



Rookwood Weir

Fitzroy River Turtle Nest Protection Management Plan

RWW-GHD-ENV-PM-001

Sunwater Limited

1 December 2023

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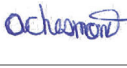

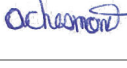

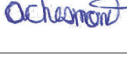




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Acronyms

Acronym	Description
AEIS	Addendum Environmental Impact Statement
AHD	Australian Height Datum
AMTD	Adopted Middle Threat Distance
cm	Centimetre
CoG	Coordinator General
DAWE	Department of Agriculture, Water and the Environment
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DoE	Department of Environment
DES	Department of Environment and Science
EIS	Environmental Impact Statement
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
FSL	Full Supply Level
FRT	Fitzroy River Turtle
ha	Hectare
km	Kilometre
KRT	Kreff's River Turtle
LFRIP	Lower Fitzroy River Infrastructure Project
m	Metre
NC Act	<i>Nature Conservation Act 1992</i>
NPMP	Nest Protection Management Plan
RL	Reduced Level
SMP	Species Management Plan
WTST	White-throated snapping turtle

Declaration of accuracy

In making this declaration, I am aware that section 491 of the *Environmental Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) makes it an offence in certain circumstances to knowingly provide false or misleading information or documents to specified persons who are known to be performing a duty or carrying out a function under the EPBC Act or the *Environment Protection and Biodiversity Conservation Regulations 2000* (Cth). The offence is punishable on conviction by imprisonment or a fine, or both. I am authorised to bind the approval holder to this declaration and that I have no knowledge of that authorisation being revoked at the time of making this declaration.

Signed:


Chris Delamont (Dec 5, 2023 14:34 GMT+10)

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Organisation: Sunwater Limited

EPBC Referral Number: EPBC 2009/5173

Rookwood Weir Fitzroy River Turtle Nest Protection Plan (EPBC Offset Management Plan)

Date: 05/12/2023

1. Introduction

1.1 Purpose of this report

The purpose of this Nest Protection Management Plan is to fulfil the offset obligations required for the inundation of turtle nests, as required by EPBC Act Approval Conditions 4 and 5. The management plan provides a framework for the implementation of nest protection actions to achieve the conservation outcomes of a reduction in nest predation and increased recruitment of hatchlings into the population.

This Nest Protection Management Plan has been prepared generally in accordance with Appendix G of the AEIS: Offset Proposal for the Fitzroy River Turtle and White-throated Snapping Turtle offset management plan. The actions proposed have been developed in consultation with turtle expert Dr Col Limpus, Chief Scientist Threatened Species Unit, Department of Environment and Science (DES), and align with priority actions within the Approved Conservation Advice for *Rheodytes leukops* (Fitzroy Tortoise) (Commonwealth of Australia, 2008); and The Biology and Management Strategies for Freshwater Turtles in the Fitzroy Catchment (Limpus *et al.*, 2011a).

This report includes the following content:

- Introduction – provides an overview of the Project and the Fitzroy River turtle offset requirements
- Species background – describes the Fitzroy River turtle and presents known information on the species, distribution and habitat, ecology and nesting requirements.
- Potential residual impact – details the expected impact to turtle nests as predicted in the EIS and AEIS, and presents results of pre-clearance surveys to identify actual predicted impact
- Nest Protection Management Plan – details the conservation outcomes, timeline and responsible person for the management plan as well as the management actions and monitoring and evaluation requirements. A detailed management plan for implementation is supported by a contingency program of corrective actions and reporting requirements.

A summary of the reports and plans relating to the delivery of offsets for the Fitzroy River turtle and white-throated snapping turtle (*Elseya albagula*) is provided in Table 1.

Table 1 Delivery documents relating to turtle offsets

Offset requirement	Delivery documents
Offset strategy	<ul style="list-style-type: none">– The Rookwood Weir Offset Strategy Version 10 (RWW-SUN-NNV-SG-0003.I0.FI_v10)
Inundation of Fitzroy River turtle nest sites within the weir impoundment areas	<ul style="list-style-type: none">– Fitzroy River Turtle Nest Protection Management Plan (RWW-GHD-ENV-PM-001)– White-throated Snapping Turtle Nest Protection Management Plan (RWW-GHD-ENV-PM-002)
Modifying aquatic habitat for the Fitzroy River turtle	<ul style="list-style-type: none">– Turtle Management and Conservation Summary Report (RWW-GHD-ENV-RP-0020)<ul style="list-style-type: none">• Turtle Habitat Enhancement Program: Expanded Feral Pest Animal Management Plan (RWP-ETR-ENV-MP-0001)• Turtle Infrastructure Design Process Report (RWW-GHD-ENV-RP-0018)• Construction Species Management Program (42-29978-02-AP-RPT-0008)• Operations Species Management Program (RWW-GHD-ENV-MP-003)

1.2 Background

As a component of the Lower Fitzroy River Infrastructure Project (LFRIP; GHD, 2009), Rookwood Weir (the Project) is being constructed by Sunwater Limited, to satisfy short-to-medium-term water supply. The proposed Weir infrastructure will span 320 metres (m) across the river and have an approximate fixed crest of reduced level (RL) 46.2 m Australian Height Datum (AHD). Located at 265.3 kilometres (km) adopted middle threat distance (AMTD) on the Fitzroy River, the impoundment at full supply level (FSL) extends up the Fitzroy River and into the Mackenzie River (322 km AMTD) and Dawson River (10 km AMTD).

The threatened Fitzroy River turtle (*Rheodytes leukops*) is endemic to the Fitzroy River catchment and is known to occur within the footprint of Rookwood Weir. This species is listed as vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the Queensland *Nature Conservation Act 1992* (NC Act).

An environmental impact statement (EIS), including an addendum (AEIS) was approved by the Queensland Government Coordinator General (CoG) in December 2016 (CoG 2016) and the Federal Minister for Environment in February 2017 (EPBC 2009/5173), subject to conditions. Conditions relating to the management and conservation of the Fitzroy River turtle include the requirement to conduct pre-clearance surveys, prepare a Species Management Program (SMP), design and implement a Turtle Movement Study, and design, construct and monitor turtle passage infrastructure on the Rookwood Weir.

Unavoidable impacts to the Fitzroy River turtle are expected to remain in relation to inundation of turtle nest sites within the Weir impoundment area, downstream of the Weir and the modification of turtle aquatic habitat. These residual impacts are considered significant in accordance with the *Matters of National Environmental Significance - Significant impact guidelines 1.1* (DoE, 2013). In accordance with Project EPBC Approval Conditions 4 and 5, an Offset Strategy and Offset Management Plan are required for the following residual impacts to the Fitzroy River turtle, determined by pre-clearance surveys required under Condition 3:

- Inundation of Fitzroy River turtle nest sites within the Weir impoundment areas and downstream of the Weir
- Modifying 545.6¹ hectares (ha) of aquatic habitat for the Fitzroy River turtle

The Rookwood Weir Offset Strategy Version 10 (Earthtrade, 2022a) was approved by the Minister in November 2022. This strategy identified that to achieve the conservation outcome of a reduction in nest predation and increased recruitment of hatchlings into the population, a Fitzroy River turtle nest protection program will be implemented as a direct offset for residual impacts to nest inundation. The offset will be in accordance with Appendix G of the AEIS: Offset Proposal for the Fitzroy River Turtle and White-throated Snapping Turtle offset management plan. As per Condition 5 of the EPBC approval, offsets for impacts to turtle aquatic habitat will be delivered via a financial offset, as outlined in the Rookwood Weir Offset Strategy (Earthtrade, 2022a).

This Fitzroy River Turtle Nest Protection Management Plan has been prepared as an attachment to the Rookwood Weir Operations Species Management Plan (GHD, 2023), to provide a framework for the implementation of turtle nest protection actions required to achieve the required conservation outcomes. In accordance with EPBC Act Approval Condition 5, the Nest Protection Management Plan will be implemented until the outcomes of the offset management plan are achieved. In accordance with the EPBC Act approval conditions, the Nest Protection Management Plan will be implemented for five years. This aligns with the Offset proposal developed for the EIS which identifies five years until ecological benefit for the Fitzroy River turtle can be achieved.

¹ Condition 4 states the LFRIP will modify 942 ha of aquatic habitat from Rookwood Weir Stage 2 and Eden Bann Stage 3. Rookwood Weir with a Weir crest height of RL 46.2 m AHD inundates 545.6 ha of aquatic habitat for the Fitzroy River turtle.

1.3 Project description

The proposed Rookwood Weir is located at a 'greenfield' site at 265.3 km AMTD on the Fitzroy River, approximately 85 km south-west of Rockhampton.

Rookwood Weir has a central concrete overflow with a smooth formed ogee spillway. The Weir has a deep smooth formed stilling basin that extends the full length of the spillway. The proposed infrastructure spans 320 m across the river and has an approximate fixed crest of RL 46.2 m AHD storing approximately 86,000 ML.

Rookwood Weir includes a fishway complex to provide adequate fish passage for the existing fish community within the Fitzroy River. A turtle passage facility in the form of a ramp and pool design will also be provided on the right bank to facilitate upstream and downstream movement of turtles.

The Project also includes:

- Replacing the low-level crossing at Riverslea with a new bridge and associated road approaches up-stream of the Weir
- Upgrading the existing low-level causeway at Hanrahan downstream of the Weir
- Upgrading the existing low-level causeway at Foleyvale upstream of the Weir; and

Figure 1 shows the location of Rookwood Weir and inundation area extent which extends 323.3 km AMTD up the Mackenzie River and 10.3 km AMTD up the Dawson River.

1.4 Turtle nest inundation offset

Operation of the Project will have residual impacts on the Fitzroy River turtle as a result of nest inundation. Confirmed and potential turtle nest habitat within the impoundment area may be inundated when inflows occur and the storage level within the impoundment increases between the period of turtle nesting and hatching. This will result in the flooding of turtle nests. Inundation of turtle nests may also occur when Weir-related water releases or spilling events result in an increase in water level downstream of the Weir.

Suitable nesting habitat for the Fitzroy River turtle is expected to persist in the upper reaches of the impoundment with potential nesting habitat remaining above the full supply level. Suitable nesting habitat is also expected to be created in flood deposition areas over time. The existence of aggregated nesting in the upper reaches of the Fitzroy River Barrage and the Tartrus Weir impoundment, demonstrates that the species has the ability to colonise new habitat where suitable conditions occur (Limpus *et al.*, 2011a; b). The Fitzroy River turtle has also demonstrated some adaptability to fluctuations in nesting habitat conditions following natural events such as flooding, or degradation from weed and pest species (Dr Col Limpus pers comm.). These behaviours indicate that the Fitzroy River turtle is expected to continue nesting within, upstream and downstream of Rookwood Weir during operations, where suitable habitat occurs.

The biggest threat to the survival of the Fitzroy River turtle is the lack of recruitment into the population (Commonwealth of Australia, 2008; Limpus *et al.*, 2011a). Predation of nests by feral animals, goannas and water rats, plus trampling of nests by cattle results in extremely poor survival of egg clutches (close to 100% of clutches predated each season). The bias in favour of adult turtles within the Fitzroy Basin catchment indicates that low recruitment of hatchlings has been occurring over many decades (Commonwealth of Australia, 2008; Limpus *et al.*, 2011a). Current recruitment rates are not considered adequate to sustain populations within the catchment (Limpus *et al.*, 2011a). As such, the protected matters attribute proposed to be protected and managed is hatching success of Fitzroy River turtle egg clutches.

The protection and management of nests will improve hatching success and thus birth rate, will target Project-specific impacts, as well as address the key processes currently threatening the survival of these species throughout the catchment. These actions will reduce nest predation, increase population recruitment and promote the recovery of the species. Nest protection programs implemented in the Fitzroy River catchment under guidance from DES and in other river systems throughout Australia (Connell and 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. For example, 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). This success was repeated in 2008 (Hale, 2009). Similar levels of success have been recorded in the Burnett and Mary River catchment with nest protection programs for other species (B. Crosbie pers. comm.).

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). Based on proven results, the confidence in the proposed change in nesting success and improved recruitment of hatchlings is 90 per cent. It is therefore conservatively estimated that the time required for the proposed offset to achieve ecological benefits is five years. In accordance with EPBC Act Approval Condition 5, the Nest Protection Management Plan will be implemented until the outcomes of the Offset Management Plan are achieved (5 years).

1.5 Limitations

This report has been prepared by GHD for Sunwater Limited (Sunwater) and may only be used and relied on by Sunwater for the purpose agreed between GHD and the Sunwater as set out in this report. GHD otherwise disclaims responsibility to any person other than Sunwater arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible. The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

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2. Species background

2.1 Description

The Fitzroy River turtle (Figure 2) has a maximum straight carapace (shell) length of 260 mm. The carapace is broadly oval and medium to dark brown in colour. The plastron, or underside of the shell, varies from pale yellow to cream. Tubercles are present on the neck and orange markings can be seen on the sides of the neck and throat of large males. The Fitzroy River turtle has a distinctive white ring around its eye. The feet are fully webbed, and five claws are present on each forelimb. The shell of hatchlings is serrated along the back edge and the ring around the eye is metallic silver-blue (Cogger, 2000; Wilson and Swan, 2003; Latta and Latta, 2005; Limpus *et al.*, 2011a).



Figure 2 Fitzroy River turtle (October 2018)

2.2 Distribution and habitat

The Fitzroy River turtle is endemic to the Fitzroy Basin catchment. The species has a known distribution extending from the Fitzroy Barrage to at least Theodore Weir (at 228.7 km AMTD) on the Dawson River, and within the lower reaches of the Nogoa River and upper reaches of the Connors River (95.7 km AMTD).

