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National Water Grid

Water infrastructure-related costs for the Victoria and Southern Gulf catchments

A technical report from the CSIRO Victoria and Southern Gulf Water Resource Assessments for the National Water Grid

Rider Levett Bucknall

RLB Rider Levett Bucknall

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Aspects of the Assessments have been undertaken in conjunction with the Northern Territory and Queensland governments.

The Assessments were guided by three committees:

i. The Governance Committee: CRC for Northern Australia/James Cook University; CSIRO; National Water Grid (Department of Climate Change, Energy, the Environment and Water); Northern Land Council; NT Department of Environment, Parks and Water Security; NT Department of Industry, Tourism and Trade; Office of Northern Australia; Queensland Department of Agriculture and Fisheries; Queensland Department of Regional Development, Manufacturing and Water

ii. The joint Roper and Victoria River catchments Steering Committee: Amateur Fishermen's Association of the NT; Austrade; Centrefarm; CSIRO; National Water Grid (Department of Climate Change, Energy, the Environment and Water); Northern Land Council; NT Cattlemen's Association; NT Department of Environment, Parks and Water Security; NT Department of Industry, Tourism and Trade; NT Farmers; NT Seafood Council; Office of Northern Australia; Parks Australia; Regional Development Australia; Roper Gulf Regional Council Shire; Watertrust

iii. The Southern Gulf catchments Steering Committee: Amateur Fishermen's Association of the NT; Austral Fisheries; Burketown Shire; Carpentaria Land Council Aboriginal Corporation; Health and Wellbeing Queensland; National Water Grid (Department of Climate Change, Energy, the Environment and Water); Northern Prawn Fisheries; Queensland Department of Agriculture and Fisheries; NT Department of Environment, Parks and Water Security; NT Department of Industry, Tourism and Trade; Office of Northern Australia; Queensland Department of Regional Development, Manufacturing and Water; Southern Gulf NRM

Responsibility for the Assessments' content lies with CSIRO. The Assessments' committees did not have an opportunity to review the Assessments' results or outputs prior to their release.

This report was reviewed by Kevin Devlin (Independent consultant), Cuan Petheram (CSIRO) and Lee Rogers (CSIRO).

Acknowledgement of Country

CSIRO acknowledges the Traditional Owners of the lands, seas and waters of the area that we live and work on across Australia. We acknowledge their continuing connection to their culture and pay our respects to their elders past and present.

Photo

Lake Moondarra in the Leichhardt catchment. Source: CSIRO – Nathan Dyer

Director's foreword

Sustainable development and regional economic prosperity are priorities for the Australian, Queensland and Northern Territory (NT) governments. However, more comprehensive information on land and water resources across northern Australia is required to complement local information held by Indigenous Peoples and other landholders.

Knowledge of the scale, nature, location and distribution of likely environmental, social, cultural and economic opportunities and the risks of any proposed developments is critical to sustainable development. Especially where resource use is contested, this knowledge informs the consultation and planning that underpin the resource security required to unlock investment, while at the same time protecting the environment and cultural values.

In 2021, the Australian Government commissioned CSIRO to complete the Victoria River Water Resource Assessment and the Southern Gulf Water Resource Assessment. In response, CSIRO accessed expertise and collaborations from across Australia to generate data and provide insight to support consideration of the use of land and water resources in the Victoria and Southern Gulf catchments. The Assessments focus mainly on the potential for agricultural development, and the opportunities and constraints that development could experience. They also consider climate change impacts and a range of future development pathways without being prescriptive of what they might be. The detailed information provided on land and water resources, their potential uses and the consequences of those uses are carefully designed to be relevant to a wide range of regional-scale planning considerations by Indigenous Peoples, landholders, citizens, investors, local government, and the Australian, Queensland and NT governments. By fostering shared understanding of the opportunities and the risks among this wide array of stakeholders and decision makers, better informed conversations about future options will be possible.

Importantly, the Assessments do not recommend one development over another, nor assume any particular development pathway, nor even assume that water resource development will occur. They provide a range of possibilities and the information required to interpret them (including risks that may attend any opportunities), consistent with regional values and aspirations.

All data and reports produced by the Assessments will be publicly available.

Chris Chilcott

Project Director

The Victoria and Southern Gulf Water Resource Assessment Team

Project Director	Chris Chilcott
Project Leaders	Cuan Petheram, Ian Watson
Project Support	Caroline Bruce, Seonaid Philip
Communications	Emily Brown, Chanel Koeleman, Jo Ashley, Nathan Dyer

Activities

Agriculture and socio-economics	Tony Webster, Caroline Bruce, Kaylene Camuti[1], Matt Curnock, Jenny Hayward, Simon Irvin, Shokhrukh Jalilov, Diane Jarvis[1], Adam Liedloff, Stephen McFallan, Yvette Oliver, Di Prestwidge[2], Tiemen Rhebergen, Robert Speed[3], Chris Stokes, Thomas Vanderbyl[3], John Virtue[4]
Climate	David McJannet, Lynn Seo
Ecology	Danial Stratford, Rik Buckworth, Pascal Castellazzi, Bayley Costin, Roy Aijun Deng, Ruan Gannon, Steve Gao, Sophie Gilbey, Rob Kenyon, Shelly Lachish, Simon Linke, Heather McGinness, Linda Merrin, Katie Motson[5], Rocio Ponce Reyes, Jodie Pritchard, Nathan Waltham[5]
Groundwater hydrology	Andrew R. Taylor, Karen Barry, Russell Crosbie, Margaux Dupuy, Geoff Hodgson, Anthony Knapton[6], Shane Mule, Stacey Priestley, Jodie Pritchard, Matthias Raiber, Steven Tickell[7], Axel Suckow
Indigenous water values, rights, interests and development goals	Marcus Barber/Kirsty Wissing, Pethie Lyons, Peta Braedon, Kristina Fisher, Petina Pert
Land suitability	Ian Watson, Jenet Austin, Bart Edmeades[7], Linda Gregory, Ben Harms[10], Jason Hill[7], Jeremy Manders[10], Gordon McLachlan, Seonaid Philip, Ross Searle, Uta Stockmann, Evan Thomas[10], Mark Thomas, Francis Wait[7], Peter L. Wilson, Peter R. Wilson, Peter Zund
Surface water hydrology	Justin Hughes, Matt Gibbs, Fazlul Karim, Julien Lerat, Steve Marvanek, Cherry Mateo, Catherine Ticehurst, Biao Wang
Surface water storage	Cuan Petheram, Giulio Altamura[8], Fred Baynes[9], Jamie Campbell[11], Lachlan Cherry[11], Kev Devlin[4], Nick Hombsch[8], Peter Hyde[8], Lee Rogers, Ang Yang

Note: Assessment team as at September, 2024. All contributors are affiliated with CSIRO unless indicated otherwise. Activity Leaders are underlined. For the Indigenous water values, rights, interests and development goals activity (Victoria catchment), Marcus Barber was Activity Leader for the project duration except August 2022 – July 2023 when Kirsty Wissing (a CSIRO employee at the time) undertook this role.

[1]James Cook University; [2]DBP Consulting; [3]Badu Advisory Pty Ltd; [4]Independent contractor; [5] Centre for Tropical Water and Aquatic Ecosystem Research. James Cook University; [6]CloudGMS; [7]NT Department of Environment, Parks and Water Security; [8]Rider Levett Bucknall; [9]Baynes Geologic; [10]QG Department of Environment, Science and Innovation; [11]Entura

Shortened forms

SHORT FORM	FULL FORM
CPI	Consumer Price Index
GRP	glass-reinforced plastic
HDPE	high-density polyethylene
NT	Northern Territory
OSO	on-site overheads
RCC	roller compacted concrete
TDC	total direct construction costs
TOC	total out turn costs
TPC	total project costs
WA	Western Australia

Units

SHORT FORM	FULL FORM
cu m	cubic metre
GL	gigalitre
ha	hectare
km	kilometre
m	metre
m^3	cubic metre

Preface

Sustainable development and regional economic prosperity are priorities for the Australian, NT and Queensland governments. In the Queensland Water Strategy, for example, the Queensland Government (2023) looks to enable regional economic prosperity through a vision which states 'Sustainable and secure water resources are central to Queensland's economic transformation and the legacy we pass on to future generations.' Acknowledging the need for continued research, the NT Government (2023) announced a Territory Water Plan priority action to accelerate the existing water science program 'to support best practice water resource management and sustainable development.'

Governments are actively seeking to diversify regional economies, considering a range of factors, including Australia's energy transformation. The Queensland Government's economic diversification strategy for north west Queensland (Department of State Development, Manufacturing, Infrastructure and Planning, 2019) includes mining and mineral processing; beef cattle production, cropping and commercial fishing; tourism with an outback focus; and small business, supply chains and emerging industry sectors. In its 2024–25 Budget, the Australian Government announced large investment in renewable hydrogen, low-carbon liquid fuels, critical minerals processing and clean energy processing (Budget Strategy and Outlook, 2024). This includes investing in regions that have 'traditionally powered Australia' – as the North West Minerals Province, situated mostly within the Southern Gulf catchments, has done.

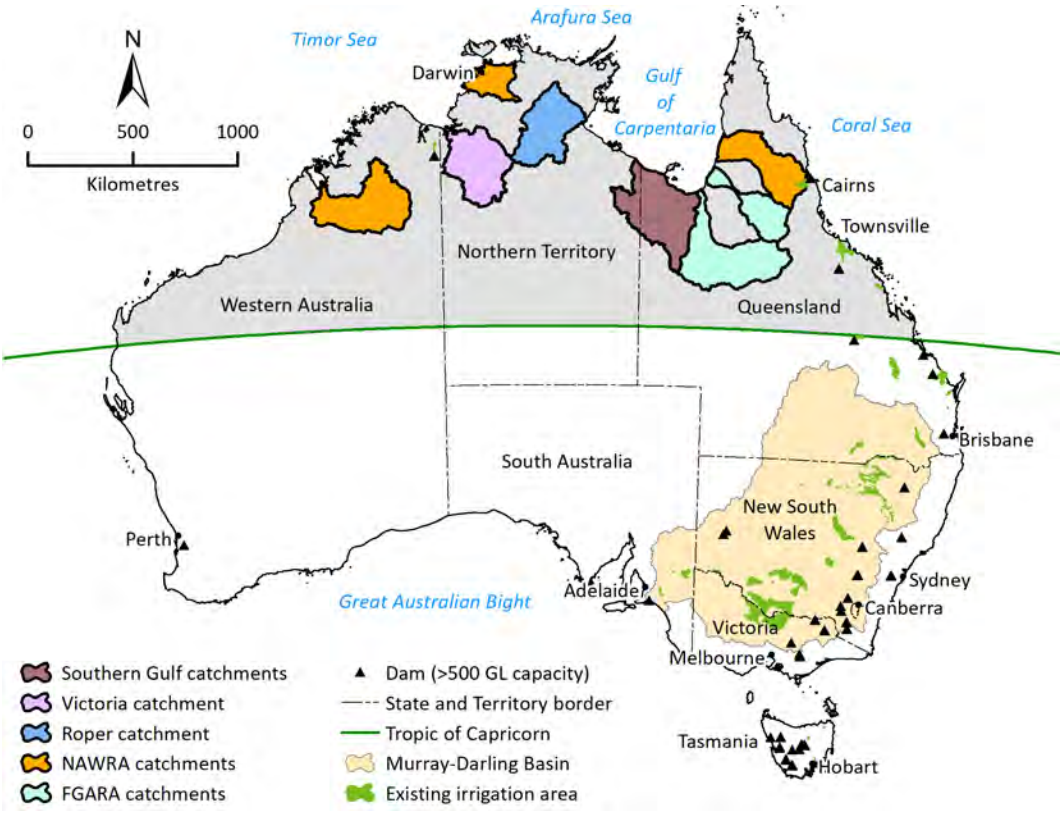
For very remote areas like the Victoria and Southern Gulf catchments, the land (Preface Figure 1-1), water and other environmental resources or assets will be key in determining how sustainable regional development might occur. Primary questions in any consideration of sustainable regional development relate to the nature and the scale of opportunities, and their risks.

How people perceive those risks is critical, especially in the context of areas such as the Victoria and Southern Gulf catchments, where approximately 75% and 27% of the population (respectively) is Indigenous (compared to 3.2% for Australia as a whole) and where many Indigenous Peoples still live on the same lands they have inhabited for tens of thousands of years. About 31% of the Victoria catchment and 12% of the Southern Gulf catchments are owned by Indigenous Peoples as inalienable freehold.

Access to reliable information about resources enables informed discussion and good decision making. Such information includes the amount and type of a resource or asset, where it is found (including in relation to complementary resources), what commercial uses it might have, how the resource changes within a year and across years, the underlying socio-economic context and the possible impacts of development.

Most of northern Australia's land and water resources have not been mapped in sufficient detail to provide the level of information required for reliable resource allocation, to mitigate investment or environmental risks, or to build policy settings that can support good judgments. The Victoria and Southern Gulf Water Resource Assessments aim to partly address this gap by

providing data to better inform decisions on private investment and government expenditure, to account for intersections between existing and potential resource users, and to ensure that net development benefits are maximised.



Preface Figure 1-1 Map of Australia showing Assessment areas (Victoria and Southern Gulf catchments) and other recent CSIRO Assessments

FGARA = Flinders and Gilbert Agricultural Resource Assessment; NAWRA = Northern Australia Water Resource Assessment.

The Assessments differ somewhat from many resource assessments in that they consider a wide range of resources or assets, rather than being single mapping exercises of, say, soils. They provide a lot of contextual information about the socio-economic profile of the catchments, and the economic possibilities and environmental impacts of development. Further, they consider many of the different resource and asset types in an integrated way, rather than separately.

The Assessments have agricultural developments as their primary focus, but they also consider opportunities for and intersections between other types of water-dependent development. For example, the Assessments explore the nature, scale, location and impacts of developments relating to industrial, urban and aquaculture development, in relevant locations. The outcome of no change in land use or water resource development is also valid.

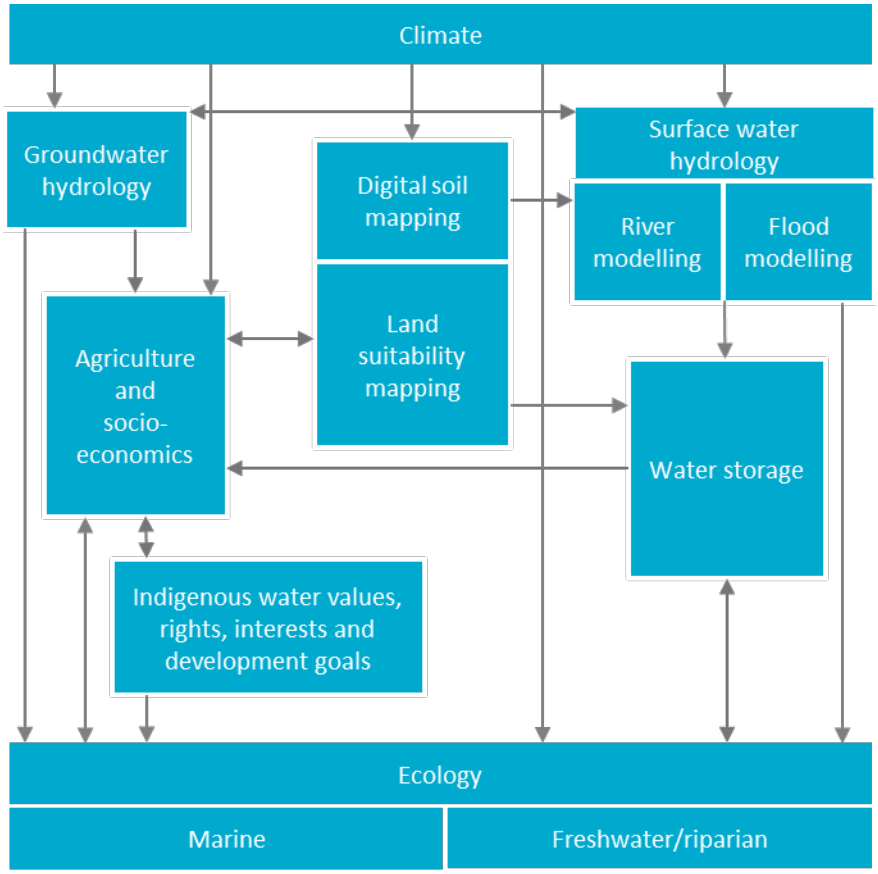
The Assessments were designed to inform consideration of development, not to enable any particular development to occur. As such, the Assessments inform – but do not seek to replace – existing planning, regulatory or approval processes. Importantly, the Assessments do not assume a given policy or regulatory environment. Policy and regulations can change, so this flexibility enables the results to be applied to the widest range of uses for the longest possible time frame.

It was not the intention of – and nor was it possible for – the Assessments to generate new information on all topics related to water and irrigation development in northern Australia. Topics

not directly examined in the Assessments are discussed with reference to and in the context of the existing literature.

