19. Economics

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19.1 Introduction

19.1.1 Overview

This chapter summarises the economic impact assessment undertaken for the Lower Fitzroy River Infrastructure Project (Project). The economic impacts from the Project are assessed and methods by which these impacts can be reduced are identified. Together with the social impact assessment (Chapter 18) this assessment addresses Part B, Sections 7.1 – 7.4 of the terms of reference (ToR) for the environmental impact statement (EIS) in relation to economics and local participation. Objectives for 'sustainable development' are also addressed as required by the ToR Part B, Section 7-5 -7.7 are also described. A table cross-referencing the ToR requirements is provided in Appendix B.

19.1.2 Approach and Methodology

An economic impact assessment was undertaken for the Project and has been provided in Appendix S. The economic impact assessment provides a description of the affected local and regional economies. This description is provided in the chapter below and was undertaken using the following methodology:

- A statistical analysis of demographics and regional economies
- A quantitative and qualitative discussion of market trends, regional competitive advantage and other factors relevant to the project
- A review of: the Australian Bureau of Statistics (ABS) data from the 2011 Census of Population and Housing; population projections from the Department of State Development, Infrastructure and Planning; a landholder survey; the Queensland housing market report: June quarter 2013; Rookwood and Eden Bann Project cost estimates; and Chapter 2 Project description; Chapter 9 Surface water resources and Chapter 18 Social impact assessment of the Project EIS.

The economic impact assessment undertaken for the Project also included a benefit cost analysis (BCA) to identify and value all benefits and costs associated with the Project. The steps involved in the BCA included:

- Identification of the issue; the current situation (base case); and Project scenarios
- Identification and description of the economic, social and environmental impacts relating to the Project scenarios
- Identification of the Project costs and benefits and physical quantification of the costs, where practical including:
  - Construction capital costs (weir infrastructure (including aquatic fauna passage), road and river crossings, power infrastructure and critical infrastructure protection measures)
  - Costs associated with approvals, land acquisition/compensation and water regulation
  - Environmental mitigation, management and offsetting costs (including provision for management of indigenous cultural heritage and contaminated land)
  - Owners' costs (associated with non-capital components)
  - Operations and maintenance costs.

- Estimation of the present value (PV) of Project benefits and Project costs using a discount rate of seven per cent and ranking of the efficiency of development scenarios, according to their net present values (NPVs) and benefit cost ratios (BCRs)
- Undertaking a sensitivity analysis of key model parameters including:
  - Adjusting discount rates to ten per cent and four per cent
  - Adjusting capital costs upwards by 20 per cent and downwards by 20 per cent
  - Increasing the value of water by 20 per cent and decreasing the value of water by 20 per cent.
- Reporting of results.

The BCA applied a 25 year timeframe, and assumed costs and benefits would be incurred and accrued according to Table 19-1.

Table 19-1 Schedule for costs and benefits

Cost or benefit category	Years in which costs are incurred or benefits accrued
Costs	
Capital works at the weir	1 and 2
Capital works for upgrades to road and river crossings (State controlled)	1 and 2
Capital works for upgrades to road and river crossings (local roads)	1 and 2
Capital works for power to Site	1 and 2
Critical infrastructure protection	1 and 2
Property acquisition / easement and compensation	1
Project environmental and planning approvals	1
Fitzroy River turtle (*Rheodytes leukops*) management and offsets	50 per cent in Years 1-2 50 per cent in Years 3-7
Fish passage management and monitoring	50 per cent in Years 1-2 50 per cent in Years 3-7
Other environmental offset considerations	1 and 2
Riparian protection	1 and 2
Indigenous cultural heritage surveys	1
Contaminated land investigation, remediation and management	1 and 2
Water regulation and licence changes	1
Owners' costs	1 and 2
Operations and maintenance	3 to 25
Benefits	
Value of high priority water provided	3 to 25
Residual value	25

The primary source of cost information was the estimates prepared for the Project (Commercial in Confidence), which were completed in September 2012. These costs were escalated to reflect March 2014 figures, applying the average annual rate of inflation of the consumer price index over the period (2.3 per cent), reported by the Reserve Bank of Australia.

An indicative value for high priority water was adopted for the purposes of the economic assessment (based on a study commissioned by the Gladstone Area Water Board (GAWB) in relation to investigations into a second water source (Wedgewood White Ltd 2008)). The raw water cost is taken to be an in-river cost and excludes treatment, pumping, construction and maintenance of pipelines, pump stations, etc. Costs associated with transmission and/or distribution of water (including treatment) is assumed to be incorporated into the customer cost base as determined by multiple end-users. For example, GAWB has separately addressed the cost of treating and pumping water from the Fitzroy River (as a result of the allocation afforded it through the Project) to potential customers in Gladstone via the proposed Gladstone-Fitzroy Pipeline (GFP).

The analysis assumes that the benefit of availability of high priority water will occur according to the expected yield of each development scenario. In reality, however, each of these scenarios is associated with a different degree of reliability of supply. The analysis presents the benefit as listed of high priority water based on the yield value. Similarly, each investment scenario is associated with varying degrees of reliability of supply.

