

# Delivery Strategy for NZ's Largest Water Treatment Plant Replacement to date - Lessons from around the world

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## ABSTRACT

The existing Huia Water Treatment Plant is almost at the end of its operational life. A project is currently underway for the planning, design and construction of a replacement plant at a neighbouring site. The predicted value of the project (>\$700M) and complexity has led Watercare to explore project delivery mechanisms in addition to its own Enterprise Model framework.

This paper summarises the lessons learnt from the procurement strategies employed on recent projects at Watercare and at other water sector projects within New Zealand, in Australia, and in the United Kingdom. The lessons learnt were captured in interviews with personnel that were involved on projects or in the organisations completing them at the time. These lessons have been used to identify the ideal delivery strategy for the replacement Huia Water Treatment Plant.

18 case studies were conducted in total. These projects were identified on the grounds that they had similarities in either sector type, scale, risk profile, outcomes, or location. 4 of these were large Watercare projects, to capture lessons learnt in the company. Following this, 12 large water sector projects in the rest of New Zealand, Australia and the United Kingdom were identified to focus on jurisdictions with similar environments and procurement practices. To add greater depth to the study, 2 case studies in different industries were also identified. These studies are also summarised in the paper.

The UK has generally been aligned on delivery through framework partner approaches. Australia has been delivering through differing procurement models, with a mix of framework and ECI Design & Build approaches, including DBOM contracts. For tendered projects ECI appears to be a market favoured approach, with a growing expectation for full or partial reimbursement for tender costs.

In the market, supply chain concerns may be short-lived, though the global macro-economic picture is still evolving, and future market and supply chain predictions fall short of any certainty. The global contractor market appears to be saturated especially with the current trend of delivering programs through longer term contracts and alliance type models.

Common themes of the study included - reduced risk appetite from contractors, requirement of advanced warning of intent to go to market (but not too long), need for ECI and collaborative contracting, importance of building the right teams and partnerships and getting the appropriate people involved in the project.

**KEYWORDS:** procurement, mega project, water treatment plant, industry best practice, contracts, ECI

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# 1 Presenter Profiles (50 words max each)

## **Nikhil Susarla**

Nikhil is a planning engineer at Watercare responsible for managing feasibility studies and delivering business cases for water treatment projects in Auckland. He is a CPEng and has held various roles at Watercare ranging from Operations to Commissioning. Nikhil is the project manager for the Huia WTP replacement.

## **Michelle Morris**

Michelle is a highly skilled and trusted Infrastructure Advisor. She has held lead transaction and commercial advisory roles across a broad range of rail and water infrastructure projects, under a variety of contract models. Across these engagements, she has helped Government frame and implement complex packaging and commercial strategies for delivery.

## **Mia Thomson**

Mia is an Infrastructure Advisory consultant who joined Aurecon in 2022 as a graduate with a keen interest in the water industry. Mia has worked with Watercare to help validate their Asset Management Plan in 2022 and more recently on the creation of the Huia Delivery Strategy.

# 2 Introduction

## 2.1 Disclaimer

For probity reasons the specific case study source is omitted for the lessons learnt documented. Some of the case study projects are still in procurement, and other projects are confidential and have been given pseudonyms.

## 2.2 Context

The existing Huia Water Treatment Plant (WTP) is almost at the end of its operational life. A project is currently underway for the planning, design and construction of a replacement plant at a neighbouring site.

Watercare typically delivers projects through its Enterprise Model Framework (EMF). This framework allows Watercare to deliver projects through two routes - Asset Upgrades and Renewals (AUR) and Major Projects (MP). Projects are allocated to AUR and MP in the planning phase, based on overall cost of project, timeframe, complexity, and repeatability.

The MP EMF is a 10-year collaboration between Watercare, our two strategic planning partners (Aurecon and Stantec), our two design delivery partners (Beca and WSP), and our two construction partners (Fletcher Construction and Fulton Hogan). The AUR EMF involves a similar partnership or 'panel' and is currently being developed.

The predicted complexity, scale and value of the replacement Huia WTP project (the project) has led Watercare to explore project delivery mechanisms in addition to its own EMF. The project will be the largest of its kind in New Zealand, a full replacement of an existing water treatment plant, until the Ardmore WTP in Auckland is replaced in the 2050's. The project has numerous documented risks and is part of a larger programme of works with inter-dependencies and interfaces.