CSIRO has strong organisational commitments to Indigenous reconciliation and to conducting ethical research with the free, prior and informed consent of human participants. The Assessments allocated significant time to consulting with Indigenous representative organisations and Traditional Owner groups from the catchments to aid their understanding and potential engagement with their requirements. The Assessments did not conduct significant fieldwork without the consent of Traditional Owners.

Functionally, the Assessments adopted an activities-based approach (reflected in the content and structure of the outputs and products), comprising activity groups, each contributing its part to create a cohesive picture of regional development opportunities, costs and benefits, but also risks. Preface Figure 1-2 illustrates the high-level links between the activities and the general flow of information in the Assessments.



Preface Figure 1-2 Schematic of the high-level linkages between the eight activity groups and the general flow of information in the Assessments

Assessment reporting structure

Development opportunities and their impacts are frequently highly interdependent and, consequently, so is the research undertaken through these Assessments. While each report may be read as a stand-alone document, the suite of reports for each Assessment most reliably informs discussion and decisions concerning regional development when read as a whole.

The Assessments have produced a series of cascading reports and information products:

- Technical reports present scientific work with sufficient detail for technical and scientific experts to reproduce the work. Each of the activities (Preface Figure 1-2) has one or more corresponding technical reports.
- Catchment reports, one for each of the Victoria and Southern Gulf catchments, synthesise key material from the technical reports, providing well-informed (but not necessarily scientifically trained) users with the information required to inform decisions about the opportunities, costs and benefits associated with irrigated agriculture and other development options.
- Summary reports, one for each of the Victoria and Southern Gulf catchments, provide a shorter summary and narrative for a general public audience in plain English.
- Summary fact sheets, one for each of the Victoria and Southern Gulf catchments, provide key findings for a general public audience in the shortest possible format.

The Assessments have also developed online information products to enable users to better access information that is not readily available in print format. All of these reports, information tools and data products are available online at https://www.csiro.au/victoriariver and https://www.csiro.au/southerngulf. The webpages give users access to a communications suite including fact sheets, multimedia content, FAQs, reports and links to related sites, particularly about other research in northern Australia.

Executive summary

Cost estimation is the process of attempting to forecast the financial costs of a project before receiving tender prices from a contractor (or contractors). It involves analysing factors such as quantities, materials, labour, equipment, and overhead costs to generate an estimated project cost. Effective cost estimation is essential for budgeting, planning, and decision making in construction management. Accurate cost estimations help stakeholders understand the financial implications of a project, secure funding, make informed decisions, and manage risks effectively.

The primary objective of this study is to document how high-level unit cost, initial setup cost, and indirect cost estimates for roller compacted concrete dams and reticulation infrastructure in the Victoria and Southern Gulf catchments vary with scale.

To establish how unit costs, initial setup costs and indirect costs for dams and reticulation infrastructure vary with scale in the Victoria and Southern Gulf catchments, Rider Levett Bucknall prepared indicative construction costs for seven hypothetical roller compacted concrete dams of varying size in each of these two study areas. The cost estimates were based on quantities supplied by CSIRO for each of the seven hypothetical dams. The hypothetical dams ranged in scale from 40,000 m^3 roller compacted concrete to 1,700,000 m^3 roller compacted concrete.

Rider Levett Bucknall's high-level cost analysis applied suitable adjustments to account for the economies of scale associated with each dam size and the remoteness of the selected geographical locations.

This report also briefly outlines for the general reader an array of factors specific to the regions, as well as national and international influences on material and labour costs that affect the construction costs of the potential dams.

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1 Introduction

1.1 Overview

As part of the Victoria and Southern Gulf Water Resource assessments, CSIRO engaged Rider Levett Bucknall NT (RLB) to provide water infrastructure-related unit costs, initial setup costs and indirect costs appropriate for the Victoria and Southern Gulf catchments. As costs vary with scale of project, these high-level costs were provided for seven hypothetical dams of different sizes. Size was categorised on a scale of 1 to 7, with 1 representing the smallest dam and 7 the largest. The seven different-sized dams were selected from hypothetical dams CSIRO have evaluated across northern Australia over the past 10 years.

Cost estimations were developed for a representative location in each study area: Gunpowder Creek in the catchment of the Leichhardt River, Southern Gulf catchments, and the Upper West Baines River in the catchment of the Victoria River, NT (referred to hereafter as Upper Baines). CSIRO selected these locations and the seven different dam sizes to represent a broad spectrum of potential dam sites that could be encountered within the study areas and more widely across northern Australia.

1.2 Report objectives and structure

The primary objective of this study was to document how high-level unit cost, initial setup cost and indirect cost estimates for dams and reticulation infrastructure in the Victoria and Southern Gulf catchments vary with scale.

This report also outlines an array of factors specific to the regions, as well as national and international influences on material and labour costs that affect the construction costs of the potential dams.

The report begins with an overview of the cost estimation types and techniques. It then addresses the levels of uncertainty inherent in the estimations, acknowledging the variables and risks that could affect the projected costs. The report examines the escalation of construction costs due to the COVID-19 pandemic and details how global disruptions have influenced material and labour expenses.

The methods section provides insight into the systematic approach employed in gathering data, analysing costs, and developing costs estimations. Section 4 presents a summary of the potential dam cost estimations.

The report also covers the estimated costs for major reticulation infrastructure works. It outlines the assumptions and exclusions that formed the basis of the cost estimation, which should be read and understood to fully appreciate the limitations of the cost estimations. This structured approach informs readers of the indicative construction costs associated with dam construction and reticulation infrastructure works.

2 Cost estimation types and techniques

2.1 Overview of cost estimation

Cost estimation is the process of attempting to forecast the financial costs of a project before receiving tender prices from a contractor (or contractors). It involves analysing factors such as quantities, materials, labour, equipment and overhead costs to generate an estimated project cost.

Effective cost estimation is essential for budgeting, planning and decision making in construction management. Accurate cost estimations help stakeholders understand the financial implications of a project, secure funding, make informed decisions and manage risks effectively. The cost estimation process encompasses several key components and steps, which can vary depending on the project's complexity, location and requirements.

2.2 Types of cost estimates

Cost-estimating techniques and types vary depending on the project and the design information available. Various types of estimates and techniques are outlined below in sections 2.2.1 - 2.2.4.

2.2.1 Preliminary estimates (conceptual)

Preliminary estimates are undertaken at the conceptual phase of a project. They are typically based on conceptual information and used for feasibility studies, initial budgeting and deciding what type of development is to be considered for a specific site. A preliminary estimate is often produced without any drawings (instead, using a nominated area), but be based on schematic plans. Preliminary estimate costs are generally calculated based on square costs or unit rates and multiplied by the quantity needed. Costs are calculated using historical project information and adjusted for escalation and factors differing between the various project locations. Preliminary estimates provide a broad overview of cost.

2.2.2 Elemental estimates

An elemental estimate is typically undertaken at the sketch design phase, which follows on from the preliminary estimate. The level of detail within the elemental estimate varies depending on the level of design information available at this phase of the project. The more accurate and reliable the design information, the more accurate and reliable the cost estimate will be. Elemental estimates are separated into the various project elements and are used to check whether the initial cost estimate is correct and if the project is viable. They are the gateway to the next phase of the project.

2.2.3 Elemental fully measured estimates

When a project has been further developed by the design team in the design development phase**,** a comprehensive elemental fully measured estimate can be created using detailed drawings and

specifications. Detailed estimates of materials and quantities required can be calculated using the design drawings, which are then priced to provide indicative project cost. This estimate is required to provide an accurate end cost of the project and to provide a cost model against which future cost checks can be made as the design continues to develop.

2.2.4 Trade estimates

At the contract documentation phase, a detailed trade estimate is prepared containing accurate measurement of trade items and applying current market pricing to individual items. A cost estimate at this phase is generally structured by trade, or packages or activities, to establish trade budgets that can be compared and analysed against a contractor's tender return.

2.3 Components of construction costs

Construction cost estimates typically include several components, which can be broadly categorised as:

- **direct construction costs** – costs directly associated with construction, including materials, labour, equipment, and subcontractor fees
- **indirect costs** – expenses that are not linked to specific construction activities but are necessary for project completion, such as head-contractor management and supervision, site security, temporary facilities, and insurance
- **contingencies** – an allowance for unforeseen costs or risks, typically expressed as a percentage of the total cost
- **fees** – costs related to legal, design, and administrative services, as well as permits and inspections.

Appendices A and B provide detailed breakdowns of the component structure of the potential dams, including a summary of the direct construction costs, indirect costs, fees and risk adjustments.

2.4 Levels of uncertainty

Every cost estimation is subject to levels of uncertainty, which stem from various sources, such as changes in project scope, market volatility, unpredictable events and latent conditions. A variety of strategies to mitigate risk and enhance accuracy can be used to manage this uncertainty when estimating costs.

2.4.1 Phased estimation

A common approach is to implement a phased estimation process, whereby early-stage estimates are refined as more-detailed project information becomes available. This method is used as not all project details are known at the early stages of a project, and preliminary cost estimates are inherently less accurate than later estimates due to the high degree of uncertainty. By structuring the estimation process into phases, each corresponding to a different stage of project development, cost estimates can be refined and adjusted as more information becomes available, thereby enhancing the accuracy and reliability of the estimates over time.

The process typically starts with a preliminary cost estimate, which is conducted during the earliest phase of a project. This preliminary estimate provides a broad cost range, often with a variance of up to ±50% depending on the project and information available within the brief. A preliminary estimate is useful for initial feasibility studies or for comparing different project options. As the project progresses into the sketch design phase and design development phase, more-detailed designs and specifications allow for a more refined and detailed estimate, which typically reduces the variance to around ±10%.

Finally, as the project moves into the contract documentation phase, continuous estimation or updated estimation can occur to reflect changes, unforeseen conditions or scope modifications, ensuring that cost estimates remain aligned with the project's scope.

Phased estimation offers several benefits, including improved accuracy of cost estimates over time, enhanced decision-making capabilities, and the ability to manage and mitigate financial risk more effectively.

2.4.2 Probabilistic modelling

Another common approach to minimising uncertainty and risk on projects of this nature is to use probabilistic modelling, such as Monte Carlo simulations. Probabilistic modelling looks at the financial uncertainty of projects through the process of modelling risks and/or opportunities to gain an overall understanding of a project's total costs at various probability levels. Probabilistic estimating assesses the quantitative or financial risks of a project using Monte Carlo simulation to report the total likely project cost at relevant confidence levels.

In accordance with the prescribed standards and industry best practice, the Inherent and Contingent models are modelled together to capture the most accurate and realistic project contingency profile. The modelling is carried out through Monte Carlo simulation that will produce a 'P-value' to report the relevant confidence levels, which demonstrates the probability of cost that will not be exceeded.

2.4.3 Sensitivity analysis

Another tool, sensitivity analysis, helps to identify which variables have the most significant impact on cost and thus should be given priority for detailed review and monitoring. Sensitivity analysis methodically examines how variations in different input variables, such as labour rates, material costs, equipment usage and project timelines, affect the overall cost of a project. This analytical process is crucial for identifying the key elements that have the most substantial influence on the project's financial outcome. By adjusting one variable at a time while holding others constant, cost managers can establish which factors are most volatile and therefore require closer scrutiny and management.

Sensitivity analysis prioritises areas for careful cost control and also assists in developing more-resilient project plans. For instance, if sensitivity analysis reveals that the project cost is particularly sensitive to fluctuations in material costs, clients can focus on securing fixed-price contracts for those materials or explore alternative materials or suppliers.

Furthermore, sensitivity analysis facilitates strategic decision making under uncertainty by providing a clearer understanding of the potential range of outcomes and their likelihoods. This insight is invaluable for stakeholder communication, as it highlights the cost risks and the rationale behind contingency values.

Collectively, these strategies form a robust framework for managing the unpredictable nature of cost estimation in complex projects. Due to the limited information available when undertaking the cost estimation for hypothetical dams and the level of uncertainty, a 40% risk adjustment has been applied to the total project costs, including the direct construction costs, on-site overheads and owner costs. This is to account for project scope changes, market volatility, unpredictable events and latent conditions. Appendices A and B provide a detailed breakdown of the cost estimation and risk adjustments.

3 Impact of local, national and international factors

The costs of materials and labour are fundamental components of construction costs and can be influenced by a combination of local, national and international factors. Locally, availability of resources, regulatory requirements and labour market conditions can significantly affect costs. Nationally and internationally, trade policies, exchange rates and global market trends play crucial roles. Fluctuations in steel, cement and fuel prices in the Australian market can dramatically alter the estimated costs for dam construction projects. Examining these factors in detail provides insights into the patterns that may help anticipate future price movements.

3.1 Labour market conditions

Labour market conditions are a critical driver of cost in construction and infrastructure projects. These conditions are influenced by factors such as the availability of skilled labour, immigration policies and the health of the economy. For instance, a booming economy might lead to a labour shortage, pushing wages and, consequently, construction costs higher. On the other hand, economic downturns can lead to higher unemployment among skilled workers, potentially lowering costs. Regulatory changes affecting immigration can also affect the supply of labour in Australia, given the reliance on migrant workers within the construction industry.

Remote locations like northern Australia further magnify these challenges, as attracting and retaining skilled labour in less accessible areas may require offering increased wages, which can drive up costs significantly.

3.2 Supply chain weaknesses

The supply chain for materials used in the construction project is prone to disruption, leading to price fluctuations that can have a significant effect on cost of large-scale water infrastructure projects. Northern Australia's geographical remoteness and reliance on interstate and international supply chains significantly affect the cost and availability of materials. The region's dependency on imported materials, such as steel and concrete, is a critical vulnerability, and the construction sector in northern Australia has felt the impact of fluctuating prices of steel, which is primarily sourced from interstate and China. Delays and increased freight costs can further compound these challenges, making projects more expensive and slower to complete.

3.3 Price fluctuations and their drivers

Price fluctuations in northern Australia are influenced by both global events and local conditions. For example, cyclones and extreme weather events, common in this region can have a greater impact to a project compared to southern Australia, due to the limited transport options available, fewer all-purpose roads and long distances between ports, airports and other capital cities in Australia. This can disrupt both local supply chains and labour availability, leading to spikes in material costs and labour wages. Before COVID-19, the region had already experienced volatility in

material costs due to global economic factors, such as the US–China trade war, affecting the prices of imported materials like steel, copper and aluminium.

The interrelated nature of global supply chains means that an increase in the price of one key material can lead to widespread cost increases across various sectors, including the water infrastructure sector. The construction industry in northern Australia is particularly sensitive to these fluctuations due to its reliance on imported materials and specialised labour.

3.4 Long-term trends and price recovery

Over the long-term, construction costs in northern Australia have generally risen faster than the Consumer Price Index (CPI), and the Heavy and Civil Engineering Construction index (Class 3109) driven by the region's unique challenges, including remote location, extreme weather events and labour market conditions. While the prices of specific materials may decrease temporarily due to global oversupply or reduced demand, the overall trend for construction costs is upward. Once prices increase, they rarely return to lower levels, reflecting the cumulative nature of cost increases in materials and labour over time.

Cost estimating on a large water infrastructure project within northern Australia requires acknowledging the region's specific challenges, from its remote and unpredictable weather conditions to its reliance on skilled migrant labour and imported materials. By considering these factors, stakeholders can better anticipate and plan for the impacts of price fluctuations on projects.

4 Escalation of costs due to COVID-19

The COVID-19 pandemic highlighted the vulnerability of global supply chains and the construction industry to unexpected global events. Lockdowns and restrictions severely disrupted supply chains, leading to shortages of materials and delays in project timelines. Furthermore, the pandemic resulted in labour shortages due to health concerns and travel restrictions, further exacerbating cost pressures.

The construction industry witnessed a significant escalation in costs as a result of these disruptions. Projects became more expensive due to increased material costs and the need for additional health and safety measures. This period highlighted the importance of flexibility in project planning and the ability to adapt cost estimation and project management strategies to rapidly changing global circumstances.

Post COVID-19, the construction industry in northern Australia has witnessed significant rises in material prices, putting pressure on contractors and clients alike. Material prices have risen across the board, in particular for concrete, steel, masonry, reinforcement, aluminium, copper, electrical cables and PVC-based products.

Recent examples include the cost of structural steel, which has seen a sharp increase of around 17% in one year in the NT, attributed to supply chain disruptions and increased demand. The cost of concrete, another fundamental construction material, has increased by about 7% in one year, reflecting higher energy costs and increased demand.

Recent data from the Australian Bureau of Statistics show the following building material mean cost increases across 6 Capital cities over the 24-month period to the end of Q1 2024:

- concrete, cement and sand – 22.2%
- reinforcing steel – 1.3%
- other metal products – 11.2%
- cement products – 22.5%
- electrical equipment – 11.3%
- copper pipes/fittings – 13.1%
- plastic pipes/fittings – 7.3%

Over recent years the construction industry in northern Australia has experienced record high levels of cost escalation. As a result, the costs associated with large-scale construction projects are still likely to increase due to an increase in demand of materials and continued labour shortages. The pipeline of projects for 2024 is predominantly underpinned by local and Australian Government projects, including a record investment in the Australian Defence Force.