The SunWater Limited (SunWater) Annual Report 2012-13 provided typical rates of depreciation for water infrastructure assets

19.1.3 Study area

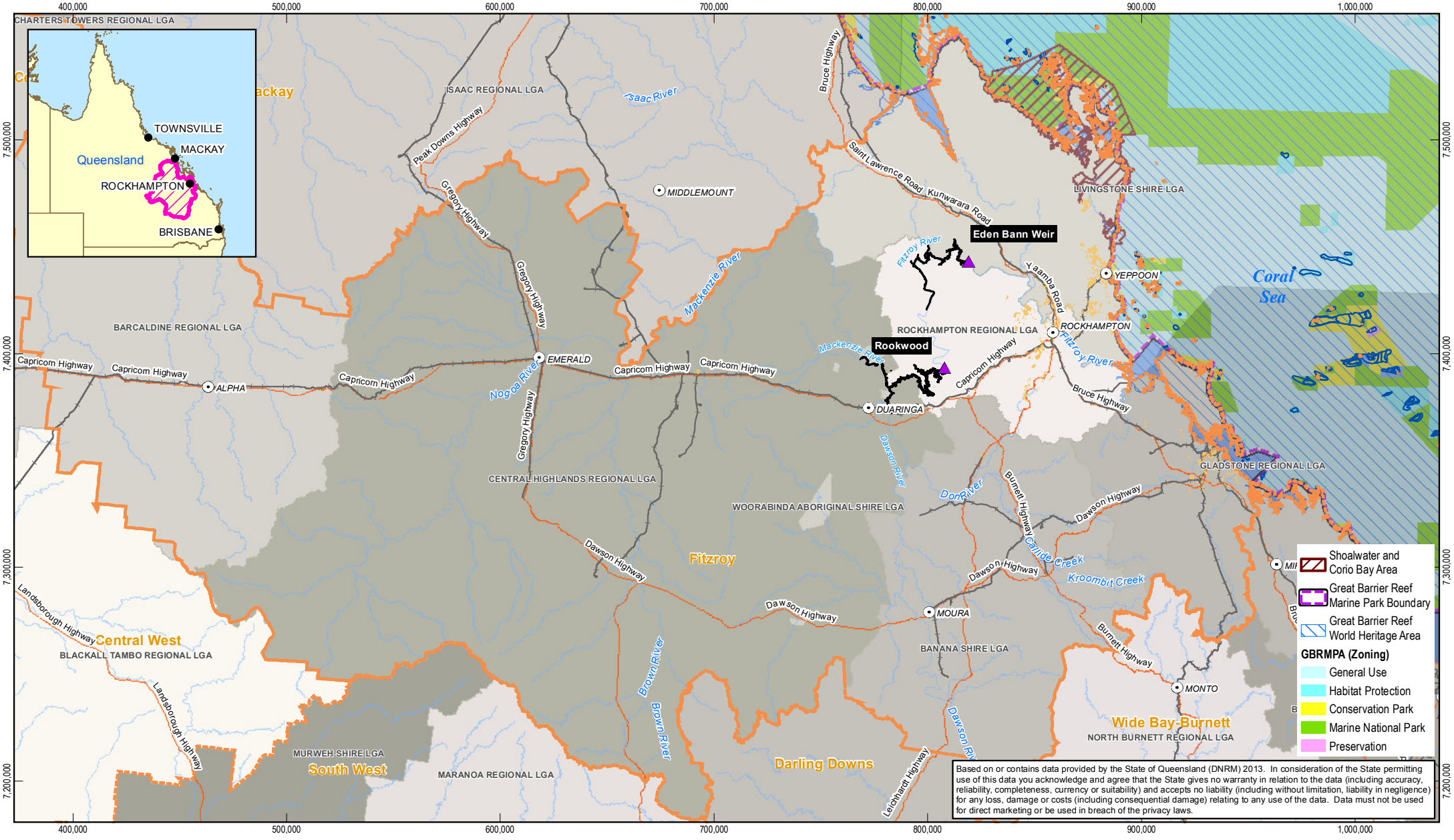
The regional study area for the purposes of the economic assessment, is defined as the Rockhampton Regional Council (RRC) local government area (LGA) (noting that at the time of analysis this included the recently (1 January 2014) de-amalgamated Living Shire Council LGA), Central Highland Regional Council (CHRC) LGA and Woorabinda Aboriginal Shire Council (WASC) LGA. The local study area comprises the land directly adjacent to the Fitzroy, Dawson and Mackenzie rivers at the full supply level associated with a raised Eden Bann Weir and a new weir at Rookwood.

The location of the Project is shown on Figure 19-1.

The Project will have a wider area of influence, including communities more distant from the regional study area, that may provide higher order social infrastructure services and source of labour and areas to which benefits would extend.

The Fitzroy Basin Resource Operations Plan (Fitzroy ROP) allows for up to 30,000 ML of unallocated water (the Gladstone reserve) to be made available to GAWB from the strategic water infrastructure reserve for the purposes of urban and industrial use in Gladstone and the wider Gladstone Regional Council LGA.

