Rookwood Weir

Operations Phase - Annual Turtle Monitoring Report 2025-26

Sunwater

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Executive summary

The purpose of this Operations Phase Annual Monitoring Report 2025-26 is to assess the effectiveness of the Rookwood Weir turtle passage infrastructure and turtle protection design features against agreed success criteria, and provide information on the relative abundance, dynamics, health and movement behaviour of the white-throated snapping turtle (*Elseya albagula*) and Fitzroy River turtle (*Rheodytes leukops*) population within the vicinity of Rookwood Weir. This monitoring has been conducted in accordance with the Rookwood Weir Operations Species Management Plan (SMP) to fulfil State and Commonwealth project approval conditions.

Year 2 2025-26 of the operational phase involved monitoring of turtle movement behaviour within the turtle passage constructed at Rookwood Weir, and broad-scale monitoring at areas upstream and downstream of the weir. Methods used for the turtle passage monitoring included turtle capture surveys, acoustic telemetry, passive integrated transponder (PIT) and camera monitoring, supported by inspectional and observational records. Broad-scale monitoring methods included turtle capture surveys and acoustic telemetry.

Turtle capture surveys recorded 16 turtles from within or adjacent to the turtle passage: four white-throated snapping turtles, seven Fitzroy River turtles, four male Krefft's River turtles (*Emydura macquarii krefftii*), and one saw-shelled turtle (*Wollumbinia latisternum*). In addition, 579 turtles were captured upstream or downstream of the weir during broad-scale monitoring. Of the 80 white-throated snapping turtles captured in Year 2 2025-26 monitoring, 36 were tagged with acoustic tags bringing the total number of turtles tagged since 2017 to 1632 A total of 71 Fitzroy River turtles were captured in Year 2 2025-26 monitoring with 39 of these tagged with acoustic tags to achieve a total of 108 turtles tagged since 2017.

Of the 163 acoustic tags deployed on white-throated snapping turtle before March 2026, 93 white-throated snapping turtles were detected in Year 2 2025-26 monitoring. During this time, 82 turtles were recorded downstream from Rookwood Weir, and 19 were recorded upstream between Rookwood Weir and The Pocket. Ten white-throated snapping turtles were detected making a complete movement past Rookwood Weir (i.e. recorded both upstream and downstream of the weir) between March 2025 and March 2026. One turtle (ID 16187) was confirmed to have successfully moved upstream through the full length of the turtle passage, taking approximately 14.4 days to navigate the ramp and pool arrangement. A further nine white-throated snapping turtles were detected on both sides of the weir; while their movement upstream via the turtle passage cannot be confirmed from acoustic data alone, they were not recorded within the turtle passage. In addition, two white-throated snapping turtle (ID 16187 and ID 16249) were detected at the receiver station placed in resting pool DSRP8 in September 2025 and January 2026 indicating that the turtles successfully found the turtle ramp entrance and ascended to the first resting pool. One adult male white-throated snapping turtle (ID 16187) was detected by the receivers within USRP1 and USRP5 indicating the turtle had successfully ascended the ramp sections, moved through the abutment tunnel and descended into the weir pool. A total of 70 white-throated snapping turtle appeared to be attracted to the turtle passage being detected by the acoustic hydrophone located at the downstream ramp entrance. In total, the operations phase monitoring detected 75 white-throated snapping turtles interacting with the turtle passage with one turtle confirmed successfully moving upstream past Rookwood Weir via the turtle passage, and up to a further nine successfully moved upstream past the weir.

Of the 108 acoustic tags deployed on Fitzroy River turtles before March 2026, 46 were detected in Year 2 2025-26 monitoring. During this time, 44 turtles were recorded downstream from Rookwood Weir and two were detected upstream between the weir and The Pocket. No tagged Fitzroy River turtles were detected on both sides of the weir during Year 2 2025-26 monitoring. Only one Fitzroy River turtle was detected at a receiver positioned within the turtle passage (DSRP8), with an additional female sub-adult Fitzroy River turtle captured within the turtle passage (DSRP2) during the May 2026 turtle capture survey, confirming use of the turtle passage by this species. Thirty-one Fitzroy River turtles appeared to be attracted to the turtle passage being detected by the acoustic hydrophone located at the downstream ramp entrance.

Remote cameras recorded an additional 12 unidentified turtles using the turtle passage in Year 2 2025-26 monitoring; however, imagery quality and detection rates remain limited due to known deficiencies with the existing camera setup. Captured imagery indicates that turtles are utilising both the resting pools and the ramp sections.

Acoustic tracking indicated that white-throated snapping turtles were detected across and up to the full extent of the array (36.4 km), with an average linear home range of 11.2 km, and cumulative movements reaching up to 316 km. Activity varied seasonally and by sex, with the greatest within-range movement occurring during late spring and early summer months for males which aligns with the active breeding period, and the lowest in mid-winter when reduced temperatures likely promote energy conservation. Females occupied larger ranges and travelled greater distances during the nesting period (May to August).

Fitzroy River turtles occupied smaller ranges and exhibited lower overall movement than white-throated snapping turtles, with an average home range of 5.64 km and cumulative distances up to 275 km. Seasonal variation in movement was also evident, with greater movement recorded during autumn and reduced activity during winter. Unlike white-throated snapping turtles, which exhibited increased movement during spring and summer, Fitzroy River turtles displayed a different seasonal pattern, likely reflecting species-specific ecological requirements and behavioural traits. Overall, these results indicate that Fitzroy River turtles exhibit a more localised pattern of space use and lower overall movement than white-throated snapping turtles within the study area.

Mean monthly home range size and movement patterns varied over time for both species, with notable peaks associated with specific years and individuals. For white-throated snapping turtles, female home ranges and distances travelled were greatest early in the pre-construction monitoring period (2017–2019), then gradually decreased in size from 2020 onwards to the smallest home range size in 2024 (1.32 km), before increasing again in 2025 (3.93 km) and 2026 (2.94 km), largely driven by a small number of wide-ranging individuals. Male home ranges were lowest in 2024 (2.87 km) and 2025 (2.92 km), while their mean monthly distance travelled remained relatively consistent across the study period.

Fitzroy River turtles also exhibited variation in home range size and movement through time. Female and male monthly home ranges and distances have increased in recent years, particularly between 2024 and 2026. Overall, mean monthly distances travelled by Fitzroy River turtles since weir operations commenced were generally higher than during pre-construction and construction phases.

In Year 2 2025-26 monitoring, an increased occurrence of turtle injuries was observed during the November 2025 broad-scale survey (scute damage, healed fractures, plastron grazing, and worn claws) compared with Year 1 observations. The May 2026 survey recorded lower rates of injury compared to the November 2025 survey, with damage typically minor (scute damage and missing claws) , similar to Year 1. The available injury observations do not indicate whether the injuries were directly associated with the turtle passage, contact with natural or artificial structures or other unidentified causes. A total of 12 turtle mortalities were recorded during the 2025-26 monitoring period, comprising nine white-throated snapping turtles, two Krefft's river turtles and one Fitzroy River turtle. Most mortalities were associated with the downstream left-bank rock scour protection, where turtles were assumed to have become entrapped and drowned during a high-flow event. One Fitzroy River Turtle mortality was attributed to a fall from the weir abutment adjacent to the turtle passage infrastructure. None of these turtle mortalities were the result of falls from the turtle ramps. There was no evidence of turtle injury or mortality associated with the weir trash screens, inlets, fishway, or from downstream passage over the spillway.

As required by Project approval conditions, the results of the operations phase monitoring were assessed against 18 success criteria developed for the protection of turtles, turtle movement and habitat. Of the 16 success criteria relevant to this Operations Phase monitoring report, eight were unable to be assessed. Success Criteria 1, 5, 6, 7, 8, 11, 12 and 17 were unable to be reliably assessed due to insufficient data quality and quantity generated by the current monitoring methods. Of the remaining eight success criteria that were able to be assessed, six were achieved, one was partially achieved and one was not achieved in Year 2 2025-26 monitoring of Rookwood Weir operations. The key assessment findings included:

– White-throated snapping turtles and Fitzroy River turtles were confirmed using the turtle passage, including successful upstream passage of at least one white-throated snapping turtle. Nine white-throated snapping turtles were identified (acoustically) to have moved from downstream to upstream of the weir but were not recorded within the turtle passage. A further 18 unidentified turtles were observed or photographed on remote cameras within the turtle passage. Overall passage utilisation remained low and insufficient to reliably assess performance of individual passage components.
– Turtle injury and mortality rates remained low (<5%), with no evidence of predation within the turtle passage. However, the rock scour protection on the left bank is a high risk to turtle mortality.

– Habitat conditions within the turtle passage were generally suitable, although attraction flows, variable water velocities, algal growth and sediment accumulation may influence passage effectiveness.
– Suitable habitat and ongoing recruitment of both turtle species were confirmed upstream and downstream of Rookwood Weir. Turtle distribution remains concentrated around the weir, with fewer turtles recorded upstream than downstream.

Corrective actions were triggered for two criteria (Success Criteria 13 and 14) and included:

– Refine and monitor attraction flows to improve consistency between upstream and downstream conditions and enhance the ability of turtles to locate and enter the turtle passage. Adjustments should be informed by ongoing monitoring results and observations.
– Conduct routine maintenance of the turtle passage, including removal of sediment and algae build-up, and rectification of structural features (e.g. lip protrusions or uneven surfaces) that may impede turtle movement.

Corrective actions have also been recommended to remediate the rock scour protection on the left bank and prevent turtles from being able to climb unsafe locations between the turtle passage and the weir on the right bank.

Overall, assessment of monitoring results against success criteria was strongly influenced by monitoring limitations, including low detection rates within the turtle passage, uncertainty in monitoring equipment performance, and differences in tagging effort and spatial coverage. Accordingly, it is recommended that the design of the monitoring program and the suitability of the success criteria are reviewed and modified to correct ongoing limitations in ability to meet the key objectives of the monitoring program.

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Acronyms and abbreviations

Acronyms and abbreviations	Description
AEIS	Addendum Environmental Impact Statement
AHD	Australian Height Datum
AMTD	Adopted Middle Threat Distance
°C	Degrees Celsius
cm	Centimetres
COA	Centres of Activity
CoG	Coordinator General
Cumecs or m^3/s	Cubic Metre per Second
CVC	Conventional Vibrated Concrete
DCCEEW	Department of Climate Change, Energy, Environment and Water
DETSI	Department of Environment, Tourism, Science and Innovation
DO	Dissolved oxygen
DSRP	Downstream Resting Pool
DEHP	Department of Environment and Heritage
EC	Electrical conductivity
EIS	Environmental Impact Statement
EL	Elevation Level
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
FRT	Fitzroy River turtle
FNU	Formazin Nephelometric Units
FSL	Full Supply Level
g	Grams
HW	Headwater
km	Kilometre
kg	Kilogram
kHz	Kilohertz
LFRIP	Lower Fitzroy River Infrastructure Project
m	Metre
m/s	Meters per second
max	Maximum
min	Minimum
mg/L	Milligrams per litre
ML	Megalitres
ML/day	Megalitres per day
mm	Millimetres
µS	Microsiemens
NC Act	*Nature Conservation Act 1992*
NTU	Nephelometric Turbidity Units
PIT	Passive Integrated Transponder

Acronyms and abbreviations	Description
RL	Relative Level
SCL	Straight carapace length
SE	Standard error
SMP	Species Management Plan
SQP	Suitably Qualified Person
TW	Tailwater
USRP	Upstream Resting Pool
WTST	White-throated snapping turtle

1. Introduction

1.1 Purpose of this report

The purpose of this Operations Phase Annual Monitoring Report 2025-26 is to assess the effectiveness of the Rookwood Weir turtle passage infrastructure and turtle protection design features against agreed success criteria, and provide information on the relative abundance, dynamics, health and movement behaviour of the white-throated snapping turtle (*Elseya albagula*) and Fitzroy River turtle (*Rheodytes leukops*) population within the vicinity of Rookwood Weir. Operations phase monitoring has been completed to comply with approval conditions (EPBC 2009/5173 and Coordinator General (CoG) Evaluation Report, CoG, 2018) and management actions outlined in the Rookwood Weir Operations Species Management Plan (SMP) RWW-GHD_ENV-MP-003 (GHD, 2023). This report is required to be submitted to the Queensland Department of Environment, Tourism, Science and Innovation (DETSI) and the Commonwealth Department of Climate Change, Energy, Environment and Water (DCCEEW), and published online, within 12 months of the completion of construction of Rookwood Weir and annually thereafter for five years.

This report has been prepared by GHD Pty Ltd (GHD) on behalf of Tunuba Pty Ltd (Tunuba) and Sunwater Limited (Sunwater) to address this requirement. The report outlines the methodology and results from the second year of turtle passage and broad-scale turtle monitoring conducted under the Rookwood Weir Operation Phase Turtle Monitoring Specification. As required under the Project's approval conditions, the report includes an assessment of turtle movement and the observed performance of relevant infrastructure and design features, in the context of the established success criteria. This document represents the second of five planned annual reports, covering the period from June 2025 to May 2026.

Specifically, the report includes:

- **Introduction** – describes the Project background including aims and objectives of the operations phase monitoring.
- **Methodology** – describes the turtle passage and broad-scale monitoring methodologies implemented during Year 2 2025-26 monitoring of Rookwood Weir operational phase, including maps of monitoring locations, and imagery of turtle capture techniques and tagging procedures.
- **Results and discussion** – presents and discusses the results of turtle capture field surveys and tracking of turtle movements.
- **Compliance with success criteria** – assessment of results against success criteria.
- **Corrective actions** – outlines any corrective actions required based on success criteria that were not achieved.
- **Conclusions and recommendations** – provides a summary of the assessment findings and future recommendations.
- **Supporting documentation** (Appendices) – including data, photographs, observation and inspection forms, and curricula vitae.

1.2 Project background

The white-throated snapping turtle and Fitzroy River turtle are two freshwater turtle species known to occur within the footprint of Rookwood Weir. The white-throated snapping turtle is currently listed as critically endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the Queensland *Nature Conservation Act 1992* (NC Act). The Fitzroy River turtle is currently listed as endangered under the EPBC Act and the NC Act.

As a component of the Lower Fitzroy River Infrastructure Project (LFRIP), Rookwood Weir has been constructed by Sunwater to satisfy short- to medium- term water supply. The weir infrastructure spans 210 metres (m) across the river and has an approximate fixed crest of relative level (RL) 46.2 m Australian Height Datum (AHD). The Weir site is approximately 15 kilometres (km) north of Gogango adjacent to Thirsty Creek Road (Figure 1.1). Gogango lies approximately 66 km southwest of Rockhampton along the Capricorn Highway. The impoundment at full supply level (FSL) extends up the Fitzroy River and into the Mackenzie River (322 km Adopted Middle Thread

Distance (AMTD)) and Dawson River (10 km AMTD). The construction phase of Rookwood Weir commenced in December 2020 and was completed in November 2023. Operation of the weir officially commenced in June 2024, following a commissioning period.

An environmental impact statement (EIS) (GHD, 2015), including an addendum (AEIS) (GHD, 2017) was approved by the Queensland Government's CoG in December 2016 (CoG, 2016) and the Federal Minister for Environment in February 2017 (EPBC 2009/5173), subject to conditions. These conditions included the requirement to design, construct and monitor turtle passage infrastructure and turtle protection design features at Rookwood Weir.

In accordance with EPBC Act Approval Condition 7 and CoG Appendix 2, Schedule 1, Part B Condition 2, a Turtle Movement Study was conducted during the Project design phase to collect baseline data on turtle movement patterns and home range size. The Turtle Movement Study was conducted for four years prior to construction and three years during construction (total seven years implementation (2017 – 2023)). Results of the Turtle Movement Study informed the design of the turtle passage infrastructure and turtle protection design features of the weir, and the development of quantifiable success criteria for demonstrating successful turtle movement (refer to Section 1.2.2).

The turtle passage infrastructure at Rookwood Weir consists of a 172 m long by 2 m wide sloped turtle ramp with resting pools every 15 m (Figure 1.2). The ramp varies in slope up to a maximum of 45 degrees and is textured with exposed aggregate (5 mm greencut) to create a roughened surface for the turtles to grip. Stainless steel resting pool shelters provide shade and protection within each resting pool. A small attraction flow is provided down the ramp and permanent water is contained within the resting pools. The water is distributed through pipework with hand valves used to evenly distribute the discharge through each resting pool. The outlets at each resting pool are fitted with a lay-flat hose extending below the water level to reduce noise.

The turtle passage operates from 0.5 m below minimum headwater and tailwater levels, up to a 1 in 5-year spilling event. The entry and exit points of the turtle passage are located at the river margins where turtles can access them during low velocity conditions. A widened (6 m) funnel entrance/exit is provided both upstream and downstream to increase the area over which turtles can access the turtle passage at minimum headwater and tailwater conditions. The downstream entrance is immediately adjacent to the low flow outlet and fishway.

The turtle passage was required to pass through the right abutment to minimise the length of the ramp and comply with dam safety requirements. The abutment throughfare has been positioned as close to the surface as possible and a mesh grid roof provided to maximise natural light and provide a view to the sky.

The structural components of Rookwood Weir and the turtle passage infrastructure have been designed to avoid/minimise risk of turtle injury and mortality. Key turtle protection design features within the Rookwood Weir include:

– A fixed crest Conventional Vibrated Concrete (CVC) ogee spillway to provide a smooth formed surface finish at the crest of the weir in the spillway section.
– Stilling basin that extends across the full length of the spillway to prevent turtles being projected against hard concrete during spilling events.
– Type 1 stilling basin without baffles or dissipator teeth to avoid turtles contacting hard structures.
– A smooth stilling basin floor with a 45-degree sloped end sill below lowest tailwater to allow turtles to move freely between the stilling basin and downstream approach channel.
– Computational fluid dynamics modelling of turbulence conditions in the stilling basin was undertaken to provide hydraulic flow paths that allow turtles to escape extreme turbulence locations.
– A minimum tailwater depth of 2 m is provided during non-spilling conditions to provide sufficient water depth for downstream turtle passage at commence of spilling and during non-spilling conditions.
– Trash and inlet screens are provided to prevent turtles entering the outlet works from the impoundment.
– The inlet screens for the outlets are designed to prevent turtles being trapped by high water pressures on the upstream side of the outlet works. The outlet screens are inclined at 45 degrees to the flow channel. Screen openings are 20 mm with a maximum water velocity through the screen of approximately 0.3 m/s. The 0.3 m/s velocity occurs at a maximum discharge of 15 m^3/s through the outlet, which will occur infrequently. There is no discharge/flow through the outlet screens during spilling conditions.

- 500 mm wide fishway attraction slots are designed to allow turtle access to the fishway lock chambers and prevent turtles getting stuck in the slots.
- Lock chambers are designed to minimise turbulence conditions within the chambers and avoid injury of turtles.
- Diffusers are included within the lock chambers to present turtle access to outlets and provide safe hydraulic conditions during attraction flow release.
- Height of low flow outlet weir (>6 m) is designed to prevent turtle access during non-spilling conditions.
- Side-winder gate included in low flow outlet to allow turtles to exit the area following elevated tailwater.
- Selector bulks used to select the draw off level for water quality control in discharges.
- Actuators exposed to the environment feature leakage chambers attached to a leakage drain line for collection to prevent contamination of oil to the waterway in the event of actuator leak.
- Shelters are positioned within all resting pools to provide protection to turtles along the turtle passage.
- Turtle passage ramp and pools contain 0.5 m high inward sloping walls and smooth surfaces (anti-graffiti paint) to prevent turtles falling or climbing unsafe locations.
- Turtle passage infrastructure is textured with exposed aggregate (5 mm) to create a roughened surface for the turtles to grip and minimise risk of falls.
- Constant water supply provided within the turtle passage infrastructure to maintain water quality conditions within resting pools.
- Access to weir infrastructure for monitoring of turtle populations is facilitated.

In accordance with Project approval conditions (refer to Section 1.2.1), the turtle passage infrastructure and turtle protection design features are required to be monitored to assess their effectiveness against the approved success criteria (refer to Section 1.2.2). The deployment of identification and acoustics tags during the baseline and construction phase Turtle Movement Study, and Year 1 2024-2025 of the operational phase on white-throated snapping turtles and Fitzroy River turtles, will facilitate ongoing monitoring of the turtle passage infrastructure and turtle protection design features throughout Project operation.

The turtle passage infrastructure design is experimental and although based on best available information, it is not yet known whether the turtles will use the passage or if the success criteria developed are appropriate for the two threatened turtle species. The operations phase monitoring will occur during a period when turtle movement behaviour is likely to be impacted by the completion of construction and commencement of operation. It is unknown how long it may take for habitat conditions to stabilise and turtle movement behaviour to reflect operational conditions following the completion of construction and associated river impoundment. The operations phase monitoring is therefore expected to be adaptive to account for unforeseen circumstances, as well as expected variability in environmental conditions (e.g. flow events) that can influence monitoring methodology. A range of monitoring techniques have been selected for implementation to allow for contingency in data capture refer to Section 2). Over time, results of the monitoring program are expected to inform refinement of the monitoring program design.



Legend

- Project Location
- Town
- Highway
- Secondary Road
- Local Connector Road
- Street/Local Road
- Private or Restricted Road
- Bikeway/Walkway
- Watercourse
- Full Supply Level 46.2m

Paper Size ISO A4

0 2 4 6 8

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

GHD

SunWater Limited
Rookwood Operations Phase TMS

Project No. **12633406**
Revision No. **0**
Date **10/06/2026**

Project locality

FIGURE 1.1

\\ghdnet\ghd\AU\Brisbane\Projects\41\12633406\GIS\Maps\Deliverables\12633406_Annual_Reporting.aprx\12633406_004_ProjectLocality_Rev0
Print date: 10 Jun 2026 - 12:49

Data source: DoR: Baseline Road (2021), Watercourse (2018); GHD: Full Supply Level 46.2m (2018), Project Location (2021); Imagery (2018); World Topographic Map: DESI, Esri, TomTom, Garmin, FAO, NOAA, USGS; World Imagery (Wayback 2024-11-18): ; Basemaps_LatestStateProgram_AllUsers: ; World Hillshade: Esri, USGSDate extracted - 18/06/2025 Created by: epangan

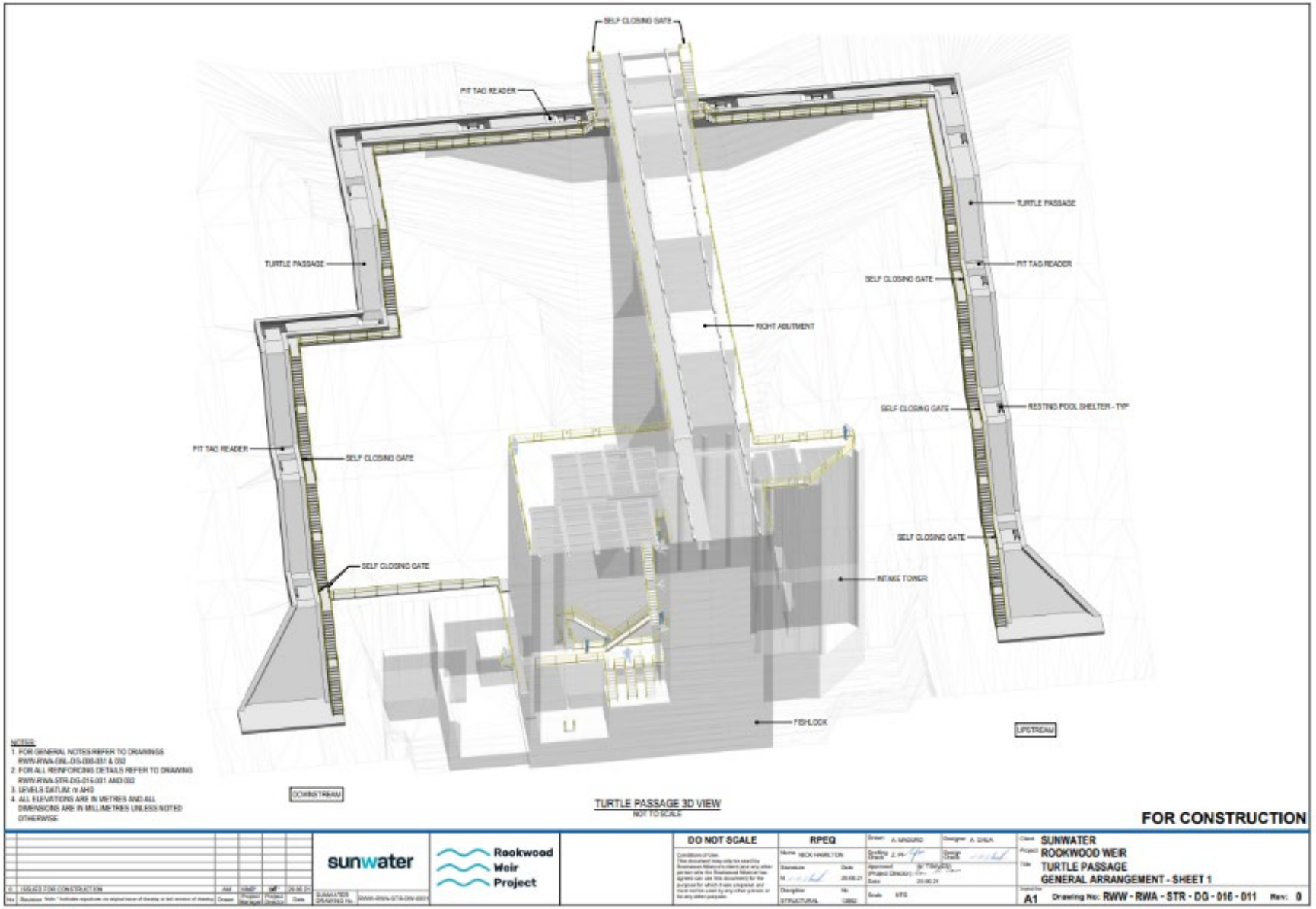


Figure 1.2 Turtle passage general arrangement

1.2.1 Legislative requirements

At the time of the LFRIP EIS, the white-throated snapping turtle was not listed as a threatened species under the EPBC Act. As such, legislative requirements for this species have been specified by the CoG under the NC Act. Whereas, requirements for the Fitzroy River turtle have been conditioned by the Federal Minister for Environment under the EPBC Act. Specifically, approval conditions related to the Operations Phase Turtle Monitoring are as follows:

CoG Appendix 2. Imposed conditions – Rookwood Weir, Schedule 1. White-throated snapping turtle, Part B. Turtle movement study and passage:

Condition 3. Turtle passage infrastructure -

(d) Monitor the effectiveness of the turtle passage infrastructure against the success criteria approved in accordance with Condition 2(d) (which states the turtle movement success criteria must be approved by department of Environment and Heritage Protection (DEHP) (now DETSI), in writing, prior to the construction of turtle passage infrastructure at the weir site).

(e) Report to DEHP (now DETSI) on the effectiveness of the turtle passage infrastructure in relation to the turtle movement success criteria twelve months after the construction of the relevant stage of the weir and annually thereafter.

(f) The monitoring methodology and reporting of the effectiveness of the turtle passage infrastructure must be externally peer reviewed and undertaken by a suitably qualified person.

(g) If monitoring evidence indicates that the turtle movement success criteria are not being met, the turtle passage infrastructure is to be modified to achieve the success criteria.

EPBC Act Condition 7 Turtle passage infrastructure:

a) At each Weir (Eden Bann and Rookwood), the approval holder must:

(iv) monitor the effectiveness of the turtle passage infrastructure against the success criteria approved by the Minister (at conditions 7c) iii. and 7d)) twelve months after the construction of the relevant weir; and

(v) report to Department of Environment and Science (DES) (now DETSIDETSI) on the effectiveness of the turtle passage infrastructure in relation to the turtle movement success criteria, (taking account of wet and dry seasons and a full year of turtle movement, breeding and nesting distribution) twelve months after the construction of the relevant weir and thereafter annually and include a copy as part of the annual environmental report required under condition 10.

c) The Study (…) must:

(i) be prepared and undertaken by a suitably qualified person in accordance with a methodology determined in consultation with DES (now DETSI).

(ii) collect data on seasonal movement patterns and home ranges of the Fitzroy River turtle. The study must include wet and dry season movements, breeding periods and nesting distribution; and

(iii) inform the development of criteria for demonstrating successful movement of Fitzroy River turtles around the relevant weir (success criteria).

f) The monitoring and reporting of the effectiveness of the turtle passage infrastructure (condition 7a) iv.) must be undertaken by a suitably qualified person and externally peer reviewed.

g) If the monitoring specified by conditions 7a) iv. and 7a) v. fails to demonstrate that the success criteria are being met, the turtle passage infrastructure must be modified in accordance with advice provided by DES (now DETSI) with the aim of achieving the success criteria.

Species Management Plan

The Rookwood Weir Operations SMP (RWW-GHD-ENV-MP- 003; GHD, 2023), was developed to fulfil the legislative approval requirements of the Project and assist Sunwater and its contractors in the avoidance and mitigation of potential impacts to the white-throated snapping turtle and Fitzroy River turtle during the operation phase of the Rookwood Weir. Under the approved Operations SMP, there are defined management strategies requiring implementation during Rookwood Weir operations to minimise the Project's impacts that have the potential to contribute to the existing threatening processes impacting the white-throated snapping turtle and Fitzroy River turtle. The Operations SMP includes four management strategies:

– Management Strategy 1: Turtle movement (to maintain upstream and downstream movement of turtles)
– Management Strategy 2: Turtle protection (to avoid/minimise the potential for turtle injury and mortality)
– Management Strategy 3: Protection of nesting habitat and increase in recruitment
– Management Strategy 4: Protection of habitat.

Each management strategy includes objectives, alignment with species conservation/recovery plans, management actions, success criteria, monitoring and corrective actions and reporting.

The following actions from the Operations SMP apply to the Operations Phase Turtle Monitoring:

– *Action 1B: Effectiveness of turtle passage infrastructure against success criteria and adaptive management implemented if required:*
    - *1B1: Operation Phase Turtle Movement Study to be conducted by suitably qualified persons (as outlined below and as agreed with DETSI and DCCEEW) for five years from the time the turtle passage becomes operational following completion of construction and once the storage reaches 8,000 ML (EL 35.20m AHD).*
    - *1B2: Notify DETSI and DCCEEWW of the commencement of turtle passage operation and initiation of the Operations Phase Turtle Movement Study.*
    - *1B3: Safe access to the turtle passage infrastructure will be maintained during operation for monitoring and compliance purposes.*
    - *1B4: Fisheries monitoring program to record incidental observation of turtles during monitoring of the fishway and broad-scale fish community monitoring.*
    - *1B5: Incidental observations and fishway PIT tag reader results to be provided to Operations Phase Turtle Movement Study team for inclusion in Turtle Movement Study Annual Report.*
    - *1B6: A report (Turtle Movement Study Annual Report) on the effectiveness of the turtle passage infrastructure in relation to the turtle movement success criteria will be provided to DETSI and DCCEEW (and published online) twelve months after the completion of construction and annually thereafter for the duration of the Operations Phase Turtle Movement Study*
    - *1B7: The monitoring methodology and reporting of the effectiveness of the turtle passage infrastructure will be externally peer reviewed and undertaken by a suitably qualified person. The monitoring report and evidence of the suitably qualified expert will be submitted to DETSI and the environmental audit and compliance section within DCCEEW.*
    - *1B8: An annual meeting with DETSI and DCCEEW (and all other relevant stakeholders- independent reviewer, monitoring program technical lead). The meeting will discuss the Turtle Movement Study Annual Report and the findings of the independent reviewer.*
    - *1B9: Raw data from the Operation Phase Turtle Movement Study will be provided to DETSI Threatened Species Operations for inclusion into the DES freshwater Turtle Database.*
    - *1B10: the monitoring fails to demonstrate that the success criteria are being met, the turtle passage infrastructure will be modified in accordance with advice provided by DETSI with the aim of achieving the success criteria. The process that will be implemented in the event that monitoring indicates that the success criteria are not being met is outlined in Section 6 with corrective actions for each success criteria identified below.*

- *1B11: If the monitoring demonstrates that the success criteria are not being met, the approval holder must implement an ongoing catch and release program for the Fitzroy River turtle and white-throated snapping until the criteria are met.*
- *1B12: At the completion of five years of Operations Phase Turtle Movement Study monitoring, a report will prepare detailing the results of the monitoring and compliance of the turtle passage with the success criteria, as well as recommendations for ongoing monitoring to enable reporting against the success criteria. This report will be submitted to DETSI and the environmental audit and compliance section within DCCEEW for review to inform a decision on what is appropriate for ongoing monitoring.*
- *1B13: Annual environmental monitoring and reporting undertaken for the life of the approval (i.e. 2046), as per Condition 10, will include reporting on the ongoing effectiveness of the turtle passage infrastructure.*

– *Action 2C: Evidence of turtle injury/mortality monitored against success criteria and adaptive management implemented if required.*
  - *2C1: Operation phase Turtle Movement Study (refer to Management Strategy Action 1B) to monitor and assess efficiency of turtle protection design features and weir operating strategy at achieving turtle protection success criteria.*
  - *2C2: Fisheries monitoring program to record incidental observation of turtles injury/mortality during monitoring of the fishway and broad-scale fish community monitoring.*
  - *2C3: A report (Turtle Movement Study annual report) on the effectiveness of the turtle protection design features against the success criteria will be provided to DETSI and DCCEEW twelve months after the completion of construction and annually thereafter for the duration of the Operations phase Turtle Movement Study.*
  - *2C4: The monitoring methodology and reporting of the effectiveness of the turtle protection design features and operating strategy will be externally peer reviewed and undertaken by a suitably qualified person. The monitoring report and evidence of the suitably qualified expert will be submitted to DETSI and the environmental audit and compliance section within DCCEEW.*
  - *2C5: An annual meeting with DETSI and DCCEEW (and all other relevant stakeholders- independent reviewer, monitoring program technical lead). The meeting will discuss the Turtle Movement Study Annual Report and the findings of the independent reviewer.*
  - *2C6: Raw data on turtle injuries/mortality will be provided to DETSI Threatened Species Operations for inclusion into the DETSI freshwater Turtle Database.*
  - *2C7: If the monitoring fails to demonstrate that the success criteria are being met, the turtle protection design features will be modified in accordance with advice provided by DETSI with the aim of achieving the success criteria.*
  - *2C8: At the completion of five years of operational phase Turtle Movement Study monitoring, a report will prepare detailing the results of the monitoring and compliance the turtle protection design features with the success criteria, as well as recommendations for ongoing monitoring to enable reporting against the success criteria. This report will be submitted to DCCEEW and DES. The departments (DCCEEW and DES) will provide comments on the report. Within 3 months of receiving the comments on the report, and after incorporating the comments submitted by DCCEEW and DETSI, the report will be submitted to the Minister for approval.*

– *Action 4C: Implementation of broad-scale turtle population monitoring program*
  - *4C1: A Broad-Scale Turtle Population Monitoring Program will be developed and implemented to monitor the turtle population within, upstream and downstream of the Weir. Monitoring will be conducted for five years from the time the turtle passage becomes operational following completion of construction and once the storage reaches 8,000 ML.*
  - *4C2: Results of the Broad-Scale Turtle Population Monitoring Program will be included in the Turtle Movement Study Annual Report and Annual Nest Protection Management Plan Report.*
  - *4C3: An annual meeting with DETSI and DCCEEW (and all other relevant stakeholders- independent reviewer, monitoring program technical lead). The meeting will discuss the Turtle Movement Study Annual Report and the findings of the independent reviewer.*

- *4C4: Raw data on turtle injuries/mortality will be provided to DETSI Threatened Species Operations for inclusion into the DETSI freshwater Turtle Database.*
- *4C5: If the monitoring fails to demonstrate that the success criteria are being met, corrective actions will be implemented in accordance with advice provided by DETSI and DCCEEW with the aim of achieving the success criteria.*
- *4C6: The Broad-scale Turtle Population Monitoring Program will be reviewed after five years and ongoing management requirements identified for incorporation into Weir operational plans and/or Nest Protection Management Plans, as considered necessary and applicable (in collaboration with DETSI).*

1.2.2 Success criteria

As defined in the Operations SMP (GHD, 2023), success criteria have been developed to provide a measurable target to determine if management actions are effectively minimising potential Project-related impacts on turtle movement and survival. As per approval conditions (refer to Section 1.2.1), this Operations Phase Turtle Monitoring Annual Report must assess whether the success criteria are being met and, where they are not, provide recommendations in line with the corrective actions outlined in the Operations SMP.

The following success criteria have been defined under the Operations SMP:

1. 75% of white-throated snapping turtles and Fitzroy River turtles that attempt to use the turtle passage each year for upstream passage will do so successfully.
2. Turtle monitoring downstream of the weir demonstrates no turtle injury/mortality during downstream turtle passage over the spillway, as evidence by impact damage to turtles.
3. The turtle passage remains operational (attraction flow is provided and passage unobstructed) continuously when the storage is above 8000 ML up to a 1 in 5-year spilling event.
4. The turtle passage operates for one week after each four weeks of non-operation when the storage is below 8000 ML.
5. 75% of adult white-throated snapping turtles and Fitzroy River turtles recorded within 50 m of the turtle ramp and fishway entrances within a 12-month period, are attracted to and can successfully locate the turtle passage entrance (as defined as entering the funnel shaped ramp).
6. 75% of adult white-throated snapping turtles and Fitzroy River turtles that attempt to use the ramp within a 12-month period can successfully ascend the ramp and pool arrangement to reach the abutment throughfare.
7. 75% of adult white-throated snapping turtles and Fitzroy River turtles that attempt to use the ramp within a 12-month period can successfully move through the abutment throughfare.
8. 75% of adult white-throated snapping turtles and Fitzroy River turtles that attempt to use the ramp can successfully descend the turtle ramp from the abutment throughfare into the impoundment to complete passage past the weir.
9. Turtle monitoring demonstrates no predation of turtles from within the turtle passage infrastructure.
10. Turtle monitoring demonstrates no turtle injury and/or mortality from within the turtle passage as a result of falls.
11. The ratio of adult male and female white-throated snapping turtles and Fitzroy River turtles successfully moving upstream through the turtle ramp within a 12-month period is equivalent to pre-development ratios of turtles moving outside their home range.
12. Seasonal variation in use of the turtle ramp by adult male and female white-throated snapping turtle and Fitzroy River turtle is equivalent to pre-development seasonal trends over a 12-month period.
13. Measurement of the turtle ramp attraction flow during inspections and turtle capture monitoring events indicates that the depth of water flow on the upstream ramp remains suitable for turtles to climb as per annual depth criteria.
14. Over a 12-month period, habitat conditions within the resting pools remain suitable for adult white-throated snapping turtles and Fitzroy River turtles, as evidenced by achievement of suitable pool depth criteria, compliance with water quality objectives and long-term availability of shelters.
15. Annual monitoring downstream of the weir trash screens and inlets indicates no entrapment or drowning of white-throated snapping turtles or Fitzroy River turtles.

16. Monitoring of the fishway over a 12-month period indicates no injury/mortality of white-throated snapping turtles or Fitzroy River turtles occurred within the fishway complex.
17. At least 20 adult Fitzroy River turtles and white-throated snapping turtles recorded attempting to use the turtle passage within a 12-month period.
18. Suitable turtle habitat is present within, and/or upstream and/or downstream of Rookwood Weir.

As recommended by DETSI and DCCEEW, if sampling sizes for the Fitzroy River turtle and white-throated snapping turtle are too low to allow the success criteria to be assessed (less than 20 turtles recorded using the turtle ramp within a 12-month period), corrective actions will be implemented and may include:

– Expansion of the Turtle Movement Study to include monitoring of the common Krefft's river turtle (*Emydura macquarii krefftii*). Data from the Krefft's River turtle would then be used to infer suitability of ramp for the threatened species. Initially, monitoring via PIT tags readers, cameras, turtle capture surveys, observations and inspections to occur following the first year of non-compliance. Inclusion of acoustic tags to be considered following the second consecutive year of non-compliance.
– Artificial experimentation involving the relocation of tagged turtles from upstream of the Weir to the downstream entrance of the turtle passage and/or to within the turtle passage to obtain results on the physical suitability of the turtle passage for the Fitzroy River turtle and white-throated snapping turtle.

If monitoring evidence indicates that the success criteria are not being met, as per the triggers and monitoring frequency outlined within each management strategy, corrective/contingency actions will be implemented. These are provided in detail in the Operations SMP (GHD, 2023).

1.2.3 Suitably qualified and experienced persons

As per approval conditions (refer to Section 1.2.1), the operation phase turtle passage monitoring, broad-scale turtle monitoring, and annual reporting are required to be conducted by suitably qualified persons. The monitoring was designed and implemented by the following suitably qualified persons:

– **Dr Natalie Clark** – freshwater turtle specialist, GHD. The operations phase turtle monitoring and Operations Phase Annual Monitoring Report was led by Dr Natalie Clark. Natalie was trained by Dr Col Limpus (DETSI) on the capture, measuring and tagging of freshwater turtles within the Fitzroy River and Burnett River catchments in 2003. Natalie completed her Honours and PhD research on freshwater turtles, including the white-throated snapping turtle and Fitzroy River turtle. Over the past 20 years, Natalie has supported Sunwater with the delivery of the Rookwood Weir Project including informing the design of the turtle passage infrastructure and turtle protection design features, developing and implementing the Turtle Movement Study during baseline and construction phases, and developing the operational plans and associated success criteria including the Operations SMP, turtle monitoring methodology, nest protection plans and turtle-specific offset requirements.
– **Dr Ross Dwyer** – Senior Lecturer in Animal Ecology, University of the Sunshine Coast. Dr Ross Dwyer has over 20 years of experience tagging animals with tracking devices, and he has tagged and tracked over 150 freshwater turtles with acoustic tags in the Fitzroy and Mary rivers. He has also designed five acoustic arrays throughout Queensland to track aquatic animal movements. Dr Dwyer is an authority on the analysis of animal tracking data and has published three software packages, > 50 research papers and one book chapter on animal tracking techniques. Ross conducted turtle capture field surveys for the white-throated snapping turtle and Fitzroy River turtle during the Turtle Movement Study and he designed the acoustic array and completed the acoustic telemetry analysis for the operations phase monitoring.
– **Chris Pietsch** – Chris is a Principal Aquatic Ecologist with a Bachelor of Applied Sciences. Chris has 17+ years' experience undertaking aquatic ecology surveys and has conducted extensive surveys for the white-throated snapping turtle and Fitzroy River turtle within the Fitzroy River Catchment as part of the Turtle Movement Study during baseline and construction phases. Chris was the field team lead for the operations phase monitoring.
– **Lauren Pratt** – Lauren is a Senior Aquatic Ecologist with a Bachelor of Marine Studies, Honours Class 1A. Lauren has over 17 years' experience in aquatic ecology and has conducted numerous surveys for the white-throated snapping turtle and Fitzroy River turtle as part of the construction and establishment phases for Rookwood Weir. Lauren conducted field surveys and reporting for the operations phase monitoring.

Curricula vitae for each person are provided in Appendix A.

Field surveys were supported by Tunuba Rangers – Buzz Broome, Zac Richards and Stephen Upkett. Field surveys and/or reporting were also supported by additional GHD staff – Sarah Hampson (Ecologist), Haydn Turner (Ecologist) and Yani Mouland-Vail (Ecologist). All GHD team members are either experienced with threatened turtle species, undertaken multiple surveys for Rookwood Weir previously or were supervised by experienced personnel.

1.3 Species background

1.3.1 White-throated snapping turtle *(Elseya albagula*)

The white-throated snapping turtle is one of Australia's largest turtle species with adult females weighing up to ten kilograms (kg) with a carapace length up to 38 centimetres (cm). This species is sexually dimorphic, with females being much larger than males (Thomson *et al.,* 2006). The white-throated snapping turtle occurs throughout the Fitzroy, Burnett and Mary River catchments. Juvenile white-throated snapping turtle are carnivorous, while adult turtles are primarily herbivorous, feeding on fruit and leaves of riparian vegetation and aquatic macrophytes (Rogers, 2001). The white-throated snapping turtle can respire through cloacal respiration , with turtles obtaining approximately 40-60 % of their oxygen requirements from the water (Mathie and Franklin, 2006; Clark, Gordos & Franklin, 2008).

The white-throated snapping turtle inhabits permanent waters within flowing streams and is not thought to occur within farm dams, ephemeral swamplands, or brackish waters (Hamann *et al.,* 2007). The species is also known to inhabit impounded pools with individuals recorded within the Fitzroy Barrage, Eden Bann Weir, Theodore Weir, Glebe Weir and Callide Dam (Limpus *et al.,* 2007). The preferred habitat for this species is the permanent flowing reaches of the rivers that are characterised by steep sides, a sand-gravel substrate and an abundance of underwater refuge (e.g. rocks, logs and undercut banks) (Hamann *et al.,* 2007). During the day, the white-throated snapping turtle is generally found in deep pools (>6 m) either upstream or downstream from a riffle zone. Turtle movement studies conducted at Rookwood Weir between 2017 and 2023, prior to operations, supported this (GHD, 2024), finding that this species is most commonly detected in large permanent pool habitat downstream of Rookwood to Lawries Bend and upstream from Rookwood to Gogango Creek. Prior to inundation, this region was composed of sandy bank areas, deep pools, and significant rock bars that provided good foraging and nesting habitat. Turtle capture surveys also found there were greatest numbers of white-throated snapping turtle caught in the Rookwood Weir pool-riffle sequence (39 individuals caught between 2017-2023). This corroborates how, at night, this species is known to move into shallow riffle zones (Gordos *et al.,* 2007; Hamann *et al.*, 2007). During the dry season, white-throated snapping turtle inhabits less productive slow-moving pools where they compete for limited resources with other turtle species and aquatic fauna. The habitat and movement pattern of hatchling turtles is largely unknown.

The white-throated snapping turtle has an extended breeding season, with peak nesting occurring from April to August and hatching generally occurring September to December after an embryonic diapause over the winter months (Limpus, Limpus, Parmenter *et al.,* 2011). Nesting aggregations can occur with females often returning to the same nesting areas each year. Nests are generally laid on the front face and top of steep slopes, are an average of 5 m from the water's edge and are 3 m above the water level (McDougall *et al.*, 2015; Hollier, 2010; Hamann *et al.*, 2007). However, nesting can occur up to 60 m from the water's edge and over 8 m above the water level (Limpus, Limpus, Hollier *et al.*, 2011). The lack of hatchling and juvenile turtles within the population in the early 2000s suggested limited recruitment over the preceding two decades, estimated at less than two percent (Hamann *et al.*, 2007). High rates of nest predation by foxes, pigs, goannas, feral cats, and water rats have been identified as a major contributing factor. In total, white-throated snapping turtle nesting has been confirmed present at eight nesting banks:

– Foleyvale downstream
– Foleyvale upstream
– The Pocket upstream
– Gogango Creek mouth
– Lawries Bend
– Rookwood to Hanrahan Crossing

– Hanrahan Crossing upstream
– Rookwood downstream of crossing.

Radio tracking of the white-throated snapping turtle within the Burnett River indicated that the home range size of the species was generally small (i.e. less than 500 m) and usually restricted to the one pool (Hamann *et al.*, 2007). This observation was supported by acoustic monitoring of the species within the Mary River catchment, where a home range of <2.2 km was recorded (Micheli-Campbell *et al.*, 2017).

During Rookwood Weir pre-construction and construction phases, and Year 1 2024-25, tracking data showed an overall linear home range of 11.0 km (SE = 0.97 km), with adult males occupying significantly larger ranges (13.7 km, SE = 1.35 km) than adult females (8.48 km, SE = 1.32 km). The home range distance of white-throated snapping turtles acoustically tagged by GHD is significantly larger than previous studies (Hamann *et al.*, 2007, Micheli-Campbell *et al.*, 2017). Notably, across all monitoring periods female turtles expanded their home range and travel distances beyond those of males during the nesting season (May–September), while males were most active during the breeding season (November–April). Movement patterns of females were also variable over time, and over half of the tagged turtles undertook substantial directional movements, with long distance migrations of up to 38.54 km during pre-construction phases (GHD, 2024). These long-distance movements, particularly in males, were typically triggered by receding river flows, while females were observed making shorter upstream movements during the nesting season, often returning annually to key sites such as Gogango Creek and The Pocket (GHD, 2024). However, since the commencement of weir operations, the distribution of white-throated snapping turtles within the broader area has decreased (GHD, 2025). More specifically, comparison of home ranges between pre-construction and operation suggest that the home range of female white-throated snapping turtle have gradually decreased in size from 2020 onwards to the smallest home range size in 2024. Comparatively, the home range of male white-throated snapping turtles remained similar between years (GHD, 2025). Differences in acoustic tagging effort, methodology, and the number of turtles tagged between pre-construction and operational phases means that observations are only general and are not scientifically valid.

Similar findings have been reported by Hamann *et al.* (2007), who documented occasional long-distance movements (10 to 55 km) associated with dispersal, courtship, nesting, or repositioning after flood events. However, any overland movement is generally limited to travel between adjacent pools. Rainfall is also considered a movement cue, with individuals observed attempting to bypass impoundments during periods of rainfall and minor overtopping events (Hamann *et al.*, 2007; Limpus *et al.*, 2007). These findings collectively demonstrate how the white-throated snapping turtle can exhibit varying home range sizes across different catchments, and how these differences are likely influenced by factors such as river morphology, habitat connectivity, and flow regimes.

1.3.2 Fitzroy River turtle *(Rheodytes leukops*)

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, Limpus, Parmenter *et al.*, 2011). 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, Limpus, Parmenter *et al.*, 2011). However, in large deep-water areas (>5 m) of impoundments low in dissolved oxygen, these turtles are less likely to feed and respire effectively, especially during slow or non-flowing conditions (Limpus et al. 2008). The Fitzroy River turtle is not known to occur in off-stream habitats such as farm dams, billabongs, or flood plains (Limpus, Limpus, Parmenter *et al.*, 2011).

The Fitzroy River turtle is known to occur within the Fitzroy, Mackenzie and Dawson Rivers, within, upstream and downstream of Rookwood Weir. Results of studies of white-throated snapping turtles tagged by GHD during the construction and establishment phases of Rookwood Weir (2017-2023) 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 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).

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, Franklin & Limpu*s,* 2003). Benefits of aquatic respiration include increased time available for foraging and breeding, and reduced exposure to predation and reduced energy expenditure (Gordos, Franklin & Limpu*s,* 2003; Clark, Gordos & Franklin, 2008). The ability of the Fitzroy River turtle to respire through cloacal respiration also allows this species to inhabit fast-flowing riffle zones where primarily air-breathing species may be excluded (Gordos, Franklin & Limpu*s,* 2003).

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, 2001; Tucker *et al.,* 2001; Limpus, Limpus, Parmenter *et al.*, 2011). 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 for breeding during the dry season (Limpus, Limpus, Parmenter *et al.*, 2011).

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, Limpus, Parmenter *et al.*, 2011). Nesting generally occurs approximately 5 to 6 m from the water's edge (Hamann *et al.,* 2007; Limpus, Limpus, Parmenter *et al.*, 2011). Females can lay two or more egg clutches per year between August and December with hatching occurring during summer (November to February) (Limpus, Limpus, Parmenter *et al.*, 2011; Limpus, Limpus, Hollier *et al.*, 2011). Their eggs are approximately ~3.2 cm long and 2.4 cm wide. Nesting aggregations occur with females often returning to the same nesting areas each year. Seasonal turtle nesting surveys conducted as part of Rookwood Weir pre-clearance surveys identified 34 banks with confirmed nesting between Foleyvale Crossing (upstream of Rookwood Weir) and Hanrahan Crossing (downstream of Rookwood Weir). Aggregated nesting of the Fitzroy River turtle has been confirmed present at Rookwood, the upper inundation area (upstream and downstream of the junction between the Fitzroy River and Mackenzie River), downstream of Foleyvale Crossing, The Pocket, and Hanrahan Crossing (GHD, 2022).

Prior to the turtle movement studies conducted at Rookwood Weir for construction and establishment phases, little was known about the movement patterns of Fitzroy River turtle. A single radio tracking study conducted on the species suggested that home range size was relatively small (mean range 2.4-4.0 hectares) with local movement generally occurring between riffle zones and adjacent pools (Tucker *et al.*, 2001). The study recorded a single long-distance movement of 6.8 km downstream, with the return of the individual six month later (Tucker *et al.*, 2001). The Rookwood Weir turtle movement studies during pre-construction, construction and operations Year 1 2024-25 found similarly small home ranges for Fitzroy River turtle, with an average home size range of 5.03 km (SE = 0.76 km) for turtles tracked between 2017 and 2025. The average linear home range for adult males was smaller (3.78 km, SE = 0.79) than that of adult females (6.44 km, SE = 1.05 km). Since the commencement of weir operations, the distribution of Fitzroy River turtles has decreased. From available capture data, this species was previously concentrated around the Riverslea and Rookwood pool-riffle sequences and pools immediately downstream. From 2024 onwards, greater numbers of tagged Fitzroy River turtle were detected downstream of the weir, with very few individuals detected upstream of the weir. The large number of turtles previously recorded around Riverslea have either left the acoustic array or the batteries within the acoustic tags have gone flat since the weir commenced operations (GHD, 2025).

Identification tagging and observations of the species within the Fitzroy catchment by Dr Col Limpus, suggest large-scale movements in the order of tens of kilometres may have potentially occurred for the purpose of dispersal, courtship and nesting migrations and repositioning following flood displacement (Dr Col Limpus pers. comm.). Indeed, large distance migrations outside of home range movements have been recorded in

approximately one third of tagged Fitzroy River turtle throughout preconstruction and construction phases (2017-2023) (GHD, 2025). However, these large directional movements were observed less frequently and over shorter distances in Fitzroy River turtle than in white-throated snapping turtle. Interestingly, male Fitzroy River turtles appeared to undertake large-distance migration on the recession of peak flow events, however this was not observed in 2022-2023 during construction of Rookwood Weir. Comparatively, large distance migrations for female Fitzroy River turtle typically occurred in response to flow events during Summer and Autumn (i.e. mid to late nesting season), and a number of females have also been recorded moving outside their home range during the nesting season.