The Fitzroy River turtle is considered to be a specialist species that occupies freshwater habitats within the river channel. Riffle zones are considered particularly important habitat; however, the species also inhabits pools, runs and creeks. Foraging in these habitats is generally associated with in-stream debris such as fallen logs. Undercut banks, root mats, logs and rocks provide important sheltering and foraging habitat. Whilst flowing waters are thought to be preferred by the species, the Fitzroy River turtle retreats into non-flowing, potentially isolated pools during the dry season (Limpus *et al.*, 2011a). The Fitzroy River turtle is also known to inhabit the shallow upstream margins of impoundments such as the Fitzroy Barrage and Neville Hewitt Weir impoundments (Limpus *et al.*, 2011a). However, the deep-water areas (>5 m) of impoundments are largely uninhabitable to the turtle species due to very low oxygen levels, little or no light penetration and cold temperatures. The Fitzroy River turtle is not known to occur in off-stream habitats such as farm dams, billabongs, or flood plains (Limpus *et al.*, 2011a). The Fitzroy River turtle is known to occur within the Fitzroy, Mackenzie and

Dawson Rivers, within, upstream and downstream of Rookwood Weir. A total of 76 Fitzroy River turtles have been captured within the vicinity of Weir over four years of the Rookwood Weir Turtle Movement Study (GHD, 2018; 2019; 2020). Results of this study found that the Fitzroy River turtle was mostly captured and detected in areas within or immediately downstream of riffles. Key habitat areas supporting high abundance of turtles included the Rookwood Weir site pool-riffle sequence, pool-riffle sequence upstream from Riverslea Crossing, at Lawries Bend and within the Hanrahan Crossing pool-riffle sequence. Large numbers of turtle detections were also observed between Rookwood and Lawries Bend. While habitats in the upstream extent of this sequence include shallow pools (<0.5 m) with runs and riffles habitats, a high number of tagged Fitzroy River turtle were detected in the lower flow section downstream the rock bar located below the Rookwood Weir site. This section also includes isolated deep pools (1–3 m).

Nesting in the Fitzroy River is generally restricted to alluvial sand/loam banks which are deposited during flood events. Banks with a relatively steep slope, low density of ground/understorey vegetation and partial shade cover appear to be preferred (Limpus *et al.*, 2011a). Nesting generally occurs approximately 5 to 6 m from the water's edge (Hamann *et al.*, 2007; Limpus *et al.*, 2011a). Females can lay two or more egg clutches per year between August and December with hatching occurring during summer (November to February) (Limpus *et al.*, 2011a; b). Their eggs are approximately ~3.2 centimeters (cm) long and 2.4 cm wide.

2.3 Ecology

The Fitzroy River turtle is one of a unique group of Australian freshwater turtles that can extract oxygen from both the air and the water. Aerial respiration is achieved via the lungs at the water's surface, whilst aquatic respiration occurs underwater via gill like structures in the cloaca (Priest and Franklin, 2002). The ability to respire aquatically allows the Fitzroy River turtle to remain underwater for weeks at a time during ideal conditions (Priest, 1997; Gordos *et al.*, 2003). Benefits of aquatic respiration include increased time available for foraging and breeding, and reduced exposure to predation and reduced energy expenditure (Gordos, 2004; Clark, 2008). The ability of the Fitzroy River turtle to respire aquatically also allows this species to inhabit fast-flowing riffle zones where primarily air-breathing species may be excluded (Gordos, 2004).

The Fitzroy River turtle has a unique foraging technique of 'scrape feeding' whereby the turtle uses the horny sheaths of the upper jaw to scrape the surface of the substrate, particularly submerged logs and rocks. This method of foraging primarily captures slow moving benthic invertebrates, invertebrate eggs, aquatic insects, sponges and algae (Leger and Cann, 1980; Rogers, 2000; Tucker *et al.*, 2001; Limpus *et al.*, 2011a). Food resources for the Fitzroy River turtle can often be in short supply within natural pools and impounded habitats. Access to highly productive riffle zones or flowing shallow water margins assist in the accumulation of fat reserves that are utilised by the species for breeding during the dry season (Limpus *et al.*, 2011a).

The Rookwood Weir turtle movement study has been monitoring the movement behaviour of this species since April 2017 (GHD, 2018; 2019; 2020). The average home range size of this species for the entire tracking duration was 2.99 km (SE=0.40 km). Prior to 2020, limited large-scale movement had been detected in the Fitzroy River turtle with turtle remaining within the pool-riffle sequences from which they were captured. However, high discharge in early 2020 appeared to correlate with the timing of movements of at least ten tagged turtles whose movement typically occurred between Rookwood and Lawrie's Bend in March and April. The maximum distance travelled by a Fitzroy River turtle during the TMS was 11.18 km. The results of the Turtle Movement Study indicate that the Fitzroy River turtle does not undertake long-distance migration for breeding activities, with females nesting within their home range (GHD, 2018; 2019; 2020).

3. Potential residual impact

3.1 Expected impact (EIS and AEIS)

The potential impact to Fitzroy River turtle nesting habitat as a result of inundation from Rookwood Weir was predicted in the following reports:

- Appendix G of the AEIS: Offset Proposal for the Fitzroy River Turtle and White-throated Snapping Turtle offset management plan
- Appendix L of the EIS: Fitzroy River Turtle *Rheodytes leukops* technical report.

Nesting habitat expected to be impacted included:

- Three historical nesting banks at Redbank crossing (Fitzroy River downstream of Rookwood Weir), Glenroy crossing (Fitzroy River downstream of Rookwood Weir) and Boolburra Rail crossing (Dawson River upstream of the Rookwood Weir inundation area).
- Six confirmed nesting banks between 266 and 329 km AMTD within the Rookwood Weir Project footprint.
- One high potential nesting bank at 321 km AMTD within the Rookwood Weir Project footprint.

There were three sites within the upper reaches of the Rookwood Weir impoundment where potential nesting habitat was expected to remain above the full supply level associated with Rookwood Weir Stage 2. Conservatively, the Project was expected to impact up to 80% of nests within the inundation area with an approximate area of 2.0 ha of confirmed and potential nesting habitat expected to be inundated.

3.2 Pre-clearance surveys

As required by EPBC Act Condition 3, pre-clearance surveys for turtle nesting activity have been undertaken within, upstream and downstream of Rookwood Weir from 2019 to 2021. The turtle nesting surveys extended from below Hanrahan Crossing, approximately 18 km downstream of Rookwood Weir, to above Foleyvale Crossing, approximately 65 km upstream of Rookwood Weir. Surveys were also conducted further upstream on the Mackenzie River at Tartus Weir. A total of 12 pre-clearance surveys have been undertaken within the Fitzroy River turtle nesting and hatching season, as well during the nesting season of the white-throated snapping turtle (*Elseya albagula*), as summarised in Table 2.

Table 2 Pre-clearance nesting survey events

Field survey event	Season
June 2019	White-throated snapping turtle nesting season
September 2019	Fitzroy River turtle nesting season
December 2019	Fitzroy River turtle hatching season
June 2020	White-throated snapping turtle nesting season
October 2020	Fitzroy River turtle nesting season
December 2020	Fitzroy River turtle hatching season
April 2021	White-throated snapping turtle nesting season
June 2021	White-throated snapping turtle nesting season
July 2021	White-throated snapping turtle nesting season
August 2021	Fitzroy River turtle nesting season
October 2021	Fitzroy River turtle nesting season
January 2022	Fitzroy River turtle hatching season

Throughout the duration of the seasonal turtle nesting surveys, 46 potential turtle nesting sites have been assessed for turtle habitat suitability with 34 of these found to have confirmed evidence of turtle nesting (Table 3). Four additional sites have been assessed as having 'high', two with 'medium', and six with 'low' suitability for turtle nesting (Table 3).

Overall trends of nesting habitat suitability indicate a high level of habitat suitability for nesting across all sites demonstrated by the large increase in both the number of nests and number of eggs recorded in 2020 and 2021 compared to 2019 (Appendix A). Total number of nests recorded each year included:

- 2019 – at least 27 nests with at least 69 eggs + fragments
- 2020 – at least 130 nests with at least 417 eggs + fragments
- 2021 – at least 247 nests with at least 917 eggs + fragments.

However, predation rates were very high with 100% nest predation recorded in 2019 and 92% in 2020 (Figure 3). In 2021, 21 intact nests (8.5 % of the 247 nests recorded in 2021) were identified within 24 hours of being laid and nest protection mesh applied (Figure 4), only one nest was found to have naturally hatched in 2021 (99.6% predation rate; Figure 5). Over the course of the three years of pre-clearance survey, a total of 11 turtle nests were observed to have hatched without nest protection, leading to an overall nesting success rate off 2.7%.



Figure 3 ***Predated nests***



Figure 4 ***Intact turtle nesting – Upper Inundation area 9 (UI9) with nest protection mesh fitted (August 2021)***



Figure 5 *Hatched nest (The Pocket - P3) and nesting habitat (October 2021)*

Table 3 *Turtle nesting habitat suitability ratings from pre-clearance surveys within all study areas*

Site ID	Site name	Location	Overall rating*
F3	Foleyvale downstream	Within inundation area	Confirmed
F4	Foleyvale downstream	Within inundation area	Confirmed
F5	Foleyvale downstream	Within inundation area	Confirmed
F6	Foleyvale downstream	Within inundation area	Medium
P1	The Pocket (upstream)	Within inundation area	Confirmed
P3	The Pocket	Within inundation area	Confirmed
P4	The Pocket	Within inundation area	High
G1	Gogango mouth 1	Within inundation area	High
G2	Gogango mouth 2	Within inundation area	Confirmed
G3	Gogango mouth 3	Within inundation area	Confirmed
G4	Gogango Creek mouth	Within inundation area	Confirmed
R5	Rookwood downstream of crossing	Within inundation area	Confirmed
R6	Rookwood north of crossing	Within inundation area	Confirmed
R7	Riverslea Crossing	Within inundation area	Low
R8	Riverslea to Rookwood 1	Within inundation area	Confirmed
R9	Riverslea Riffle complex	Within inundation area	Confirmed
R10	Riverslea downstream island	Within inundation area	High
UI1	Upper Inundation Area 1	Within inundation area	Low
UI2	Upper Inundation Area 2	Within inundation area	Confirmed
UI3	Upper Inundation Area 3	Within inundation area	Confirmed
UI4	Upper Inundation Area 4	Within inundation area	Confirmed
UI5	Upper Inundation Area 5	Within inundation area	Confirmed
UI6	Upper Inundation Area 6	Within inundation area	Low
UI7	Upper Inundation Area 7	Within inundation area	Confirmed
UI8	Upper Inundation Area 8	Within inundation area	Medium

Site ID	Site name	Location	Overall rating*
UI8a	Upper Inundation Area 8a**	Within inundation area	Confirmed
UI9	Upper Inundation Area 9	Within inundation area	Confirmed
UI10	Upper Inundation Area 10	Within inundation area	Confirmed
UI11	Upper Inundation Area 11	Within inundation area	Confirmed
F1	Foleyvale Crossing	Upstream of inundation area	High
F2	Foleyvale downstream	Upstream of inundation area	Confirmed
F7	Foleyvale upstream	Upstream of inundation area	Low
F8	Foleyvale upstream	Upstream of inundation area	Confirmed
F9	Foleyvale upstream	Upstream of inundation area	Confirmed
F10	Foleyvale upstream	Upstream of inundation area	Confirmed
F11	Foleyvale upstream	Upstream of inundation area	Confirmed
H1	Hanrahan far downstream	Downstream of inundation area	Confirmed
R1	Lawries Bend	Downstream of inundation area	Confirmed
R2	Rookwood to Hanrahan Crossing	Downstream of inundation area	Confirmed
R3	Rookwood to Hanrahan Crossing	Downstream of inundation area	Low
R4	Hanrahan Crossing upstream	Downstream of inundation area	Confirmed
T1 DLB	Tartus Weir to rockbar (left bank)	Upstream on Mackenzie River	Confirmed
T1 DRB	Tartus Weir to rockbar (right bank)	Upstream on Mackenzie River	Confirmed
T2 DLB	Tartus rockbar to culvert (left bank)	Upstream on Mackenzie River	Confirmed
T2 DRB	Tartus rockbar to culvert (right bank)	Upstream on Mackenzie River	Low
T3 DLB	Tartus downstream of culvert (left bank)	Upstream on Mackenzie River	Confirmed

* Highest nesting suitability rating used from all survey events for the site

Specifically, within the Rookwood Weir inundation area, confirmed turtle nesting was recorded at 21 nesting banks. Of these, Fitzroy River turtle nesting has been confirmed present at 15 banks (Table 3 and Appendix A). An additional five sites have been identified as potential Fitzroy River turtle or Krefft's River turtle (*Emydura macquarii krefftii*). The reason for the uncertainty is that the Fitzroy River turtle and Krefft's River turtle both nest during spring and the eggs of these species overlap in size and shape. Within the range of egg overlap, viewing of hatchlings is required to distinguish between the two species. As a result, fragments of shell, predated and/or hatched eggs cannot be distinguished between these two species (refer to Figure 6). Nests were only confirmed as Fitzroy River turtle where whole egg measures could be confidently identified as this species due to their smaller size (Figure 6). Where egg measurements overlapped in size with the Krefft's River turtle, these nests were identified as potential Fitzroy River turtle or Krefft's River turtle. All other confirmed nests recorded in the inundation area were identified to another turtle species (e.g. white-throated snapping turtle, *Elseya albagula*), or were unidentified to species level.

Overall, at least 12 sites within the inundation area have recorded aggregated nesting of the Fitzroy River turtle, defined as two or more confirmed Fitzroy River turtle nests or potential Fitzroy River turtle nests (Fitzroy River turtle OR Krefft's River turtle) nests located at an individual site (Appendix A).