5 Methods

To establish how unit costs, initial setup costs and indirect costs for dams and reticulation infrastructure vary with scale in the Victoria and Southern Gulf catchments Rider Levett Bucknall prepared indicative construction costs for seven hypothetical dams of varying size in each of these two study areas. The cost estimates were based on quantities supplied by CSIRO for each of the seven hypothetical dams. Rider Levett Bucknall's high-level cost analysis has applied suitable adjustments to account for the economies of scale associated with each dam size and the remoteness of the selected geographical locations. It is to be noted that any further local variations in remoteness from these locations would have very little effect on overall cost of the project.

The quantities provided by CSIRO for the seven different-sized roller compacted concrete (RCC) dams were based on a selection of hypothetical RCC dams in northern Australia that CSIRO has evaluated over the last 10 years (Table 5-1). Table 5-1 includes the unit cost of RCC because it is a key driver to the total cost of a RCC dam. In some cases CSIRO modified the quantities of some materials so the quantity increments were rounded and more evenly spaced while also ensuring the quantities of other materials were internally consistent for each hypothetical dam.

Table 5-1 Selected hypothetical dams

SELECTED HYPOTHETICAL DAM	LOCATION	ORIGINAL REFERENCE	QUANTITY OF RCC (M3)	ASSIGNED CATEGORICAL SCALE
Mount Bennett	Finniss River	Petheram et al. (2017)	40,000	1
Nitchaga	Walsh River	Petheram et al. (2020)	80,000	2
Elizabeth	Elizabeth River	Petheram et al. (2017)	145,000	3
Dagworth	Einasleigh River	Petheram et al. (2013)	410,000	4
Rookwood	Walsh River	Petheram et al. (2017)	800,000	5
Herbert	Herbert River	Petheram et al. (2020)	1,200,000	6
Hells Gate	Burdekin River	Petheram et al. (2020)	1,700,000	7

The approach adopted for this cost estimation encompassed several key phases, as described below in sections 5.1 - 5.5.

5.1 Geographical and environmental impact assessments

The cost estimates are founded upon site-specific analyses conducted for the Upper Baines River in the Victoria catchment, NT, and Gunpowder Creek in the Leichhardt catchment, Queensland. These assessments carefully considered geographical challenges, including terrain characteristics, climate variations and accessibility factors, and adherence to environmental regulations. We also factored in the remoteness of the location and distance to the nearest capital city where the materials would likely be sourced. Additionally, insights gathered from previous environmental impact assessments and geological surveys were influential in informing the cost projections.

5.2 Scale variation analysis

To accurately capture the cost implications across different scales, factors in line with the characteristics of each scale of the RCC dams in regard to parameters such as height, volume and structural complexity were taken into account. Notably, the method acknowledges that the scale of the rate for the supply and placement of the RCC exhibits minimal variation among the seven sizes due to the efficiency thresholds reached in maximum daily production. This production ceiling is determined by the RCC output per crew per day and the maximum concurrent crews on-site. Consequently, while the direct cost rate will remain relatively stable, indirect costs will escalate in tandem with the growing number of on-site crews. This understanding guided the approach to ensuring proportional and precise cost estimations aligned with economies of scale and production efficiencies.

5.3 Regional cost factors evaluation

The estimate incorporates a thorough evaluation of regional cost factors specific to the Upper Baines and Gunpowder Creek. This assessment encompassed comprehensive considerations, including:

- **labour costs** – analysis of prevailing wage rates, availability of skilled labour and additional costs associated with remote settings, such as travel allowances and accommodations
- **material availability** – assessment of the availability and associated transportation costs of essential construction materials such as aggregates, cement, steel and specialised RCC mixtures
- **transportation logistics** – in-depth analysis of logistical considerations for material transport to remote sites, including road conditions, distances and alternative transportation methods
- **local regulatory requirements** – identification and integration of regulatory compliance costs and permitting processes unique to each location, ensuring full regulatory adherence.

5.4 Risk and contingency analysis

Recognising the inherent risks in such projects, the method includes a comprehensive risk and contingency analysis. This process involved:

- identifying potential risks such as weather-related disruptions, supply chain challenges, labour market volatility and technical complexities associated with RCC construction.
- establishing a robust contingency framework tailored to address identified risks with allocated reserves reflecting risk severity and probability.

By integrating these methods, the cost estimates for the construction of RCC dams in Upper Baines and Gunpowder Creek provide robust cost projections that account for the complex geographical, environmental, scale-related, regional cost and risk factors specific to these projects.

5.5 Basis of rate build-ups

Most of the direct construction rates were developed using first principles with four key assumptions.

On-site material sourcing – All materials for RCC and structural concrete will be sourced directly from the construction site, based on the practicality of using on-site resources efficiently. This assumption excludes materials like cement, which are typically procured externally due to logistical constraints or specialised requirements.

Quarry materials – All quarry materials, including aggregates, will be sourced on-site. This assumption is grounded in the availability of suitable materials within proximity to the construction site, which will minimise transportation costs and other impacts associated with importing materials from distant locations.

On-site facilities – Allowance has been made for setting up a comprehensive on-site laydown area with all necessary services and extensive facilities that satisfies the need for a functional and self-sufficient work environment. This includes provisions for accommodation, utilities, storage areas for equipment and materials, office spaces and amenities to support the workforce during the project duration.

Labour arrangements – Most of the workforce will operate on a structured roster of 2 weeks on and 1 week off. This recognises the availability of skilled workers within the local and wider community, promotes sustainable work practices by providing regular rest periods and optimises productivity by maintaining a consistent workforce rotation.

The method used for the rate build-ups incorporates these key assumptions to ensure the cost estimate for the project is realistic and comprehensive. Leveraging on-site material sourcing, optimising quarry materials, accounting for on-site facilities and structuring labour arrangements as described ensures the rates are built on a foundation that aligns with practical construction practices and industry standards. These assumptions collectively contribute to the accuracy, reliability and feasibility of the cost estimate, facilitating effective budgeting and project planning processes from a high-level perspective.

6 Total cost of hypothetical dams

Table 6-1 details the total cost of the seven scales of hypothetical dams at Gunpowder Creek and Upper Baines. This table also provides the total cost expressed per cubic of RCC material. Although each of the seven hypothetical dams has a different configuration and hence other materials are not necessarily scaled as per the volume of RCC (e.g. saddle dam embankments, foundation treatment) there is nonetheless a decreasing trend in total cost per cubic metre of RCC and increasing categorical scale of dam. Note while total costs are provided in this report, the purpose of this study was not to provide revised estimates of these hypothetical dams, but rather uses these hypothetical dams to explore how unit costs, initial setup costs and indirect costs vary with scale.

Appendices A and B provide a comprehensive breakdown of unit rates applicable to the seven sizes of dams at the two locations. These unit rates are crucial components of the cost estimation process, particularly in evaluating the feasibility and strategic planning aspects of the hypothetical dam projects

Table 6-1 Total cost of seven scales of hypothetical dam projects

LOCATION / SCALE	TOTAL COST	COST PER CUBIC METRE OF RCC
Gunpowder Creek		
Scale 1 (Mount Bennett)	$213,407,251	$5,335
Scale 2 (Nitchaga)	$247,220,673	$3,090
Scale 3 (Elizabeth)	$369,230,665	$2,546
Scale 4 (Dagworth)	$825,048,267	$2,012
Scale 5 (Rookwood)	$1,392,733,682	$1,741
Scale 6 (Herbert)	$1,818,204,879	$1,515
Scale 7 (Hells Gate)	$2,619,201,905	$1,541
Upper Baines		
Scale 1 (Mount Bennett)	$215,839,848	$5,396
Scale 2 (Nitchaga)	$247,919,616	$3,099
Scale 3 (Elizabeth)	$369,274,645	$2,547
Scale 4 (Dagworth)	$822,513,738	$2,006
Scale 5 (Rookwood)	$1,387,861,832	$1,735
Scale 6 (Herbert)	$1,810,634,340	$1,509
Scale 7 (Hells Gate)	$2,608,789,139	$1,535

It is essential to note that the unit rate costs outlined in Appendices A and B are conceptual estimates intended for use in strategic master planning reviews and options analysis. They serve as valuable tools for initial cost assessments and high-level decision-making processes. However, these estimates are not intended for detailed decision-making analysis related to project commitment, such as acquisition, finance approval, equity approval or similar crucial decisions.

Rider Levett Bucknall recommends preparing a more-detailed elemental cost estimate before considering any significant commitments or project approvals.

7 Major reticulation infrastructure work costs

The major reticulation infrastructure items encompass critical components responsible for conveying water from either the hypothetical dam-site or the downstream weir to the designated serviced lands. These elements play a pivotal role in ensuring the efficient distribution of water resources to the serviced lands.

The rates provided in the cost estimation cover a diverse range of solutions, incorporating both channel-based and piped systems, as well as hybrid combinations of both approaches. This comprehensive coverage allows for flexibility in choosing the most suitable conveyance method based on factors such as terrain, distance and environmental considerations.

Costs associated with major reticulation infrastructure are anticipated to escalate in a non-linear manner with increasing scale. However, these costs are expected to rise proportionally with the geographic distance covered, which reflects the inherent complexities and challenges associated with extending water conveyance systems over larger areas.

The major reticulation infrastructure work cost breakdown is provided in Table 7-1 and further details in Appendix C.

The scope of major reticulation infrastructure extends to delivering services to designated lands, assuming these serviced areas do not exceed 400 hectares for substantial parcels. This limitation ensures the infrastructure development is a manageable scale while catering to the water needs of significant agricultural or industrial zones.

It is important to note that the cost estimation for major reticulation infrastructure excludes considerations for on-site expenses such as internal distribution systems, development of individual properties, drainage solutions within the farm and the construction of access roads within the serviced areas. These additional aspects would typically be accounted for separately within the overall project planning and budgeting process.

Detailed assumptions provided by CSIRO regarding major reticulation infrastructure are provided in Appendix D.

Table 7-1 Major reticulation infrastructure work cost breakdown

ITEMS	UNIT	QUANTITY	RATE
Develop borrow areas			
Earthfill (based on 200,000 m^3 of material) Pipe bedding and haunch material (based on 200,000 m^3 of material)	Lump sum	1	$415,205.00
Earthfill (based on 200,000 m^3 of material) Pipe bedding and haunch material (based on 200,000 m^3 of material)	Lump sum	1	$1,753,785.00
Channel preparation			
Clear and grub	ha	50	$4,145.27
Topsoil removal and stockpile	m^3	50,000	$8.21
Channel earthworks			
Common excavation in channels, borrow areas and drainage works	m^3	50,000	$13.40
Rock excavation for channels and drains	m^3	50,000	$80.14
Haul, place, condition and compact bank material (maximum haul of 600 m)	m^3	100,000	$15.79
Topsoil and access berm	m^2	500,000	$2.51
Concrete works			
Concrete to structures, including pump stations	m^3	500	$4,279.52
Prestressed access bridges to open channels (0.6 m × 0.3 m × 20 m)	No	100	$34,436.25
Pipelines, cross drains and siphons			
Reinforced concrete pipe			
Supply and delivery of DN900 Class Y pipe	m	5,000	$1,136.26
Excavate, lay and backfill of DN900 Class Y pipe	m	5,000	$661.21
Supply and delivery of DN2100 Class Y pipe	m	5,000	$2,521.15
Excavate, lay and backfill of DN2100 Class Y pipe	m	5,000	$1,831.96
High-density polyethylene (HDPE) pipe			
Supply and delivery of DN450 PN6 pipe	m	5,000	$533.25
Excavate, lay and backfill of DN450 PN6 pipe	m	5,000	$389.43
Supply and delivery of DN1200 PN6 pipe	m	5,000	$2,320.76
Excavate, lay and backfill of DN1200 PN6 pipe	m	5,000	$1,062.03
Glass-reinforced plastic (GRP) pipe			
Supply and delivery of DN1500 PN10 SN10,000 pipe	m	5,000	$2,615.88
Excavate, lay and backfill of DN1500 PN10 SN10,000 pipe	m	5,000	$1,490.27
Supply and delivery of DN4000, PN10, SN10,000 pipe	m	5,000	$10,168.77
Excavate, lay and backfill of DN4000, PN10, SN10,000 pipe	m	5,000	$7,943.44

8 Assumptions

Rider Levett Bucknall has formulated several key assumptions in the cost estimation process, particularly focusing on access to the site, on-site facilities, labour arrangements, dam construction, and reticulation infrastructure. These assumptions play a crucial role in shaping the overall cost estimates and planning for the project's execution.

Access to site – RLB has accounted for two distinct access roads, each tailored to specific locations:

- For Gunpowder Creek, a 72 km access road starting from Burke Development Road to the designated site has been budgeted.
- For Upper Baines, a 75 km access road from Victoria Highway to the designated site has been budgeted.

Constructing these access roads involves clearing and grubbing, stripping topsoil to 100 mm, undertaking minor earthworks, preparing pavement subgrade, placing pavement material to 300 mm thick produced on-site, constructing floodway and/or culvert crossings at regular 500 m intervals, and installing miscellaneous signage and guideposts along the road's length.

On-site concrete batching plants – RLB anticipates the need for concrete batching plants on-site to produce RCC and structural concrete. Resources are allocated for establishing and maintaining these plants, including a contingency plan for a back-up batching plant at all times to handle unforeseen issues effectively.

Labour force and accommodation – The labour workforce is projected to operate on a 2 weeks on and 1 week off roster, implying a rotational schedule to manage workforce availability efficiently. Additionally, Rider Levett Bucknall assumes that all accommodation requirements for the labour force will be met through an on-site camp facility.

Dam construction costs – The unit costs for constructing scale dams are derived from quantities provided by CSIRO, specifically referencing the seven dam sizes. These quantities are based on CSIRO's previous dam projects but have been adjusted to encompass a broader range of values, ensuring consistency across the various dam sizes.

Reticulation infrastructure – Detailed assumptions regarding major reticulation infrastructure work have been provided by CSIRO and are outlined in Appendix D of the cost estimation report. These assumptions encompass various aspects of infrastructure development, including water distribution systems, pipelines, and associated construction and installation costs.

Overall, these assumptions form the foundational framework for estimating costs, planning resources, and executing the potential project in a structured and systematic manner. They reflect a comprehensive understanding of the project's scope, requirements, and potential challenges, thereby facilitating effective cost management and project delivery.

Appendix D provides a detailed breakdown of all the assumptions regarding the direct construction costs and their rates.

9 Exclusions

Rider Levett Bucknall has consciously excluded the following key factors from consideration in preparing their report.

Escalation beyond March 2024 – RLB has limited the consideration of cost escalation to March 2024. This exclusion implies that any potential cost increases beyond this time frame have not been factored into the report's estimates. Stakeholders should be aware that, if the project extends beyond this specified period, actual costs may differ due to inflation, market fluctuations or other economic factors.

Removal and/or remediation of hazardous material and asbestos – The report does not account for costs associated with identifying, removing or remediating hazardous materials such as asbestos. These activities typically require specialised expertise and can significantly affect project costs and timelines. Stakeholders must independently assess and address any considerations relating to hazardous materials during project planning and execution.

Decanting of the owner and their belongings during the course of the works or any temporary arrangements – Costs related to temporarily relocating the owner and their belongings during project activities have not been included in the report. Such arrangements may be necessary for ensuring safety, minimising disruptions, and facilitating construction activities, but they are not accounted for in the provided cost estimates.

Land costs – The report excludes expenses related to acquiring land for the project. This includes costs associated with purchasing, leasing or acquiring land rights, as well as any land valuation or appraisal fees. Land costs can vary significantly based on location, size and market conditions, and stakeholders must separately evaluate and budget for these expenses.

Finance and interest charges – RLB has not factored in finance charges, including interest payments, in the cost estimates. Financing costs are a crucial aspect of project financing and can significantly affect the overall project budget. Stakeholders should consult with financial experts to assess and incorporate these expenses into their financial planning.

Legal costs and disbursements – Legal fees and related disbursements, such as contract reviews, permits, licenses, and regulatory compliance costs, have not been included in the report.

Staging or phasing costs – The report does not address staging or phasing costs, which pertain to the sequential execution of project phases or stages. Staging costs may include mobilisation and demobilisation expenses, temporary facilities and logistical arrangements for phased project delivery.

Goods and services taxation (GST) – GST, or any other applicable taxes, have not been factored into the cost estimates.

