LOWER FITZROY RIVER
INFRASTRUCTURE PROJECT

Appendix G

Offset proposal for the Fitzroy River turtle and white-throated snapping turtle

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MAKING WATER WORK

Gladstone Area Water Board

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Glossary and abbreviations

Acronym/abbreviation	Term
AMTD	Adopted middle thread distance
DEHP	Department of Environment and Heritage Protection (Qld)
EIS	Environmental Impact Statement
EO Act	*Environmental Offsets Act 2014* (Qld)
EO Regulation	Environmental Offsets Regulation 2014
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
Project	The Lower Fitzroy River Infrastructure Project

1. Introduction

1.1 Overview

In response to submissions received on the draft environmental impact statement (EIS) for the Lower Fitzroy River Infrastructure Project (Project) this appendix outlines the offset legislative requirements and implementation options for the Project in relation to significant residual impacts on the Fitzroy River turtle (*Rheodytes leukops*) and the white-throated snapping turtle (*Elseya albagula*).

Volume 1 Chapter 22 and Volume 2 Chapter 14 of the draft EIS have reference.

Where the Project will have unavoidable impacts on certain environmental values, offsets are required under legislation administered by the Australian Government and the Queensland Government.

The offset requirements of the Project were assessed with reference to the following regulatory framework:

- Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) and the EPBC Act Environmental Offsets Policy, administered by the Australian Government
- *Environmental Offsets Act 2014* (Qld) (EO Act), Environmental Offsets Regulation 2014 (EO Regulation) and the Queensland Environmental Offsets Policy Version 1.1 (December 2014), administered by the Queensland Government (DEHP 2014a).

This coordinated approach to offsets across jurisdictions means that specific offsets sought under one policy will not also be sought under another policy, providing that the offsets package satisfies the requirements of both policies. A state offset will count toward an offset under the EPBC Act to the extent that it compensates for the residual impact to the protected matter identified under the EPBC Act.

1.2 Approach and methodology

The approach to developing the offset proposal for the Project consisted of the following tasks:

- Review and interpretation of current Commonwealth offsets legislation and policies
- Quantification of offset requirements:
  - Identification of prescribed activities and prescribed environmental matters
  - Assessment of residual impact from the application of mitigation and management measures. The significance of residual impacts has been determined based on the Commonwealth *Matters of National Environmental Significance - Significant impact guidelines 1.1* (DoE 2013) for the Fitzroy River turtle and the Queensland Environmental Offsets Policy Significant Residual Impact Guideline (DEHP 2014b) for white-throated snapping turtle.

- Development of offset proposal:
  - Calculation of impact and offset requirements utilising the Commonwealth Offset Assessment Guide and the State Financial Settlement Offset calculator. The proposed proponent driven offsets have been developed to meet the offset requirements of the EPBC Act on the basis that a condition for an offset imposed under that authority will satisfy the requirements for offsets under the EO Act
  - Preparation of offset management plans (or frameworks as applicable)
  - Identification of opportunities for offset staging.

2. Offset proposal

2.1 Overview

The assessment of offset requirements has identified the Fitzroy River turtle as a matter of National environmental significance and the white-throated snapping turtle as a matter of State environmental significance requiring offsetting[1].

Unavoidable impacts are expected to remain in relation to operational activities. These residual impacts are considered significant in accordance with the *Matters of National Environmental Significance - Significant impact guidelines 1.1* (DoE 2013) for the Fitzroy River turtle and the Queensland Environmental Offsets Policy Significant Residual Impact Guideline (DEHP 2014b) for white-throated snapping turtle. Offsets are proposed consistent with Commonwealth and State environmental offset policies.

The offset proposal includes two elements:

- A proponent driven offset for impacts to nesting habitat through the management and protection of turtle nests to improve birth rates. The offset proposal for residual impacts to Fitzroy River turtle and white-throated snapping turtle nests has been developed using the Offsets assessment guide that accompanies the EPBC Act Environmental Offsets Policy. The Offsets assessment guide utilises a balance sheet approach to estimate impacts and offsets. A direct offset proposal for the Fitzroy River turtle and white-throated snapping turtle has been developed inclusive of impact and offset calculations, development of a proposed management plan and staging considerations
- A financial offset of Fitzroy River turtle and white-throated snapping turtle aquatic habitat through financial compensation under the Queensland environmental offsets framework and the financial settlement offset calculator under the EO Act. Like for like offsets for aquatic habitat are not practicable and cannot be achieved for this Project due to the nature of the habitat being offset. As such it is considered that a financial contribution provided as an indirect offset is appropriate and it could be utilised for beneficial research or similar activities aimed at improving survival of the species. In the order of 950 ha of aquatic habitat is proposed to be offset in this manner.