Separately to the Project, GAWB's GFP Project proposes to construct and operate a pipeline capable of extracting the Gladstone reserve volume annually from the Fitzroy River. Further a local government authority can make a submission for up to 4,000 ML of the strategic infrastructure reserve for urban water supplies for the Capricorn Coast and anyone can make a submission for the remaining 42,000 ML of the strategic water infrastructure reserve.



1:2,365,000 (at A4)

0 25 50 75 100

Kilometres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA94)
Grid: Map Grid of Australia 1994, Zone 55

N

LEGEND

- Weir Location
- Populated Places
- Railway
- Waterway (Major)
- Highways (National)
- Impoundment Area
- Reef
- Statistical Division
- Fitzroy Basin

Gladstone Area Water Board, SunWater
Lower Fitzroy River Infrastructure Project

Job Number 41-20736
Revision E
Date 29 May 2014

Project location

Figure 19-1

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The economic benefits from the extraction and supply of water from the strategic water infrastructure reserve have been considered as part of the EIS for the GFP Project and will be considered as part of environmental and other assessments by others required as part of submissions made for allocations from the remaining reserve and as such are not included within the Project economic assessment.

19.1.4 Description of the base case

Under the base case scenario, the existing Eden Bann Weir facility continues to function as normal and there is no development at the proposed Rookwood Weir site. The water demands of the region will continue to increase over time, with shortages occurring during drought periods. This increased demand and occasional shortages will be managed through demand management strategies (e.g. urban water use restrictions) and contingency strategies (e.g. cartage of water, installation of water tanks or the development of alternative water supply infrastructure). However, it is understood that at present, a decision is yet to be made as to which particular demand management and/or contingency strategies would be implemented in the absence of the Project. On this basis, it is therefore assumed that under the base case there will be no additional capital investment in the existing Eden Bann Weir or development at Rookwood or associated employment during development and operation. It is also assumed there will be no additional economic, environmental or social disturbance to the area, thereby negating the need for any management, offset, acquisition or compensation measures.

19.1.5 Description of development scenarios

For the purpose of the economic assessment, the scenarios evaluated for development are listed in Table 19-2. The economic assessment analyses the costs and benefits of the estimated theoretical yields and yield capped at 76,000 ML/a for each scenario, as applicable (Chapter 9 Surface water resources).

Table 19-2 Development scenarios evaluated

Scenario	Rookwood Weir	Eden Bann Weir
RW1 + EB2	Stage 1 (Fixed crest)	Stage 2 (Fixed crest)
RW1 + EB3	Stage 1 (Fixed crest)	Stage 3 (Gates)
RW2 + EB1	Stage 2 (Gates)	Stage 1 (Existing weir)
RW2 + EB2	Stage 2 (Gates)	Stage 2 (Fixed Crest)
RW2 + EB3	Stage 2 (Gates)	Stage 3 (Gates)
RW1 + EB1	Stage 1 (Fixed crest)	Stage 1 (Existing weir)
EB2	None	Stage 2 (Fixed crest)
EB3	None	Stage 3 (Gates)

19.2 Existing local and regional economies

19.2.1 Gross regional product

In 2012/13 the Gross Regional Product (GRP) for the Fitzroy Statistical Division was estimated at over $22 billion, accounting for 7.7% of Queensland and 1.5% of the Australian production (Table 19-3). Since 2000-2001 the Fitzroy GRP has grown at a higher rate than the state and national averages.

Table 19-3 Nominal gross regional product

Region	2000–01	2006–07	2010–11	2012-13*
GRP ($M)				
Fitzroy	7,842	14,741	20,974	22,666
Queensland	180,462	251,866	272,561	294,54
Australia	1,060,093	1,304,022	1,434,227	1,524,969
Proportional GRP				
Fitzroy GRP as % of Queensland GRP	4.3	5.9	7.7	7.7
Fitzroy GRP as % of Australian AUD	0.7	1.1	1.5	1.5
GRP growth				
Fitzroy		14.7%	10.6%	4.0%
Queensland		6.6%	2.1%	4.0%
Australia		3.8%	2.5%	3.2%

* Fitzroy GRP for 2012-13 is an estimate based on the assumption that it has maintained the same proportion of state and national GRP, as per 2010-11 (7.7% and 1.5% respectively).
Source: Queensland Treasury and Trade 2008, ABS Australian National Accounts: National Income, Expenditure and Product (Catalogue 5206.0).

19.2.2 Population

The regional study area had a population of 142,898 people in 2011, with the large majority (112,383) residing in the RRC (Table 19-4). Population growth has averaged 0.9 per cent between 2006 and 2011. Further detail on population is presented in Chapter 18 Social impact.

Table 19-4 Estimated resident population in the regional study area (2006-2011)

Local government area	Estimated resident population as at 30 June			Average annual growth rate (%)
	2006	2010	2011 pr	2006 – 2011 pr
CHRC	28,256	29,296	29,533	0.9
RRC	107,517	111,939	112,383	0.9
WASC	918	959	982	1.4
Regional study area totals	**136,691**	**142,194**	**142,898**	**0.9**
Rockhampton City	60,597	61,977	63,237	0.9
Queensland	4,090,908	4,424,158	4,474,098	1.8
Regional study area as % of Queensland	3.3	3.2	3.2	N/A

19.2.3 Labour force and income

Recent unemployment data from the Office of Economic and Statistical Research (OESR) shows a varied unemployment rate for the three LGAs within the regional study area as detailed on Table 19-5. Further detail on labour force and incomes is presented in Chapter 18 Social impact.

