE - QLD

https://www.viadux.com.au/sites/default/files/2017-08/Burdekin_casestudy.pdf - Cost and distance

HAUGHTON PIPELINE STAGE 1 - QLD

http://infrastructurepipeline.org/project/haughton-pipeline-duplication-project---stage-2/

HAUGHTON PIPELINE STAGE 2 - QLD

Trenching details

https://www.iconwater.com.au/water-and-sewerage-system/our-projects/watersecurity-projects/murrumbidgee-to-googong-water-transfer/project-planning-andapprovals/development-application.aspx
C IPART's electricity calculator

This attachment contains details of IPART's electricity calculator.

C.1 Purpose

This model is designed to model the energy required to pump water through a generic pipeline to estimate the energy requirements of the Wentworth to Broken Hill Pipeline.

C.2 Model overview and inputs

The key output of the model is the energy required to pump a given volume of water at a particular flow rate over a given time period. It calculates dynamic head based on a turbulent flow regime using the Darcy-Weisbach equation, with the friction factor estimated using Swamee and Jain estimation. It assumes that friction losses in the pipe as a result of fittings are 1.5% of the base friction losses.

Table 32 contains the inputs to the model by section of the pipeline. Section 1 is the pipeline between the water intake at Wentworth and TPS1, section 2 represents the pipeline between TPS1 and TPS3 while section 3 shows the pipeline between TPS3 and the bulk water storage near Broken Hill.

Inputs	Symbol	Unit	Value section 1	Value section 2	Value section 3
Pipeline starting height	H0	m AHD	31	36	172
Final pipeline height	Hf	m AHD	36	172	239
Water pumped each day	V	ML	27	27	27
Pumping time each day	t	hours	24	24	24
Pipeline diameter	d	m	0.535	0.726	0.726
Pipeline length	I	Km	8.75	219.25	21
Pump efficiency	Eff	%	76.8	74.5	76.2
Material roughness factor (based on design specification)	rf	mm	0.03	0.3	0.3
Kinematic viscosity of water	v	m2/s	1.31x10-6	1.31x10-6	1.31x10-6
Acceleration due to gravity	g	m/s2	9.81	9.81	9.81
Density of water	ρ	kg/m3	1000	1000	1000

Table 32 Model inputs

C.3 Model Description and Equations

(Note: for brevity metric conversions have been excluded eg km to m)

The energy required in kWh to pump a given volume per day, assuming constant pumping, is calculated by:

$$Energy = \frac{Q \times H_T \times g \times \rho}{Eff} \times t$$

Where Q is the flow rate calculated as:

$$Q = \frac{V}{t}$$

And H_T is total hydraulic head given by:

$$H_T = H_f - H_0 + H_D$$

Where H_D is the dynamic head. This assumes the atmospheric pressure for the starting and final reservoirs are the same.

The dynamic head is estimated using a slightly modified version of the empirically determined Darcy-Weisbach equation:

$$H_D = \frac{(L_P + L_f) \times \text{velocity}^2}{2g}$$

Where the velocity of water in the pipe is equal to the flow rate divided by the cross sectional area of the pipe, L_f is the factor to account for friction losses due to fittings in the pipe (which is assumed to be zero in this model) and L_p is the is the factor to account for friction losses in the pipe:

$$L_P = \frac{F_d \times l}{d}$$

Where F_d is the Darcy friction factor, which is a unit-less quantity relating friction to the roughness and size of the pipe, and the turbulence of the water flow. F_d is an implicit function but is estimated here using the Swamee and Jain method:

$$F_d \approx \frac{0.25}{\left\{ log \left(\frac{rf}{3.7 \times d} + \frac{5.74}{R^{0.9}} \right) \right\}^2}$$

Where R is the Reynolds number, a unitless measure of the turbulence of the water flowing through the pipe:

$$R = \frac{\text{velocity} \times d}{\nu}$$