Under the EO Act, where an offset condition has been applied to an authority by the Commonwealth, a further condition for an offset cannot be applied by the State for the same activity or matter. Consequently, it is considered that offsets provided to satisfy the EPBC Act Environmental Offset Policy will also satisfy the offset requirements of the Queensland Environmental Offsets Policy.

[1] At the time of referral (EPBC referral 2009/5173) white-throated snapping turtle was not listed under the EPBC Act and did not comprise a controlling provision for the Project.

2.2 Nesting habitat

2.2.1 Impact calculator

Direct residual impacts to Fitzroy River turtle and white-throated snapping turtle nesting as a result of the Project will occur through the inundation of nesting habitat within the Project footprints (Figure 2-1).While the Project's residual impact is related to loss of turtle nesting habitat, protecting nests is considered more effective than protecting nesting habitat in improving birth rates and recruitment of hatchlings into the population.

The biggest threat to the survival of the Fitzroy River turtle and the white-throated snapping turtle is the lack of recruitment into the population. Current recruitment rates are not considered adequate to sustain the population of Fitzroy River turtles within the catchment (Limpus et al. 2007).

A study conducted at the Tartrus Weir, on the Mackenzie River, found that 100 per cent of the 90 clutches identified in the aggregated nesting area downstream had been destroyed (Limpus et al. 2011). Similarly, 13 of 15 clutches located at on an island in the Isaac River had been predated or destroyed by trampling (Limpus et al. 2011).

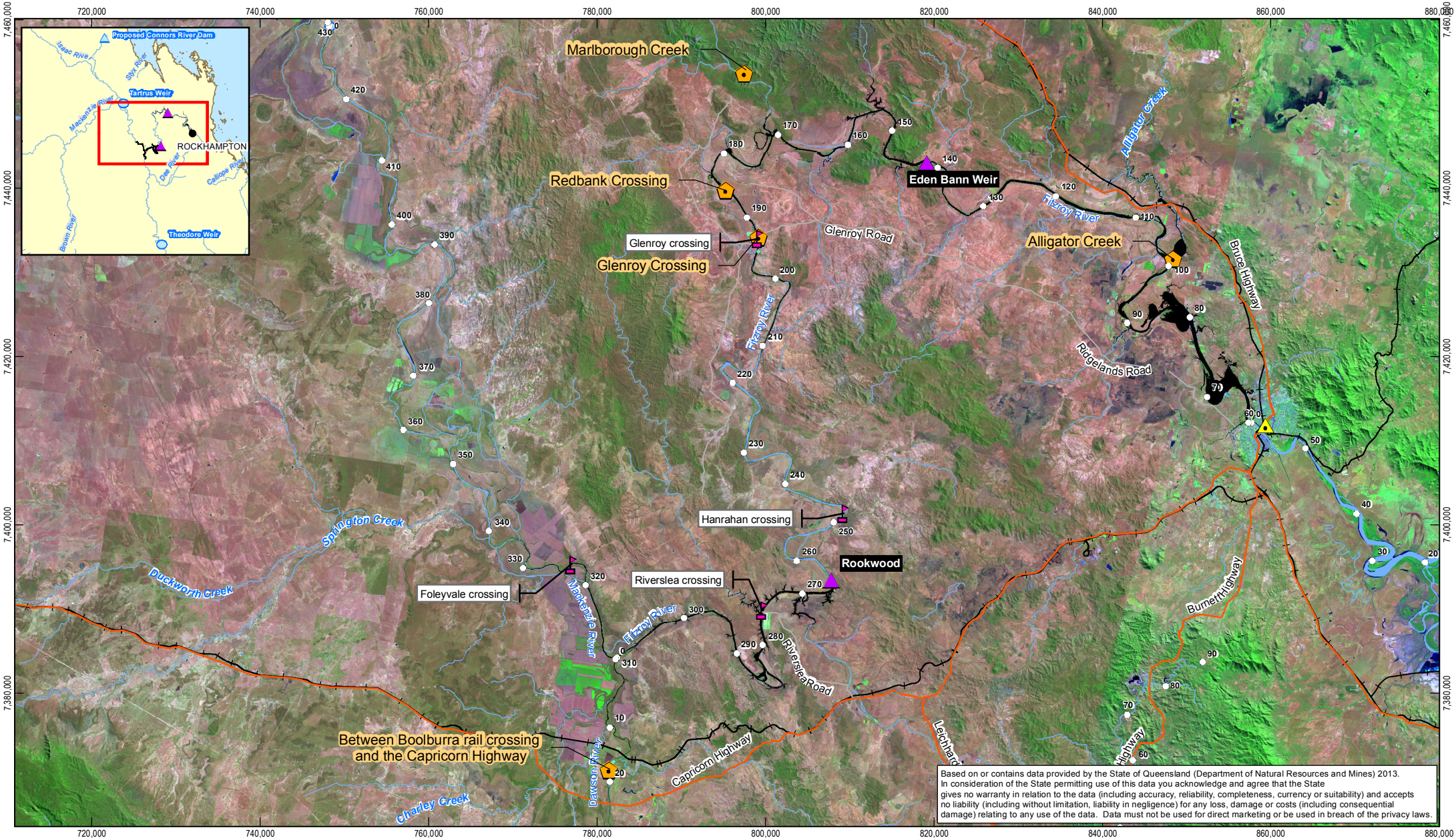
The high mortality rate has led to a significant reduction in the recruitment of hatchlings over the last decade. The Fitzroy River turtle population in particular is now primarily comprised of adult individuals. The high rates of nest predation and bias in favour of adult turtles has been observed at all sites surveyed throughout the Fitzroy Basin catchment (Limpus et al. 2007; Limpus et al. 2011) inclusive of Project areas.