Table 19-5 Unemployment and labour force status within the regional study area

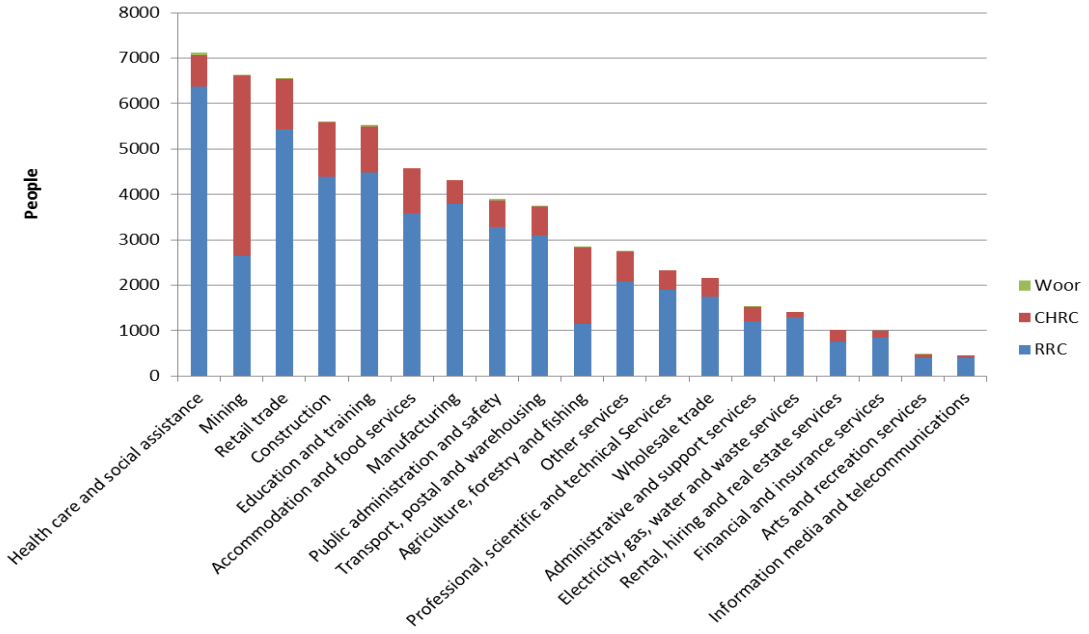
Local government area	Unemployed*	Labour force*	Unemployment rate* (%)
CHRC	405	19,475	2.1
RRC	3,582	62,540	5.7
WASC	243	359	67.7
Regional study area totals	**4,230**	**82,374**	**5.1**
Rockhampton City	223	2,012	11.1
Queensland	139,800	2,480,000	5.6
Regional study area region as % of Queensland	3.0%	3.3%	-

*September quarter 2012
Source: OESR (2013d, e, f, g).

19.2.4 Key industries and economic contribution

As Figure 19-2 shows, in 2011 the largest industry of employment in the regional study area was health care and social assistance (7,131 people) followed by mining (6,619 people), retail trade (6,551 people) and construction (5,602 people).

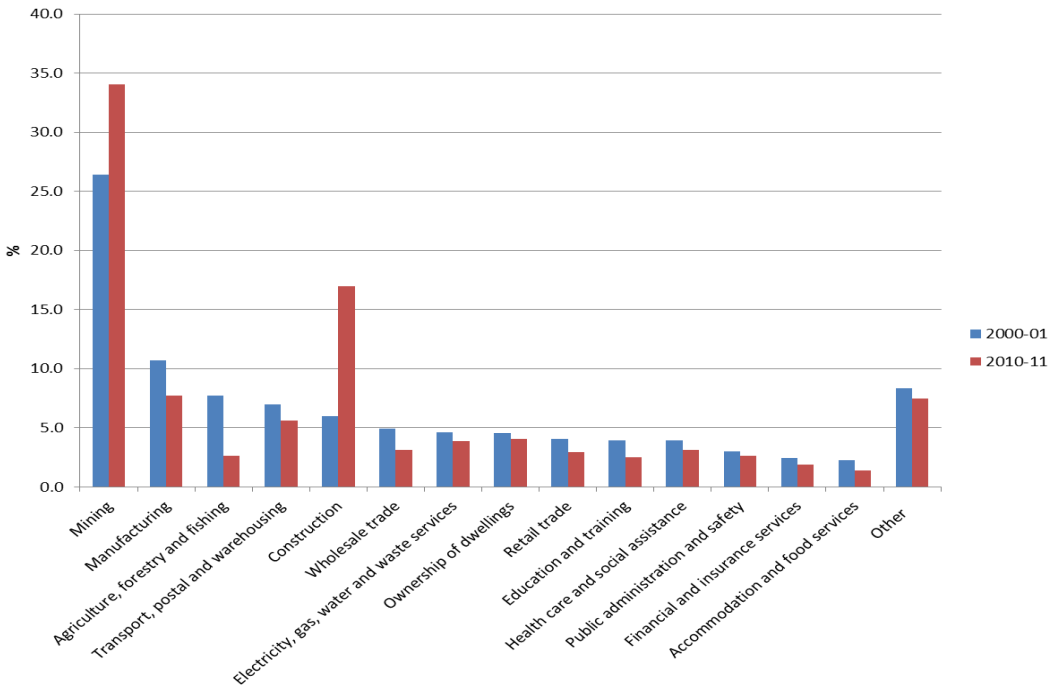
Figure 19-2 Employment by industry in the regional study area