Movement of Fitzroy River turtles over land is only known to occur between adjacent pools. Rainfall is thought to act as a trigger for turtle movement with individuals observed attempting to move past impoundments during rainfall and small flow events (Limpus *et al.*, 2007; Limpus, Limpus, Parmenter *et al.*, 2011; Limpus, Limpus, Hollier *et al.*, 2011). The habitat and movement requirements of hatchling turtles are still unknown.

1.4 Limitations and Assumptions

Sunwater have engaged Tunuba, in collaboration with GHD, to complete the turtle monitoring requirements of the Operations SMP. Specifically, the turtle monitoring scope of work is detailed within the Rookwood Weir Specification of Services: Turtle Monitoring.

This report has been prepared by GHD for Sunwater and may only be used and relied on by Sunwater for the purpose agreed between GHD and Sunwater as set out in Section 1.1 of 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.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared. The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points. Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location vegetation or accessibility limits. As a result, not all relevant site features and conditions may have been identified in this report.

GHD has prepared this report on the basis of information provided by *Sunwater* and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

This Operations Phase Annual Turtle Monitoring Report does not include monitoring or reporting (i.e. Annual Nest Protection Management Plan Report) associated with enhancement of turtle nesting habitat, protection of turtle nests or increase recruitment of hatchlings (Management strategy 2 of the Operations SMP).

This report has been prepared based on the following information provided by Sunwater and Tunuba:

– Hydrophone data recorded along turtle passage and broader array from January 2025 up to and including March 3 2026.
– PIT tag data recorded along the turtle passage and fishway from June 2025 up to and including May 15 2026.
– Rookwood Weir data for water level (mean daily mAHD) and flow (mean ML/day) for headwater (HW) and tailwater (TW), and weir storage level (mean %) were provided by Sunwater from June 2025 up to and including May 15, 2026.
– Reviewed remote camera imagery of turtles and other fauna in the turtle passage captured from June 2025 up to and including May 15, 2026.

– Turtle passage inspection, turtle observation and turtle injury/mortality forms completed from June 2025 up to and including May 15, 2026.
– Confirmed locations of Priority Turtle Nesting Areas as per the 2025 Annual Nest Protection Management Plan (Tunuba, 2025). Key turtle habitat locations for Year 2 2025-26 monitoring are outlined in Table 2.10.
– The outcome of the third party review of the Year 1 2024-25 'Operations Phase – Turtle Annual Monitoring Report' report (Hamish Campbell, 2025) were considered in drafting this report, however only the high-level summary of the review was provided for consideration.

The 2024-25 Operations Phase Annual Report (GHD, 2025) identified the following actions were required to improve monitoring methodology:

– The placement, type and number of remote cameras are to be reviewed and modified to allow continuous monitoring of turtle behaviour along the full length of the turtle passage
– The PIT tag readers within the turtle passage are to be reviewed to confirm they are operating as intended and repaired if required
– Continue to monitor turtle passage conditions and conduct maintenance / repairs as required
– Identify additional suitable capture locations within the weir pool to improve upstream turtle monitoring
– Standardisation of *in-situ* water quality measurements and assessments as results differed between Sunwater and GHD.

Operation of the PIT tag readers was investigated in 2025 and during Year 2 2025-26 monitoring, turtles were tagged with Biomark APT12 FDX-B PIT tags (12.5 mm × 2.0 mm; 134.2 kHz), which comply with ISO 11784/11785 standards and are compatible with the fixed PIT tag readers installed within the turtle passage and fishway infrastructure. These tags replaced the PIT tags previously deployed, which were subsequently determined to have insufficient detection range to be reliably detected by the fixed PIT tag readers within the turtle passage.

The other recommendations from the 2024-25 Operations Phase Annual Report (GHD, 2025) were not implemented during Year 2 2025-26 monitoring and therefore data deficiencies remain. Deficiencies in data quantity, quality or availability of results limited the ability to robustly assess the success criteria. See Section 2.9 for further discussion of assessment limitations and caveats.

2. Methodology

Year 2 2025-26 of Rookwood Weir operations phase monitoring was conducted in accordance with the approved methodologies described in the Rookwood Weir Operations SMP (GHD, 2023). Year 2 2025-26 involved monitoring of turtle movement behaviour within the turtle passage constructed at Rookwood Weir, and broad-scale monitoring at areas upstream and downstream of Rookwood Weir. Methods used for the turtle passage monitoring included turtle capture surveys, remote telemetry (acoustic and Passive Integrated Transponder (PIT)) and camera monitoring, supported by inspectional and observational records (Figure 2.1 and Figure 2.2). Broad-scale monitoring methods included turtle capture surveys and remote telemetry (acoustic) (Figure 2.3 and Figure 2.5). The methods used for these two distinct, but associated monitoring programs are described below.

2.1 Survey area

2.1.1 Turtle passage monitoring

The survey area for the turtle passage monitoring comprises the entire constructed turtle passage at Rookwood Weir, in addition to the upstream turtle passage entrance and downstream approach channel immediately downstream of the weir (Figure 2.1, Figure 2.2). This area represents the where turtles may access turtle passage infrastructure. Sections of the turtle passage have been named according to Sunwater designations to ensure consistent terminology across reporting commitments. Naming conventions for the turtle passage include Downstream Resting Pools (DSRP) and Upstream Resting Pools (USRP). These pools are numbered sequentially based on their distance from the highest point of the turtle passage (abutment tunnel) in relation to Rookwood Weir. Specifically, DSRP1 and USRP1 are the closest resting pools downstream and upstream of the abutment tunnel, respectively. In contrast, DSRP8 and USRP7 are the furthest from this point in their respective directions, however USRP6 and USRP7 are typically inundated within the weir pool.

2.1.2 Broad-scale monitoring

The broad-scale monitoring program covers the area upstream and downstream of Rookwood Weir, however the extent of the survey area varies with the different methodologies.

For remote telemetry (i.e. the hydrophone array), the survey area encompasses a 33 km reach of the Fitzroy River ranging from The Pocket, approximately 17 km upstream of the Rookwood Weir impoundment, to Hanrahan Crossing, approximately 16 km downstream of Rookwood Weir (Figure 2.5).

For turtle capture surveys the survey area extends to Gogango Creek within the Rookwood Weir impoundment, located approximately 4.5 km upstream from Rookwood Weir and downstream to Hanrahan Crossing (Figure 2.3). The areas of the turtle capture for broad-scale monitoring were selected based on the diversity and location of habitat types (i.e. pools, riffles, runs, creeks, floodplains, priority nest protection areas), turtle population size/capture success, access and effectiveness of turtle capture methods within the different habitat types. The specific locations within the survey areas targeted during each survey event was dependent upon conditions at each survey location at the time of survey, success of turtle capture, and distribution of previously tagged turtles within the survey area.

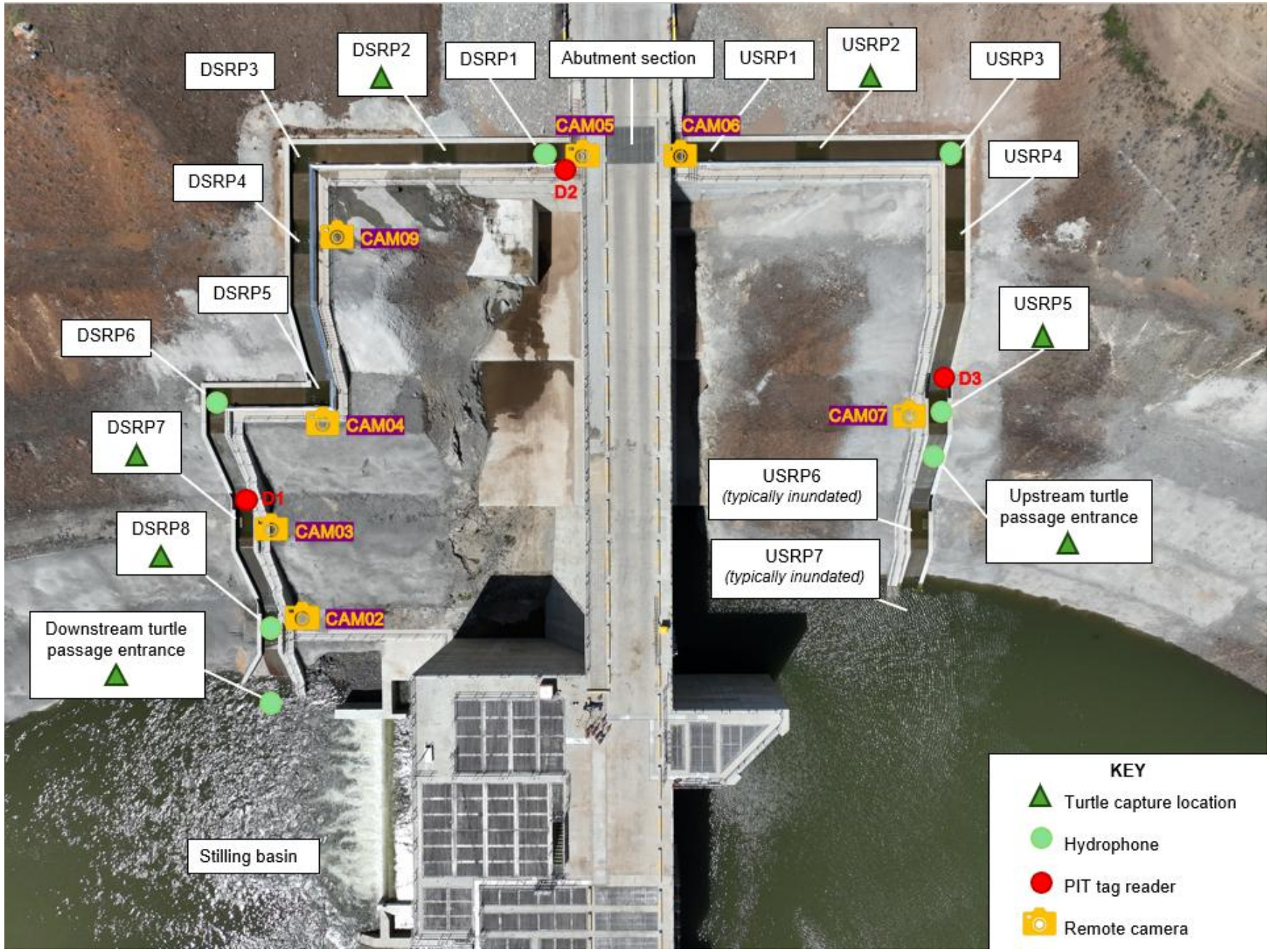


Figure 2.1 Turtle passage monitoring locations (aerial view)

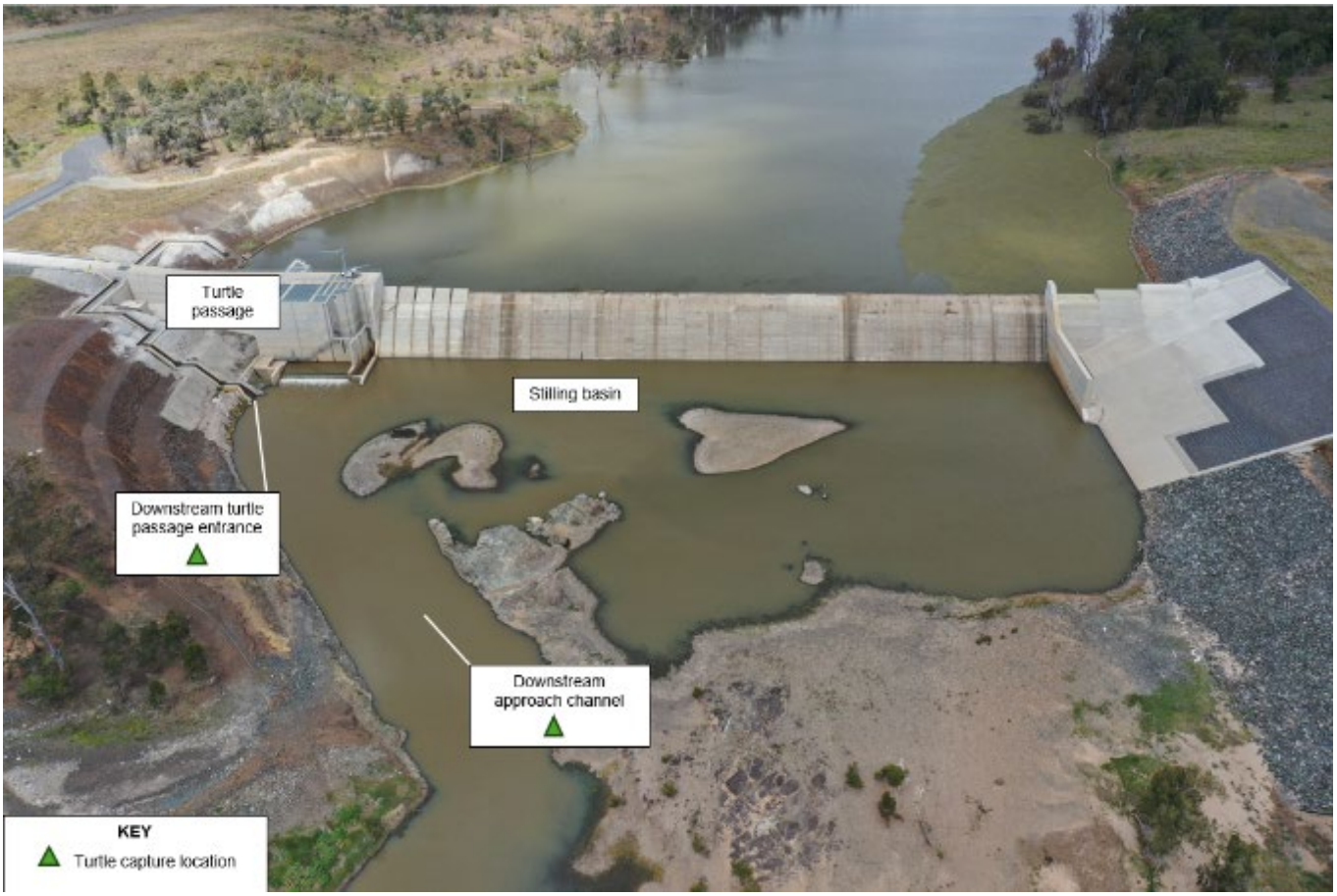


Figure 2.2 Downstream approach channel turtle capture location

2.2 Survey effort and timing

Field survey effort for Year 2 2025-26 monitoring is presented in Table 2.1. Survey events were split into either one of two types:

- **Hydrophone survey:** download, retrieval of continuously recorded data, and maintenance of hydrophones from within turtle passage and broad-scale monitoring arrays
- **Turtle capture survey:** capture, and identification and acoustic tagging of targeted turtle species within turtle passage and across broad-scale monitoring turtle capture locations.

Data retrieved during these two types of surveys are intended to contribute to both the turtle passage and broad-scale monitoring programs, supporting a coordinated and efficient approach to monitoring.

Hydrophone surveys are conducted quarterly, and during Year 2 2025-26 monitoring, they were conducted in June, September and December 2025, and March 2026 (Table 2.1).

There have been two turtle capture surveys targeting the white-throated snapping turtle and Fitzroy River turtle conducted during Year 2 2025-26 monitoring. The first turtle capture survey event occurred in November 2025. The second turtle capture survey occurred in May 2026 (Table 2.1).

Remote monitoring of the turtle passage (refer to Section 2.6) occurred continuously for acoustic hydrophones (with data retrieved quarterly) and continuously for PIT tags and remote cameras during the monitoring period (June 2025 – May 2026).The data from these methods informs the success criteria for the turtle passage.

Table 2.1 Survey effort Year 2 2025-26 monitoring

Survey	Dates	Field team (GHD)	Field team (Tunuba)
June 2025 Hydrophone Survey	10 – 12 June 2025	Chris Pietsch and Yani Mouland-Vail	Buzz Broome

Survey	Dates	Field team (GHD)	Field team (Tunuba)
September 2024 Hydrophone Survey	2 – 4 September 2025	Lauren Pratt and Chris Pietsch	Stephen Upkett
November 2025 Turtle Capture Survey	3 – 12 November 2025	Lauren Pratt, Chris Pietsch, Yani Mouland-Vail, Natalie Clark* and Tania Duratovic*	Buzz Broome and Stephen Upkett
December 2025 Hydrophone Survey	16 – 18 December 2025	Chris Pietsch and Tim Moeser	Stephen Upkett and Zac Richards
March 2026 Hydrophone Survey	3 – 5 March 2026	Chris Pietsch and Haydn Turner	Stephen Upkett
May 2026 Turtle Capture Survey	5 – 15 May 2026	Lauren Pratt, Chris Pietsch and Sarah Hampson	Buzz Broome

*Attended for Animals Ethics Committee and Health and Safey audit

2.3 Survey conditions

Environmental conditions were recorded during the Year 2 2025–26 monitoring to describe habitat at survey sites. This information was used to identify preferred habitat conditions for turtles and to facilitate the identification of optimal survey conditions for turtle capture.

For the purposes of this report, survey conditions are presented from June 2025, when the Year 2 2025-26 monitoring period commenced.

2.3.1 Weather conditions

Minimum and maximum daily temperature data during the survey events were sourced from the Rockhampton Aero Station (039083) via the Australian Bureau of Meteorology (BOM, 2026). Rainfall data were sourced from the Fitzroy River at Riverslea Station (130003B). These data characterise the general weather conditions prior to and during survey events. River flow

Flow data for the broad-scale turtle monitoring survey area were retrieved via the online Queensland Government Water Monitoring Information Portal (DRDMW, 2026). This comprised daily flow data (mean ML/day) from stations upstream of Rookwood Weir along the Fitzroy River (130003B), Dawson River (130302A) and Mackenzie River (130105B), as well as downstream of Rookwood Weir at Hanrahan Crossing (130010A) (DRDMW, 2026).

Additionally, river level data were sourced from the Fitzroy River at Riverslea Station (130003B). This station has pre-defined minor, moderate and major flood levels (BOM, 2025) which were used to inform whether any flooding events occurred during Year 2 2025-26 monitoring.

2.3.2 Rookwood Weir water level and releases

Rookwood Weir water level (mean daily mAHD) and flow (mean ML/day) for headwater and tailwater, and weir storage level (mean %) were provided by Sunwater up to and including 15 May 2026. These data gave insight into overtopping events and flow conditions immediately upstream and downstream of the weir.

2.3.3 Blue-green algae

Sunwater actively monitors water quality for the presence and quantity of blue-green algae species within Rookwood Weir pool. Blue-green algae species can cause harmful algal blooms and are more prone to occur in stratified lentic systems with warm, still, nutrient-rich water conditions (Edgar & Davis, 2007). Blue-green algae can reduce dissolved oxygen during die-off events and release toxins that may adversely humans, animals and aquatic life. Prior to all hydrophone and capture surveys in Year 2 2025-26 monitoring, Sunwater was contacted to determine the status of blue-green algae presence and risk within Rookwood Weir pool. This was done to identify residual risks for the safety of field staff and potential impacts to aquatic fauna associated with trapping activities.

2.3.4 *In-situ* water quality

In-situ water quality data was collected opportunistically during turtle capture and hydrophone download field survey events. This data was recorded using a handheld multiparameter water quality meter that had been calibrated in accordance with the manufacturer's specifications and used in accordance with operating protocols defined in the *Monitoring and Sampling Manual 2018* (DES, 2018). Parameters recorded included:

– Water temperature (°C)
– pH (pH units)
– Electrical conductivity (EC) (µS/cm)
– Dissolved oxygen (DO) concentrations (mg/L and percent saturation)
– Turbidity (NTU).

In-situ measurements of physiochemical conditions were taken at least 1 m from the edge of the waterway, within 0.1 m to 0.5 m of the water surface, and 0.1 m from the substrate where water depth allowed. Results were compared against:

– Pre-construction baseline values (from pre-construction monitoring) for selected water quality parameters (presented as 75th percentile unless indicated as a range), as defined in the Rookwood Weir Lower Fitzroy Water Quality Monitoring and Reporting Program submitted to DCCEEW in May 2024 (Sunwater, 2024), and

Table 2.2 Pre-construction baseline water quality parameters (Sunwater, 2024)

Location	Temp.	pH	EC	DO	Turb.
	°C	pH units	µS/cm	% saturation	NTU
Pre-construction baseline	15.3-31.3	7.3-8.4	269	89-101	191

The *in-situ* water quality site measurements were grouped into four locations for analysis; Rookwood Weir Upstream, Rookwood Weir Downstream, Turtle Passage Resting Pools, Turtle Passage Approach Channels. The sites measured within each group location are outlined below in Table 2.3. Mean values of site measurements were calculated for each location.

Raw *in-situ* water quality data is provided in Appendix B.

Table 2.3 Water quality in-situ measurement locations in Year 2 2025-26 monitoring

Location group	*In-situ* water quality measurement sites within location group	Water quality guideline applied
Rookwood Weir Upstream	Rookwood Weir pool at camping reserve Rookwood Weir pool at Gogango Creek The Pocket upstream Upstream approach channel	Pre-construction baseline
Rookwood Weir Downstream	Rookwood downstream pool Hanrahan upstream Hanrahan Crossing	Pre-construction baseline
Turtle Passage Approach Channels	Downstream approach channel Ramp entrance downstream	Pre-construction baseline
Turtle Passage Resting Pools	USRP5 USRP3 USRP2 DSRP1 DSRP2 DSRP5 DSRP7 DSRP8	Pre-construction baseline

2.4 Turtle capture

2.4.1 Turtle passage monitoring

During Year 2 2025-26 monitoring, turtle capture surveys were undertaken within and adjacent to the turtle passage infrastructure. Along the turtle passage, one resting pool was trapped per 24 hours. The downstream approach channel and upstream turtle passage entrance were trapped repeatedly over multiple consecutive days (Table 2.4). Surveys were conducted at a total of eight sites within Year 2 2025-26 monitoring.

The main technique employed during turtle passage monitoring was a fyke net within a frame for resting pools within the turtle passage (Plate 2.1). A specifically designed fyke net with was deployed for trapping within the downstream approach channel when possible and cathedral traps were used at the downstream and upstream turtle passage entrance.

Overall, in November 2025, turtle capture was undertaken at seven sites (Table 2.4). The downstream turtle passage entrance was unable to be surveyed due to the high flow velocity created through releases from the low flow outlet. During the May 2026 turtle capture survey, the weir was overtopping, resulting in high water velocities within the downstream approach channel that prevented the use of effective capture techniques and posed animal welfare concerns. Access to the stilling basin was also restricted due to site safety protocols under overtopping conditions. Consequently, neither the stilling basin nor the downstream approach channel were trapped as part of this survey (Plate 2.2).

Table 2.4 presents the specific turtle passage survey locations accessed during the November 2025 and May 2026 turtle capture surveys. Table 2.5 and Table 2.6 summarise the survey effort specific to turtle passage monitoring for November 2025 and May 2026 turtle capture surveys, respectively.

Table 2.4 Turtle passage monitoring – turtle capture locations and effort

Site	November 2025	May 2026	Latitude	Longitude
Upstream turtle passage entrance	✓	✓	-23.54050	150.01675
USRP5	✓	✓	-23.54042	150.01679
USRP2	✓	✓	-23.54022	150.01689
DSRP2	✓	✓	-23.53999	150.01670
DSRP7	✓	✓	-23.53999	150.01633
DSRP8	✓	✓	-23.54005	150.01624
Downstream turtle passage entrance	Regulated flow – unsuitable conditions for capture	✓	-23.53957	150.01465
Downstream approach channel	✓	Weir overtopping – unsuitable conditions for capture	-23.53988	150.01546
Stilling basin	Regulated flow – unsuitable conditions for capture	Weir overtopping – considered unsafe for access	-23.54062	150.01485



Plate 2.1 *Turtle passage capture techniques: cathedral trap at downstream turtle passage entrance (left), fyke net within frame in a resting pool (right)*

Table 2.5 Turtle passage trapping and survey effort – November 2025

Site	Method	Units	Date in	Time in	Date out	Time out	Duration
DSRP8	Fyke	1	03/11/2025	11:00	04/11/2025	07:00	20 hours
	Fyke	1	04/11/2025	07:00	04/11/2025	16:00	9 hours
DSRP7	Fyke	1	04/11/2025	16:00	05/11/2025	07:00	15 hours
	Fyke	1	05/11/2025	07:00	05/11/2025	16:45	9 hours 45 minutes
DSRP2	Fyke	1	05/11/2025	16:45	06/11/2025	06:45	14 hours
	Fyke	1	06/11/2025	06:45	06/11/2025	16:00	8 hours 45 minutes
USRP2	Fyke	1	06/11/2025	16:00	07/11/2025	06:45	14 hours 45 minutes
	Fyke	1	07/11/2025	06:45	07/11/2025	15:45	8 hours 30 minutes
USRP5	Fyke	1	07/11/2025	15:45	08/11/2025	06:45	15 hours
	Fyke	1	08/11/2025	06:45	08/11/2025	15:30	7 hours 15 minutes
Downstream approach channel	Fyke	1	05/11/2025	07:05	05/11/2025	15:30	7 hours 35 minutes
	Fyke	1	05/11/2025	14:00	06/11/2025	07:05	17 hours 5 minutes
	Fyke	1	06/11/2025	07:00	06/11/2025	16:00	9 hours
	Fyke	1	06/11/2025	15:30	07/11/2025	07:00	15 hours 30 minutes
	Fyke	1	07/11/2025	07:00	07/11/2025	15:30	8 hours 30 minutes
	Fyke	1	07/11/2025	15:30	08/11/2025	07:00	15 hours 30 minutes
	Fyke	1	08/11/2025	15:30	09/11/2025	07.50	16 hours 20 minutes
Upstream turtle passage entrance	Cathedral	1	03/11/2025	11:00	03/11/2025	16:00	5 hours
	Cathedral	1	04/11/2025	08:00	04/11/2025	15:50	7 hours 50 minutes
	Cathedral	1	04/11/2025	16:00	05/11/2025	07:00	15 hours
	Cathedral	1	05/11/2025	06:45	05/11/2025	16:45	10 hours
	Cathedral	1	05/11/2025	15:50	06/11/2025	06:45	14 hours 55 minutes
	Cathedral	1	06/11/2025	06:45	06/11/2025	16:00	8 hours 45 minutes
	Cathedral	1	06/11/2025	16:45	07/11/2025	06:45	15 hours
	Cathedral	1	07/11/2025	06:45	07/11/2025	15:45	9 hours
	Cathedral	1	07/11/2025	16:00	08/11/2025	06:45	14 hours 45 minutes
	Cathedral	1	08/11/2025	06:45	08/11/2025	16:00	8 hours 45 minutes
	Cathedral	1	08/11/2025	15:45	09/11/2025	06:45	15 hours
	Cathedral	1	09/11/2025	06:45	09/11/2025	16:00	9 hours 45 minutes
	Cathedral	1	09/11/2025	16:00	10/11/2025	06:45	14 hours 45 minutes
	Cathedral	1	10/11/2025	16:00	11/11/2025	06:45	14 hours 45 minutes

Table 2.6 Turtle passage trapping and survey effort – May 2026

Site	Method	Units	Date in	Time in	Date out	Time Out	Duration
DSRP8	Fyke	1	06/05/2026	14:00	07/05/2026	07:00	17 hours
	Fyke	1	07/05/2026	07:00	07/05/2026	14:00	7 hours
DSRP7	Fyke	1	07/05/2026	16:00	08/05/2026	07:00	15 hours
	Fyke	1	08/05/2026	07:00	08/05/2026	16:00	9 hours
DSRP2	Fyke	1	08/05/2026	16:00	09/05/2026	07:00	15 hours
	Fyke	1	09/05/2026	07:00	09/05/2026	16:00	9 hours
USRP2	Fyke	1	09/05/2026	16:00	10/05/2026	07:00	15 hours
	Fyke	1	10/05/2026	07:00	10/05/2026	15:30	8 hours 30 minutes
USRP5	Fyke	1	10/05/2026	15:30	11/05/2026	07:00	15 hours 30 minutes
	Fyke	1	11/05/2026	07:00	11/05/2026	15:00	8 hours
Downstream turtle passage entrance	Cathedral	1	06/05/2026	16:00	07/05/2026	07:00	15 hours
	Cathedral	1	06/05/2026	07:00	06/05/2026	16:30	9 hours 30 minutes
	Cathedral	1	07/05/2026	16:30	08/05/2026	07:00	14 hours 30 minutes
	Cathedral	1	07/05/2026	07:00	07/05/2026	16:00	9 hours
	Cathedral	1	08/05/2026	16:00	09/05/2026	07:00	15 hours
Upstream turtle passage entrance	Cathedral	1	09/05/2026	14:00	10/05/2026	07:00	17 hours
	Cathedral	1	09/05/2026	07:00	09/05/2026	16:00	9 hours
	Cathedral	1	10/05/2026	07:00	10/05/2026	15:30	8 hours 30 minutes
	Cathedral	1	11/05/2026	15:30	12/05/2026	07:00	15 hours 30 minutes
	Cathedral	1	11/05/2026	07:00	11/05/2026	15:00	8 hours
	Cathedral	1	12/05/2026	15:00	13/05/2026	07:00	16 hours



Plate 2.2 Water release from the low flow outlet during November 2025 turtle capture surveys (left) and weir and overtopping during May 2026 turtle capture surveys (right)

2.4.2 Broad-scale monitoring

As per the Rookwood Weir Operations SMP (GHD, 2023) broad-scale turtle population monitoring was conducted at sites upstream, and downstream of Rookwood Weir, including within the vicinity of Priority Nest Protection Areas (Figure 2.3). Priority Nest Protection Areas for 2025-26 were defined in the 2025 and 2026 Annual Nest Protection Plans (Tunuba, 2025; Tunuba, 2026a). During Year 2 2025-26 monitoring, turtle capture surveys were conducted at the following locations:

Within Rookwood Weir

- Gogango Creek (Priority Nest Protection Area)
- Rookwood Weir pool immediately upstream of weir wall

Downstream of Rookwood Weir

- Rookwood downstream pool and riffle complex (left bank as a Priority Nest Protection Area)
- Hanrahan Crossing riffle complex and upstream pool (Priority Nest Protection Area).

The survey locations targeted during each survey event were dependent upon conditions at each survey location at the time of survey, success of turtle capture, health and safety risks (e.g. associated with weir infrastructure and crocodiles) distribution of previously tagged turtles within the survey area and timing in relation to turtle nesting periods. Approximate turtle capture site locations and site-specific effort for broad-scale monitoring turtle capture surveys are presented in Table 2.7 for Year 2 2025-26 monitoring.

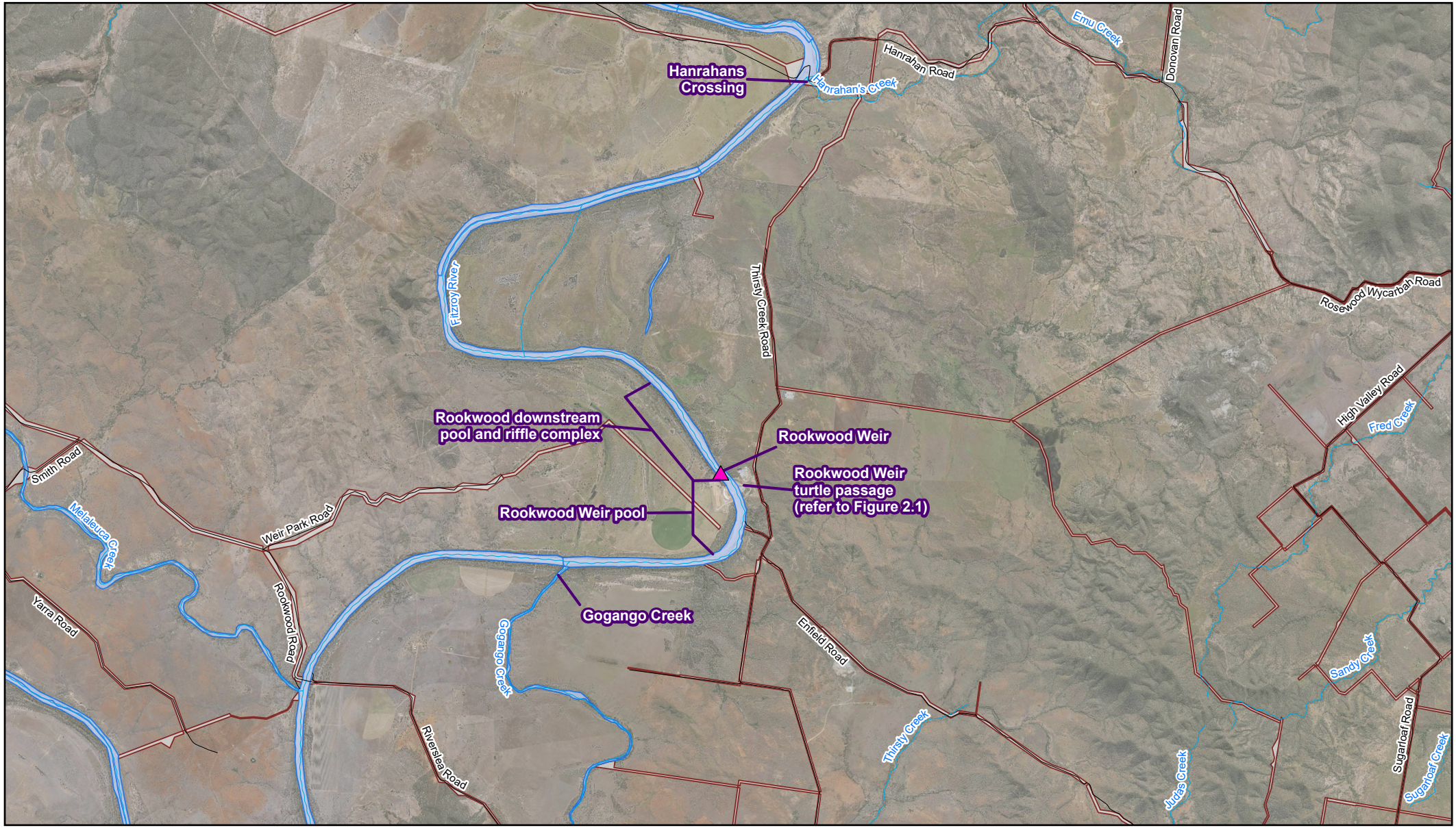
Table 2.7 Broad-scale monitoring – turtle capture locations and effort

General area	Site name	Location	November 2025	May 2026	Latitude	Longitude
Gogango Creek	Rookwood Weir (pool at Gogango Creek confluence)	Approximately 4.5 km upstream of Rookwood Weir	✓	✓	-23.546864	150.017288
Rookwood Weir pool	Rookwood Weir (pool at Rookwood camping reserve)	Approximately 710 m upstream of Rookwood Weir	–	✓	-23.544425	150.016854
Rookwood downstream pool and riffle complex	Rookwood downstream pool	Approximately 1.1 km downstream of Rookwood Weir	✓	✓	-23.532419	150.008236
	Rookwood riffle complex	Approximately 2.1 km downstream of Rookwood Weir	✓	✓	-23.525301	150.002894
Hanrahan Crossing	Hanrahan upstream pool	Approximately 16.7 km downstream of Rookwood Weir	✓	✓	-23.469051	150.026830
	Hanrahan riffle	Riffle complex approximately 18.1 km downstream of Rookwood Weir	✓	✓	-23.459808	150.024398

For the broad-scale monitoring, turtle capture involved primarily cathedral traps and fyke netting (Plate 2.3). Cathedral traps were baited and set at survey locations for up to 24 hours (traps were checked twice during this period). Similarly, fyke nets were set for up to 24 hours (nets were checked twice during this period), however these were limited to shallow sections of the Fitzroy River, including riffle habitat downstream of Rookwood Weir and downstream of Hanrahan Crossing. Table 2.8 and Table 2.9 summarise the survey effort specific to broad-scale turtle monitoring for November 2025 and May 2026 turtle capture surveys, respectively.



Plate 2.3 ***Broad-scale monitoring capture techniques: cathedral traps deployed (top left) and retrieved (top right), fyke nets deployed from boat in deep (>1m) riffle habitats (middle left and middle right); fyke nets deployed in shallow riffle habitat (bottom left and bottom right)***



Legend

- Rookwood Weir
- Road
- Watercourse
- Road reserve
- Watercourse reserve

Paper Size ISO A4

0 750 1,500 2,250 3,000

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 55

N

GHD

sunwater

SunWater Limited
Rookwood Operational Phase Turtle Movement Study

Broad scale monitoring - turtle capture locations

Project No. **12633406**
Revision No. **0**
Date **10/06/2026**

FIGURE 2.3

\\ghdnet\ghd\AU\Brisbane\Projects\41\12552096\GIS\Maps\Deliverables\12552096_Annual_Report\12552096_Annual_Report.aprx\12633406_002_TurtleLocations_rev0
Print date: 10 Jun 2026 - 23:26

Data source: GHD: Turtle capture survey site (2023); DoR: Road (2021), Watercourse (2023), Cadastre (2024); Queensland Imagery Latest State Program Public Basemap Service: Includes material © State of Queensland (Department of Resources); © Planet Labs Netherlands B.V. reproduced under licence from Planet and Geoplex, all rights reserved, 2023. Created by: epangan

Table 2.8 Broad-scale trapping and survey effort – November 2025

Site	Method	Units	Date in	Time in	Date out	Time out	Duration
Hanrahan riffle	Fyke	2	10/11/2025	11:30	10/11/2025	15:00	3 hours 30 minutes
	Fyke	2	11/11/2025	08:00	11/11/2025	15:00	7 hours
	Fyke	2	11/11/2025	15:00	12/11/2025	08:00	17 hours
	Fyke	2	12/11/2025	15:00	13/11/2025	08:00	17 hours
Hanrahan upstream pool	Cathedral	10	11/11/2025	07:15	11/11/2025	14:00	6 hours 45 minutes
	Cathedral	10	11/11/2025	14:00	12/11/20255	07:15	17 hours 15 minutes
	Cathedral	10	12/11/2025	14:00	13/11/2025	07:15	17 hours 15 minutes
Rookwood downstream pool	Cathedral	9	03/11/2025	12:45	03/11/2025	15:30	2 hours 45 minutes
	Cathedral	9	04/11/2025	08:00	04/11/2025	15:30	7 hours 30 minutes
	Cathedral	9	04/11/2025	15:30	05/11/2025	08:00	16 hours 30 minutes
	Cathedral	9	05/11/2025	08:00	05/11/2025	16:15	8 hours 15 minutes
	Cathedral	9	05/11/2025	15:30	06/11/2025	08:00	16 hours 30 minutes
	Cathedral	9	06/11/2025	08:30	06/11/2025	15:45	7 hours 15 minutes
	Cathedral	9	06/11/2025	16:15	07/11/2025	08:30	16 hours 45 minutes
	Cathedral	9	07/11/2025	08:15	07/11/2025	13:00	4 hours 45 minutes
	Cathedral	9	07/11/2025	15:45	08/11/2025	08:15	16 hours 30 minutes
Rookwood riffle complex	Fyke	2	03/11/2025	13:30	03/11/2025	15:15	1 hour 45 minutes
	Fyke	2	03/11/2025	14:15	03/11/2025	15:15	1 hour
	Fyke	2	04/11/2025	07:15	04/11/2025	15:00	7 hour 45 minutes
	Fyke	2	04/11/2025	07:30	04/11/2025	15:15	7 hour 45 minutes
	Fyke	2	04/11/2025	15:15	05/11/2025	07:15	16 hours
	Fyke	2	04/11/2025	15:15	05/11/2025	07:30	16 hours 15 minutes
	Fyke	2	05/11/2025	07:15	05/11/2025	15:50	8 hours 35 minutes
	Fyke	2	05/11/2025	07:30	05/11/2025	16:00	8 hours 30 minutes
	Fyke	2	05/11/2025	15:00	06/11/2025	07:15	16 hours 15 minutes
	Fyke	2	05/11/2025	15:15	06/11/2025	07:30	16 hours 15 minutes
	Fyke	2	06/11/2025	07:40	06/11/2025	15:10	6 hours 20 minutes
	Fyke	2	06/11/2025	08:00	06/11/2025	15:20	6 hours 20 minutes
	Fyke	2	06/11/2025	15:50	07/11/2025	07:40	16 hours
	Fyke	2	06/11/2025	16:00	07/11/2025	08:00	16 hours
	Fyke	2	07/11/2025	07:20	07/11/2025	15:20	8 hours
	Fyke	2	07/11/2025	07:10	07/11/2025	15:30	8 hours 20 minutes
	Fyke	2	07/11/2025	15:20	08/11/2025	07:10	16 hours 10 minutes
	Fyke	2	07/11/2025	15:10	08/11/2025	07:20	16 hours 10 minutes
	Fyke	2	08/11/2025	07:20	08/11/2025	15:45	8 hours 25 minutes
	Fyke	2	08/11/2025	07:30	08/11/2025	16:00	8 hours 30 minutes
	Fyke	2	08/11/2025	15:20	09/11/2025	07:20	16 hours
	Fyke	2	08/11/2025	15:30	09/11/2025	07:30	16 hours
	Fyke	2	09/11/2025	15:45	10/11/2025	08:00	16 hours 15 minutes

Site	Method	Units	Date in	Time in	Date out	Time out	Duration
	Fyke	2	09/11/2025	16:00	10/11/2025	08:15	16 hours 15 minutes
Rookwood Weir (pool at Gogango Creek confluence)	Cathedral	9	08/11/2025	08:15	08/11/2025	14:30	6 hours 15 minutes
	Cathedral	9	08/11/2025	14:30	08/11/2025	08:15	17 hours 45 minutes
	Cathedral	9	09/11/2025	07:00	09/11/2025	15:15	8 hours 15 minutes
	Cathedral	9	09/11/2025	14:30	10/11/2025	07:00	16 hours 30 minutes
	Cathedral	9	10/11/2025	15:15	11/11/2025	07:15	16 hours

Table 2.9 Broad-scale trapping and survey effort – May 2026

Site	Method	Units	Date in	Time in	Date out	Time Out	Duration
Hanrahan riffle	Fyke	2	12/05/2026	11:30	12/05/2026	14:30	3 hours
	Fyke	2	12/05/2026	14:30	13/05/2026	08:10	17 hours 40 minutes
	Fyke	2	13/05/2026	08:10	13/05/2026	14:45	6 hours 35 minutes
	Fyke	2	14/05/2026	14:45	15/05/2026	08:10	17 hours 25 minutes
Hanrahan upstream pool	Cathedral	10	12/05/2026	14:00	13/05/2026	07:30	17 hours 30 minutes
	Cathedral	10	13/05/2026	07:30	13/05/2026	14:00	6 hours 30 minutes
	Cathedral	10	13/05/2026	14:00	14/05/2026	07:30	17 hours 30 minutes
Rookwood downstream pool	Cathedral	9	05/05/2026	15:00	06/05/2026	08:15	17 hours 15 minutes
	Cathedral	9	06/05/2026	08:15	06/05/2026	15:45	7 hours
	Cathedral	9	06/05/2026	15:45	07/05/2026	08:30	16 hours 45 minutes
	Cathedral	9	07/05/2026	08:30	07/05/2026	15:30	7 hours
	Cathedral	9	07/05/2026	15:30	08/05/2026	08:30	17 hours
Rookwood riffle complex	Fyke	2	05/05/2026	12:00	05/05/2026	15:15	3 hours 15 minutes
	Fyke	2	05/05/2026	15:15	06/05/2026	07:45	16 hours 30 minutes
	Fyke	2	06/05/2026	07:45	06/05/2026	15:15	7 hours 30 minutes
	Fyke	3	06/05/2026	15:15	07/05/2026	07:45	16 hours 30 minutes
	Fyke	3	07/05/2026	07:45	07/05/2026	15:10	7 hours 25 minutes
	Fyke	3	07/05/2026	15:10	08/05/2026	07:40	16 hours 30 minutes
	Fyke	3	08/05/2026	07:40	08/05/2026	15:10	7 hours 30 minutes
	Fyke	3	08/05/2026	15:10	09/05/2026	08:50	17 hours 40 minutes
	Fyke	3	09/05/2026	08:50	09/05/2026	14:25	5 hours 35 minutes
	Fyke	3	09/05/2026	14:25	10/05/2026	07:45	17 hours 20 minutes
	Fyke	3	10/05/2026	07:45	10/05/2026	16:10	8 hours 25 minutes
	Fyke	3	10/05/2026	16:10	11/05/2026	09:00	16 hours 50 minutes
Rookwood Weir (pool at Gogango Creek confluence)	Cathedral	9	11/05/2026	14:15	12/05/2026	07:45	17 hours 30 minutes
	Cathedral	9	12/05/2026	7:45	12/05/2026	14:00	6 hours 15 minutes
	Cathedral	9	12/05/2026	14:00	13/05/2026	07:30	17 hours 30 minutes
Rookwood Weir (pool at Rookwood camping reserve)	Cathedral	9	08/05/2026	14:30	09/05/2026	07:30	17 hours
	Cathedral	9	09/05/2026	07:30	09/05/2026	15:00	7 hours 30 minutes
	Cathedral	9	10/05/2026	09:15	10/05/2026	14:15	5 hours
	Cathedral	9	10/05/2026	15:00	11/05/2026	09:15	18 hours 15 minutes

Site	Method	Units	Date in	Time in	Date out	Time Out	Duration
	Cathedral	9	11/05/2026	07:45	11/05/2026	14:00	6 hours 15 minutes

2.4.3 Key turtle monitoring locations

Habitat conditions at the key turtle monitoring locations were recorded in Year 2 2025-26 monitoring surveys and are described in Table 2.10.

Table 2.10 Description of key turtle habitat locations

Survey location	Habitat description	Photographs
Rookwood Weir areas		
Turtle passage and approach channels	The turtle passage infrastructure at Rookwood Weir consists of a 172 m long by 2 m wide sloped turtle ramp with resting pools every 15 m. The entry and exit points of the turtle passage are located at the river margins where turtles can access them during low velocity conditions. A widened (6 m) funnel entrance/exit is provided both upstream and downstream to increase the area over which turtles can access the turtle passage at minimum headwater and tailwater conditions. The downstream entrance is immediately adjacent to the low flow outlet and fishway. The ramp varies in slope up to a maximum of 45 degrees and is textured with exposed aggregate to create a roughened surface for the turtles to grip. The entry and exits into each resting pool are sloped for easy turtle access. Resting pool shelters provide shade and protection within each resting pool. A small attraction flow is provided down the ramp and permanent water contained within the resting pools. Passive Integrated Transponder (PIT) tag readers and acoustic hydrophone receivers are included at the entrance, middle and exit of the turtle passage to facilitate turtle monitoring. The approach channels (upstream and downstream) are within the Fitzroy River and are immediately upstream and downstream of the entrance ramps to the turtle passage.	

Survey location	Habitat description	Photographs
Rookwood Weir pool	Rookwood Weir pool is the impoundment at, and immediately upstream of Rookwood weir. Since inundation, the habitat has become dominated by deep (<15 m) and relatively still pool habitat with a large amount of large woody debris along the margins where past banks and vegetation are now underwater and in various states of decay. Substrate is dominated by silts and clays. There was some undercut banks and root overhang along the banks providing some in-stream habitat. The riparian zone was dominated by Eucalyptus and was continuous throughout the surveyed reach.	
Upstream areas		
Gogango Creek	Gogango Creek is a tributary of the Fitzroy River, approximately 4.4 km upstream of Rookwood Weir and has been identified as a priority turtle nesting area for 2025. Since the inundation of the impoundment, Gogango Creek has been modified from a small shallow creek to a much wider and deeper channel. Water velocity is negligible which maintains a pool habitat, which is similar to pre-construction conditions. Banks are steep but low and predominantly compacted earth. Riparian vegetation consisting of mature Melaleuca and Eucalyptus species has been inundated and begun decaying with the woody debris creating complex aquatic habitat.	
Downstream areas		

Survey location	Habitat description	Photographs
Stilling basin and associated pool	The stilling basin is at the base of Rookwood weir which is connected with the pool directly downstream of the weir. The pool extends from the stilling basin approximately 100 m downstream before connecting with the larger, deeper pool (Rookwood downstream pool). The channel is approximately 230 m at its' widest point and 10 m at its' narrowest (downstream) point which represents the approach channel for the turtle passage. This pool is approximately 5 m deep with flow velocity and water depth highly influenced by releases from the weir and uncontrolled spilling events. There is a large, high quality sand bank on the left bank with slumping of the earthen upper bank. Substrate consists of a mix of bedrock, gravel and sand.	
Rookwood downstream pool	This Rookwood downstream pool is approximately 0.45 km downstream from Rookwood Weir. This pool is deep (<2 m), wide (70 m) and slow flowing and is connected with and downstream of the stilling basin (and its associated pool). Substrate is varied, including predominantly bedrock, boulders and cobbles within the channel and sandy, silt/clay on the banks. There is some woody debris present, primarily on the bank margins where erosion is also visible. Banks are 1-2 m tall and primarily dominated by Melaleuca vegetation, with root overhang in eroded sections.	

Survey location	Habitat description	Photographs
Rookwood riffle	Rookwood riffle is the approximately 0.6 km downstream of Rookwood Weir and connected with the Rookwood downstream pool. Habitat comprises shallow (<1 m) riffle and run which is created due to the bedrock, cobble, pebble and gravel substrate. The riffle section is approximately 85 m wide and 60 m in length. There is minimal detritus and woody debris, however there is the occasional young melaleuca in-stream. There has been extensive periphyton and filamentous algae noted on the substrate throughout surveys. Bank height to 2 m on the left bank and up to 10 m on the right bank. Banks were low and moderately stable, with mostly cleared riparian vegetation.	
Hanrahan Crossing	Hanrahan Crossing is located approximately 17 km downstream from the Rookwood Weir. Hanrahan Crossing consisted of deep pool habitat with sections of run downstream of the crossing. Substrate was generally fine coarse sands and silts, with some gravel. Banks had some aquatic habitat with some overhanging and trailing bank vegetation. Root overhangs were also scattered throughout the reach. Bank vegetation generally comprised a band of large canopy trees with a grassy/weedy understorey.	

2.5 Turtle measurement and tagging

All white-throated snapping turtles and Fitzroy River turtles captured during the field survey events were measured and tagged in accordance with standard DETSI procedures, animal ethics approval conditions (refer to Section 2.7), and as specified in the Rookwood Weir Operations SMP (GHD, 2023).

2.5.1 Measurements

Turtle measurement data gives insight into species population estimates, overall health of the turtles and whether the turtles have injuries that could be attributed to the operation of the turtle passage or weir. Where a previously tagged turtle is recaptured, it is recorded and its measurements and condition are retaken. This recapture data is informative for population size estimations, biological data (i.e. growth rates) and injury monitoring from the weir, turtle passage and/or capture and release techniques.

The following measurements were recorded for target turtle species to provide biological baseline data on each individual:

- **Straight carapace length** (SCL) – measured from the anterior midline margin of the carapace to the posterior midline margin of the carapace
- **Straight carapace width** – measured at the widest part of the carapace perpendicular to the midline axis of the carapace
- **Plastron length** – measured from the middle anterior to the middle posterior of the plastron
- **Plastron width** – measured perpendicular to the midline axis of the plastron immediately anterior to the bridges
- **Head length** – measured from the anterior tip of the maxillary sheath of the jaw to the posterior tip of the supra-occipital process
- **Head width** – measured across the widest part of the head behind the ears at the quadrate bones
- **Tail** – measured from the tip of the firmly out-stretched tail to the plastron, to the anterior of the vent and to the posterior mid-point of the carapace
- **Weight** – weighed with either a hanging spring or electric balance
- **Plastron curvature** – scored as concave, convex or flat by inspection with a straight edge laid over each of the length and width of the mid plastron
- **Gravid** (carrying eggs) – adult female turtles were assessed for oviductal eggs via inguinal palpation.

All non-target turtles caught were released at the point of capture following the recording of the species, sex, life history stage and noting any damage potentially attributed to weir operations.

2.5.2 Identification tagging

All turtles captured during November 2025 were carapace notched, had a passive integrated transponder (PIT) tag inserted and monel foot tag attached (Plate 2.4). The exception to this was where turtles were either severely damaged (for example, those with extensive scute damage or a missing limb), or were too small for tagging, such as juveniles or hatchlings.

These mark-recapture measures allow for the identification of individuals and will facilitate the long-term monitoring of the turtle population throughout the catchment over the life of the Project. The multiple techniques selected and used in parallel will increase the probability that one form of identification will persist over a long period of time and will allow for identification under differing scenarios and monitoring methods.

Specifically, each turtle was individually tagged with the following methods (Plate 2.4):

- **Coded carapace notching** – marginal scutes of the carapace were assigned a three letter code in order from the right front in a clockwise direction; one or more notches were cut using an electric grinder into the marginal scutes each to a depth of approximately one third of the width of the scute to provide a series of coded turtles. No more than one notch was applied per marginal scute. Carapace notches allow for the identification of deceased turtles if shells are located. During the May 2026 survey, carapace notching was

not completed as approval for this method was removed by GHD's animal ethics committee based on insufficient information being provided within the 2025 report to the Animals Ethics Committee (AEC) to justify the impact of shell notching on the turtles. Specifically, the AEC noted that the Operations Phase turtle monitoring does not include any survey methods to detect deceased turtles and only a very small number of recaptured turtles have been identified through shell notching over the nine years of monitoring.