While mitigation measures are proposed (Appendix F Revised environmental management plan, Appendix E Fitzroy River turtle and white-throated snapping turtle species management program) the Project has the potential to increase the abundance of predators within the Eden Bann Weir and Rookwood Weir impoundments. The increase in permanent water resource availability may increase the abundance of terrestrial predators, potentially resulting in an increase in predation of Fitzroy River turtle nests. Nesting habitat located within the impoundments may also be subject to increased rates of trampling by cattle with river margins made more accessible. Weed infestation within the Fitzroy catchment also impacts upon turtle nesting success as weeds prevent turtles from accessing suitable nesting habitat.

Due to the existing extremely high predation rates (close to 100 per cent) the potential Project impact on birth rate is considered to be minimal. Direct residual impacts on Fitzroy River turtle and white-throated snapping turtle as a result of the Project will occur through inundation of nests. Conservatively the Project is expected to impact 80 per cent of nests within the inundation area. Not all nests would be inundated every year.

Current recruitment rates are not considered adequate to sustain populations within the catchment (Limpus et al. 2007). As such, the protected matters attribute proposed to be protected and managed through the provision of an offset is Fitzroy River turtle and white-throated snapping turtle birth rate. The protection and management of nests will improve nest success and thus birth rate; will target Project specific impacts; as well as address the key processes currently threatening the survival of the species throughout the catchment. These actions will reduce nest predation, increase population recruitment and promote the recovery of the species.

Table 2-1 presents the impact calculator relative to birth rate in relation to the Fitzroy River turtle.



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

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LEGEND

- AMTD (km)
- Weir Location
- Fitzroy Barrage
- River Crossing
- Highway
- Minor Road
- Waterway
- Railway
- Impoundment Area
- Fitzroy river turtle important habitat areas
- Essential Habitat fitzroy river turtle
- Existing weir
- Proposed Connors River Dam

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Gladstone Area Water Board, SunWater
Lower Fitzroy River Infrastructure Project

Job Number 41-20736
Revision E
Date 06 Aug 2014

Fitzroy River turtle important habitat areas

Figure 2-1

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Data Source: © Copyright Commonwealth of Australia (Geoscience Australia): Waterways, State (2007); Sunwater: Waterways, Weir Locations - 2008; DNRM: Roads - 2010, Railways - 2010, Weirs - 2010, Imagery/2005, Essential Habitat /2011; GHD: Proposed Dam - 2014. Created by: MS