Source: 1379.0.55.001 National Regional Profile, 2007-2011

Figure 19-3 shows the proportional contribution of different sectors to the regional economy (measured as Gross Value Added). Between 2000/01 and 2010/11 the mining and (associated) construction industries increased their proportional contribution, while other industries including manufacturing, agriculture, forestry and fishing and retail trade had a reduced contribution.

Figure 19-3 Composition of gross value added in the Fitzroy Region ($m)



Source: Queensland Treasury and Trade 2008

19.2.5 Key regional markets and factor prices

19.2.5.1 Labour market

In total a workforce of approximately 150 persons is anticipated across the approximately two year construction period at each weir. Raising Eden Bann Weir may require a workforce of approximately 40 people, while Rookwood Weir may require approximately 60 people on site at the busiest stage. The level of resourcing required at each river crossing site will depend on the contractors approach, but it is anticipated that human resource levels will be kept to a minimum. Peak workforce levels at each river crossing site are expected to be less than 50 people. The majority of employees are likely to be sourced from within the regional study area. A small proportion of highly specialised workers may be sourced from outside the regional study area, but from within Queensland as far as is practicable. Suitable accommodation for construction personnel is available in Rockhampton and surrounding areas.

After construction the Project is expected to employ between one and five full time equivalent persons in operations and maintenance capacities.

As discussed in Section 19.2.5.1 above, unemployment within the RRC LGA is at 5.7 per cent, and is generally in-line with the state average (5.6 per cent). Average income in the RRC LGA has risen in recent years (Figure 19-3).

Wage rates within the region are comparative to the Queensland state however, substantially lower than the Australian average (ABS 2012):

- RRC LGA area $51,778 per annum
- Greater Brisbane area $52,171 per annum
- Queensland state $49,863 per annum
- Australia $77,573 per annum

These rates have been considered in the development of Project development costs.

19.2.5.2 Housing, residential land and rental markets

Table 19-6 shows the median house, vacant land and weekly rental prices, for the RRC and CHRC and compared with the Queensland median.

Table 19-6 Median rental and house prices

	Median house price (detached house)	Median vacant land prices	Median weekly rent (detached house)
RRC	$337,000	$175,500	$350
CHRC	$399,000	$145,500	$400
Queensland	$415,000	$186,500	$350

Source: Queensland housing market report: June quarter 2013 (DHPW 2013)

The results show the RRC LGA house, land and rental prices are at or below the state average. While in the CHRC LGA, houses and rents are generally more expensive, with vacant land substantially less expensive.

19.2.5.3 Agricultural land value

Land use within the Project area is limited to agricultural and broad scale grazing (Chapter 5 Land). Land valuations across these use types do not vary across the regions.

The Fitzroy Natural Resource Management region represents 84 per cent of livestock grazing in the broader Great Barrier Reef region in 2013 (ABS 2014), having an area of 12.4 million hectares at a rateable value of $3,86 million. Fitzroy contains almost half the Great Barrier Reef region's total agriculture cropping and (47.8 per cent) covering an area of 865,000 hectares with a rateable value of $558,805 (ABS 2014).

19.2.5.4 Construction services and building inputs market

This discrepancy (described above between land value and house/rental prices in the CRHC LGA is indicative of a housing market constrained by skill shortages in the construction services industry. This type of skill shortage is common in rural areas which have experienced rapid growth in the mining and resources sectors.

19.2.6 Regional competitive advantage and expected future growth

The changing sectoral contributions to the regional economy (Figure 19-3) reflect changes to regional competitive advantage. These changes may be short term (e.g. due to drought or currency fluctuations), or may reflect more permanent longer term changes to the region's economy.

Despite a recent slowing of investment, regional growth in the mining and associated construction industries is likely to continue into the future, as the region continues to develop its coal and coal seam gas resources. Mining and resources investment is likely to be the main driver of economic growth into the future, providing indirect growth to associated sectors.

19.3 Project benefits

19.3.1 Increased ability to satisfy water demand

The primary benefit of the Project will be the availability of 76,000 ML of high priority (high reliability) water per annum. High priority water will be sold primarily for industrial and urban/residential uses and potentially some agricultural development (Chapter 1 introduction).

The adopted sale price for high priority water provides a lower level estimate of the value of water provided, in that water end-users are likely to place a much higher value on the water than the price paid. These benefits will be realised once the development is complete (i.e. from Year 3 onwards). It is assumed that the benefit of availability of high priority water will occur regardless of which investment scenario is pursued. In reality, however, each of the scenarios is associated with a different degree of reliability of supply.