- **Numbered self-piercing, self-locking, monel tags –** monel tags were applied through the webbing between digits four and five of the turtle's rear foot. Pressure was applied to the tag to cause the sharp point to puncture through the webbing. The tags were then closed using pliers. The tag was then swabbed with a topical antiseptic cream (betadine) following foot tag application. Monel foot tags provide a form of identification (i.e. tag number) that can be easily recorded and reported by persons not involved in the operations phase monitoring and will provide identification when the carapace of the turtle is damaged.
- **Passive integrated transponder (PIT) tags –** During the 2025-26 monitoring period, turtles were fitted with Biomark APT12 FDX-B PIT tags (12.5 mm × 2.0 mm; 134.2 kHz), which comply with ISO 11784/11785 standards and are compatible with the fixed PIT tag readers installed within the turtle passage and fishway. These tags replaced the PIT tags deployed previously, which were subsequently determined to have insufficient detection range to be reliably detected by the fixed PIT tag readers within the turtle passage. PIT tags were injected intramuscularly, immediately below the anterior carapace below the junction of the first vertebral scute and the first left costal scute. The insertion site was swabbed with a topical antiseptic cream (e.g. betadine) following implantation. A pocket reader was used to verify and record the tag number prior to release. PIT tagging allows for the remote detection and identification of individual turtles.

2.5.3 Acoustic tagging

Year 2 2025-26 monitoring aimed to attach acoustic transmitters (V13 Vemco Amirix Systems Ltd, NS, Canada; Plate 2.4) to as many individuals of each of the two target turtle species as possible, provided this was within the approved research permit conditions for each species (refer to Section 2.7). Hatchling/juvenile turtles were not targeted for acoustic tagging due to their small size.

Following the November 2025 turtle passage and broad-scale monitoring, a reduced representation of Fitzroy River turtles on the acoustic array was identified in comparison to white-throated snapping turtles. Given the limited number of acoustic tags available for the remaining May 2026 survey (n = 22), Fitzroy River turtles were prioritised for acoustic tagging during this survey until tag availability was exhausted. This targeted approach is reflected accordingly in the results, where no white-throated snapping turtles were acoustically tagged during this monitoring event (refer Section 3.2.2.2).

Acoustic transmitters were attached to the posterior marginal scutes of the carapace using a purpose-built cap, plastic saddle and PVC nut and bolts (1.5 mm). Two holes (2.5 mm diameter) were drilled vertically through the carapace and the transmitter screwed into place. The ends of the bolts were covered in a 2-part epoxy putty to prevent abrasion with the turtle's skin (Micheli-Campbell *et al.*, 2017), which was painted in black nail polish, providing camouflage (Plate 2.5).

The V13 acoustic transmitters were ~12 grams (g) in weight with dimensions of 45 mm length x 13 mm depth. Total weight of the tags was <1 % of an individual's body weight. The expected battery life of the V13 transmitter is approximately 1130 days (approximately three years), at which point they cease to function.



Plate 2.4 *Turtle mark-recapture methods: field set up for measuring and tagging turtles (top left), example of a monel foot tag (right)*



Plate 2.5 *Acoustic V13 transmitter before (left) and after camouflage painting (right)*

2.6 Remote monitoring

2.6.1 Acoustic telemetry

Acoustic hydrophones are being used to monitor turtle movement behaviour for the turtle passage and broad-scale monitoring within the 33 km reach of the Fitzroy River. The hydrophones work by detecting and logging the acoustic pulses from acoustic tags attached to turtles during Year 2 2025-26 monitoring or in earlier monitoring programs (e.g. Year 1 2024-25 monitoring and Turtle Movement Study during pre-construction and construction phases (2017-2024). Unlike PIT tags, which remain embedded in turtles, acoustic tags are externally attached and may detach over time or stop transmitting. Hydrophone data is intended to be downloaded on a quarterly basis for five years, involving physical retrieval of each hydrophone and connection to computer software.

2.6.1.1 Acoustic hydrophone array design

For turtle passage monitoring, seven hydrophones were positioned within resting pools or adjacent to the turtle passage infrastructure in April 2024 to capture fine scale movements (Figure 2.4). An eighth hydrophone was intended to be deployed in the stilling basin during Year 2 2025-26 monitoring, however this has yet to be installed. Installation of hydrophones involved attachment of each hydrophone via a multi-strand stainless steel cable to various anchor points located on the turtle passage containment walls. As such, some hydrophones have identical anchorage points, but the hydrophones themselves are located in different locations. A floating buoy was attached to keep the hydrophone in a vertical position in the water column (Plate 2.6). It should be noted that hydrophones located within the turtle passage may be affected by signal reflection from the passage structure, particularly under shallow water conditions, which has the potential to reduce detection accuracy and transmitter identification reliability. Further discussion of these limitations is provided in Section 2.9.2.

During the establishment phase (2023-2024), five hydrophone locations were discontinued in April 2024 as they were either no longer relevant to the objectives of the operations phase program or the inundation of the impoundment created areas which substantially overlapped hydrophone detection ranges creating duplication. Of the five hydrophones that were removed, three were at the most downstream reach of the array (Hanrahan far downstream, Hanrahan downstream, Hanrahan Creek) and two locations were upstream of the weir (Rookwood riffle and Riverslea riffle upstream).

The current operations phase hydrophone array for broad-scale turtle monitoring consists of 24 hydrophones along the 33 km length of the Fitzroy River to capture larger scale movement within the study area (Table 2.11 and Figure 2.5). The majority of hydrophones in this array were installed as part of the Turtle Movement Study (conducted during pre-construction and construction phases) and have been receiving data since April 2017. Broad-scale monitoring hydrophones have a mean distance between each of approximately 1.38 km (minimum = 0.22 km, maximum = 3.38 km) along the course of the river. The detection range of each hydrophone along the broad-scale array is approximately 200 – 400 m depending on river topography. For example, during the June 2025 hydrophone survey, the hydrophone detection range within a direct line of sight at Lawrie's bend was found to be between 380-400 m. However, this detection range was reduced to 230 metres when positioning the acoustic tag on the same side of the bank as the hydrophone, which featured woody debris and a shallow sand bank.

For installation, each hydrophone was secured to a concrete anchor and moored to a tree on the riverbank by a 6 mm multi-strand stainless steel cable, with alterations when required. During Year 2 2025-26 monitoring hydrophone download and maintenance surveys, the originally installed large and heavy anchors (~15kg) were all progressively replaced with smaller anchors (~7kg) across the array (Plate 2.6). The smaller anchors aim to reduce the risk of injury from manual handling (i.e. retrieval and redeployment of hydrophones).

Since the commencement of Rookwood Weir operations, some hydrophones became inaccessible due to a combination of restricted access (i.e. inundation) and being physically stuck by debris/sediment, resulting in their temporary removal from the array during Year 2 2025-26 monitoring. Specifically, two hydrophones were retrieved and required specialist assessment. Replacement hydrophones were deployed, one immediately following retrieval after maintenance at Lawries bend upstream (ID 131274), and the second to replace the waterlogged hydrophone at Rookwood upstream riffle (ID 135474) during the subsequent hydrophone survey. An additional two hydrophones could not be retrieved during the March 2026 hydrophone download survey; one due to high water level at Rookwood Weir site (ID 131261), and the other at Lawries bend upstream (ID 131274) due to the cable

becoming snagged under large woody debris. An attempt to recover these units will be made during the scheduled hydrophone survey in June 2026.

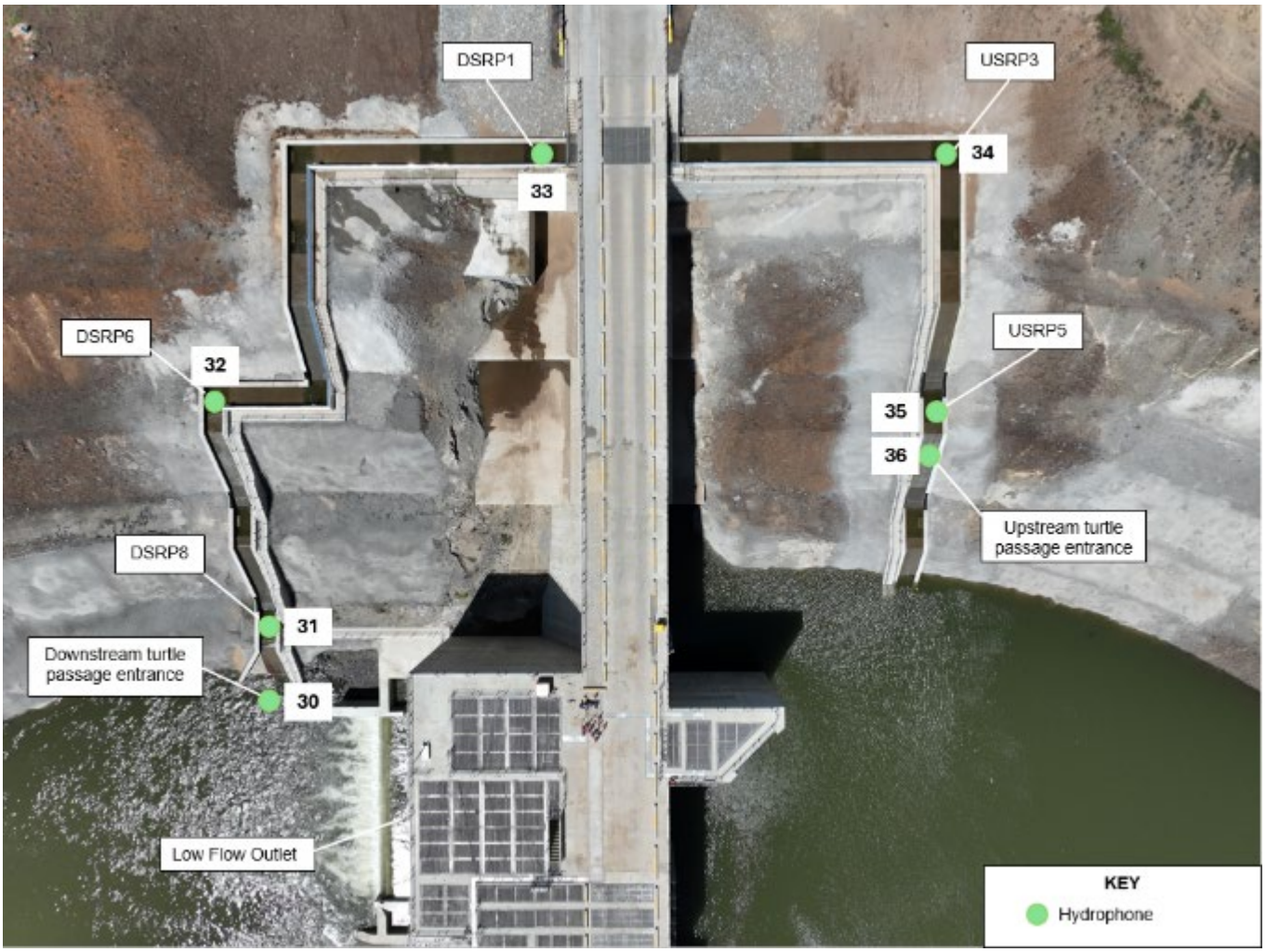


Figure 2.4 Turtle passage monitoring – acoustic hydrophone array

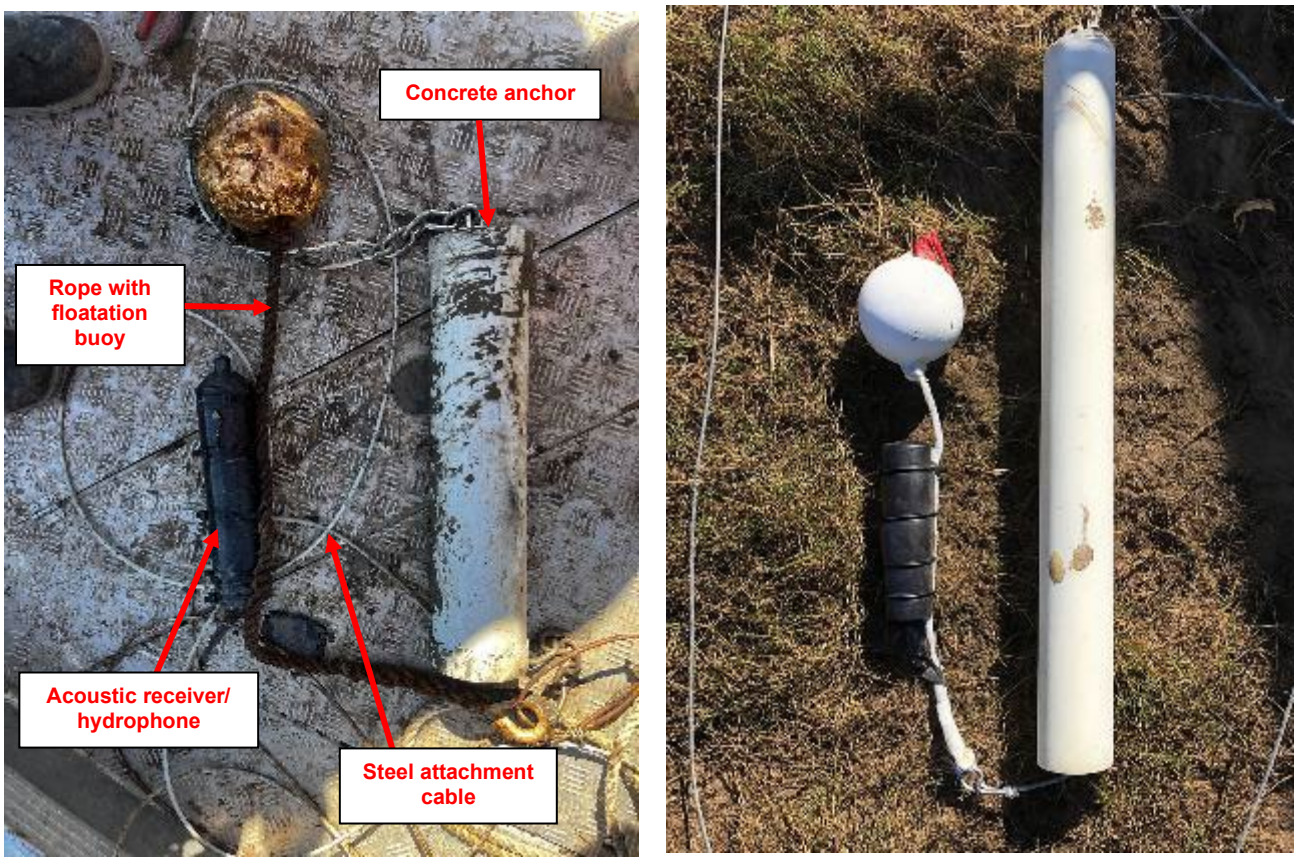
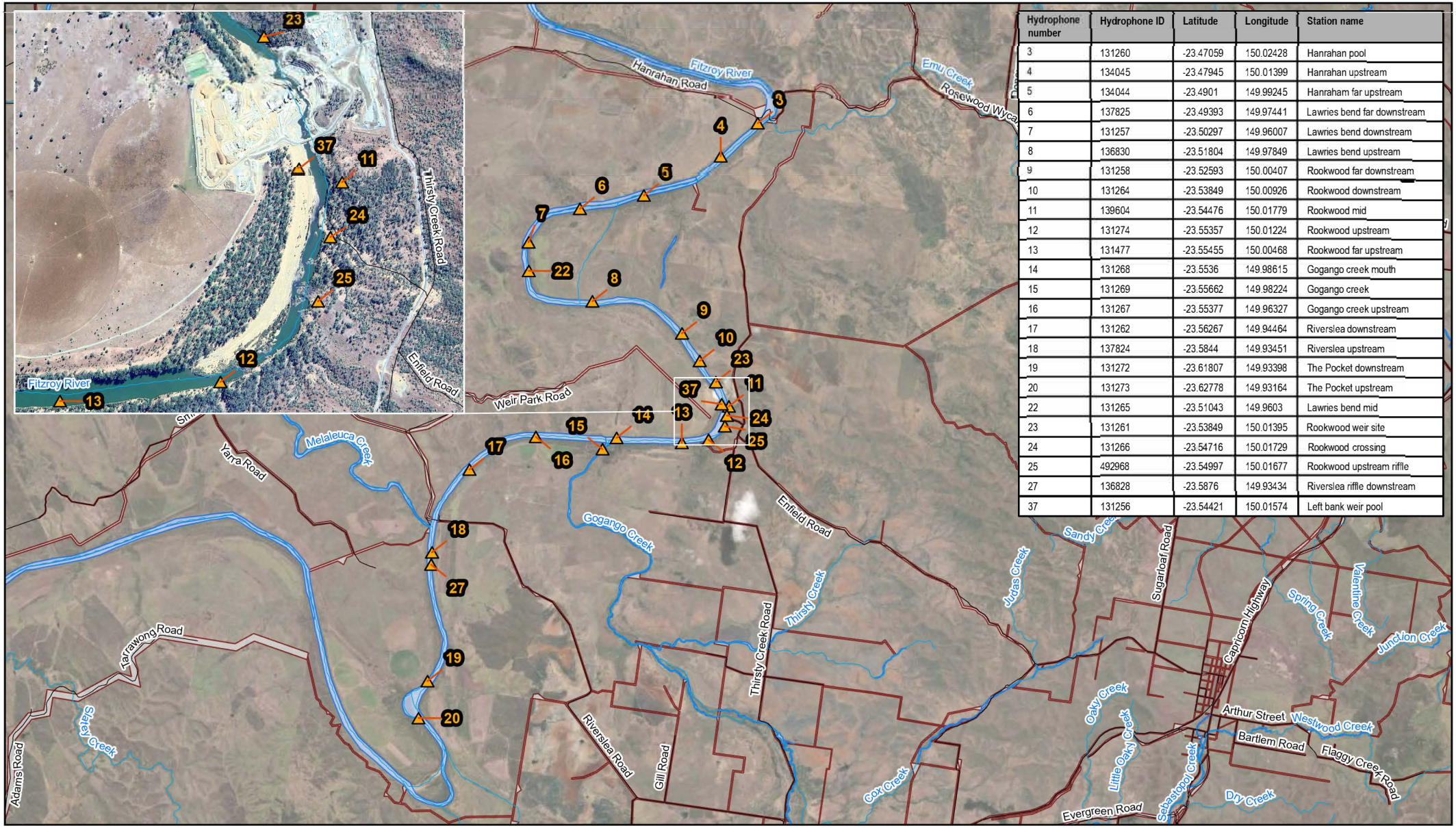


Plate 2.6 *Vemco VR2-W underwater acoustic hydrophone mounted to 12 mm rope with floatation buoy and steel attachment cable fitted with new small anchor (left), and formerly with discontinued large anchor (right)*

Table 2.11 *Hydrophones deployed as of March 2026*

Site number	Hydrophone ID	Latitude	Longitude	Station name
Rookwood Weir turtle passage				
30	139606	-23.54005	150.01624	Ramp entrance downstream (i.e. Downstream turtle passage entrance)
31	139608	-23.54005	150.01624	Lower resting pool downstream (i.e. DSRP8)
32	139607	-23.53992	150.01642	Mid resting pool downstream (i.e. DSRP6)
33	135473	-23.54006	150.01676	Upper resting pool downstream (i.e. DSRP1)
34	131270	-23.54030	150.01696	Upper resting pool upstream (i.e. USRP1)
35	137823	-23.54039	150.01680	Lower resting pool upstream (i.e. USRP5)
36	135475	-23.54039	150.01680	Approach channel upstream (i.e. Upstream turtle passage entrance)
Rookwood Weir site to The Pocket – upstream of Rookwood Weir				
37	131256	-23.54421	150.01574	Left bank weir pool
11	139604	-23.54476	150.01779	Rookwood mid
24	139605	-23.54716	150.01729	Rookwood crossing
25	492968	-23.53937	150.01471	Rookwood upstream riffle
12	131266	-25.55357	150.01224	Rookwood upstream
13	131477	-23.55455	150.00468	Rookwood far upstream
14	131268	-23.55360	149.98615	Gogango Creek downstream

Site number	Hydrophone ID	Latitude	Longitude	Station name
15	131269	-23.55662	149.98224	Gogango Creek
16	136829	-23.55377	149.96327	Gogango Creek upstream
17	131262	-23.56267	149.94464	Riverslea downstream
18	137824	-23.58440	149.93451	Riverslea upstream
27	136828	-23.58760	149.93434	Riverslea riffle downstream
19	131272	-23.61807	149.93398	The Pocket downstream
20	131273	-23.62778	149.93164	The Pocket upstream
Hanrahan to Rookwood Weir site – downstream of Rookwood Weir				
3	131260	-23.47059	150.02428	Hanrahan pool
4	134045	-23.47945	150.01399	Hanrahan upstream
5	134044	-23.49010	149.99245	Hanrahan far upstream
6	137825	-23.49393	149.97441	Lawries bend far downstream
7	131257	-23.50297	149.96007	Lawries bend downstream
22	131265	-23.51043	149.96030	Lawries bend mid
8	131274	-23.51900	149.97880	Lawries bend upstream
9	131258	-23.52593	150.00407	Rookwood far downstream
10	131264	-23.53303	150.00926	Rookwood downstream
23	131261	-23.54997	150.01677	Rookwood Weir site



Hydrophone number	Hydrophone ID	Latitude	Longitude	Station name
3	131260	-23.47059	150.02428	Hanrahan pool
4	134045	-23.47945	150.01399	Hanrahan upstream
5	134044	-23.4901	149.99245	Hanraham far upstream
6	137825	-23.49393	149.97441	Lawries bend far downstream
7	131257	-23.50297	149.96007	Lawries bend downstream
8	136830	-23.51804	149.97849	Lawries bend upstream
9	131258	-23.52593	150.00407	Rookwood far downstream
10	131264	-23.53849	150.00926	Rookwood downstream
11	139604	-23.54476	150.01779	Rookwood mid
12	131274	-23.55357	150.01224	Rookwood upstream
13	131477	-23.55455	150.00468	Rookwood far upstream
14	131268	-23.5536	149.98615	Gogango creek mouth
15	131269	-23.55662	149.98224	Gogango creek
16	131267	-23.55377	149.96327	Gogango creek upstream
17	131262	-23.56267	149.94464	Riverslea downstream
18	137824	-23.5844	149.93451	Riverslea upstream
19	131272	-23.61807	149.93398	The Pocket downstream
20	131273	-23.62778	149.93164	The Pocket upstream
22	131265	-23.51043	149.9603	Lawries bend mid
23	131261	-23.53849	150.01395	Rookwood weir site
24	131266	-23.54716	150.01729	Rookwood crossing
25	492968	-23.54997	150.01677	Rookwood upstream riffle
27	136828	-23.5876	149.93434	Riverslea riffle downstream
37	131256	-23.54421	150.01574	Left bank weir pool

Legend

- Hydrophone location
- Road
- Watercourse
- Road reserve
- Watercourse reserve

Paper Size ISO A4

0 1 2 3 4

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 55

N

GHD

sunwater

SunWater Limited
Rookwood Operations Phase TMS

Project No. **12633406**
Revision No. **0**
Date **01/08/2025**

Broad-scale hydrophone locations

FIGURE 2.5

\\ghdnet\ghd\AU\Brisbane\Projects\41\12633406\GIS\Maps\Deliverables\12633406_AnnualMonitoringPlan.aprx\12633406_002_Hydrophones_rev0
Print date: 01 Aug 2025 - 10:58

Data source: GHD: Hydrophone (2024); DoR: Road (2021), Watercourse (2023), Road reserve (2024); World Imagery: Earthstar Geographics Created by: epangan

2.6.1.2 Data collection and preparation

Following the recovery, download and redeployment of the 31 underwater receivers (turtle passage: seven hydrophones; broad-scale: 24 hydrophones) in June, September and December 2025, and March 2026, detections of acoustically tagged turtles were initially uploaded into Innovasea's VUE software (www.Innovasea.com). The Year 2 2025–26 monitoring dataset was also uploaded into a new Workspace in Innovasea's new Fathom Central platform (https://fathomcentral.com) to facilitate data visualisation and collaboration.

Once compiled, the Year 2 2025–26 monitoring detection dataset was exported as a single .CSV file (comma separated file format), merged with the receiver deployment metadata for Year 2 2025–26 monitoring, and joined with the historical detection dataset (2017–2025) for analysis using the R statistical program (R Core Team, 2025). As the acoustic tags deployed on turtles were dual sensor tags with a separate acoustic tag ID code for the temperature sensor data and pressure sensor (temperature sensor ID +1), we merged the pressure and temperature sensor tag data stream to the same tag ID (i.e. the temperature sensor ID).

Abacus plots of detections at acoustic receivers through time were generated using the ggplot2 package in R with detections coloured depending on whether the receiver fell below or above the weir, or within and adjacent to the turtle passage. To visualise the movements of tagged turtles along the river, the locations of acoustic receiver stations were plotted according to their river distance (AMTD) between the farthest upstream receiver (The Pocket Upstream) and the receiver positioned below Hanrahan Crossing: ID 1 = Hanrahan Far Downstream (AMTD 0).

For the purposes of this report, hydrophone data analysis includes all data recorded from 22 April 2017 to the most recent hydrophone retrieval (March 2026). The inclusion of these data aim to provide historical context to the results for Year 2 2025-26 of broad-scale monitoring during Rookwood Weir operations. To compare metrics of turtle presence, movements and range use across the entire study period, tagged turtle detection data were allocated to calendar years (January 01 - December 31) according to the date and time it was detected. Here, years 2017-2019 are the pre-construction period, years 2020-2023 are the during construction period and years 2024 - 2026 are the operation period). Note, 2017 only covers the period from 8 April 2017 (i.e. the first tagging event) until 31 December 2017, and 2026 contains only data from 1 January 2026 until 5 March 2026 (i.e. the last download event).

2.6.1.3 Data analysis

Using the VTrack package (Campbell et al., 2012) in R, the departure and arrival times when acoustic transmitters moved between the detection fields of adjacent receivers were extracted using the RunResidenceExtraction function. Linear home range estimates were calculated by extracting the extent of river (AMTD) between the most upstream and downstream receivers where a tagged turtle was detected. If a turtle was detected in multiple branches of the river network, the extent of river occupied also included the distance between the main trunk and the most upstream receiver in the tributary.

Tagging records included four individuals that were re-tagged following detachment or loss of their original transmitters, resulting in two monitoring periods for each individual:

White-throated snapping turtle:

– Male: ID 15816 (October 2018), re-tagged as ID 16334 (April 2021)
– Male: ID 15822 (June 2018), re-tagged as ID 16187 (May 2025)

Fitzroy River turtle:

– Female: ID 15818 (October 2018), re-tagged as ID 14285 (June 2019)
– Female: ID 11283 (June 2019), re-tagged as ID 11314 (March 2023).

The minimum distance travelled by a tagged turtle during the study period was calculated by summing all consecutive upriver and downriver movements between underwater receivers along the course of the river. As there were sections of our acoustic array that had overlapping detection fields, there were occasions where animals could be detected at two hydrophones at the same point in time. This had the undesirable effect of greatly inflating our estimates of distance travelled. As recommended by Dywer *et al.* (2018), prior to estimating travel distances we transformed raw acoustic detections into 12-hour COA estimates. These estimated positions of

tagged animals within fixed 12-hour time steps weighted by the number of detections at each hydrophone which removed the problem of overlapping detection areas and lead to more precise estimates of distance travelled.

Space usage by tagged turtles across the broad-scale survey area was quantified through using the following metrics: maximum extent of river utilized by a tagged turtle over the entire tracking period, monthly mean extent of river utilized by a tagged turtle, distance travelled per day and distance travelled per month. Depth use by tagged turtles across the broad-scale survey area was calculated from the pressure sensor tags.

Specific to turtle passage monitoring, detections within and adjacent to the turtle passage (i.e. on the turtle passage hydrophone array) were compared to identify successful movement of acoustically tagged turtles through the turtle passage.

2.6.2 PIT tag readers

As part of turtle passage monitoring, PIT tag readers were installed on the turtle passage (D1 at DSRP7, D2 at DSRP1 and D3 at USRP5) and within the fishway during construction (Figure 2.1 and Plate 2.7). These PIT tag readers intend to detect the PIT tag numbers of white-throated snapping turtles and Fitzroy River turtle that were tagged during operations phase monitoring or in earlier monitoring programs (e.g. Turtle Movement Study). PIT tags are designed to remain embedded in the turtle's tissue for life, allowing for long-term identification and monitoring of individuals across years.

PIT tag data are considered limited for Year 2 2025-26 monitoring as it was identified during Year 1 2024-25 monitoring that the PIT tag readers on the turtle passage did not register any turtles, despite known tagged turtles crossing the readers. It was determined that the signal range of the older version PIT tags used in Year 1 2025-26 monitoring was not strong enough to be detected by the PIT tag readers embedded within concrete within the turtle passage. As such, turtles captured during Year 2 2025-26 monitoring were tagged with a new PIT tag. It is recommended that the effectiveness of the PIT tag reader to detect the new PIT tags and the suitability of PIT tags for turtles is assessed in Year 3 2026-27 monitoring.

Collected PIT tag data was downloaded from the third-party website from June 2025 up to and including May 15, 2026 (i.e. Year 2 2025-26 monitoring). These data were then analysed to identify turtles utilising the turtle passage infrastructure and/or fishway. Data was also interrogated to determine the number, species, and sex of turtles detected by each PIT tag reader, as well as calculate the percentage of turtles utilising the turtle passage infrastructure and/or fishway that successfully completed passage, and the timing/environmental conditions of detections.

PIT tag data are only relevant to the turtle passage monitoring, and do not inform broad-scale monitoring except for identification of recaptured turtles.



Plate 2.7 ***Location of three installed PIT tag readers along turtle passage (top left): D1 (top right), D2 (bottom left) and D3 (bottom right)***

2.6.3 Remote cameras

There are seven remote cameras positioned along the turtle passage (Figure 2.6). The cameras are motion triggered with photographs recorded on SD cards. This data is intended to assist in visually observing turtle movement and behaviour within the turtle passage infrastructure. Additionally, these cameras have been, and continue to be used in monitoring for falls, signs of predation and/or turtle aggression. The 2024-25 Operations Phase Annual Report (GHD, 2025) identified that the remote cameras do not comply with the Rookwood Weir Operations SMP methodology and are ineffective at detecting turtles due to limited temperature difference and slow movement. It was recommended that camera placement, type and number be reviewed. Sunwater have been investigating the feasibility of replacing the remote cameras, however, this assessment is still on-going, and remote cameras remained for Year 2 205/26 monitoring.

The remote camera number and placement has evolved since the beginning of operations. Initially, five remote cameras (Browning Dark Ops Pro DCL Nano) were installed (14 October 2024) on the turtle passage infrastructure by Sunwater to view the entrance, middle and exit of the turtle passage (Figure 2.6). One camera was subsequently lost due to high inflow during the January 2026 flood event. Three additional cameras (Browning Spec Ops Elite HP5 Trail Cameras) were later purchased and installed, bringing the total amount of deployed cameras to seven (Figure 2.6) Imagery captured by the cameras has been reviewed by Sunwater up to May 15, 2026, for Year 2 2025-26 monitoring. Images of turtles, and other fauna in or around the passageway were the uploaded to a central SharePoint for interpretation and integration into this report.



Figure 2.6 Turtle passage – remote camera locations

2.7 Operational inspections and observations

As per the approved Rookwood Weir Operations SMP, an Inspection Form was completed by Sunwater during all inspections of the turtle passage infrastructure and by GHD during all operations phase field surveys to document the operating conditions (Appendix C). Parameters recorded included *in-situ* water quality, build-up of algae, water levels and flow, turbidity, presence of fish, presence of predatory birds, presence of sediment and debris. Inspections were completed during various river conditions (including low headwater and tailwater conditions, during and following flooding events). The form also documented whether any repair or maintenance was required and/or completed.

In addition to the Inspection Form, a Turtle Observation Form and Turtle Injury/Mortality Form were used to record incidental turtle observations and any identified injury/mortalities, respectively (Appendix D and Appendix E). These forms captured operating conditions, location and behaviour of turtles, species and age class (where possible). Observations were recorded by Sunwater and GHD during site visits, maintenance and inspections during Year 2 2025-26.

2.8 Permits and approvals

Turtle capture and tagging procedures were conducted in accordance with the following Acts and permits:

- Queensland Animal Care and Protection Act 2001
- Queensland Fisheries Act 1994
- General Fisheries Permit (Permit number 266945; expiry 18 September 2026)
- GHD Scientific Users Registration Certificate (Registration Number 132; expiry 17 December 2028)
- GHD Scientific Purposes Permit (Permit number P-SPP-100816242-1; expiry 27 March 2030)
- GHD Animal Ethics Committee Animal Research Authority (GHD QLD ARA-2024-12633406; ARA-2025-12633406; ARA-2026-12633406)

2.9 Success criteria

2.9.1 Assessment

The success criteria specified within the Rookwood Weir Operations SMP to assess the effectiveness of the turtle passage infrastructure and the turtle protection design features of the weir are detailed in Table 2.12. Table 2.12 also summarises the monitoring and assessment methodology for each success criteria.

2.9.2 Limitations and caveats

During Year 1 2024-25 monitoring, several success criteria were conservatively assessed due to limited data availability, with the expectation that additional, higher-quality data would be collected in subsequent monitoring years to address key uncertainties such as small sample sizes and equipment limitations, associated with early operational phases. In particular, it was anticipated that increased detections on the hydrophone array (driven by a greater number of tagged turtles), along with improvements to complementary monitoring methods (e.g. remote cameras and PIT tag readers), would enable verification of turtle use of the turtle passage and other structures (e.g. the fishway). Accordingly, the intent of Year 2 2025-26 monitoring was to reassess outcomes against the success criteria with improved data quality and quantity and thereby provide a more robust and reliable evaluation.

However, based on the data available for Year 2 2025-26 monitoring, data quantity and quality remain insufficient to support robust assessment of several success criteria. Limitations associated with monitoring equipment and methodologies have continued to constrain data collection and confidence in detections, including issues with PIT tag signal strength which required replacement, uncertainty regarding the accuracy of hydrophone data within the turtle passage (due to interference of the turtle passage walls on acoustic transmissions), and camera systems that are not consistently capturing turtle movement at sufficient resolution or coverage to verify turtle passage use. Collectively, these limitations reduce confidence in the completeness and reliability of the monitoring dataset.

Unlike Year 1 2024-25 monitoring, where conservative assumptions were applied in the context of limited data, the Year 2 2025-26 monitoring dataset demonstrates that the current monitoring program is not generating data of sufficient resolution or reliability to enable accurate assessment against several success criteria.

An Independent Scientific Evaluation of Rookwood Weir – Operations Phase: Annual Turtle Monitoring Report 2024-2025 conducted by Dr Hamish Campbell, affirmed that the deficiencies in the monitoring equipment and the low sample size of tagged turtles undermined the reliability of the results and ability to draw robust conclusions from 2024-2025 monitoring. The review also identified that to draw robust inferences about turtle movement with high confidence, detections must be generated by the same technology, and species-specific detection probability for that technology must be quantifiable. Consistency in sample sizes (i.e. number and sex of turtle species tagged) between pre-development and operational phases is also required to accurately compare movement across Project phases.

Following these limitations, success criteria have been assessed selectively based on data availability and reliability. Where sufficient data of appropriate quality were available, criteria have been assessed in accordance with the existing program framework. Where assessments have relied on incomplete or limited data, conclusions are inferred given the available information. Where data are demonstrably insufficient or unreliable, success criteria have not been assessed (specifically, Success Criteria 1, 6, 7 and 8, which relate to turtle passage usage).

This approach ensures that outcomes remain as reliable as possible within the noted limited and are not based on unsupported assumptions. Accordingly, the absence of assessment for certain criteria reflects monitoring limitations rather than confirmed ecological outcomes.

Where relevant observations or indicative findings were available during Year 2 2025-26 monitoring, these have been described to provide context on turtle behaviour, movement, or passage use. These observations support interpretation of monitoring outcomes but do not constitute formal assessment where data are insufficient to do so robustly.

In addition, certain success criteria are inherently unsuitable for assessment under the current monitoring framework and dataset. Specifically, Success Criteria 11 and 12, relating to the ratio of males to females utilising the turtle passage and seasonal movement trends, have not been assessed. These criteria rely on consistent and comparable tagging and detection across time; however, differences in tagging effort, methodology, and the number of turtles tagged between pre-construction and operational phases preclude meaningful comparison. While relevant Year 2 2025-26 monitoring observations have been noted, formal assessment of these criteria would not be scientifically valid.

Table 2.12 Success criteria assessment methodology

No.	Success criteria	Monitoring methods	Assessment
Management strategy 1 – Turtle movement **Management strategy 2 – Turtle protection**			
1	75% of white-throated snapping turtles and Fitzroy River turtles that attempt to use the turtle passage each year for upstream passage will do so successfully.	Remote telemetry (acoustic and PIT) Cameras Turtle capture surveys Observations	***Comparison between the turtles attempting to use the turtle passage and those that were detected upstream.*** Turtles attempting to use the turtle passage was defined by the number of turtles that were detected by any methodology within or beyond the first downstream resting pool (DSRP8). This was compared to the turtles that were considered to have successfully used the turtle passage which were defined by the number of those same turtles that were subsequently detected upstream within the weir pool by any methodology following initial detection or observation. Where the percentage of turtles successfully using the turtle passage was less than 75% the success criteria was not achieved and where it was lower than 50% corrective actions were triggered. *Note: This success criterion is not considered suitable for robust assessment due to insufficient data generated by the current monitoring methods to reliably quantify turtle passage use. As such, no definitive conclusion has been drawn. Relevant findings are presented qualitatively based on available information (see Section 1.4).*
2	Turtle monitoring downstream of the weir demonstrates no turtle injury/mortality during downstream turtle passage over the spillway, as evidenced by impact damage to turtles.	Remote telemetry (acoustic and PIT) Cameras Turtle capture surveys Observations Operational inspections	***Comparison between the number of turtles observed with damage and the total number recorded within 500 m downstream of the weir during the monitoring period.*** The monitoring methods were reviewed for evidence of turtles moving downstream over the spillway which was primarily inferred from any injuries from turtles captured during surveys at locations within 500m downstream of the weir. This was further supported by evidence obtained from the other monitoring methods. This was then compared with the total number of turtles captured during the turtle capture survey at locations within 500m downstream of the weir. This success criterion was achieved where less than 5% of turtles recorded within 500 m downstream of the weir showed evidence of impact damage. Where more than 5% of turtles had impact damage which was likely to be the result of movement over the spillway, the success criterion was not achieved, and corrective actions were triggered.
3	The turtle passage remains operational (attraction flow is provided and passage unobstructed) continuously when the storage is above 8,000 ML up to a 1 in 5-year spilling event.	Operational inspections	Sunwater to complete this assessment
4	The turtle passage operates for one week after each four weeks of non-	Operational inspections	Sunwater to complete this assessment

No.	Success criteria	Monitoring methods	Assessment
	operation when the storage is below 8,000 ML.		
5	75% of adult white-throated snapping turtles and Fitzroy River turtles recorded within 50 m of the turtle ramp and fishway entrances within a 12-month period are attracted to and can successfully locate the turtle passage entrance (as defined as entering the funnel-shaped ramp).	Remote telemetry (acoustic) Cameras Turtle capture surveys Observations	***Comparison between the number of turtles detected at the turtle passage entrance and the number of turtles attempting to use the turtle passage.*** Turtles attempting to use the turtle passage was defined by the number of turtles that were detected by any methodology within or beyond the first downstream resting pool (DSRP8). This was compared with number of turtles detected on the hydrophone within the downstream approach channel (as indicative of turtles within 50 m of ramp entrance), in addition to the number of turtles assumed to have moved through the downstream approach channel if not on the hydrophone array but observed within or beyond DSRP8 using another methodology. Where the percentage of turtles successfully locating the turtle passage was less than 75% this success criterion was not achieved and where it was lower than 50% corrective actions were triggered. *Note: This success criterion is not considered suitable for robust assessment due to insufficient data generated by the current monitoring methods to reliably quantify turtle passage use. As such, no definitive conclusion has been drawn. Relevant findings are presented qualitatively based on available information (see Section 1.4).*
6	75% of adult white-throated snapping turtles and Fitzroy River turtles that attempt to use the ramp within a 12-month period can successfully ascend the ramp and pool arrangement to reach the abutment throughfare.	Remote telemetry (acoustic and PIT) Cameras Turtle capture surveys Observations	***Comparison between turtles attempting to use the turtle passage and those that were detected at the downstream upper resting pool (DSRP1).*** Turtles attempting to use the turtle passage was defined by the number of turtles that were detected by any methodology within or beyond the first downstream resting pool (DSRP8). This was compared with number of turtles detected by any method within or beyond the downstream upper resting pool (DSRP1; as indicative of turtles successfully ascending the ramp and pool arrangement to reach the abutment thoroughfare). Where the percentage of turtles successfully ascending the ramp and pool arrangement was less than 75% this success criterion was not achieved and where it was lower than 50% corrective actions were triggered. Note: *This success criterion is not considered suitable for robust assessment due to insufficient data generated by the current monitoring methods to reliably quantify turtle passage use. As such, no definitive conclusion has been drawn. Relevant findings are presented qualitatively based on available information (see Section 1.4).*
7	75% of adult white-throated snapping turtles and Fitzroy River turtles that attempt to use the ramp within a 12-month period can successfully move through the abutment throughfare.	Remote telemetry (acoustic and PIT) Cameras Turtle capture surveys Observations	***Comparison between turtles attempting to use the turtle passage and those that were detected at the upstream upper resting pool (USRP1).*** Turtles attempting to use the abutment thoroughfare was defined by the number of turtles that were detected by any methodology within or before the upper downstream resting pool (DSRP1).

No.	Success criteria	Monitoring methods	Assessment
			This was compared with number of turtles detected by any method within or beyond the upstream upper resting pool (USRP1; as indicative of successful movement through the abutment thoroughfare). Where the percentage of turtles successfully moving through the abutment thoroughfare was less than 75% this success criterion was not achieved and where it was lower than 50% corrective actions were triggered. Note: *This success criterion is not considered suitable for robust assessment due to insufficient data generated by the current monitoring methods to reliably quantify turtle passage use. As such, no definitive conclusion has been drawn. Relevant findings are presented qualitatively based on available information (see Section 1.4).*
8	75% of adult white-throated snapping turtles and Fitzroy River turtles that attempt to use the ramp can successfully descend the turtle ramp from the abutment throughfare into the impoundment to complete passage past the weir.	Remote telemetry (acoustic and PIT) Cameras Turtle capture surveys Observations	***Comparison between turtles that had moved through the abutment and those that were detected within the weir.*** Turtles that had moved through the abutment were defined by the number of turtles that were detected by any methodology within the first upstream resting pool (USRP1). This was compared with number of turtles detected by any method within the weir pool that had also been detected in resting pool USRP1 (as indicative of successful descent of the turtle ramp from abutment thoroughfare). Where the percentage of turtles successfully moved from the upstream abutment to the weir pool was less than 75% this success criterion was not achieved and where it was lower than 50% corrective actions were triggered. Note: *This success criterion is not considered suitable for robust assessment due to insufficient data generated by the current monitoring methods to reliably quantify turtle passage use. As such, no definitive conclusion has been drawn. Relevant findings are presented qualitatively based on available information (see Section 1.4).*
9	Turtle monitoring demonstrates no predation of turtles from within the turtle passage infrastructure.	Remote telemetry (acoustic) Cameras Observations	***Comparison of the number of turtles which were predated and/or attempted predation within the turtle passage and total number of turtles recorded on the turtle passage.*** All monitoring methods were reviewed for evidence of predation of turtles by assessing behaviour of potential predators when in the presence of turtles. This was compared with the total number of turtles recorded by any method within the turtle passage. This success criterion was achieved if less than 5% of turtles recorded within the turtle ramp within a 12-month period were subject to predation or attempted predation. If more than 5% of turtles experienced predation or attempted predation, corrective actions were triggered.
10	Turtle monitoring demonstrates no turtle injury and/or mortality from within the turtle passage as a result of falls.	Cameras Turtle capture surveys Observations	***Comparison between the number of turtles recorded falling from the turtle passage and the total number of turtles recorded on the turtle passage.*** All monitoring methods were reviewed for footage or evidence of turtles falling from the turtle passage and inference from any injuries from turtles captured during surveys.

No.	Success criteria	Monitoring methods	Assessment
			This was compared with the total number of turtles recorded by any method within the turtle passage. This success criterion was achieved if less than 5% of turtles recorded within the turtle passage were observed falling within or from the turtle ramp resulting in serious turtle injury/mortality. If more than 5% of turtles experienced serious injury or mortality from falling from the turtle passage, corrective actions were triggered.
11	The ratio of adult male and female white-throated snapping turtles and Fitzroy River turtles successfully moving upstream through the turtle ramp within a 12-month period is equivalent to pre-development ratios.	Remote telemetry (acoustic and PIT) Cameras Turtle capture surveys	***Comparison between the number of male and female turtles moving upstream through the turtle passage during operations and the number of male and female turtles moving upstream between the Rookwood Weir location during pre-construction.*** The number of male and female turtles successfully moving upstream through the turtle ramp as defined by turtles being recorded attempting to use the turtle passage which were then recorded in the weir pool. This was then compared with the mean number of male and female turtles moving upstream from the Rookwood Weir site hydrophone to the Rookwood Mid hydrophone (i.e. past the Rookwood Weir location) during pre-development (2017 to 2020).Note: *This success criterion was deemed unsuitable for a robust assessment due to the recognition that the monitoring methods used did not enable for true quantitative comparison between pre-construction and operational conditions. As such, no definitive conclusion has been drawn in relation to this Success Criterion for this report. This criterion has subsequently only been qualitatively discussed based on the below methods (see Section 1.4).*
12	Seasonal variation in use of the turtle ramp by adult male and female white-throated snapping turtles and Fitzroy River turtles is equivalent to pre-development seasonal trends over a 12-month period	Remote telemetry (acoustic and PIT) Cameras Turtle capture surveys Observations	***Comparison between the number of male and female turtles moving upstream through the turtle passage during operations and the number of male and female turtles moving upstream between the Rookwood Weir location during pre-construction by month.*** The number of male and female turtles by month successfully moving upstream through the turtle ramp as defined by turtles being recorded attempting to use the ramp which were then recorded in the weir pool. This was then compared with the season that had the maximum number of turtle movements of male and female turtles by month moving upstream from the Rookwood Weir site hydrophone to the Rookwood Mid hydrophone (i.e. past the Rookwood Weir location) during pre-development (2017 to 2020) to determine the specific months that turtles moved. If the seasonal use of the turtle ramp (measured by attempted use and successfully passage per month) by adult white-throated snapping turtles and Fitzroy River turtles is substantially different to pre-development seasonal trends in movement behaviour this success criterion was not achieved and corrective actions triggered. Note: *This success criterion was deemed unsuitable for a robust assessment due to the recognition that the monitoring methods used did not enable for true quantitative comparison between pre- construction and operational conditions. As such, no definitive conclusion has been drawn in relation to this Success Criterion for this report. This*

No.	Success criteria	Monitoring methods	Assessment
			criterion has subsequently only been qualitatively discussed based on the below methods (see Section 1.4).
13	Measurement of the turtle ramp attraction flow during inspections and turtle capture monitoring events indicates that the depth of water flow on the upstream ramp remains suitable for turtles to climb as per annual depth criteria	Cameras Observations Operational inspections	***Comparison of water flow on the turtle passage with the annual depth criteria.*** Information and data on attraction flow was collected with the mean flow depth on the horizontal sections of ramp compared with the annual depth criteria (initially defined as 5 cm). Where the difference was greater than 25% this success criterion was not achieved, and corrective actions were triggered.
14	Over a 12-month period, habitat conditions within the resting pools remain suitable for adult white-throated snapping turtles and Fitzroy River turtles, as evidenced by achievement of suitable pool depth criteria, compliance with water quality objectives, and long-term availability of shelters	Remote telemetry (acoustic and PIT) Cameras Turtle capture surveys Observations Operational inspections	***Comparison between resting pool conditions (in-situ water quality and physical conditions) and the annual pool suitability criteria.*** Mean habitat conditions within resting pools (as measured at three locations) were calculated for water depth, water quality (temperature, pH, dissolved oxygen, conductivity and turbidity) and the shelters within resting pools assessed for availability and functionality (i.e. not damaged, broken or buried under silt). This was then compared with mean water quality data for the Fitzroy River – upstream and downstream of Rookwood Weir, current Fitzroy River water quality and pre-construction water quality. If the resting pool water quality was more than 25% different to annual pool suitability criteria (initially defined as 0.50 m water depth, water quality equivalent to background levels (temperature, pH, dissolved oxygen, conductivity and turbidity compliant (±25%) with conditions within similar depth habitat upstream and/or downstream), and shelter is available/functioning), the success criterion was not achieved and corrective actions triggered.
15	Annual monitoring downstream of the weir trash screens and inlets indicates no entrapment or drowning of white-throated snapping turtles or Fitzroy River turtles.	Operational inspections Turtle capture surveys Observations	***Comparison between the number of turtles with injury/mortality as a result of the weir trash screens and the total number of turtles recorded within 500 m upstream or downstream of the weir.*** All monitoring methods were used to determine the number of turtles with injuries or mortalities that were likely the result of the weir trash screens and inlets. The weir trash screens were inspected for deceased turtles. This was then compared with the total number of turtles captured during the turtle capture surveys within 500 m upstream and downstream of the weir. If more than 5% of turtles recorded within 500 m upstream and downstream of the weir showed evidence of entrapment/drowning on the weir trash screens or inlets, this success criterion was not achieved and corrective actions triggered.
16	Monitoring of the fishway over a 12-month period indicates no injury/mortality of white-throated snapping turtles or Fitzroy River turtles occurred within the fishway complex.	Fishway monitoring Turtle capture surveys Observations	***Comparison between the number of turtles with injury/mortality as a result of the fishway and the total number of turtles recorded within 500 m upstream or downstream of the weir.*** All monitoring methods were used to determine the number of turtles with injuries or mortalities that were likely the result of the fishway complex either from the structure itself

No.	Success criteria	Monitoring methods	Assessment
			or the operation of the fishway (as evidenced by entrapment/drowning within fishway and/or crushing injuries from gates). This was then compared with the total number of turtles captured during the turtle capture surveys within 500 m upstream and downstream of the weir.. If more than 5% of turtles recorded within 500 m upstream and downstream of the weir showed evidence of injury or mortality from the fishway complex, this success criterion was not achieved and corrective actions triggered.
17	At least 20 adult Fitzroy River turtles and white-throated snapping turtles recorded attempting to use the turtle passage within a 12-month period.	Remote telemetry (acoustic and PIT) Cameras Turtle capture surveys Observations Operational inspections	***Count of the number of turtles attempting to use the turtle passage.*** All monitoring methods were used to calculate the total number of Fitzroy River turtles and white-throated snapping turtles attempting to use the turtle passage. Turtles attempting to use the turtle passage was defined by the number of turtles that were detected by any methodology within the first downstream resting pool (DSRP8). If there were less than 20 of each target turtle species recorded attempting to use the turtle passage this success criterion was not achieved and corrective actions triggered. *Note: This success criterion is not considered suitable for robust assessment due to insufficient data generated by the current monitoring methods to reliably quantify turtle passage use. As such, no definitive conclusion has been drawn. Relevant findings are presented qualitatively based on available information (see Section 1.4).*
Management strategy 4 – Protection of habitat			
18	Suitable turtle habitat is present within, and/or upstream and/or downstream of Rookwood Weir.	Remote telemetry (acoustic) Turtle capture	***Assessment of in-situ water quality, potential nesting banks, aquatic habitat and presence of turtles and turtle condition upstream and downstream of the weir.*** Suitable turtle habitat was assessed through analysis of: – Water quality in the Fitzroy River with comparison to pre-development baseline conditions – Suitability of nesting habitat of the priority turtle nesting banks as identified for Year 2 2025-2026 monitoring – Availability of aquatic habitat including woody debris and food sources (e.g. aquatic plants, algae, periphyton, crustaceans, invertebrates etc.). If turtle habitat conditions were poor, there were no turtles identified within the impoundment or within 1 km downstream of the weir, and if turtles captured in these areas were in a poorer health than those recorded during baseline surveys (as measured by higher rates of injury/mortality/illness) then this success criterion was not achieved and corrective actions triggered.

3. Results and discussion

3.1 Survey conditions

3.1.1 Weather conditions

Rainfall at Riverslea (upstream from Rookwood Weir) is presented in Figure 3.1. Rainfall during survey events was low (<10 mm), except for the turtle capture survey in November 2025 which experienced 16 mm of rainfall across the 10 day survey. Rainfall was sporadic throughout Year 2 2025-26 monitoring with the most rainfall in the summer months, as expected. The highest total daily rainfall occurred on 25 December 2025 with 101 mm recorded. This rainfall event on December 2025 was brief, only lasting 24 hours but in conjunction with a three-day combined rainfall total of 110 mm on 11-13 January 2026, resulted in the largest flow event of the Year 2 2025-26 monitoring period. Further rainfall over five days in early March resulted in the second flow event in the Fitzroy River as discussed in Section 3.1.2 below.

Average minimum and maximum temperatures during the survey events show seasonal differences in survey conditions (Table 3.1). As expected, temperatures were cooler during the winter months (~5-27°C), and warmer during summer months (~21-33°C). An unusually cold period occurred in June 2025 and coincided with the June 2025 hydrophone study where minimum temperatures reached 5.4°C.