Table 2-1 Impact calculator for Fitzroy River turtle and white throated snapping turtle

Protected matter attribute[1]	Description	Quantum of impact	Unit	Information source
Birth rate	Loss of nests	80	%	Predation of nesting banks by feral animals, goannas and water rats and trampling of nests by cattle results in extremely poor survival of egg clutches (close to 100 per cent of clutches predated each season). Sourced from reports: Limpus et al. 2007; Limpus et al. 2011; DERM 2008 Draft EIS Volume 1 Chapter 7 Aquatic ecology Draft EIS Volume 2 Chapter 10 Threatened species and ecological communities Draft EIS Volume 3 Appendix L Fitzroy River turtle technical report. Additional information to the draft EIS Appendix E Fitzroy River turtle and white-throated snapping turtle species management program

1. Protected matter attribute: shows the option used to calculate a suitable offset depending on a protected matter's habitat or ecology that a proposed action may be likely to impact – for example area of habitat or birth rate. The attribute that most effectively captures the nature of the residual impact is selected. For the Project the protected matters attribute proposed to be protected and managed through the provision of an offset is Fitzroy River turtle and white-throated snapping turtle birth rate.

2.2.1 Offset calculator

Table 2-2 is an extract of the Offsets assessment guide relevant to calculating offset requirements for residual impacts to the Fitzroy River turtle and white-throated snapping turtle. The calculator shows that the degree to which the proposed offset compensates for the total quantum of impact is 100 per cent and therefore the direct offset requirement is met (offsets are required to achieve at least 90 per cent) and no additional financial contributions are required.

In order to offset the residual impact of the Project on Fitzroy River turtle and white-throated snapping turtle nesting it is proposed that a nest protection program be implemented. Greening Australia currently implements a Fitzroy River Turtle Conservation Program through funding from Australia Pacific LNG and the Fitzroy Basin Association. It is proposed that funding will be provided by the Project to develop similar programs.

To protect natural nests the program would aim to:

- Identify and select priority nesting banks within the Fitzroy River catchment where there is an aggregation of the Fitzroy River turtle and white-throated snapping turtle (e.g. Alligator Creek)
- Identify landowners willing to participate in the protection program and allow access to the river bank during nesting season
- Field officers or volunteers would:
  - Monitor stream banks for signs of turtle nesting, especially after rainfall
  - Secure a 70-100 cm square plastic mesh cover with a 10 cm grid (to allow hatchlings to escape) with sand pegs
  - Mark nests with a numbered stake to allow hatching success to be monitored.
- Encourage landowners to use electric fences during the nesting season to minimise trampling by stock or more permanent fencing if preferred
- Manage terrestrial and aquatic weeds to prevent weeds from blocking access to suitable nesting habitat (Weed Management Plan).

A Feral Animal Control Program will also be developed and implemented for the Project in collaboration with local councils, community groups and landholders. Specific control measures may include culling, baiting and trapping of pigs, foxes, wild dogs and feral cats. The Feral Animal Control Program will be developed in accordance with approved conservation advice for the species and approved threat abatement plans for feral cats (DEWHA 2008a), European red fox (DEWHA 2008b) and feral pigs (DEH 2005).

Nest protection programs implemented at Alligator Creek by Greening Australia (assisted by the Fitzroy Basin Association, and under guidance from the Department of Environment and Heritage Protection (DEHP)) (Limpus et al. 2001) and in other river systems throughout Australia (Wedlock 2006; Connell 2011; Connell 2012; Stockfeld and Kleinert 2013), are shown to immediately improve turtle nesting success and recruitment of hatchlings within a single breeding season.

In 2007 the Greening Australia team protected over 110 nests with an average of 15 eggs per nest. The sites were searched every morning at dawn for evidence of new nests between mid-September and the end of November (Hale 2009). A protective mesh was placed over nests found to keep predators from gaining access but still allowing the turtles to hatch and make their way to the water. It is estimated that over 1,700 hatchlings reached the Fitzroy River (Hale 2009).