19.3.2 Avoided costs

The development will secure additional high priority water, thereby substantially avoiding the need for demand management strategies (e.g. water use restrictions) and contingency strategies (e.g. cartage of water, instillation of water tanks or the development of alternative water supply infrastructure). These benefits will be realised once the development is complete (i.e. from Year 3 onwards).

It is uncertain which of the demand management or contingency strategies would be adopted should the development not proceed, and there is a lack of data to accurately estimate the likely

costs of these alternative strategies. Therefore this analysis has not included a quantified measure of avoided costs, which can be viewed as an additional benefit.

19.3.3 Residual value of infrastructure at Year 25

The Queensland Project Assurance Framework: Cost Benefit Analysis Guidelines (DIP 2012) recommends that a project's residual value be based on estimated market value at the end of the analysis period. This analysis has assumed the market value for the assets will depreciate at a rate of two per cent per annum (or 50 per cent over the 25 year period), with the initial value based on the cost of construction. This estimate is within the range of depreciation rates that SunWater applies to other infrastructure assets, namely 0.5 per cent to 10 per cent (SunWater 2013).

19.3.4 Regional economic benefits

The Project is likely to have a number of regional economic benefits, particularly during the construction phase, e.g. employment of local labour resources and use of local suppliers (Chapter 16 Social impact assessment and Appendix R).

These impacts have not been quantified in the BCA due to uncertainty around the nature and extent of these benefits relative to the base case. Furthermore, the exclusion of employment and income effects is supported by various BCA guidelines including the Commonwealth's Handbook of Cost Benefit Analysis (2006), which states: 'inclusion of a multiplier effect from income and spending generated by a project is justified only when (a) the affected resources would otherwise have been unemployed and (b) the activities displaced by the project would not also have made use of the idle resources'.

During operations the availability of additional high priority water is expected to deliver regional benefits to business and industry. The rationale for the Project is to provide water security for urban growth and industrial development, plus potential for future agricultural development, which will provide an overall benefit for the region through business and employment opportunities and increased economic activity.

19.3.5 Ecological and social impacts

For the purposes of the economic assessment, the BCA does not:

- Quantify any additional impacts on the ecology and environment of the area, beyond those which have been avoided, mitigated, managed and/or offset (through measures such as the species management program (SMP) for the Fitzroy River turtle, the provision of fish passage and the provision of other environmental offsets)
- Quantify any additional social impacts beyond those which have been avoided, mitigated, managed and/or offset (for example, implementation of indigenous cultural heritage management plans, upgrades to river crossings and roads, and compensation in relation to land impacts).

19.4 Benefit Cost Analysis results

This analysis quantifies the marginal benefits and costs of each development option, relative to a base case in which the development does not proceed (the status quo). The BCA results show that all of the investment scenarios considered would provide a net gain to society, as demonstrated by the positive NPVs and BCRs greater than one (Table 19-7). When considering only the provision of unallocated high priority water held as strategic water infrastructure reserve (nominally 76,000 ML/a), Rookwood Stage 1 delivers the highest NPV ($453,568,000) and BCR (3.10).

When considering the estimated theoretical high priority yields, Rookwood Stage 2 delivers the highest BCR (4.17), however Rookwood Stage 2 and Eden Bann Weir Stage 3 delivers a slightly higher NPV ($912,907,000). The Queensland Department of Infrastructure and Planning (DIP)'s (2012) Project Assurance Framework: Cost Benefit Analysis Guidelines recommend that in this situation the NPV be used as the primary method for evaluating projects, thus making Rookwood Stage 2 and Eden Bann Weir Stage 3 the preferred option, when estimated theoretical high priority yields are considered.

Table 19-7 Benefit Cost Analysis results

Scenario	Capped yield (76,000 ML/a)				Estimated theoretical high priority yield			
	PV of benefits ($'000)*	PV of costs ($'000)*	NPV ($'000)*	BCR	PV of benefits ($'000)*	PV of costs ($'000)*	NPV ($'000)*	BCR
RW1+EB2	$725,721	$404,224	$321,497	1.80	$1,005,382	$404,224	$601,158	2.49
RW1+EB3	$728,588	$431,974	$296,613	1.69	$1,122,952	$431,974	$690,978	2.60
RW2+EB1	$708,968	$243,181	$465,787	2.92	$1,013,132	$243,181	$769,951	4.17
RW2+EB2	$728,543	$433,401	$295,142	1.68	$1,308,174	$433,401	$874,773	3.02
RW2+EB3	$1,353,022	$461,324	$891,698	2.93	$1,374,231	$461,324	$912,907	2.98
RW1+EB1	$669,129	$215,560	$453,568	3.10	$669,129	$215,560	$453,568	3.10
EB2	$459,886	$190,220	$269,667	2.42	$459,886	$190,220	$269,667	2.42
EB3	$628,971	$218,143	$410,828	2.88	$628,971	$218,143	$410,828	2.88

*Escalated to reflect dollars as at March 2014

Table 19-8 and Table 19-9 present the results of a sensitivity analysis in relation to estimated theoretical yields and capped yield, respectively. The sensitivity analysis tests the sensitivity of the BCA results to changes in select model parameters which are anticipated to significantly influence the BCA.