## **2.3 Solution – Think Global, Act Local**

A project of this kind is not very common in Watercare and in the water industry in New Zealand, so it was imperative to look to markets, utilities and companies with recent experience delivering these and document any lessons others may have learnt. The intention was to leverage learnings from those that have been down this path before and others on the journey. This would also be an opportunity to understand the latest trends in the industry.

Watercare reached out to our SPP – Aurecon, who have vast experience advising water utilities with similar challenges. Aurecon assisted Watercare in development of a methodology to identify a suitable delivery model for the project.

The decision was made to “Apply Global Thinking to the Local Market”. There are many new Water and Wastewater treatment plants, desalination plants and schemes built all over the world and the project strategy needed to leverage learnings from these. Lessons, both positives and negative about various delivery approaches were documented. There were often quite a few messages about other specifics like resourcing and procurement that were also relevant to the project and were noted too.

### 3 Approach

To explore delivery model alternatives outside of the Enterprise Model our objective was to select case studies of recent projects to understand the latest trends and procurement lessons learnt.

The procurement objectives for the new Huia WTP project were identified and are summarised as timeframe for delivery, plant performance, value for money and ability to meet the wider project objectives around sustainability and other important outcomes for Watercare and the communities it serves.

These objectives would be used later in the development of the delivery strategy and additionally to decipher which lessons learnt should be carried for Huia.

Once the procurement objectives were defined, the Huia Delivery Strategy working group (Aurecon and Watercare) tapped into our networks to leverage experience. The working group established a list of 18 projects to use as case studies, largely consisting of Water Sector projects in jurisdictions such as New Zealand, Australia and the United Kingdom that have transferrable procurement practices. The case study projects are defined in Table 1 Case Studies. Interviews to create the case studies were then conducted over two months with personnel that were involved on projects or in the organisations completing them at the time. A questionnaire formed the basis of questioning in each interview, with questions such as what drove the selection of the delivery model used, general project information, main risks perceived, and general inquiry into the project’s outcome.

*Table 1 Case Studies*

	<b>Project Name</b>	<b>Delivery Model</b>	<b>Location</b>
1	Central Interceptor	Design-Bid-Build	Auckland, NZ
2	Hunua 4 Watermain	Primarily Design-Bid-Build	Auckland, NZ
3	Māngere BNR	Design-Bid-Build	Auckland, NZ
4	Waikato 50 WTP	Enterprise Model	Auckland, NZ
5	Moa Point Sludge Minimisation Facility	Competitive Alliance	Wellington, NZ
6	Waiāri Water Supply Scheme	Primarily Design-Bid-Build	Te Puke, NZ
7	Adelaide Desalination Plant	Design-Build-Operate-Maintain	Adelaide, AUS
8	Alkimos Desalination Project	Competitive Alliance	Perth, AUS
9	Western Treatment Plant (WTP) Bundle	Competitive ECI (2 teams), then a Design and Construct, followed by a 6-month proof of performance (PoP)	Victoria, AUS
10	WTP 160S Nutrient Removal Plant	Competitive ECI (3 teams), then a Design and Construct, followed by a 24-month PoP	Victoria, AUS
11	WTP 5W Nutrient Removal Plant	Design then Construct (Design-Bid-Build)	Victoria, AUS

	<b>Project Name</b>	<b>Delivery Model</b>	<b>Location</b>
12	WSP Treatment Plant Delivery Models	Multiple Projects and Delivery Models	AUS
13	Glencorse Water Treatment Works	Progressive Design & Build	Scotland, UK
14	Katrine Water Project	Design & Build Alliance	Scotland, UK
15	Birmingham Resilience Project	ECI Design & Build	England, UK
16	Scottish Water's Programme	Alliance D&B consortia	Scotland, UK
17	Food Manufacturing Factory	Direct Managed	Canterbury, NZ
18	Power Generation Project	ECI to EPC, change halfway to Direct Managed and Design & Build	Canterbury, NZ

## 4 Learnings

Once case studies were complete the learnings were compiled into a 'Best Practice Memorandum'. The following sections summarise the lessons learnt as documented within the Best Practice Memorandum.