Table 2-2 Fitzroy River turtle and white-throated snapping turtle offset calculator

Protected matter attribute	Total quantum of impact	Proposed offset	Time horizon (years)[1]	Start value[2]	Future value		Raw gain[5]	Confidence in results[6]	Adjusted gain[5]	Net present value[5]	% of impact offset	Information source
					Without offset[3]	With offset[4]						
Birth rate	80%	Nest protection	5 (until ecologic benefit)	5	5	95	90	90%	81	80	100	Limpus et al. 2011 Connell and Wedlock 2006 Connell 2011 Connell 2012 Stockfeld and Kleinert 2013

The *How to use the offsets assessment guide* accompanies the EPBC Act environmental offsets policy and has been used to estimate impacts and offset requirements for the Fitzroy River turtle and white-throated snapping turtle. Definitions within the guide and as applied to the Project are described below:

2. **Time horizon or time until ecological benefit:** is the estimated time (in years) that it will take for the habitat quality improvement of the proposed offset to be realised. This component is connected to the 'future value with offset' and 'future value without offset' categories, as it defines the future point in time for which these quality scores are predicted. Shorter time frames until ecological benefits are realised are valued more highly than longer time frames. The current predation of nest clutches is in the order of 100 per cent and protection of nests through active measures is shown to improve nest success. As such it is considered that the timeframe between impact and the delivery of the proposed offset would occur within a single season. Conservatively a five year period has been adopted for the Project.
3. **Start value:** is the current value of the protected matter attribute. Given the current nesting success is almost zero the start value is low and conservatively estimated at five for the Project.
4. **Future value without offset**: the 'future value without offset' and 'future value with offset' contribute to a calculation of the likely future value of the proposed offset in two scenarios; one where it is used as an offset and the other where it is not used as an offset.. Currently nest protection programmes are limited and ad hoc depending on funding received and nest predation rates remain high. It is considered that the future value of the birth rate without secure and consistent management from the proposed offset will be at a low level (rated as 5 out of 100).
5. **Future value with offset**: is what the proponent is proposing as a suitable offset for the proposed impact. With protection and the implementation of management measures proposed, the future value of the birth rate is predicted to improve (rating of 95 out of 100). As described above this comprises the protection of nests in accordance with tried and tested methods shown to benefit nest success and thus increase the birth rate.
6. **Raw gain; adjusted gain, net present value and percentage of impact offset**: are calculated automatically by the Offsets calculator.
7. **Confidence in results**: is a percentage that records the level of certainty regarding the success of the proposed offset. The offset targets a key threatening process on the species and based on proven results, the confidence in the proposed change in nesting success and improved recruitment of hatchlings is 90 per cent.

This success was repeated in 2008 (Hale 2009). It is therefore conservatively estimated that the time required for the proposed offset to achieve ecological benefits is five years.

During periods of management, recruitment of Fitzroy River turtle hatchlings at Alligator Creek is shown to increase (Greening Australia, Dr Col Limpus, pers comms). Nest management has also proven successful at protecting the Mary River turtle (*Elusor macrurus*) along the Mary River (Connell and Wedlock 2006; Connell 2011; Connell 2012) and broad-shelled river turtle nests (*Chelodina expansa*) on Gunbower Island (Stockfeld and Kleinert 2013), resulting in an increase in the recruitment of hatchlings into the population. Due to the existing extremely high predation rates (close to 100 per cent), it is considered that the future value of the birth rate without secure and consistent management from the proposed offset will be at a low level (rated as 5 out of 100).With protection and the implementation of management measures proposed, the future value of the Fitzroy River turtle birth rate is predicted to improve (rating of 95 out of 100). This improvement has been observed during implementation of nest management programmes at the Alligator Creek site and in other similar environments. Based on proven results, the confidence in the proposed change in nesting success and improved recruitment of hatchlings is 90 per cent.

The Greening Australia Fitzroy River Turtle Conservation program is currently funded by contributions from Australia Pacific LNG (one nesting season) and the Fitzroy Basin Association. This current program utilises volunteers for implementation of the program. It is likely that paid staff would be required to guarantee the program and therefore these costs have been considered within the Project's offset proposal based on an estimate of cost provided by Greening Australia (April 2015), inclusive of costs associated with pest management and weed control. Offset costs are included within the Project's economic analysis presented in the draft EIS (Volume 1 Chapter 19) and cover a period of five years during which time it is expected that an ecological benefit would be achieved. The birth rate and nesting success of the species will be monitored and reviewed over time. When it can be shown that the nesting banks within the inundation zones have re-established and that the Fitzroy River turtle population has recovered and has viable recruitment into the population, the program will cease.