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Part II Appendices

Appendix A Unit rates for Gunpowder Creek (dam size scales 1 to 7)

Gunpowder Creek - Scale 1 (Mount Bennett)

DIRECT CONSTRUCTION COSTS

General		Qty	Rate	Total
Environmental management	Lump sum	1	$ 600,000.00	$ 600,000.00
Cultural heritage management	Lump sum	1	$ 480,000.00	$ 480,000.00
Mobilisation and demobilisation				
Establishment of workforce accommodation	Lump sum	1	$ 1,852,500.00	$ 1,852,500.00
Establishment of major plant	Lump sum	1	$ 364,000.00	$ 364,000.00
Demobilisation of major plant	Lump sum	1	$ 364,000.00	$ 364,000.00
Demobilisation of workforce accommodation	Lump sum	1	$ 1,014,000.00	$ 1,014,000.00
Clear site and X% of storage area	ha	2,000	$ 2,945.00	$ 5,890,000.00
Access				
Access to site from Highway	km	72	$ 600,433.00	$ 43,231,176.00
Develop sources of constuction materials				
Quarry	Lump sum	1	$ 180,000.00	$ 180,000.00
Sand gravel sources	Lump sum	1	$ 180,000.00	$ 180,000.00
River diversion				
Excavate diversion channel	cu m	10,000	$ 24.50	$ 245,000.00
Coffer dams	Lump sum	1	$ 800,000.00	$ 800,000.00
Foundation excavation and treatment				
Excavate sand from river bed	cu m	5,000	$ 25.00	$ 125,000.00
Excavate rock from bed and abutments	cu m	75,000	$ 52.50	$ 3,937,500.00
Foundation treatment	sq m	2,000	$ 75.00	$ 150,000.00
Construct grouting plinth	cu m	300	$ 2,438.50	$ 731,550.00
Foundation grouting	cu m	700	$ 388.50	$ 271,950.00
RCC dam river section				
RCC concrete to dam wall	cu m	40,000	$ 523.50	$ 20,940,000.00
Establish RCC Plant	Lump sum	1	$ 1,175,000.00	$ 1,175,000.00
De mobilise RCC Plant	Lump sum	1	$ 350,000.00	$ 350,000.00
Conventional concrete to faces	cu m	6,000	$ 2,157.50	$ 12,945,000.00
Conventional concrete to spillway crest	cu m	100	$ 2,157.00	$ 215,700.00
Conventional concrete to spillway apron and end sill apron	cu m	50	$ 2,095.00	$ 104,750.00
Convental concrete to training walls	cu m	500	$ 2,285.00	$ 1,142,500.00
Outlet works				
Intake tower convenional concrete	cu m	400	$ 2,285.50	$ 914,200.00
Intake tower gates, guides and seals	Lump sum	1	$ 90,000.00	$ 90,000.00
Outlet conduit and concrete surround	m	150	$ 3,920.50	$ 588,075.00
Valve house conventional concrete	cu m	100	$ 2,753.50	$ 275,350.00
Valve house pipework and valves	Lump sum	1	$ 805,000.00	$ 805,000.00
Fish transfer facility				
Construct fish lift	Lump sum	20	$ 22,500.00	$ 450,000.00
Commission and monitroring	Lump sum	1	$ 40,000.00	$ 40,000.00
Permanent downstream crossing	Lump sum	1	$ 1,000,000.00	$ 1,000,000.00
Total direct construction costs (TDC)				**$ 101,452,251.00**
ON SITE OVERHEADS				

Camp operations	Lump sum	1	$ 453,943.00	$ 453,943.00
Site office operations	Lump sum	1	$ 130,447.00	$ 130,447.00
Site Management and Supervision	Lump sum	1	$ 5,073,254.55	$ 5,073,254.55
Insurances, public liability	Lump sum	1	$ 2,780,135.57	$ 2,780,135.57
Total on site overheads (OSO)				**$ 8,437,780.12**
Total direct and on site overhead costs				**$ 109,890,031.12**
Profit and off site overheads 10% of TDC and OSO	Lump sum	1	$ 13,755,256.91	$ 13,755,256.91
Total Out Turn Costs (TOC)				$ 13,755,256.91
OWNER'S COSTS				
Investigation and design				
Preliminary design	Lump sum	1	$ 1,014,316.20	$ 1,014,316.20
Geotechnical and materials	Lump sum	1	$ 127,144.68	$ 127,144.68
Hydraulic model study	Lump sum	1	$ 552,617.65	$ 552,617.65
Detailed design and documentataion	Lump sum	1	$ 1,800,000.00	$ 1,800,000.00
Acquisition and Approvals				
Environmental assessment and approvals	Lump sum	1	$ 8,117,370.79	$ 8,117,370.79
Storage area acquisition	ha	10	$ 100,000.00	$ 1,000,000.00
Storage area access relocations	Lump sum	1	$ 710,305.46	$ 710,305.46
Surveys and legals	Lump sum	1	$ 1,065,458.19	$ 1,065,458.19
Permanent onsite buildings and services	Lump sum	1	$ 456,726.41	$ 456,726.41
Principal's insurances	Lump sum	1	$ 2,217,274.09	$ 2,217,274.09
Owners management and supervision	Lump sum	1	$ 12,176,056.19	$ 12,176,056.19
Total owners costs				$ 29,237,269.66
TOTAL PROJECT COSTS (TPC)				**$ 152,882,557.69**
Risk adjustment (40% of TPC)				$ 60,524,693.33
TOTAL CAPITAL COST				$ 213,407,251.02

Gunpowder Creek - Scale 2 (Nitchaga)

DIRECT CONSTRUCTION COSTS

General		Qty	Rate	Total
Environmental management	Lump sum	1	$ 900,000.00	$ 900,000.00
Cultural heritage management	Lump sum	1	$ 640,000.00	$ 640,000.00
Mobilisation and demobilisation				
Establishment of workforce accommodation	Lump sum	1	$ 2,730,000.00	$ 2,730,000.00
Establishment of major plant	Lump sum	1	$ 503,100.00	$ 503,100.00
Demobilisation of major plant	Lump sum	1	$ 503,100.00	$ 503,100.00
Demobilisation of workforce accommodation	Lump sum	1	$ 1,456,000.00	$ 1,456,000.00
Clear site and X% of storage area	ha	500	$ 2,945.00	$ 1,472,500.00
Access				
Access to site from Highway	km	72	$ 600,433.00	$ 43,231,176.00
Develop sources of constuction materials				
Quarry	Lump sum	1	$ 270,000.00	$ 270,000.00
Sand gravel sources	Lump sum	1	$ 270,000.00	$ 270,000.00
River diversion				
Excavate diversion channel	cu m	20,000	$ 24.50	$ 490,000.00
Coffer dams	Lump sum	1	$ 1,400,000.00	$ 1,400,000.00
Foundation excavation and treatment				
Excavate sand from river bed	cu m	20,000	$ 23.00	$ 460,000.00
Excavate rock from bed and abutments	cu m	25,000	$ 52.50	$ 1,312,500.00
Foundation treatment	sq m	2,666	$ 75.00	$ 199,950.00
Construct grouting plinth	cu m	1,000	$ 2,438.50	$ 2,438,500.00
Foundation grouting	cu m	600	$ 388.50	$ 233,100.00
RCC dam river section				
RCC concrete to dam wall	cu m	80,000	$ 517.50	$ 41,400,000.00
Establish RCC Plant	Lump sum	1	$ 1,175,000.00	$ 1,175,000.00
De mobilise RCC Plant	Lump sum	1	$ 350,000.00	$ 350,000.00
Conventional concrete to faces	cu m	3,000	$ 2,157.50	$ 6,472,500.00
Conventional concrete to spillway crest	cu m	500	$ 2,157.00	$ 1,078,500.00
Conventional concrete to spillway apron and end sill apron	cu m	1,000	$ 2,095.00	$ 2,095,000.00
Convental concrete to training walls	cu m	100	$ 2,285.00	$ 228,500.00
Outlet works				
Intake tower convenional concrete	cu m	200	$ 2,285.50	$ 457,100.00
Intake tower gates, guides and seals	Lump sum	1	$ 130,000.00	$ 130,000.00
Outlet conduit and concrete surround	m	100	$ 3,920.50	$ 392,050.00
Valve house conventional concrete	cu m	100	$ 2,753.50	$ 275,350.00
Valve house pipework and valves	Lump sum	1	$ 1,495,000.00	$ 1,495,000.00
Fish transfer facility				
Construct fish lift	Lump sum	30	$ 22,500.00	$ 675,000.00
Commission and monitroring	Lump sum	1	$ 51,000.00	$ 51,000.00
Permanent downstream crossing	Lump sum	1	$ 1,239,601.00	$ 1,239,601.00
Total direct construction costs (TDC)				**$ 116,024,527.00**
ON SITE OVERHEADS				

Camp operations	Lump sum	1	$ 907,887.00	$ 907,887.00
Site office operations	Lump sum	1	$ 260,895.00	$ 260,895.00
Site Management and Supervision	Lump sum	1	$ 5,887,665.45	$ 5,887,665.45
Insurances, public liability	Lump sum	1	$ 3,226,431.47	$ 3,226,431.47
Total on site overheads (OSO)				$ 10,282,878.92
Total direct and on site overhead costs				**$ 126,307,405.92**
Profit and off site overheads 10% of TDC and OSO	Lump sum	1	$ 15,959,426.47	$ 15,959,426.47
Total Out Turn Costs (TOC)				$ 15,959,426.47
OWNER'S COSTS				
Investigation and design				
Preliminary design	Lump sum	1	$ 1,177,144.64	$ 1,177,144.64
Geotechnical and materials	Lump sum	1	$ 147,555.25	$ 147,555.25
Hydraulic model study	Lump sum	1	$ 641,329.51	$ 641,329.51
Detailed design and documentataion	Lump sum	1	$ 2,050,000.00	$ 2,050,000.00
Acquisition and Approvals				$ -
Environmental assessment and approvals	Lump sum	1	$ 8,780,348.72	$ 9,420,454.48
Storage area acquisition	ha	20	$ 100,000.00	$ 2,000,000.00
Storage area access relocations	Lump sum	1	$ 824,330.99	$ 824,330.99
Surveys and legals	Lump sum	1	$ 1,236,496.48	$ 1,236,496.48
Permanent onsite buildings and services	Lump sum	1	$ 530,044.83	$ 530,044.83
Principal's insurances	Lump sum	1	$ 2,572,512.40	$ 2,572,512.40
Owners management and supervision	Lump sum	1	$ 14,130,681.72	$ 14,130,681.72
Total owners costs				$ 34,730,550.30
TOTAL PROJECT COSTS (TPC)				**$ 176,997,382.69**
Risk adjustment (40% of TPC)				70,223,289.84
TOTAL CAPITAL COST				**$ 247,220,672.53**

Gunpowder Creek - Scale 3 (Elizabeth)

DIRECT CONSTRUCTION COSTS

General		Qty	Rate	Total
Environmental management	Lump sum	1	$ 1,200,000.00	$ 1,200,000.00
Cultural heritage management	Lump sum	1	$ 800,000.00	$ 800,000.00
Mobilisation and demobilisation				
Establishment of workforce accommodation	Lump sum	1	$ 3,250,000.00	$ 3,250,000.00
Establishment of major plant	Lump sum	1	$ 503,100.00	$ 503,100.00
Demobilisation of major plant	Lump sum	1	$ 503,100.00	$ 503,100.00
Demobilisation of workforce accommodation	Lump sum	1	$ 1,456,000.00	$ 1,456,000.00
Clear site and X% of storage area	ha	1,000	$ 2,945.00	$ 2,945,000.00
Access				
Access to site from Highway	km	72	$ 600,433.00	$ 43,231,176.00
Develop sources of constuction materials				
Quarry	Lump sum	1	$ 360,000.00	$ 360,000.00
Sand gravel sources	Lump sum	1	$ 360,000.00	$ 360,000.00
River diversion				
Excavate diversion channel	cu m	15,000	$ 24.50	$ 367,500.00
Coffer dams	Lump sum	1	$ 2,150,000.00	$ 2,150,000.00
Foundation excavation and treatment				
Excavate sand from river bed	cu m	3,000	$ 25.00	$ 75,000.00
Excavate rock from bed and abutments	cu m	50,000	$ 52.50	$ 2,625,000.00
Foundation treatment	sq m	4,142	$ 75.00	$ 310,650.00
Construct grouting plinth	cu m	500	$ 2,438.50	$ 1,219,250.00
Foundation grouting	cu m	1,200	$ 388.50	$ 466,200.00
RCC dam river section				
RCC concrete to dam wall	cu m	145,000	$ 511.50	$ 74,167,500.00
Establish RCC Plant	Lump sum	1	$ 1,175,000.00	$ 1,175,000.00
De mobilise RCC Plant	Lump sum	1	$ 350,000.00	$ 350,000.00
Conventional concrete to faces	cu m	10,000	$ 2,157.50	$ 21,575,000.00
Conventional concrete to spillway crest	cu m	1,500	$ 2,157.00	$ 3,235,500.00
Conventional concrete to spillway apron and end sill apron	cu m	100	$ 2,095.00	$ 209,500.00
Convental concrete to training walls	cu m	1,500	$ 2,285.00	$ 3,427,500.00
Outlet works				
Intake tower convenional concrete	cu m	600	$ 2,285.50	$ 1,371,300.00
Intake tower gates, guides and seals	Lump sum	1	$ 200,000.00	$ 200,000.00
Outlet conduit and concrete surround	m	200	$ 3,920.50	$ 784,100.00
Valve house conventional concrete	cu m	100	$ 2,753.50	$ 275,350.00
Valve house pipework and valves	Lump sum	1	$ 2,530,000.00	$ 2,530,000.00
Fish transfer facility				
Construct fish lift	Lump sum	35	$ 22,500.00	$ 787,500.00
Commission and monitroring	Lump sum	1	$ 82,850.00	$ 82,850.00
Permanent downstream crossing	Lump sum	1	$ 1,427,587.00	$ 1,427,587.00
Total direct construction costs (TDC)				**$ 173,420,663.00**
ON SITE OVERHEADS				

Camp operations	Lump sum	1	$ 1,645,546.00	$ 1,645,546.00
Site office operations	Lump sum	1	$ 472,870.00	$ 472,870.00
Site Management and Supervision	Lump sum	1	$ 8,789,578.95	$ 8,789,578.95
Insurances, public liability	Lump sum	1	$ 4,816,675.54	$ 4,816,675.54
Total on site overheads (OSO)				$ 15,724,670.49
Total direct and on site overhead costs				**$ 189,145,333.49**
Profit and off site overheads 10% of TDC and OSO	Lump sum	1	$ 23,829,541.93	$ 23,829,541.93
Total Out Turn Costs (TOC)				$ 23,829,541.93
OWNER'S COSTS				
Investigation and design				
Preliminary design	Lump sum	1	$ 1,757,335.89	$ 1,757,335.89
Geotechnical and materials	Lump sum	1	$ 220,282.30	$ 220,282.30
Hydraulic model study	Lump sum	1	$ 957,428.10	$ 957,428.10
Detailed design and documentataion	Lump sum	1	$ 3,100,000.00	$ 3,100,000.00
Acquisition and Approvals				
Environmental assessment and approvals	Lump sum	1	$ 14,063,609.61	$ 14,063,609.61
Storage area acquisition	ha	25	$ 100,000.00	$ 2,500,000.00
Storage area access relocations	Lump sum	1	$ 1,230,627.38	$ 1,230,627.38
Surveys and legals	Lump sum	1	$ 1,845,941.06	$ 1,845,941.06
Permanent onsite buildings and services	Lump sum	1	$ 791,293.40	$ 791,293.40
Principal's insurances	Lump sum	1	$ 3,841,165.56	$ 3,841,165.56
Owners management and supervision	Lump sum	1	$ 21,095,414.42	$ 21,095,414.42
Total owners costs				**$ 51,403,097.72**
TOTAL PROJECT COSTS (TPC)				**$ 264,377,973.14**
Risk adjustment (40% of TPC)				$ 104,852,692.09
TOTAL CAPITAL COST				**$ 369,230,665.23**

Gunpowder Creek - Scale 4 (Dagworth)

DIRECT CONSTRUCTION COSTS

General		Qty	Rate	Total
Environmental management	Lump sum	1	$ 2,387,600.00	$ 2,387,600.00
Cultural heritage management	Lump sum	1	$ 1,146,040.00	$ 1,146,040.00
Mobilisation and demobilisation				
Establishment of workforce accommodation	Lump sum	1	$ 3,932,500.00	$ 3,932,500.00
Establishment of major plant	Lump sum	1	$ 604,500.00	$ 604,500.00
Demobilisation of major plant	Lump sum	1	$ 604,500.00	$ 604,500.00
Demobilisation of workforce accommodation	Lump sum	1	$ 2,015,000.00	$ 2,015,000.00
Clear site and X% of storage area	ha	3,000	$ 2,945.00	$ 8,835,000.00
Access				
Access to site from Highway	km	72	$ 600,433.00	$ 43,231,176.00
Develop sources of constuction materials				
Quarry	Lump sum	1	$ 945,966.00	$ 945,966.00
Sand gravel sources	Lump sum	1	$ 945,966.00	$ 945,966.00
River diversion				
Excavate diversion channel	cu m	80,000	$ 24.50	$ 1,960,000.00
Coffer dams	Lump sum	1	$ 2,768,955.00	$ 2,768,955.00
Foundation excavation and treatment				
Excavate sand from river bed	cu m	50,000	$ 23.00	$ 1,150,000.00
Excavate rock from bed and abutments	cu m	125,000	$ 47.50	$ 5,937,500.00
Foundation treatment	sq m	16,400	$ 75.00	$ 1,230,000.00
Construct grouting plinth	cu m	2,500	$ 2,438.50	$ 6,096,250.00
Foundation grouting	cu m	6,560	$ 388.50	$ 2,548,560.00
RCC dam river section				
RCC concrete to dam wall	cu m	410,000	$ 506.50	$ 207,665,000.00
Establish RCC Plant	Lump sum	1	$ 2,350,000.00	$ 2,350,000.00