### 4.1 What we learnt during the case study process

- Despite creating a questionnaire, it was best to let people talk to their projects and prompt with further questions when required. This ensured the information wasn't biased due to leading questions and allowed people to recall the most memorable and key lessons.
- 'You get what you give'. It was important that we provided people with the context of the Huia project, the procurement study, and why we were talking to them.
- Overall there was a resounding willingness to share from those we interviewed. Notably, some of the projects are not yet complete, and people encouraged us to return to discuss the finished result. Three Australian water utilities were willing to help Watercare to understand the commercial arrangement of their delivery models, including their proposed contract terms and conditions for their chosen delivery models. The message was clear — water utilities are all in this together and this fosters a willingness to share to help each other to solve complex project development issues.

### 4.2 Learnings from the case studies

- Market Participation and Readiness:
  - Choose your delivery model wisely to get market participation. The choice of delivery model and corresponding approach to risk does influence the contractor's appetite to participate in the context of a "hot" market.
  - Work with the market to keep them informed during the readiness for market phase (prior to procurement start) to encourage participation in the project. Engage with the market to seek feedback on the proposed procurement approach. A key takeaway from a NZ project was that if market research is completed in advance, it is crucial to retest closer to tendering so that there is sufficient competitive tension in the procurement phase.
- Early Contractor Involvement (ECI):
  - ECI is a market favoured approach. Nearly all case studies referenced some form of ECI, either noting its efficacy or that the project would have benefitted from it.
  - On a New Zealand project using ECI allowed for the early implementation of innovative ideas. From a commercial stance ECI also helped mitigate uncertainty due to COVID-19 via early discussions and mutual agreement on costs.
  - A lesson learnt from a Watercare case study was that some of the challenges faced during construction would have been mitigated by higher levels of ECI in the design phase to better understand starting conditions and utilize the design process to mitigate risk, programme delay, and cost increase.
  - On another Watercare project part of the need for a significant amount of re-design in later stages of the project was due to having an unsuitable ECI partner on board. The commercial

structure meant the ECI partner would be precluded from tendering and as a result players who would have given the most useful input were not consulted in early project stages.

- Cost reimbursement:
  - There is a growing expectation for full or partial reimbursement for ECI participation and tendering costs. This expectation was a clear theme on the projects we talked to that were about to, or had just, recently awarded the contract, and it is effective to bring ‘big players’ to the ‘tendering table’. See the section on Australian Market Trends for greater detail.
  - Reimbursement is also becoming more prevalent in New Zealand, for example on large alliancing transport projects.
- Collaborative forms of delivery models are becoming more commonplace, particularly those with pain-gain share mechanisms or incentivized target cost mechanisms.
- There remains immense value in building relationships and strong teams:
  - Despite a Watercare project’s main contract being delivered through a traditional Design-Bid-Build, some designers, contractors and Watercare personnel were collocated to a small project office.
  - Collaborative co-located delivery teams were called out as effective by multiple case studies. Noting that many of these projects were before the migration to online working post COVID-19.
  - On two Scottish projects a large amount of effort was spent on behaviour, collaboration, and team set up. The project’s had integrated teams, one of which saw staff co-located at a site-office.
  - A project in Scotland had owner’s clauses that penalised successful tenderers a large amount if the top people listed on the tender did not fulfil their role and this was deemed very effective. This Scottish water utility noted that the evaluation of tenders should give a significant weighting to people, and who is delivering the project, which they saw as just as, if not more important, than the financial criteria.
- Risk as a key concern and lever:
  - Project procurement decision were often made based on risk, such as a delivery model that provides risk mitigation or sharing opportunities, or appropriate apportionment of risk to the parties best equipped to manage each risk.
  - Many case studies noted the market’s reluctance to take on certain risks. Contractors have not been bidding or have stepped away from jobs where their risk is too high. There are a limited number of suppliers with the knowledge, experience, and preparedness to take on substantial risks in the water industry.
  - As the maturity of water utilities increase, they are evolving to a more realistic outlook on risk ownership based on allocation to the party best equipped to manage the risk and acknowledgement of who will eventually own process risk. Process risk can be effectively managed via water utilities actively carrying out their due diligence on technologies and technology provider selection through pilot trials, research and review of reference facilities and increasing in-house technical capability. With the adoption of innovative process technologies high on the agenda of UK water utilities, most have either in-house capability



and responsibility for technology decisions or appointed suitably qualified service providers to bring their knowledge and expertise of low-risk high benefit technical options.