It is considered that as the current funding is generally limited and inconsistent to support the continuity of programmes, the Project's proposal to guarantee secure funding for conservation programs will improve nesting success and achieve ecological benefits.

2.2.2 Nest offset management plan

To achieve the offset outcomes, a Fitzroy River turtle and white-throated snapping turtle nest offset management plan has been drafted and presented in Table 2-3.

The proposed offset management plan details the management actions that will be implemented to specifically target the key threatening processes of high nest predation and low population recruitment.

Management actions, based on current measures utilised by Greening Australia and the DEHP will include predator control (Feral Animal Control Program), weed management (Weed Management Plan), and individual nest protection. These management actions are known to reduce nest predation rates and increase recruitment of hatchlings into the population as reported in Connell and Wedlock 2006; Connell 2011; Connell 2012.

Current funding for nest protection is limited to the Fitzroy River turtle and is generally limited and inconsistent to support the continuity of programmes. The proposed guaranteed secure funding for conservation programs will improve nesting success and ecological benefits for both the Fitzroy River turtle and white-throated snapping turtle.

Table 2-3 Fitzroy River turtle and white-throated snapping turtle nests offset management plan

Element	Fitzroy River turtle and white-throated snapping turtle
Operational policy	• Protection and management of nests.
Legislative compliance requirements	• EPBC Act 1999 • EPBC Act Environmental Offset Policy • NC Act • EO Act • EO Regulation • Queensland Environmental Offset Policy.
Performance criteria	• Reduction in nest predation and increased recruitment of hatchlings into the population.

Element	Fitzroy River turtle and white-throated snapping turtle
Implementation strategy	• Priority turtle nest monitoring areas are to be identified, this will be based on access requirements, landowner agreement and suitability of site for nesting (e.g. existing aggregation) • A Feral Animal Control Program will be developed and implemented for the Project in collaboration with local council, community groups and landholders. Specific control measures may include culling, baiting and trapping of pigs, foxes, wild dogs and feral cats • A Weed Management Plan will be developed and implemented to enhance the quality of habitat within and adjacent to the Project area. Specific management measures will include regular monitoring, removal and control of terrestrial and aquatic weeds within and adjacent to the Fitzroy River. Monitoring and removal will be undertaken prior to the peak Fitzroy River turtle and white-throated snapping turtle nesting seasons • The Feral Animal Control Program and Weed Management Plan will be implemented in accordance with the plans and strategies set out by Biosecurity Queensland (Department of Agricultural and Forestry). As such, identification and management of declared pests will be undertaken in accordance with the *Land Protection (Pest and Stock Route Management) Act 2002* (Qld) and relevant local government strategies and plans, including the Rockhampton Regional Council Pest Management Plan 2012-2016 and the Central Highlands Regional Council Pest Management Plan 2012 • Individual turtle nests laid within monitoring areas (to be determined) will be protected within 24 hours of being laid. Nests laid will be identified and nesting characteristics recorded (e.g. date, location and depth of nest). Aluminium grid (1 m^2) will then be placed over each individual nests and secured with sand pegs. The grid size should be large enough to allow hatchlings to pass through it • The hatching success of individual nests protected will be recorded throughout the egg hatching seasons. Protected nests will be excavated to the top of the first egg to check for evidence of hatching. For those nests that have hatched, the number of eggs from which hatchlings have successfully emerged will be recorded and compared to the total number of eggs laid. Predated egg shell and evidence of predators (e.g. tracks and scats) will also be recorded. Nests that have not hatched at the time of survey will be covered over and re-assessed during subsequent monitoring.