De mobilise RCC Plant	Lump sum	1	$ 700,000.00	$ 700,000.00
Conventional concrete to faces	cu m	15,000	$ 2,157.50	$ 32,362,500.00
Conventional concrete to spillway crest	cu m	20,000	$ 2,157.00	$ 43,140,000.00
Conventional concrete to spillway apron and end sill apron	cu m	250	$ 2,095.00	$ 523,750.00
Convental concrete to training walls	cu m	750	$ 2,285.00	$ 1,713,750.00
Outlet works				
Intake tower convenional concrete	cu m	800	$ 2,285.50	$ 1,828,400.00
Intake tower gates, guides and seals	Lump sum	1	$ 500,000.00	$ 500,000.00
Outlet conduit and concrete surround	m	300	$ 3,920.50	$ 1,176,150.00
Valve house conventional concrete	cu m	200	$ 2,753.50	$ 550,700.00
Valve house pipework and valves	Lump sum	1	$ 6,900,000.00	$ 6,900,000.00
Fish transfer facility				
Construct fish lift	Lump sum	25	$ 22,500.00	$ 562,500.00
Commission and monitroring	Lump sum	1	$ 142,850.00	$ 142,850.00
Permanent downstream crossing	Lump sum	1	$ 2,141,381.00	$ 2,141,381.00
Total direct construction costs (TDC)				**$ 388,596,494.00**
ON SITE OVERHEADS				
Camp operations	Lump sum	1	$ 4,652,924.00	$ 4,652,924.00
Site office operations	Lump sum	1	$ 1,337,082.00	$ 1,337,082.00
Site Management and Supervision	Lump sum	1	$ 19,653,825.00	$ 19,653,825.00
Insurances, public liability	Lump sum	1	$ 10,770,265.40	$ 10,770,265.40
Total on site overheads (OSO)				$ 36,414,096.40
Total direct and on site overhead costs				**$ 425,010,590.40**
Profit and off site overheads 10% of TDC and OSO	Lump sum	1	53,280,512.29	$ 53,280,512.29
Total Out Turn Costs (TOC)				$ 53,280,512.29
OWNER'S COSTS				
Investigation and design				
Preliminary design	Lump sum	1	$ 3,929,468.32	$ 3,929,468.32
Geotechnical and materials	Lump sum	1	$ 492,559.40	$ 492,559.40
Hydraulic model study	Lump sum	1	$ 2,140,844.79	$ 2,140,844.79
Detailed design and documentataion	Lump sum	1	$ 6,900,000.00	$ 6,900,000.00
Acquisition and Approvals				
Environmental assessment and approvals	Lump sum	1	$ 31,446,753.45	$ 31,446,753.45
Storage area acquisition	ha	30	$ 100,000.00	$ 3,000,000.00
Storage area access relocations	Lump sum	1	$ 2,751,728.51	$ 2,751,728.51
Surveys and legals	Lump sum	1	$ 4,127,592.77	$ 4,127,592.77
Permanent onsite buildings and services	Lump sum	1	$ 1,769,361.43	$ 1,769,361.43
Principal's insurances	Lump sum	1	$ 8,588,417.89	$ 8,588,417.89
Owners management and supervision	Lump sum	1	$ 47,170,130.18	$ 47,170,130.18
Total owners costs				$ 112,316,856.74
TOTAL PROJECT COSTS (TPC)				**$ 590,607,959.43**
Risk adjustment (40% of TPC)				$ 234,440,308.05

TOTAL CAPITAL COST				**$ 825,048,267.48**

Gunpowder Creek - Scale 5 (Rookwood)

DIRECT CONSTRUCTION COSTS

General		Qty	Rate	Total
Environmental management	Lump sum	1	$ 4,658,700.00	$ 4,658,700.00
Cultural heritage management	Lump sum	1	$ 2,236,180.00	$ 2,236,180.00
Mobilisation and demobilisation				
Establishment of workforce accommodation	Lump sum	1	$ 4,680,000.00	$ 4,680,000.00
Establishment of major plant	Lump sum	1	$ 604,500.00	$ 604,500.00
Demobilisation of major plant	Lump sum	1	$ 604,500.00	$ 604,500.00
Demobilisation of workforce accommodation	Lump sum	1	$ 2,015,000.00	$ 2,015,000.00
Clear site and X% of storage area	ha	5,000	$ 2,945.00	$ 14,725,000.00
Access				
Access to site from Highway	km	72	$ 600,433.00	$ 43,231,176.00
Develop sources of constuction materials				
Quarry	Lump sum	1	$ 945,966.00	$ 945,966.00
Sand gravel sources	Lump sum	1	$ 945,966.00	$ 945,966.00
River diversion				
Excavate diversion channel	cu m	60,000	$ 24.50	$ 1,470,000.00
Coffer dams	Lump sum	1	$ 3,105,897.00	$ 3,105,897.00
Foundation excavation and treatment				
Excavate sand from river bed	cu m	10,000	$ 23.00	$ 230,000.00
Excavate rock from bed and abutments	cu m	450,000	$ 47.50	$ 21,375,000.00
Foundation treatment	sq m	12,308	$ 75.00	$ 923,100.00
Construct grouting plinth	cu m	1,500	$ 2,438.50	$ 3,657,750.00
Foundation grouting	cu m	2,525	$ 388.50	$ 980,962.50
RCC dam river section				
RCC concrete to dam wall	cu m	800,000	$ 502.00	$ 401,600,000.00
Establish RCC Plant	Lump sum	1	$ 2,350,000.00	$ 2,350,000.00

De mobilise RCC Plant	Lump sum	1	$ 700,000.00	$ 700,000.00
Conventional concrete to faces	cu m	45,000	$ 2,157.50	$ 97,087,500.00
Conventional concrete to spillway crest	cu m	3,000	$ 2,157.00	$ 6,471,000.00
Conventional concrete to spillway apron and end sill apron	cu m	5,000	$ 2,095.00	$ 10,475,000.00
Convental concrete to training walls	cu m	3,000	$ 2,285.00	$ 6,855,000.00
Outlet works				
Intake tower convenional concrete	cu m	1,000	$ 2,285.50	$ 2,285,500.00
Intake tower gates, guides and seals	Lump sum	1	$ 750,000.00	$ 750,000.00
Outlet conduit and concrete surround	m	500	$ 3,920.50	$ 1,960,250.00
Valve house conventional concrete	cu m	200	$ 2,753.50	$ 550,700.00
Valve house pipework and valves	Lump sum	1	$ 12,650,000.00	$ 12,650,000.00
Fish transfer facility				
Construct fish lift	Lump sum	65	$ 22,500.00	$ 1,462,500.00
Commission and monitroring	Lump sum	1	$ 181,200.00	$ 181,200.00
Permanent downstream crossing	Lump sum	1	$ 3,568,968.00	$ 3,568,968.00
Total direct construction costs (TDC)				**$ 655,337,315.50**
ON SITE OVERHEADS				
Camp operations	Lump sum	1	$ 9,078,876.71	$ 9,078,876.71
Site office operations	Lump sum	1	$ 2,608,941.00	$ 2,608,941.00
Site Management and Supervision	Lump sum	1	$ 33,206,256.67	$ 33,206,256.67
Insurances, public liability	Lump sum	1	$ 18,196,976.78	$ 18,196,976.78
Total on site overheads (OSO)				$ 63,091,051.16
Total direct and on site overhead costs				**$ 718,428,366.66**
Profit and off site overheads 10% of TDC and OSO	Lump sum	1	$ 90,019,651.36	$ 90,019,651.36
Total Out Turn Costs (TOC)				$ 90,019,651.36
OWNER'S COSTS				
Investigation and design				
Preliminary design	Lump sum	1	$ 6,639,060.52	$ 6,639,060.52
Geotechnical and materials	Lump sum	1	$ 832,207.16	$ 832,207.16
Hydraulic model study	Lump sum	1	$ 3,617,079.19	$ 3,617,079.19
Detailed design and documentataion	Lump sum	1	$ 11,650,000.00	$ 11,650,000.00
Acquisition and Approvals				
Environmental assessment and approvals	Lump sum	1	$ 53,131,080.91	$ 53,131,080.91
Storage area acquisition	ha	35	$ 100,000.00	$ 3,500,000.00
Storage area access relocations	Lump sum	1	$ 4,649,202.04	$ 4,649,202.04
Surveys and legals	Lump sum	1	$ 6,973,803.06	$ 6,973,803.06
Permanent onsite buildings and services	Lump sum	1	$ 2,989,436.91	$ 2,989,436.91
Principal's insurances	Lump sum	1	$ 14,510,478.15	$ 14,510,478.15
Owners management and supervision	Lump sum	1	$ 79,696,621.37	$ 79,696,621.37
Total owners costs				$ 188,188,969.31
TOTAL PROJECT COSTS (TPC)				**$ 996,636,987.33**
Risk adjustment (40% of TPC)				$ 396,096,694.44
TOTAL CAPITAL COST				**$ 1,392,733,681.77**

Gunpowder Creek - Scale 6 (Herbert)

DIRECT CONSTRUCTION COSTS

General		Qty	Rate	Total
Environmental management	Lump sum	1	$ 6,988,050.00	$ 6,988,050.00
Cultural heritage management	Lump sum	1	$ 3,354,280.00	$ 3,354,280.00
Mobilisation and demobilisation				
Establishment of workforce accommodation	Lump sum	1	$ 5,362,310.00	$ 5,362,310.00
Establishment of major plant	Lump sum	1	$ 725,840.00	$ 725,840.00
Demobilisation of major plant	Lump sum	1	$ 725,840.00	$ 725,840.00
Demobilisation of workforce accommodation	Lump sum	1	$ 2,359,425.00	$ 2,359,425.00
Clear site and X% of storage area	ha	7,000	$ 2,945.00	$ 20,615,000.00
Access				
Access to site from Highway	km	72	$ 600,433.00	$ 43,231,176.00
Develop sources of constuction materials				
Quarry	Lump sum	1	$ 945,966.00	$ 945,966.00
Sand gravel sources	Lump sum	1	$ 945,966.00	$ 945,966.00
River diversion				
Excavate diversion channel	cu m	30,000	$ 24.50	$ 735,000.00
Coffer dams	Lump sum	1	$ 3,876,588.00	$ 3,876,588.00
Foundation excavation and treatment				
Excavate sand from river bed	cu m	80,000	$ 23.00	$ 1,840,000.00
Excavate rock from bed and abutments	cu m	350,000	$ 47.50	$ 16,625,000.00
Foundation treatment	sq m	24,000	$ 75.00	$ 1,800,000.00
Construct grouting plinth	cu m	3,500	$ 2,438.50	$ 8,534,750.00
Foundation grouting	cu m	6,400	$ 388.50	$ 2,486,400.00
RCC dam river section				
RCC concrete to dam wall	cu m	1,200,000	$ 494.50	$ 593,400,000.00
Establish RCC Plant	Lump sum	1	$ 2,350,000.00	$ 2,350,000.00

De mobilise RCC Plant	Lump sum	1	$ 700,000.00	$ 700,000.00
Conventional concrete to faces	cu m	30,000	$ 2,157.50	$ 64,725,000.00
Conventional concrete to spillway crest	cu m	6,000	$ 2,157.00	$ 12,942,000.00
Conventional concrete to spillway apron and end sill apron	cu m	10,000	$ 2,095.00	$ 20,950,000.00
Convental concrete to training walls	cu m	1,000	$ 2,285.00	$ 2,285,000.00
Outlet works				
Intake tower convenional concrete	cu m	1,500	$ 2,285.50	$ 3,428,250.00
Intake tower gates, guides and seals	Lump sum	1	$ 1,350,000.00	$ 1,350,000.00
Outlet conduit and concrete surround	m	1,000	$ 3,920.50	$ 3,920,500.00
Valve house conventional concrete	cu m	200	$ 2,753.50	$ 550,700.00
Valve house pipework and valves	Lump sum	1	$ 17,250,000.00	$ 17,250,000.00
Fish transfer facility				
Construct fish lift	Lump sum	50	$ 22,500.00	$ 1,125,000.00
Commission and monitroring	Lump sum	1	$ 270,000.00	$ 270,000.00
Permanent downstream crossing	Lump sum	1	$ 4,996,556.00	$ 4,996,556.00
Total direct construction costs (TDC)				**$ 851,394,597.00**
ON SITE OVERHEADS				
Camp operations	Lump sum	1	$ 13,618,315.00	$ 13,618,315.00
Site office operations	Lump sum	1	$ 3,913,411.76	$ 3,913,411.76
Site Management and Supervision	Lump sum	1	$ 43,466,316.18	$ 43,466,316.18
Insurances, public liability	Lump sum	1	$ 23,819,473.38	$ 23,819,473.38
Total on site overheads (OSO)				$ 84,817,516.32
Total direct and on site overhead costs				**$ 936,212,113.32**
Profit and off site overheads 10% of TDC and OSO	Lump sum	1	$ 117,828,846.49	$ 117,828,846.49
Total Out Turn Costs (TOC)				$ 117,828,846.49
OWNER'S COSTS				
Investigation and design				
Preliminary design	Lump sum	1	$ 8,690,395.50	$ 8,690,395.50
Geotechnical and materials	Lump sum	1	$ 1,089,342.29	$ 1,089,342.29
Hydraulic model study	Lump sum	1	$ 4,734,683.26	$ 4,734,683.26
Detailed design and documentataion	Lump sum	1	$ 15,200,000.00	$ 15,200,000.00
Acquisition and Approvals				
Environmental assessment and approvals	Lump sum	1	$ 69,547,506.85	$ 69,547,506.85
Storage area acquisition	ha	40	$ 100,000.00	$ 4,000,000.00
Storage area access relocations	Lump sum	1	$ 6,085,711.13	$ 6,085,711.13
Surveys and legals	Lump sum	1	$ 9,128,566.70	$ 9,128,566.70
Permanent onsite buildings and services	Lump sum	1	$ 3,913,112.25	$ 3,913,112.25
Principal's insurances	Lump sum	1	$ 18,993,028.28	$ 18,993,028.28
Owners management and supervision	Lump sum	1	$ 104,321,260.27	$ 104,321,260.27
Total owners costs				$ 245,703,606.53
TOTAL PROJECT COSTS (TPC)				**$ 1,299,744,566.34**
Risk adjustment (40% of TPC)				$ 518,460,312.85
TOTAL CAPITAL COST				**$ 1,818,204,879.19**

Gunpowder Creek - Scale 7 (Hells Gates)

DIRECT CONSTRUCTION COSTS

General		Qty	Rate	Total
Environmental management	Lump sum	1	9,899,650.00	$ 9,899,650.00
Cultural heritage management	Lump sum	1	4,751,832.00	$ 4,751,832.00
Mobilisation and demobilisation				
Establishment of workforce accommodation	Lump sum	1	$ 5,362,310.00	$ 5,362,310.00
Establishment of major plant	Lump sum	1	$ 725,840.00	$ 725,840.00
Demobilisation of major plant	Lump sum	1	$ 725,840.00	$ 725,840.00
Demobilisation of workforce accommodation	Lump sum	1	$ 2,359,425.00	$ 2,359,425.00
Clear site and X% of storage area	ha	10,000	$ 2,945.00	$ 29,450,000.00
Access				
Access to site from Highway	km	72	$ 600,433.00	$ 43,231,176.00
Develop sources of constuction materials				
Quarry	Lump sum	1	$ 945,966.00	$ 945,966.00
Sand gravel sources	Lump sum	1	$ 945,966.00	$ 945,966.00
River diversion				
Excavate diversion channel	cu m	40,000	$ 24.50	$ 980,000.00
Coffer dams	Lump sum	1	$ 4,399,844.00	$ 4,399,844.00
Foundation excavation and treatment				
Excavate sand from river bed	cu m	1,200,000	$ 19.00	$ 22,800,000.00
Excavate rock from bed and abutments	cu m	250,000	$ 47.50	$ 11,875,000.00
Foundation treatment	sq m	17000	$ 75.00	$ 1,275,000.00
Construct grouting plinth	cu m	5,000	$ 2,438.50	$ 12,192,500.00
Foundation grouting	cu m	3,400	$ 388.50	$ 1,320,900.00
RCC dam river section				
RCC concrete to dam wall	cu m	1,700,000	$ 487.50	$ 828,750,000.00
Establish RCC Plant	Lump sum	1	$ 2,350,000.00	$ 2,350,000.00