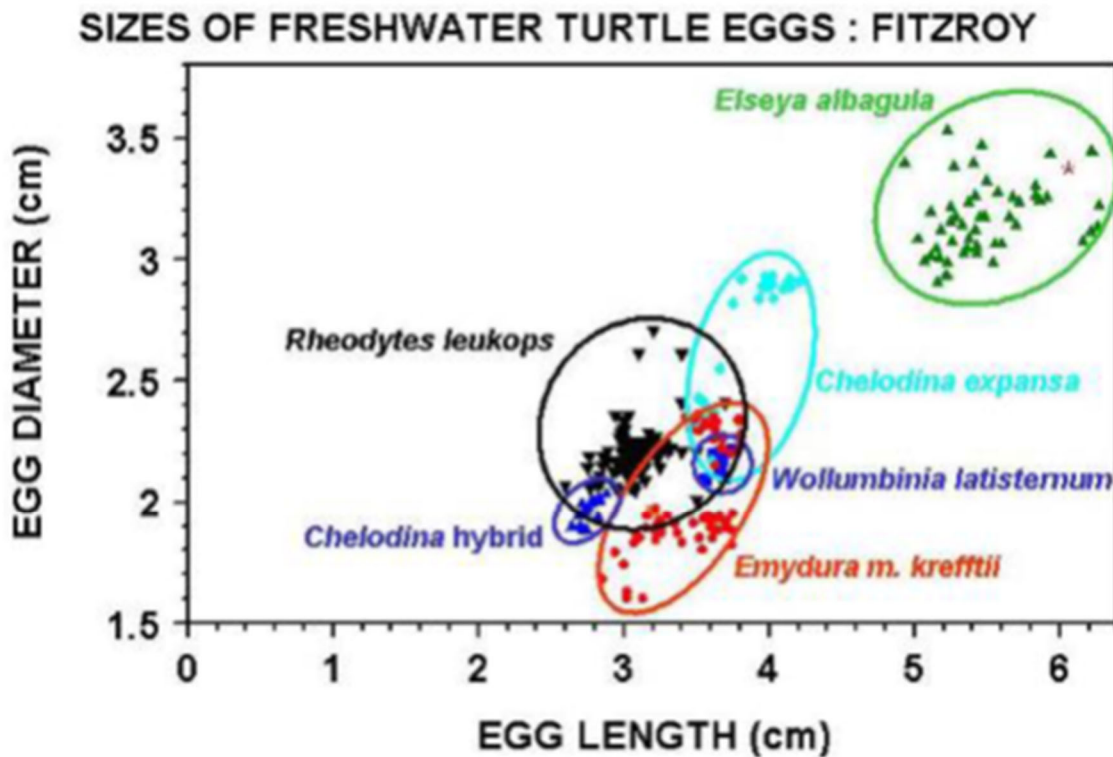


Figure 6 Freshwater river turtle egg size chart (Limpus et al., 2011a)

3.3 Predicted actual impact

In accordance with the methodology used in the EIS and AEIS, to calculate expected impacts to turtle nesting habitat, the predicted actual impact to turtle nesting habitat has been calculated based on the inundation of confirmed nesting sites within the Rookwood inundation area. This assessment identified that a total of 21 confirmed turtle nesting sites (16 of these known to support Fitzroy River turtle nesting) are located within the inundation area of Rookwood Weir and that at a Weir crest height of RL 46.2 m ADH, sufficient nesting habitat will remain above full supply level (FSL) at almost all sites (refer to Table 4 and Appendix A). Specifically:

- No impact from inundation is expected at 11 of the 21 nesting sites located within the inundation area.
- Eight sites are predicted to be partially inundated with sufficient nesting habitat remaining above full supply level to avoid impacts to turtle nesting. The largest area of impact to confirmed nesting habitat is expected to occur immediately upstream of the Weir site at R5 and R6, however, due to the large size of these sand banks, sufficient habitat is predicted to remain above FSL.
- Only two sites, (a total area of 1.22 ha), are expected to be lost within the Rookwood Weir inundation area.

Table 4 Extent of impact to confirmed turtle nesting habitat within Rookwood inundation area at 46.2 m FSL

Site ID	Site	Species	Inundation impact area (ha)	Extent of inundation
F3	Foleyvale downstream	Fitzroy River turtle / white-throated snapping turtle	0	No impact, 100% of nesting habitat remains above FSL
F4	Foleyvale downstream	Fitzroy River turtle	0	No impact, 100% of nesting habitat remains above FSL
F5	Foleyvale downstream	Unknown	0	No impact, 100% of nesting habitat remains above FSL
P1	The Pocket (upstream)	Fitzroy River turtle / white-throated	0	No impact, 100% of nesting habitat remains above FSL

Site ID	Site	Species	Inundation impact area (ha)	Extent of inundation
		snapping turtle		
P3	The Pocket	Fitzroy River turtle	Partial inundation (0.08 ha)	No impact - sufficient habitat remains above FSL, refer to Appendix B
G2	Gogango mouth 2	Fitzroy River turtle	0	No impact, 100% of nesting habitat remains above FSL
G3	Gogango mouth 3	White-throated snapping turtle	0	No impact, 100% of nesting habitat remains above FSL
G4	Gogango Creek mouth	Fitzroy River turtle	0	No impact, 100% of nesting habitat remains above FSL
R5	Rookwood downstream of crossing	Fitzroy River turtle / white-throated snapping	Partial inundation (2.24 ha)	No impact - sufficient habitat remains above FSL, refer to Appendix B
R6	Rookwood north of crossing	Unknown	Partial inundation (1.17 ha)	No impact - sufficient habitat remains above FSL, refer to Appendix B
R8	Riverslea to Rookwood 1	Fitzroy River turtle / white-throated snapping turtle	Partial inundation (0.04 + 0.06 + 0.01 = 0.11 ha)	No impact - sufficient habitat remains above FSL, refer to Appendix B
R9	Riverslea Riffle complex	Unknown	0	No impact, 100% of nesting habitat remains above FSL
UI2	Upper Inundation Area 2	Fitzroy River turtle	Partial inundation (0.22 ha)	No impact - sufficient habitat remains above FSL, refer to Appendix B
UI3	Upper Inundation Area 3	Fitzroy River turtle / white-throated snapping turtle	Partial inundation (0.22 + 0.16 = 0.38 ha)	No impact - sufficient habitat remains above FSL, refer to Appendix B
UI4	Upper Inundation Area 4	Fitzroy River turtle	0	No impact, 100% of nesting habitat remains above FSL
UI5	Upper Inundation Area 5	Unknown	Partial inundation (0.21 + 0.80 = 1.01 ha)	1.01 ha of lost nesting habitat, refer to Appendix B
UI7	Upper Inundation Area 7	Fitzroy River turtle / white-throated snapping turtle	0	No impact, 100% of nesting habitat remains above FSL
UI8	Upper Inundation Area 8	Fitzroy River turtle	Partial inundation (0.21 ha)	0.21 ha of lost nesting habitat, refer to Appendix B
UI9	Upper Inundation Area 9	Fitzroy River turtle	Partial inundation (0.04 + 0.06 = 0.10 ha)	No impact - sufficient habitat remains above FSL, refer to Appendix B
UI10	Upper Inundation Area 10	Fitzroy River turtle / white-throated snapping turtle	0	No impact, 100% of nesting habitat remains above FSL
UI11	Upper Inundation Area 11	Fitzroy River turtle / white-throated snapping turtle	0	No impact, 100% of nesting habitat remains above FSL

4. Nest Protection Management Plan

4.1 Conservation outcomes

This Nest Protection Management Plan will be implemented to specifically target the key threatening processes of high nest predation and low population recruitment. The key management objective, as defined in the Operations SMP, is the enhancement of Fitzroy River turtle nesting habitat, protection of turtle nests and increased recruitment of hatchlings into the population. The conservation outcomes and performance criteria of the Nest Protection Management Plan are detailed in Table 5.

Whilst this management plan been designed to specifically target the Fitzroy River turtle, the management actions proposed will provide a broad scale benefit to other turtle species and habitats.

Table 5 Management objectives and performance criteria

Conservation outcomes		Performance criteria
Maintenance of functional turtle nesting habitat	Nesting habitat suitability	Suitable nesting habitat present within, upstream and/or downstream of Rookwood Weir as defined by the presence of high suitability, confirmed and/or functional nesting banks
	Nesting activity	Confirmed turtle nesting occurring at one or more Priority Nest Protection Area within, upstream and/or downstream of Rookwood Weir
Reduction in nest predation	Predator control	Successful implementation (>95%) of planned predator control measures/ annual reduction in predator abundance within target area.
	Predator activity	80% reduction in evidence of predator activity at Priority Turtle Nest Protection Areas
	Nest predation rate	90% reduction in predation of turtle nests within Priority Nest Protection Areas compared to pre-offset success.
Increased recruitment of hatchlings into the population	Hatchling recruitment	90% increase in recruitment of hatchlings into the population compared to pre-offset success

Commonwealth and State Government recommended conservation actions for the Fitzroy River turtle are described in:

- Approved Conservation Advice for *Rheodytes leukops* (Fitzroy Tortoise) (Commonwealth of Australia, 2008)
- The biology and management strategies for freshwater turtles in the Fitzroy Catchment, with particular emphasis on the *Rheodytes leukops* and *Elseya albagula* (Limpus *et al.*, 2011a)

The approved conservation advice and management plan address threats that impact on the population dynamics, habitats, and sustainability of the Fitzroy River turtle across the river system as a whole.

The conservation outcomes and performance criteria for this Nest Protection Management Plan, as described in Table 5, align with the management strategies of the Commonwealth and State Government recommended conservation actions. The Commonwealth and State Government management strategies that will be supported through implementation of this Nest Protection Management Plan are highlighted in bold in Table 6.

Table 6 Commonwealth and State Government conservation management strategies for the Fitzroy River turtle

Relevant conservation advice and plans	Commonwealth and State Government management strategies
<p>Approved Conservation Advice for <i>Rheodytes leukops</i> (Fitzroy Tortoise) (Commonwealth of Australia, 2008)</p>	<p>Regional Priority Actions</p> <ul style="list-style-type: none"> – Identify populations of high conservation priority – Protect areas of riparian habitat where populations of <i>Rheodytes leukops</i> are known or have the potential to occur – Ensure mining operations and other infrastructure or development activities in areas where <i>Rheodytes leukops</i> occurs do not impact on known populations – Manage, in such a manner that there is no detrimental impact, any changes to hydrology that may result in changes to the water table levels, increased run-off, sedimentation or pollution, particularly from cotton/grazing production – Investigate formal conservation arrangements such as the use of covenants, conservation agreements or inclusion in reserve tenure – Develop and implement a stock management plan along riparian habitats and travelling stock routes – Develop a management plan to be implemented for the control and eradication of foxes, pigs, dingoes and cats around breeding colonies of the Fitzroy River turtle – Raise awareness of <i>Rheodytes leukops</i> within the local community, particularly with boat owners to minimise boat strike – Improve recruitment of hatchlings into the population – Maintain stream flow and the continuity of turtle populations between impoundments. <p>Local Priority Actions</p> <ul style="list-style-type: none"> – Monitor known populations to identify key threats – Monitor the progress of recovery, including the effectiveness of management actions and the need to adapt them if necessary – Control access routes to suitably constrain public access to known sites on public land – Suitably control and manage access to nest sites on private land – Adequately consider the requirements and protection of this species in all proposals for impoundment developments – Minimise adverse impacts from land use at known sites – Protect populations of <i>Rheodytes leukops</i> through the development of conservation agreements and/or covenants – Maintain nesting banks used by the turtles and protect turtle nests from predation and disturbance – Improve water quality in the lower Fitzroy River catchment – Prevent trampling and riparian habitat damage by grazing animals at known sites on leased crown land through exclusion fencing or other barriers – Manage threats at known sites in reserve areas to control pigs, foxes and cats – Develop <i>ex situ</i> breeding population – Evaluate the efficacy of removing eggs from the wild, hatching them in artificial sites, and returning hatchlings to the wild.
<p>The biology and management strategies for freshwater turtles in the Fitzroy Catchment, with particular emphasis on <i>Rheodytes leukops</i> and <i>Elseya albagula</i> (Limpus <i>et al.</i>, 2011a)</p>	<ul style="list-style-type: none"> – Improve recruitment of hatchlings into the population – Maintain functional turtle nesting banks throughout the catchment – Maintain stream flow and high quality in-river habitat between impoundments

Relevant conservation advice and plans	Commonwealth and State Government management strategies
	<ul style="list-style-type: none"> – Maintain continuity of turtle populations throughout the catchment – Reduce the incidence of death and physical injury of turtles at existing and future impoundment structures – Manage recreational fishing and boating activities in impoundments to be compatible with maintenance of sustainable turtle populations and reduce unnecessary injury to turtles – Improve water quality within the Lower Fitzroy catchment – Increase the area of river and adjacent riverine habitat managed for conservation purposes – Increase stake-holder participation in conservation and management processes – Monitor the response of turtle populations in the Fitzroy Catchment to the management strategies and evaluate the effectiveness of these strategies.
Bold highlighting indicates management strategies that will be supported through implementation of this Nest Protection Management Plan	

4.2 Timeline

In accordance with EPBC Act Approval Condition 5, the Nest Protection Management Plan will be implemented until the outcomes of the offset management plan are achieved. In accordance with the EPBC Act approval conditions, the Nest Protection Management Plan will be implemented for five years. This aligns with the Offset proposal developed for the EIS which identifies five years until ecological benefit for the Fitzroy River turtle can be achieved.

The Nest Protection Management Plan will be implemented annually for five years with management actions conducted during the following seasons:

- Pre-nesting season – June - July
- Nesting season – August to December
- Hatching season – September to January.

The specific management actions that will be implemented during each season are detailed in the management plan provided in Section 4.6.

4.3 Responsible persons

All Sunwater staff and contractors associated with the Project are required to abide by the *Environmental Protection Act 1994*, EPBC Act and NC Act and comply with all procedures outlined in this Nest Protection Management Plan. Persons involved with the Project must not carry out any activities that may cause, or is likely to cause, environmental harm unless the person(s) involved take all reasonable and practicable measures to prevent or minimise harm (the General Environmental Duty). Parties who have active roles in the Nest Protection Management Plan are outlined in Table 7.

Table 7 Roles and responsibilities of personnel associated with the Nest Protection Management Plan

Role	Responsibilities
Sunwater Operations General Manager	<ul style="list-style-type: none"> – Operate Rookwood Weir in compliance with all legal requirements including approval conditions relating to the Fitzroy River turtle. – Allocate adequate resources and staff to allow effective implementation of the Nest Protection Management Plan. – Reporting environmental incidents to the Department of Environment and Science and Federal Minister for Environment where required.
Sunwater Operations Environmental Manager	<ul style="list-style-type: none"> – Coordinate and oversee implementation of the Nest Protection Management Plan. – Engage Turtle Movement Study Team, Nest Protection Team, Predator Control Contractor/s and any other sub-contractors as required to implement the Operation SMP.

Role	Responsibilities
	<ul style="list-style-type: none"> – Inform all operational staff, Nest Protection Team, Predator Control Contractor/s and any other sub-contractors of their obligations under the Operation SMP. – Coordinate and oversee annual Nest Protection Management Plan Report and assessment of success of actions against performance criteria and against for each conservation outcome. – Coordinate and oversee completion of Animal Breeding Register. – Monitor, manage and report on corrective actions required to meet the performance criteria. – Coordinate and oversee annual meeting with DES and DCCEWW to discuss annual report. – Reporting environmental incidents to the Sunwater Operational Manager for action.
Nest Protection Team	<ul style="list-style-type: none"> – Obtaining any licences and permits required to implement the Nest Protection Management Plan (e.g. high risk SMP under NC Act; animal ethics permit, rehabilitation permit). – Implement relevant management actions as per Nest Protection Management Plan. – Record details of management actions implemented, and data collected. – Support completion of Annual Nest Protection Management Plan Report and Animal Breeding Register. – Support annual monitoring and evaluation of Nest Protection Management Plan against performance criteria measures of success for each conservation outcome. – Attend annual meeting with DES and DCCEWW, where required.
Predator Control Contractors	<ul style="list-style-type: none"> – Obtaining any licences and permits required to undertake predator control. – Implement broad-scale predator control management actions as per Turtle Habitat Enhancement Program: Extended Feral Pest Animal Management Plan (Earthtrade 2022b). – Record details of management actions implemented, and data collected.