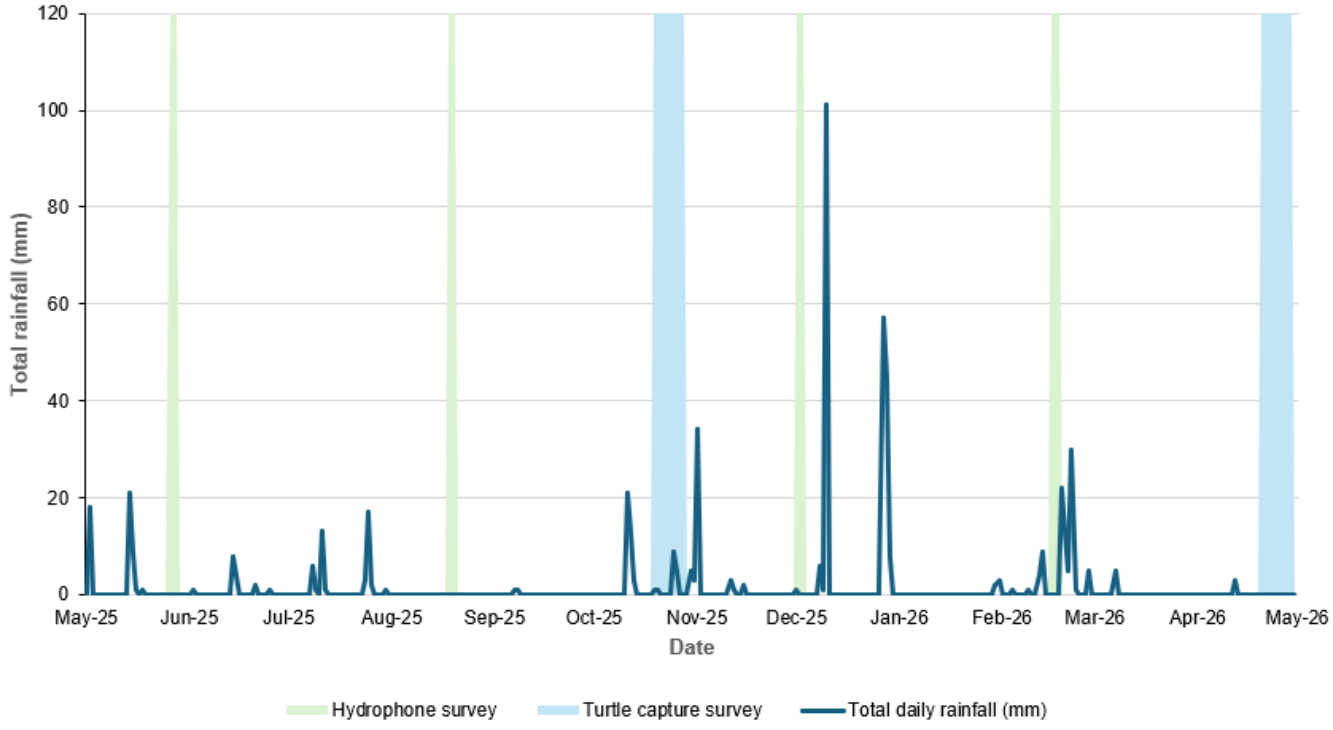


Figure 3.1 Total daily rainfall (mm) throughout Year 2 2025-26 monitoring and survey events

Table 3.1 Mean minimum and maximum temperature (°C) during survey events

Survey	Dates	Mean min temperature (°C)	Mean max temperature (°C)
Hydrophone survey	10 – 12 June 2025	5.4	21.7
Hydrophone survey	2 – 4 September 2025	15.9	26.9
Turtle capture survey	3 – 12 November 2025	21.4	32.1
Hydrophone survey	16 – 18 December 2025	23.0	32.6
Hydrophone survey	3 – 5 March 2026	21.7	30.5
Turtle capture survey	5 – 15 May 2026	16.7	27.3

3.1.2 River flow

Average daily flow (ML/day) at sites upstream and downstream of Rookwood Weir during Year 2 2025-26 of turtle passage and broad-scale monitoring (i.e. May 2025 to May 2026) are presented in Figure 3.2Two flow events occurred on the Fitzroy River in January and March 2026, with mean daily flows in the Fitzroy River exceeding 500,000 ML/day and 300,000 ML/day, respectively. The hydrophone download survey in March 2026 occurred following peak flows in January, where the flow and river height on the were still elevated during the survey period (Figure 3.2).

The flood event in January 2026 peaked at 20.74 m at Riverslea, only 26 cm below a defined moderate flood event. This flood event lasted 10 days from 14 January 2026 to 24 January 2026. The second event in March 2026 peaked lower at 17.78 m on 14 March 2026 and the river height was above minor flood level for 9 days (Figure 3.3).

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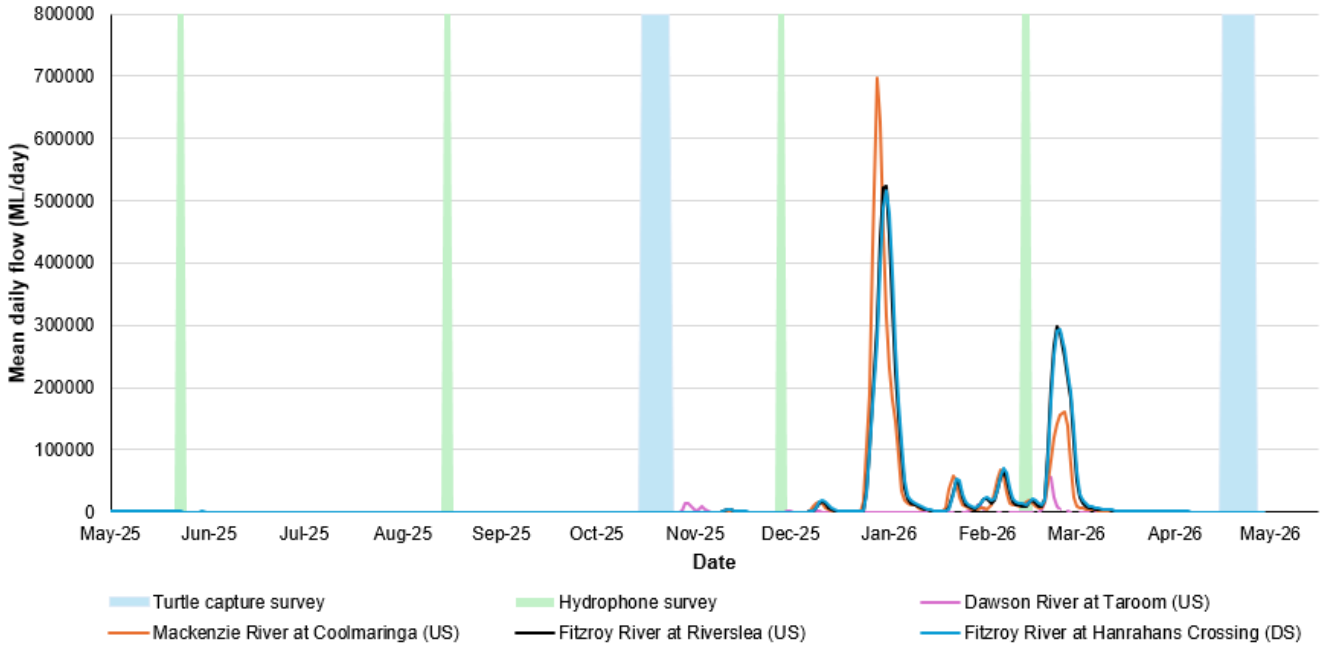


Figure 3.2. Mean daily flow (ML/day) at sites upstream (US) and downstream (DS) of Rookwood Weir

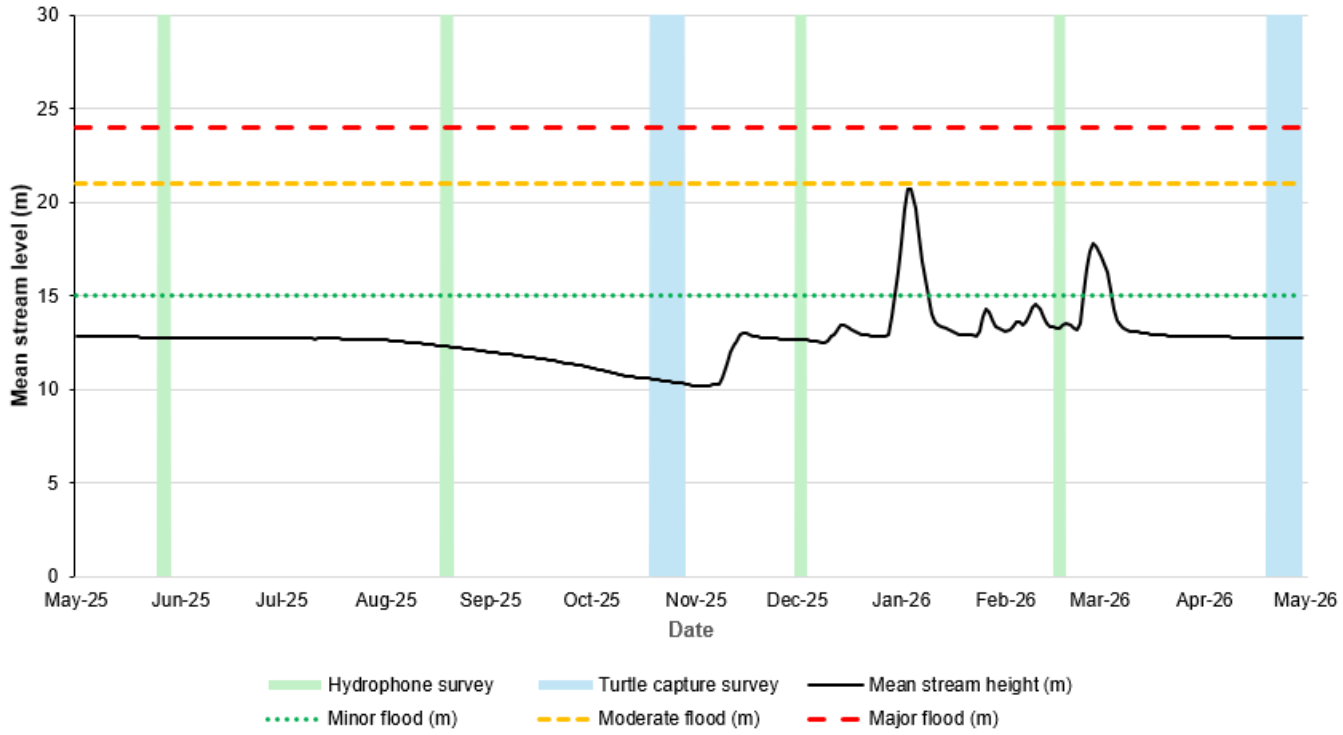


Figure 3.3. Mean stream level (m) for Fitzroy River at Riverslea (130003B) and defined flood levels

3.1.3 Rookwood Weir water level and releases

From June 2025 to August 2025, the weir operated at full supply level (FSL), with levels falling below FSL for approximately four months during spring to early summer (1 August 2025 to 29 November 2025). The lowest recorded supply level occurred on 16 November 2025 at a level of 63%, and highest capacity on 19 January 2026 at 238% capacity. This cycle was similar to the Year 1 2024-25 monitoring period where Rookwood Weir operated below FSL until early summer and reached over 100% capacity in mid-December 2024 following a flood event.

During periods where capacity is below 100%, Sunwater conducts controlled releases of water through the low flow outlet (LFO) to retain water flow downstream of the weir. Throughout Year 2 2025-26 monitoring, controlled releases occurred intermittently between July 2025 and January 2026 at varying rates of up to 350 ML/day (Figure 3.6).

The largest overtopping events were during January 2026 and March 2026, coinciding with the highest recorded storage capacity, with mean daily flows in the Fitzroy River exceeding 500,000 ML/day and 300,000 ML/day, respectively (Figure 3.5). The weir operated at over 100% capacity, and was therefore overtopping, from May 2025 through to August 2025 and from December 2025 through to the end of the Year 2 2025-26 monitoring period in May 2026 (Figure 3.4). In total, Rookwood Weir overtopped for 232 days, representing around 64% of Year 2 2025-26 monitoring. No major flow events coincided with hydrophone or turtle capture surveys. The hydrophone download survey in March 2026 occurred following peak flows in January, where flow and river height were still elevated during the survey period (Figure 3.4Figure 3.2), with mean daily flow ranging from 478 ML/day to 259 ML/day downstream at Hanrahan Crossing (station 130010A). During the November 2025 turtle capture survey, whilst Rookwood Weir was not overtopping, water was being discharged from the low flow outlet. This release resulted in mean daily flow ranging from 183 ML/day to 230 ML/day downstream at Hanrahan Crossing (station 130010A) throughout the survey period.

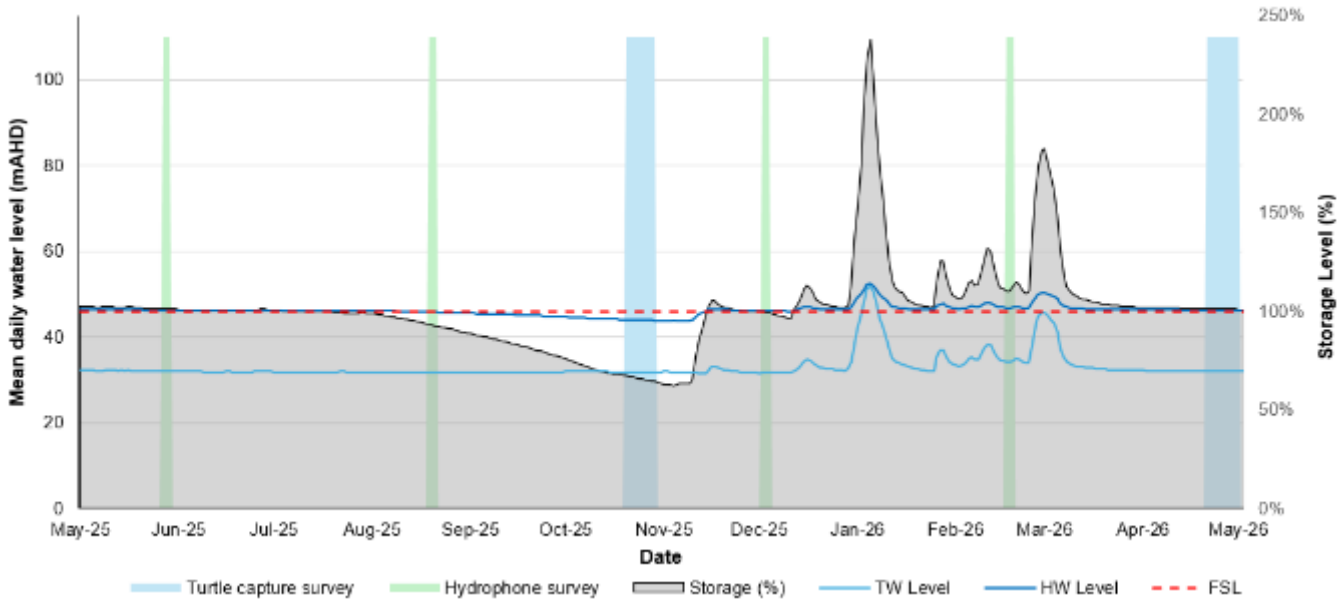


Figure 3.4 ***Mean water levels at the headwater (HW) and tailwater (TW), and storage level (%) at Rookwood Weir in relation to full supply level (FSL)***

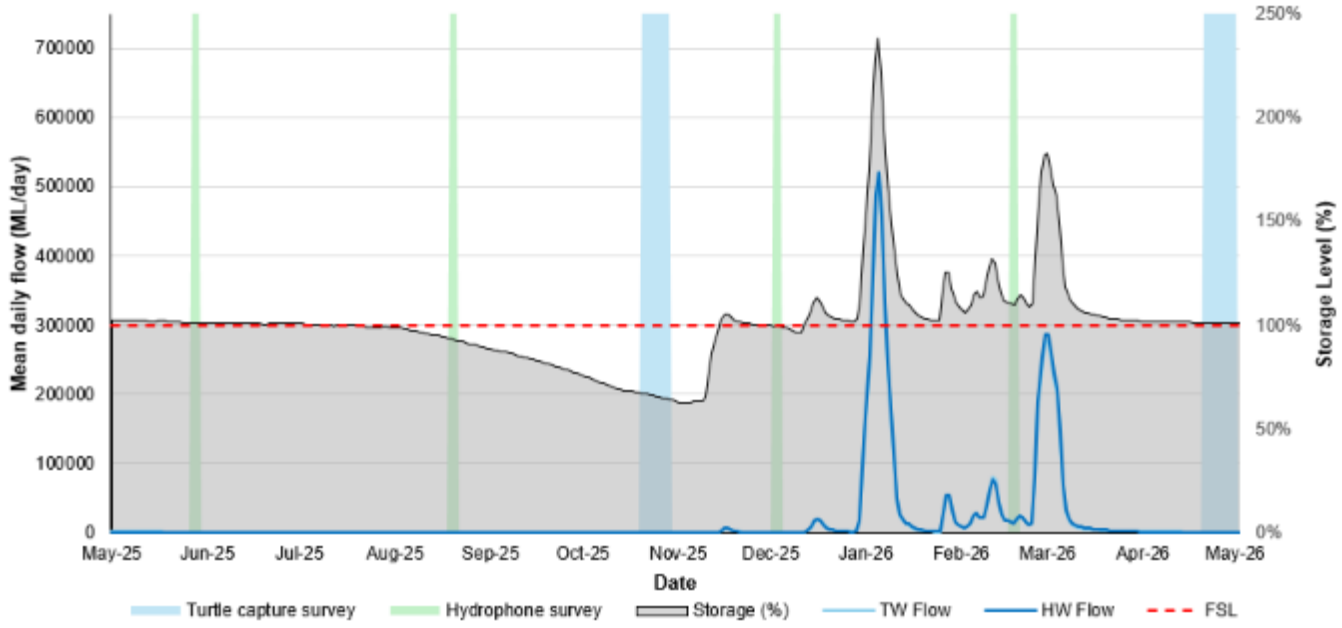


Figure 3.5 ***Mean daily flow rate at the headwater (HW) and tailwater (TW), and storage level (%) at Rookwood Weir in relation to full supply level (FSL)***

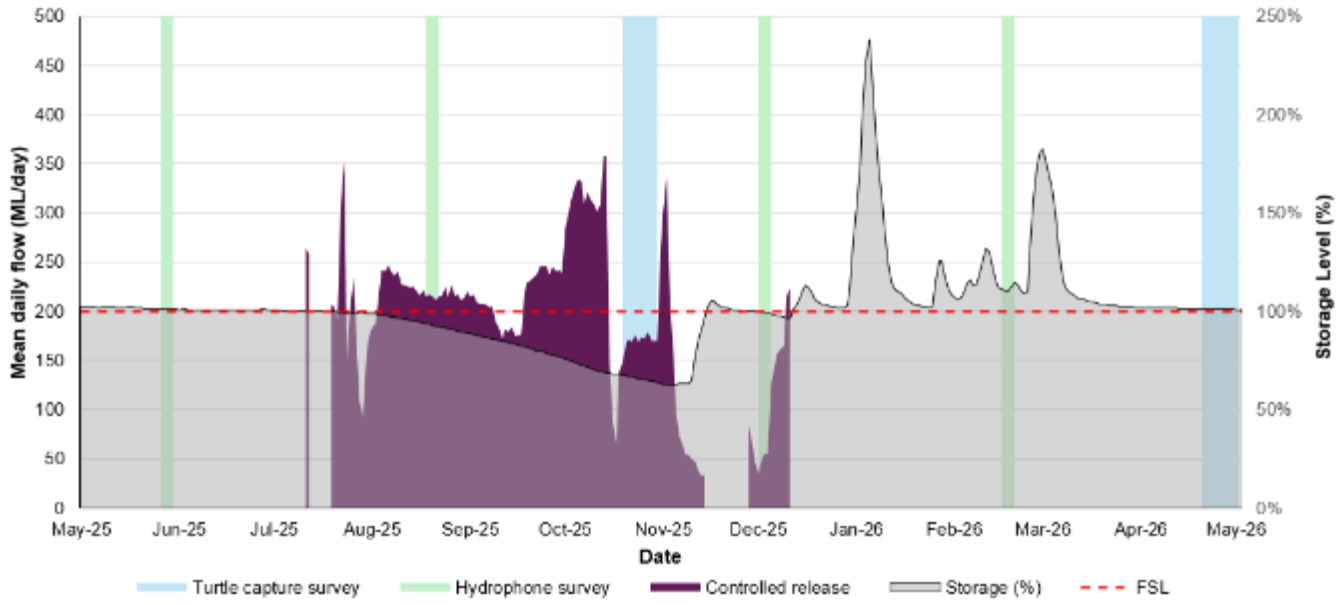


Figure 3.6 Controlled release rates of water from Rookwood Weir

3.1.4 *In-situ* water quality

Overall, the water quality upstream and downstream of Rookwood Weir was suitable for turtle habitat, with parameters equal or better than pre-construction baseline values, except for dissolved oxygen which was within 25% of the pre-construction baseline value and was suitable for aquatic life (Table 3.2). The water quality within the turtle passage did not demonstrate any discernible differences from ambient conditions within the Fitzroy River and provided suitable conditions for turtles.

3.1.4.1 Temperature

Surface water temperature recorded during Year 2 2025-26 monitoring survey events across the Fitzroy River and associated monitoring sites ranged from approximately 17.3°C to 29.8°C (Appendix B). Variation in temperature between survey events generally reflected natural seasonal variability, with lower temperatures recorded during September and May surveys and higher temperatures during November–March sampling events.

There were no clear or consistent spatial differences in temperature between upstream and downstream sites or between the Fitzroy River and turtle passage environments. Temperatures recorded within turtle passage resting pools and approach channels were comparable to those observed within the Fitzroy River, indicating that the passage provides a thermal environment broadly consistent with ambient river conditions (Table 3.2). All recorded water temperatures were within the expected pre-construction baseline range (15.3–31.3°C) and are considered typical for a large order river system with substantial pool habitats and seasonal variation.

3.1.4.2 pH

During Year 2 2025-26 monitoring survey events, pH across the Fitzroy River and turtle passage ranged from 6.7 to 9.2. The grouped location average pH values recorded in Year 2 2025-26 monitoring were between 7.2 and 7.7, indicating predominantly neutral to mildly alkaline conditions across the monitoring areas (Table 3.2).

Occasional lower pH values (below the pre-construction baseline range of 7.3–8.4) were recorded during some survey events upstream and downstream of Rookwood Weir and in the turtle passage; however, these were limited (Appendix B).

Overall, pH conditions within the turtle passage resting pools and approach channels were comparable to those of the Fitzroy River, indicating that the conditions were similar to the river at the time of sampling (Table 3.2).

3.1.4.3 Electrical conductivity

Electrical conductivity recorded during Year 2 2025-26 monitoring survey events ranged from approximately 138 µS/cm to 290 µS/cm across all monitoring locations (Appendix B). Conductivity values were relatively consistent across sites within the Fitzroy River, turtle passage resting pools and approach channels.

There were no clear spatial trends in conductivity between upstream and downstream locations or between the turtle passage and broader river environments. Conductivity tended to vary slightly between survey events, with slightly higher readings occurring during low-flow periods in November and December (Appendix B). Lower readings of EC post-flow events in March and May surveys demonstrate that flow events lower the concentration of ions in the river system through the input of freshwater and therefore lower the EC.

Most recorded values were below or close to the pre-construction baseline average conductivity (269 µS/cm), particularly during November and December 2025 sampling. Despite these exceedances, conductivity values remained within a relatively narrow range and did not indicate any substantial departure from expected conditions (Table 3.2).

Overall, conductivity within the turtle passage was comparable to that of the Fitzroy River and consistent with baseline conditions (Table 3.2).

3.1.4.4 Dissolved oxygen

Dissolved oxygen (DO) recorded during Year 2 2025-26 monitoring survey events varied substantially across locations and survey periods, ranging from low concentrations below 40% saturation to conditions exceeding 100% saturation (Appendix B).

Lower DO concentrations were observed during several survey events, particularly during November and December 2025, with reduced oxygen levels recorded at both turtle passage sites and Fitzroy River locations (Appendix B). These lower values are indicative of reduced oxygen availability and are likely influenced by factors such as elevated temperatures, low flow conditions, and decomposition of organic matter.

Conversely, higher DO concentrations were recorded at several sites during September 2025, March 2026 and May 2026 survey events. These higher values likely reflect increased mixing, photosynthetic activity and/or improved flow conditions.

As observed in Year 1 2024-25 monitoring, DO concentrations were frequently below the pre-construction baseline range (89–101%). Downstream of Rookwood Weir demonstrated higher DO concentrations on average (Table 3.2), this may be due to increased turbulence from the downstream lotic conditions (i.e. flows over riffle sections) or from the weir operation (Plate 3.1).

Within the turtle passage, DO concentrations were broadly comparable to those recorded in the Fitzroy River, with both environments exhibiting periods of reduced oxygen availability interspersed with periods of higher oxygen concentrations, likely due to seasonal changes such as increased flow conditions, mixing and/or microalgal influence (Table 3.2).



Plate 3.1 Turbulence of water downstream of Rookwood Weir from overtopping in March 2026

3.1.4.5 Turbidity

Turbidity recorded during Year 2 2025–26 monitoring survey events ranged from low values below 25 NTU to highly turbid conditions exceeding 190 NTU across the monitoring area (Appendix B).

Variation in turbidity between survey events was pronounced and likely reflects changes in flow conditions, runoff inputs and sediment mobilisation within the Fitzroy River catchment. Lower turbidity values were generally recorded during the September and November 2025 surveys, while substantial increases in turbidity were observed during March and May 2026 survey events, where values commonly exceeded 150 NTU and in some cases approached or exceeded 190 NTU (Appendix B) (Plate 3.2). These higher readings coincided with the two flood events in January and March 2026 as outlined in Section 3.1.2.

Turbidity levels were broadly consistent between the Fitzroy River and turtle passage environments, with resting pools and approach channels closely reflecting river conditions during each survey period. There were no consistent spatial differences observed between upstream and downstream sites.

Turbidity values generally remained within or comparable to the pre-construction baseline (190.5 NTU). Periods where turbidity was low were limited to lower flow conditions during earlier survey events.

Overall, turbidity within the turtle passage was reflective of ambient Fitzroy River conditions, with temporal variability dominating observed patterns (Table 3.2).



Plate 3.2 High turbidity post flood events at Hanrahan Crossing during March 2026 hydrophone field survey

3.1.4.6 Blue-green algae

Blue-green algae levels were assessed as low for all survey events except for the 2025 capture survey, which was originally scheduled for October. In October 2025, Sunwater advised of a medium-hazard blue-green algae bloom within the Rookwood Weir impoundment. Investigations by Sunwater confirmed the presence of the toxic species *Dolichospermum circinale*. Subsequently, the capture survey was postponed as it was determined that there was residual risk to field staff and potential impacts to aquatic fauna associated with trapping activities. After four weeks of monitoring, including the assessment of concentrations, the hazard rating was downgraded to low by Sunwater and the capture survey went ahead in November 2025. During the survey, environmental conditions and animal welfare risks were continually reassessed, with particular consideration given to the potential for cumulative stress associated with trapping and tagging in addition to exposure to blue-green algae.

3.1.4.7 *In-situ* water quality comparison between turtle passage and broad-scale monitoring survey areas

Mean surface water quality parameters recorded across the turtle passage (resting pools and approach channels) and the broader Fitzroy River monitoring sites upstream and downstream of Rookwood Weir indicate broadly comparable conditions across all locations.

In general, surface water quality within the turtle passage was similar to conditions in the Fitzroy River. Mean pH and electrical conductivity were consistent across all monitoring areas and were generally within or close to pre-construction baseline concentrations. Mean water temperatures were within the pre-construction baseline range across all locations and showed no consistent spatial variation.

Mean turbidity values were comparable between the turtle passage and Fitzroy River sites and remained consistent with broader river conditions and within baseline levels.

Mean dissolved oxygen concentrations within the turtle passage were variable but were broadly comparable to those recorded in the Fitzroy River, with both environments experiencing periods of reduced oxygen availability. These patterns are consistent with processes such as organic matter decomposition and stratification within the weir pool, which can influence oxygen dynamics.

Overall, the turtle passage environment, including resting pools and approach channels, provides water quality conditions broadly consistent with those of the surrounding Fitzroy River. The water quality within the turtle passage did not demonstrate any discernible differences from ambient conditions within the Fitzroy River and provided suitable conditions to support the passage of turtles.

Table 3.2 Mean in-situ surface water quality parameters recorded within the turtle passage and the Fitzroy River

Location	n	Temp.	pH	EC	DO	Turb.
		°C	pH units	µS/cm	% saturation	NTU
Pre-construction Baseline [3]	–	15.3-31.3	7.3-8.4	269	89-101	191
Turtle Passage Resting Pools [2,3]	26	24.0	7.7	232	75.2	85.1
Turtle Passage Approach Channels [1,3]	10	24.1	7.2	242	76.2	55.9
Rookwood Weir Upstream [2,3]	14	25.3	7.4	242	75.9	82.1
Rookwood Weir Downstream [1,3]	21	23.9	7.5	236	83	79.6

Yellow shading denotes parameters that were lower than the pre-construction baseline ranges

3.2 Turtle capture

3.2.1 Turtle passage capture

3.2.1.1 November 2025

During the November 2025 turtle capture survey, no turtles were captured within the turtle passage ramps or resting pools. A total of 15 turtles were captured at turtle passage downstream approach channel, comprising 10 target species and five non-target species (Table 3.3). Target species captures occurred exclusively within the downstream approach channel and included four white-throated snapping turtles and six Fitzroy River turtles. Of these, three white-throated snapping turtles, and five Fitzroy River turtles were tagged with identification and acoustic tags (Table 3.4).

Of the target species captured at turtle passage locations, one white-throated snapping turtle and one Fitzroy River turtle were recaptures from previous surveys (Table 3.5). The white-throated snapping turtle was first captured in 2018 at Rookwood riffle complex and recaptured at Downstream approach channel in the November 2025 survey, resulting in a seven year period between recapture (Plate 3.3). During this period, the turtle recorded a reduction in weight by 200 grams. Upon recapture, minor old damage was noted on scutes K, N and A and the turtle displayed recent scrapes on the carapace which were not noted on the initial capture. The recaptured Fitzroy River turtle was initially captured at Rookwood riffle complex in May 2025 and was recaptured in the Downstream

approach channel, which was a six month period between recapture (Plate 3.3). This turtle maintained the same weight and size and did not have any damage on either capture.

Non-target species captured at turtle passage locations included four Krefft's river turtles (*Emydura macquarii krefftii*), captured across the downstream approach channel and upstream turtle passage entrance, and one saw-shelled turtle (*Wollumbinia latisternum*), captured at the upstream turtle passage entrance (Table 3.3).

Table 3.3 Turtle passage capture survey results – November 2025

Species	Common name	Turtle passage infrastructure	Downstream approach channel	Upstream turtle passage entrance	Total
Wollumbinia latisternum	Saw-shelled turtle	0	0	1	**1**
Emydura macquarii krefftii	Krefft's river turtle	0	3	1	**4**
Elseya albagula	White-throated snapping turtle	0	4	0	**4**
Rheodytes leukops	Fitzroy River turtle	0	6	0	**6**
Total		**0**	**13**	**2**	**15**

Table 3.4 Turtle passage summary of acoustic tagging – November 2025

Species	Common Name	Number of turtles tagged with acoustic tags			
		Male	Female	Juvenile	Total
Elseya albagula	White-throated snapping turtle	2	1	0	**3**
Rheodytes leukops	Fitzroy River turtle	2	3	0	**5**
Total		**4**	**4**	**0**	**8**

Table 3.5 Turtle passage summary of turtle recaptures – November 2025

Species	Common Name	Notch code	Sex	Initial capture date	Recapture date	Period since recapture
Elseya albagula	White-throated snapping turtle	FIQ	Female	08/10/2018	06/11/2025	**~ 7 years**
Rheodytes leukops	Fitzroy River turtle	CKV	Male	09/05/2025	09/11/2025	**~ 6 months**

Pink shading denotes turtles that had an existing acoustic tag
Yellow shading denotes turtles where the acoustic tag has detached



Plate 3.3 *Recaptured white-throated snapping turtle (left) and Fitzroy River turtle (right) during November 2025 turtle passage capture*

3.2.1.2 May 2026

In May 2026, one Fitzroy River turtle was captured within the turtle passage (Table 3.6). The Fitzroy River turtle was captured in a fyke net set in the upper resting pool on the downstream side of the abutment tunnel (DSRP2). The female Fitzroy River turtle was PIT tagged, foot tagged and acoustically tagged, measured, and then released back into DSRP2 (Table 3.7). This turtle showed older plastron grazes but was otherwise healthy (Plate 3.4).

Table 3.6 *Turtle passage capture survey results – May 2026*

Species	Common name	Turtle passage infrastructure	Downstream turtle passage entrance	Upstream turtle passage entrance	Total
Wollumbinia latisternum	Saw-shelled turtle	0	0	0	**0**
Emydura macquarii krefftii	Krefft's river turtle	0	0	0	**0**
Elseya albagula	White-throated snapping turtle	0	0	0	**0**
Rheodytes leukops	Fitzroy River turtle	1	0	0	**1**
Total		**1**	**0**	**0**	**1**

Table 3.7 *Turtle passage summary of acoustic tagging – May 2026*

Species	Common Name	Number of turtles tagged with acoustic tags			
		Male	Female	Juvenile	Total
Elseya albagula	White-throated snapping turtle	0	0	0	**0**
Rheodytes leukops	Fitzroy River turtle	0	1	0	**1**
Total		**0**	**1**	**0**	**1**



Plate 3.4 ***Fitzroy River turtle captured within turtle passage (DSRP2) (left), plastron of captured Fitzroy River turtle displaying old grazes (right)***

3.2.2 Broad-scale turtle capture

3.2.2.1 November 2025

A total of 203 turtles were captured over 10 days during the November 2025 survey at Rookwood Weir pool at Gogango Creek confluence, Rookwood downstream pool, Rookwood riffle complex, Hanrahan upstream pool and Hanrahan riffle (Table 3.8). Of these, 57 individuals were the target freshwater turtle species, comprising 36 white-throated snapping turtles and 21 Fitzroy River turtles. No turtles were captured at Rookwood Weir pool at Rookwood Camping Reserve.

Of the target turtle species, 50 turtles were acoustically tagged (Table 3.9), including 18 adult male and 15 adult female white-throated snapping turtles, and seven adult male and 10 adult female Fitzroy River turtles. No juvenile target turtle species were captured or tagged during the survey. Several target turtles were not acoustically tagged as they were either recaptures with existing acoustic tags or were captured outside the operational hydrophone array (i.e. at Hanrahan Crossing).

Of the non-target turtle species captured, 144 individuals were Krefft's river turtles (*Emydura macquarii krefftii*), one was a saw-shelled turtle (*Wollumbinia latisternum*), and one was an eastern long-necked turtle (*Chelodina longicollis*).

A total of four target species recaptures were recorded during the survey, comprising two white-throated snapping turtles and two Fitzroy River turtles, with recapture intervals ranging from approximately six months to 2.75 years (Table 3.10). The two white-throated snapping turtle recaptures showed negligible change in body mass (<100 g) and size (<5 mm change in carapace and plastron length), with both individuals appearing in good condition upon recapture; one individual retained evidence of historical plastron damage that was considered healed at the time of initial capture and recapture. For the Fitzroy River turtle, one individual recaptured after approximately 2.75 years showed notable growth (>400 g increase in mass and >10 mm increase in carapace and plastron length), whereas the second, recaptured after approximately one year, exhibited minimal size change and a slight reduction in mass (~100 g).

During the November 2025 survey, an increase in the occurrence of turtle injuries was observed relative to previous operational surveys (Plate 3.7). Several white-throated snapping turtles and Fitzroy River turtles exhibited damage to the carapace and/or plastron, including healed fractures and grazing consistent with contact with hard substrates. Additionally, multiple individuals from both target species displayed moderately worn claws, a condition

not widely documented in earlier surveys. All Fitzroy River turtles captured below the weir also exhibited a build-up of dark silts on the plastron and underside of the legs (Plate 3.7).

Table 3.8 Broad-scale turtle capture survey results – November 2025

Species	Common name	Upstream of Rookwood Weir		Downstream of Rookwood Weir				Total
		Rookwood Weir pool at Gogango Creek confluence	Rookwood Weir pool at Rookwood Camping Reserve	Rookwood downstream pool	Rookwood riffle	Hanrahan upstream pool	Hanrahan riffle	
Chelodina longicollis	Eastern long-necked turtle	0	0	0	0	1	0	**1**
Wollumbinia latisternum	Saw-shelled turtle	0	0	1	0	0	0	**1**
Emydura macquarii krefftii	Krefft's river turtle	4	0	73	10	57	0	**144**
Elseya albagula	White-throated snapping turtle	0	0	2	33	1	0	**36**
Rheodytes leukops	Fitzroy River turtle	0	0	0	19	0	2	**21**
Total		**4**	**0**	**76**	**62**	**59**	**2**	**203**

Table 3.9 Broad-scale summary of acoustic tagging – November 2025

Species	Common Name	Number of turtles tagged with acoustic tags			
		Male	Female	Juvenile	Total
Elseya albagula	White-throated snapping turtle	18	15	0	**33**
Rheodytes leukops	Fitzroy River turtle	7	10	0	**17**
Total		**25**	**25**	**0**	**50**

Table 3.10 Broad-scale summary of turtle recaptures – November 2025

Species	Common Name	Notch code	Sex	Initial capture date	Recapture date	Period since recapture
Elseya albagula	White-throated snapping turtle	FNX	Female	03/11/2024	05/11/2025	**~ 1 year**
		FST	Female	13/05/2025	05/11/2025	**~ 6 months**
Rheodytes leukops	Fitzroy River turtle	CJM	Female	01/03/2023	07/11/2025	**~ 2.75 years**
		CKM	Female	02/11/2024	09/11/2025	**~ 1 year**

Pink shading denotes turtles that had an existing acoustic tag
Orange shading denotes turtles that were not previously acoustically tagged



Plate 3.5 ***White-throated snapping turtles (top left: female; top right: male) and Fitzroy River turtles (bottom left: female; bottom right: male) – November 2025***



Plate 3.6 ***Recaptured white-throated snapping turtles (top left and top right) and recaptured Fitzroy River turtles (right) – November 2025***

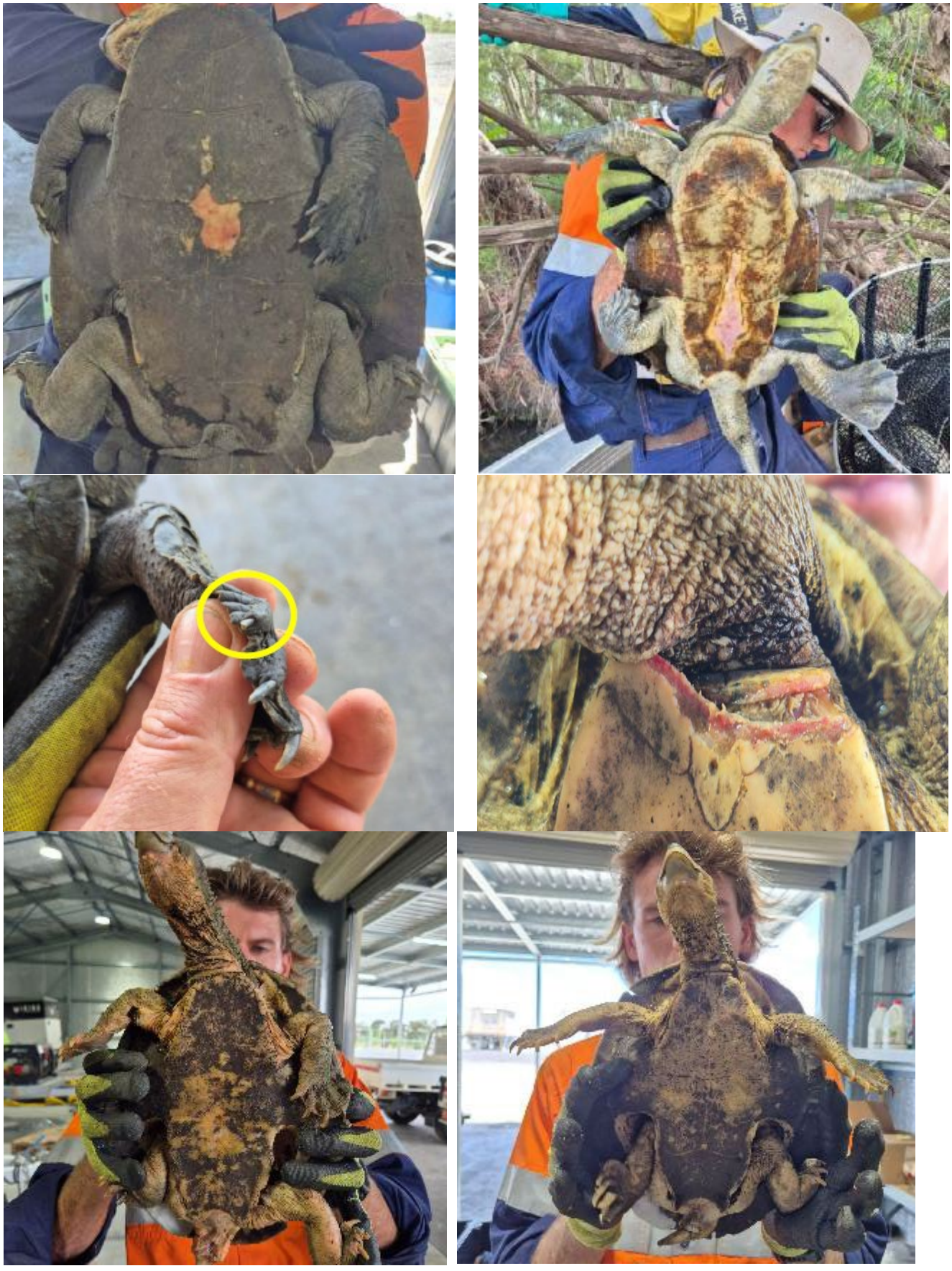


Plate 3.7 Turtles with plastron grazing (top left: white-throated snapping turtle; top right: Krefft's river turtle), worn down claws (middle left: white-throated snapping turtle), plastron fracture (middle right; white-throated snapping turtle), and silt build up (bottom left and right: Fitzroy River turtle) – November 2025

3.2.2.2 May 2026

A total of 376 turtles were captured over 10 days at Rookwood Weir pool (at Rookwood Camping Reserve), Rookwood downstream pool, Rookwood riffle, Gogango Creek, Hanrahan Crossing upstream pool and Hanrahan Crossing riffle. Of these, 89 were the target freshwater turtle species which included 40 white-throated snapping turtles and 49 Fitzroy River turtles (Table 3.11; Plate 3.8). The highest number of target species was recorded at Rookwood riffle, where 24 white-throated snapping turtles and 49 Fitzroy River turtles were captured.

Of the target turtle species, 21 were acoustically tagged (Table 3.12), all of which were Fitzroy River turtles. This comprised seven adult males and 14 adult females. No white-throated snapping turtles were acoustically tagged in May 2026 as Fitzroy River turtles were prioritised for acoustic tagging during this survey (refer Section 2.5.3).

Of the non-target turtle species captured, 282 were Krefft's river turtles and five were saw-shelled turtles.

There were six juvenile Fitzroy River turtles and two juvenile white-throated snapping turtles captured during the survey. All juvenile Fitzroy River turtles and one white-throated snapping turtle were caught at Rookwood riffle, with the second white-throated snapping turtle caught in the Rookwood Weir pool at the Rookwood Camping Reserve.

A total of six turtle recaptures were recorded during the May 2026 survey (Table 3.13), comprising five white-throated snapping turtles and one Fitzroy River turtle (Plate 3.9). Of the white-throated snapping turtle recaptures, three were male and two were female, with periods since initial capture ranging from approximately six months to 6.7 years. The Fitzroy River turtle recapture was a female, with approximately 6.9 years since initial capture. Recaptured individuals exhibited minimal growth over time. A male white-throated snapping turtle recaptured after 6.7 years showed negligible change in carapace length (<10 mm increase) and a similar body mass (~100 g lighter), while the Fitzroy River turtle recaptured after 6.9 years showed similarly limited growth (<5 mm change across most measurements) and a minor increase in mass (~100 g). The remaining four white-throated snapping turtles, recaptured after 6 to 18 months, also exhibited limited growth (<10 mm increase in carapace length) and generally stable body condition. Although two females were lighter at recapture (~150 g and ~500 g decrease), both were gravid and in good condition (convex plastron) at the time of recapture, noting that initial captures occurred outside the breeding season. Evidence of prior (historical) scute and claw damage was observed on some individuals, with minor fresh scute damage recorded on one white-throated snapping turtle female. All recaptures were recorded within the Rookwood downstream pool and riffle complex.

The number of turtles captured with signs of injury were notably lower than recorded during the previous November 2025 survey. Damage was typically minor, such as scute damage and missing claws (Plate 3.10). Two turtles, one white-throated snapping turtle and one Fitzroy River turtle, were captured with a missing eye. One completely blind female white-throated snapping turtle was captured (Plate 3.10). As this turtle was considered underweight there were concerns for the turtle's survivability, so the individual was transported to Rockhampton for veterinary assessment and treatment. One deceased Fitzroy River turtle was found decaying along the downstream left bank below the weir. There was no apparent damage to the shell, limbs or head with cause of death undetermined (Plate 3.16). A turtle injury and mortality form was completed for this specimen (Appendix E).

The build-up of dark silts on the plastron and legs of Fitzroy River turtles previously noted in November 2025 was not evident during this survey. The absence of silt build-up may reflect a flush out of finer material below the weir and/or change in water quality within/released from the weir with over topping occurring continuously since January 2026.

Table 3.11 Broad scale turtle capture survey results – May 2026

Species	Common name	Upstream of Rookwood Weir		Downstream of Rookwood Weir				Total
		Rookwood Weir pool at Gogango Creek confluence	Rookwood Weir pool at Rookwood Camping Reserve	Rookwood downstream pool	Rookwood riffle	Hanrahan upstream pool	Hanrahan riffle	
Wollumbinia latisternum	Saw-shelled turtle	0	3	0	2	0	0	**5**
Emydura macquarii krefftii	Krefft's river turtle	78	54	68	24	56	2	**282**
Elseya albagula	White-throated snapping turtle	5	2	2	24	4	3	**40**
Rheodytes leukops	Fitzroy River turtle	0	0	0	49	0	0	**49**
Total		**83**	**59**	**70**	**99**	**60**	**5**	**376**

Table 3.12 Broad scale summary of tagging results – May 2026

Species	Common Name	Number of turtles tagged with acoustic tags			
		Male	Female	Juvenile	Total
Elseya albagula	White-throated snapping turtle	0	0	0	**0**
Rheodytes leukops	Fitzroy River turtle	7	14	0	**21**
Total		**7**	**14**	**0**	**21**

Table 3.13 Broad-scale summary of turtle recaptures – May 2026

Species	Common Name	Notch code	Sex	Initial capture date	Recapture date	Period since recapture
Elseya albagula	White-throated snapping turtle	FJQ	Male	14/09/2019	10/05/2026	**~ 6.7 years**
		FNQ	Female	1/11/2024	08/05/2026	**~ 1.5 years**
		FNR	Male	2/11/2024	08/05/2026	**~ 1.5 years**
		LMP	Male	5/11/2025	08/05/2026	**~ 6 months**
		LOR	Female	8/11/2025	10/05/2026	**~ 6 months**
Rheodytes leukops	Fitzroy River turtle	CEO	Female	15/06/2019	09/05/2026	**~ 6.9 years**

Pink shading denotes turtles that had an existing acoustic tag
Yellow shading denotes turtles where the acoustic tag has detached
Orange shading denotes turtles that were not previously acoustically tagged



Plate 3.8 ***White-throated snapping turtle (top left), Fitzroy River turtle (top right), and sub-adult Fitzroy River turtle (bottom left and right) – May 2026***



Plate 3.9 ***Recaptured white-throated snapping turtles (top left, top right, middle left, middle right and bottom left) and recaptured Fitzroy River turtles (bottom right) – May 2026***



Plate 3.10 *Turtles with injuries including missing eyes (top left and top right: white-throated snapping turtle; bottom left: Fitzroy river turtle) and missing claw (bottom right: Fitzroy River turtle) – May 2026*

3.3 Remote monitoring

3.3.1 Acoustic telemetry

3.3.1.1 Data summary

This data summary provides context for the results that follow by describing key aspects of the dataset, including detection patterns, tagging history and known limitations. It highlights factors that should be considered when interpreting the results in subsequent sections.

Between 6 March 2025 and 5 March 2026, 3,618,144 detections were obtained on acoustic receivers from turtles tagged with acoustic transmitters. Of these, 2,607,715 detections were from 93 tagged white-throated snapping turtle, and 1,010,429 detections were from 46 tagged Fitzroy River turtle.

From the commencement of acoustic tagging (22 April 2017) to 5 March 2026, 20,083,871 detections were obtained on acoustic receivers from turtles tagged with acoustic transmitters. Of these, 10,149,802 detections were from tagged white-throated snapping turtle, and 9,934,069 detections were from tagged Fitzroy River turtle (Table 3.14).

Table 3.14 Summary table of white-throated snapping turtle (n = 163) and Fitzroy River turtle (n = 108) detections at 36 acoustic receiver stations between April 2017 and March 2026

Station name	White-throated snapping turtle		Fitzroy River turtle		Latitude	Longitude
	No. detections	No. tagged turtles	No. detections	No. tagged turtles		
Downstream of Rookwood Weir						
*Hanrahan far downstream **	4831	8	9,620	2	*-23.461*	*150.018*
*Hanrahan downstream **	27,761	12	756	3	*-23.463*	*150.027*
*Hanrahan creek **	323,820	17	13,234	4	*-23.470*	*150.029*
Hanrahan pool	561,447	39	256,256	12	-23.471	150.024
Hanrahan upstream	42,927	40	63,944	11	-23.479	150.014
Hanrahan far upstream	41,812	53	14,829	12	-23.490	149.992
Lawries bend far downstream	282,367	62	9,452	14	-23.494	149.974
Lawries bend downstream	424,484	75	16,022	17	-23.503	149.960
Lawries bend mid	755,522	85	24,434	17	-23.510	149.960
Lawries bend upstream	74,259	41	161,911	15	-23.518	149.978
Rookwood far downstream	1,048,331	119	497,270	71	-23.526	150.004
Rookwood downstream	690,164	121	1,884,534	75	-23.533	150.009
Rookwood Weir site	1,094,944	105	1,092,580	70	-23.539	150.015
Turtle passage						
Ramp entrance downstream	106,636	74	26,137	31	-23.540	150.016
Lower resting pool downstream (DSRP8)	671	5	1,502	1	-23.540	150.016
Mid resting pool downstream (DSRP6)	93	2	0	0	-23.540	150.016
Upper resting pool downstream (DSRP1)	10	1	0	0	-23.540	150.017
Upper resting pool upstream (USRP1)	14	1	0	0	-23.540	150.017
Lower resting pool upstream (USRP5)	16	2	0	0	-23.540	150.017
Approach channel upstream	72,144	17	133	1	-23.540	150.017
Upstream of Rookwood Weir						
Left bank weir pool	176,077	17	137,908	1	-23.544	150.016
Rookwood mid	639,804	46	665,010	33	-23.545	150.017
Rookwood crossing	786,353	37	943,680	24	-23.547	150.017
*Rookwood riffle **	437,115	26	1,047,809	24	*-23.549*	*150.017*
Rookwood upstream riffle	259,893	33	181,023	16	-23.550	150.017
Rookwood upstream	457,302	49	127,437	9	-23.554	150.012
Rookwood far upstream	310,399	50	186,639	11	-23.555	150.005
Gogango Creek mouth	70,023	44	26,268	11	-23.554	149.986
Gogango Creek	109,073	39	1,001	7	-23.557	149.982
Gogango Creek upstream	185,827	36	297,597	10	-23.554	149.963
Riverslea downstream	234,117	36	40,279	9	-23.563	149.945
Riverslea upstream	578,805	25	1,131,013	18	-23.584	149.935
Riverslea riffle downstream	78,554	19	872,471	17	-23.588	149.934

Station name	White-throated snapping turtle		Fitzroy River turtle		Latitude	Longitude
	No. detections	No. tagged turtles	No. detections	No. tagged turtles		
*Riverslea riffle upstream **	52,017	11	195,646	15	*-23.593*	*149.935*
The Pocket downstream	113,014	17	5,712	5	-23.618	149.934
The Pocket upstream	109,176	15	1,962	2	-23.628	149.932

* Site discontinued in April 2024

3.3.1.1.1 White-throated snapping turtle detections

Year 2 2025-26

During Year 2 2025–26 monitoring, detection rates remained high, with 93 of the 160 tagged white-throated snapping turtles continuing to be detected on the acoustic array (Appendix F). Detections were concentrated downstream of Rookwood Weir (82 individuals; ≤19.4 km AMTD 0), with fewer individuals recorded upstream between the weir and The Pocket (19 individuals) (Figure 3.7). Eight turtles were detected on both sides of the weir during this period (ID 10238, ID 11562, ID 13070, ID 13102, ID 13116, ID 16137, ID 16187, ID 16217), indicating some movement between upstream and downstream habitats (Figure 3.8a and Figure 3.8b). The higher number of downstream detections likely reflects greater capture success in this area, while more constrained capture methods within the weir pool may limit tagging and subsequent detections upstream. Overall, this pattern indicates continued strong use of downstream habitats, consistent with trends observed throughout the monitoring program and continued presence of the species within the Rookwood Weir impoundment.