Element	Fitzroy River turtle and white-throated snapping turtle
Monitoring	• The identified monitoring areas will be monitored to describe the existing habitat conditions and level of nesting activity prior to the implementation of the offset management plan. Monitoring will be undertaken during the peak turtle nesting seasons and hatching seasons. Individual monitoring events for nesting activity will follow periods of rainfall. Parameters recorded will include: bank characteristics (bank width, height, slope, substrate, vegetation), levels of disturbance, presence of weeds and pests, nesting activity (number and location of turtle nests or attempted nesting), nest characteristics (distance from waters' edge, depth, number of eggs, species), and nesting success (number of successful hatchings) • Following implementation of the offsets management plan, identified sites will be monitored regularly (indicative frequency of three times per week) during the peak nesting seasons for the purposes of identifying and protecting individual nests. Nesting is triggered by rainfall and monitoring should occur during and/or immediately following each event • Throughout the egg hatching seasons, protected nests will be monitored regularly (indicative frequency of once per month) for the purposes of recorded hatching success and rates of nest predation. Monitoring tools may include the use of remote cameras to record nesting and predator activity • The Fitzroy River turtle and white-throated snapping turtle populations in the vicinity of the monitoring areas will be monitored annually for a period of five years from the implementation of the offset management plan. • The success of the offset management plan will be evaluated annually with regard to the suitability of the management actions and assess the requirement for adaptive management in light of new information and developments in technology • At the end of the five year period the success of the offset management plan together with the realised impact of the Project on nests will be evaluated and ongoing implementation requirements determined in consultation with DEHP and the Department of the Environment • During the monitoring period turtles will be tagged with passive integrated transponder tags, carapace notching and numbered monel metal foot tags. Parameters recorded will include: – Morphometric measurements – Age and sexual maturity – Reproductive biology – Evidence of injury, mortality and disease.

2.2.3 Potential nest offset areas

Table 2-4 and Table 2-5 describe nesting sites identified within the Eden Bann Weir and Rookwood Weir impoundments, respectively, as shown on Figure 2-1, where potential nesting habitat would remain above the full supply level of the impoundments. The methodology for nesting site identification is provided in the draft EIS (Volume 3 Appendix L).

There are three sites within the upper reaches of the proposed Rookwood Weir impoundment that could be suitable offset sites; particularly the confirmed nesting site for the Fitzroy River turtle on the Mackenzie River (329 km adopted middle thread distance (AMTD)). While potential nesting habitat would remain at Glenroy Crossing above the full supply level of Eden Bann Weir Stage 2, this habitat would likely be inundated by the Stage 3 impoundment.

In addition to the sites identified within the impoundment, further potential sites were identified based on a desktop assessment outside the impoundment as follows:

- Nine sites were identified downstream of Eden Bann Weir to the Fitzroy Barrage impoundment
- Ten sites were identified between the upper extent of the proposed raised Eden Bann Weir impoundment and the proposed Rookwood Weir site
- Twenty-seven sites were identified within 50 km upstream of the Rookwood Weir impoundment on the Dawson and Mackenzie rivers.

Table 2-4 Historical, confirmed and high potential nesting sites within the Eden Bann Weir impoundment

Site number	Nesting site location	Nesting habitat suitability (field verified)	Eden Bann Weir	
			Stage 2	Stage 3*
EB Bank 3	Glenroy Crossing Fitzroy River (193 km AMTD)	Historical	Potential nesting habitat remains above the impoundment	Unlikely to be suitable nesting habitat above the impoundment

Table 2-5 Historical, confirmed and high potential nesting sites within the Rookwood Weir impoundment

Site number	Location	Nesting habitat suitability (field verified)	Rookwood Weir	
			Stage 1	Stage 2
RW Bank 6	Mackenzie River (321 km AMTD)	High potential	Potential nesting habitat remains above the impoundment	Potential nesting habitat remains above the impoundment
RW Bank 7	Mackenzie River (329 km AMTD)	Confirmed	Potential nesting habitat remains above the impoundment	Potential nesting habitat remains above the impoundment
RW Bank 8	Boolburra, Dawson River (15 km AMTD)	Historical	Potential nesting habitat remains above the impoundment	Potential nesting habitat remains above the impoundment

2.2.4 Nest offset staging

The Project will be implemented by way of a flexible strategy to allow the rapid delivery of water to meet anticipated future water demands, when triggered. There is yet to be a decision on the order or composition in which the proposed developments will proceed. While the Project is expected to be staged with sequencing and timing dependent on a number of demand triggers, it is proposed that offsets in relation to the Fitzroy River turtle and white-throated snapping nests will be provided for in total when a first stage of development is triggered. In effect, offsets are therefore provided in advance of future development stages.