4.4 Management actions

4.4.1 Priority Nest Protection Areas

Each nesting season, Priority Nest Protection Areas will be identified based on previously confirmed turtle nesting sites, nesting habitat suitability, access requirements, landholder agreements and suitability/condition of the site for nesting. The Priority Nest Protection Areas will be located within one or more of the following regions:

- Inundation area
- Upstream of the inundation area to the terrestrial offset area at Foleyvale Crossing, and/or
- Downstream of the Weir to Hanrahan Crossing.

The specific location/s of the Priority Nest Protection Areas within these regions are expected to change over the five years that the Nest Protection Plan is implemented. Initial Priority Nest Protection Areas will be established following first filling of the impoundment as well as any flooding events that occur. These initial areas are expected to align with confirmed aggregated nesting areas identified during pre-clearance surveys (refer to Section 3.2). Throughout the five years of the Nest Protection Plan, the condition, suitability, and use of these areas by turtles for nesting will be monitored and alternative Priority Nest Protection Areas identified and established based on natural and/or Project-related fluctuations in habitat suitability and actual use by turtles for nesting. These factors will also influence the number and size of Priority Nest Protection Areas established annually.

A description of the Priority Nest Protection Areas will be recorded at the start of the nesting season as per the Pre-nesting Season Data Sheet provided in Appendix C. The following parameters will be recorded:

- Location

- Photographs of area (north, south, east and west at 50 m intervals along bank).
- Bank height, length, and width.
- Average bank slope: vertical (89–90°); steep (60–80°); moderate (30–60°); low (10–30°) and flat (<10°).
- Average bank composition: percent of cobble/pebble; gravel; coarse sand; fine sand; and silt/clay.
- Riparian canopy vegetation cover including ground cover, scrub, canopy cover: none (none); little (1–10%); some (10–50%); moderate (50–75%) and extensive (>75%).
- Weed density overall; little (1–10%); some (10–50%); moderate (50–75%) and extensive (>75%).
- Weed density per species; little (1–10%); some (10–50%); moderate (50–75%) and extensive (>75%).
- Evidence of predator activity: little (1–10%); some (10–25%); moderate (25–50%) and extensive (>50%).
- Cattle disturbance: little (1–10%); some (10–25%); moderate (25–50%) and extensive (>50%).
- Pig disturbance: little (1–10%); some (10–25%); moderate (25–50%) and extensive (>50%).
- Flow level: none (isolated pools); low (<watermark); moderate (=watermark); high (>watermark); flood.
- Habitats adjacent: deep pool (>0.5 m); shallow pool (<0.5 m); run; riffle.

4.4.2 Habitat protection

The condition and nesting habitat suitability of the Priority Nest Protection Areas will be restored annually, prior (June/July) to the nesting season of the Fitzroy River turtle, by undertaking the following specific management actions:

- Installing electric fence (e.g., 150 m perimeter fence) around the Priority Nesting Protection Areas to protect against predators and exclude other forms of potential nest disturbance such as cattle and/or vehicles.
- Removing/controlling terrestrial and aquatic weeds, where required, from within the Priority Nesting Protection Areas to facilitate turtle access to the area for nesting. Weed control activities shall comply with general biosecurity and Sunwater's weed management procedures, as outlined in the Sunwater Operational Environmental Management Plan.

The location and type of activities conducted at Priority Nest Protection Areas will be documented as per the Pre-nesting Season Data Sheet provided in Appendix C.

4.4.3 Broad-scale predator control

Predator control will be undertaken for feral animals that occur at Priority Nest Protection Areas. Feral pest animal management area and the specific management actions that will be undertaken in managing and reducing the impacts of feral predators on turtle nesting sites are detailed in the Turtle Habitat Enhancement Program: Extended Feral Pest Animal Management Plan. Activities in Priority Control Areas (PCAs) will be identified annually based on levels of activity and type of predators recorded during the pre-nesting season surveys. The PCAs will concentrate on high and medium priority nesting sites and the adjoining areas containing lacustrine, palustrine and/or riverine wetland areas up to one kilometre either side of the high bank of the river, within the one-kilometre buffer zone either side of the centreline of the Fitzroy, Mackenzie and Dawson Rivers between Hanrahan Crossing and the northern boundary of Foleyvale. Activities will occur where access is permitted. The timing of the feral animals' management activities will be design around the nesting and hatching seasons of the Fitzroy River turtle.

Feral pest animal control measures will include culling (aerial and ground shooting), baiting, trapping of pigs, foxes, and wild dogs. The location and type of predator control activities planned and implemented will be documented as per the Predator Control Data Sheet within the Turtle Habitat Enhancement Program: Extended Feral Pest Animal Management Plan. The monitoring of pest animal activity pre- and post-control operations will be undertaken using camera traps, and the recorded feral

pest animal activity will be reported annually. This annual report, together with the findings of the Turtle Nest Protection Management reports, will determine future control methodology and effort as well as the duration of management/contingency program to be put in place.

4.4.4 Nest protection

Priority Nest Protection Areas will be monitored regularly (indicative frequency of three times per week) during the peak nesting season (August to December) for the purposes of identifying and protecting individual nests. Nesting is triggered by rainfall and monitoring will occur during and/or immediately following events.

Priority Nest Protection Areas will be examined for signs of nesting and predator activity (which included the presence of turtle tracks, diggings, nests and predated eggshells) using a single strip transect parallel to the water's edge, as per the standard methodology of Limpus *et al.*, 2011a. Transects will vary in length and width according to bank morphology and will cover all potentially suitable nesting habitat within the Priority Nest Protection Areas. Any evidence of turtle nesting and predator activity will be recorded as per Nesting Season Data Sheet in Appendix D will be photographed, and the GPS location recorded. If nests are detected, the following information will be recorded:

- Date
- GPS location of nest
- Weather conditions
- Survey team members
- Photographs of nesting bank, nest, and eggs or predated eggshell
- Distance of nest from water (m) and height above the water's surface (m)
- Flow level
- Habitats adjacent
- Bank slope, ground cover, riparian vegetation cover and weed density as per nesting bank characterisation ratings above
- Distance to first egg (m)
- Egg diameter (cm) and egg length (cm)
- Number of eggs within nest
- Nesting evidence and species where possible
- Cattle activity
- Evidence of predator activity as a percentage of bank disturbance overall, on upper bank, mid bank and lower bank
- Number of predated eggs observed (if relevant).

Nest protection cages will be installed, where possible and safe to do so, within 24 hours of nests being laid to minimise predation. Cages will be installed over nests *in-situ* or individual nests relocated to a communal protection cage/s located within the Priority Nest Protection Areas, as per DES methodology. Protected nests located within Priority Nest Protection Areas will be relocated to an alternative suitable nesting site if they are at risk of inundation from changes in impoundment levels and/or flooding.

Handling and relocation of eggs will occur in accordance with animal ethics and relocation permits/approvals to minimise risk of embryo dislocation and other risks to egg viability.

Results of each nesting survey undertaken, details of nests detected, and nest protection activities implemented will be documented as per the Nesting Season Data Sheet provided in Appendix D.

4.4.5 Hatching success

The hatching success of individual nests protected will be recorded throughout the hatching season (September to December). Monitoring may include the use of remote cameras to record emergence of hatchlings and/or the physical excavation of the nests to the top of the first egg to check for evidence

of hatching. Physical excavation of hatched nests will be conducted by a field team member based on the timing and abundance of nests laid during the nesting season with hatching success monitoring conducted within two weeks of the expected date of hatching of each nest.

For those nests that have hatched, the number of eggs from which the hatchlings have successfully emerged will be recorded and compared to the total number of eggs laid. Predated eggshell and evidence of predators (e.g., tracks and scats) will also be recorded and photographed as per the Hatching Season Data Sheet provided in Appendix E. Nests that have not hatched at the time of survey will be covered over and reassessed during subsequent monitoring.

At the end of the hatching success monitoring, predator protection cages and electric fencing will be removed prior to wet season flow events.

4.4.6 Population monitoring

Monitoring of the turtle population within, upstream and downstream of Rookwood Weir will be implemented for the first five years of Project operation in accordance with the operational monitoring plan (Rookwood Weir Operation SMP). Surveys will be conducted twice per year during optimal turtle capture conditions. Locations selected for the turtle population surveys will include within the vicinity of the Priority Nest Protection Areas. Standardised turtle capture surveys will be undertaken and may include the use of fyke nets, cathedrals traps, seine nets and/or snorkelling. Turtles captured will be measured and tagged with passive integrated transponder tags, numbered monel metal foot tags and carapace notched. Acoustic tags may also be deployed on captured turtles if required to support the Rookwood Weir Turtle Movement Study. Parameters recorded will include morphometric measurements, age and sexual maturity, reproductive biology and evidence of injury, mortality, and disease.

The results of the population monitoring will provide information on the abundance and population dynamics of the Fitzroy River turtle within the vicinity of the Priority Nest Protection Areas. Continuous monitoring of turtle movement behaviour as part of the Turtle Movement Study will also provide evidence of breeding migrations and will identify potential locations of nesting activity.

The Rookwood Weir Operation SMP will be reviewed after five years and ongoing management requirements identified for incorporation into Weir operational plans and/or this Nest Protection Management Plan, as considered necessary and applicable (in collaboration with DES and the Department of Climate Change, Energy, the Environment and Water (DCCEEW)). The results of the Rookwood Weir Operation SMP and the Turtle Movement Study may provide causative evidence for the success or failure of this Nest Protection Management Plan, as determined through the assessment of performance criteria for conservation outcomes (Section 4.5). For example, low nesting activity within a particular area may be the cause of low population abundance rather than absence of suitable nesting habitat.

4.5 Management plan

The management plan proposed to achieve the conservation outcomes (as identified in Section 4.1) are detailed in Table 8.

Table 8 Nest Protection Management Plan

ID	Management action	Timing	Location	Responsible persons
1	Identification and management of Priority Nest Protection Areas			
1a	<p>Each nesting season, Priority Nest Protection Areas will be identified based on previously confirmed turtle nesting sites, nesting habitat suitability, access requirements, landholder agreements and suitability/condition of the site for nesting</p> <p>Initial Priority Nest Protection Areas to be established following first filling of the impoundment as well as any flooding events that occur, are expected to align with confirmed aggregated nesting areas identified during pre-clearance surveys (refer to Section 3.2).</p> <p>The condition, suitability and use of these areas by turtles for nesting will be monitored and alternative Priority Nest Protection Areas identified and established based on natural and/or Project-related fluctuations in habitat suitability and actual use by turtles for nesting.</p>	Annually during pre-nesting season (June - July)	Within Rookwood Weir impoundment and/or Upstream of impoundment to Foleyvale Crossing and/or Downstream of Rookwood Weir to Hanrahan Crossing.	Sunwater Operations Environment Manager
1b	<p>A description of the Priority Nest Protection Areas will be recorded at the start of the nesting season as per Pre-nesting Season Data Sheet provided in Appendix C.</p>			
2	Habitat protection			
2a	<p>The condition and nesting habitat suitability of the Priority Nest Protection Areas will be restored by undertaking the specific management actions (below), prior to the nesting season of the Fitzroy River turtle. Specific management actions will include:</p> <ul style="list-style-type: none">– Installing electric fence (e.g. 150 m perimeter fence) around the Priority Nesting Protection Areas to protect against predators and exclude other forms of potential nest disturbance such as cattle and/or vehicles.	Annually during pre-nesting season (June - July)	Within Priority Nest Protection Areas	Turtle Nest Protection Team
2b	<ul style="list-style-type: none">– Removing/controlling terrestrial and aquatic weeds, where required, from within the Priority Nesting Protection Areas to facilitate turtle access to the area for nesting. Weed control activities shall comply with general biosecurity and Sunwater’s weed management procedures, as outlined in the Sunwater Operational Environmental Management Plan.			
2c	<p>The location and type of activities conducted at Priority Nest Protection Areas will be documented as per the Pre-nesting Season Data Sheet provided in Appendix C.</p>			
3	Broad-scale predator control			

ID	Management action	Timing	Location	Responsible persons
3a	Predator control will be undertaken for predators that occur at Priority Nest Protection Areas. Activities will be identified annually based on levels of activity and type of predators recorded during the pre-nesting season. Activities may include culling, baiting, trapping of pigs, foxes, wild dogs.	Annually during pre-nesting, nesting and hatching seasons as required for specific control methods	Within and adjacent to Priority Nest Protection Areas	Predator Control Contractor
3b	The location and type of predator control activities planned and implemented will be documented as per the Predator Control Data Sheet within the Turtle Habitat Enhancement Program: Extended Feral Pest Animal Management Plan.			
4	Nest protection			
4a	Priority Nest Protection Areas will be monitored regularly during the peak nesting season for the purposes of identifying and protecting individual nests. Priority Nest Protection Areas will be examined for signs of nesting (which included the presence of turtle tracks, diggings, nests and predated eggshells) using a single strip transect parallel to the water's edge, as per the standard methodology of Limpus et al., 2011a. Transects will vary in length and width according to bank morphology and will cover all potentially suitably nesting habitat within the Priority Nest Protection Areas.	Regular monitoring (indicative frequency of three times per week) during nesting season (August to December) Monitoring to occur during and immediately prior to rainfall events during nesting season.	Within Priority Nest Protection Areas	Turtle Nest Protection Team
4b	If nests are detected, the following information will be recorded: <ul style="list-style-type: none">– GPS location of nest.– Photographs of nesting bank, nest, egg or predated eggshell.– Distance of nest from water (m) and height above the water's surface (m).– Bank slope, ground cover and riparian vegetation cover as per ratings nesting bank characterisation ratings above.– Distance to first egg (m).– Egg diameter (cm) and egg length (cm).– Number of eggs within nest.– Species of nest.– Evidence of predator activity.– Number of predated eggs observed (if relevant).	Upon identification of confirmed turtle nest		
4c	Nest protection cages will be installed within 24 hours of nests being laid, where safe to do so, to minimise predation. Cages will be installed over nests <i>in-situ</i> or individual nests relocated to a communal protection cage/s located within the Priority Nest Protection Areas, as per DES methodology. Handling and relocation of eggs will occur in accordance			