De mobilise RCC Plant	Lump sum	1	$ 700,000.00	$ 700,000.00
Conventional concrete to faces	cu m	70,000	$ 2,157.50	$ 151,025,000.00
Conventional concrete to spillway crest	cu m	12,000	$ 2,157.00	$ 25,884,000.00
Conventional concrete to spillway apron and end sill apron	cu m	500	$ 2,095.00	$ 1,047,500.00
Convental concrete to training walls	cu m	6,000	$ 2,285.00	$ 13,710,000.00
Outlet works				
Intake tower convenional concrete	cu m	2,000	$ 2,285.50	$ 4,571,000.00
Intake tower gates, guides and seals	Lump sum	1	$ 2,000,000.00	$ 2,000,000.00
Outlet conduit and concrete surround	m	1,500	$ 3,920.50	$ 5,880,750.00
Valve house conventional concrete	cu m	200	$ 2,753.50	$ 550,700.00
Valve house pipework and valves	Lump sum	1	$ 27,600,000.00	$ 27,600,000.00
Fish transfer facility				
Construct fish lift	Lump sum	100	$ 22,500.00	$ 2,250,000.00
Commission and monitroring	Lump sum	1	$ 385,000.00	$ 385,000.00
Permanent downstream crossing	Lump sum	1	$ 4,996,556.00	$ 4,996,556.00
Total direct construction costs (TDC)				**$ 1,224,941,755.00**
ON SITE OVERHEADS				
Camp operations	Lump sum	1	$ 19,292,600.00	$ 19,292,600.00
Site office operations	Lump sum	1	$ 5,544,000.00	$ 5,544,000.00
Site Management and Supervision	Lump sum	1	$ 62,738,917.74	$ 62,738,917.74
Insurances, public liability	Lump sum	1	$ 34,380,828.92	$ 34,380,828.92
Total on site overheads (OSO)				$ 121,956,346.66
Total direct and on site overhead costs				**$ 1,346,898,101.66**
Profit and off site overheads 10% of TDC and OSO	Lump sum	1	$ 170,074,236.38	$ 170,074,236.38
Total Out Turn Costs (TOC)				$ 170,074,236.38
OWNER'S COSTS				
Investigation and design				
Preliminary design	Lump sum	1	$ 12,543,644.27	$ 12,543,644.27
Geotechnical and materials	Lump sum	1	$ 1,572,347.56	$ 1,572,347.56
Hydraulic model study	Lump sum	1	$ 6,834,002.26	$ 6,834,002.26
Detailed design and documentataion	Lump sum	1	$ 21,950,000.00	$ 21,950,000.00
Acquisition and Approvals				
Environmental assessment and approvals	Lump sum	1	$ 100,384,290.50	$ 100,384,290.50
Storage area acquisition	ha	50	$ 100,000.00	$ 5,000,000.00
Storage area access relocations	Lump sum	1	$ 8,784,064.61	$ 8,784,064.61
Surveys and legals	Lump sum	1	$ 13,176,096.93	$ 13,176,096.93
Permanent onsite buildings and services	Lump sum	1	$ 5,648,153.55	$ 5,648,153.55
Principal's insurances	Lump sum	1	$ 27,414,566.46	$ 27,414,566.46
Owners management and supervision	Lump sum	1	$ 150,576,435.75	$ 150,576,435.75
Total owners costs				$ 353,883,601.89
TOTAL PROJECT COSTS (TPC)				**$ 1,870,855,939.93**
Risk adjustment (40% of TPC)				$ 748,345,964.71
TOTAL CAPITAL COST				**$ 2,619,201,904.64**

Appendix B Unit rates for Upper Baines (dam size scales 1 to 7)

Upper Baines - Scale 1 (Mount Bennett)

DIRECT CONSTRUCTION COSTS

General		Qty	Rate	Total
Environmental management	Lump sum	1	$ 600,000.00	$ 600,000.00
Cultural heritage management	Lump sum	1	$ 480,000.00	$ 480,000.00
Mobilisation and demobilisation				
Establishment of workforce accommodation	Lump sum	1	$ 1,425,000.00	$ 1,425,000.00
Establishment of major plant	Lump sum	1	$ 280,000.00	$ 280,000.00
Demobilisation of major plant	Lump sum	1	$ 280,000.00	$ 280,000.00
Demobilisation of workforce accommodation	Lump sum	1	$ 780,000.00	$ 780,000.00
Clear site and X% of storage area	ha	2,000	$ 2,945.00	$ 5,890,000.00
Access				
Access to site from Highway	km	75	$ 600,433.00	$ 45,032,475.00
Develop sources of constuction materials				
Quarry	Lump sum	1	$ 180,000.00	$ 180,000.00
Sand gravel sources	Lump sum	1	$ 180,000.00	$ 180,000.00
River diversion				
Excavate diversion channel	cu m	10,000	$ 24.50	$ 245,000.00
Coffer dams	Lump sum	1	$ 800,000.00	$ 800,000.00
Foundation excavation and treatment				
Excavate sand from river bed	cu m	5,000	$ 25.00	$ 125,000.00
Excavate rock from bed and abutments	cu m	75,000	$ 52.50	$ 3,937,500.00
Foundation treatment	sq m	2,000	$ 75.00	$ 150,000.00
Construct grouting plinth	cu m	300	$ 2,438.50	$ 731,550.00
Foundation grouting	cu m	700	$ 385.50	$ 269,850.00
RCC dam river section				
RCC concrete to dam wall	cu m	40,000	$ 521.00	$ 20,840,000.00
Establish RCC Plant	Lump sum	1	$ 1,155,001.00	$ 1,155,001.00
De mobilise RCC Plant	Lump sum	1	$ 330,000.00	$ 330,000.00
Conventional concrete to faces	cu m	6,000	$ 2,154.50	$ 12,927,000.00
Conventional concrete to spillway crest	cu m	100	$ 2,149.00	$ 214,900.00
Conventional concrete to spillway apron and end sill apron	cu m	50	$ 2,088.50	$ 104,425.00
Convental concrete to training walls	cu m	500	$ 2,279.50	$ 1,139,750.00
Outlet works				
Intake tower convenional concrete	cu m	400	$ 2,279.50	$ 911,800.00
Intake tower gates, guides and seals	Lump sum	1	$ 90,000.00	$ 90,000.00
Outlet conduit and concrete surround	m	150	$ 3,916.50	$ 587,475.00
Valve house conventional concrete	cu m	100	$ 2,750.00	$ 275,000.00
Valve house pipework and valves	Lump sum	1	$ 805,000.00	$ 805,000.00
Fish transfer facility				
Construct fish lift	Lump sum	20	$ 22,500.00	$ 450,000.00
Commission and monitroring	Lump sum	1	$ 40,000.00	$ 40,000.00
Permanent downstream crossing	Lump sum	1	$ 1,000,000.00	$ 1,000,000.00
Total direct construction costs (TDC)				**$ 102,256,726.00**
ON SITE OVERHEADS				

Camp operations	Lump sum	1	$ 453,943.00	$ 453,943.00
Site office operations	Lump sum	1	$ 130,447.00	$ 130,447.00
Site Management and Supervision	Lump sum	1	$ 5,150,055.80	$ 5,150,055.80
Insurances, public liability	Lump sum	1	$ 2,822,222.54	$ 2,822,222.54
Total on site overheads (OSO)				**$ 8,556,668.34**
Total direct and on site overhead costs				**$ 110,813,394.34**
Profit and off site overheads 10% of TDC and OSO	Lump sum	1	$ 13,960,716.38	$ 13,960,716.38
Total Out Turn Costs (TOC)				$ 13,960,716.38
OWNER'S COSTS				
Investigation and design				
Preliminary design	Lump sum	1	$ 1,029,671.38	$ 1,029,671.38
Geotechnical and materials	Lump sum	1	$ 129,069.46	$ 129,069.46
Hydraulic model study	Lump sum	1	$ 560,983.43	$ 560,983.43
Detailed design and documentataion	Lump sum	1	$ 1,800,000.00	$ 1,800,000.00
Acquisition and Approvals				
Environmental assessment and approvals	Lump sum	1	$ 8,240,255.27	$ 8,240,255.27
Storage area acquisition	ha	10	$ 100,000.00	$ 1,000,000.00
Storage area access relocations	Lump sum	1	$ 721,058.40	$ 721,058.40
Surveys and legals	Lump sum	1	$ 1,081,587.58	$ 1,081,587.58
Permanent onsite buildings and services	Lump sum	1	$ 463,640.55	$ 463,640.55
Principal's insurances	Lump sum	1	$ 2,250,349.64	$ 2,250,349.64
Owners management and supervision	Lump sum	1	$ 12,360,382.90	$ 12,360,382.90
Total owners costs				$ 29,636,998.61
TOTAL PROJECT COSTS (TPC)				**$ 154,411,109.33**
Risk adjustment (40% of TPC)				$ 61,428,738.32
TOTAL CAPITAL COST				$ 215,839,847.65

Upper Baines - Scale 2 (Nitchaga)

DIRECT CONSTRUCTION COSTS

General		Qty	Rate	Total
Environmental management	Lump sum	1	$ 900,000.00	$ 900,000.00
Cultural heritage management	Lump sum	1	$ 640,000.00	$ 640,000.00
Mobilisation and demobilisation				
Establishment of workforce accommodation	Lump sum	1	$ 2,100,000.00	$ 2,100,000.00
Establishment of major plant	Lump sum	1	$ 387,000.00	$ 387,000.00
Demobilisation of major plant	Lump sum	1	$ 387,000.00	$ 387,000.00
Demobilisation of workforce accommodation	Lump sum	1	$ 1,120,000.00	$ 1,120,000.00
Clear site and X% of storage area	ha	500	$ 2,945.00	$ 1,472,500.00
Access				
Access to site from Highway	km	75	$ 600,433.00	$ 45,032,475.00
Develop sources of constuction materials				
Quarry	Lump sum	1	$ 270,000.00	$ 270,000.00
Sand gravel sources	Lump sum	1	$ 270,000.00	$ 270,000.00
River diversion				
Excavate diversion channel	cu m	20,000	$ 24.50	$ 490,000.00
Coffer dams	Lump sum	1	$ 1,400,000.00	$ 1,400,000.00
Foundation excavation and treatment				
Excavate sand from river bed	cu m	20,000	$ 23.00	$ 460,000.00
Excavate rock from bed and abutments	cu m	25,000	$ 52.50	$ 1,312,500.00
Foundation treatment	sq m	2,666	$ 75.00	$ 199,950.00
Construct grouting plinth	cu m	1,000	$ 2,438.50	$ 2,438,500.00
Foundation grouting	cu m	600	$ 385.50	$ 231,300.00
RCC dam river section				
RCC concrete to dam wall	cu m	80,000	$ 515.00	$ 41,200,000.00
Establish RCC Plant	Lump sum	1	$ 1,155,001.00	$ 1,155,001.00
De mobilise RCC Plant	Lump sum	1	$ 330,000.00	$ 330,000.00
Conventional concrete to faces	cu m	3,000	$ 2,154.50	$ 6,463,500.00
Conventional concrete to spillway crest	cu m	500	$ 2,149.00	$ 1,074,500.00
Conventional concrete to spillway apron and end sill apron	cu m	1,000	$ 2,088.50	$ 2,088,500.00
Convental concrete to training walls	cu m	100	$ 2,279.50	$ 227,950.00
Outlet works				
Intake tower convenional concrete	cu m	200	$ 2,279.50	$ 455,900.00
Intake tower gates, guides and seals	Lump sum	1	$ 130,000.00	$ 130,000.00
Outlet conduit and concrete surround	m	100	$ 3,916.50	$ 391,650.00
Valve house conventional concrete	cu m	100	$ 2,750.00	$ 275,000.00
Valve house pipework and valves	Lump sum	1	$ 1,495,000.00	$ 1,495,000.00
Fish transfer facility				
Construct fish lift	Lump sum	30	$ 22,500.00	$ 675,000.00
Commission and monitroring	Lump sum	1	$ 51,000.00	$ 51,000.00
Permanent downstream crossing	Lump sum	1	$ 1,239,601.00	$ 1,239,601.00
Total direct construction costs (TDC)				**$ 116,363,827.00**
ON SITE OVERHEADS				

Camp operations	Lump sum	1	$ 907,887.00	$ 907,887.00
Site office operations	Lump sum	1	$ 260,895.00	$ 260,895.00
Site Management and Supervision	Lump sum	1	$ 5,904,630.45	$ 5,904,630.45
Insurances, public liability	Lump sum	1	$ 3,235,728.27	$ 3,235,728.27
Total on site overheads (OSO)				$ 10,309,140.72
Total direct and on site overhead costs				**$ 126,672,967.72**
Profit and off site overheads 10% of TDC and OSO	Lump sum	1	$ 16,004,811.41	$ 16,004,811.41
Total Out Turn Costs (TOC)				$ 16,004,811.41
OWNER'S COSTS				
Investigation and design				
Preliminary design	Lump sum	1	$ 1,180,536.53	$ 1,180,536.53
Geotechnical and materials	Lump sum	1	$ 147,980.43	$ 147,980.43
Hydraulic model study	Lump sum	1	$ 643,177.47	$ 643,177.47
Detailed design and documentataion	Lump sum	1	$ 2,050,000.00	$ 2,050,000.00
Acquisition and Approvals				$ -
Environmental assessment and approvals	Lump sum	1	$ 9,447,599.03	$ 9,447,599.03
Storage area acquisition	ha	20	$ 100,000.00	$ 2,000,000.00
Storage area access relocations	Lump sum	1	$ 826,706.26	$ 826,706.26
Surveys and legals	Lump sum	1	$ 1,240,059.38	$ 1,240,059.38
Permanent onsite buildings and services	Lump sum	1	$ 531,572.13	$ 531,572.13
Principal's insurances	Lump sum	1	$ 2,579,818.62	$ 2,579,818.62
Owners management and supervision	Lump sum	1	$ 14,171,398.54	$ 14,171,398.54
Total owners costs				$ 34,818,848.39
TOTAL PROJECT COSTS (TPC)				**$ 177,496,627.52**
Risk adjustment (40% of TPC)				70,422,988.73
TOTAL CAPITAL COST				**$ 247,919,616.25**

Upper Baines Creek - Scale 3 (Elizabeth)

DIRECT CONSTRUCTION COSTS

General		Qty	Rate	Total
Environmental management	Lump sum	1	$ 1,200,000.00	$ 1,200,000.00
Cultural heritage management	Lump sum	1	$ 800,000.00	$ 800,000.00
Mobilisation and demobilisation				
Establishment of workforce accommodation	Lump sum	1	$ 2,500,000.00	$ 2,500,000.00
Establishment of major plant	Lump sum	1	$ 387,000.00	$ 387,000.00
Demobilisation of major plant	Lump sum	1	$ 387,000.00	$ 387,000.00
Demobilisation of workforce accommodation	Lump sum	1	$ 1,120,000.00	$ 1,120,000.00
Clear site and X% of storage area	ha	1,000	$ 2,945.00	$ 2,945,000.00
Access				
Access to site from Highway	km	75	$ 600,433.00	$ 45,032,475.00
Develop sources of constuction materials				
Quarry	Lump sum	1	$ 360,000.00	$ 360,000.00
Sand gravel sources	Lump sum	1	$ 360,000.00	$ 360,000.00
River diversion				
Excavate diversion channel	cu m	15,000	$ 24.50	$ 367,500.00
Coffer dams	Lump sum	1	$ 2,150,000.00	$ 2,150,000.00
Foundation excavation and treatment				
Excavate sand from river bed	cu m	3,000	$ 25.00	$ 75,000.00
Excavate rock from bed and abutments	cu m	50,000	$ 52.50	$ 2,625,000.00
Foundation treatment	sq m	4,142	$ 75.00	$ 310,650.00
Construct grouting plinth	cu m	500	$ 2,438.50	$ 1,219,250.00
Foundation grouting	cu m	1,200	$ 385.50	$ 462,600.00
RCC dam river section				
RCC concrete to dam wall	cu m	145,000	$ 509.00	$ 73,805,000.00
Establish RCC Plant	Lump sum	1	$ 1,155,001.00	$ 1,155,001.00
De mobilise RCC Plant	Lump sum	1	$ 330,000.00	$ 330,000.00
Conventional concrete to faces	cu m	10,000	$ 2,154.50	$ 21,545,000.00
Conventional concrete to spillway crest	cu m	1,500	$ 2,149.00	$ 3,223,500.00
Conventional concrete to spillway apron and end sill apron	cu m	100	$ 2,088.50	$ 208,850.00
Convental concrete to training walls	cu m	1,500	$ 2,279.50	$ 3,419,250.00
Outlet works				
Intake tower convenional concrete	cu m	600	$ 2,279.50	$ 1,367,700.00
Intake tower gates, guides and seals	Lump sum	1	$ 200,000.00	$ 200,000.00
Outlet conduit and concrete surround	m	200	$ 3,916.50	$ 783,300.00
Valve house conventional concrete	cu m	100	$ 2,750.00	$ 275,000.00
Valve house pipework and valves	Lump sum	1	$ 2,530,000.00	$ 2,530,000.00
Fish transfer facility				
Construct fish lift	Lump sum	35	$ 22,500.00	$ 787,500.00
Commission and monitroring	Lump sum	1	$ 82,850.00	$ 82,850.00
Permanent downstream crossing	Lump sum	1	$ 1,427,587.00	$ 1,427,587.00
Total direct construction costs (TDC)				**$ 173,442,013.00**
ON SITE OVERHEADS				