- ECI was called out as an effective way to de-risk projects. Risks such as ground conditions and geotechnical risks are seen as the major items and the water utilities are taking on responsibility of these risks and by getting ECI and early sharing of data these risks are being managed collaboratively and collectively.
- On an in-flight New Zealand project, a Design and Build approach was strongly considered; however, the consultancy contractor market meant the allocation of process risk was problematic. Generally, the consultant doing the design typically can't get insurance for process guarantees, and contractors won't take on process risk. From market sounding early in the procurement process the feeling was that if the project went for an open market Design and Build then there would not be enough interest.
- Delivery entities are more frequently stepping away from certain risk areas, in particular third-party risk, ground conditions, programme risk, weather and climate change impacts and process risk. Water utilities are owning and managing certain risks (that they are seen as the most competent to manage and own such as process and operational risk) for the long-term.
- Seek out and value early operational input:
  - Multiple studies called out the benefits of getting operational input early on projects, especially during the feasibility and design phases. Using early supplier engagement and including the plant's operation and maintenance as part of the scope has enabled water utilities to gain the benefits of the supplier knowledge and experience while also getting shared ownership of the whole of life costs and process risk.
  - On some programme level procurement models in Scotland, operations staff who are near retirement are permanently seconded to provide input into projects. Meanwhile, in Australia alliances the input of eventual operators has kept the principal, designers, and contractors accountable to operational performance and objectives.
  - On a Scottish water project the commissioning manager was included in a successful first project phase to develop the target price, design, and risk profile.

### **4.3 New Zealand Market Trends**

While our study was focused on overseas jurisdictions there were some New Zealand market trends observed:

- On previous public sector projects in transportation there has been a move towards alliancing with mixed results. Some recent transport projects have seen substantial cost escalation, which has caused significant public interest, and a level of concern around the alliance procurement solution used. Meanwhile, other projects have employed a hybrid (sometimes competitive) alliancing model, in which a target cost is set, and designers and contractors seek to derive quality within the set cost boundaries. This has helped solve an issue on previous procurements that saw costs being reduced to the point that the overall project quality has been compromised.

- As markets and supply chains have become increasingly constrained, there has been a shift towards the creation of panels, programme level delivery, or long-term contracts that help lock in suppliers, designers, and contractors, and allow for longer lead times.

Additionally, some other lessons learned from the NZ market are:

- Competitive tension can be lost if the net for tender is cast too widely, leading contractors to perceive over-interest, and thus not pursue a project.
- Contractors would usually want to be one of two or three parties to justify the return on bidding. Providing some form of bid cost reimbursement can also encourage participation. It is usually preferable to pay two bidders an appropriate stipend, rather than three an amount insufficient to cover their costs.

#### **4.4 Australian Market Trends**

Australian Water Entity's, suppliers, and contractors were all amenable to more collaborative forms of contract.

- Water utilities are using Design and Build Lump Sum or Measure and Value methodologies for projects across Australia where the risks are low and there is plenty of competition. However, early supplier engagement and cost reimbursable with incentivized cost targets and pain/gain mechanism models are being used for the most recent large -scale projects to share costs risk in a market with limited numbers and suppliers adverse to large scale risk.
- Cost reimbursement is commonplace. The costs of preparing a concept design and tender are high (>2% of capital value). Water utilities in Australia are therefore part funding the concept design and tender using a bid cost reimbursement to offset the high costs and transfer ownership of intellectual property. On one project a water utility offered to pay each tenderer up to AUD 2 million for the ECI phase involvement to develop the tender design and Target Outturn Cost. On another project for the similar development of TOC proponents were paid AUD 7.5 million. Other water utilities pay stipends throughout the ECI phase, and in one competitive alliance model the unsuccessful tendering team would receive AUD 4.5 million for their involvement (allowing the water utility to receive two designs for the price of one).
- Competitive procurement processes with two or more consortia can drive innovation and provide the opportunity to better understand and adopt different technologies. One Australian water utility noted Dual TOC should only be used when you require significant innovation, and it is beneficial to obtain two designs.

#### **4.5 United Kingdom Market Trends**

- Current models consist of frameworks based on 5 to 10 years for delivery on the Asset Management Plan. Framework partners are selected based on past performance, capacity, capability. Works are allocated based on the framework partners strengths such as treatment plants, sewer networks or large diameter pipework. Some water utilities engage framework partners to deliver their works based purely on geographical boundaries.
- The days of "lowest bid" being the main criteria for the selection of preferred tenderers are past and more strategic and relationship based contracting models have been developed over the past 15

years, with cost reduction and performance incentive models being preferred. Through long-term partnerships, the industry has moved to aligning their strategic ambitions with their framework partners and the supply chain.