ID	Management action	Timing	Location	Responsible persons
	with animal ethics permit approvals to minimise risk of embryo dislocation and other risks to egg viability.			
4d	Protected nests located within Priority Nest Protection Areas will be relocated to an alternative suitable nesting site if they are at risk of inundation from changes in impoundment levels and/or flooding.	In the event that protected nests are at risk of inundation from changes in impoundment levels and/or flooding		
4e	Results of each nesting survey undertaken, details of nests detected, and nest protection activities implemented will be documented as per the Nesting Season Data Sheet provided in Appendix D.	During each monitoring event		
5	Hatching success			
5a	The hatching success of individual nests protected will be recorded throughout the hatching season. Monitoring may include the use of remote cameras to record emergence of hatchlings and/or the physical excavated of the nests to the top of the first egg to check for evidence of hatching. At the end of the hatching success monitoring, predator protection cages and electric fencing will be removed prior to wet season flow events.	Throughout hatching season (September to January) Physical excavation of hatched nests will be conducted based on the timing and abundance of nests laid during the nesting season with hatching success monitoring conducted within two weeks of the expected date of hatching of each nest.	Within Priority Nest Protection Areas	Turtle Nest Protection Team
5b	For those nests that have hatched, the number of eggs from which the hatchlings have successfully emerged will be recorded and compared to the total number of eggs laid. Predated eggshell and evidence of predators (e.g. tracks and scats) will also be recorded Hatching Season Data Sheet provided in Appendix E. Nests that have not hatched at the time of survey will be covered over and reassessed during subsequent monitoring.			
5c	At the end of the hatching success monitoring, predator protection cages and electric fencing will be removed prior to wet season flow events.			
6	Population monitoring			
6a	Monitoring of the turtle population within, upstream and downstream of Rookwood Weir will be implemented for the first five years of Project operation in accordance with Rookwood Weir Operation SMP. Surveys will be conducted twice per year during optimal turtle capture conditions. Locations selected for the turtle population surveys will include within the vicinity of the Priority Nest Protection Areas. Standardised turtle capture surveys will be undertaken and may include the use of fyke nets, cathedrals traps, seine nets and/or snorkelling.	Twice per year during optimal turtle capture conditions as part of Operational SMP	Within vicinity of Priority Nest Protection Areas.	Sunwater Operations Environment Manager

ID	Management action	Timing	Location	Responsible persons
	<p>Turtles captured will be measured and tagged with passive integrated transponder tags, numbered monel metal foot tags and carapace notched. Acoustic tags may also be deployed on captured turtles if required to support the Rookwood Weir Turtle Movement Study.</p> <p>Parameters recorded will include morphometric measurements, age and sexual maturity, reproductive biology and evidence of injury, mortality and disease.</p>			
6b	The Rookwood Weir Operation SMP will be reviewed after five years and ongoing management requirements identified for incorporation into Weir operational plans and/or this Nest Protection Management Plan, as considered necessary and applicable (in collaboration with DES and DCCEEW).	After 5 years of Project operation	NA	Sunwater Operations Environment Manager

4.6 Monitoring and contingency

The success of the Nest Protection Management Plan will be evaluated annually against the performance criteria for each conservation outcome. The suitability of the management actions will be assessed and the requirement for adaptive management identified in light of new information and developments in technology.

Data collected throughout the pre-nesting, nesting, and hatching seasons will be analysed in accordance with the following performance criteria to provide an assessment of compliance with conservation outcomes.

4.6.1 Nest habitat suitability

Measure of success: Suitable nesting habitat present within, upstream and/or downstream of Rookwood Weir as defined by the presence of high suitability, confirmed and /or functional nesting banks.

Evaluation methodology: Based on the description of the Priority Turtle Nest Protection Areas as recorded during/prior to the nesting season (refer to Section 4.4.1) and results of nest protection and hatching success monitoring (refer to Sections 4.4.4 and 4.4.5, respectively), a nesting habitat suitability rating will be assigned for each Priority Turtle Nest Protection Area based on the following categories:

- Low – riverbank with a relatively low gradient slope; and/or predominantly unsuitable substrate (e.g., Gravel); and/or high density of ground/scrub layer vegetation cover; and/or high density of weed species; and/or high density of predator activity.
- Medium – riverbank with a relatively medium to steep slope; predominantly sand/loam substrate; and/or medium ground/scrub layer vegetation cover; and/or medium density of weed species; and/or medium density of predator activity.
- High – riverbank with a relatively steep slope; sand/loam substrate; and/or low ground/scrub layer vegetation cover; and/or low abundance of terrestrial/aquatic weed species; and/or low abundance of predators.
- Confirmed – riverbank in which direct evidence of turtle nesting (e.g., turtle nest or predated eggshell) is observed.
- Functional – riverbank where turtle nests successfully hatch leading to recruitment of hatchlings into the population.

Nesting habitat suitability ratings will be assessed to identify if suitable nesting habitat is present within, upstream and/or downstream of Rookwood Weir, as defined by the presence of high suitability, confirmed and/or functional nesting banks.

4.6.2 Nesting activity

Measure of success: Confirmed turtle nesting occurring at one or more Priority Nest Protection Areas within, upstream and/or downstream of Rookwood Weir

Evaluation methodology: Nesting activity including presence/absence of confirmed turtle nesting banks (as defined in Section 4.6.1), number of confirmed turtle nests laid, and distribution of nesting activity (i.e., number of separate nesting banks and location in relation to Rookwood Weir). Measure of success will be determined based on results of nest protection and hatching success monitoring (refer to Sections 4.4.4).

4.6.3 Predator control

Measure of success: Successful implementation (>95%) of planned predator control measures each year achieving.

Evaluation methodology: Actual predator control measures implemented will be identified and compared to planned activities. Total numbers of predators removed from the population will be calculated based on number of success culling, trapping and estimates of success based on baiting.

4.6.4 Predator activity

Measure of success: 80% reduction in evidence of predator activity at Priority Nest Protection Areas.

Evaluation methodology: Evidence of predator activity within Priority Nest Protection Areas throughout the turtle nesting season will be recorded during nest protection monitoring (refer to Section 4.4.4) and compared to levels of predator activity recorded prior to the nesting season (refer to Section 4.4.1).

4.6.5 Nest predation rate

Measure of success: 90% reduction in predation of turtle nests compared to pre-offset success.

Evaluation methodology: Nest predation rates within the Priority Nest Protection Areas, as defined by the number of nests wholly or partially predated, will be determined throughout the nesting season (refer to Sections 4.4.4 and 4.4.5). The percentage of nests predated within Priority Nest Protection Areas will be compared to the percentage of nest predation recorded during pre-clearance surveys prior to Weir operation. The percentage of nest predation recorded prior to Weir operation to be defined following completion of final pre-clearance surveys in 2022.

4.6.6 Hatchling recruitment

Measure of success: 90% increase in hatching success and recruitment of hatchlings into the population compared to pre-offset success.

Evaluation methodology: Hatching success of nests laid within the Priority Nest Protection Areas and recruitment of hatchlings into the population, as defined by number nests that wholly or partially hatch and the percentage of successful hatchings within each nest, will be determined throughout the nesting season (as defined in Section 4.4.5). Hatching success and recruitment into the population within Priority Nest Protection Areas will be compared to success recorded during pre-clearance surveys prior to Weir operation. The percentage of hatching success and recruitment into the population recorded prior to Weir operation to be defined following completion of final pre-clearance surveys in 2022.

4.6.7 Contingency program

In accordance with the process detailed in Section 6.2 of Rookwood Weir Operations Species Management Plan, in the event that the performance criteria of the Nest Protection Management Plan are not met, as determined through compliance with the measures of success for each performance criteria, corrective actions will be implemented as per the triggers outlined in Table 9.

Table 9 *Nest Protection Management Plan performance criteria monitoring and contingency program*

Performance criteria	Type of monitoring	Frequency	Monitoring methodology and timing	Contingency program
1. Suitable nesting habitat present within, upstream and/or downstream of Rookwood Weir as defined by the presence of high suitability, confirmed and /or functional nesting banks.	Identification and monitoring of Priority Nest Protection Areas.	Nesting habitat suitability assessed annually during pre-nesting season (June to July) for duration of Nest Protection Management Plans Nesting activity within Priority Nest Protection Areas monitored regularly (indicative frequency of three times per week) during the peak nesting season (August to December).	Based on the description of the Priority Turtle Nest Protection Areas as recorded during/prior to the nesting season and results of nest protection and hatching success monitoring (as per methodology within Nest Protection Management Plans), a nesting habitat suitability rating will be assigned for each Priority Turtle Nest Protection Area based on the following categories: <ul style="list-style-type: none"> – Low – riverbank with a relatively low gradient slope; and/or predominantly unsuitable substrate (e.g. Gravel); and/or high density of ground/scrub layer vegetation cover; and/or high density of weed species; and/or high density of predator activity. – Medium – riverbank with a relatively medium to steep slope; predominantly sand/loam substrate; and/or medium ground/scrub layer vegetation cover; and/or medium density of weed species; and/or medium density of predator activity. – High – riverbank with a relatively steep slope; sand/loam substrate; and/or low ground/scrub layer vegetation cover; and/or low abundance of terrestrial/aquatic weed species; and/or low abundance of predators. – Confirmed – riverbank in which direct evidence of turtle nesting (e.g., turtle nest or predated eggshell) is observed. Functional – riverbank where turtle nests successfully hatch leading to recruitment of hatchlings into the population. Nesting habitat suitability ratings will be assessed to identify if suitable nesting habitat	If no high suitability, confirmed and /or functional nesting banks are found within, upstream or downstream of Rookwood Weir, corrective actions will be developed and implemented. Options may include: <ul style="list-style-type: none"> – Implement additional restoration and rehabilitation works within Priority Nest Protection Areas to achieve high suitability nesting habitat. – Restoration and rehabilitation works may include additional predator and weed control, removal of debris from riverbank and/or further exclusion of vehicle/people/cattle. – Where a change in bank conditions reduces nesting habitat suitability throughout the nesting season (e.g. following flood event), an alternative Priority Nest Protection Areas may be selected.

Performance criteria	Type of monitoring	Frequency	Monitoring methodology and timing	Contingency program
			is present within, upstream and/or downstream of Rookwood Weir, as defined by the presence of high suitability, confirmed and/or functional nesting banks.	
2. Confirmed turtle nesting occurring at one or more Priority Nest Protection Area/ within, upstream and/or downstream of Rookwood Weir.	Monitoring of Priority Nest Protection Areas.	Nesting activity within Priority Nest Protection Areas monitored regularly (indicative frequency of three times per week) during the peak nesting season (August to December).	<p>Priority Nest Protection Areas will be monitored regularly (indicative frequency of three times per week) during the peak nesting season (August to December) for the purposes of identifying and protecting individual nests. Nesting is triggered by rainfall and monitoring will occur during and/or immediately following events.</p> <p>Priority Nest Protection Areas will be examined for signs of nesting (which included the presence of turtle tracks, diggings, nests and predated eggshells) using a single strip transect parallel to the water's edge, as per the standard methodology of Limpus <i>et al.</i> 2011. Transects will vary in length and width according to bank morphology and will cover all potentially suitably nesting habitat within the Priority Nest Protection Areas. Any evidence of turtle nesting will be photographed, and the GPS location recorded.</p> <p>Nesting activity including presence/absence of confirmed turtle nesting banks, number of confirmed turtle nests laid, and distribution of nesting activity (i.e. number of separate nesting banks and location in relation to Rookwood Weir). Measure of success will be determined based on results of nest protection and hatching success monitoring.</p>	<p>If confirmed turtle nesting is not recorded at one or more Priority Nest Protection Areas corrective actions will be developed and implemented. Options may include:</p> <ul style="list-style-type: none"> – Review results of Broad-Scale turtle Population Monitoring to identify the relative abundance and dynamics of turtles present within the vicinity of the Priority Nest Protection Areas. – Review results of Turtle Movement Study to identify potential turtle nesting locations based on movement behaviour. – Undertake surveys to identify if turtle nesting activity is occurring outside of Priority Nest Protection Areas. Surveys to be conducted within the impoundment, upstream of the impoundment to Foleyvale Crossing and downstream of the Weir to Hanrahan Crossing to identify turtle nesting activity. – Continue to conduct surveys for turtle nesting activity as part of Nest Protection Management Plan until confirmed nesting is recorded.
3. Successful implementation (>95%) of planned predator control measures/annual reduction in	Predator control.	Annually during pre-nesting, nesting and hatching seasons for duration of Nest Protection	Broad-scale predator control will be conducted in accordance with the Turtle Habitat Enhancement Program: Extended Feral Pest Animal Management Plan.	If less than 95% of planned predator control measures are not implemented annually, corrective actions will be developed and implemented. Options may include:

Performance criteria	Type of monitoring	Frequency	Monitoring methodology and timing	Contingency program
predator abundance within target area.		Management Plan as per the Turtle Habitat Enhancement Program: Extended Feral Pest Animal Management Plan.	<p>The monitoring of pest animal activity pre- and post-control operations will be undertaken using camera traps, and the recorded feral pest animal activity will be reported annually. This annual report, together with the findings of the Turtle Nest Protection Management reports, will determine future control methodology and effort as well as the duration of management/contingency program to be put in place.</p> <p>The location and type of predator control activities planned and implemented will be documented as per the Predator Control Data Sheet provided in the Turtle Habitat Enhancement Program: Extended Feral Pest Animal Management Plan.</p> <p>Actual predator control measures implemented will be identified and compared to planned activities. Total numbers of predators removed from the population will be calculated based on number of success culling, trapping and estimates of success based on baiting.</p>	<ul style="list-style-type: none"> – Identify the cause for predator control measures not implemented and redesign program to address deficiencies. – Implement additional monitoring of Priority Nest Protection Areas to identify predator species (e.g. use of remote cameras) and develop targeted control program where required to achieve reduction in predator activity.
4. 80% reduction in evidence of predator activity at Priority Turtle Nest Protection Areas.	Predator activity.	Predator activity within Priority Nest Protection Areas monitored regularly (indicative frequency of three times per week) during the peak nesting season.	<p>Priority Nest Protection Areas will be examined for signs of predator activity (as a percentage of bank disturbance overall, on upper bank, mid bank and lower bank; evidence predated nests/eggshells) using a single strip transect parallel to the water's edge, as per the standard methodology of Limpus et al. 2011. Transects will vary in length and width according to bank morphology and will cover all potentially suitably nesting habitat within the Priority Nest Protection Areas. Any evidence of predator activity will be photographed, and the GPS location recorded.</p> <p>Evidence of predator activity within Priority</p>	<p>If less than an 80% reduction in evidence of predator activity is recorded at Priority Turtle Nest Protection Areas, corrective actions will be developed and implemented. Options may include:</p> <ul style="list-style-type: none"> – Implement additional predator exclusion measures at Priority Nest Protection Areas during the nesting season. Measures may include additional electric fencing, submerged fencing to prevent burrowing, predator deterrent devices, reinforced predator cages. – Implement additional board-scale predator control measures.