Table 19-8 Sensitivity analysis results for estimated theoretical high priority yields

Model parameters	BCR per development scenario							
	RW1 + EB2	RW1 + EB3	RW2 + EB1	RW2 + EB2	RW2 + EB3	RW1 + EB1	EB2	EB3
Expected scenario	2.49	2.60	4.17	3.02	2.98	3.10	2.42	2.88
Discount rate								
Low (4%)	2.97	3.11	5.07	3.64	3.59	3.74	2.89	3.47
High (10%)	2.16	2.25	3.54	2.59	2.56	2.67	2.10	2.48
Capital costs								
Low (-20%)	2.98	3.12	5.07	3.64	3.59	3.75	2.89	3.47
High (+20%)	2.16	2.25	3.56	2.60	2.57	2.67	2.10	2.49
Water value								
Low (-20%)	2.09	2.18	3.44	2.52	2.49	2.59	2.04	2.41
High (+20%)	2.88	3.02	4.90	3.52	3.47	3.62	2.80	3.36

Table 19-9 Sensitivity analysis results for capped yield (76,000 ML/a)

Model parameters	BCR per development scenario							
	RW1 + EB2	RW1 + EB3	RW2 + EB1	RW2 + EB2	RW2 + EB3	RW1 + EB1	EB2	EB3
Expected scenario	1.80	1.69	2.92	1.68	2.93	3.10	2.42	2.88
Discount rate								
Low (4%)	2.44	2.30	3.93	2.29	3.50	3.74	2.89	3.47
High (10%)	1.38	1.29	2.25	1.29	2.54	2.67	2.10	2.48
Capital costs								
Low (-20%)	2.22	2.08	3.62	2.08	3.54	3.75	2.89	3.47
High (+20%)	1.51	1.42	2.45	1.42	2.53	2.67	2.10	2.49
Water value								
Low (-20%) ($731)	1.46	1.37	2.35	1.37	2.45	2.59	2.04	2.41
High (+20%)($1,097)	2.13	2.00	3.48	2.00	3.42	3.62	2.80	3.36

The analysis indicates that the BCR is relatively sensitive to changes in the discount rate, capital costs and water prices. Importantly, however, the BCR remains well above one regardless of these changes. This indicates that all scenarios can withstand substantial variations in key variables, and still deliver a net benefit to society.

19.4.1 Summary of economic impacts

The economic assessment identified that the primary benefit of the Project is an increase in availability of high priority (high reliability) water to be sold to industrial and residential uses. The value of which is likely to increase as the Project progresses in the future. Other benefits include the reduced need for water management and contingency strategies and an increase in employment and use of local suppliers during construction.

The BCA results found that all the investment scenarios that were considered provided a net gain to society, as demonstrated by the positive NPVs and BCRs greater than one, with:

- Rookwood Stage 1 and the existing Eden Bann Weir stage 1 being considered the most preferred when considering only the provision of unallocated water held as strategic water infrastructure reserve, with this scenario delivering the highest NPV ($453,568,000) and BCR (3.10)
- Rookwood Weir Stage 2 and Eden Bann Weir Stage 3 being the most preferred, when considering estimated theoretical high priority yields, delivering a slightly higher NPV ($912,907,000).

It is noted that some of the Project benefits could not be quantified for the BCA and therefore the results may be under-stated, which should be kept in mind when considering the results of the analysis.

As the BCA results showed that all of the investment scenarios would provide a net gain to society, no economic mitigation measures were identified.

19.5 Sustainable development

The National Strategy for Ecologically Sustainable Development (NSESD) (Commonwealth of Australia 1992) defines Ecologically Sustainable Development (ESD) as 'using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased'. Put more simply, ESD is development which aims to meet the needs of Australians today, while conserving our ecosystems for the benefit of future generations.

The NSESD recognises that to do this, we need to take a long term view and develop ways of using environmental resources which form the basis of our economy in a way which maintains and, where possible, improves their range, variety and quality. At the same utilising those resources to develop industry and generate employment (Commonwealth of Australia 1992).

The NSESD is a broad strategic and policy framework under which the Commonwealth and State governments will cooperatively make decisions and take actions to pursue ESD in Australia. It is used by governments to guide policy and decision making, particularly in those key industry sectors which rely on the utilisation of natural resources.

The three core objects of ESD, as outlined by the NSESD, are:

- To enhance individual and community well-being and welfare by following a path of economic development that safeguards the welfare of future generations
- To provide for equity within and between generations
- To protect biological diversity and maintain essential ecological processes and life-support systems.

The guiding principles are:

- Decision making processes should effectively integrate both long and short-term economic, environmental, social and equity considerations
- Where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation
- The global dimension of environmental impacts of actions and policies should be recognised and considered
- The need to develop a strong, growing and diversified economy which can enhance the capacity for environmental protection should be recognised
- The need to maintain and enhance international competitiveness in an environmentally sound manner should be recognised
- Cost effective and flexible policy instruments should be adopted, such as improved valuation, pricing and incentive mechanisms
- Decisions and actions should provide for broad community involvement on issues which affect them.

These guiding principles and core objectives need to be considered as a package. No objective or principle should predominate over the others. A balanced approach is required that takes into account all these objectives and principles to pursue the goal of ESD.