Monitoring period summary (2017-2026)

Across the full monitoring period, 163 white-throated snapping turtles were fitted with acoustic tags between 1 April 2017 and 5 March 2026, of which 160 have been detected on the array up to March 2026. The three remaining tagged turtles were never detected on the array. The undetected turtles were juveniles captured in April 2017 (ID 467, ID 471) and May 2025 (ID 16191). One adult male (ID 11322) was found deceased on the upstream left bank in August 2025 and is no longer contributing to the dataset, although earlier detections are retained.

In addition to the undetected turtles, several turtles appear to have left the array following operation of the weir, with two moving upstream (ID 11326, ID 10268) and seven moving downstream (ID 16167, ID 16231, ID 16336, ID 13080, ID 13110, ID 13130, ID 10264). The apparent increase in downstream departures may reflect the retirement of three receiver stations at the Hanrahan Crossing locality in April 2024, with individuals potentially remaining within this area but no longer being detected.

Between 22 April 2017 and 5 March 2026, detections were highest at Rookwood downstream (121 transmitters, 690,164 detections) and Rookwood far downstream (119 transmitters, 1,048,331 detections) (Figure 3.7, Table 3.14), representing a substantial increase from pre-March 2025 detections (59 and 58 tags respectively). Relatively high detections were also recorded at Rookwood Weir (105 transmitters), Lawries Bend mid (85 transmitters) and Lawries Bend downstream (75 transmitters), while the lowest detections occurred within turtle passage and ramp pool receivers (1 to 5 transmitters, 10 to 641 detections) and at the extremities of the array, including Hanrahan far downstream (8 turtles, 4,831 detections) and The Pocket upstream (15 turtles, 109,176 detections). One turtle (ID 16336) tagged near Hanrahan Creek in mid-2021 was re-detected at Hanrahan far downstream in January to May 2024 after a three-year absence.

On average, 63,436.26 ± 6542.73 detections (mean ± SE) were recorded per turtle, ranging from 347 detections (ID 16229) to 508,157 detections (ID 11290), with detection periods spanning six to 1,656 days (mean = 450 days). A total of 28 adults were detected for more than 900 days (16 male, 12 female), and 41 individuals (18 female, 22 male, 1 unknown) for more than 600 days (Appendix F).

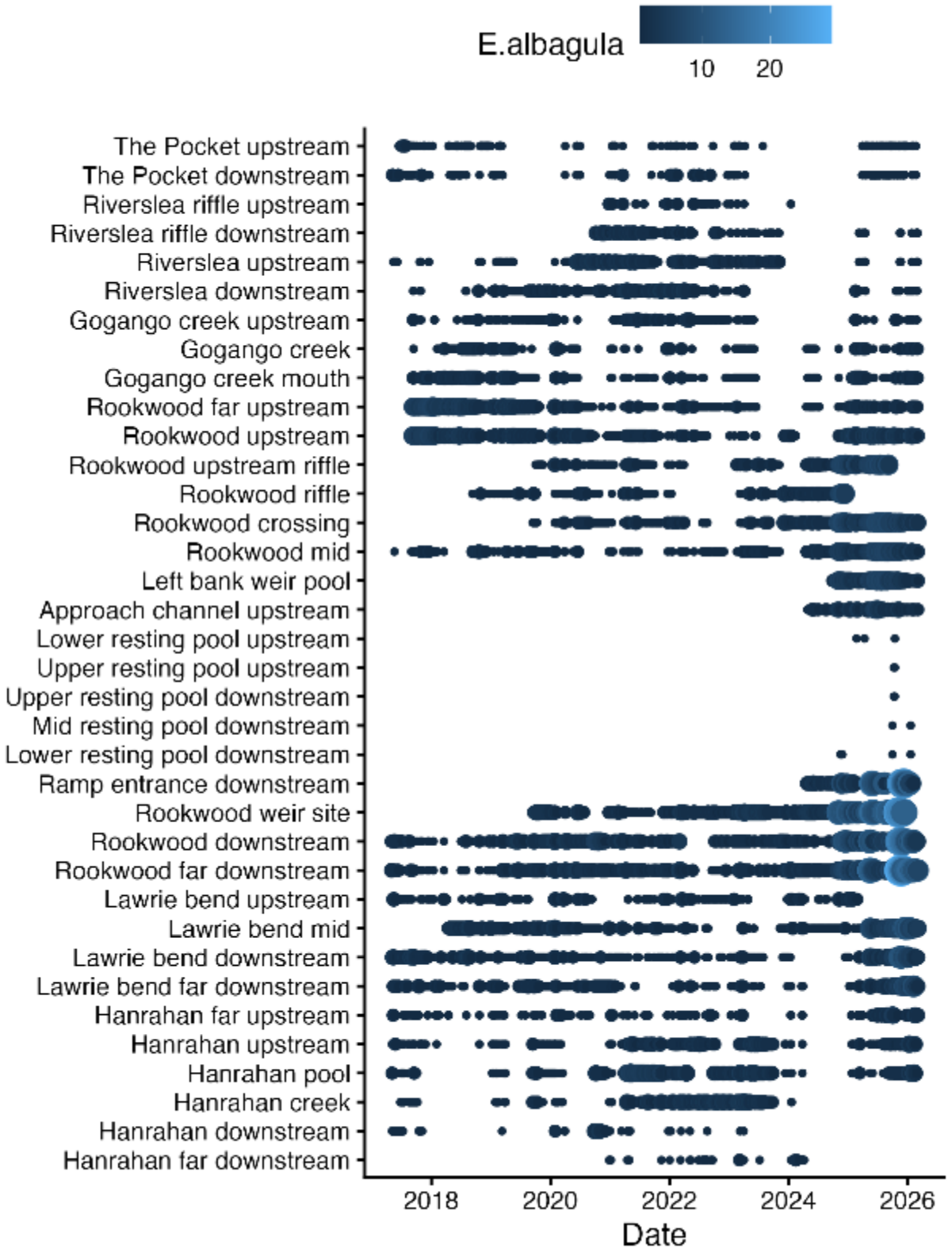


Figure 3.7 ***Abacus plot of detections of acoustically tagged white-throated snapping turtle (n = 160 tags) detected at fixed receiver stations. Colour and size of the points represents the number of tagged turtles detected per day. Note stations downstream from Hanrahan Creek and at Riverslea riffle upstream were discontinued in April 2024.***

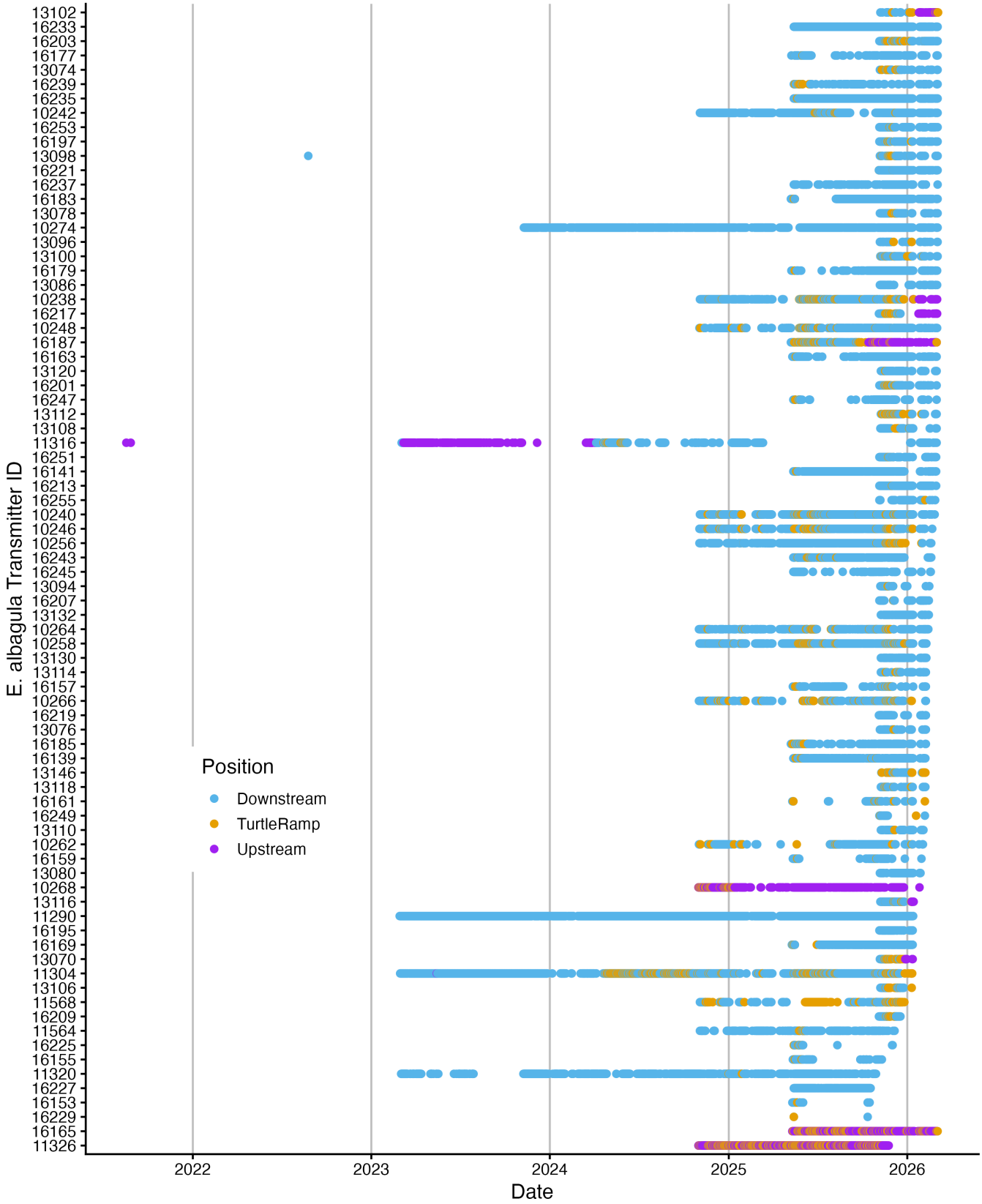


Figure 3.8a ***Abacus plot of detections of acoustically tagged white-throated snapping turtle (n = 160 tags) detected downstream, upstream or within the turtle passage at Rookwood Weir***

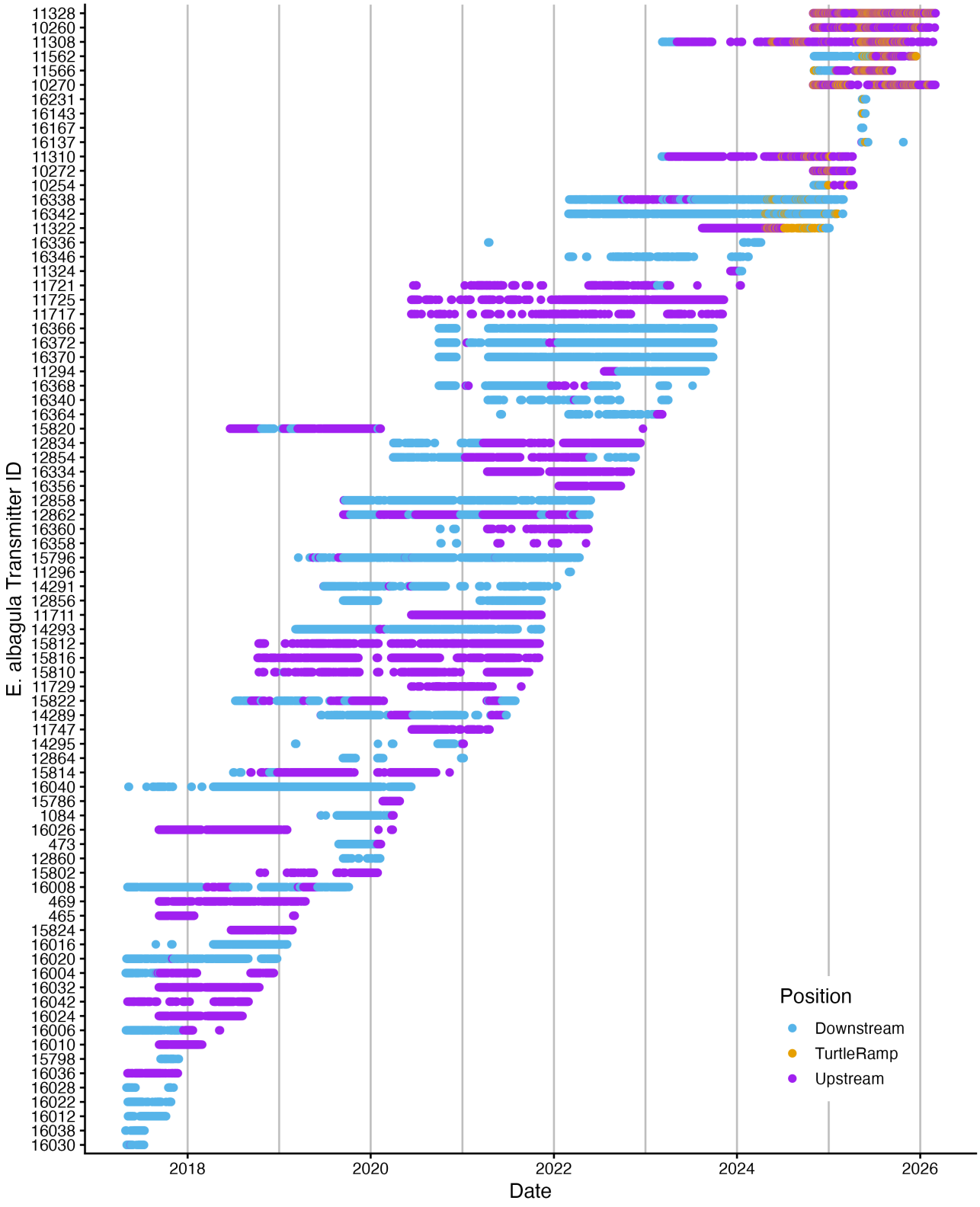


Figure 3.8b ***Abacus plot of detections of acoustically tagged white-throated snapping turtle (n = 160 tags detected downstream, upstream or within the turtle passage at Rookwood Weir (continued)***

3.3.1.1.2 Fitzroy River turtle detections

Year 2 2025-26

During Year 2 2025–26 monitoring, all Fitzroy River turtles tagged in this period were detected on the acoustic array. Of the 104 tagged Fitzroy River turtles with acoustic detection data, 46 were detected in Year 2 2025–26 monitoring (16 males; 30 females). Detections were primarily concentrated downstream of Rookwood Weir (44 individuals; ≤19.45 km AMTD 0), with only two individuals detected upstream between the weir and The Pocket (Figure 3.9). Thirteen individuals were last detected within the vicinity of Rookwood Weir in the Year 2 2025–26 monitoring period, and no tagged Fitzroy River turtles were recorded on both sides of the weir during this period (Figure 3.10a and b). Five individuals were last detected at the most downstream receiver locations in 2025-26 (ID 16193, ID 16223, ID 13104, ID 11302, ID 11312), indicating that they may have moved beyond the downstream extent of the acoustic array (Appendix F).

Monitoring period summary (2017-2026)

Across the full monitoring period, 108 Fitzroy River turtles were fitted with acoustic tags between 1 April 2017 and 5 March 2026, of which 104 were detected on the array up to March 2026. The remaining four tagged turtles were never detected on the array and were originally captured upstream of Rookwood Crossing in September 2017 (ID 15790, ID 15800, ID 15808) and October 2018 (ID 16034). Given the time elapsed since tagging, it is possible these individuals were not detected due to transmitter failure or detachment (Appendix F).

Between 22 April 2017 and 5 March 2026, transmitters were highest at Rookwood downstream (75 transmitters, 1,884,534 detections), Rookwood far downstream (71 transmitters, 497,270 detections) and the Rookwood Weir site (70 transmitters, 1,092,580 detections) (Table 3.14, Figure 3.9), representing an increase relative to Year 1 (2024–25), when 40 to 44 transmitters were recorded at these locations. Relatively high numbers of transmitters were also observed at Rookwood mid (33 transmitters, 665,010 detections), the ramp entrance downstream (31 transmitters, 26,137 detections) and approach channel upstream (31 transmitters, 26,137 detections). Whereas the lowest detections occurred within turtle passage receivers (zero to one transmitter, 0 to 1,502 detections) and at the extremities of the array at Hanrahan's Crossing and The Pocket (two to 12 transmitters).

On average, 95,519.89 ± 14,798.79 detections (mean ± SE) were recorded per turtle, ranging from 248 detections (ID 1088) to 1,284,751 detections (ID 11292). Tagged turtles were detected for periods ranging from one day to 1,614 days (mean = 573 days). Of these, 34 individuals were detected for more than 900 days (27 adult females, seven adult males), and 45 individuals (32 adult females, 12 adult males, one unknown sex) were detected for more than 600 days (Appendix F).

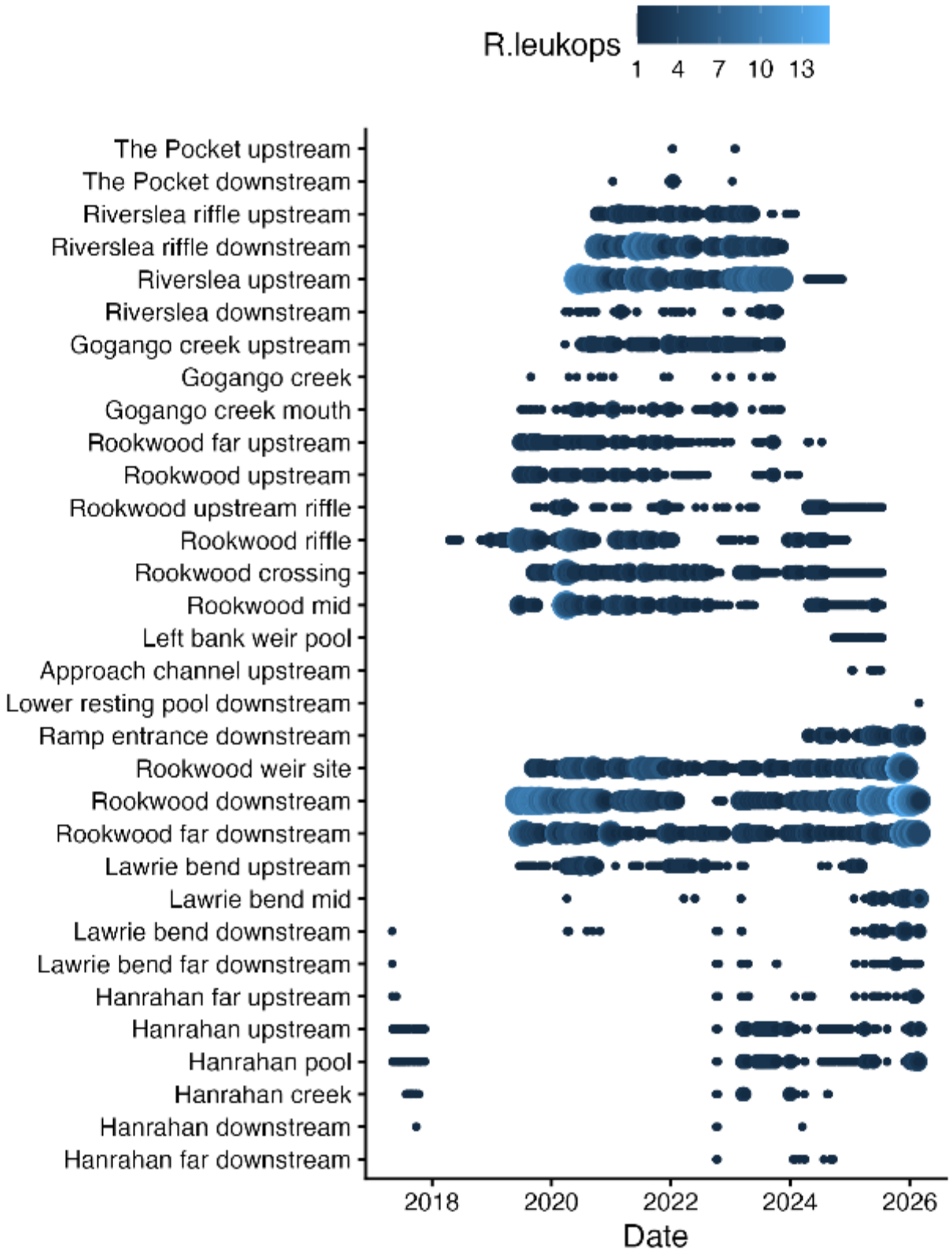


Figure 3.9 ***Abacus plot of detections of acoustically tagged Fitzroy River turtle (n = 104 tags) detected at fixed receiver stations. Colour and size of the points represents the number of tagged turtles detected per day***

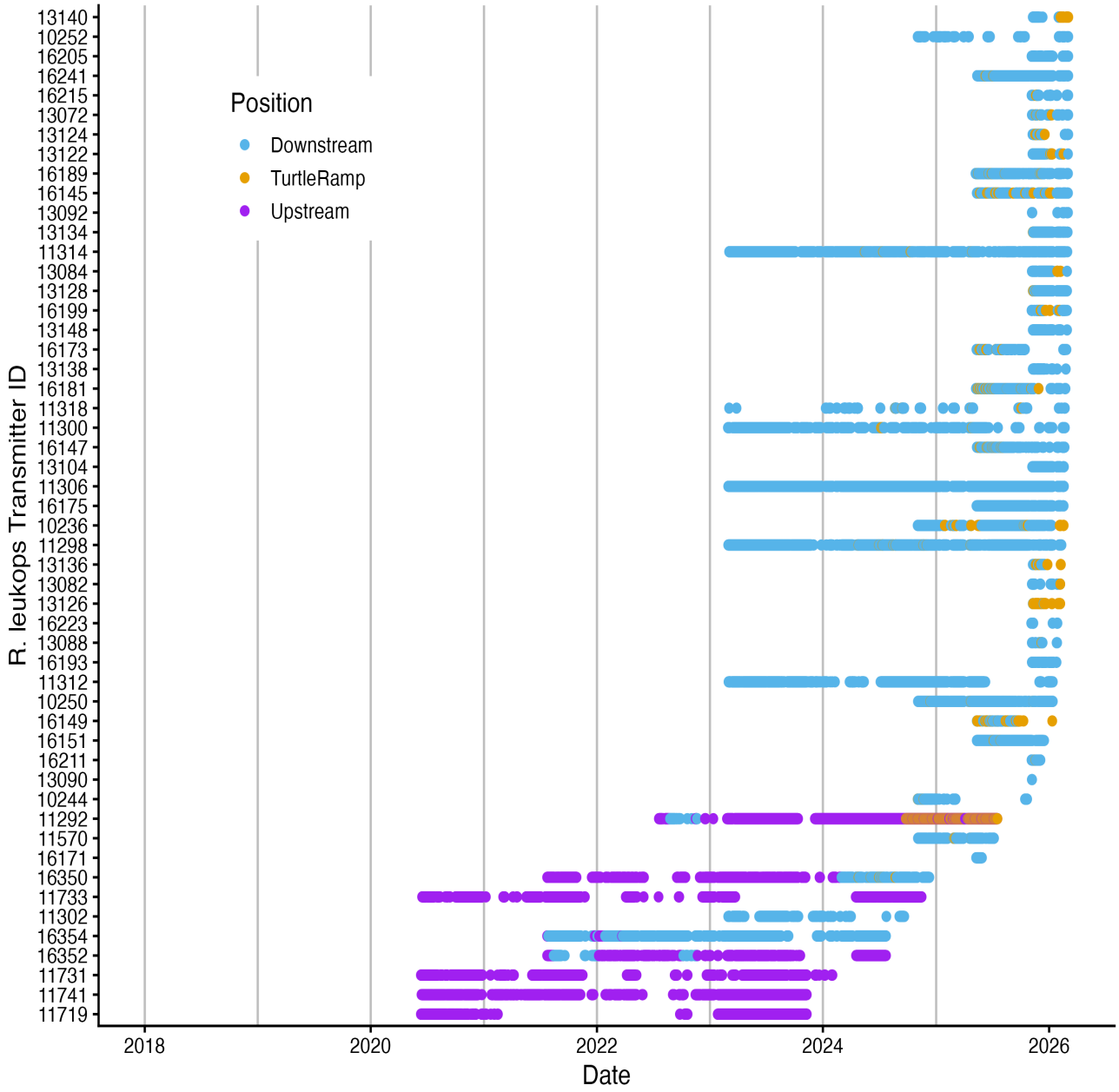


Figure 3.10a ***Abacus plot of detections of acoustically tagged Fitzroy River turtle (n = 104 tags)) detected downstream, upstream or within the turtle passage at Rookwood Weir***

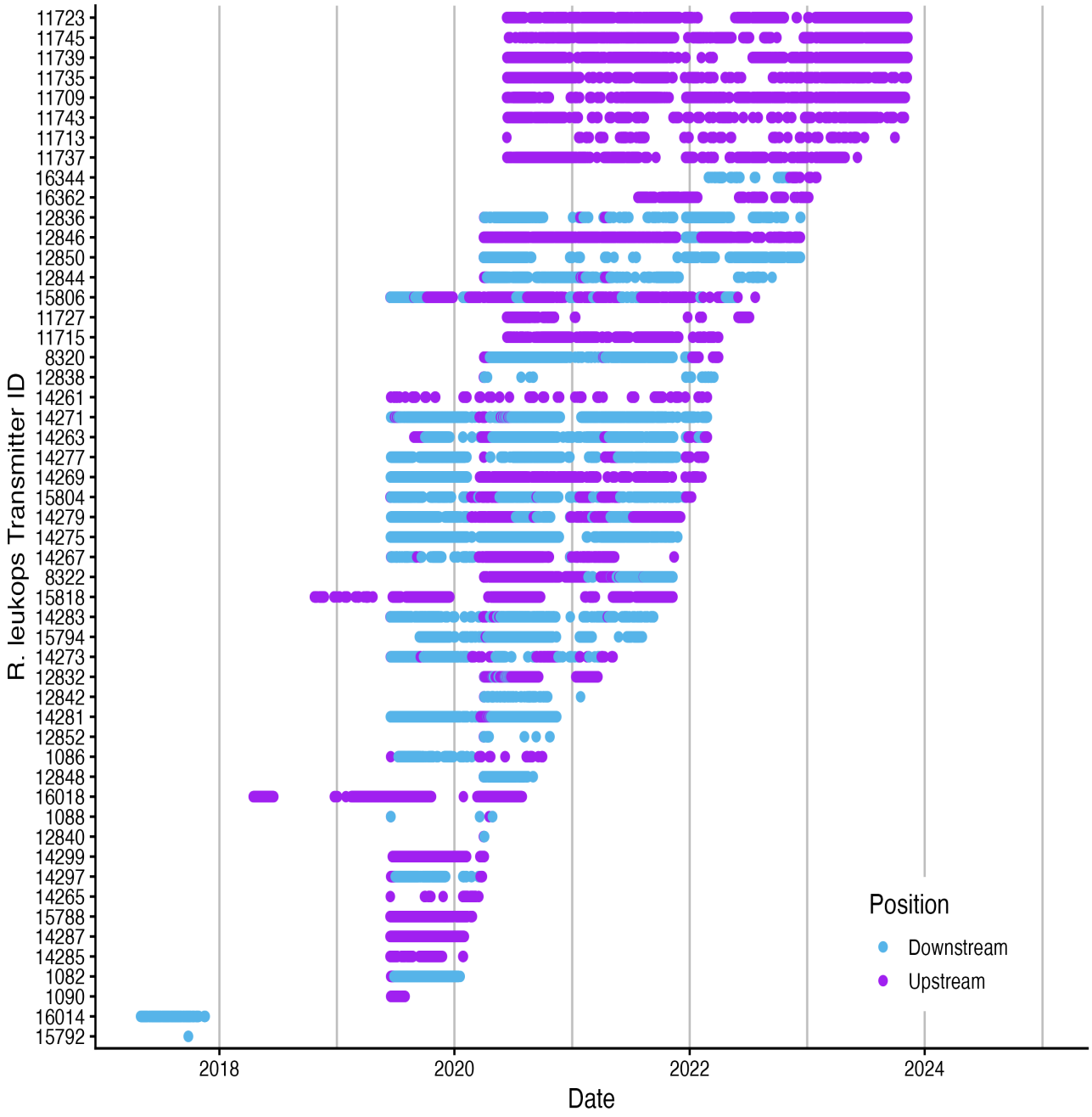


Figure 3.10b Abacus plot of detections of acoustically tagged Fitzroy River turtle (n = 104 tags) detected downstream, upstream or within the turtle passage at Rookwood Weir

3.3.1.2 Turtle passage

3.3.1.2.1 Movement of white-throated snapping turtles through the turtle passage

Overview

Most tagged white-throated snapping turtles interacted with the turtle passage, with 80 of 96 individuals detected within or adjacent to the structure, including 70 reaching the ramp entrance downstream. Despite this, very few turtles progressed through the passage, with only two individuals confirmed to enter and begin ascending, and only one completing full movement through the passage over approximately 14.4 days (Table 3.15). Additional detections on both sides of the weir indicate that some turtles moved upstream (10) or downstream (two) past the weir wall, although passage through the turtle passage infrastructure was not detected and therefore could not be confirmed. Overall, it appears that attraction to the passage occurs, but successful upstream movement through the structure remains limited based on acoustic data. Further detail on these patterns and detections is provided below.

Detailed results

Across the monitoring period, 93 tagged white-throated snapping turtles were detected between 06 March 2025 and 5 March 2026, of which 75 were recorded by at least one receiver in or adjacent to the turtle passage (i.e. Approach channel upstream, Lower resting pool upstream (USRP5), Upper resting pool upstream (USRP1), Upper resting pool downstream (DSRP1), Mid resting pool downstream (DSRP6), Lower resting pool downstream (DSRP8) or Ramp entrance downstream) (Figure 3.11).

A total of 70 white-throated snapping turtles appeared to be attracted to the downstream entrance of the turtle passage at Ramp entrance downstream (Figure 3.11). As recorded in 2024, the majority of detections in the 2025/2026 period occurred in November and December, with a peak in detections also occurring in June 2025. These timings coincided with capture events in May 2025 and November 2025 when 75 white-throated snapping turtles were captured in this region of river, with many of these individuals receiving new acoustic tags.

Between January 2025 and March 2026, 16 tagged white-throated snapping turtles were detected at the Approach channel upstream receiver adjacent to the upstream entrance of the turtle passage (ID 10254, ID 10260, ID 10268, ID 10270, ID 10272, ID 11308, ID 11310, ID 11326, ID 11328, ID 11562, ID 11566, ID 13070, ID 13102, ID 13116, ID 16165 and ID 16187). These same 16 individuals were also detected at the Left bank weir pool immediately above the weir, where detections occurred predominantly during June and July 2025. An additional turtle (ID 10238) was detected at the Left bank weir pool but not at the Approach channel upstream receiver.

Only two of 70 white-throated snapping turtles (ID 16187, 16249) detected at Ramp entrance downstream were detected at the receiver station placed at Lower resting pool downstream (DSRP8) indicating that the turtles successfully found the ramp entrance and ascended to the first resting pool (Figure 3.12a, c-d). These detections occurring at 18:37 on 29 September 2025 for ID 16187 (n = 1 detection) and between 18:24 and 21:43 on 19 January 2026 for ID 16249 (n = 10 detections). These two white-throated snapping turtles were also detected at Mid resting pool downstream (DSRP6), suggesting they both made an initial movement upstream through the passage. ID 16187 was detected 15 times between 21:34 and 22:53 on 29 September 2025, while ID 16249 was detected 78 times between 18:11 and 23:21 on the 19 January 2026.

Only one of these white-throated snapping turtles (ID 16187) was detected at the receivers placed at Upper resting pool downstream (DSRP1) and at Upper resting pool upstream (USRP1). At Upper resting pool downstream, this individual was detected five times on the 8 October 2025 between 21:39 and 21:48, and five times on the 13 October 2025 between 18:23 and 18:32. At Upper resting pool upstream, this individual was detected nine times on the 8 October 2025 and five times on the 14 October 2025.

Two tagged white-throated snapping turtles (ID 16187, ID 11326) were detected at the Lower resting pool upstream (USRP5; Figure 3.12a, a and e). ID 11326 was detected 10 times at this receiver over a 20-minute period on 21 February 2025, and again on the 11 April 2025 (three detections). Rookwood Weir was overtopping on 21 February 2025 with the Lower resting pool upstream (USRP5) submerged underwater. As such, this detection represents the confirmed presence of a white-throated snapping turtle within the weir pool rather than directly within the turtle passage. ID 16187 was detected three times at the Lower resting pool upstream receiver on 14 October 2025 as it continued its movement upstream through the turtle passage. After entering the turtle passage at Lower resting pool downstream (DSRP8) at 18:37 on 29 September 2025, ID 16187 was subsequently

detected at 05:03 on 15 October 2025 with the time taken to navigate the turtle passage for this animal being 14.44 days.

In addition to ID 16187 (male), that was confirmed moving upstream through the turtle passage, a further nine tagged white-throated snapping turtles were also detected on both sides of the weir between 6 March 2025 and 5 March 2026 (i.e. Year 2 2025-26 of hydrophone data), indicating movement past the weir. This included four female (ID 11562, ID 13116, ID 16137, and ID 16165) and five male (ID 10238, ID 10254, ID 11566, ID 13070, and ID 13102) (Figure 3.12a and b). However, due to a lack of data from other monitoring methods their movement upstream through the turtle passage cannot be confirmed.

For seven of the nine tagged white-throated snapping turtles (ID 10254, ID 11562, ID11566, ID 13070, ID 13102, ID 13116 and ID 16165), movements upstream past the weir were detected between the receivers placed at Ramp entrance downstream and Approach channel upstream (Figure 3.12a and b). Other upstream movements occurred between Ramp entrance downstream and Left bank weir pool on 25 December 2025 (ID 10238), and between Rookwood Weir site and Rookwood upstream on 3 September 2025 (ID 16137). These turtles were not detected by the hydrophones within the turtle passage during the time of these movements.

Table 3.15 Turtles moving in an upstream direction past the weir in the Year 2 2025-26 monitoring period

No.	Species	Age	Sex	Acoustic ID	Ramp Entrance Downstream	DSRP8	DSRP7	DSRP6	DSRP5	DSRP4	DSRP3	DSRP2	DSRP1	USRP1	USRP2	USRP3	USRP4	USRP5	Approach Channel Upstream	Left Bank Weir Pool	Other upstream hydrophone
1	WTST	Adult	Male	10238																	
2	WTST	Adult	Male	10254																	
3	WTST	Adult	Female	11562																	
4	WTST	Adult	Male	11566																	
5	WTST	Adult	Male	13070																	
6	WTST	Adult	Male	13102																	
7	WTST	Adult	Female	13116																	
8	WTST	Adult	Female	16137																	
9	WTST	Juvenile	Female	16165																	
10	WTST	Adult	Male	16187																	
11	WTST	Juvenile	Female	16249																	

Green shading indicates confirmed upstream movement
Light blue shading indicates upstream movement but is unconfirmed if it occurred through the turtle passage or through another path
White boxes indicate where there was no continued turtle passage upstream

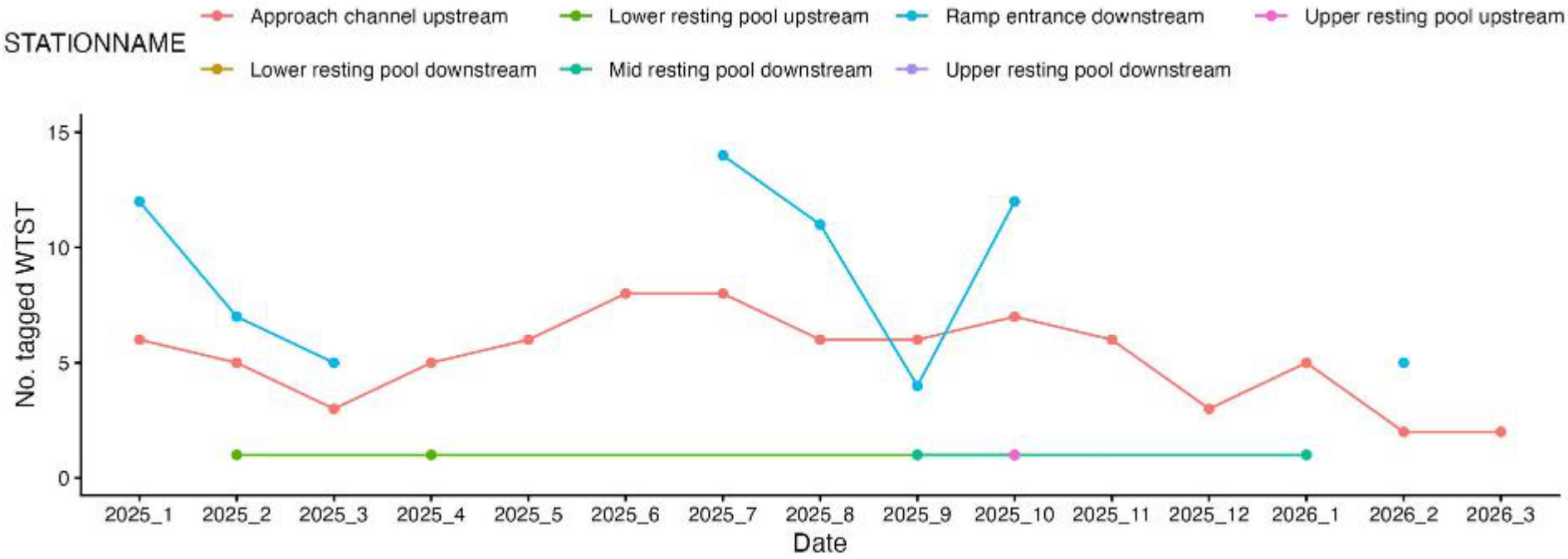


Figure 3.11 Number of tagged white-throated snapping turtle detected on acoustic receivers located within/adjacent to the turtle passage between January 2025 and March 2026

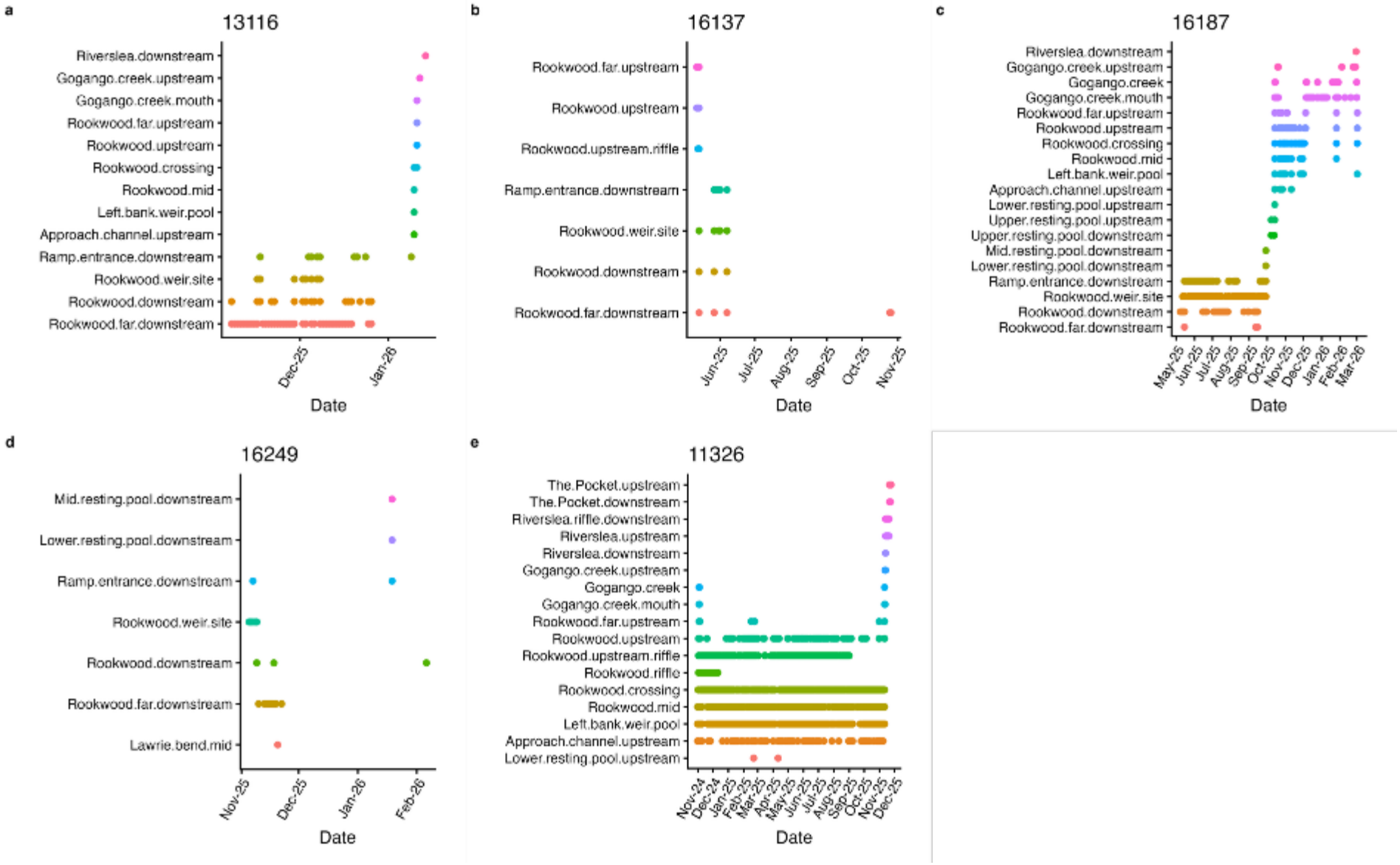


Figure 3.12a Abacus plot of detections of five acoustically tagged white-throated snapping turtles detected at fixed receiver stations positioned above and below the turtle ramp (a-e)

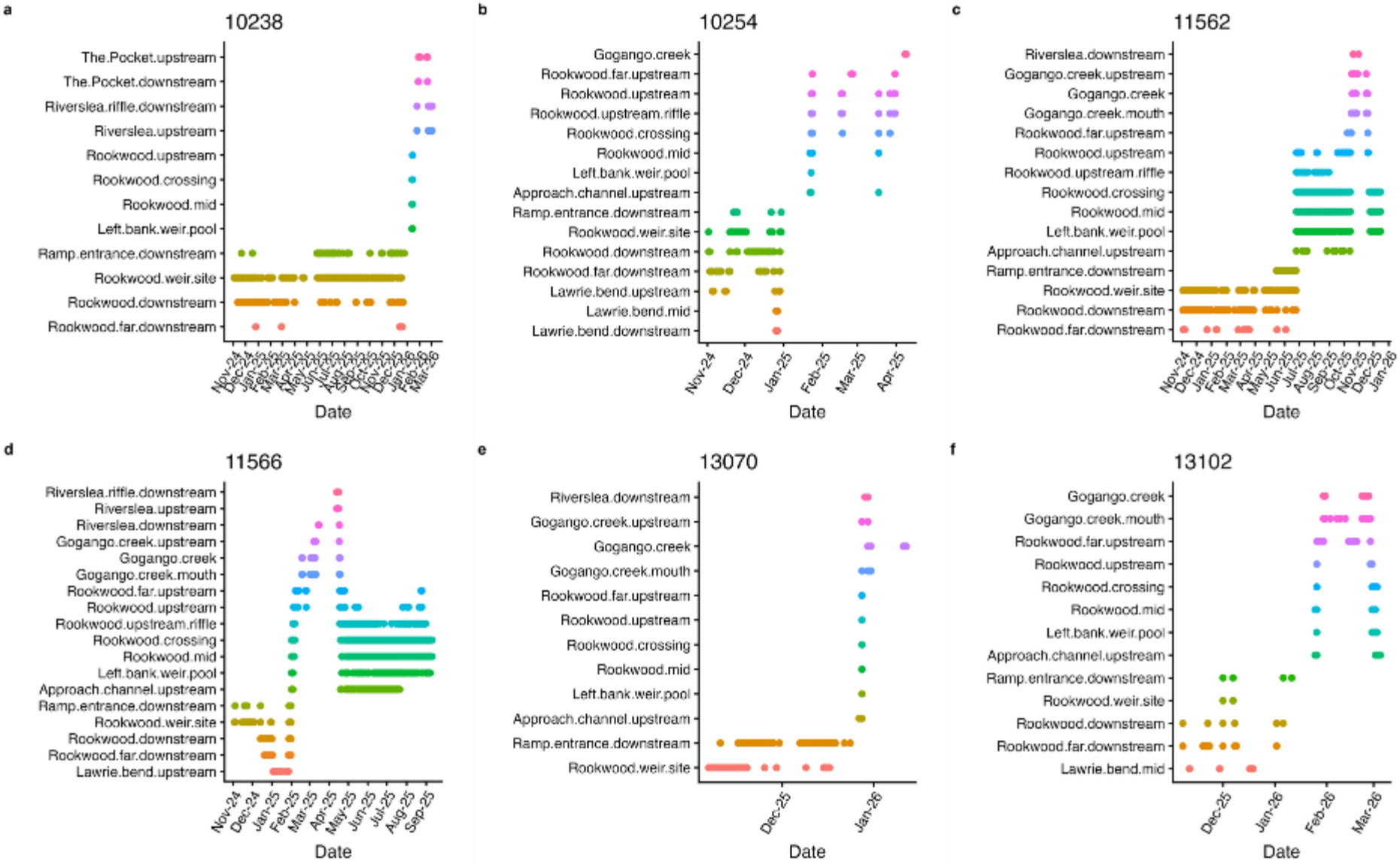


Figure 3.12b Abacus plot of detections of six acoustically tagged white-throated snapping turtle detected at fixed receiver stations positioned above and below the turtle ramp (a-f)

3.3.1.2.2 Movement of Fitzroy River turtles through the turtle passage

Overview

Most tagged Fitzroy River turtles located the downstream turtle passage entrance, but there was no evidence of movement through the structure. Of 46 individuals detected during the monitoring period, 30 were recorded within or adjacent to the structure, with detections heavily concentrated at the ramp entrance downstream (29 individuals). Very few turtles were detected within the internal sections of the passage, with only a single individual recorded at the Lower resting pool downstream and none detected through the mid to upper sections. Only one tagged female was recorded near the upstream entrance, and no confirmed upstream movement through the passage was evident. Overall, detections indicate that turtles primarily remained downstream of the weir, with activity centred around the ramp entrance and little evidence of successful passage. Further detail on these detection patterns and receiver-specific results is provided below.

Detailed results

Across the monitoring program, of the 46 Fitzroy River turtles detected between 6 March 2025 and 5 March 2026, 30 were detected by at least one receiver within/adjacent to the turtle passage (i.e. Approach channel upstream, Lower resting pool upstream (USRP5), Upper resting pool upstream (USRP1), Upper resting pool downstream (DSRP1), Mid resting pool downstream (DSRP6), Lower resting pool downstream (DSRP8) or Ramp entrance downstream) (Figure 3.13).

Twenty-nine Fitzroy River turtle were detected at Ramp entrance downstream (ID 10236, 10250, 11298, 11300, 11314, 11318, 11570, 13072, 13082, 13084, 13088, 13122, 13124, 13126, 13128, 13134, 13136, 13140, 16145, 16147, 16149, 16151, 16173, 16181, 16189, 16199, 16211, 16215, 16241). One Fitzroy River turtle (ID 13140) was detected within the Turtle Ramp at Lower resting pool downstream (Figure 3.14a, c), and no tagged Fitzroy River turtle were detected at any of the receivers positioned within the turtle passage between Mid resting pool downstream and Lower resting pool upstream.

One female Fitzroy River turtle (ID 11292) was detected at the upstream entrance of the turtle ramp, Left bank weir pool and Approach channel upstream (Figure 3.14a, a). The only other Fitzroy River turtle detected on any receiver station upstream from the Rookwood Weir between 1 January 2025 and 3 March 2026 was ID 14267 which was detected at Rookwood upstream riffle (Figure 3.14a, b). However, this individual was initially tagged in June 2019 and only a single detection of this turtle was detected in 2025. Given the estimated battery life for the acoustic tags is 985 days, it is likely that this recent detection of ID 14267 was a false detection.

The Fitzroy River turtle detected below the weir held home ranges downstream of Rookwood Weir extending between the receiver placed at the weir site, and Rookwood far downstream.