Performance criteria	Type of monitoring	Frequency	Monitoring methodology and timing	Contingency program
			Nest Protection Areas throughout the turtle nesting season will be recorded during nest protection monitoring and compared to levels of predator activity recorded prior to the nesting season (during identification of Priority Nest Protection Areas).	
5. 90% reduction in predation of turtle nests within Priority Nest Protection Areas compared to pre-offset success.	Nesting and hatching success.	Annually during nesting and hatching seasons.	Nest predation rates within the Priority Nest Protection Areas, as defined by the number of nests wholly or partially predated, will be determined throughout the nesting season as part of nest protection monitoring. The percentage of nests predated within Priority Nest Protection Areas will be compared to the percentage of nest predation recorded during pre-clearance surveys prior to Weir operation. The percentage of nest predation recorded prior to Weir operation to be defined following completion of final pre-clearance surveys in 2022.	If less than a 90% reduction in predation of turtle nests is recorded, corrective actions will be developed and implemented. Options may include: <ul style="list-style-type: none"> – Implement additional predator exclusion measures and broad-scale predator control as defined above. – Should evidence of nest predation or other risks to egg survival (e.g. flood event) become apparent, eggs will be removed from the Priority Nest Protection Areas for relocation to an alternative location within the same reach of river (i.e. within impoundment, upstream to Foleyvale Crossing or downstream to Hanrahan Crossing), or for artificial incubation. – The methodology for nest excavation, transport, selection of relocation site, and/or artificial incubation will occur in accordance with fauna rehabilitation and animal ethics permits.
6. 90% increase in recruitment of hatchlings into the population compared to pre-offset success.	Hatching success.	Annually during the hatching season (September to December).	Hatching success of nests laid within the Priority Nest Protection Areas and recruitment of hatchlings into the population, as defined by number nests that wholly or partially hatch and the percentage of successful hatchlings within each nest, will be determined throughout the nesting season as part of hatchling success monitoring. Monitoring may include the use of remote cameras to record emergence of hatchlings and/or the physical excavation of the nests to	If less than a 90% increase in recruitment of hatchlings into the population is achieved, corrective actions will be developed and implemented. Options may include: <ul style="list-style-type: none"> – Identify cause of unsuccessful hatching. – If predator related, then implement corrective actions associated with reduction in nest predation conservation outcome. – If unsuccessful nesting is not related to predation, undertake a review, including

Performance criteria	Type of monitoring	Frequency	Monitoring methodology and timing	Contingency program
			the top of the first egg to check for evidence of hatching. Hatching success and recruitment into the population within Priority Nest Protection Areas will be compared to success recorded during pre-clearance surveys prior to Weir operation. The percentage of hatching success and recruitment into the population recorded prior to Weir operation to be defined following completion of final pre-clearance surveys in 2022.	<p>potentially handling, transporting, relocating and artificially incubating turtle eggs to identify cause of egg mortality. Modify methodology as required.</p> <ul style="list-style-type: none"> – Monitor environment conditions within predator protection cages (e.g. temperature, moisture content) and modify design/location if environmental conditions are found to be contributing to egg mortality. – Review all performance criteria for the Nest Protection Management Plan and identify cause/s of insufficient hatchling recruitment. – Implement correction actions as required for relevant performance objectives and modify Nest Protection Management Plan to improve recruitment success.

4.7 Reporting requirements

Reporting requirements associated with this Nest Protection Management Plan are described below.

4.7.1 Annual Nest Protection Management Plan Report

An Annual Nest Protection Management Plan Report will be prepared to document the management actions implemented each year and the assess the success of actions against the performance objectives for each conservation outcome. The report will be provided to DES and DCCEEW twelve months after the completion of construction and annually thereafter for the duration of the Nest Protection Management Plan. Specifically, the report will include:

- Introduction - project background, legislative requirements and propose of the Nest Protection Management Plans
- Management actions - location and description of Priority Nest Protection Areas and justification for selection, description of habitat protection and broad scale predator control measures implemented during the pre-nesting season
- Nest monitoring and protection - description of nest protection monitoring conducted throughout the nesting season; details of all confirmed nest and protection measures implemented
- Hatching success - hatching success results and recruitment into the population
- Discussion - monitoring and evaluation of the Nest Protection Management Plan in accordance with the performance objectives and measures of success for each conservation outcomes. Relevant results of Broad-Scale Turtle Population Monitoring and Turtle Movement Study
- Compliance with success criteria - assessment of results against success criteria and identification of any non-compliance triggering contingency program corrective actions
- Correction actions - recommendations for adaptive management.

4.7.2 Animal breeding place register

An animal breeding place register (available at: <https://environment.des.qld.gov.au/licences-permits/plants-animals/species-management-program>) will be maintained. This register will be update when survey / nest protection activities are occurring. The register will maintain accurate records of daily site observations and location of any turtle nests detected. Records will be maintained on any of the actions undertaken in regard to management any known or suspected disturbance or tampering with (including destroyed) nests and any corrective actions implemented. The breeding place register will be made available to DES upon request, within 24 hours of an interaction, and within 10 business days after the expiry of the approved high risk SMP under the NC Act.

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Appendix A

**Pre-clearance turtle nesting survey
results**

Site ID	Site location	2019			2020			2021				Total	Total
		Jun	Sep	Dec	Jun	Oct	Dec	Jun	Jul	Aug	Oct	FRT	ALL
Inundation extent													
F3	Foleyvale downstream			2 nests, 6 eggs + fragments	Faint turtle tracks	6 nests, ~9 eggs + fragments	3 nests, ~25 eggs + fragments				2 nests, ~5 eggs	11 nests, ~39 eggs	13 nests, ~45 eggs
F4	Foleyvale downstream			1 nest, ~7 empty nests, 17 eggs	-	1 nest, ~19 eggs + fragments, tracks	1 nest, Shell fragments					1 nest, ~19 eggs + fragments, tracks	3 nests, ~36 eggs
F5	Foleyvale downstream			-	-	1 nest, ~10 eggs + fragments	1 nest, 1 egg + fragments				2 sets of turtle tracks		2 nests, ~11 eggs
F6	Foleyvale downstream	None recorded											
P1	The Pocket			4 nests, ~7 eggs + fragments	Recent track with several nesting attempts.	31 nests, >45 eggs + fragments, recent tracks	6 nests, ~28 eggs + fragments**		1 nest, ~9 eggs	1 nest, ~4 eggs	24 nests, >24 eggs + fragments	31 nests, ~56 eggs	67 nests, ~117 eggs
P3	The Pocket									1 nest, ~1 egg	11 nests, >12 eggs + fragments	12 nests, >13 eggs	12 nests, >13 eggs
G1	Gogango Mouth 1	None recorded											
G2	Gogango Mouth 2	-	-	-	-	3 nests, ~15 eggs + fragments					1 nest, ~5 eggs+ fragments	1 nest, ~5 eggs+ fragments	4 nests, ~20 eggs + fragments
G3	Gogango Mouth 3	-	-	-	1 nest, Shell fragments	-							1 nest, Shell fragments
G4	Gogango Creek mouth										3 nests, ~3 eggs*	2 nests, ~2 eggs*	2 nests, ~2 eggs
R5	Rookwood downstream	-	2 nest attempts	3 nests, ~26 eggs	Turtle tracks with	2 nests, 4 eggs +	Faint track						5 nests, ~30 eggs

Site ID	Site location	2019			2020			2021				Total	Total
		Jun	Sep	Dec	Jun	Oct	Dec	Jun	Jul	Aug	Oct	FRT	ALL
	of crossing		and turtle tracks	+ fragments	nest attempt	fragments							+ tracks
R6	Rookwood north of crossing	-	-	-	-	1 nest, ~3 eggs	3 nests, Shell fragments						4 nests, ~3 eggs
R7	Riverslea Crossing	None recorded											
R8	Riverslea to Rookwood 1	-	-	-	-	13 nests, ~29 eggs + fragments	3 nests, ~36 eggs + fragments		Shell fragments	1 nest, ~1 egg	11 nests, ~1 egg*	12 nests, >2 eggs	28 nests, ~69 eggs
R9	Riverslea Riffle Complex	-	-	-	-	-	1 nest, Shell fragments						1 nest
R10	Riverslea downstream island	None recorded											
UI1	Upper Inundation Area 1	Not assessed (first assessment occurred in June 2021)						None recorded					
UI2	Upper Inundation Area 2	Not assessed (first assessment occurred in June 2021)									1 nest, ~1 egg*	1 nest, ~1 egg*	1 nest, ~1 egg*
UI3	Upper Inundation Area 3	Not assessed (first assessment occurred in June 2021)						1 set of turtle tracks			11 nests, ~11 eggs*	11 nests, ~11 eggs*	11 nests, ~11 eggs*
UI4	Upper Inundation Area 4	Not assessed (first assessment occurred in June 2021)									2 nests, ~2 eggs*	2 nests, ~2 eggs*	2 nests, ~2 eggs*
UI5	Upper Inundation Area 4	Not assessed (first assessment occurred in June 2021)									1 set of turtle tracks		1 set of turtle tracks
UI6	Upper Inundation Area 6	Not assessed (first assessment occurred in June 2021)						None recorded					
UI7	Upper Inundation Area 7	Not assessed (first assessment occurred in June 2021)						1 nest, ~9 eggs	1 set of turtle tracks		10 nests, ~10 eggs +	10 nests, ~10 eggs +	11 nests, ~19 eggs +

Site ID	Site location	2019			2020			2021				Total	Total
		Jun	Sep	Dec	Jun	Oct	Dec	Jun	Jul	Aug	Oct	FRT	ALL
											fragments	fragments	fragments
UI8	Upper Inundation Area 8	Not assessed (first assessment occurred in June 2021)									6 nests, ~6 eggs + fragments	6 nests, ~6 eggs + fragments	6 nests, ~6 eggs + fragments
UI9	Upper Inundation Area 9	Not assessed (first assessment occurred in June 2021)								1 nest, ~5 eggs	13 nests, ~13 eggs	14 nests, ~18 eggs	14 nests, ~18 eggs
UI10	Upper Inundation Area 10	Not assessed (first assessment occurred in June 2021)						2 nests, ~5-10 eggs		1 nest, ~4 eggs	6 nests, ~6 eggs	7 nests, ~10 eggs	9 nests, ~20 eggs
UI11	Upper Inundation Area 11	Not assessed (first assessment occurred in June 2021)						2 nests, ~10-15 eggs			2 nests, ~2 eggs + fragments	2 nests, ~2 eggs + fragments	4 nests, ~17 eggs
Subtotal:	27 sites	0 nests, 0 eggs	2 nest attempts and turtle tracks	10 nests, ~56 eggs + fragments	1 nest, fragments + turtle tracks	58 nests, ~144 eggs + fragments	18 nests, ~90 eggs + fragments	5 nests, ~30 eggs + fragments	1 nest, ~9 eggs + fragments	5 nests, ~15 eggs + fragments	103 nests, ~101 eggs + fragments	123 nests, ~196 eggs + fragments	326 nests, ~641 eggs + fragments
Upstream of inundation extent													
F1	Foleyvale Crossing	None recorded											
F2	Foleyvale downstream			~16 possible nests, 7 nests with egg fragments	-	Test nest with faint tracks.	4 nests, ~5 eggs + fragments				1 nest, 1 egg + fragments	5 nests, ~6 eggs + fragments	~12 nests, ~6 eggs + fragments
F7	Foleyvale upstream	None recorded											
F8	Foleyvale upstream	None recorded											
F9	Foleyvale upstream	-	-	1 nest, Shell fragments	-	-	-						1 nest, Shell fragments
F10	Foleyvale upstream	-	-		-	2 nests, ~15 eggs + fragments	1 nest, Shell fragments						3 nests, ~15 eggs + fragments



Site ID	Site location	2019			2020			2021				Total	Total
		Jun	Sep	Dec	Jun	Oct	Dec	Jun	Jul	Aug	Oct	FRT	ALL
F11	Foleyvale upstream	-	-	10 nests, ~13 eggs + fragments	-	6 nests, ~10 eggs + fragments	3 nests, ~5 eggs + fragments						19 nests, 28 eggs + fragments
Subtotal:	7 sites	0 nests, 0 eggs	0 nests, 0 eggs	17 nests, ~13 eggs + fragments	0 nests, 0 eggs	8 nests, ~25 eggs + fragments	8 nests, ~10 eggs + fragments	0 nests, 0 eggs	0 nests, 0 eggs	0 nests, 0 eggs	1 nest, 1 egg + fragments	5 nests, ~6 eggs + fragments	35 nests, ~49 eggs + fragments
Downstream of inundation area													
H1	Hanrahan far downstream	-	-	-	-	2 nests, ~17 eggs + fragments	1 nest, Shell fragments				9 nests, ~35 eggs + fragments	9 nests, ~35 eggs + fragments	12 nests, ~52 eggs + fragments
R1	Lawries Bend	Shell fragments + multiple turtle tracks	-	-	Very recent turtle tracks and nest attempt	-	-				7 nests, ~7 eggs + fragments	7 nests, ~7 eggs + fragments	7 nests, ~7 eggs + fragments
R2	Rookwood to Hanrahan Crossing	-	-	-	Multiple turtle tracks	-	-				7 nests, ~7 eggs + fragments	7 nests, ~7 eggs + fragments	7 nests, ~7 eggs + fragments
R3	Rookwood to Hanrahan Crossing	None recorded											
R4	Hanrahan Crossing upstream	Multiple turtle tracks	-	-	Turtle track with no nesting attempt	1 nest, 1 egg in fragments	3 nests, ~44 eggs + fragments				10 nests, ~56 eggs + fragments	13 nests, ~100 eggs + fragments	14 nests, ~101 eggs + fragments
Subtotal:	5 sites	Shell fragments + turtle tracks	0 nests, 0 eggs	0 nests, 0 eggs	Multiple turtle tracks	3 nests, ~18 eggs + fragments	4 nests, ~44 eggs + fragments	0 nests, 0 eggs	0 nests, 0 eggs	0 nests, 0 eggs	33 nests, ~105 eggs + fragments	36 nests, ~149 eggs + fragments	40 nests, ~167 eggs + fragments
Upstream on the Mackenzie River													
T1 DLB	Tartus Weir to rockbar (left bank)	Not assessed (first assessment occurred in December 2020)					5 nests, ~7 eggs + fragments	9 nests, ~87 eggs + fragments	3 nests, ~18 eggs + fragments		13 nests, ~13 eggs + fragments	13 nests, ~13 eggs + fragments	30 nests, ~125 eggs + fragments