Camp operations	Lump sum	1	$ 1,645,546.00	$ 1,645,546.00
Site office operations	Lump sum	1	$ 472,870.00	$ 472,870.00
Site Management and Supervision	Lump sum	1	$ 8,790,646.45	$ 8,790,646.45
Insurances, public liability	Lump sum	1	$ 4,817,260.53	$ 4,817,260.53
Total on site overheads (OSO)				$ 15,726,322.98
Total direct and on site overhead costs				**$ 189,168,335.98**
Profit and off site overheads 10% of TDC and OSO	Lump sum	1	$ 23,832,397.71	$ 23,832,397.71
Total Out Turn Costs (TOC)				$ 23,832,397.71
OWNER'S COSTS				
Investigation and design				
Preliminary design	Lump sum	1	$ 1,757,549.32	$ 1,757,549.32
Geotechnical and materials	Lump sum	1	$ 220,309.06	$ 220,309.06
Hydraulic model study	Lump sum	1	$ 957,544.38	$ 957,544.38
Detailed design and documentataion	Lump sum	1	$ 3,100,000.00	$ 3,100,000.00
Acquisition and Approvals				
Environmental assessment and approvals	Lump sum	1	$ 14,065,317.65	$ 14,065,317.65
Storage area acquisition	ha	25	$ 100,000.00	$ 2,500,000.00
Storage area access relocations	Lump sum	1	$ 1,230,776.84	$ 1,230,776.84
Surveys and legals	Lump sum	1	$ 1,846,165.25	$ 1,846,165.25
Permanent onsite buildings and services	Lump sum	1	$ 791,389.51	$ 791,389.51
Principal's insurances	Lump sum	1	$ 3,841,625.29	$ 3,841,625.29
Owners management and supervision	Lump sum	1	$ 21,097,976.47	$ 21,097,976.47
Total owners costs				**$ 51,408,653.77**
TOTAL PROJECT COSTS (TPC)				**$ 264,409,387.46**
Risk adjustment (40% of TPC)				$ 104,865,257.88
TOTAL CAPITAL COST				**$ 369,274,645.34**

Upper Baines - Scale 4 (Dagworth)

DIRECT CONSTRUCTION COSTS

General		Qty	Rate	Total
Environmental management	Lump sum	1	$ 2,387,600.00	$ 2,387,600.00
Cultural heritage management	Lump sum	1	$ 1,146,040.00	$ 1,146,040.00
Mobilisation and demobilisation				
Establishment of workforce accommodation	Lump sum	1	$ 3,025,000.00	$ 3,025,000.00
Establishment of major plant	Lump sum	1	$ 465,000.00	$ 465,000.00
Demobilisation of major plant	Lump sum	1	$ 465,000.00	$ 465,000.00
Demobilisation of workforce accommodation	Lump sum	1	$ 1,550,000.00	$ 1,550,000.00
Clear site and X% of storage area	ha	3,000	$ 2,945.00	$ 8,835,000.00
Access				
Access to site from Highway	km	75	$ 600,433.00	$ 45,032,475.00
Develop sources of constuction materials				
Quarry	Lump sum	1	$ 945,966.00	$ 945,966.00
Sand gravel sources	Lump sum	1	$ 945,966.00	$ 945,966.00
River diversion				
Excavate diversion channel	cu m	80,000	$ 24.50	$ 1,960,000.00
Coffer dams	Lump sum	1	$ 2,768,955.00	$ 2,768,955.00
Foundation excavation and treatment				
Excavate sand from river bed	cu m	50,000	$ 23.00	$ 1,150,000.00
Excavate rock from bed and abutments	cu m	125,000	$ 47.50	$ 5,937,500.00
Foundation treatment	sq m	16,400	$ 75.00	$ 1,230,000.00
Construct grouting plinth	cu m	2,500	$ 2,438.50	$ 6,096,250.00
Foundation grouting	cu m	6,560	$ 385.50	$ 2,528,880.00
RCC dam river section				
RCC concrete to dam wall	cu m	410,000	$ 504.00	$ 206,640,000.00
Establish RCC Plant	Lump sum	1	$ 2,310,003.00	$ 2,310,003.00
De mobilise RCC Plant	Lump sum	1	$ 660,001.00	$ 660,001.00
Conventional concrete to faces	cu m	15,000	$ 2,154.50	$ 32,317,500.00
Conventional concrete to spillway crest	cu m	20,000	$ 2,149.00	$ 42,980,000.00
Conventional concrete to spillway apron and end sill apron	cu m	250	$ 2,088.50	$ 522,125.00
Convental concrete to training walls	cu m	750	$ 2,279.50	$ 1,709,625.00
Outlet works				
Intake tower convenional concrete	cu m	800	$ 2,279.50	$ 1,823,600.00
Intake tower gates, guides and seals	Lump sum	1	$ 500,000.00	$ 500,000.00
Outlet conduit and concrete surround	m	300	$ 3,916.50	$ 1,174,950.00
Valve house conventional concrete	cu m	200	$ 2,750.00	$ 550,000.00
Valve house pipework and valves	Lump sum	1	$ 6,900,000.00	$ 6,900,000.00
Fish transfer facility				
Construct fish lift	Lump sum	25	$ 22,500.00	$ 562,500.00
Commission and monitroring	Lump sum	1	$ 142,850.00	$ 142,850.00
Permanent downstream crossing	Lump sum	1	$ 2,141,381.00	$ 2,141,381.00
Total direct construction costs (TDC)				**$ 387,404,167.00**
ON SITE OVERHEADS				

Camp operations	Lump sum	1	$ 4,652,924.00	$ 4,652,924.00
Site office operations	Lump sum	1	$ 1,337,082.00	$ 1,337,082.00
Site Management and Supervision	Lump sum	1	$ 19,594,208.65	$ 19,594,208.65
Insurances, public liability	Lump sum	1	$ 10,737,595.74	$ 10,737,595.74
Total on site overheads (OSO)				$ 36,321,810.39
Total direct and on site overhead costs				**$ 423,725,977.39**
Profit and off site overheads 10% of TDC and OSO	Lump sum	1	53,115,936.15	$ 53,115,936.15
Total Out Turn Costs (TOC)				$ 53,115,936.15
OWNER'S COSTS				
Investigation and design				
Preliminary design	Lump sum	1	$ 3,917,548.98	$ 3,917,548.98
Geotechnical and materials	Lump sum	1	$ 491,065.31	$ 491,065.31
Hydraulic model study	Lump sum	1	$ 2,134,350.91	$ 2,134,350.91
Detailed design and documentataion	Lump sum	1	$ 6,850,000.00	$ 6,850,000.00
Acquisition and Approvals				
Environmental assessment and approvals	Lump sum	1	$ 31,351,365.37	$ 31,351,365.37
Storage area acquisition	ha	30	$ 100,000.00	$ 3,000,000.00
Storage area access relocations	Lump sum	1	$ 2,743,381.64	$ 2,743,381.64
Surveys and legals	Lump sum	1	$ 4,115,072.46	$ 4,115,072.46
Permanent onsite buildings and services	Lump sum	1	$ 1,763,994.39	$ 1,763,994.39
Principal's insurances	Lump sum	1	$ 8,561,843.12	$ 8,561,843.12
Owners management and supervision	Lump sum	1	$ 47,027,048.06	$ 47,027,048.06
Total owners costs				$ 111,955,670.24
TOTAL PROJECT COSTS (TPC)				**$ 588,797,583.78**
Risk adjustment (40% of TPC)				$ 233,716,154.32
TOTAL CAPITAL COST				**$ 822,513,738.10**

Upper Baines - Scale 5 (Rookwood)

DIRECT CONSTRUCTION COSTS

General		Qty	Rate	Total
Environmental management	Lump sum	1	$ 4,658,700.00	$ 4,658,700.00
Cultural heritage management	Lump sum	1	$ 2,236,180.00	$ 2,236,180.00
Mobilisation and demobilisation				
Establishment of workforce accommodation	Lump sum	1	$ 3,600,000.00	$ 3,600,000.00
Establishment of major plant	Lump sum	1	$ 465,000.00	$ 465,000.00
Demobilisation of major plant	Lump sum	1	$ 465,000.00	$ 465,000.00
Demobilisation of workforce accommodation	Lump sum	1	$ 1,550,000.00	$ 1,550,000.00
Clear site and X% of storage area	ha	5,000	$ 2,945.00	$ 14,725,000.00
Access				
Access to site from Highway	km	75	$ 600,433.00	$ 45,032,475.00
Develop sources of constuction materials				
Quarry	Lump sum	1	$ 945,966.00	$ 945,966.00
Sand gravel sources	Lump sum	1	$ 945,966.00	$ 945,966.00
River diversion				
Excavate diversion channel	cu m	60,000	$ 24.50	$ 1,470,000.00
Coffer dams	Lump sum	1	$ 3,105,897.00	$ 3,105,897.00
Foundation excavation and treatment				
Excavate sand from river bed	cu m	10,000	$ 23.00	$ 230,000.00
Excavate rock from bed and abutments	cu m	450,000	$ 47.50	$ 21,375,000.00
Foundation treatment	sq m	12,308	$ 75.00	$ 923,100.00
Construct grouting plinth	cu m	1,500	$ 2,438.50	$ 3,657,750.00
Foundation grouting	cu m	2,525	$ 385.50	$ 973,387.50
RCC dam river section				
RCC concrete to dam wall	cu m	800,000	$ 499.50	$ 399,600,000.00
Establish RCC Plant	Lump sum	1	$ 2,310,003.00	$ 2,310,003.00
De mobilise RCC Plant	Lump sum	1	$ 660,001.00	$ 660,001.00
Conventional concrete to faces	cu m	45,000	$ 2,154.50	$ 96,952,500.00
Conventional concrete to spillway crest	cu m	3,000	$ 2,149.00	$ 6,447,000.00
Conventional concrete to spillway apron and end sill apron	cu m	5,000	$ 2,088.50	$ 10,442,500.00
Convental concrete to training walls	cu m	3,000	$ 2,279.50	$ 6,838,500.00
Outlet works				
Intake tower convenional concrete	cu m	1,000	$ 2,279.50	$ 2,279,500.00
Intake tower gates, guides and seals	Lump sum	1	$ 750,000.00	$ 750,000.00
Outlet conduit and concrete surround	m	500	$ 3,916.50	$ 1,958,250.00
Valve house conventional concrete	cu m	200	$ 2,750.00	$ 550,000.00
Valve house pipework and valves	Lump sum	1	$ 12,650,000.00	$ 12,650,000.00
Fish transfer facility				
Construct fish lift	Lump sum	65	$ 22,500.00	$ 1,462,500.00
Commission and monitroring	Lump sum	1	$ 181,200.00	$ 181,200.00
Permanent downstream crossing	Lump sum	1	$ 3,568,968.00	$ 3,568,968.00
Total direct construction costs (TDC)				**$ 653,010,343.50**
ON SITE OVERHEADS				

Camp operations	Lump sum	1	$ 9,078,876.71	$ 9,078,876.71
Site office operations	Lump sum	1	$ 2,608,941.00	$ 2,608,941.00
Site Management and Supervision	Lump sum	1	$ 33,089,908.07	$ 33,089,908.07
Insurances, public liability	Lump sum	1	$ 18,133,217.93	$ 18,133,217.93
Total on site overheads (OSO)				$ 62,910,943.71
Total direct and on site overhead costs				**$ 715,921,287.21**
Profit and off site overheads 10% of TDC and OSO	Lump sum	1	$ 89,703,304.55	$ 89,703,304.55
Total Out Turn Costs (TOC)				$ 89,703,304.55
OWNER'S COSTS				
Investigation and design				
Preliminary design	Lump sum	1	$ 6,615,798.47	$ 6,615,798.47
Geotechnical and materials	Lump sum	1	$ 829,291.27	$ 829,291.27
Hydraulic model study	Lump sum	1	$ 3,604,405.61	$ 3,604,405.61
Detailed design and documentataion	Lump sum	1	$ 11,600,000.00	$ 11,600,000.00
Acquisition and Approvals				
Environmental assessment and approvals	Lump sum	1	$ 52,944,919.40	$ 52,944,919.40
Storage area acquisition	ha	35	$ 100,000.00	$ 3,500,000.00
Storage area access relocations	Lump sum	1	$ 4,632,912.09	$ 4,632,912.09
Surveys and legals	Lump sum	1	$ 6,949,368.14	$ 6,949,368.14
Permanent onsite buildings and services	Lump sum	1	$ 2,978,962.48	$ 2,978,962.48
Principal's insurances	Lump sum	1	$ 14,459,470.84	$ 14,459,470.84
Owners management and supervision	Lump sum	1	$ 79,417,379.10	$ 79,417,379.10
Total owners costs				$ 187,532,507.40
TOTAL PROJECT COSTS (TPC)				**$ 993,157,099.16**
Risk adjustment (40% of TPC)				$ 394,704,732.50
TOTAL CAPITAL COST				**$ 1,387,861,831.66**

Upper Baines - Scale 6 (Herbert)

DIRECT CONSTRUCTION COSTS

General		Qty	Rate	Total
Environmental management	Lump sum	1	$ 6,988,050.00	$ 6,988,050.00
Cultural heritage management	Lump sum	1	$ 3,354,280.00	$ 3,354,280.00
Mobilisation and demobilisation				
Establishment of workforce accommodation	Lump sum	1	$ 4,124,855.00	$ 4,124,855.00
Establishment of major plant	Lump sum	1	$ 558,340.00	$ 558,340.00
Demobilisation of major plant	Lump sum	1	$ 558,340.00	$ 558,340.00
Demobilisation of workforce accommodation	Lump sum	1	$ 1,814,935.00	$ 1,814,935.00
Clear site and X% of storage area	ha	7,000	$ 2,945.00	$ 20,615,000.00
Access				
Access to site from Highway	km	75	$ 600,433.00	$ 45,032,475.00
Develop sources of constuction materials				
Quarry	Lump sum	1	$ 945,966.00	$ 945,966.00
Sand gravel sources	Lump sum	1	$ 945,966.00	$ 945,966.00
River diversion				
Excavate diversion channel	cu m	30,000	$ 24.50	$ 735,000.00
Coffer dams	Lump sum	1	$ 3,876,588.00	$ 3,876,588.00
Foundation excavation and treatment				
Excavate sand from river bed	cu m	80,000	$ 23.00	$ 1,840,000.00
Excavate rock from bed and abutments	cu m	350,000	$ 47.50	$ 16,625,000.00
Foundation treatment	sq m	24,000	$ 75.00	$ 1,800,000.00
Construct grouting plinth	cu m	3,500	$ 2,438.50	$ 8,534,750.00
Foundation grouting	cu m	6,400	$ 385.50	$ 2,467,200.00
RCC dam river section				
RCC concrete to dam wall	cu m	1,200,000	$ 492.00	$ 590,400,000.00
Establish RCC Plant	Lump sum	1	$ 2,310,003.00	$ 2,310,003.00
De mobilise RCC Plant	Lump sum	1	$ 660,001.00	$ 660,001.00
Conventional concrete to faces	cu m	30,000	$ 2,154.50	$ 64,635,000.00
Conventional concrete to spillway crest	cu m	6,000	$ 2,149.00	$ 12,894,000.00
Conventional concrete to spillway apron and end sill apron	cu m	10,000	$ 2,088.50	$ 20,885,000.00
Convental concrete to training walls	cu m	1,000	$ 2,279.50	$ 2,279,500.00
Outlet works				
Intake tower convenional concrete	cu m	1,500	$ 2,279.50	$ 3,419,250.00
Intake tower gates, guides and seals	Lump sum	1	$ 1,350,000.00	$ 1,350,000.00
Outlet conduit and concrete surround	m	1,000	$ 3,916.50	$ 3,916,500.00
Valve house conventional concrete	cu m	200	$ 2,750.00	$ 550,000.00
Valve house pipework and valves	Lump sum	1	17,250,000.00	$ 17,250,000.00
Fish transfer facility				
Construct fish lift	Lump sum	50	$ 22,500.00	$ 1,125,000.00
Commission and monitroring	Lump sum	1	$ 270,000.00	$ 270,000.00
Permanent downstream crossing	Lump sum	1	$ 4,996,556.00	$ 4,996,556.00
Total direct construction costs (TDC)				**$ 847,757,555.00**
ON SITE OVERHEADS				
Camp operations	Lump sum	1	$ 13,618,315.00	$ 13,618,315.00