- Setting cost targets is a real struggle. The market is moving faster than inflation built into contracts requiring the water utility to proactively manage this.
- Supply chain is fragile. Programme delivery mitigates this by bringing the supply chain much further upstream, for a longer horizon planning approach. Sensible risk discussions with contractors and aligning on front-end ordering etc to avoid stacked up overheads can also alleviate supply chain problems.
- The role of technology is also key in the UK water industry procurement narrative. The drive to deliver TOTEX savings has meant water utilities have tended to be open to adopting innovative technologies and investing in managing technology rather than the development of technology.

## **5 Application to Huia**

Huia is a project of significant scale and complexity which does warrant understanding the current market practices and approaches. There were many emerging themes which validated the delivery strategy approach for Huia. A typical business as usual approach was viewed as not able to harness the best ability of the market to innovate and deliver value.

It was noted that trends in New Zealand do follow global trends and that more collaborative forms of contract are being adopted in the context of a hot construction market.

Water utilities are using, early supplier engagement and cost reimbursable models with targets (KPIs) and pain/gain mechanisms for the most recent large -scale water projects to share costs and risk in a market with limited numbers and suppliers adverse to large scale risk.

## **6 Takeaways for project development teams**

There was positive feedback on early engagement with the market to enable them to understand the proposed delivery and procurement approach and to better understand the risk profile of the proposed project.

### **6.1 Resourcing**

During the readiness for market phase the water utility will assess if they have the requisite internal resources to develop the project including, engineering, stakeholder and community management, planning, environment and sustainability, project management, finance, legal and procurement. Alternatively, consultants can be brought in to assist or the water utility may choose to hire and build up capability.

### **6.2 Approach to risk**

Risk was an emerging key theme. Specifically, the reluctance of the market to take on certain risks, to the extent that contractors will not bid on jobs or will step away from contracts where their risk is too high. As the maturity of water entities is increasing, they are evolving to a more realistic outlook on risk ownership based on who will eventually own process risk and allocating risks to the party best able to manage them.

### **6.3 Approvals (consenting, funding, governance)**

Outlining approvals and building in realistic timeframes for the overall project development phase. Working with stakeholders to manage approvals, funding and other governance. Not underestimating the timeframes involved.

### **6.4 Incentives**

ECI is a well-accepted and market favoured approach, with a growing expectation for full or partial reimbursement for tender costs.

### **6.5 Collaborative tendering**

To maximize the tenderers potential, water utilities have provided clear definition of their requirements and are engaged throughout the concept design and tender process to influence

outcomes. Technical workshops, HAZOP and risk reviews occur regularly throughout the tender development, with expectations that the water utility reviews will provide advice on options.

## **6.6 Approach to design**

The approach to design and the level of scope definition that the water utility wants to manage directly or own as opposed to contracting to the market. This could include the water utility effectively owning a detailed design, or at the other extreme, a performance-based specification, or some form of hybrid approach. There may be some specific aspects that the water utility wants to retain such as the process design. There are also varying abilities in the market for the contractor to hold process risk.

## **6.7 Operations involvement and stakeholder management**

The importance of operational input at project inception and designing with the end in mind, i.e., the operational readiness phase is also an important consideration in choosing a delivery strategy. Some water utilities adopted a DBOM delivery strategies for that exact reason to have both designer, constructor, and operator “inside the tent”.

Clear understanding of stakeholders needs, and any particular constraints or issues are better to be understood early on in the project development phase.

## **6.8 Interfaces**

Multiple construction work fronts and approaches to collaborating at interface points. Understanding of interface risk and planning for how this will be managed.

# **7 Key Conclusions**

Common themes of the study include a reduced risk appetite from contractors, requirement of advanced warning of intent to go to market (but not too long), need for ECI and collaborative contracting, importance of building the right teams and partnerships, and getting the appropriate people involved in the project.

The move away from lump sum contracts has opened up a variety of collaborative contracting models with design and build at its core. Water utilities are increasingly using incentivized cost targets, key performance indicators, pain/gain mechanisms with interactive workshops during the tender process to great success.

# **8 Acknowledgements**

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