Site ID	Site location	2019			2020			2021				Total	Total
		Jun	Sep	Dec	Jun	Oct	Dec	Jun	Jul	Aug	Oct	FRT	ALL
T1 DRB	Tartarus Weir to rockbar (right bank)	Not assessed (first assessment occurred in December 2020)					14 nests, ~39 eggs + fragments	6 nests, ~67 eggs + fragments	1 Nest, ~13 eggs + fragments		13 nests, ~66 eggs + fragments	13 nests, ~66 eggs + fragments	34 nests, ~185 eggs + fragments
T2 DLB	Tartarus rockbar to culvert (left bank)	Not assessed (first assessment occurred in December 2020)					3 nests, ~21 eggs + fragments		3 nests, ~24 eggs + fragments		6 nests, ~24 eggs + fragments	6 nests, ~24 eggs + fragments	12 nests, ~69 eggs + fragments
T2 DRB	Tartarus rockbar to culvert (right bank)	Not assessed (first assessment occurred in December 2020)					None recorded						
T3 DLB	Tartarus downstream of culvert (left bank)	Not assessed (first assessment occurred in December 2020)					8 nests, ~19 eggs + fragments	1 set of turtle tracks			1 nest, ~6 eggs + fragments	1 nest, ~6 eggs + fragments	9 nests, ~25 eggs + fragments
Subtotal	5 sites	Not assessed (first assessment occurred in December 2020)					30 nests, ~86 eggs + fragments	15 nests, ~163 eggs + fragments	7 nests, ~55 eggs + fragments	0 nests, 0 eggs	33 nests, ~109 eggs + fragments	33 nests, ~109 eggs + fragments	52 nests, ~304 eggs + fragments
Total	44 sites	Shell fragments + turtle tracks	2 nest attempts and turtle tracks	27 nests, ~69 eggs + fragments	1 nest, fragments + turtle tracks	69 nests, ~187 eggs + fragments	60 nests, ~230 eggs + fragments	19 nests, >146 eggs + fragments	8 nests, ~64 eggs + fragments	43 nests, ~361 eggs + fragments	177 nests, >347 eggs + fragments	197 nests, ~460 eggs + fragments	404 nests, ~1,404 eggs + fragments


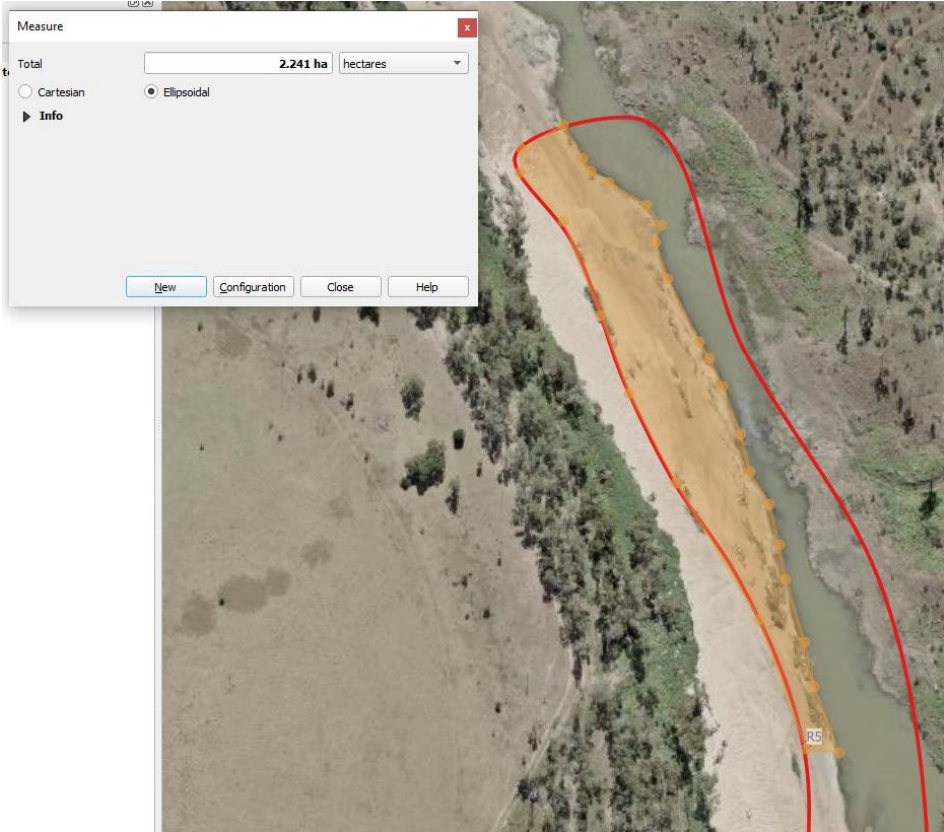
Note: * denotes nests fitted with nest protection, green shading – Fitzroy River turtle nests, grey shading – unidentified nests during Fitzroy River turtle breeding season

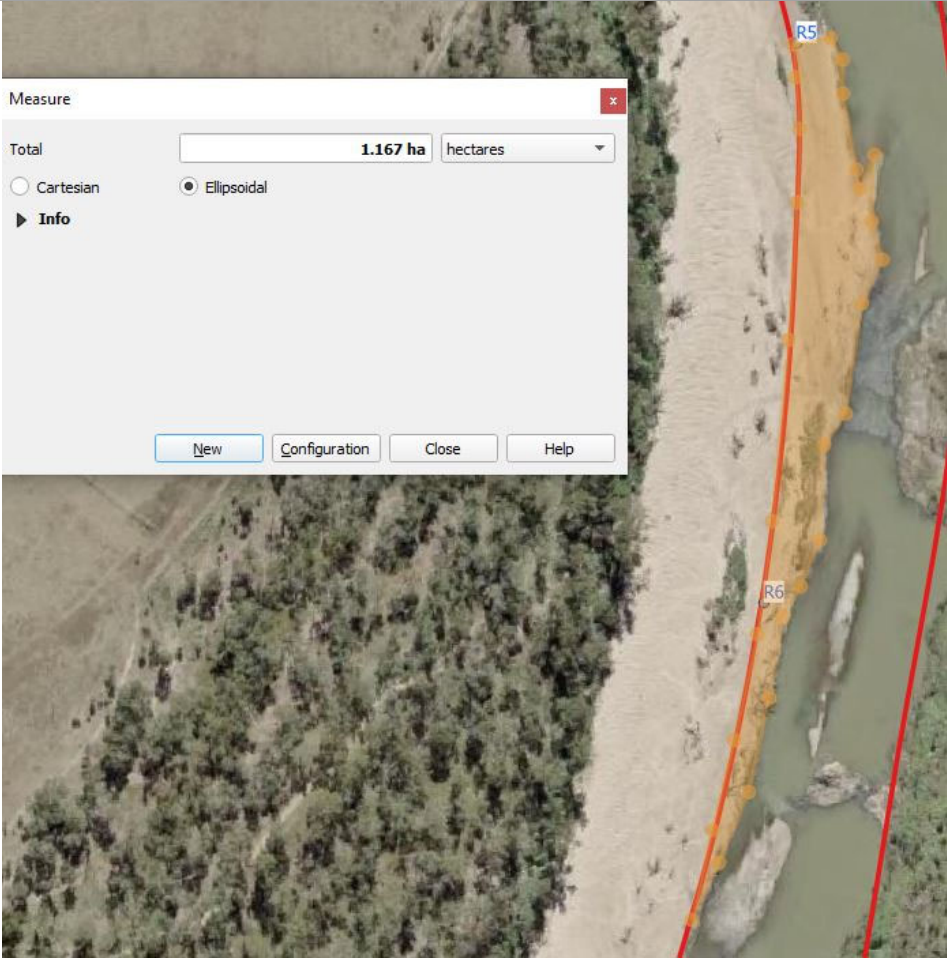
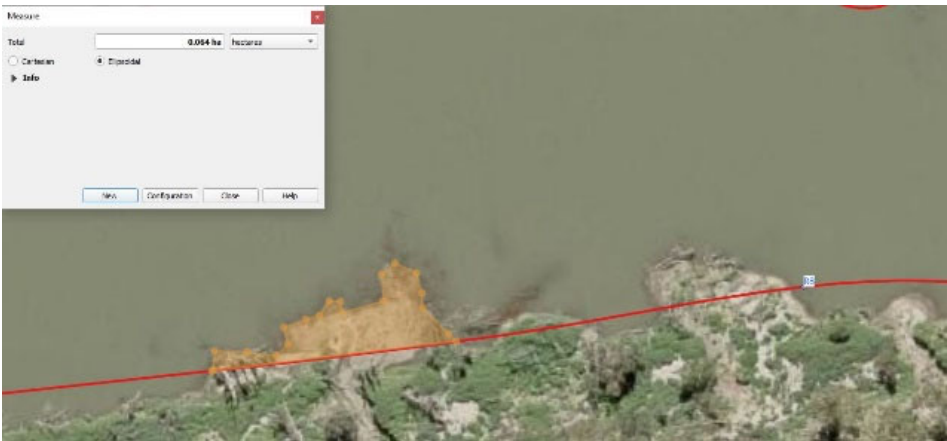
Appendix B

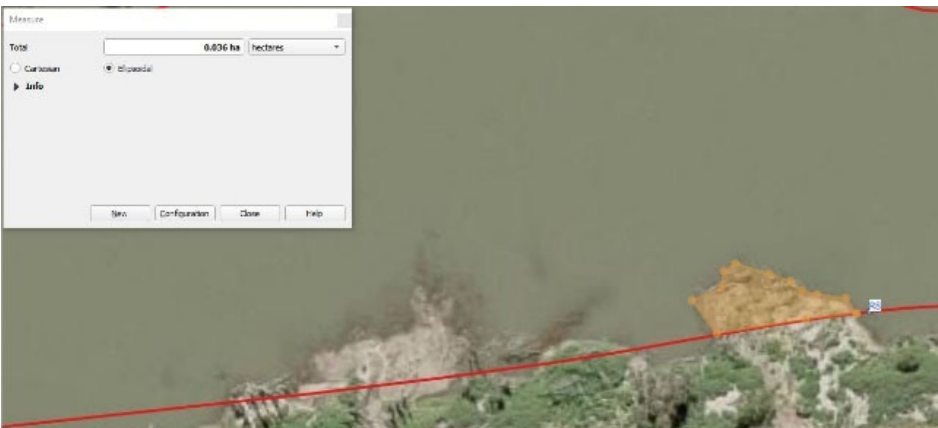
**Predicted inundation of confirmed
turtle nesting habitat**

Site ID	Site	Inundation impact area (ha)
F4	Foleyvale downstream	<p>No impact to turtle nesting</p> 
F5	Foleyvale downstream	
P1	The Pocket (upstream)	<p>No impact to turtle nesting</p> 

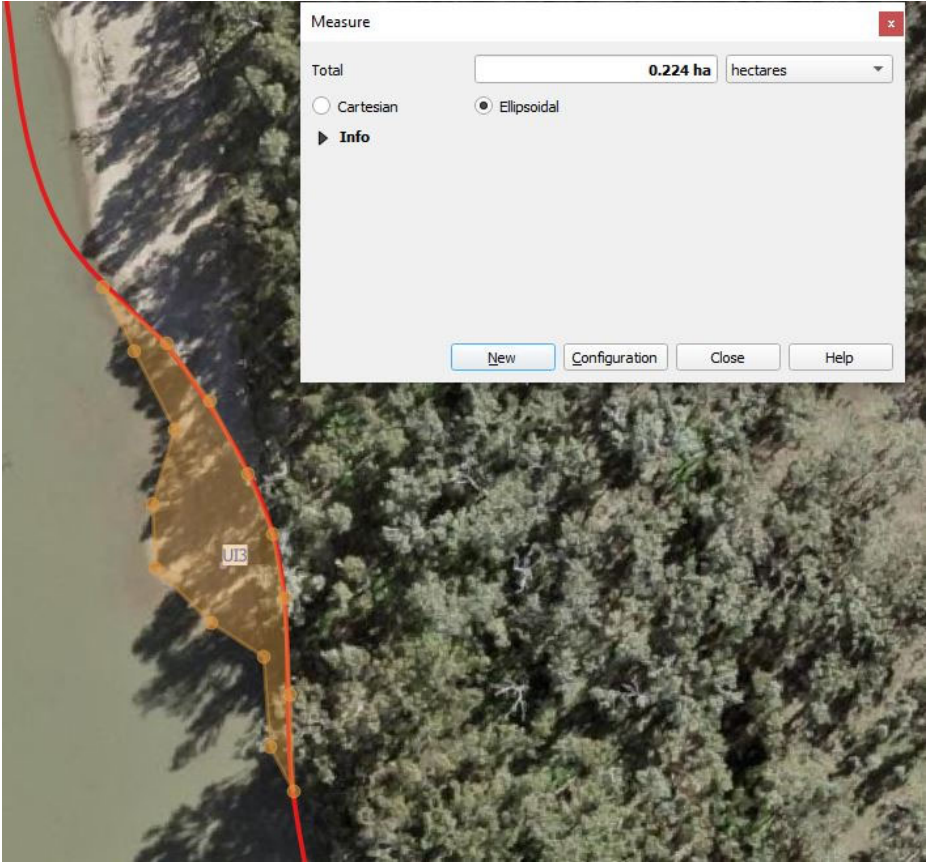
Site ID	Site	Inundation impact area (ha)
P3	The Pocket	<div>21 Measure</div> <div>Total 0.084 ha hectares</div> <div><input type="radio"/> Cartesian <input checked="" type="radio"/> Ellipsoidal</div> <div>► Info</div> <div>New Configuration Close Help</div> 
G2	Gogango mouth 2	<div>No impact to turtle nesting</div> 
G3	Gogango mouth 3	<div>No impact to turtle nesting</div> 