Site office operations	Lump sum	1	$ 3,913,411.76	$ 3,913,411.76
Site Management and Supervision	Lump sum	1	$ 43,284,464.09	$ 43,284,464.09
Insurances, public liability	Lump sum	1	$ 23,719,818.71	$ 23,719,818.71
Total on site overheads (OSO)				$ 84,536,009.56
Total direct and on site overhead costs				**$ 932,293,564.56**
Profit and off site overheads 10% of TDC and OSO	Lump sum	1	$ 117,337,264.06	$ 117,337,264.06
Total Out Turn Costs (TOC)				$ 117,337,264.06
OWNER'S COSTS				
Investigation and design				
Preliminary design	Lump sum	1	$ 8,654,037.08	$ 8,654,037.08
Geotechnical and materials	Lump sum	1	$ 1,084,784.76	$ 1,084,784.76
Hydraulic model study	Lump sum	1	$ 4,714,874.54	$ 4,714,874.54
Detailed design and documentataion	Lump sum	1	$ 15,150,000.00	$ 15,150,000.00
Acquisition and Approvals				
Environmental assessment and approvals	Lump sum	1	$ 69,256,537.63	$ 69,256,537.63
Storage area acquisition	ha	40	$ 100,000.00	$ 4,000,000.00
Storage area access relocations	Lump sum	1	$ 6,060,250.05	$ 6,060,250.05
Surveys and legals	Lump sum	1	$ 9,090,375.08	$ 9,090,375.08
Permanent onsite buildings and services	Lump sum	1	$ 3,896,740.78	$ 3,896,740.78
Principal's insurances	Lump sum	1	$ 18,913,810.96	$ 18,913,810.96
Owners management and supervision	Lump sum	1	$ 103,884,806.44	$ 103,884,806.44
Total owners costs				$ 244,706,217.32
TOTAL PROJECT COSTS (TPC)				**$ 1,294,337,045.94**
Risk adjustment (40% of TPC)				$ 516,297,294.31
TOTAL CAPITAL COST				**$ 1,810,634,340.25**

Upper Baines - Scale 7 (Hells Gates)

DIRECT CONSTRUCTION COSTS

General		Qty	Rate	Total
Environmental management	Lump sum	1	9,899,650.00	$ 9,899,650.00
Cultural heritage management	Lump sum	1	4,751,832.00	$ 4,751,832.00
Mobilisation and demobilisation				
Establishment of workforce accommodation	Lump sum	1	$ 4,124,855.00	$ 4,124,855.00
Establishment of major plant	Lump sum	1	$ 558,340.00	$ 558,340.00
Demobilisation of major plant	Lump sum	1	$ 558,340.00	$ 558,340.00
Demobilisation of workforce accommodation	Lump sum	1	$ 1,814,935.00	$ 1,814,935.00
Clear site and X% of storage area	ha	10,000	$ 2,945.00	$ 29,450,000.00
Access				
Access to site from Highway	km	75	$ 600,433.00	$ 45,032,475.00
Develop sources of constuction materials				
Quarry	Lump sum	1	$ 945,966.00	$ 945,966.00
Sand gravel sources	Lump sum	1	$ 945,966.00	$ 945,966.00
River diversion				
Excavate diversion channel	cu m	40,000	$ 24.50	$ 980,000.00
Coffer dams	Lump sum	1	$ 4,399,844.00	$ 4,399,844.00
Foundation excavation and treatment				
Excavate sand from river bed	cu m	1,200,000	$ 19.00	$ 22,800,000.00
Excavate rock from bed and abutments	cu m	250,000	$ 47.50	$ 11,875,000.00
Foundation treatment	sq m	17000	$ 75.00	$ 1,275,000.00
Construct grouting plinth	cu m	5,000	$ 2,438.50	$ 12,192,500.00
Foundation grouting	cu m	3,400	$ 385.50	$ 1,310,700.00
RCC dam river section				
RCC concrete to dam wall	cu m	1,700,000	$ 485.00	$ 824,500,000.00
Establish RCC Plant	Lump sum	1	$ 2,310,003.00	$ 2,310,003.00
De mobilise RCC Plant	Lump sum	1	$ 660,001.00	$ 660,001.00
Conventional concrete to faces	cu m	70,000	$ 2,154.50	$ 150,815,000.00
Conventional concrete to spillway crest	cu m	12,000	$ 2,149.00	$ 25,788,000.00
Conventional concrete to spillway apron and end sill apron	cu m	500	$ 2,088.50	$ 1,044,250.00
Convental concrete to training walls	cu m	6,000	$ 2,279.50	$ 13,677,000.00
Outlet works				
Intake tower convenional concrete	cu m	2,000	$ 2,279.50	$ 4,559,000.00
Intake tower gates, guides and seals	Lump sum	1	$ 2,000,000.00	$ 2,000,000.00
Outlet conduit and concrete surround	m	1,500	$ 3,916.50	$ 5,874,750.00
Valve house conventional concrete	cu m	200	$ 2,750.00	$ 550,000.00
Valve house pipework and valves	Lump sum	1	$ 27,600,000.00	$ 27,600,000.00
Fish transfer facility				
Construct fish lift	Lump sum	100	$ 22,500.00	$ 2,250,000.00
Commission and monitroring	Lump sum	1	$ 385,000.00	$ 385,000.00
Permanent downstream crossing	Lump sum	1	$ 4,996,556.00	$ 4,996,556.00
Total direct construction costs (TDC)				**$ 1,219,924,963.00**
ON SITE OVERHEADS				
Camp operations	Lump sum	1	$ 19,292,600.00	$ 19,292,600.00

Site office operations	Lump sum	1	$ 5,544,000.00	$ 5,544,000.00
Site Management and Supervision	Lump sum	1	$ 62,488,078.15	$ 62,488,078.15
Insurances, public liability	Lump sum	1	$ 34,243,369.22	$ 34,243,369.22
Total on site overheads (OSO)				$ 121,568,047.37
Total direct and on site overhead costs				**$ 1,341,493,010.37**
Profit and off site overheads 10% of TDC and OSO	Lump sum	1	$ 169,398,097.91	$ 169,398,097.91
Total Out Turn Costs (TOC)				$ 169,398,097.91
OWNER'S COSTS				
Investigation and design				
Preliminary design	Lump sum	1	$ 12,493,492.90	$ 12,493,492.90
Geotechnical and materials	Lump sum	1	$ 1,566,061.07	$ 1,566,061.07
Hydraulic model study	Lump sum	1	$ 6,806,678.90	$ 6,806,678.90
Detailed design and documentataion	Lump sum	1	$ 21,900,000.00	$ 21,900,000.00
Acquisition and Approvals				
Environmental assessment and approvals	Lump sum	1	$ 99,982,939.06	$ 99,982,939.06
Storage area acquisition	ha	50	$ 100,000.00	$ 5,000,000.00
Storage area access relocations	Lump sum	1	$ 8,748,944.60	$ 8,748,944.60
Surveys and legals	Lump sum	1	$ 13,123,416.92	$ 13,123,416.92
Permanent onsite buildings and services	Lump sum	1	$ 5,625,571.38	$ 5,625,571.38
Principal's insurances	Lump sum	1	$ 27,305,638.70	$ 27,305,638.70
Owners management and supervision	Lump sum	1	$ 149,974,408.59	$ 149,974,408.59
Total owners costs				$ 352,527,152.12
TOTAL PROJECT COSTS (TPC)				**$ 1,863,418,260.40**
Risk adjustment (40% of TPC)				$ 745,370,878.63
TOTAL CAPITAL COST				**$ 2,608,789,139.03**

Appendix C Major reticulation infrastructure work costs

Major Items - Reticulation Work

	Unit	Nominal Quantity	Rate	
Develop Borrow Areas				
Earthfill (based on 200,000m3 of material)	Lump Sum	1	$	415,205.00
Pipe bedding and haunch material (based on 200,000m3 of material)	Lump Sum	1	$	1,753,785.00
Channel Preparation				
Clear and Grub	ha	50	$	4,145.27
Topsoil removal and stockpile	cu m	50,000	$	8.21
Channel Earthworks				
Common Excavation in channels, borrow areas and drainage works	cu m	50,000	$	13.40
Rock Excavation for channels and drains	cu m	50,000	$	80.14
Haul, place, condition and compact bank material (maximum haul of 600m)	cu m	100,000	$	15.79
Topsoil and Access berm	m2	500,000	$	2.51
Concrete Works				
Concrete to structures, including pump stations	cu m	500	$	4,279.52
Prestressed Access Bridges to open Channels (0.6m x 0.3m x 20m)	No	100	$	34,436.25
Pipelines, Cross Drains and Siphons				
RC Pipe *				
Supply and delivery of DN900 Class Y pipe	m	5,000	$	1,136.26
Excavate, lay and backfill of DN900 Class Y pipe	m	5,000	$	661.21
Supply and delivery of DN2100 Class Y pipe	m	5,000	$	2,521.15
Excavate, lay and backfill of DN2100 Class Y pipe	m	5,000	$	1,831.96
HDPE Pipe *				
Supply and delivery of DN450 PN6 pipe	m	5,000	$	533.25
Excavate, lay and backfill of DN450 PN6 pipe	m	5,000	$	389.43
Supply and delivery of DN1200 PN6 pipe	m	5,000	$	2,320.76
Excavate, lay and backfill of DN1200 PN6 pipe	m	5,000	$	1,062.03
GRP Pipe *				
Supply and delivery of DN1500 PN10 SN10,000 pipe	m	5,000	$	2,615.88
Excavate, lay and backfill of DN1500 PN10 SN10,000 pipe	m	5,000	$	1,490.27
Supply and delivery of DN4000, PN10, SN10,000 pipe	m	5,000	$	10,168.77
Excavate, lay and backfill of DN4000, PN10, SN10,000 pipe	m	5,000	$	7,943.44

Appendix D Direct construction cost assumptions

DESCRIPTION	SCOPE OF WORKS	ASSUMPTIONS OF RATE BUILD-UP
Access		
Access to site from highway	• Clear and grub site • Strip 100 mm topsoil • Cut to fill over the extent • Prepare subgrade of pavement area • Produce pavement material on-site, load, haul and placement to 300 mm thick • Construct culvert crossing at 500 m intervals • Allow miscellaneous costs for road signs and guide posts	• 11 m wide road formation • 300 mm thick pavement material • Material can be produced on-site • Culvert crossings are to be 1200 mm × 900 mm reinforced concrete box culvert (RCBC)
Develop sources of construction materials		
Quarry	• Clear and grub site • Strip 100 mm topsoil • Construct access roads • Survey and peg borrow area boundaries	• Full access will be available to the entire footprint of the borrow area • Topsoil is to be stockpiled within 500 m
Sand gravel sources	• Clear and grub site • Strip 100 mm topsoil • Construct access roads • Survey and peg borrow area boundaries	• Full access will be available to the entire footprint of the borrow area • Topsoil is to be stockpiled within 500 m
River diversion		
Excavate diversion channel	• Excavate diversion channel and stockpile on-site	• Method used is a hybrid of scraper fleet and excavator and dump truck fleet • Material is to be stockpiled within 1 km of site

DESCRIPTION	SCOPE OF WORKS	ASSUMPTIONS OF RATE BUILD-UP
Coffer dams	• Construct coffer dam including maintenance throughout the construction duration • Construct holding basins to control water flow through the construction footprint • Safely bypass water through the construction footprint	• Material excavated from on-site will be used for constructing the coffer dam • Allowance for temporary pumps, pipe and associated infrastructure to safely control water flow through the site
Foundation excavation and treatment		
Excavate sand from river bed	• Excavate sand from river bed and stockpile on-site	• Method used is excavator and dump truck fleet • Material is to be stockpiled within 1 km of site
Excavate rock from bed and abutments	• Excavate rock and stockpile on-site	• Allowance to excavate rippable rock with a D9 dozer • Material is to be stockpiled within 1 km of site
Treat foundation	• Treat foundation subgrade prior to construction of roller compacted concrete (RCC) dam	• Allowance for ripping and compacting existing subgrade, seam treatment and dental concrete
Construct grouting plinth	• Supply and place grouting plinth	• Aggregate is to be produced on-site, including load and haul to batching plant
Grout foundation	• Construct grouting curtain into the existing subgrade underneath RCC dam structure above	• Aggregate is to be produced on-site, including load and haul to batching plant
RCC dam river section		
RCC concrete to dam wall	• Supply, place and compact RCC to dam	• Allowance for the hire of the main batching plants as well as back-up batching plants as contingency • Aggregate is to be produced on-site • Production is to be 900 per m^3 per day per crew
Establish RCC plant	• Establish all plant required to produce the RCC concrete on-site	• Includes establishing all of the main batching plant and the back-up batching plant

DESCRIPTION	SCOPE OF WORKS	ASSUMPTIONS OF RATE BUILD-UP
Demobilise RCC plant		• Demobilise all plant necessary for the production of RCC concrete at the completion of the project
Conventional concrete to faces	• Supply and place structural concrete to concrete faces • Supply and erect all formwork • Supply and fix all reinforcement	• Aggregate is to be produced on-site • Concrete is to be 32 MPa • Reinforcement required will be approximately 120 kg/m^3 • Allowance for temporary works such as scaffolding
Conventional concrete to spillway crest	• Supply and place structural concrete to spillway crest • Supply and erect all formwork • Supply and fix all reinforcement	• Aggregate is to be produced on-site • Concrete is to be 32 MPa • Reinforcement required will be approximately 120 kg/m^3
Conventional concrete to spillway apron and end sill apron	• Supply and place structural concrete to spillway apron and end sill apron • Supply and erect all formwork • Supply and fix all reinforcement	• Aggregate is to be produced on-site • Concrete is to be 32 MPa • Reinforcement required will be approximately 100 kg/m^3
Conventional concrete to training walls	• Supply and place structural concrete to training walls • Supply and erect all formwork • Supply and fix all reinforcement	• Aggregate is to be produced on-site • Concrete is to be 32 MPa • Reinforcement required will be approximately 150 kg/m^3
Outlet works		
Intake tower conventional concrete	• Supply and place structural concrete to intake tower • Supply and erect all formwork • Supply and fix all reinforcement	• Aggregate is to be produced on-site • Concrete is to be 32 MPa • Reinforcement required will be approximately 150 kg/m^3 • Allowance for temporary works such as scaffolding etc.
Intake tower gates, guides and seals	• Supply and erect gates, guides and seals to the intake tower	• All structural steel will be supplied and delivered from the nearest major distribution point (Darwin for Upper Baines and Mount Isa for Gunpowder Creek)

DESCRIPTION	SCOPE OF WORKS	ASSUMPTIONS OF RATE BUILD-UP
Outlet conduit and concrete surround	• Supply and place 1200 mm outlet conduit with a concrete encasement	• Conduit is to be 1200 mm diameter • Aggregate is to be produced on-site • Concrete is to be 32 MPa • Reinforcement required will be approximately 100 kg/m^3
Valve house conventional concrete	• Supply and place structural concrete for the construction of the valve house • Supply and erect all formwork • Supply and fix all reinforcement	• Aggregate is to be produced on-site • Concrete is to be 32 MPa • Reinforcement for slabs required will be approximately 120 kg/m^3 • Reinforcement for walls required will be approximately 150 kg/m^3 • Allowance for temporary works such as scaffolding etc.
Valve house pipework and valves	• Supply, deliver and construct all pipework and valves associated with the valve house	• Pricing is based upon discussions between RLB and CSIRO involving previous similar projects
Fish transfer facility		
Construct fish lift	• Supply, fabricate and construct all structures associated with the fish lift	• All structural steel will be supplied and delivered from the nearest major distribution point (Darwin for Upper Baines and Mount Isa for Gunpowder Creek) • Allowance for temporary works such as scaffolding etc.
Permanent downstream crossing		
Permanent downstream crossing	• Construct a crossing from one side of the river to the other to facilitate construction	• Pricing is based on previous similar projects, and cost increases with the scale of the total cost for each option

ON-SITE OVERHEADS		
Camp Operations	• Provide allowance for all camp facilities necessary to accommodate construction staff	• Accommodation units with ensuites • Kitchen and dining facilities • Laundry facilities • Gym and recreation facilities • IT facilities
Site Office Operations	• Provide allowance for all site resources necessary to facilitate construction	• Site offices • Site Lunchrooms • Storage Requirements • Toilet facilities • Temporary power requirements
Site Management and Supervision	• Provide allowance for all staff required on-site to manage the project safely, efficiently and productively	• Construction Manager • Project Manager • Site Manager • Project Engineers • Site Engineers • Quality Control Engineers • Site Supervisors • Health, Safety and Environmental Managers • Site Administrators • Document Controllers

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Contact us

1300 363 400
+61 3 9545 2176
csiroenquiries@csiro.au
csiro.au

For further information

Environment
Dr Chris Chilcott
+61 8 8944 8422
chris.chilcott@csiro.au

Environment
Dr Cuan Petheram
+61 467 816 558
cuan.petheram@csiro.au

Agriculture and Food
Dr Ian Watson
+61 7 4753 8606
Ian.watson@csiro.au