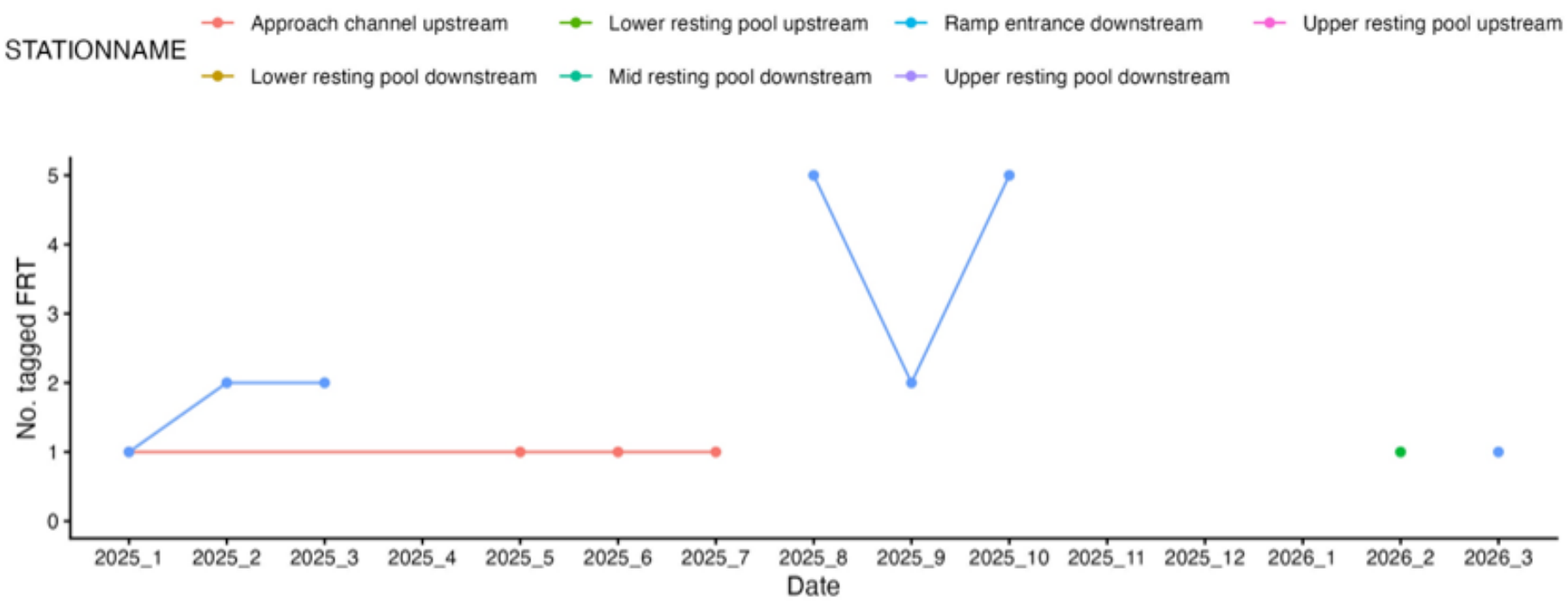


Figure 3.13 Number of tagged Fitzroy River turtle detected on acoustic receivers located within/adjacent to the turtle passage between January 2025 and March 2026

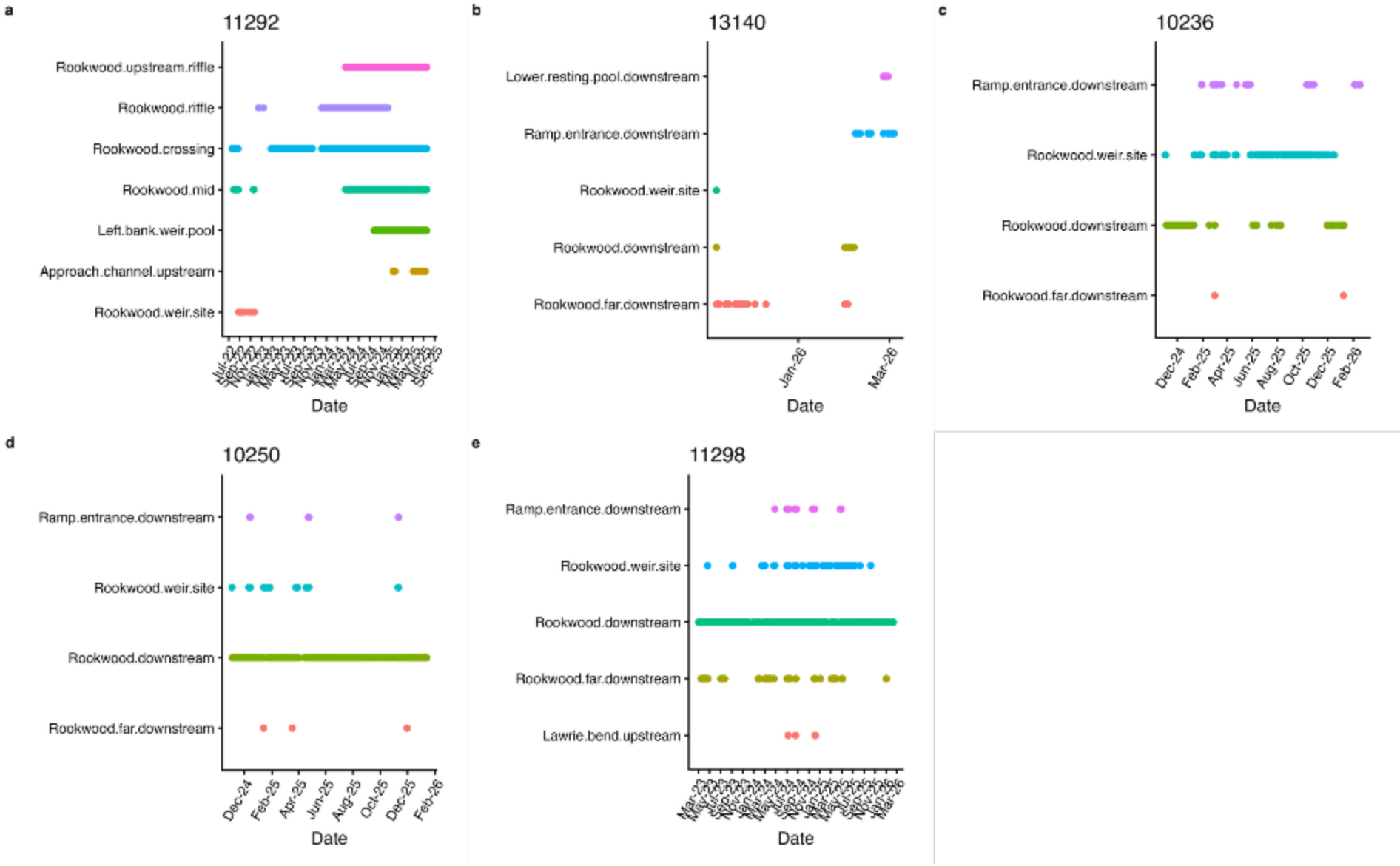


Figure 3.14a *Abacus plot of detections of acoustically tagged Fitzroy River turtle detected at fixed receiver stations above the turtle passage (a), and below the turtle passage (b-e)*

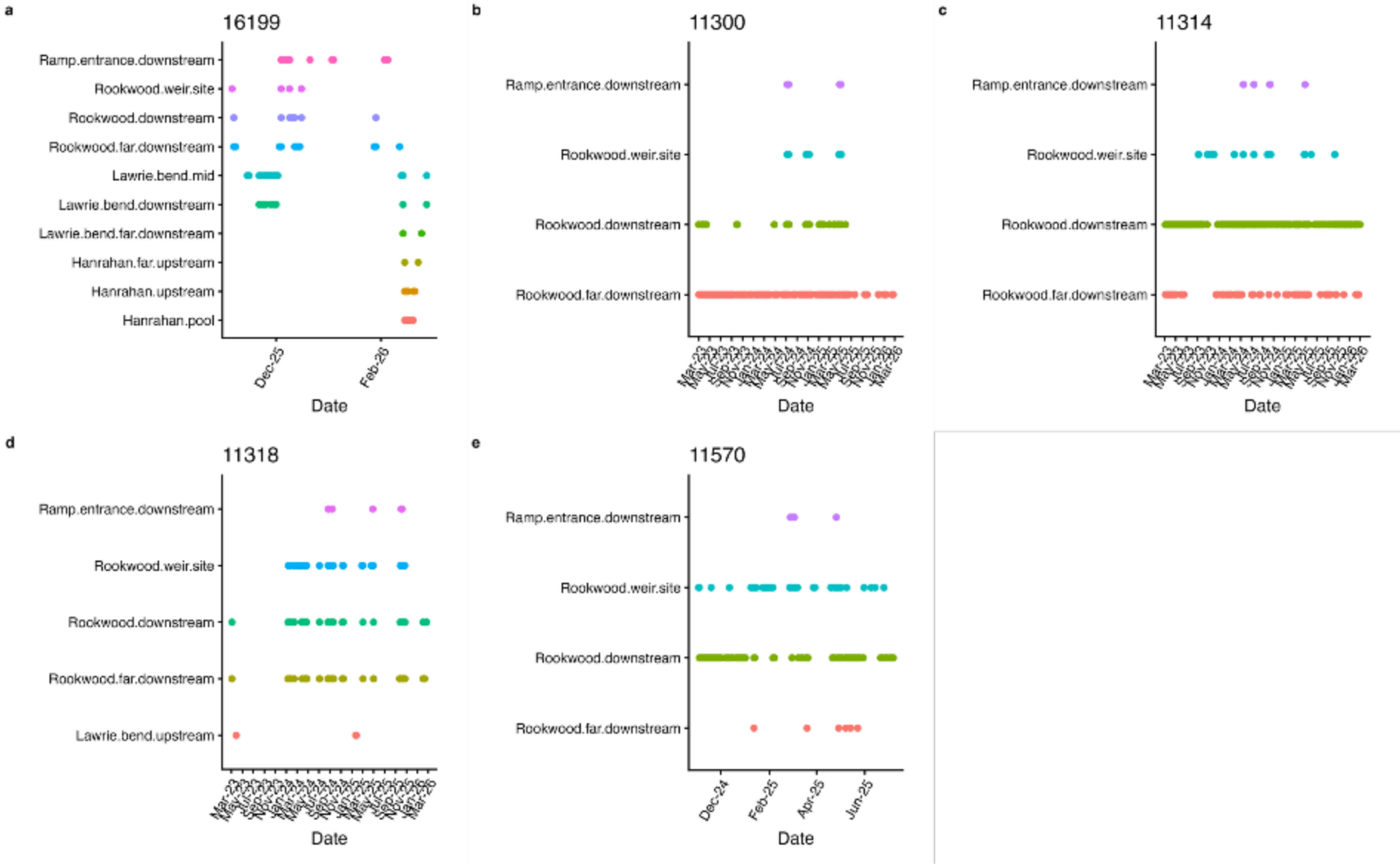


Figure 3.14b Abacus plot of detections of acoustically tagged Fitzroy River turtle detected at fixed receiver stations below the turtle passage (a-e).

3.3.1.3 Broad-scale turtle population

3.3.1.3.1 Important areas

Overview

Across the monitoring period, white-throated snapping turtles were consistently detected in higher numbers and across a broader spatial extent than Fitzroy River turtles, with annual detections averaging 39 individuals compared to 28, and both species showing variability linked in part to tagging effort. White-throated snapping turtles used the full acoustic array but were strongly concentrated downstream of Rookwood Weir, particularly between the ramp entrance and Rookwood far downstream, with increased detections in 2025 and 2026 reflecting intensified tagging in this area. Despite widespread detections, movement upstream of the weir appears limited in recent years, and there is evidence of aggregating turtles below the weir, with very few individuals progressing into or beyond the turtle passage.

In contrast, Fitzroy River turtles exhibited more localised and clustered distributions, with historical use of discrete reaches such as the Riverslea pool-riffle sequence and downstream of the weir. Following construction, connectivity across the weir footprint appears reduced, with no recorded movements between upstream and downstream receivers and a decline in detections at previously used upstream sites. Recent increases in detections downstream of the weir suggest some redistribution of individuals into lower river sections. Whereas detections within the upstream array are expected to decline over time as existing tags reach the end of their battery life and detach, without the opportunity for future tagging in upstream areas. Overall, these patterns indicate strong downstream residency and constrained longitudinal connectivity for both species, particularly for Fitzroy River turtles. These findings should be interpreted in the context of tagging effort, which has been concentrated downstream of Rookwood Weir during the operations phase due to logistical constraints associated with upstream turtle capture. While this may influence the relative distribution of detections, the limited exchange of tagged turtles between upstream and downstream reaches and the decline in detections at upstream receivers support the interpretation of reduced connectivity. Further detail on spatial patterns, receiver-level detections, and temporal trends is provided below.

Detailed temporal trends

On average, 39 white-throated snapping turtles were detected per year (SE = 8.07), with 20 white-throated snapping turtles tracked in 2017, 21 in 2018, 26 in 2019, 36 in 2020, 32 in 2021, 25 in 2022, 22 in 2023, 35 in 2024, 96 in 2025 and 74 in 2026. On average, 28 Fitzroy River turtle were detected per year (SE= 5.36), with two Fitzroy River turtle tracked in 2017, two in 2018, 26 in 2019, 51 in 2020, 41 in 2021, 33 in 2022, 25 in 2023, 18 in 2024, 46 in 2025, and 37 in 2026.

Tagged white-throated snapping turtle used the full extent of the acoustic array, with historically high numbers of white-throated snapping turtle detected downstream of Riverslea downstream, at Rookwood, Gogango Creek, Lawries bend and Hanrahan pool (Figure 3.15). The greatest number of tagged white-throated snapping turtle were detected immediately downstream from the weir at Rookwood Weir site (n = 105 turtles) Rookwood downstream (n = 121 turtles) and Rookwood far downstream (n= 119 turtles), with very high numbers of white-throated snapping turtle detected between Ramp entrance downstream and Rookwood far downstream in 2025. This increase in turtle numbers in these regions were largely due to increased tagging effort in these regions in late 2024 and in 2025 when an additional 80 white-throated snapping turtle were tagged in the section downstream of the Weir. There is also evidence to suggest turtles are aggregating below Rookwood Weir given that only five out of 74 tagged white-throated snapping turtle navigated past the Ramp entrance downstream and were detected in the Lower resting pool downstream (DSRP8) and only one was detected at Upper resting pool downstream (DSRP1).

The stretch of river upstream of Rookwood Weir from Rookwood mid to Riverslea downstream had been visited by between 26-46 tagged white-throated snapping turtle from pre-construction to the current operations phase (Figure 3.15). The section upstream from Rookwood mid to Gogango Creek mouth upstream has historically held moderate numbers of tagged white-throated snapping turtle prior to weir inundation. However, no tagged white-throated snapping turtle were detected in the river section between Rookwood far upstream and Riverslea downstream in late 2023, and no tagged white-throated snapping turtle were recorded between Gogango Creek upstream and The Pocket upstream in 2024 (Figure 3.15). In contrast, no comparable absence of tagged white-

throated snapping turtles was evident within this reach during the Year 2 2025-26 monitoring period, with detections recorded throughout the upstream receiver array (Figure 3.17). Despite their continued presence, the mean number of detection days per tagged individual declined within the reach upstream of Gogango Creek compared with downstream sections, suggesting reduced receiver detection time during 2025-26 (Figure 3.17).

Greater numbers of tagged white-throated snapping turtle were detected at the receiver positioned immediately downstream of the weir between Rookwood Weir site and Rookwood far downstream than upstream of the weir, with between 105–119 turtles detected in this stretch between April 2017-March 2026. The number of tagged white-throated snapping turtles in this stretch of river greatly increased in late 2024, with 85 detected in this section in 2025 and 51 detected in this section in 2026 (Figure 3.15). Receivers deployed downstream of Rookwood around Lawries bend (Lawries bend upstream – Lawries bend far downstream) historically detected a large number of acoustic tagged white-throated snapping turtle (min = 41, max = 85), with the stations deployed between Hanrahan far upstream (n = 53 turtles) and Hanrahan pool (n = 39 turtles) detecting fewer tagged turtles than those receivers positioned closer to the weir site. (Figure 3.7). Fewer white-throated snapping turtle have been detected downstream of Hanrahan Crossing (8–12 tags) and these receivers were subsequently removed in 2025 to allow movements in the turtle passage to be surveyed.

Receivers placed between Lawries bend mid to Hanrahan far downstream have held fewer white-throated snapping turtle from 2023 onwards (Figure 3.15), with no detections of tagged white-throated snapping turtle on receivers deployed between Lawries bend downstream and Hanrahan pool in mid-late 2024. During Year 2 2025-26, detections increased within this lower river reach, with 58 tagged individuals recorded between 6 March 2025 and 5 March 2026, reflecting both additional tagging effort and ongoing use of these downstream habitats. In contrast, the receiver at Lawries Bend upstream detected comparatively few tagged turtles in 2025 and 2026 despite recording moderate numbers of white-throated snapping turtles across the monitoring program overall (41 individuals).

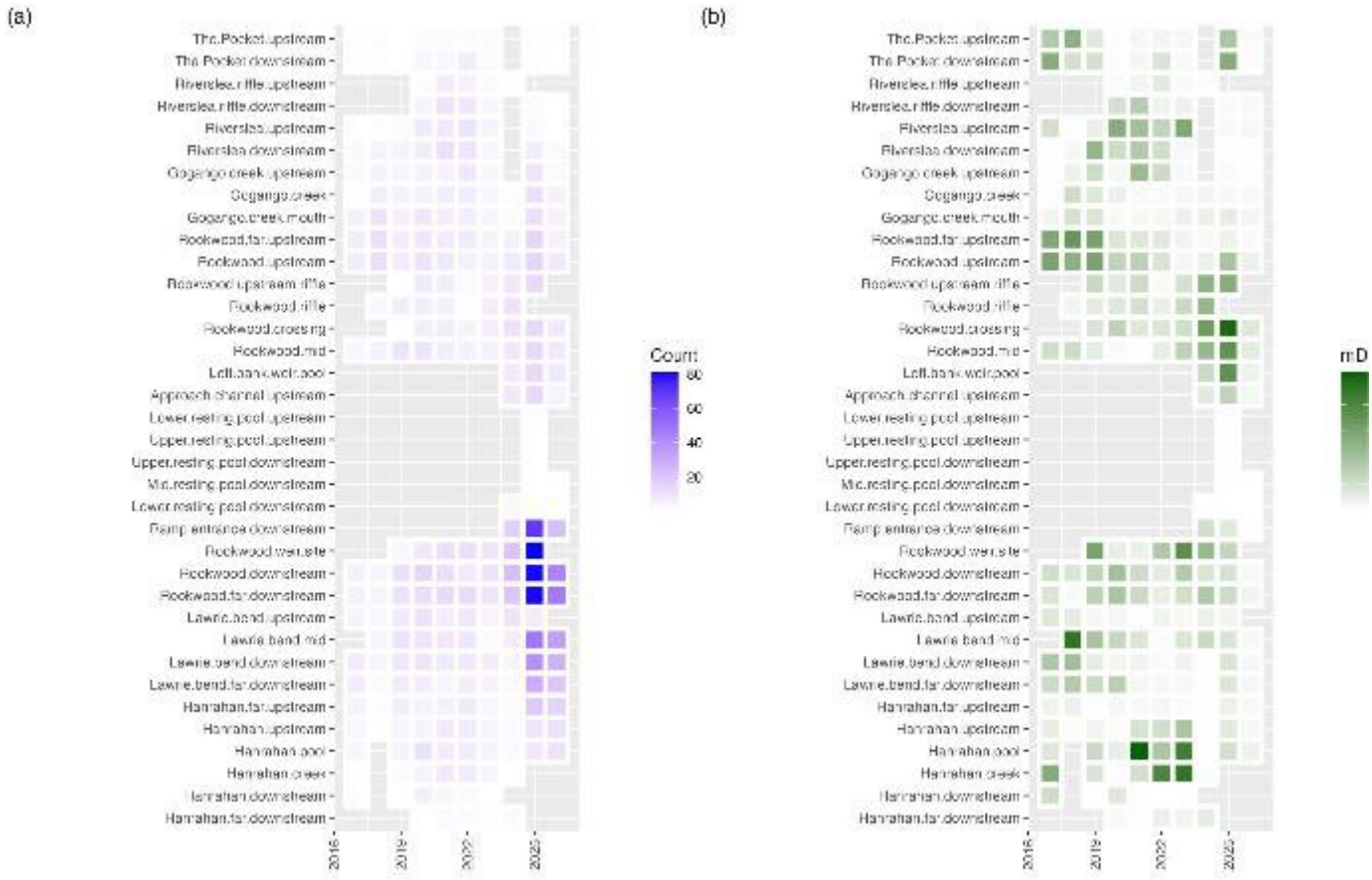


Figure 3.15 ***a) Number of acoustic tagged white-throated snapping turtles detected at each receiver station in the acoustic array each year between 22 April 2017 and 01 March 2026. b) the mean number of days that acoustic tagged white-throated snapping turtles were detected at each receiver station in the acoustic array each year between 22 April 2017 and 05 March 2026***

In contrast to tagged white-throated snapping turtle which were detected throughout the broad-scale survey area, Fitzroy River turtles have historically been detected in clusters of acoustic receivers throughout the study region. The most upstream cluster was in the Riverslea pool-riffle sequence, where between 12-14 tagged Fitzroy River turtles have been detected each year between 2020–23. This included Riverslea upstream (n = 18 tags), Riverslea riffle downstream (n= 17 tags), and Riverslea riffle upstream (n = 15 tags) (Figure 3.16, a). In this stretch of river, Fitzroy River turtles spent the greatest number of days at the Riverslea upstream receiver with this high use extending into early 2024 (Figure 3.16, b). However, only Riverslea riffle upstream and Riverslea upstream held one turtle each in 2024 and no tagged Fitzroy River turtles have been detected on any of these stations in 2025 and 2026.

The highest numbers of Fitzroy River turtle were detected at the stretch of river between Rookwood far downstream and Rookwood Weir site (n = 71 –75 tags; Table 3.14). Following the construction of the weir, the connectivity between the continuous stretch of habitat for Fitzroy River turtle that ran between Rookwood far downstream and Rookwood riffle appears to have been cut off with no movements of tagged Fitzroy River turtle moving across this section. Although only 4 tagged Fitzroy River turtle were detected at the Rookwood mid, Rookwood crossing or Left bank weir pool between 2023–25 (ID11292, 14267, 16350, and 16352), these turtles showed high residency in terms of number of days detected (Figure 3.16, b). No tagged Fitzroy River turtles were detected at any receiver positioned upstream from the Approach channel upstream receiver in 2026.

The region of river downstream from Rookwood far downstream has historically been rarely visited by tagged Fitzroy River turtle, with the annual total of turtles using this stretch between 2017–24 being 1 or 8 turtles per year. However, in 2025–26, receivers positioned between Lawrie bend upstream and Hanrahan pool detected 15 (2025) and 12 (2026) tagged Fitzroy River turtle with these turtles moving downstream from below the weir site (Figure 3.16, a).

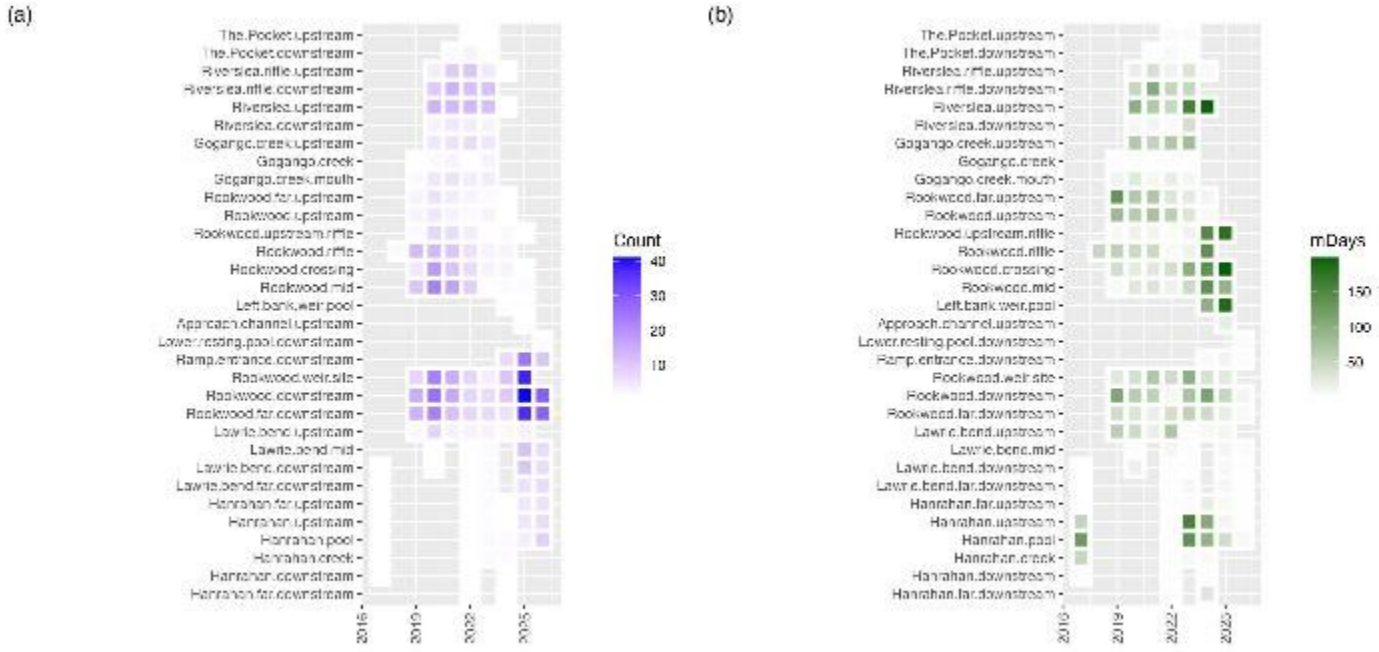


Figure 3.16 ***a) Number of acoustic tagged Fitzroy River turtles detected at each receiver station in the acoustic array each year between 22 April 2017 and 01 March 2025. b) the mean number of days that acoustic tagged Fitzroy River turtles were detected at each receiver station in the acoustic array each year between 22 April 2017 and 03 March 2026***

3.3.1.3.2 Variation in home range and distance travelled

Overview

Acoustic tracking indicates that white-throated snapping turtles occupied larger home ranges and were more mobile than Fitzroy River turtles. White-throated snapping turtles were detected across and up to the full extent of the array (36.4 km), with an average linear home range of 11.2 km, and cumulative movements reaching up to 316 km. Activity varied seasonally, with the greatest within-range movement occurring during late spring and early

summer months which aligns with the male breeding period, and the lowest in mid-winter when reduced temperatures likely promote energy conservation.

By comparison, Fitzroy River turtles occupied smaller ranges and exhibited lower overall movement, with an average home range of 5.64 km and cumulative distances up to 275 km. Seasonal variation in movement was also evident, with greater movement recorded during autumn and reduced activity during winter. Unlike white-throated snapping turtles, which exhibited increased movement during spring and summer, Fitzroy River turtles displayed a different seasonal pattern, likely reflecting species-specific ecological requirements and behavioural traits. Overall, these results indicate that Fitzroy River turtles exhibit a more localised pattern of space use and lower overall movement than white-throated snapping turtles within the study area. Further detail on movement patterns and home range dynamics is provided below.

Detailed temporal trends

Acoustic tagged white-throated snapping turtle (n = 160) were detected on between 1–28 receivers and occupied extents of the river (linear home range) of between 0 km (i.e. those turtles detected on only one receiver) and 36.4 km of river (i.e. the full extent of our acoustic array: ID 16368) (Appendix F). The average extent of river occupied by a tagged white-throated snapping turtle for the whole tracking duration was 11.2 km (SE = 0.62 km). Mean extent of river occupied by acoustically tagged white-throated snapping turtle was lowest in July (mean = 1.28 km, SE = 0.14, n = 160 replicates) and August (mean = 1.38 km, SE = 0.15, n = 162 replicates) and greatest during March (mean = 3.41 km, SE = 0.42, n = 167 replicates) (Figure 3.17).

After converting raw detections to 12-hour centres of activity, estimates of cumulative distance travelled by a tagged white-throated snapping turtle for the period April 2017 to March 2026 ranged between 0 and 316 km for the entire tracking period (mean = 70.1 km, SE = 5.13 km), or between 0 (min) – 63.6 km (max) per month (Appendix F). On average, tagged white-throated snapping turtle were most active within their home range during December (mean = 6.64 km per month, SE = 0.45, n = 211 replicates), May (mean = 6.48 km per month, SE = 0.60, n = 166 replicates), and November (mean = 5.91 km per month, SE = 0.58, n = 225 replicates) (Figure 3.17). This is in contrast to previous years (2017–2025), when tagged white-throated snapping turtle were least active within their home range during November (mean = 3.16 km per month, SE = 0.55 km, n = 146 replicates).

Acoustic tagged Fitzroy River turtle were detected between one and 23 receivers and occupied extents of the river (i.e. linear home range) of between 0 km (i.e. those turtles detected on only one receiver) and 36.4 km of river (i.e. the full extent of our acoustic array: ID 16344) (Appendix F). The average extent of river occupied by a tagged Fitzroy River turtle for the entire tracking duration was 5.64 km (SE = 0.59 km). The extent of river occupied by acoustically tagged Fitzroy River turtle was greatest in April (mean = 1.36 km, SE = 0.16 km, n = 125 replicates) and lowest during August (mean = 0.69 km, SE = 0.14, n = 152 replicates) (Figure 3.17).

After converting raw detections to 12-hour centres of activity, estimates of cumulative distance travelled by a tagged Fitzroy River turtle ranged between 0–275.10 km (female ID 12846) throughout the tracking period (mean = 33.1 km; SE = 4.07 km), or 0 (min) – 31.3 km (max) per month (Appendix F). Mean monthly distance travelled by acoustically tagged Fitzroy River turtle was lowest during August (mean = 1.50 km, SE= 0.29, n = 152 replicates) and greatest during May (mean = 2.57 km, SE = 0.46, n = 127 replicates) (Figure 3.17).

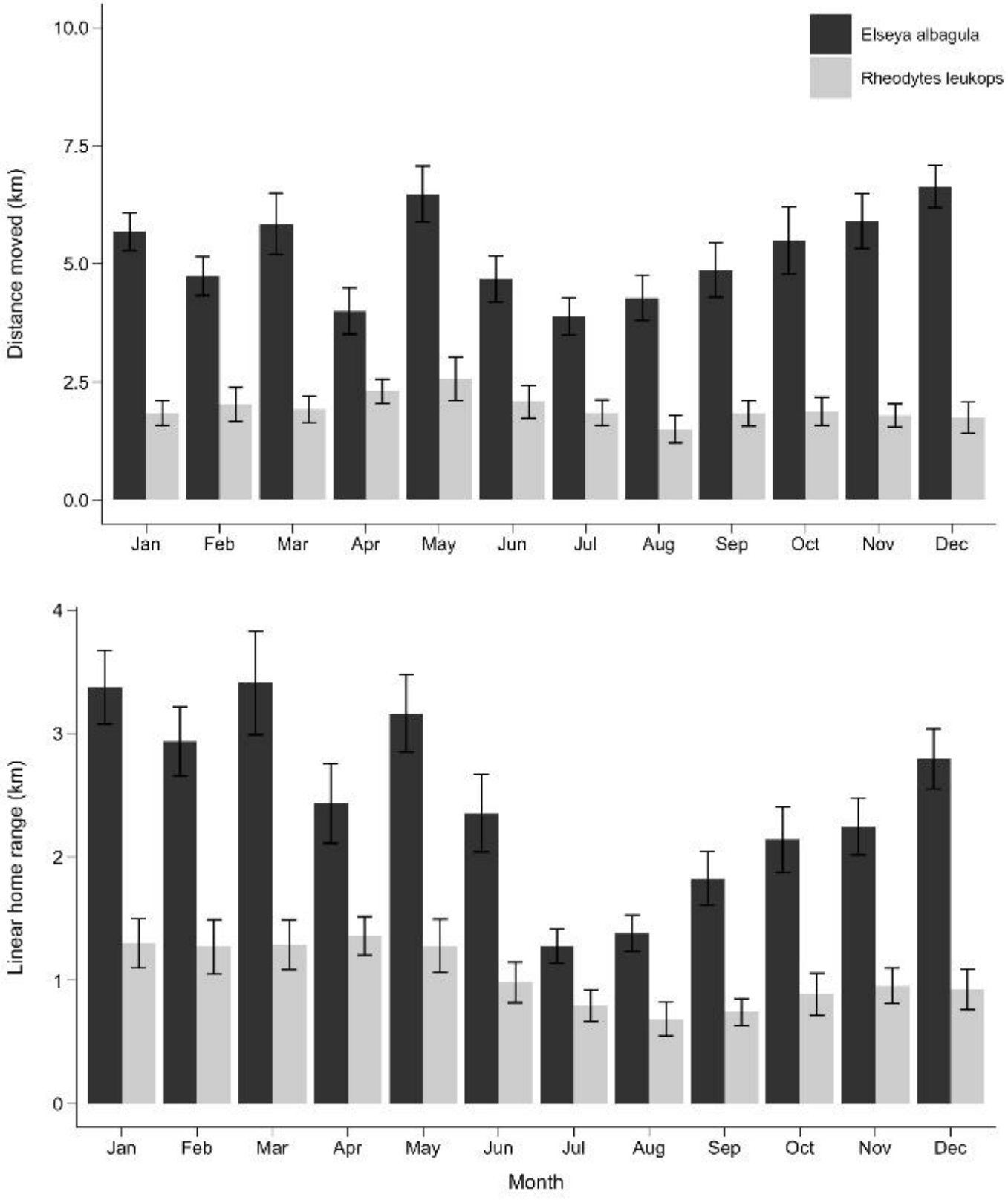


Figure 3.17 ***Distance moved (mean monthly ± standard error) and linear home range size (mean monthly ± standard error) of acoustic tagged white-throated snapping turtles (WTST) and Fitzroy River turtles (FRT) between 22 April 2017 and 05 March 2026***

3.3.1.3.3 Sex-related difference in space use

Overview

Acoustic tracking data indicates clear sex-based and seasonal differences in movement for both species. For white-throated snapping turtles, males exhibited larger overall home ranges than females across the full tracking period. Seasonal variation was evident, with females occupying larger ranges and travelling greater distances during the nesting period (May to August), but particularly in May and June, while males showed greater movement and larger ranges between October and April, peaking in summer months. Despite these differences, average monthly distances travelled were similar between sexes.

Fitzroy River turtles exhibited smaller differences between sexes, with females generally occupying slightly larger home ranges and travelling marginally greater distances than males. Seasonal patterns were also evident, with male home ranges and movements peaking between late summer and autumn and contracting markedly in winter. Female movement peaked during spring and autumn, including during the nesting period, although overall movement rates remained lower than those recorded for white-throated snapping turtles.

Overall, these results indicate sex- and season-specific movement patterns in both species, with stronger differentiation between males and females observed in white-throated snapping turtles than in Fitzroy River turtles. Further detail on sex-specific movement patterns and seasonal trends is provided below.

Detailed temporal trends

When comparing river extent occupied for the entire tracking period between the 73 tagged adult male and 80 female white-throated snapping turtles, the average linear home range for adult males was found to be 13.9 km (SE = 0.97 km) and the average linear home range for adult females was 9.40 km (SE = 0.72 km).

On average, female home ranges were larger than male home ranges between May – August, the nesting season for this species (Figure 3.18). The greatest difference between male and female home ranges was in May and June, and these months were also when female home ranges were the largest overall. The extent of river occupied by male white-throated snapping turtle were generally larger than female white-throated snapping turtle between October – April, with males having the largest home ranges between December and March (Figure 3.18)

Overall, female white-throated snapping turtle travelled similar distances per month as males (female: mean = 5.68 km/month, SE = 0.23 km, n =1041 replicates; male = 5.08 km/month, SE = 0.21 km, n = 1024 replicates). (Figure 3.19). Movements of female white-throated snapping turtle were on average 2.5x greater in November 2025 than the same month in previous years, with movements in October 2025 1.5–2x greater than in previous years.

As with the linear home range comparisons, females travelled greater distances than male turtles between May – November, whereas males travelled greater distance than female white-throated snapping turtle between December – April (Figure 3.18). Tagged male white-throated snapping turtle travelled ~2x further during March than in May – September, and the extent of river occupied was also ~2x larger during this month.

For the 37 male and 60 female Fitzroy River turtles which were detected on more than one acoustic hydrophone station, we found that the total extent of river occupied by adult females were generally larger than that of male Fitzroy River turtle (females: mean = 6.27 km, SE = 0.85 km; males: mean = 5.19 km, SE = 0.85 km). The disparity between male and female Fitzroy River turtle home range use was smaller than previously reported due to an increase in the extent of river used by male Fitzroy River turtle in 2025.

For male Fitzroy River turtle, the extent of river occupied (i.e. their linear home range) peaked between February and May, with individuals maintaining highly confined home ranges (mean <0.8 km) between the months of July – November (Figure 3.18). In contrast, female Fitzroy River turtle occupied large (mean >1.0 km) monthly home ranges in September and November (Cann and Sadler, 2017), with another larger peak in home range size between January and May.

Estimates of monthly distances travelled (calculated from COA estimates) was greater in female Fitzroy River turtle (mean = 2.01 km, SE = 0.10 km, n = 1135 replicates) compared to males (mean = 1.93 km, SE = 0.20 km, n = 530 replicates). The disparity between female and male Fitzroy River turtle monthly distance travelled was smaller than previously reported due to an increase in movements by male Fitzroy River turtle in 2025.

The mean monthly distances moved by tagged male Fitzroy River turtle were greater between December and June, and were lower between July and October (Figure 3.19). The distances moved by tagged male Fitzroy River turtle were lowest in March, The monthly distances travelled by male Fitzroy River turtle were greater in May, 2025, June 2025, July 2025, August 2025, September 2025, October 2025, November 2025 and February 2026 than the same months in previous years. The mean monthly distances for males were approximately 2x greater in May 2025 than August 2025. The monthly distance travelled by female Fitzroy River turtle was greatest between March and May (Figure 3.19).

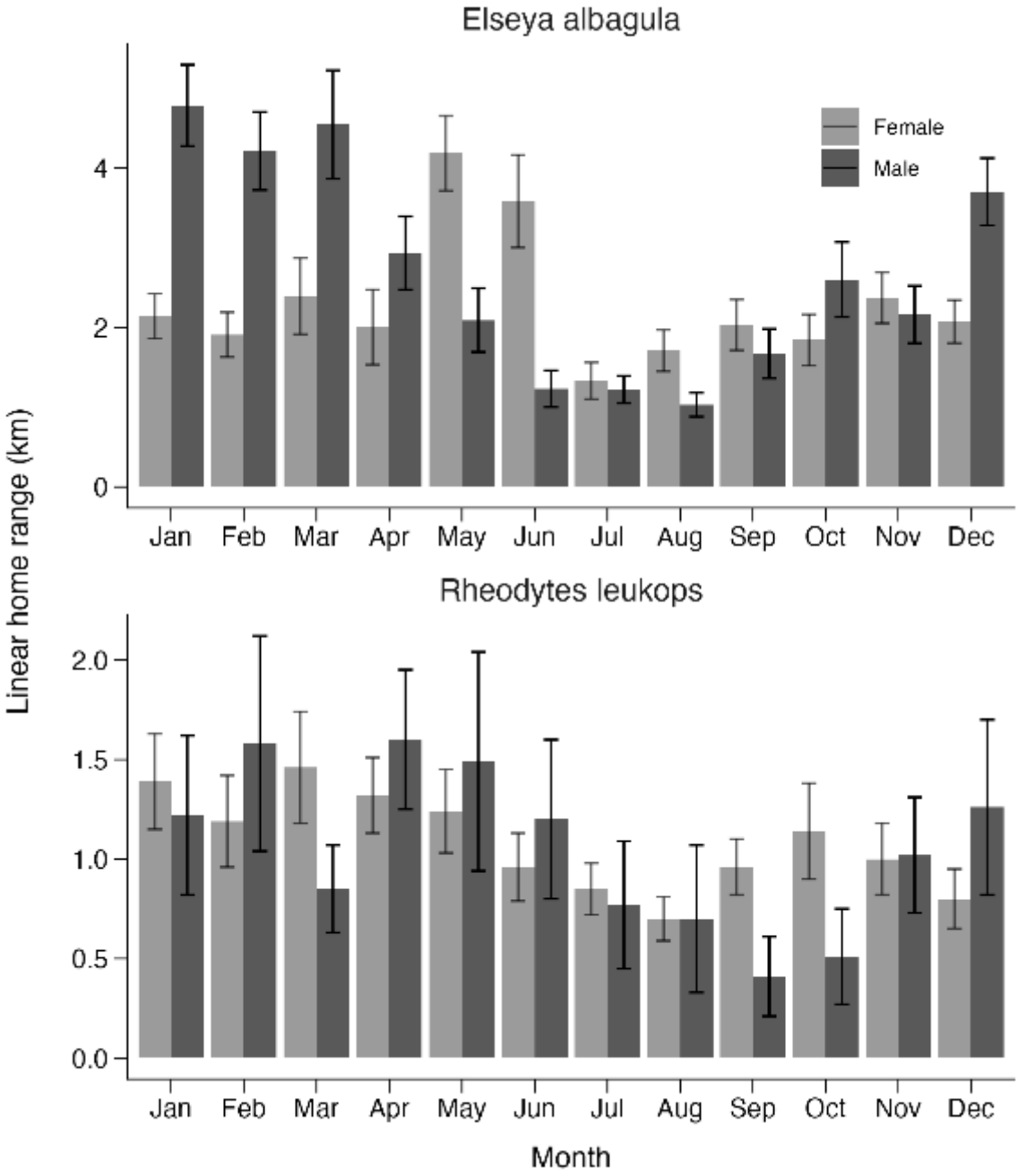


Figure 3.18 ***Linear home range size (mean monthly ± standard error) by male and female acoustic tagged white-throated snapping turtles (WTST) (a) and Fitzroy River turtles (FRT) (b) detected on the acoustic array between 22 April 2017 and 05 March 2026***

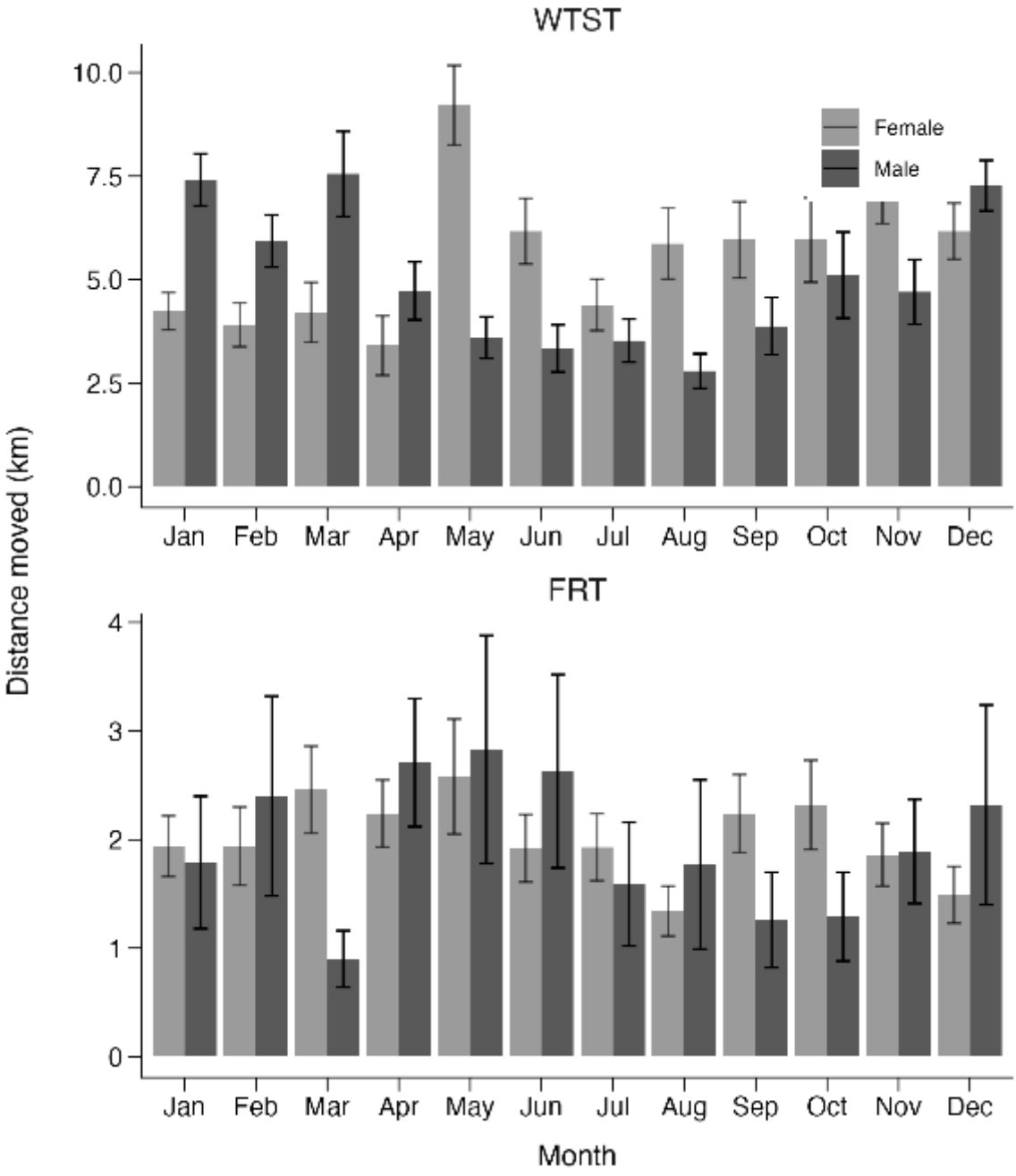


Figure 3.19 ***Distance moved (mean monthly ± standard error) by male and female acoustic tagged white-throated snapping turtles (WTST) (a) and Fitzroy River turtles (FRT) (b) detected on the acoustic array between 22 April 2017 and 05 March 2026***

3.3.1.3.4 Comparison between pre-construction and operation

Overview

Mean monthly home range size and movement patterns varied over time for both species, with notable peaks associated with specific years and individuals. For white-throated snapping turtles, female home ranges and distances travelled were greatest early in the pre-construction monitoring period (2017–2019), declined to a minimum during construction (2024), and then increased again in operations (2025–2026), largely driven by a small number of wide-ranging individuals. Male home ranges were lowest in recent years, while their mean monthly distance travelled remained relatively consistent across the study period.

Fitzroy River turtles also exhibited variation in home range size and movement through time. Female home ranges and distances travelled were greatest in 2017 and again in 2025, while male home ranges and movement

increased in recent years, particularly between 2024 and 2026. Several of these peaks were influenced by individual turtles undertaking extensive movements. Overall, mean monthly distance travelled for Fitzroy River turtles since weir operations commenced were generally higher (particularly Year 2) than during pre-construction and construction phases. Further detail on inter-annual variation in movement patterns and home range extent is provided below.

Detailed temporal trends

Mean monthly home ranges (max river extent) of female white-throated snapping turtle were greatest between 2017– 2019, then gradually decreased in size from 2020 onwards to the smallest home range size in 2024 (mean = 1.32 km, SE = 0.16 km) (Figure 3.20). In 2025 and 2026, the mean monthly home range max river extent increased to 3.93 km and 2.94 km, respectively, which were similar to pre-2021 home range sizes. Note, the 2026 home range metrics were generated using data from January and February 2026 only, and so should be interpreted with caution. This increase in 2025 was driven by several tagged females which undertook large directional movements in 2025 (e.g. ID 11326, ID 13116, ID 16139, ID 16163, ID 16167, ID 16183, ID 16231) (Figure 3.21, Figure 3.22). In male white-throated snapping turtle, mean monthly home ranges were lowest in 2024 and 2025 when they were 2.87 km (SE = 0.45) and 2.92 km (SE = 0.22), respectively.

Similar to mean monthly home range size, the monthly distances travelled by female white-throated snapping turtle were greatest between 2017– 2019, and again in 2025. Between 2020–24, the monthly distances travelled by female white-throated snapping turtle gradually decreased becoming most site-attached in 2024 (mean = 2.71 km) (Figure 3.21). Mean monthly distances travelled in male white-throated snapping turtle were similar across years (Figure 3.21).

Mean monthly home range size and mean monthly distances travelled of female Fitzroy River turtle was greatest in 2017 (mean = 2.69 km) and again in 2025 (mean = 2.22 km) (Figure 3.20, Figure 3.21). The high movements of Fitzroy River turtle in 2017 was largely due to the behaviours of one female (ID 16014) which was highly active following release at Lawries bend on 01 May 2017 with movements around the Hanrahan pool region before the tag disappeared from the acoustic array on the 18 November 2017. In 2025, multiple consecutive wide ranging movements were made downstream of the weir between Rookwood weir site and Hanrahan pool by female Fitzroy River turtle ID 10252. In male Fitzroy River turtle, mean monthly home ranges were greatest in 2025 and 2026, and mean monthly distance travelled was greatest in 2024, 2025 and 2026, where they were detected on between 7-10 receivers and occupied an extent of river between 10.2 – 16.1 km long. Males that showed high mobility in 2025 included Fitzroy River turtle ID 16145, ID 16181, ID 16189, and ID 16199.

Mean monthly distances travelled by female and male Fitzroy River turtles since weir operations commenced was greater than pre-development and construction phases. Mean monthly home range size of male Fitzroy River turtles was higher in 2025 than previous years.

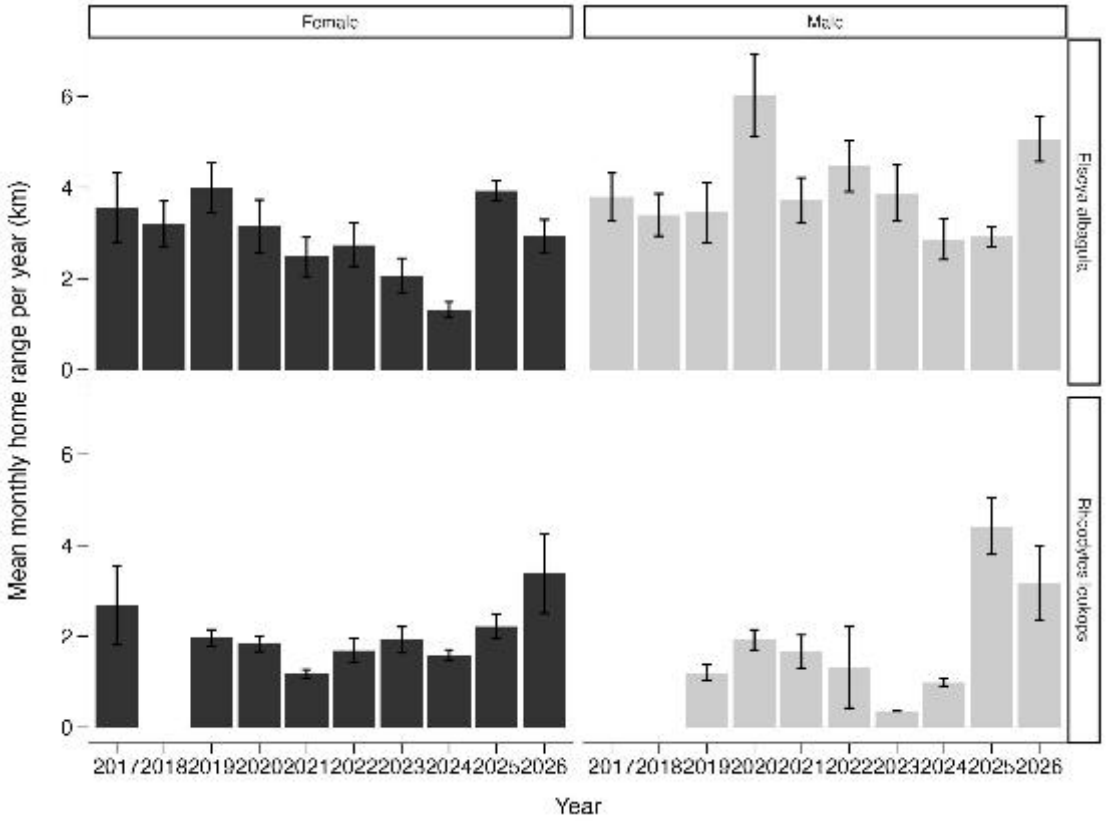


Figure 3.20 ***Annual variation in home range size (mean monthly ± standard error) by female and male acoustic white-throated snapping turtles (top) and Fitzroy River turtles (bottom) detected on the acoustic array between 22 April 2017 and 05 March 2026***

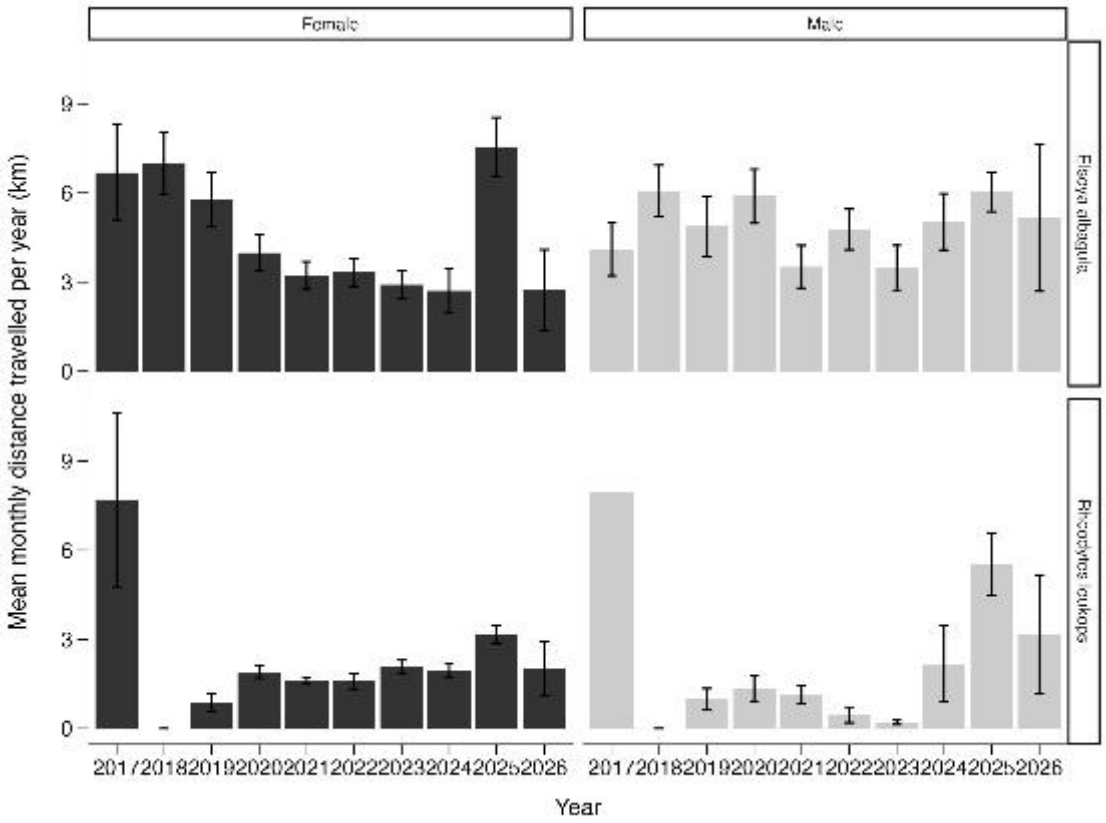


Figure 3.21 ***Annual variation in distance travelled (mean monthly ± standard error) by female and male acoustic tagged white-throated snapping turtles (top) and Fitzroy River turtles (bottom) detected on the acoustic array between 22 April 2017 and 05 March 2026***

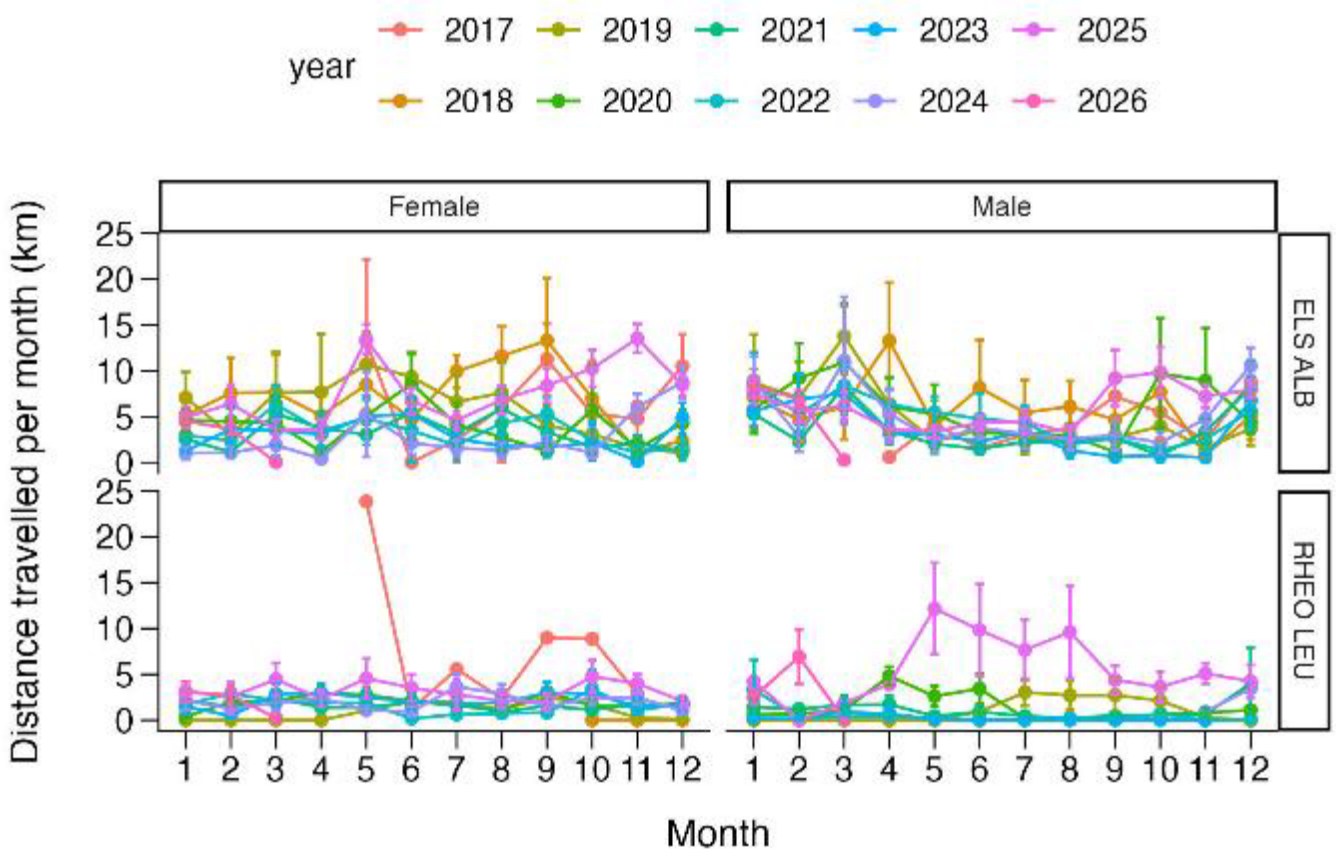


Figure 3.22 ***Annual variation in monthly distance travelled (mean monthly ± standard error) by acoustic tagged white-throated snapping turtles (top) and Fitzroy River turtles (bottom) detected on the acoustic array between 22 April 2017 and 01 March 2026***

Between 2017 and March 2026, there were 128 detected movements by 42 tagged white-throated snapping turtle (26 males, 16 females) across the site of the weir at Rookwood (i.e. between the receivers placed at Approach Channel Upstream and the receiver placed between Ramp entrance downstream). This included 67 movements in an upstream direction, and 61 movements in a downstream direction. These movements upstream and downstream by tagged white-throated snapping turtle across the site of the weir occurred in all months, peaking in May: January (13), February (4), March (18), April (10), May (20), June (16), July (5), August (3), September (9), October (10) November (5), and December (6).