A comparative analysis of the Project against the core objectives and guiding principles of ESD is provided in Table 19-10.

Table 19-10Comparative analysis of the NSED core objectives

Core objective or guiding principle	Project analysis
To enhance individual and community well-being and welfare by following a path of economic development that safeguards the welfare of future generations	The Central Queensland Regional Water Supply Strategy (CQRWSS) (DNRM 2006) identified that the short to medium term urban and industrial needs of the Lower Mackenzie-Fitzroy sub-region that cannot be met by trading and/or efficiency measures are expected to be met by the raising of Eden Bann Weir and/or construction of a weir at Rookwood on the Fitzroy River in Central Queensland. As such, the Project will both enhance current community welfare and safeguard the welfare of future generations through the provision of long term water supply primarily for urban populations and industry in Rockhampton, Gladstone and Capricorn Coast regions (Chapter 1 Introduction).

Core objective or guiding principle	Project analysis
To provide for equity within and between generations	The Project will provide for equity within and between generations through the enduring nature of the infrastructure. Current generations will initially benefit from the Project through an increase in water supply. The permanency of the infrastructure will ensure that the weirs remain long into the future and continue to provide water supply for coming generations. The infrastructure has been designed and planned considering environmental and socio-economic protection for future generations, as shown through the management and mitigation measures provided in this EIS (Chapter 2 Project description). These measures will facilitate that the development of the Project will not reduce or degrade the health, diversity and productivity of the environment or adversely affect current and future generations.
To protect biological diversity and maintain essential ecological processes and life-support systems	Flora and fauna assessments have been undertaken for the Project to determine the biodiversity values and important ecological processes occurring within the existing environment. The assessments allowed for the identification and analysis of potential impacts on local flora and fauna values that may occur as a result of the Projects construction and/or operation (Chapter 6 Flora; Chapter 7 Aquatic ecology; Chapter 8 Terrestrial fauna). These assessments have been used as part of the planning and development of the Project, including the formulation of a Project environmental management plan (EMP) (Chapter 23). The draft EMP identifies management and mitigation measures to protect biological diversity during the construction and operation phases of the Project. Where significant residual impacts have been identified offsets are proposed (Chapter 22 Offsets) In conjunction with the EMP environmental flows will be maintained though water releases from the weirs (Chapter 9 Surface water resources). This will maintain river health. The Project will also include turtle and fish passage infrastructure to allow for the continued migration of these species up and down the river (Chapter 2 Project description; Chapter 7 Aquatic ecology).
Decision making processes should effectively integrate both long and short-term economic, environmental, social and equity considerations	The Project was identified in the CQRWSS to help meet future demand for water primarily for urban populations and industry and the Rockhampton, Gladstone and Capricorn Coast regions. Detailed investigations and assessments have been undertaken as part of the EIS to enable the Proponents and stakeholders to make a sound decision that considers both the short and long term economic, environmental, social and equity impacts resulting from the Project.
Where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation	Investigations and assessments have been undertaken to inform the development of a draft EMP (Chapter 23) such that practicable and feasible mitigation and management are applied to adverse Project impacts. Where significant residual impacts have been identified offsets are proposed (Chapter 22 Offsets). Specifically, offsets are proposed for the Fitzroy River turtle, black ironbox (*Eucalyptus raveretiana*), and Brigalow (*Acacia harpophylla* dominant and co-dominant) threatened ecological community.

Core objective or guiding principle	Project analysis
The global dimension of environmental impacts of actions and policies should be recognised and considered	Predicted increased temperatures, increased evaporation and reduced rainfall as a result of climate change will impact on catchment yields. Staging the development of the Project will allow the Project to respond to actual demand over time taking into account climate variation, economic considerations and Government policy, planning instruments and guidelines based on circumstances at the time. Water storages are likely to become more important for the purpose of water supply, mitigating drought and for maintaining environment flows as climate change impacts are realised (Chapter 4 Climate, natural hazards and climate change). The Project will not have any direct impacts on the Great Barrier Reef World Heritage Area (GBRWHA), approximately 150 km downstream of the Project. Further, with the recommended management and mitigation in place no significant indirect impacts are predicted to the GBRWHA as a result of the Project (Chapter 9 Surface water resources).
The need to develop a strong, growing and diversified economy which can enhance the capacity for environmental protection should be recognised.	Section 19.4 of the BCA shows that all of the Project investment scenarios considered would provide a net gain to society, as demonstrated by the positive NPVs and BCRs greater than one.
The need to maintain and enhance international competitiveness in an environmentally sound manner should be recognised.	
Cost effective and flexible policy instruments should be adopted, such as improved valuation, pricing and incentive mechanisms.	
Decisions and actions should provide for broad community involvement on issues which affect them.	Public consultation is being undertaken as part of the Project EIS (Appendix F).

The analysis of the core objectives and principles of ESD in demonstrates the Proponent's commitment to incorporate sustainability considerations throughout design, construction, operation and decommissioning of the Project. In conclusion, this EIS demonstrates that an iterative planning approach has been taken to the design and development of the Project, effectively integrating both environmental and social considerations into decision making for the Project and supporting the objectives of ESD.