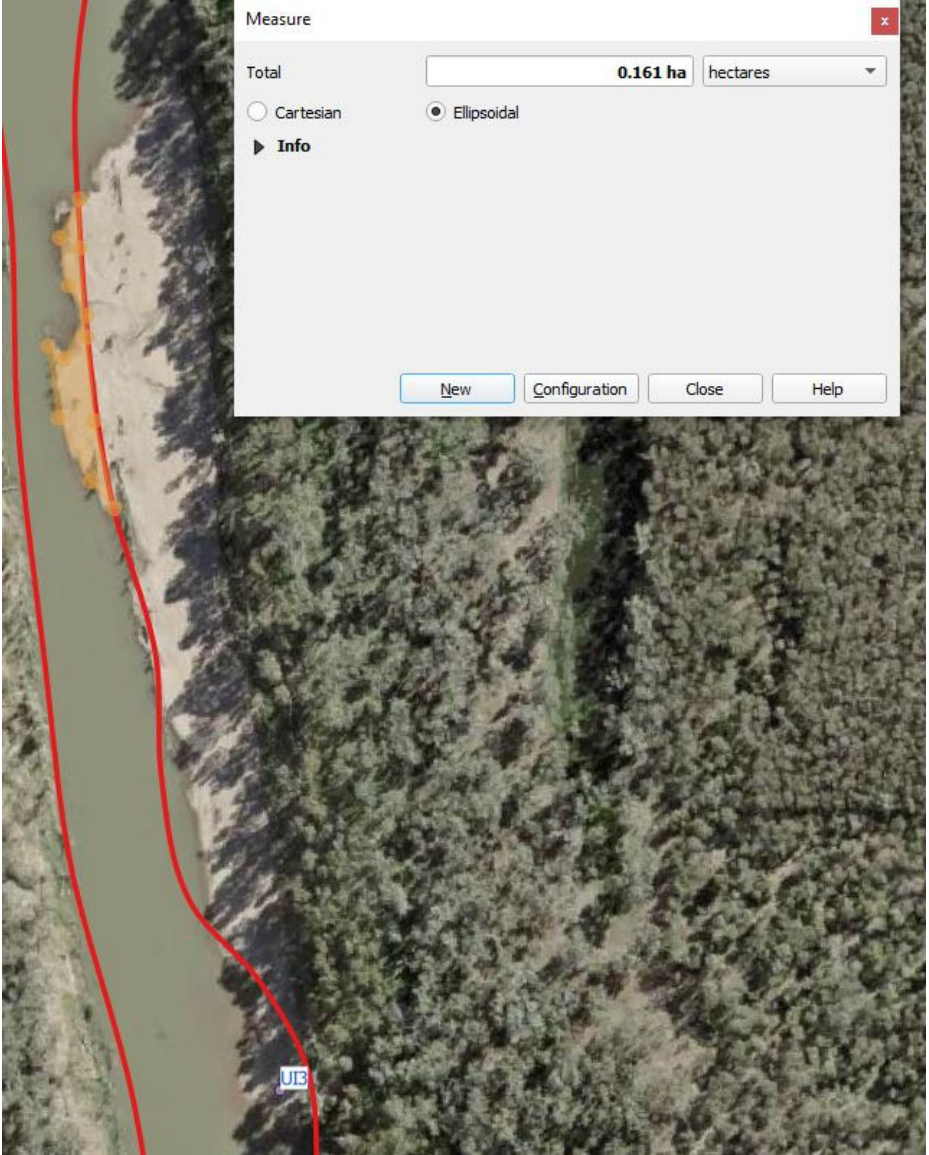
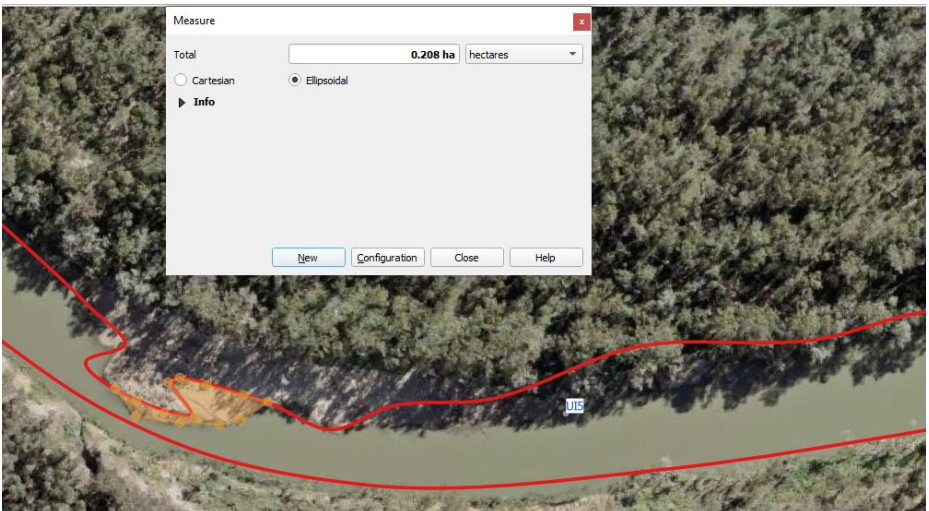
Site ID	Site	Inundation impact area (ha)
G4	Gogango Creek mouth	<div>No impact to turtle nesting</div> <div></div>
R5	Rookwood downstream of crossing	<div></div>
R6	Rookwood north of crossing	



Site ID	Site	Inundation impact area (ha)
		 <p>Measure</p> <p>Total 1.167 ha hectares</p> <p><input type="radio"/> Cartesian <input checked="" type="radio"/> Ellipsoidal</p> <p>► Info</p> <p>New Configuration Close Help</p>
R8	Riverslea to Rookwood 1	 <p>Measure</p> <p>Total 0.064 ha hectares</p> <p><input type="radio"/> Cartesian <input checked="" type="radio"/> Ellipsoidal</p> <p>► Info</p> <p>New Configuration Close Help</p>



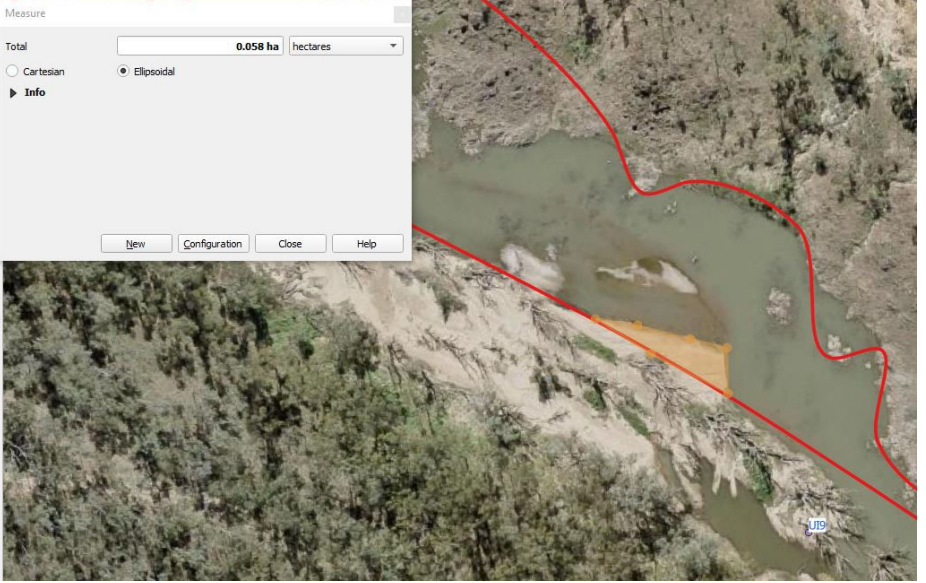
Site ID	Site	Inundation impact area (ha)
		<div><div><div>Measure</div><div>Total0.009 hahectares</div><div><input type="radio"/> Cartesian<input checked="" type="radio"/> Ellipsoidal</div><div>► Info</div><div><div>New</div><div>Configuration</div><div>Close</div><div>Help</div></div></div></div>  <div><div><div>Measure</div><div>Total0.036 hahectares</div><div><input type="radio"/> Cartesian<input checked="" type="radio"/> Ellipsoidal</div><div>► Info</div><div><div>New</div><div>Configuration</div><div>Close</div><div>Help</div></div></div></div> 
R9	Riverslea Riffle complex	<p>No impact to turtle nesting</p> 

Site ID	Site	Inundation impact area (ha)
UI2	Upper Inundation Area 2	

Site ID	Site	Inundation impact area (ha)
UI3	Upper Inundation Area 3	

Site ID	Site	Inundation impact area (ha)
		
UI5	Upper Inundation Area 5	

Site ID	Site	Inundation impact area (ha)
		<div data-bbox="486 230 1085 600"><p>Measure</p><p>Total <input type="text" value="0.795 ha"/> hectares</p><p><input type="radio"/> Cartesian <input checked="" type="radio"/> Ellipsoidal</p><p>► Info</p><p>New Configuration Close Help</p></div> 
UI7	Upper Inundation Area 7	<p data-bbox="486 983 766 1014">No impact to turtle nesting</p> 

Site ID	Site	Inundation impact area (ha)
UI8	Upper Inundation Area 8	
UI9	Upper Inundation Area 9	 
UI10	Upper Inundation Area 10	No impact to turtle nesting

Site ID	Site	Inundation impact area (ha)
		
UI1 1	Upper Inundation Area 11	<p>No impact to turtle nesting</p> 

Appendix C

Pre-nesting Season Data Sheet

Date:			
Survey team members:			
Location: <i>(latitude and longitude)</i>			
Priority Nest Protection Bank: <i>(name and site identification number)</i>			
Weather conditions:			
Photograph reference numbers: <i>(north, south, east and west at 50 m intervals along bank)</i>			
Bank profile (m):	Height:	Length:	Width:
Average bank slope: <i>(vertical (89–90°); steep (60–80°); moderate (30–60°); low (10–30°) and; flat (<10°))</i>			
Average bank composition (%):	Cobble/pebble (%):	Gravel (%):	Coarse sand (%):
	Fine sand (%):	Silt/clay (%):	Other (%):
Riparian canopy vegetation: <i>(None (none); little (1–10%); some (10–50%); moderate (50–75%) and extensive (>75%))</i>	Ground cover:	Scrub cover:	Canopy cover:
Weed density: <i>(little (1–10%); some (10–50%); moderate (50–75%) and extensive (>75%))</i>	Overall density:	Density per species:	
Evidence of predator activity: <i>(little (1–10%); some (10–25%); moderate (25–50%) and extensive (>50%))</i>	Overall activity per species (%):	Upper bank activity per species (%):	Mid bank activity per species (%):
	Lower bank per species activity (%):		
Evidence of cattle activity: <i>(little (1–10%); some (10–25%); moderate (25–50%) and extensive (>50%))</i>	Overall activity (%):	Upper bank activity (%):	Mid bank activity (%):

Appendix D

Nesting Season Data Sheet

Nesting Season Data Sheet

Date:			
Survey team members:			
Priority Nest Protection Bank: <i>(name and site identification number)</i>			
Nesting survey transit: <i>(length and width of each transit), latitude and longitude for start and end locations)</i>			
Weather conditions:			
Photograph reference numbers: <i>(north, south, east and west at 50 m internals along bank)</i>			
Riparian canopy vegetation: <i>(None (none); little (1–10%); some (10– 50%); moderate (50–75%) and extensive (>75%))</i>	Ground cover:	Scrub cover:	Canopy cover:
Weed density: <i>(little (1–10%); some (10–50%); moderate (50–75%) and extensive (>75%))</i>	Overall density:	Density per species:	
Evidence of predator activity: <i>(little (1–10%); some (10–25%); moderate (25–50%) and extensive (>50%))</i>	Overall activity per species (%):	Upper bank activity per species (%):	Mid bank activity per species (%)”
	Lower bank per species activity (%):		
Evidence of cattle activity: <i>(little (1–10%); some (10–25%); moderate (25–50%) and extensive (>50%))</i>	Overall activity (%):	Upper bank activity (%):	Mid bank activity (%)”
	Lower bank activity (%):		
Flow level: <i>(None (isolated pools); low (<watermark); moderate (=watermark); high (>watermark); flood)</i>			

Habitats adjacent: <i>(deep pool (>0.5 m); shallow pool (<0.5 m); run; riffle)</i>	
Evidence of nesting: <i>(number of tracks, test holes, confirmed nests, predated nests)</i>	

Nesting record

Nesting record identification number:			
Priority Nest Protection Bank: <i>(name and site identification number)</i>			
Date:			
Location of nesting record: <i>(latitude and longitude)</i>			
Type of nesting activity: <i>(track, test hole, nest, egg shell)</i>			
Turtle species:			
Photograph reference numbers: <i>(photographs of nesting activity -nest, eggs, egg shell)</i>			
Average bank slope: <i>(vertical (89–90°); steep (60–80°); moderate (30–60°); low (10–30°) and; flat (<10°))</i>			
Distance of nest from water (m):			
Height above the water's surface (m):			
Average bank composition (%):	Cobble/pebble (%):	Gravel (%):	Coarse sand (%):
	Fine sand (%):	Silt/clay (%):	Other (%):
Depth of nest to top of egg (cm):			
Egg diameter (cm):			
Egg length (cm):			
Number of eggs within nest:			

Evidence of nest predation: <i>(number of eggs predation, species of predator)</i>	
Predator protection actions implemented:	

Appendix E

Hatching Season Data Sheet

Hatching Season Data Sheet

Date:			
Survey team members:			
Location: <i>(latitude and longitude)</i>			
Priority Nest Protection Bank: <i>(name and site identification number)</i>			
Weather conditions:			
Photograph reference numbers: <i>(north, south, east and west at 50 m intervals along bank)</i>			
Riparian canopy vegetation: <i>(None (none); little (1–10%); some (10–50%); moderate (50–75%) and extensive (>75%))</i>	Ground cover:	Scrub cover:	Canopy cover:
Weed density: <i>(little (1–10%); some (10–50%); moderate (50–75%) and extensive (>75%))</i>	Overall density:	Density per species:	
Evidence of predator activity: <i>(little (1–10%); some (10–25%); moderate (25–50%) and extensive (>50%))</i>	Overall activity per species (%):	Upper bank activity per species (%):	Mid bank activity per species (%):
	Lower bank per species activity (%):		
Evidence of cattle activity: <i>(little (1–10%); some (10–25%); moderate (25–50%) and extensive (>50%))</i>	Overall activity (%):	Upper bank activity (%):	Mid bank activity (%):
	Lower bank activity (%):		
Flow level: <i>(None (isolated pools); low (<watermark); moderate (=watermark); high (>watermark); flood)</i>			



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