Of the 61 recorded movements in a downstream direction in this section of river, five were in 2017, four were in 2018, 13 were in 2019, nine were in 2020, eight were in 2021, seven were in 2022, 10 were in 2023, three were in 2024 and two were in 2025. In terms of the number of tagged white-throated snapping turtle present in the vicinity of the weir that could have travelled downstream, there were in 10 tagged turtles detected immediately upstream of the weir in 2017, 15 were detected in 2018, 14 in 2019, 15 in 2020, 13 in 2021, nine in 2022, nine in 2023, 11 in 2024, 15 in 2025 and eight tagged white-throated snapping turtle were detected immediately upstream of the weir in 2026. In 2024, downstream movements past the weir occurred in January (male ID 11324), April (male ID 11316) and July (male ID 11322). In 2025, downstream movements past the weir occurred in May (female ID 16137), and September (female ID 16187).

Of the 67 recorded movements by tagged white-throated snapping turtle upstream across the weir location, seven were in 2017, four were in 2018, 11 were in 2019, nine were in 2020, 11 were in 2021, four were in 2022, 13 were in 2023, one was in 2024 and five were in 2025, and two were in 2026. In terms of the number of tagged white-throated snapping turtle that could have made the movement upstream in each year, six tagged turtles were detected immediately downstream of the weir in 2017, five were detected in 2018, 14 in 2019, 15 in 2020, 14 in 2021, 14 in 2022, 12 in 2023, 24 in 2024, 85 in 2025 and 51 tagged white-throated snapping turtle were present in 2026.

In 2024, upstream movements across the weir by tagged white-throated snapping turtle occurred in December (male ID 10254). In 2025, upstream movements occurred in January (male ID 11566), June (male ID 11562), September (female ID 16187), and December (Male ID 13070, Male ID 10238), January (male ID 11566). In 2026, all movements upstream occurred in January (female ID 13116, female ID 13102).

Between 2017 and March 2026, there were 205 detected movements of 32 tagged Fitzroy River turtle (11 males, 18 females, three juveniles) between the receiver placed upstream of the weir (i.e. between receivers placed at Approach Channel Upstream and the receiver placed between Ramp entrance downstream). Of these 205 movements, 95 were in an upstream direction and 110 were in a downstream direction (Table 3.16). Movements upstream and downstream across the site of the weir occurred in all months, peaking in April: January (14), February (13), March (20), April (46), May (18), June (50), July (10), August (7), September (9), October (3) November (7), and December (8).

Of the 110 recorded movements downstream by tagged Fitzroy River turtle, zero were in 2017, zero were in 2018, 16 were in 2019, 59 were in 2020, 26 were in 2021, eight were in 2022, zero were in 2023, one was in 2024 and zero were in 2025 and 2026. As a measure of the number of tagged Fitzroy River turtles present that could have made the movement downstream across the weir, there were zero tagged Fitzroy turtles detected in 2017 immediately upstream of the weir, two in 2018, 19 in 2019, 32 in 2020, 21 in 2021, 11 in 2022, three in 2023, three in 2024, and two in 2025. In 2024, the downstream movement of the female Fitzroy River turtle (ID 16350) downstream across the weir site occurred in January.

Of the 95 recorded movements upstream across the weir by tagged Fitzroy River turtle, zero were in 2017, zero were in 2018, seven were in 2019, 50 were in 2020, 27 were in 2021, 11 were in 2022, zero were in 2023, and zero in 2024, 2025 and 2026. In terms of the number of tagged Fitzroy River turtle in the vicinity of the weir that could have travelled upstream, there were zero tagged turtles detected at receivers located immediately downstream from the weir in 2017 or 2018, 17 in 2019, 27 in 2020, 18 in 2021, 11 in 2022, eight in 2023, 12 in 2024, 43 in 2025 and 33 tagged Fitzroy River turtle were detected immediately downstream of the weir in 2026.

Table 3.16 Turtle movement across Rookwood weir

Species	Direction of travel across weir	Year	Phase	Female	Male	Juvenile
White throated snapping-turtle	Downstream	2017	Pre-construction	1	4	0
White-throated snapping turtle	Downstream	2018	Pre-construction	1	3	0
White-throated snapping turtle	Downstream	2019	Pre-construction	10	3	0
White-throated snapping turtle	Downstream	2020	Pre-construction	7	2	0
White-throated snapping turtle	Downstream	2021	Construction	3	3	0
White-throated snapping turtle	Downstream	2022	Construction	3	4	0
White-throated snapping turtle	Downstream	2023	Construction	1	9	0
White-throated snapping turtle	Downstream	2024	Operation	0	3	0
White-throated snapping turtle	Upstream	2017	Pre-construction	1	6	0
White-throated snapping turtle	Upstream	2018	Pre-construction	1	3	0
White-throated snapping turtle	Upstream	2019	Pre-construction	8	3	0
White-throated snapping turtle	Upstream	2020	Pre-construction	7	2	0
White-throated snapping turtle	Upstream	2021	Construction	4	6	0
White-throated snapping turtle	Upstream	2022	Construction	1	3	0
White-throated snapping turtle	Upstream	2023	Construction	2	10	0
White-throated snapping turtle	Upstream	2024	Operation	0	1	0
White-throated snapping turtle	Upstream	2025	Operation	1	1	0
White-throated snapping turtle	Upstream	2026	Operation	1	1	0
Fitzroy River turtle	Downstream	2019	Pre-construction	12	3	1

Species	Direction of travel across weir	Year	Phase	Female	Male	Juvenile
Fitzroy River turtle	Downstream	2020	Pre-construction	18	40	1
Fitzroy River turtle	Downstream	2021	Construction	14	5	7
Fitzroy River turtle	Downstream	2022	Construction	8	0	0
Fitzroy River turtle	Downstream	2024	Operation	1	0	0
Fitzroy River turtle	Upstream	2019	Pre-construction	4	3	0
Fitzroy River turtle	Upstream	2020	Pre-construction	17	33	0
Fitzroy River turtle	Upstream	2021	Construction	16	5	6
Fitzroy River turtle	Upstream	2022	Construction	10	0	1

3.3.1.3.5 Depths used and associations with environmental flows

The recorded transmitter depth for both white-throated snapping turtle and Fitzroy River turtle were significantly deeper in 2024 and 2025 than in previous years of monitoring (2017-2023). For white-throated snapping turtle, the depths recorded by the tags increased beyond previous levels in October 2024 and remained high throughout January-March 2025, and then returned to similar depth levels for previous years of monitoring from April 2025 to March 2026 (Figure 3.23).

Environmental flows in early 2026 were the largest experienced in the study region from commencement of the project in 2017 where river flow at Riverslea exceeded 6,000 Cumecs. These flows were associated with the movements of several white-throated snapping turtles located downstream of the weir moving in a downstream direction, including female ID 13132, 16159, 16139, and 16163 (Figure 3.24) and male IDs 10238, 10264, 13116, 16233, and 16255 (Figure 3.25; Figure 3.24).

Three female Fitzroy River turtle also moved during the moderate flows in January- April 2025 and January 2026 (Figure 3.26). These movements included: female Fitzroy River turtle ID 10252 which performed several consecutive wide-ranging movements from the station positioned at the Rookwood Weir site to Hanrahan pool; female Fitzroy River turtle ID 10244 which moved from Rookwood Weir site to Lawries bend upstream; and female Fitzroy River turtle ID 13082 which ranged between Rookwood Weir site, to Lawries bend mid to Hanrahan pool.

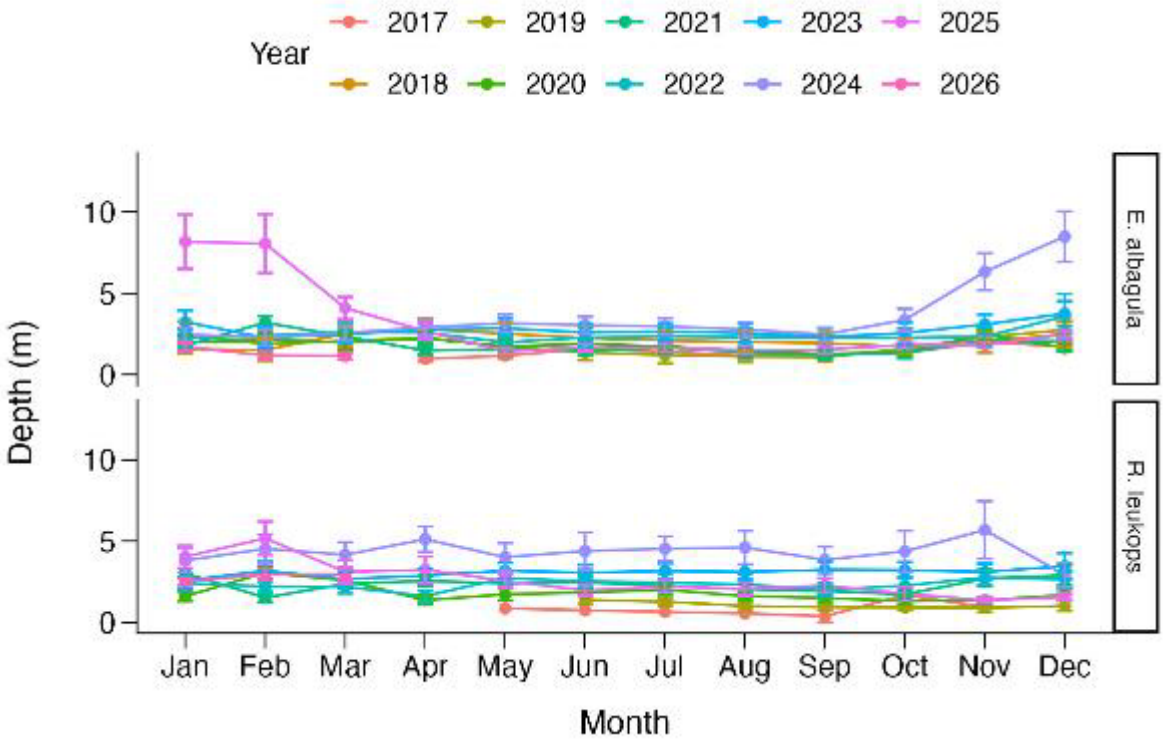


Figure 3.23 ***Annual variation in transmitter depth in meters (mean monthly ± standard error) by acoustic tagged white-throated snapping turtles (top) and Fitzroy River turtles (bottom) detected on the acoustic array between 22 April 2017 and 3 March 2026***

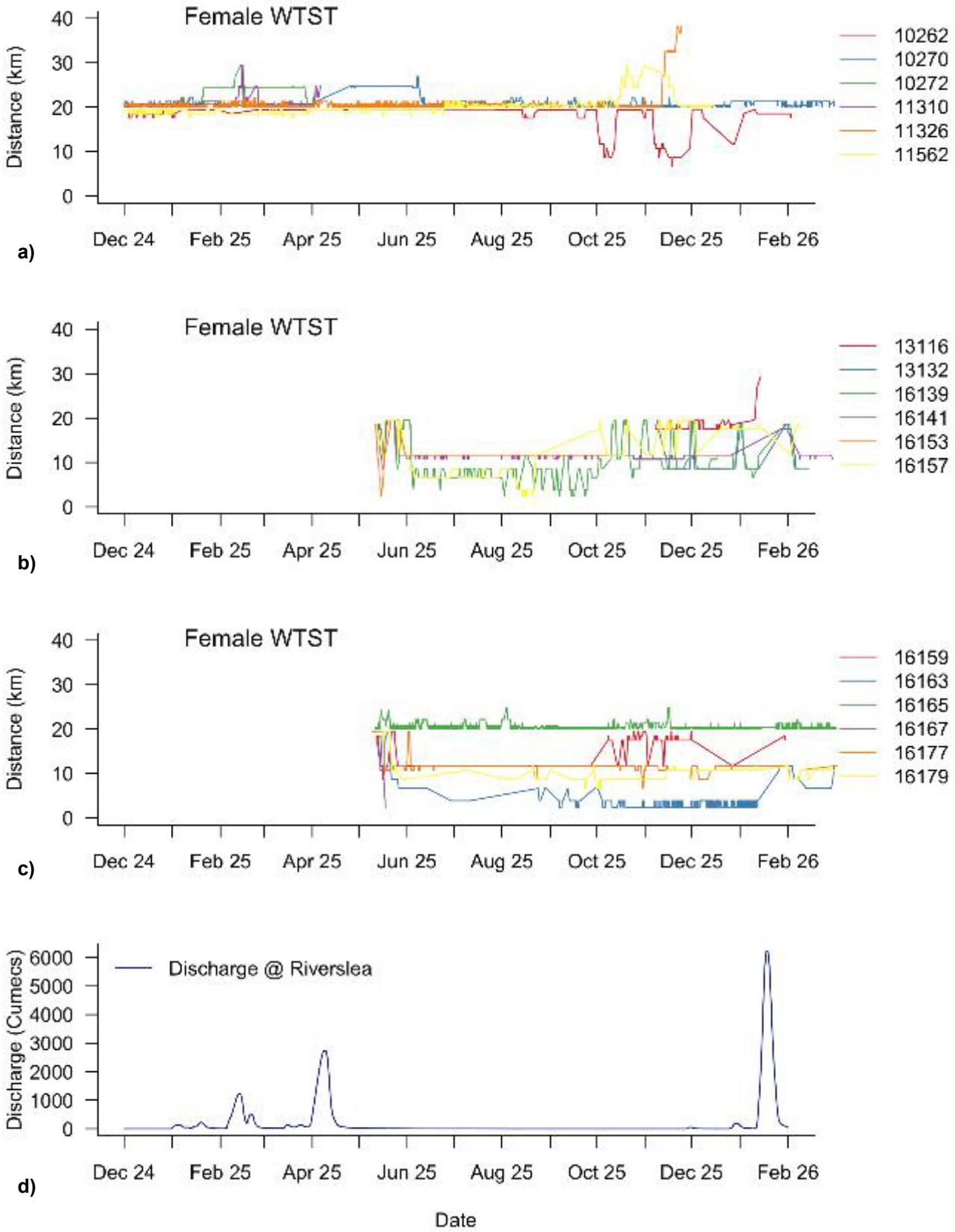


Figure 3.24 ***Location of an acoustically tagged white-throated snapping turtles (a-c) in 2025 and 2026 relative to the most downstream receiver at Hanrahan far downstream and flow (discharge) at Riverslea (d)***

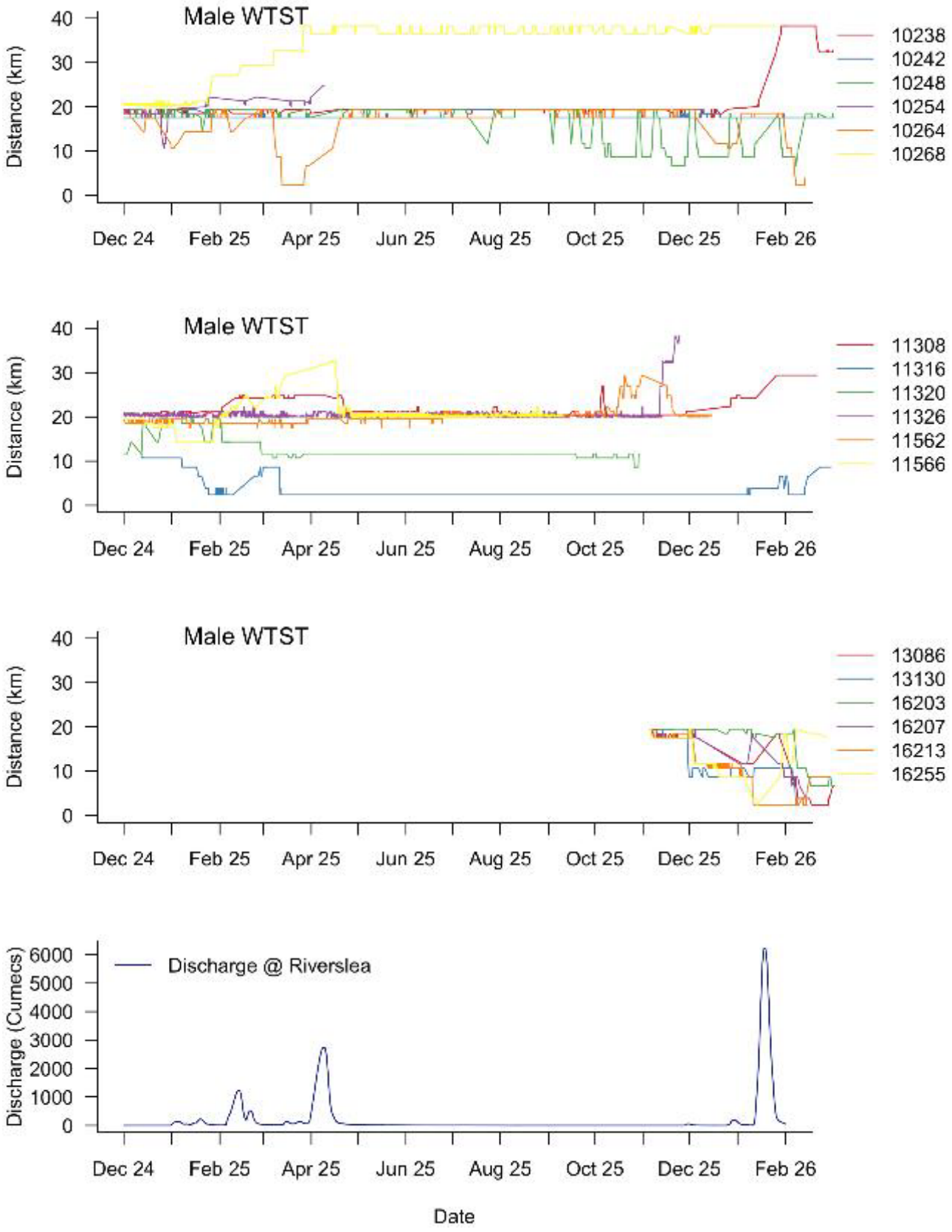


Figure 3.25 ***Location of an acoustically tagged white-throated snapping turtles (a-c) in 2025 and 2026 relative to the most downstream receiver at Hanrahan far downstream and flow (discharge) at Riverslea (d)***

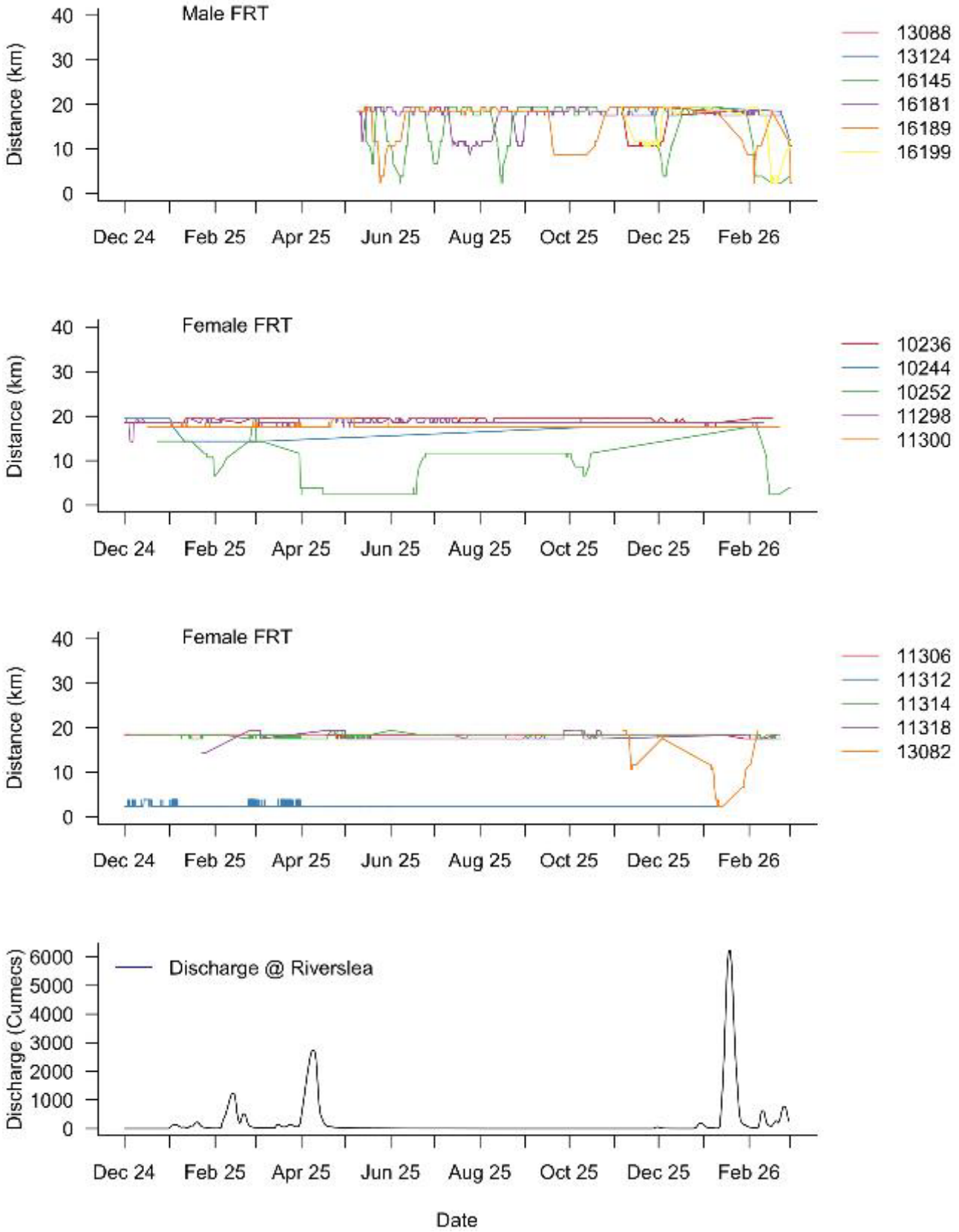


Figure 3.26 ***Location of an acoustically tagged Fitzroy River turtles (a-c) in 2025 and 2026 relative to the most downstream receiver at Hanrahan far downstream and flow (discharge) at Riverslea (d)***

3.3.2 PIT tag readers

No Fitzroy River or white-throated snapping turtles were recorded by the PIT tag readers in 2025-26 reporting period. PIT tag data for Year 2 2025-26 monitoring from the three PIT tag readers installed in the turtle passage are presented in Table 3.17.

PIT tag detections of fish and unknown tags from other fish tagging programs mostly occurred when downstream resting pools (DSRP7) were submerged during the flood event in January 2026. No detections were recorded for the resting pools upstream (USRP5) or at the abutment channel (DSRP1) at the top of the turtle passage.

During the May 2026 turtle capture survey, one Fitzroy River turtle was captured in the turtle passage (Table 3.6) and was fitted with an acoustic tag and a PIT tag on 9 May 2026. This turtle was detected crossing the D2 PIT tag reader on 16 and 29 May 2026 (Table 3.17) which demonstrates a successful reading event using the new PIT tags and upstream movement of this turtle. Ongoing monitoring and cross referencing with acoustic telemetry, camera footage and observational data in Year 3 will be undertaken to assess the reliability of the PIT tag readers. Data from the Year 3 monitoring period will also be required to reveal whether this particular Fitzroy River turtle successfully passed through the turtle passage.

During the May 2026 survey, it was identified that the protruding lip at USRP5 where the PIT tag reader has been installed (D3) requires smoothing to minimise potential damage to turtles when moving across this ramp section. DSRP7 where another PIT tag reader is installed (D1) also had this protrusion, however this was not as pronounced as USRP5.

Table 3.17 PIT tag reader data along turtle passage

PIT tag reader	PIT tag numbers	Date	Number of detections	Species
D1 (DSRP7)	0989001040552664	16 January 2026	1	Unknown
		17 January 2026	1	
	0989001040550985	16 January 2026	1	Golden perch
	0989001040553189	17 January 2026	3	Unknown
	0989001040549391	17 January 2026	1	Unknown
	0989001040549467	18 January 2026	1	Unknown
	0989001040552664	18 January 2026	1	Unknown
	0989001040550334	20 January 2026	1	Leathery grunter
	0989001040550570	13 March 2026	1	Unknown
		14 March 2026	1	
	0989001040550547	15 March 2026	1	Unknown
D2 (DSRP1)	No detections			
D3 (USRP5)	No detections			

3.3.3 Remote cameras

Individual turtles were recorded on 12 separate occasions on the remote cameras (Plate 3.11), spanning between June 2025 and 15 March 2026. The remote camera images include a variety of captured positions, including turtle heads surfacing, carapace and head resting on a horizontal ramp and turtles ascending vertical ramps. No turtles captured by the remote cameras could be confidently identified due to the quality of images, limited exposed body parts or turtle distance from camera. Most of the recorded turtle movement in the turtle passage was in the afternoon (from 2 pm to 7 pm), with only one other event occurring at 5 am. All camera recordings were between 3 March 2026 and 14 April 2026 with no recordings captured in 2025.

Captured imagery indicates that turtles are utilising resting pools, vertical and horizontal ramp sections on the turtle passage (Plate 3.11). It is suspected that individuals may remain in resting pools for several hours to multiple days to weeks based upon time stamps, locality of captured images and hydrophone data.

Table 3.18 Summary of remote camera recordings in Year 2 2025-26 monitoring

Date(s)	Camera	Location on turtle passage	Description
3-4 March 2026	CAM06	USRP1 and USRP2	Three camera recordings over a 24-hour period (Plate 3.11a-c). While it is possible that the same individual was recorded on both occasions, this cannot be confirmed. It is unknown whether the turtle/s recorded successfully travelled through the entirety of the turtle passage as no more footage was captured from other cameras upstream or downstream within the same temporal period and no turtles were detected by the acoustic receives or PIT tag readers. Two turtle observations were recorded by Sunwater of turtle/s in DSRP2 and DSRP3 on 03 March 2026 (Table 3.19) which is likely to be the same turtle as both of these locations are along the top of the turtle passage.
31 March 2026	CAM02	DSRP8	Two camera recordings of a turtle ascending the vertical ramp above DSRP8 (Plate 3.11d-e).
6 April 2026	CAM06	USRP1 and USRP2	Three camera recordings over a 3-hour period. The turtle can be seen moving along the horizontal ramp between USRP1 and USRP2 (Plate 3.11f-h). While it is possible that this turtle is the same as the one that ascended the vertical ramp above DSRP7 seven days earlier, this cannot be confirmed without secondary tagging or observational data. This camera was temporarily mislabelled as ‘CAMERA1’ upon deployment as per image details.
10 April 2026	CAM03	DSRP7	One camera recording of a turtle ascending the vertical ramp above DSRP7 (Plate 3.11i)
14 April 2026	CAM02	DSRP8	Three camera recordings over a 1-hour period. The images show a turtle within DSRP8, then approximately an hour later, a turtle ascending the vertical ramp above the resting pool (Plate 3.11j-l). The final image captured shows the turtle facing sideways on the vertical ramp. It is not known if this turtle successfully ascended the turtle passage as no more images were captured after this date and no tagging or observational data was recorded.

Overall, the captured remote camera imagery was insufficient to confirm whether any turtles moved through the entire length of the turtle passage infrastructure. This is due to suboptimal camera positioning, with some units mounted too high or angled too broadly to detect turtle movement effectively and camera type being unsuitable for reliably capturing turtle movement as identified in the 2024-25 Operations Phase Annual Report (GHD, 2025). Only three cameras (CAM02, CAM03, CAM06) captured images of turtles. CAM04 and CAM09 are located between or below the cameras which recorded images which suggests if these cameras were functioning optimally, they should have captured the movement of the turtle/s in their movement within the turtle passage. Furthermore, there were four observations reported by Sunwater of turtles within the turtle passage prior to March 2026 (Table 3.19) which were not recorded by any cameras. No images were captured from CAM07 on the upstream side of the turtle passage. It is unknown why all the camera detections occurred over a short period in March and April 2026 and whether this result reflects increased use of the turtle passage during this period or whether the cameras were not operating at other times.

a) Unidentified turtle – head seen at surface near resting pool USRP2.



b) Unidentified turtle – head seen at surface near resting pool USRP2.



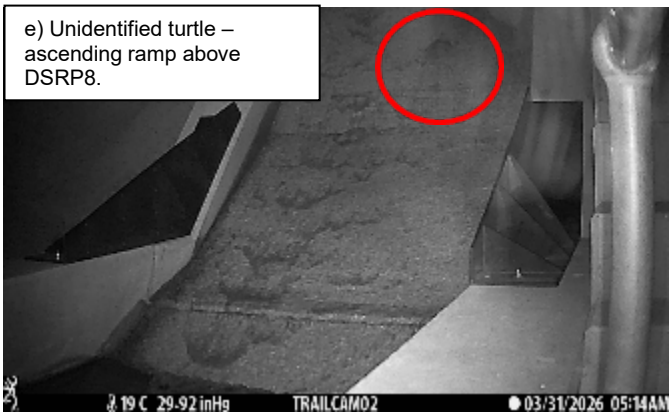
c) Unidentified turtle – head seen at surface near resting pool USRP2.



d) Unidentified turtle – ascending ramp above DSRP8.



e) Unidentified turtle – ascending ramp above DSRP8.



f) Unidentified turtle – head seen at surface of horizontal ramp between USRP1 and USRP2.



g) Unidentified turtle – head seen at surface of resting pool USRP2.



h) Unidentified turtle – seen at surface of resting pool USRP1.



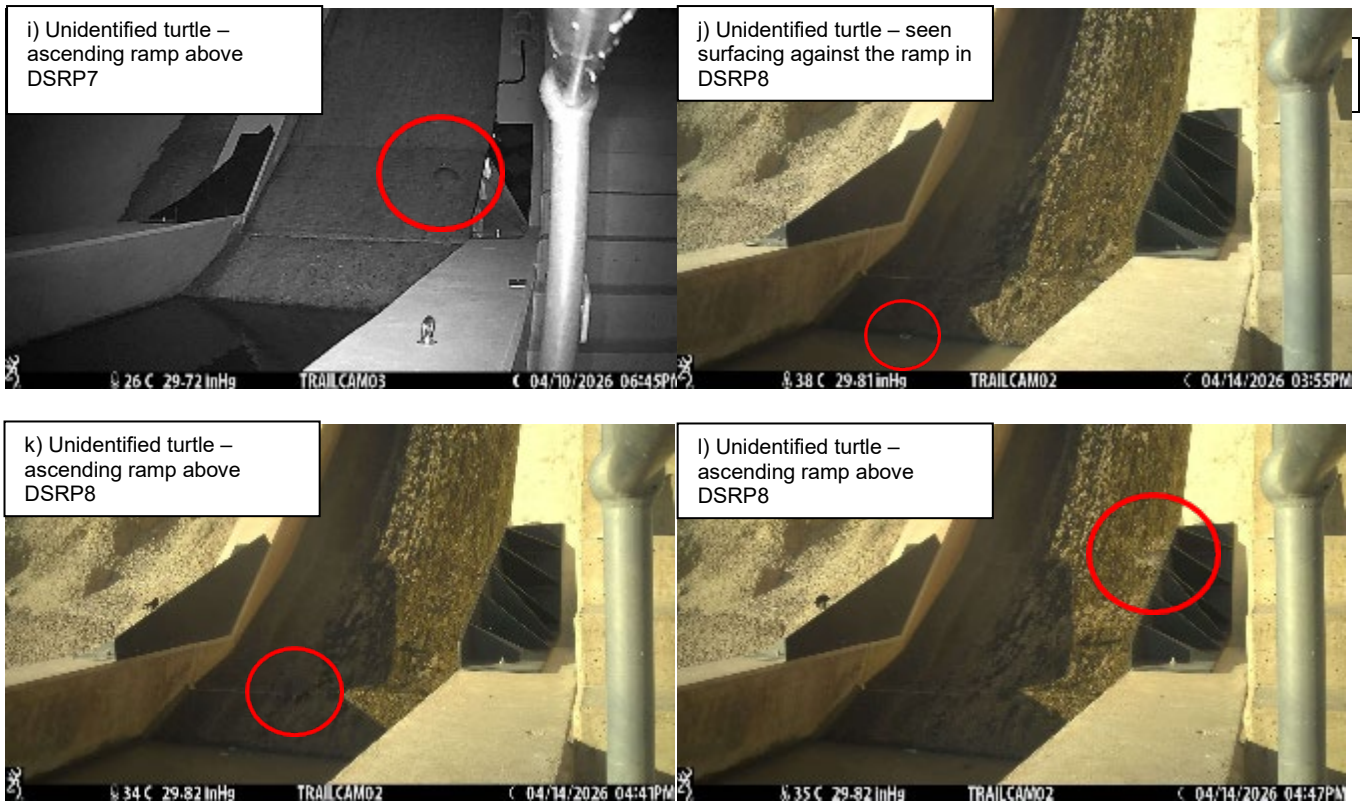


Plate 3.11 Turtles recorded via remote cameras (a-l in chronological order), date stamp format mm/dd/yyyy

3.4 Operational inspections and observations

Completed turtle passage inspection, turtle observation, and turtle injury/mortality forms up to 15 May 2026, are provided in Appendix C, Appendix D, and Appendix E, respectively. These were completed by a combination of Sunwater and GHD during operational inspections and field survey events.

3.4.1 Turtle passage inspections

A total of 16 turtle passage inspection forms were completed during Year 2 2025-26 of operational phase monitoring (Appendix C). Forms were completed between June, 2025 to May 15, 2026. Of these, 12 were completed by Sunwater monthly from June 2025 to May 2026, and four completed by GHD; once during each turtle capture or hydrophone survey.

3.4.2 Flow depth and velocity

After standardising units and averaging across all flow depth and velocity observations (Appendix C):

– Ramp sections were characterised by shallow flow depths, generally ≤0.05 m, and highly variable velocities ranging from near-zero to approximately 2.0 m/s on the vertical ramp sections, with higher values recorded during June–September 2025 and March 2026 inspections.
– Resting pool sections were recorded displaying consistent depths, typically ~0.4–0.6 m, and low flow velocities, generally ≤0.03 m/s across both upstream and downstream passages.

Temporal variability in ramp flow velocities was observed, with reduced velocities recorded during October–December 2025 (generally ≤0.3 m/s), followed by increased velocities during early 2026 inspections (February to April). The vertical ramp flow velocity between downstream resting pools (DSRP6 to DSRP5) was found to be low (0.02 m/s) during the May 2026 inspection. This variability in ramp flow velocities reflects ongoing adjustment of operational settings as part of adaptive management of the turtle passage and needs to be monitored closely to provide sufficient attraction flows within ramps.

From September 2025 onwards, sections of the upstream passage (particularly USRP6–USRP7) were frequently not measurable due to inundation, with inspection records noting these sections were submerged and inaccessible during surveys.

3.4.3 Condition of turtle passage infrastructure

Within resting pools, algal growth and sediment accumulation were consistently recorded across most inspections (Appendix C). Algal growth was variously described as light, moderate, or extensive, and typically occurred as filamentous mats or surface films. Sediment accumulation was also common, with reported depths including approximately 0.3 m in DSRP8 (March 2026) and up to 0.2 m in upstream pools. Heavy sediment build up in USRP5 was noted in May 2026 inspection. Elevated turbidity and fine sediment deposition were also noted in multiple inspections (Appendix C).

Ramp sections similarly exhibited persistent algal buildup, particularly on vertical and flat ramp surfaces. Algal growth ranged from thin films to extensive sheeting, with observations including approximately 10 mm buildup on ramp surfaces (January 2026) and heavy or extensive growth in downstream sections during later inspections (Plate 3.12). Sediment and vegetation accumulation on ramps was also noted, particularly at USRP5, where material partially obstructed flow in some instances (Plate 3.12).

The abutment tunnel consistently exhibited debris and sediment accumulation, commonly attributed to material entering through the surface grating, including gravel and soil from vehicle movements. While generally not considered obstructive to turtle movement, sediment buildup within the tunnel was a recurring observation.

Structural conditions of the turtle passage were generally sound; however, several issues were routinely identified. These included formation of a concrete “lip” at PIT tag reader installations at USRP5 and DSRP8, which has potential to impact turtle movement or cause injury, and minor structural defects such as a leaking construction joint identified in January 2026. Missing handles on hand-operated globe valves were also recorded across multiple inspections.

3.4.4 Maintenance requirements

Most inspections concluded that routine maintenance was required to manage sediment, algal growth, and debris accumulation within the turtle passage.

Recurring maintenance recommendations included:

– Removal of sediment from resting pools, particularly in DSRP8 and upstream pools (USRP1–USRP5)
– Cleaning or flushing of algal buildup from ramp surfaces and resting pools
– Removal of sediment and debris from the abutment tunnel and ramp transition zones
– General “flush out” or system clean, recommended intermittently across several inspections.

Specific maintenance actions identified during inspections included:

– Rectification of the concrete “lip” at PIT tag reader locations to reduce potential turtle injury
– Replacement of missing handles on hand-operated globe valves
– Adjustment of flow conditions, including modification of valve settings to optimise velocities
– Repair of minor structural defects, including a leaking construction joint.

All the identified maintenance requirements were first identified in Year 1 monitoring period and have not been addressed throughout the Year 2 period.



Plate 3.12 ***Algae growth and PIT tag reader lip protruding from the join on the ramp above DSRP8 (top left), algae on ramp and sedimentation build up with vegetation growth at entrance to USRP5 (top right), accumulation of debris and algae (bottom left), unsuitable attraction flow at downstream entrance (bottom right)***

3.4.5 Turtle observations

A total of 15 turtle observation forms were completed in Year 2 2025-26 (Appendix D). Of all observations in Year 2 2025-26, seven observations were of turtles within the turtle passage (Table 3.19), and eight observations were from below Rookwood Weir (Plate 3.13). One turtle was observed climbing the concrete bank immediately adjacent to the turtle passage downstream of the weir on 17 February 2026 (Plate 3.13). The species of this turtle could not be identified; however, it is an important observation because a reported turtle mortality occurred from a fall in September 2025 near to this location (Plate 3.15). Twelve observations were reported of turtles that could not be species identified. Of the remaining three observations reported, two were white-throated snapping turtles, and one was a Fitzroy River turtle. The white-throated snapping turtle observations were at the base of Rookwood

Weir in September 2025 and January 2026. The one observation of a Fitzroy River turtle was in January 2026 and was seen within the downstream resting pool (DSRP2) at the top the turtle passage. There were no recorded observations of turtles upstream of the weir. All observed turtles were reported as being healthy and no signs of injury.

Table 3.19 Turtle observations within the turtle passage

Date	Time	Species	Location
31 July 2025	11:33	Unknown	DSRP2
08 Jan 2026	10:50	Fitzroy River turtle	DSRP2 horizontal ramp
14 Jan 2026	14:25	Unknown	USRP3
26 Feb 2026	12:45	Unknown	DSRP5
03 Mar 2026	10:51	Unknown	DSRP2
03 Mar 2026	11:21	Unknown	DSRP3
10 Mar 2026	13:07	Unknown	DSRP2



Plate 3.13 Reported turtle observations: unidentified turtle climbing concrete bank next to turtle passage (left), unidentified turtles within turtle passage (middle and right)

3.4.6 Turtle injury/mortality

Five turtle injury/mortality forms and three follow-up incident reports were completed in Year 2 2025-26 (Appendix E). A total of 11 turtle mortalities were reported in the Year 2 monitoring period, consisting of seven white-throated snapping turtles, three Fitzroy River turtles and one Krefft's turtle.

Two of the mortality reports from Year 2 monitoring period were found to be a related incident and resulted in an incident report conducted by Sunwater. The incident reported:

A total of nine turtle mortalities were identified on the left bank or Rookwood Weir on 22 and 25 August 2025. This included one (1) Fitzroy River turtle (Rheodytes leukops) and seven (7) White-throated snapping turtles (Elseya albagula), of which three (3) were gravid. The time of death is unknown, however may be related to a high flow event during the period 1 to 20 April 2025.

All nine carapaces were found in various states of decay in the scour protection on the left bank of the weir (Plate 3.14). One of the carapaces was identified as a Krefft's turtle (*Emydura* krefftii). The cause of death is unknown but appears to be linked to the flood event in April 2025, where the turtles may have been trapped in the scour protection whilst seeking refuge or got caught during receding water levels.

Corrective actions outlined in the incident report by Sunwater included:

– Undertake site inspection to ascertain extent of impact
– Notify the DETSI in writing
– Undertake daily site inspections (or as required) during and post high flow events
– Seek advice from a suitably qualified person to determine the potential impacts of the incident
– Investigate options for rock scour protection appropriate for turtles
– Undertake remediation works as per investigative options, if practicable and appropriate



Plate 3.14 Reported Fitzroy River and White-throated snapping turtle mortality in August 2025

Another mortality in Year 2 2025-26 was reported by GHD staff on 4 September 2025. During the turtle passage inspection, a Fitzroy River turtle was identified deceased beside the turtle passage (Plate 3.15). The turtle appeared to have climbed the abutment between the turtle passage and the weir wall and fallen from height, causing large cracks in the plastron and subsequent death. Three adaptive management actions were recommended to Sunwater to prevent future occurrences of this type of mortality or injury. These included:

– Reviewing camera footage for evidence of the fall to inform management decisions
– Potentially barricading the bank area downstream of the turtle passage
– Monitor the area regularly for other turtles not within the turtle passage

During the May 2026 turtle capture survey, a deceased Fitzroy River turtle was discovered by GHD staff on the left bank of the Fitzroy River, approximately 500 m downstream of Rookwood Weir (Plate 3.16). The turtle was partially decomposed and had no visible signs of injuries to the carapace, plastron, limbs or head. The cause of mortality could not be determined. The immediate actions advised were to survey the banks downstream of Rookwood Weir to Rookwood riffle for any additional sick, injured or deceased turtles. No adaptive management actions were recommended as there was insufficient evidence to attribute the turtle mortality to the operation of Rookwood Weir.



Plate 3.15 *Fitzroy River turtle mortality near turtle passage in September 2025*



Plate 3.16 *Deceased Fitzroy River turtle found downstream of Rookwood Weir in May 2026*

4. Compliance with success criteria

In accordance with Project approval conditions, the turtle passage infrastructure and turtle protection design features were monitored to assess effectiveness against the approved performance criteria (Section 1.2.2). This monitoring has formed part of the operations phase turtle monitoring program. Table 4.1 assesses whether the success criteria have been achieved through evidence (provided in Section 3) and whether the contingency program threshold has been triggered requiring corrective actions.

As outlined in Section 2.9, several success criteria were conservatively assessed during Year 1 2024-25 due to limited data availability, with the expectation that improved data collection during Year 2 2025-26 would support a more robust assessment. However, findings from Year 2 2025-26 indicate that data availability and quality remain insufficient to support full or defensible assessment of several criteria. Key limitations include:

– Deficiencies in monitoring technology: monitoring methods have demonstrated uncertainty in suitability for turtle detection within the turtle passage infrastructure and low detection probability (i.e. unreliability) leading to low sample sizes of data available for analysis. Specifically,
    - No turtle detections recorded on PIT tag readers during Year 2 2025-26, noting that the PIT tags installed prior to November 2025 were ineffective for detections on the turtle passage PIT tag readers. New PIT tags were implemented from November 2025 capture survey which have since been confirmed to be detected by the PIT tag readers, however, detection probability remains unknown.
    - Limited ability to confirm turtle movement through the turtle passage using hydrophone data, with several turtles detected moving upstream past the weir but their use of the turtle passage unable to be verified. Detection probability of the hydrophones within the turtle passage pools remains unknown.
    - Observations of turtles within the turtle passage from remote cameras and opportunistic observations, with detections of insufficient resolution or consistency to confirm successful passage events (i.e. unable to identify species). Remote cameras are ineffective at detecting turtles within the turtle passage infrastructure.
– Sampling design inconsistencies: Differences in tagging effort between pre-construction and operation phases preclude meaningful comparison relating to sex ratios and seasonal movement patterns across Project phases, and therefore relevant success criteria have not been formally assessed, although relevant observations have been noted where applicable.
– Data analysis limitation: In the absence of effective monitoring technology, data has been pooled across monitoring methods with expected variation in detection probability. To draw robust inferences about turtle movement with high confidence, detections must be generated by the same technology, and species-specific detection probability for that technology must be quantifiable. Mixing uncalibrated methods undermines comparability and confidence in the results.

As a result of these limitations, the dataset does not provide a reliable basis for statistical data analysis. Accordingly, success criteria have been assessed based on absolute values (or percentage of absolute values) where sufficient data are available. Where data are limited, outcomes have been interpreted cautiously given the available information. Where data are demonstrably insufficient, formal assessment has not been undertaken. Further detail on these limitations is provided in Section 2.9.2.

Finally, it is noted that the success criteria were developed prior to implementation of the turtle passage and operational monitoring program. As such, ongoing refinement of monitoring methodologies has occurred concurrently during the operations phase, and the Rookwood Weir Operations SMP, which includes all success criteria, is currently under review to improve monitoring methodology and suitability of the success criteria.

Table 4.1 Assessment of turtle movement information against the success criteria

No.	Success Criteria	Outcome and evidence	Corrective action required & contingency program threshold
Management strategy 1 – Turtle movement **Management strategy 2 – Turtle protection**			
1	75% of white-throated snapping turtles and Fitzroy River turtles that attempt to use the turtle passage each year for upstream passage will do so successfully.	**Success criteria unable to be adequately assessed** ***The data available for Year 2 2025-26 is considered insufficient to be able to assess this success criteria. As such, only an interpretation of available data is provided.*** – Two white-throated snapping turtles and three Fitzroy River turtles were detected attempting to use the turtle passage between March 2025 and May 2026 (i.e. Year 2 2025-26) based on hydrophone data, incidental observations and capture data. Of these, one white-throated snapping turtle was confirmed to successfully move upstream through the entirety of the turtle passage. No Fitzroy River turtles were confirmed to move upstream through the turtle passage during Year 2 2025-26. – This equates to 50% of white-throated snapping turtles and 0% of Fitzroy River turtles successfully using the turtle passage to move upstream of Rookwood Weir. – Successful attempts of turtles utilising the turtle passage included the following: • Turtles recorded on hydrophones: Two white-throated snapping turtles and one Fitzroy River turtle were recorded on hydrophones within the lower downstream resting pool (DSRP8) during Year 2 2025-26. • Opportunistic observations of turtles within the passage: one confirmed Fitzroy River turtle was observed by Sunwater staff during Year 2 2025-26. – Turtles captured within the passage: one confirmed Fitzroy River turtle caught during May 2026 (end of the Year 2 2025-2026 monitoring period). However, for Year 2 2025-26, it is unknown whether this turtle successfully navigated the turtle passage but is an indication that the species is utilising the turtle passage. The successful attempt of this turtle will be assessed for Year 3 2026-27. – Twelve turtles were recorded by the remote cameras utilising the passage, however, the species could not be identified and there is no evidence that they completed the full upstream movement through the passage. – Nine white-throated snapping turtles were identified (acoustically) to have moved from downstream to upstream of the weir but were not recorded within the turtle passage. It is unknown how these turtles navigated upstream of the weir. These occurrences were not counted as successful passage of the turtle passage but do demonstrate there is movement past the weir. – The limited data available, and low quality of this data (e.g. camera images unable to be identified for species, PIT tag readers not operating properly) is considered insufficient for this criteria to be accurately assessed. It is recommended that this success criteria be revised as part of the Operations Species Management Plan review.	**Insufficient data available to assess performance against contingency program threshold** *See outcomes and evidence for further details* Threshold: < 50% of Fitzroy River turtles that attempted to use the turtle passage successfully did so.

No.	Success Criteria	Outcome and evidence	Corrective action required & contingency program threshold
2	Turtle monitoring downstream of the weir demonstrates no turtle injury/mortality during downstream turtle passage over the spillway, as evidenced by impact damage to turtles.	**Success criteria achieved** **There were no identified mortalities from downstream movement over the spillway however, 3% of the white-throated snapping turtles and 4% of Fitzroy River turtles had major injuries potentially indicative of contact with hard surfaces. There were other mortalities and injuries recorded within the vicinity of Rookwood Weir:** – One deceased Fitzroy River turtle was recorded beside the downstream side of the turtle passage during Year 2 2025-2026 monitoring, where it appeared to have fallen from a height causing large cracks in the plastron and subsequent death. The fall was not a result of downstream passage over the weir spillway but rather the weir concrete infrastructure adjacent to the turtle passage. – Nine turtles (seven white-throated snapping turtle, one Fitzroy River turtle and one Krefft's turtle) were identified deceased and decomposed within the scour protection rocks on the left bank, above and below the weir in August 2025. These turtles are thought to have been trapped within the rock resulting in drowning with no evidence of shell factures that would indicate mortality from downstream movement over the spillway. – A deceased Fitzroy River turtle was discovered on the left bank of the Fitzroy River, approximately 500 m downstream of Rookwood Weir. The turtle was partially decomposed and had no visible signs of injuries to the carapace, plastron, limbs or head. – Minor damage including grazes to the carapace and/or the plastron, and small chips to the external margins of scutes were recorded on 14 of the 66 white-throated snapping turtles and 15 of the 75 Fitzroy River turtles which were captured within 500 m downstream of the weir. – Major damage to the carapace was recorded for three of the 66 white-throated snapping turtles, and three of the 75 Fitzroy River turtles. – Overall, during 2025-26, 21% of white-throated snapping turtles and 20% of Fitzroy River turtles showed signs of fresh or healed injuries. Compared to pre-construction levels (noting difference is sampling sizes prevents reliable comparison), injury rates during operations were slightly lower for white-throated snapping turtles (28%) and for Fitzroy River turtles (34%), and also lower than the injury rates observed during Year 1 2024-25 (35% and 25% for white-throated snapping turtles and Fitzroy River turtles, respectively). – Of the major injuries and mortalities, 3% of the white-throated snapping turtles and 4% of Fitzroy River turtles potentially had injuries indicative of impacts from the weir/turtle passage – Ramps sections of the turtle passage where PIT tag readers are installed may present an emergent risk or injury to turtles due to protrusion of the lip between concrete sections under which PIT tag readers are installed (e.g. ramp section above USRP5). – Overall, as there were less than 5% of white-throated snapping turtles and Fitzroy River turtles which were recorded with evidence of impact damage within 500 m downstream of the weir, no corrective actions are required. The rock scour protection is a high risk to turtle mortality and corrective actions should be implemented as soon as possible to minimise turtle deaths.	**No** Threshold: < 5% of turtles recorded within 500 m downstream of the weir within a 12-month period show evidence of impact damage (i.e. serious shell fractures).

No.	Success Criteria	Outcome and evidence	Corrective action required & contingency program threshold
3	The turtle passage remains operational (attraction flow is provided and passage unobstructed) continuously when the storage is above 8,000 ML up to a 1 in 5-year spilling event.	This success criterion is out of scope for the turtle movement study so is to be assessed by Sunwater.	To be assessed by Sunwater.
4	The turtle passage operates for one week after each four weeks of non-operation when the storage is below 8,000 ML.	This success criterion is out of scope for the turtle movement study so is to be assessed by Sunwater.	To be assessed by Sunwater.
5	75% of adult white-throated snapping turtles and Fitzroy River turtles recorded within 50 m of the turtle ramp and fishway entrances within a 12-month period are attracted to and can successfully locate the turtle passage entrance (as defined as entering the funnel-shaped ramp).	**Success criteria unable to be adequately assessed** ***The data available for Year 2 2025-26 is considered insufficient to be able to assess this success criteria. As such, only an interpretation of available data is provided.*** – Two out of 70 white-throated snapping turtles and three out of 32 Fitzroy River turtles recorded within 50 m of the turtle ramp and fishway entrances (or assumed to have transited through this area) were subsequently recorded, captured or observed within or beyond the DSRP8 between during Year 2 2025-26 (refer to Success Criteria 1 for further details). – This equates to 3% of white-throated snapping turtles and 9% of Fitzroy River turtles which were successfully attracted to and located the turtle passage entrance. – Turtles recorded within 50 m of the turtle passage and fishway included the following: • 70 white-throated snapping turtles and 30 Fitzroy River turtles recorded on the downstream approach channel hydrophone during Year 2 2025-26. • The additional two untagged Fitzroy River turtles observed/captured within the turtle passage during Year 2 2025-26. These individuals are assumed to have transited through the downstream approach channel in order to move upstream through the turtle passage. – However, data availability and confidence is currently limited by the following: • The remote cameras do not adequately capture turtle movements at the turtle passage entrance or throughout the turtle passage. The cameras also do not allow for confident identification of species, direction of movement or turtle behaviour while on the turtle passage.	**Insufficient data available to assess performance against contingency program threshold** Threshold: < 50% of adult white-throated snapping turtles and Fitzroy River turtles recorded within 50 m of the turtle ramp and fishway entrances within a 12-month period, were attracted to and successfully located the turtle passage entrance.