2.3 Aquatic habitat

2.3.1 Impact calculation

Aquatic habitat is directly impacted by the Project due to potential changes in water levels. Aquatic habitat types within the Project footprint included in the calculation of impacted aquatic habitat include pool, riffle, run habitats and creeks adjoining the main river. In the absence of suitable GIS data, aquatic habitat was manually digitised using satellite imagery (Digital Globe World View 2, July 2010) based on the discernible boundaries of water within the river channel (excluding rock and sand banks) between the upper limit of the existing and proposed Eden Bann Weir impoundment and within the proposed Rookwood Weir impoundment. While sand banks within the river channel are utilised by aquatic species, impacts on these habitats have been assessed separately. The digitised data was then cross-checked against river bed level cross-section data at 81 locations. A detailed methodology for the calculation of aquatic habitat with the Project footprint is provided in the draft EIS (Volume 3 Appendix L).

While the Fitzroy River turtle and white-throated snapping turtle are often referred to as a riffle zone specialist, the species also inhabit pools, runs and creeks. However, deep water areas (> 5 m) of pools are largely uninhabitable to the turtle species due to reduced oxygen levels, limited light penetration and lower temperatures. Currently there is not enough information available on depth profiles to be able to exclude deep water habitat that would not be utilised by species. As such, the inclusion of pool habitat in the calculation of impacted turtle aquatic habitat is considered conservative.

Approximately 282 ha of aquatic habitat occurs within the Eden Bann Weir (Stage 3) Project footprint and approximately 660 ha of aquatic habitat occurs within the Rookwood Weir Project (Stage 2) footprint. Table 2-6 provides the area of aquatic habitat impacted at the upper limit of Project development (that is Eden Bann Weir Stage 3 and Rookwood Weir Stage 2) within each local government area, bioregion and subregion as required by the Queensland Government's financial offset calculator.

Table 2-6 Aquatic habitat impact area and offset area

Local government area	Bioregion	Subregion	Area impacted (ha)
Central Highlands Regional Council	Brigalow Belt	Isaac-Comet Downs	153.0
		Boomer Range	41.0
		Dawson River Downs	36.5
Rockhampton Regional Council	Brigalow Belt	Isaac-Comet Downs	72.8
		Boomer Range	134.9
		Marlborough Plains	76.4
		Mount Morgan Ranges	396.4
Woorabinda Aboriginal Shire Council	Brigalow Belt	Isaac-Comet Downs	24.3
Livingstone Shire Council	Brigalow Belt	Marlborough Plains	6.9
Total			**942.2**

2.3.2 Financial offset proposal

Offsetting of impacts to aquatic habitat is proposed through the application of a financial offset. Like for like offsets for aquatic habitat are not practicable and cannot be achieved for this Project due to the nature of the habitat being offset. As such it is considered that a financial contribution provided as an indirect offset is appropriate and it could be utilised for beneficial research or similar activities aimed at improving survival of the species.

The Queensland Government's financial settlement offset calculator has been used to determine the financial contribution required to offset the Project impacts on aquatic habitat at full development.

It is proposed that although aquatic habitat is being offset, the terrestrial calculator for Fitzroy River turtle has been utilised. The marine and aquatic calculator only applies to marine matters, fish habitat and fish passage, each of which does not require an offset with regard to the Project.

As per Table 2-6 the impact area (for the upper limit of Project development, that is Eden Bann Weir Stage 3 and Rookwood Weir Stage 2) and as applied to the financial settlement offset calculator is 942.2 ha

2.3.3 Offset staging

The Project will be implemented by way of a flexible strategy to allow the rapid delivery of water to meet anticipated future water demands, when triggered. There is yet to be a decision on the order or composition in which the proposed developments will proceed. Should the Project be developed in a staged manner the financial offset may also be staged to reflect the staged impacts.

2.4 Summary

The proposed offsets for Fitzroy River turtle and white-throated snapping turtle nesting habitat have been developed to meet the offset requirements of the EPBC Act on the basis that a condition for an offset imposed under that authority will satisfy the requirements for offsets under the EO Act. An offset management plan has been developed inclusive of monitoring actions and potential nest habitat areas identified.

The proposed offset for impacts on aquatic habitat are proposed to be achieved through the provision of a financial contribution calculated in accordance with the Queensland environmental offsets policy's financial settlement calculator.

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