No.	Success Criteria	Outcome and evidence	Corrective action required & contingency program threshold
		• The PIT tag readers were unable to read any turtles with PIT tags fitted prior to November 2025. • Hydrophones located within the turtle passage may be affected by signal reflection from the passage structure, particularly under shallow water conditions, which has the potential to reduce detection accuracy and transmitter identification reliability. • Overall, detection probabilities for all monitoring equipment remain unverified, with available evidence indicating low reliability and likely under-detection of turtles using the turtle passage. – A further 12 unidentified turtles were observed or photographed on remote cameras within the turtle passage. These were unable to be counted as successful attempts to locate the turtle passage entrance. – The limited and low-quality data currently available does not allow this criterion to be robustly assessed. However, the comparatively low number of observations recorded within the turtle passage (i.e. <5 for each species), relative to the number of turtles recorded within 50 m downstream (>30 for each species), suggests that fewer than 50% of both white-throated snapping turtles and Fitzroy River turtles are being attracted to and successfully navigating the passage. – It is recommended that this success criterion be revised as part of the Operations Species Management Plan review.	
6	75% of adult white-throated snapping turtles and Fitzroy River turtles that attempt to use the ramp within a 12-month period can successfully ascend the ramp and pool arrangement to reach the abutment throughfare.	**Success criteria unable to be adequately assessed** ***The data available for Year 2 2025-26 is considered insufficient to be able to assess this success criteria. As such, only an interpretation of available data is provided.*** – One out of two white-throated snapping turtles and two of three Fitzroy River turtles that were detected attempting to use the turtle passage were acoustically recorded and/or observed in the downstream upper resting pools (DSRP1-3) before the abutment thoroughfare between March 2025 and May 2026 (i.e. Year 2 2025-26). – This equates to 50% of white-throated snapping turtles and 66% of Fitzroy River turtles successfully ascending the ramp and pool arrangements to reach the abutment thoroughfare. – Successful attempts of turtles ascending the turtle passage ramp sections included the following: • Turtles recorded on hydrophones: one white-throated snapping turtles was recorded on hydrophones moving through the entire turtle passage during Year 2 2025-26. • Opportunistic observations of turtles within the passage: one confirmed Fitzroy River turtle was observed by Sunwater staff during Year 2 2025-26 in DSRP1 suggesting it had ascended the turtle passage ramp. • Turtle captured within the passage: one confirmed Fitzroy River turtle was found in DSRP2 suggesting it had ascended the turtle passage ramp.	**Insufficient data available to assess performance against contingency program threshold** *See outcomes and evidence for further details* Threshold: > 50% of adult white-throated snapping turtles and Fitzroy River turtles that attempted to use the turtle passage within a 12-month period, successfully ascended the ramp and pool arrangement to reach the abutment thoroughfare.

No.	Success Criteria	Outcome and evidence	Corrective action required & contingency program threshold
		– The data available suggests that both the white-throated snapping turtle and Fitzroy River turtle are capable of successfully ascending the ramp and pool arrangement to reach the abutment throughfare however, the limited data available, and low quality of this data is considered insufficient for this criteria to be accurately assessed. It is recommended that this success criteria be revised as part of the Operations Species Management Plan review.	
7	75% of adult white-throated snapping turtles and Fitzroy River turtles that attempt to use the ramp within a 12-month period can successfully move through the abutment throughfare.	**Success criteria unable to be assessed** ***The data available for Year 2 2025-26 is considered insufficient to be able to assess this success criteria. As such, only an interpretation of available data is provided.*** – One out of one white-throated snapping turtles and zero out of two Fitzroy River turtles that were acoustically recorded and/or observed on the downstream side of the abutment thoroughfare were also recorded and/or observed on the upstream side of the abutment thoroughfare between March 2025 and May 2026 (i.e. Year 2 2025-26) indicating movement through the abutment tunnel. – This equates to 100% of white-throated snapping turtles and 0% of Fitzroy River turtles which successfully moved through the abutment thoroughfare. – Successful attempts of turtles navigating through the abutment thoroughfare included only one white-throated snapping turtle. This individual was recorded on hydrophones moving through the entire turtle passage during Year 2 2025-26. – The limited data available, and low quality of this data is considered insufficient for this criteria to be accurately assessed. It is recommended that this success criteria be revised as part of the Operations Species Management Plan review.	**Insufficient data available to assess performance against contingency program threshold** *See outcomes and evidence for further details* Threshold: < 50% of adult Fitzroy River turtles that attempted to use the turtle passage within a 12-month period, successfully moved through the abutment thoroughfare.
8	75% of adult white-throated snapping turtles and Fitzroy River turtles that attempt to use the ramp can successfully descend the turtle ramp from the abutment throughfare into the impoundment to complete passage past the weir.	**Success criteria unable to be assessed** ***The data available for Year 2 2025-26 is considered insufficient to be able to assess this success criteria. As such, only an interpretation of available data is provided.*** – One out of one white-throated snapping turtles and no Fitzroy River turtles were acoustically recorded and/or observed moving between the upstream side of the abutment thoroughfare to the upstream approach channel/weir pool between March 2025 and May 2026 (i.e. Year 2 2025-26). – This equates to 100% of white-throated snapping turtles and 0% of Fitzroy River turtles which successfully moved from the abutment thoroughfare and descended down the upstream ramp sections and into the weir pool. – Successful attempts of turtles descending the turtle ramps from the abutment thoroughfare included only one white-throated snapping turtle. This individual was recorded on hydrophones moving through the entire turtle passage during Year 2 2025-26. – The limited data available, and low quality of this data is considered insufficient for this criteria to be accurately assessed. It is recommended that this success criteria be revised as part of the Operations Species Management Plan review. –	**Insufficient data available to assess performance against contingency program threshold** *See outcomes and evidence for further details* Threshold: < 50% of adult Fitzroy River turtles that attempted to use the turtle passage within a 12-month period, successfully descend the turtle ramp from the abutment thoroughfare into the impoundment to complete passage past the weir.

No.	Success Criteria	Outcome and evidence	Corrective action required & contingency program threshold
9	Turtle monitoring demonstrates no predation of turtles from within the turtle passage infrastructure.	**Success criteria achieved** – There was no evidence of predation or attempted predation of turtles observed/recorded on the turtle passage between March 2025 and May 2026 (i.e. Year 2 2025-26). – No predatory birds or animals were observed on the turtle passage cameras in Year 2 monitoring period. – However, the remote cameras are considered ineffective at detecting turtles within the turtle passage and as such compliance with success criteria should be interpreted cautiously.	**No** Threshold: < 5% of turtles recorded within the turtle ramp within a 12-month period are subject to predation or attempted predation.
10	Turtle monitoring demonstrates no turtle injury and/or mortality from within the turtle passage as a result of falls.	**Success criteria achieved** – There was no mortality of turtles on the turtle passage as a result of falls observed or photographed between March 2025 and May 2026 (i.e. Year 2 2025-26). – However, the remote cameras are considered ineffective at detecting turtles within the turtle passage and as such compliance with success criteria should be interpreted cautiously. – There was one deceased Fitzroy River turtle was recorded beside the downstream side of the turtle passage, where it appeared to have fallen from a height causing large cracks in the plastron and subsequent death. However, this death occurred outside of the turtle passage structure and likely due to the turtle climbing the shotcrete.	**No** Threshold: < 5% of turtles recorded within the turtle ramp within a 12-month period are observed falling within or from the turtle ramp resulting in serious turtle injury/mortality.
11	The ratio of adult male and female white-throated snapping turtles and Fitzroy River turtles successfully moving upstream through the turtle ramp within a 12-month period is equivalent to pre-development ratios.	**Success criteria unable to be assessed** ***Quantitative comparison between pre-operational and operational data is not appropriate due to differences in monitoring methodologies across these phases at Rookwood Weir. Consequently, this success criterion cannot be reliably assessed, and only qualitative observations have been provided.*** – During pre-development a mean of four male and four female white-throated snapping turtles moved between hydrophones at the Rookwood Weir site. – During Year 2 2025-26 of operations, one adult male white-throated snapping turtle successfully moved upstream through the turtle passage. – During pre-development a mean of nine male and five female Fitzroy River turtles moved between hydrophones at the Rookwood Weir site. – During operations, no Fitzroy River turtles successfully moved upstream through the turtle passage. – The comparison of ratios is inappropriate for the purposes of any robust quantitative assessment between pre-development and operational phases. It is recommended that this success criteria be revised as part of the Operations Species Management Plan review.	**Insufficient data available to assess performance against contingency program threshold** *See outcomes and evidence for further details* Threshold: The ratio of adult male to female turtles successfully utilising the turtle ramp from the entrance channel to the impoundment within a 12-month period is substantially different to predevelopment ratios within a 12-month period.
12	Seasonal variation in use of the turtle ramp by adult male and female white-throated snapping turtles and Fitzroy River turtles is equivalent to pre-development seasonal	**Success criteria unable to be assessed** ***Quantitative comparison between pre-operational and operational data is not appropriate due to differences in monitoring methodologies across these phases at Rookwood Weir. Consequently, this success criterion cannot be reliably assessed, and only an interpretation of available data is provided.***	**Insufficient data available to assess performance against contingency program threshold**

No.	Success Criteria	Outcome and evidence	Corrective action required & contingency program threshold
	trends over a 12-month period.	– During pre-development, male white-throated snapping turtles predominantly moved upstream during September and October. During operations Year 2 2025-26, one male white-throated snapping turtles moved upstream past Rookwood Weir using the turtle passage in September/October 2025. Another four males moved upstream of the weir (September2025, December 2025 x 2 and January 2026) but these cannot be verified as movement through the turtle passage due to no records or observations of these turtles within the passage itself. – Seasonal movements upstream past Rookwood Weir for male white-throated snapping turtles during operations were slightly later, by approximately two months than during pre-construction in Year 2 monitoring. This was also observed during Year 1 2024-25 of operations. – During pre-development, female white-throated snapping turtles typically moved upstream during January, March, May and June. During operations Year 2 2025-26, there were two female white-throated snapping turtles recorded moving upstream of the weir (June 2025 and January 2026) but these cannot be verified as movement through the turtle passage due to no records or observations of these turtles within the passage itself. The timing of these movements aligns with the movement periods observed pre-construction. – During pre-development, male Fitzroy River turtles predominantly moved during June. During operations Year 2 2025-26, there were no male Fitzroy River turtles recorded moving through the turtle passage. – During pre-development, female Fitzroy River turtles typically moved upstream during September. During operations Year 2 2025-26, one female Fitzroy River turtle was recorded moving through the turtle passage. This turtle was captured in May which is different to the temporal movements observed pre-construction. – There is a notably limited amount of data for turtle utilising the turtle passage during Year 2 2025-26. As such, limited conclusions can be drawn on seasonal movement of turtles. Further monitoring will be required to confirm seasonal movements. – The comparison of ratios has been assessed as inappropriate for the purposes of any robust quantitative assessment between pre-development and operational phases. It is recommended that this success criteria be revised as part of the Operations Species Management Plan review.	*See outcomes and evidence column for further details* Threshold: The seasonal use of the turtle ramp (measured by attempted use and successfully passage per month) by adult white-throated snapping turtles and Fitzroy River turtles is substantially different to predevelopment seasonal trends in movement behaviour over a 12month period.
13	Measurement of the turtle ramp attraction flow during inspections and turtle capture monitoring events indicates that the depth of water flow on the upstream ramp remains suitable for turtles to climb as per annual depth criteria.	**Success criteria achieved on SQP advice** – The mean water flow on the ramp turtle passage sections on the downstream side of the weir during inspections was 2.4 cm. – The mean water flow on the ramp turtle passage sections on the upstream side of the weir during inspections was 4.3 cm. – During the inspection in May 2026, it was noted that there was minimal water flow on the downstream side of the turtle passage, with several ramps with algal build up contributing to no flow on parts of ramp sections. Additionally, there was sediment build up throughout all resting pools and along the abutment thoroughfare. The flow rate at the attraction funnel was	**No** Threshold: Depth of flow was reduced from 5 cm to 2.5 cm based on advice from SQP and subsequently achieved. Ongoing corrective actions are however recommended. It is recommended that the water flow is distributed over the width of the ramp to increase

No.	Success Criteria	Outcome and evidence	Corrective action required & contingency program threshold
		noted as too low and should be increased to increase attraction. Comparatively, the flow on the upstream side the flow was faster (0.3 m/s) and considered suitable for attraction to the passage entrance. – The low flow rate on the downstream ramp is not expected to restrict turtle movement (as would high velocity) but may reduce turtle attraction to the ramp entrance, up each ramp from the resting pool, and through the abutment tunnel. – As indicated in the Year 1 2024-2025 annual report, the annual depth criterion of 5 cm of flow is not achievable based on the flow rates required to increase the flow depth to 5 cm. The high rate of flow would not be suitable for turtles to climb the ramps. A lower annual depth criterion of 2.5 cm was recommended by the SQP during Year 1 2024-25 monitoring. It is subsequently recommended that the success criteria be revised to also consider velocity, depth and area of coverage rather than just depth as part of the Operations Species Management Plan review. – The suitability of the turtle passage flow is based on observations of flow conditions only as camera footage was unsuitable to assess turtle behaviour. The specific flow conditions required for turtle attraction and ramp use are unknown with recommendations based on opportunistic observations of turtle behaviour at other water infrastructure sites. It is expected that modifications to the turtle passage flow are likely to continue to occur overtime as analysis of turtle behaviour in response to flow variability can be monitored.	overall flow discharge volume and improve attraction at the ramp entrance, without increasing the depth of flow on the ramps.
14	Over a 12-month period, habitat conditions within the resting pools remain suitable for adult white-throated snapping turtles and Fitzroy River turtles, as evidenced by achievement of suitable pool depth criteria, compliance with water quality objectives, and long-term availability of shelters.	**Success criteria partially achieved** – The mean water depth in all resting pools during inspections was 0.38 m which is 0.12 m less than the defined 0.5 m of water depth. However, the difference in water depth of the resting pools from the defined water depth is less than 25%. – The upstream resting pools were notably shallower (mean 0.31 m) than downstream resting pools (mean 0.41 m), likely due to the build-up of silt in USRP5 which became inundated during Year 2 2025-26. The USRP5 resting pool had an average depth of 0.27 m across all passage inspections which is 46% shallower than the defined water depth. – Water quality in the resting pools was similar to the water quality of the Fitzroy River downstream and upstream of Rookwood Weir (refer Section 3.1.4.6). – Turbidity within the resting pools was higher than the water quality guidelines (85.1 NTU) but was comparable to the upstream environment (82.1 NTU). – Dissolved oxygen was slightly lower than the water quality guidelines. Overall, water quality conditions were still considered to be reasonable to support turtles. – There were frequent observations of silt deposition in resting pools throughout the turtle passage, with moderate to extensive sedimentation across every inspection for resting pools closest to passage entrances (DSRP8 and USRP5). Both pools showed a clear accumulation trend through Year 2 2025-26. Additionally, there was observed sediment build up within the abutment thoroughfare, with completely dry sections observed along shallower panels (e.g. between DSRP1 and USRP1).	**Yes** Threshold: Average habitat conditions within resting pools (as measured at three locations) is < 25% different to annual pool suitability criteria (initially defined as 0.50 m water depth. **No** Threshold: Water quality equivalent to background levels (temperature, pH, dissolved oxygen, conductivity and turbidity compliant (±25%) with conditions within similar depth habitat upstream and/or downstream).

No.	Success Criteria	Outcome and evidence	Corrective action required & contingency program threshold
		– The shelters were generally good condition for turtles to seek refuge. Due to excessive sediment build up identified in USRP5, the shelter would be covered and unusable. – There was recorded algae on the surfaces of ramps and shallow section of the turtle passage. – Overall, it is expected that habitat within the resting pools remains relatively suitable for white-throated snapping turtles and Fitzroy River turtles. However, the ongoing build-up of fine sediment is a concern, as excessive sedimentation can reduce effective pool depth, may impede turtle movement, increase risk of turtle injury/mortality during falls, and potentially affect water quality within pools. Without regular cleaning, continued accumulation may compromise the functionality of the resting pools as suitable shelters. This is of particular concern given that the most heavily sedimented pools (i.e. DSRP8 and USRP5) are typically the first pools turtles encounter when entering the passage from the downstream and upstream directions, respectively. If conditions within these entry pools are unsuitable, turtles may be deterred from entering or continuing through the passage altogether. Algae buildup on ramps are considered possibly detrimental to turtle movement, as the significant build of this on ramps is impeding water movement on downstream ramp sections. Additional video footage would likely be required to discern any possible benefit/impact of algae within the turtle passage.	
15	Annual monitoring downstream of the weir trash screens and inlets indicates no entrapment or drowning of white-throated snapping turtles or Fitzroy River turtles.	**Success criteria achieved** – There has been no evidence of weir trash screens and inlets entrapping or drowning white-throated snapping turtles or Fitzroy River turtles. – The headwater exit passage of the fishway and low flow inlet trash screens were inspected by Sunwater every 3 months with no injured or deceased turtles recorded during inspections. – However, as the storage level of the weir pool was high (minimum of 60%), any evidence of turtle mortality (i.e. turtle shell remains) at the base of the intake/screens would not be visible. – One deceased Fitzroy River turtle was recorded on the downstream side of the weir structure but the mortality was determined to be the result of a fall, and not the result of entrapment or drowning from the weir trash screens and inlets.	**No** Threshold: < 5% of turtles recorded within 500 m upstream and downstream of the weir within a 12-month period show evidence of entrapment/drowning on the weir trash screens or inlets.
16	Monitoring of the fishway over a 12-month period indicates no injury/mortality of white-throated snapping turtles or Fitzroy River turtles occurred within the fishway complex.	**Success criteria achieved** – There has been no evidence of injury/mortality of white-throated snapping turtles or Fitzroy River turtles from the fishway complex as observed through fishway inspections and during the fishway monitoring program. – There have been some injuries observed (see success criteria 2), however, these are unlikely to be the result of the fishway complex.	**No** Threshold: < 5% of the total number of turtles recorded within 500 m downstream of the fishway within a 12-month period show evidence of injury/mortality within the fishway or from fishway operation (as evidenced by entrapment/drowning within

No.	Success Criteria	Outcome and evidence	Corrective action required & contingency program threshold
			fishway and/or crushing injuries from gates).
17	At least 20 adult Fitzroy River turtles and white-throated snapping turtles recorded attempting to use the turtle passage within a 12-month period.	**Success criteria unable to be assessed** ***The data available for Year 2 2025-26 is considered insufficient to be able to assess this success criteria. As such, only an interpretation of available data is provided.*** – Two white-throated snapping turtles and three Fitzroy River turtle were recorded attempting to use the turtle passage which is less than the contingency threshold of 20 turtles. – A further 18 unidentified turtles were observed or photographed on remote cameras within the turtle passage. – The limited and low-quality data currently does not allow this criterion to be robustly assessed. – It is recommended that this success criteria be revised as part of the Operations Species Management Plan review.	**Insufficient data available to assess performance against contingency program threshold** *See outcomes and evidence column for further details* Threshold: < 20 adult Fitzroy River turtles and < 20 white-throated snapping turtles recorded using the turtle ramp within a 12-month period.
Management strategy 4 – Protection of habitat			
18	Suitable turtle habitat is present within, and/or upstream and/or downstream of Rookwood Weir.	**Success criteria achieved** – Suitable turtle habitat is present within the weir pool, and upstream and downstream of Rookwood Weir as evidenced by: • Confirmed presence of the two turtle species within, upstream and downstream of the weir. However, the high mortality at the left bank rock scour protection both upstream and downstream of the weir indicates that this is not a suitable area for turtles and should be mitigated. • Suitable water quality within the Fitzroy River, upstream and downstream of the weir • Confirmed nesting and successful recruitment of hatchings • Indicative turtle health similar to baseline turtle health. – Downstream, water quality was typically good except for the slightly low dissolved oxygen concentration. Within the weir pool, water quality was typically good except for the slightly low dissolved oxygen concentration. – A nesting bank is still present on the downstream left bank, however it was heavily eroded following flooding events in January and March 2026. The condition of this nesting bank has deteriorated since Year 1 2025-26, reducing the extent of suitable nesting habitat, although some sandy areas suitable for nesting remain. A predated turtle nest was recorded in May 2026 confirms that turtles continue to utilise this bank for nesting despite the recent erosion. This observation is consistent with monitoring undertaken during the 2025 nesting season, which recorded turtle nesting activity at Rookwood immediately upstream and downstream of the weir, Hanrahan's Crossing, Foleyvale Upstream, Foleyvale Far Upstream and The Pocket, indicating that these areas continue to function as important nesting habitats for freshwater turtles within the lower Fitzroy River system (Tunuba, 2026b).	**No** Threshold: Turtles have been identified within the impoundment or within 1 km downstream. Turtles captured in these areas are not in a poorer health than those recorded during baseline surveys (as measured by higher rates of injury/mortality/illness).

No.	Success Criteria	Outcome and evidence	Corrective action required & contingency program threshold
		– Successful recruitment of Fitzroy River turtles was observed downstream of the weir at Rookwood downstream riffle with the capture of four juveniles. – There were 20 white-throated snapping turtle and two Fitzroy River turtles acoustically recorded present within the weir pool immediately upstream of the weir wall between January 2025 and March 2026 (i.e. Year 2 2025-26). – Seven white-throated snapping turtles were captured within the weir pool immediately upstream of the weir wall during Year 2 2025-26 turtle capture field surveys. There are no suitable methods to capture Fitzroy River turtle upstream of the weir. – 51 white-throated snapping turtles and 68 Fitzroy River turtles were captured in Rookwood downstream pool and riffle during Year 2 2025-26 turtle capture field surveys. – Throughout operations (Year 1 and Year 2 inclusive) there was a slight increase (up by 3%) in the number of white-throated snapping turtles and slight decrease (down by 7%) of Fitzroy River turtles with minor grazes/chips to the carapace and plastron and eye damage compared with pre-construction. – In August 2025 nine turtles (including one Fitzroy River turtle and seven white-throated snapping turtles) were found in various stats of decay in the scour protection on the left bank of the weir. It is assumed that turtles may have become trapped and drowned during a flooding event in April 2025. Overall, turtle health during operation is comparable to pre-construction levels.	

5. Corrective actions

If monitoring evidence indicates that the success criteria are not being met, as per the triggers and monitoring frequency outlined in the Rookwood Weir Operations SMP, corrective/contingency actions will be implemented. Table 5.1 discusses success criteria which were not achieved, the corrective action outlined in the Rookwood Weir Operations SMP, the recommended course of action and the timing of the response.

For success criteria that were not assessed due to insufficient or unreliable data (refer Section 2.9 and Section 4), corrective actions as per the Operations SMP have not been applied, as the relevant triggers could not be reliably evaluated. Accordingly, it is recommended that these success criteria be reviewed and revised, and that updated corrective actions be developed to align with criteria that can be reliably assessed under the current monitoring program and methodologies used.

Table 5.1 Operations SMP corrective actions and recommendations to achieve success criteria

Success criteria no.	Operations SMP corrective action	Justification	Recommendation	Timeframe
Management strategy 1 – Turtle movement **Management strategy 2 – Turtle protection**				
13	If average water flow on the upstream ramp (as measured at three locations) is greater than 25% different to the annual depth criteria (initially defined as 5 cm of flow) to be refined and set after each 12 months of monitoring), corrective actions will be developed and implemented. Options may include: – Adjust volume/velocity of attraction flow: Globe values and SCADA to be adjusted as per Rookwood Weir Operation and Maintenance Plan, to maintain required discharge and height of flow over the ramps and pools. Discharge to be initially set to achieve 5-15 mm of flow over the ramps and pools. Target discharge and height to be informed by results of the turtle passage infrastructure monitoring. – Modify ramp substrate to improve grip. – Completion of maintenance/repair actions to restore operation as soon as possible.	1. Four species of turtle have been recorded using the turtle passage, including the upper pools 2. Attraction flows continue to be modified throughout the year as the ramp funnel water flow was observed to be low, and the downstream flow depth was notably lower than upstream flow (2.4 cm cf. 4.3 cm, respectively). There is no camera footage to confirm the outcome of the adjustments made to flow throughout Year 2. 3. During Year 1 2024-25 it was recommended that the recommended annual depth criteria be decreased to 2.5 cm.	1. Sunwater to continue to monitor turtle passage flows, ensuring flows are similar across both upstream and downstream sides of the turtle passage 2. Sunwater to conduct maintenance of the turtle passage including but not limited to the following: clean out resting pools and horizontal abutment thoroughfare of silt build up, clean ramp sections to remove algal build up, fix lip protrusions of concrete covering PIT tag readers on ramp sections 4. Decrease the annual depth criteria based on Year 1 and Year 2 to 2.5 cm.	As soon as practicable
14	If average habitat conditions within resting pools (as measured at three locations) is greater than 25% different to annual pool suitability criteria (initially defined as 0.50 m water depth, water quality equivalent to background levels (temperature, pH, dissolved oxygen, conductivity and turbidity compliant (±25%) with conditions within similar depth habitat	4. Mean water depth in resting pools during inspections was 0.38 m which is 0.12 m less than the defined 0.5 m water depth required for pool suitability. 5. Shelter is not available in all resting pools due to silt build up	5. Completion of maintenance/repair actions to restore suitable resting pool conditions as soon as possible. 6. Increase water depth and shelter availability within resting pools by removing sediment build up.	As soon as practicable

Success criteria no.	Operations SMP corrective action	Justification	Recommendation	Timeframe
	upstream and/or downstream), and shelter is available/functioning), to be refined and set after each 12 months of monitoring), corrective actions will be developed and implemented. Options may include: – Adjust volume/velocity of attraction flow and/or water depth/quality within resting pools. – Provide additional shelters and/or other habitat features within resting pools to control environmental conditions, provide protection and increase habitat value (foraging resources). – Pipework outlets for washdown lines allow for connection of temporary water pump to maintain flow during maintenance/repair of submersible pump. – Completion of maintenance/repair actions to restore operation as soon as possible.			

5.1 Other recommended corrective actions

5.1.1 Rock scour protection

Although not specifically related to a success criteria, the rock scour protection located on the left bank downstream of the weir has been identified as a high risk to turtle mortality during flood events and the right abutment between the turtle passage and the weir has been identified as a mortality risk associated with falling from a height onto a hard surface.

The following corrective actions are proposed:

1. Site inspection of the scour protection (reno mattress) completed on 25 August 2025 to assess the extent of impacts.
2. Relevant incidents were notified to the Department on 14 November 2024, 22 August 2025, 25 August 2025 and 16 September 2025.
3. Incident investigation reports detailing incidents, corrective actions, potential impacts and proposed remedial measures were submitted to the Department on 5 September 2025 and 26 September 2025.
4. Daily inspections during and following high-flow events were initiated, where safe and practicable, to identify and address fauna entrapment risks associated with the scour protection.
5. Independent advice regarding the potential impacts of the incidents was obtained through the Rookwood Weir Turtle Monitoring Program and documented in a technical memorandum.
6. Investigate options for rock scour protection appropriate for turtles, in the area of impact
7. Undertake remediation works as per investigative options, if practicable and appropriate
8. Undertake repairs on the eroded areas of the shotcrete on the right bank post wet season. The new design shall consider turtle access to this area. Where access cannot be prevented, barriers will be considered.

Corrective actions should be implemented as soon as possible to minimise turtle deaths. It is recommended that options to be investigated for the rock scour protection modification include infilling of the spaces between the rock to minimise areas where turtles can become entrapped. Options may include the use of smaller rock/substrate or shotcrete. It is also recommended that the area between the turtle passage infrastructure and the low-flow outlet on the right bank is modified to prevent turtles from being able to climb this area and accessing unsafe locations. Options may include installation of a vertical or overhanging smooth surface at least 0.5 m in height above typical tailwater levels (i.e. water level during low flow outlet releases).

5.1.2 Monitoring improvements

To improve data collection during Year 3 2026-27 monitoring, which would support a more robust assessment of success criteria, the following corrective actions are proposed:

1. Sunwater to reassess the type, number and placement of remote cameras. Cameras should ideally provide high quality imagery for identifying turtles, and consistency of imagery across a longer duration (i.e. 24/7 video footage for most reliable data capture, targeting turtle passage entrances) and capture the entirety of the turtle passage where possible.
2. PIT tag readers to be monitored throughout Year 3 2026-27 in conjunction with remote camera and hydrophone data to confirm the effectiveness of the new Biomark PIT tags.
3. Acoustic assessment of species-specific hydrophone detection probability within the turtle passage. to determine any interference with the turtle passage walls or infrastructure that may be limiting detection.

6. Conclusions and recommendations

As required by Project approval conditions, the results of the operations phase monitoring were assessed against the success criteria developed for the protection of turtles, turtle movement and habitat.

Not all success criteria were able to be assessed during Year 2 2025-26 due to limitations in data availability and reliability. Where sufficient information was available, success criteria were assessed; however, where data were insufficient or unreliable, criteria were not formally assessed or have been discussed qualitatively only. Based on this approach, of the 16 success criteria relevant to this operations phase monitoring report, compliance was achieved or partially-achieved with seven of the success criteria, one success criterion was not achieved, and eight were unable to be assessed.

The key assessment findings included:

– Both the white-throated snapping turtle and Fitzroy River turtles were confirmed successfully ascending the turtle passage ramp and pools sections. One white-throated turtle was confirmed successfully moving through the abutment tunnel and descending into the weir pool to successfully move upstream past Rookwood Weir. No Fitzroy River turtles were recorded successfully moving upstream through the passage in Year 2 2025-26. Nine white-throated snapping turtles were identified (acoustically) to have moved from downstream to upstream of the weir but were not recorded within the turtle passage. It is unknown how these turtles navigated upstream of the weir. These occurrences were not counted as successful passage of the turtle passage but do demonstrate there is movement past the weir. A further 18 unidentified turtles were observed or photographed on remote cameras within the turtle passage. These were unable to be counted as successful attempts to locate the turtle passage entrance but indicate higher use of the turtle passage than indicated by confirmed detection data.

  Overall, the number of turtles that were detected successfully moving upstream past the weir was low in relation to those recorded partially utilising the turtle ramp. The number of turtles attracted to the turtle passage entrance was also higher than the number of turtles locating and ascending the turtle passage. Based on the available information, the number of turtles utilising the turtle passage was considered too low to reliably assess utilisation of specific sections of the turtle passage (i.e. ascent/decent of ramps and travelling through abutment thoroughfare).
– There was no evidence of predation of turtles within the turtle passage, and monitoring indicates that injury and mortality rates associated with the weir and/or turtle passage were low (less than 5%). This represents a reduction compared to Year 1 2024-25, where higher rates of injury and mortality triggered corrective actions. A single mortality of a Fitzroy River turtle was recorded, associated with major shell and plastron damage likely resulting from a fall from concrete infrastructure adjacent to the turtle. Nine turtles (seven white-throated snapping turtle, one Fitzroy River turtle and one Krefft’s turtle) were identified deceased and decomposed within the scour protection rocks on the left bank, above and below the weir in August 2025. These turtles are thought to have been trapped within the rock scour protection resulting in drowning. There was no evidence of turtle injury or mortality associated with the weir trash screens, inlets or fishway.
– Overall, habitat conditions within the turtle passage were suitable for turtles however, the small attraction flow at the downstream passage entrance, high velocity flow on the ramp sections, algae growth, and cumulative sediment build up within resting pools were identified as having potential to impact turtle movement and/or habitat suitability.
– Suitable habitat for white-throated snapping turtle and Fitzroy River turtles remains present within, upstream and downstream of Rookwood Weir. Both species were confirmed present with the Rookwood Weir impoundment although, number of turtles captured and detected by the acoustic hydrophones was lower upstream of the weir than downstream. The distribution of turtles recorded by the acoustic hydrophones has constricted since the start of weir operations with the majority of turtles now located immediately upstream and downstream of Rookwood Weir. Suitable nesting habitat is present with turtle nesting activity recorded at Rookwood immediately upstream and downstream of the weir, Hanrahan's Crossing, Foleyvale Upstream, Foleyvale Far Upstream and The Pocket in 2025.

One success criterion was not achieved in Year 2 2025-26, meeting the threshold for corrective action. Attraction flow success criterion was achieved based on SQP advice, however corrective actions to increase turtle passage attraction has been recommended. The corrective actions required include:

– Refine and monitor attraction flows to improve consistency between upstream and downstream conditions and enhance the ability of turtles to locate and enter the turtle passage. Adjustments should be informed by ongoing monitoring results and observations.
– Conduct routine maintenance of the turtle passage, including removal of sediment and algae build-up, and rectification of structural features (e.g. lip protrusions or uneven surfaces) that may impede turtle movement.

Although not specifically related to a success criteria, the rock scour protection located on the left bank downstream of the weir has been identified as a high risk to turtle mortality during flood events and the right abutment between the turtle passage and the weir has been identified as a mortality risk associated with falling from a height onto a hard surface Corrective actions associated with design that have been proposed by Sunwater include:

– Investigate options for rock scour protection appropriate for turtles, in the area of impact
– Undertake remediation works as per investigative options, if practicable and appropriate
– Undertake repairs on the eroded areas of the shotcrete on the right bank post wet season. The new design shall consider turtle access to this area. Where access cannot be prevented, barriers will be considered.

Corrective actions should be implemented as soon as possible to minimise turtle deaths. Is recommended that options to be investigated for the rock scour protection modification include infilling of the spaces between the rock to minimise areas where turtles can become entrapped. Options may include the use of smaller rock/substrate or shotcrete. It is also recommended that the area between the turtle passage infrastructure and the low-flow outlet on the right bank is modified to prevent turtles from being able to climb this area and accessing unsafe locations. Options may include installation of a vertical or overhanging smooth surface at least 0.5 m in height above typical tailwater levels (i.e. water level during low flow outlet releases).

An additional eight success criteria were unable to be reliably assessed. However, as identified in Section 5, these outcomes are strongly influenced by monitoring limitations, including low detection rates within the turtle passage, uncertainty in monitoring equipment performance, and differences in tagging effort and spatial coverage. As such, trigger thresholds cannot be reliably interpreted as evidence of non-compliance or reduced passage performance.

Accordingly, it is recommended that the design of the monitoring program and the suitability of the success criteria are reviewed and modified to correct ongoing limitations in ability to meet the key objectives of the monitoring program, that is: *assess the effectiveness of the Rookwood Weir turtle passage infrastructure and turtle protection design features, and provide information on the relative abundance, dynamics, health and movement behaviour of the white-throated snapping turtle and Fitzroy River turtle population within the vicinity of Rookwood Weir.*

The monitoring program review should consider, but not be limited to, the following recommendations:

– Reliability and suitability of monitoring technology: monitoring equipment has demonstrated uncertainty in suitability for turtle detection within the turtle passage infrastructure and low detection rates (i.e. unreliability) leading to low sample sizes of data available for analysis. Specifically,
    - Acoustic telemetry: the acoustics hydrophones are effective in detecting broad-scale turtle movement however, hydrophones located within the turtle passage may be affected by signal reflection from the passage structure, particularly under shallow water conditions, which has the potential to reduce detection accuracy and transmitter identification reliability. Continuation of acoustic telemetry within the monitoring program will require assessment of species-specific hydrophone detection probability with the turtle passage. Attachment of acoustic tags should aim to achieve consistent sample size within each species (i.e. between males and females), between species, and across locations (i.e. upstream and downstream of Rookwood Weir), where possible within known constraints of turtle capture. Acoustics tags should continue to be deployed to maintain a sufficient sampling size for statistical analysis of movement results.
    - PIT tag readers: the detection probability remains unknown, and the performance of newly installed tags remains uncertain. Continuation of PIT tag readers within the monitoring program will require monitoring of species-specific detection probability and an increase in turtles tagged with the new Biomark PIT tags to increase sample size.
    - Remote cameras: remote cameras are not reliant on mark-recapture and have the potential to detect all turtle movement within the turtle passage infrastructure however, the current cameras deployed do not comply with the Rookwood Weir Operations SMP methodology and are ineffective at detecting turtles. Remote cameras should be replaced to provide continuous and high-quality imagery sufficient to reliably

detect, identify and interpret turtle species, movement and behaviour within the turtle passage. Quantification of species-specific detection probability of the new cameras will be required.

– Suitability of success criteria:
  - In the absence of effective monitoring technology, data has been previously pooled across monitoring methods with expected variation in detection probability. To draw robust inferences about turtle movement with high confidence, detections must be generated by the same technology, and species-specific detection probability for that technology must be quantifiable. Mixing uncalibrated methods undermines comparability and confidence in the results. The suitability of the success criteria should be reviewed and revised to align with a standardised monitoring methodology with consistent and quantified detection probability to avoid inappropriate data aggregation.
  - The current dataset does not provide a reliable basis for statistical data analysis. Accordingly, success criteria have been assessed based on absolute values (or percentage of absolute values). Success criteria should be quantified based on statistical analysis appropriate for the revised monitoring methodology.
  - Success criteria relating to sex ratios and seasonal movement patterns across Project phases should be removed from the monitoring program due differences sampling sizes.
  - The existing turtle movement and turtle protection success criteria (Operations Phase SMP Management Strategy 1 and Management Strategy 2) were selected to assess the effectiveness of specific design features of the turtle passage and weir. The suitability of each criterion should be reviewed against any changes made to monitoring / SMP objectives, limitations identified in assessment methodology and increased knowledge obtained during the first two years of operations phase monitoring.

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Appendices

Appendix A

Curricula Vitae

A GHD Associate

Dr Natalie Clark

Technical Director - Aquatic Fauna Passage and Ecology



Location
Brisbane, QLD, Australia

Experience
16+ years

Qualifications/Accreditations
– Dr Philosophy (Hons) 2008
– B/Science (Zoology and Marine Biology) 2002

Key technical skills
– Aquatic fauna passage
– Threatened turtles and water infrastructure
– Ecological impact assessment
– Threatened species management

Memberships
– Suitability qualified fishway ecologist
– GHD Animal Ethics Committee
– -Australian inclusion and diversity committee
– Neurodiversity Employee Resource Group

Relevant experience summary

Natalie is a GHD's lead aquatic ecologist with 17+ years' experience in aquatic ecosystem monitoring, impact assessment, threatened species management and aquatic fauna passage. Natalie completed her PhD on the impacts of river damming on freshwater turtle species and she has extensive experience in the design and implementation of freshwater turtle research projects and field surveys. Survey capabilities include in-field capture and handling of turtles, tagging of individuals for mark recapture, remote telemetry, nesting surveys and turtle nest protection. Natalie has supported Sunwater with the delivery of the Rookwood Weir project for more than 15 years. Specifically, Natalie led the design of the turtle passage infrastructure, the turtle protection design features, developed and implemented the TMS during Baseline and Construction phases, and developed the project SMP's and approvals including the Operations Phase TMS methodology and associated success criteria. Natalie has detailed knowledge and understanding of project design and operation, the approval conditions and the expectations of the regulators in relation to the TMS. This knowledge of the project, combined with her technical knowledge of the species and threatened species management, has allowed her to develop solutions to successfully deliver for the Rookwood Weir project for over a decade.

Rookwood Weir Turtle Movement Study and Turtle Passage Infrastructure – Turtle Monitoring Program

Technical Lead / Project Manager

Sunwater | Rookwood Weir, QLD, Australia

- Turtle Monitoring Program.
  Design and implementation of a turtle movement study. Project involved monitoring the movement behaviour of threatened turtle species via satellite, acoustic and mark-recapture telemetry. Data was collected and analysed to inform the design of turtle passage infrastructure.
- Turtle passage infrastructure design
  Natalie led the design process for the development of the first specifically designed turtle ramp in Australia. This process involved developing design criteria to target two threatened turtles and extensive engagement with Government Agencies and the Design Team. Success criteria and an operational phase monitoring program were developed to monitoring and assess the success of the design during project operation.
- Safe aquatic fauna passage
  Natalie led the design process for the provision of safe fish and turtle passage at Rookwood Weir. This process involved assessment and rating of risks from weir design and operation and development of design protection features.
- Turtle management
  Natalie led the development of Construction and Operational Species Management Plans, Nest Protection Plans and Offset Strategy/Management Plans for the threatened white-throated snapping turtle and Fitzroy River turtle.
- Turtle nest identification and protection – Natalie completed surveys within, upstream and downstream of Rookwood Weir to identify potential turtle nesting habitat and turtle nests. These surveys included detailed surveys of the Riverslea, Rookwood, Foleyvale and Hanrahan nesting bank

prior to pre-construction and construction activities. Turtle nests found were identified and protected with mesh.

Rookwood Weir Offsets Management Plan, Sunwater

Natalie was the technical lead for the development of an offsets management plan for threatened turtle species. Scope of work included identification of on-ground projects, multi-criteria assessment of options, engagement with Commonwealth and State government agencies, selection and development of final offset and development of offset management plan.

Rookwood Weir Environmental Approvals

Aquatic Ecology and Approvals Lead |

Natalie was the Aquatic Ecologist and Approvals Lead for the Rookwood Weir project over the 12 year period of the project design and construction. In addition to leading the delivery of the aquatic ecology EIS chapters and technical reports, Natalie supported Sunwater with obtaining secondary approvals and biodiversity offsets. During the detailed design phase, Natalie led the fishway design process for development of low- and high-level locks. Extensive engagement with DAF and the design team was undertaken to successfully obtain the project Development Approval for waterway barrier works. The innovative fish lock was also designed to support the project infrastructure sustainability council Excellent design rating for the project.

Wyaralong Dam Project

Technical Lead and Project Manager |

Natalie was the Technical Lead and project manager for the management of freshwater turtles during construction and operation of Wyaralong Dam. Key responsibilities included: development of a turtle management plan to manage potential impacts of dam construction and operation on freshwater turtle populations. Construction and operation phase turtle monitoring undertaken, engagement with dam operators, managers and regulators, critical assessment of monitoring results against program objectives legislative requirements, reporting to demonstrate compliance with approval conditions and management of project to time, budget, safety and quality requirements. Field surveys included turtle capture and tagging and turtle nesting surveys. Research published within Australian Journal of Zoology: https://www.publish.csiro.au/ZO/ZO17082

Urannah PHES Aquatic Fauna Passage Design and Environmental Approvals

Technical and Approvals Lead |

Natalie was the Technical Lead for the aquatic flora, fauna and fish passage components of a large scale EIS including two PHES locations. Expensive field surveys for aquatic flora and fauna values were designed and undertaken. Technical reports and EIS chapters were produced for each component of the project and included description of impacts, proposed avoidance and mitigation measures, assessment of significance and calculation of biodiversity offsets. Extensive engagement with the design engineer, client, fish passage biologist and Commonwealth and State regulators occurred throughout the project. Natalie led the fishway design process including identification of potential feasible fishway design options for PHES operations and completion of a multi-criteria assessment to identify the preferred solutions for the provision of safe and adequate upstream and downstream fish passage. Engagement with DAF was undertaken throughout the design process and the project assessed against State Code 18 Constructing and raising a waterway barrier in fish habitats.

Borumba Dam PHES and Pioneer Burdekin PHES Lower Reservoirs Aquatic Fauna Passage Design

Technical Lead |

Natalie led the fishway design assessment for the lower reservoir of the Borumba Dam PHES and the lower reservoir of the Pioneer-Burdekin PHES. Background information on the existing waterway, hydrology, aquatic fauna species and migration requirements were investigated. Natalie led a multi-disciplinary workshop of key stakeholders to identify potentially feasible aquatic fauna passage designs for the site and PHES operation. The benefits and constraints of each design were identified, and options assessed in a multi-criteria assessment to identify the preferred solution for the site to inform the business case. A multi-design aquatic fauna passage system was developed to accommodate the threatened fish and turtle species present at the sites. Design features for minimisation of aquatic fauna injury and mortality were also developed and advice provided for how to manage aquatic fauna passage during construction. Engagement with DAF occurred to discuss PHES specific impacts and design solutions.

Big Rocks Weir EIS and Fish Passage

Technical Lead |

Natalie led the ecology component of the EIS for Big Rocks Weir within the Burdekin River Catchment. Seasonal baseline surveys for ecological values were designed and implemented to meet Terms of Reference requirements. Technical reports were prepared following each field survey event and an EIS chapter developed with detailed description of matters of national, state, local and culturally important values, impact assessment of project design, construction and operation, detailed avoidance, mitigation and management measures, and completion of significant residual impact assessments. Management of aquatic fauna onsite included development of concept designs for aquatic fauna passage and extensive engagement with regulators.

Abbot Point – Cumulative Ecological Impact Assessment

Leadership Team |
Port of Abbot Point | Abbot Point, QLD, Australia

Natalie was part of the leadership and technical team undertaking a cumulative impact assessment (CIA) for five projects proposed for development at the Port of Abbot Point, Queensland. Project involved the assessment of cumulative impacts on key ecologically sensitive receptors including the Great Barrier Reef World Heritage Area, marine turtle nesting habitat, migratory shorebirds and the Caley Valley Wetland. Mitigation measures were identified and assimilated into impact management for individual projects as well as the cumulative development scenario. Recommendations for detailed design requirements were developed to achieve compliance with Australian Standards and best environmental practice. A key outcome included delivery of a Joint Environmental Monitoring Framework, specifying minimum requirements for all proponents to support management of potential cumulative environmental impact risks.

Cooby and Cressbrook Dam Upgrade Projects

Technical Lead |

Natalie facilitated the ecology assessment and fishway design process for dam upgrade works at Cooby and Cressbrook Dams. A detailed literature review and field surveys were undertaken to inform baseline conditions and the development of ecological objectives for the provision of fish passage within the Upper Brisbane and Balonne-Condamine Catchments. A fish migration model was prepared and fishway design specification and success criteria development to inform the fishway design process. A feasibility assessment of fishway designs was undertaken including assessment of water security and ecological benefit of fishway operation scenarios. Engagement with DAF was conducted to discuss the fishway design process and the ecological benefits on offsite fish passage and offsite mitigation. Offsite fishway mitigation measures were investigated.

Burdekin Falls Dam Raising Project

Technical Lead |

Natalie was the Technical Lead for an environmental assessment of Burdekin Falls Dam to support the dam raising project. Project involved the identification of aquatic ecological values present during the dry season within the existing water storage area, proposed inundation areas and downstream affected environment. Values identified included Matters of National, State and Local Environmental Significance and biosecurity threats.

Three Rivers Environmental Impact Assessment

Technical Lead Aquatic Ecology |

Natalie was the Ecology Lead for the Three Rivers Water Infrastructure Project. The project involved the identification of aquatic ecological values within the Flinders River catchment, assessment of impacts and environmental management for an irrigated cropping project and water supply.

Burdekin Falls Dam Raising Project – Ecological Impact Assessment

Technical Lead Aquatic Ecologist

Sunwater | Burdekin Falls Dam, QLD, Australia

Project involved the identification of aquatic ecological values present during the dry season within the existing water storage area, proposed inundation areas and downstream affected environment. Values identified included matters of National, State and Local Environmental Significance and biosecurity threats.

Abbot Point – Cumulative Ecological Impact Assessment

Senior Ecologist

Port of Abbot Point | Abbot Point, QLD, Australia

Natalie was part of the leadership and technical team undertaking a cumulative impact assessment (CIA) for five projects proposed for development at the Port of Abbot Point, Queensland. Project involved the assessment of cumulative impacts on key ecologically sensitive receptors including the Great Barrier Reef World Heritage Area, marine turtle nesting habitat, migratory shorebirds and the Caley Valley Wetland. Mitigation measures were identified and assimilated into impact management for individual projects as well as the cumulative development scenario. Recommendations for detailed design requirements were developed to achieve compliance with Australian Standards and best environmental practice. A key outcome included delivery of a Joint Environmental Monitoring Framework, specifying minimum requirements for all proponents to support management of potential cumulative environmental impact risks.

Coondoo Creek Bridge Replacement Project – Ecological Assessment and Threatened Species Management

Technical Lead

TMR | Coondoo Creek, QLD, Australia

Project involved the assessment of aquatic ecological values, assessment of impacts and ecological management associated with bridge replacement construction works and operation. Located in an area of high ecological significant management measures were developed to minimise risk to threatened species and habitats including the Australian lungfish, Mary River cod, Mary River turtle and white-throated snapping turtle.

A EPBC referral was prepared and approved with commendations from the Department of Environment. Species management programs and water quality plans were prepared to manage impacts during project construction.

Experience prior to joining GHD

- **Fauna Spotter, Queensland** – Rescue and relocation of terrestrial and aquatic fauna.
- **PhD Research, Queensland** – Investigations into the influence of changing environmental conditions on the behaviour and ecology of freshwater turtles.
- **Freshwater Ecosystem Monitoring, Mary River, Queensland –** Design and implementation of freshwater ecosystem monitoring programs in the Mary River.
- **Biological Monitoring, various Rivers –** Biological monitoring of freshwater turtle populations in the Brisbane, Mary, Burnett and Fitzroy Rivers;
- **Turtle Nesting Surveys and Nest Protection, Mary and Fitzroy River** – Identification and protection of freshwater turtle nests along the Mary and Fitzroy Rivers including training by Dr Col Limpus.

Lauren Pratt BMarSt (Hons)

Senior Aquatic Ecologist



Location

Brisbane, Queensland

Experience

16 years

Qualifications/Accreditations

- Bachelor of Marine Studies (Marine Biology and Ecology) Honours (2006)
- AusRivAS accredited (2018)
- Coxswains Near Coastal 3
- Remote Pilot's Licence (RePL) and Radio Licence (AROC)

Key technical skills

- Aquatic ecological assessment and field surveying
- Threatened species habitat assessments and targeted surveys
- Stygofauna sampling and assessment
- Waterway barrier works assessment
- Environmental impact and risk assessment
- Receiving environment monitoring programs

Relevant experience summary

Lauren Pratt is a Senior Aquatic Ecologist with 16 years' experience in freshwater, marine, and estuarine ecosystem monitoring. Lauren is currently project manager of the Rookwood Weir Operations Phase Turtle Monitoring Study (2024–2029), assessing the effectiveness of turtle passage infrastructure and protection features for the white-throated snapping turtle (*Elseya albagula*) and Fitzroy River turtle (*Rheodytes leukops*). Her work includes targeted turtle surveys, tagging (acoustic transmitters, PIT tags, monel foot tags, carapace notching), and nesting bank observations and searches across a 30 km reach equipped with acoustic hydrophones. Lauren has also conducted turtle nesting bank searches for several major infrastructure and water projects including the Urannah Water Scheme EIS, Capricornia PHES Project, Big Rocks Weir EIS. These projects involved ecological baseline assessments and targeted surveys for conservation-significant aquatic species, often in remote and environmentally sensitive areas. Lauren's expertise spans habitat assessments, water and sediment quality monitoring, and threatened species surveys, with a strong focus on remote and ecologically sensitive areas. She is highly skilled in survey design, data interpretation, and delivering clear, fit-for-purpose technical reporting across government and private sector projects.

Project experience

Rookwood Weir Operations Phase Turtle Monitoring Study 2024-2029

Tunuba | Rockhampton Region, QLD.

GHD were engaged by Tunuba on behalf of Sunwater to assess the effectiveness of the Rookwood Weir turtle passage infrastructure and turtle protection design features against agreed success criteria, and provide information on the relative abundance, dynamics, health and movement behaviour of the white-throated snapping turtle (*Elseya albagula*) and Fitzroy River turtle (*Rheodytes leukops*) population within the vicinity of Rookwood Weir. Targeted surveys for the two turtle species, identification and tagging of animals with acoustic transmitters and identification (PIT tags, monel foot tags and carapace notching) is completed twice yearly. An acoustic hydrophone array was designed and deployed over a 30 km reach. Data was downloaded and acoustic hydrophones have been maintained since 2017. Opportunistic observations and searches of turtle nesting banks was undertaken to supplement broad-scale turtle monitoring assessments. Lauren is the project manager and undertook fieldwork, data entry and analysis and reporting for this project.

Rookwood Weir Turtle Movement Study 2017-2023

Sunwater | Rockhampton Region, QLD.

GHD were engaged by Sunwater to complete a turtle movement study (TMS). The TMS was designed and implemented as an approval condition associated with

the construction and operational activities of Rookwood Weir on the Fitzroy River, Central Queensland. The TMS targeted two threatened turtle species, white-throated snapping turtle (*Elseya albagula*) and Fitzroy river turtle (*Rheodytes leukops*). Targeted surveys for the two turtle species, identification and tagging of animals with acoustic transmitters and identification (PIT tags, monel foot tags and carapace notching) was completed twice yearly. An acoustic hydrophone array was designed and deployed over a 30 km reach. Data was downloaded and acoustic hydrophones have been maintained since 2017. Turtle nest pre-clearance surveys were undertaken prior to the commencement of construction works. Annual reports were written describing turtle movement prior to and during construction. Lauren was the project manager and undertook fieldwork, data entry and analysis and reporting for this project.

Lake Manchester Significant Impact Assessment
SEQWater | South -East Queensland Region, QLD.

SEQWater were investigating options to commence water releases from Lake Manchester in to Cabbage Tree Creek. Seqwater engaged GHD to undertake preliminary technical assessments to investigate the feasibility of this option and Significant Impact Assessment undertaken for the Australian Lungfish (*Neoceratodus forsteri*) and platypus (*Ornithorhynchus anatinus*). Potential residual impacts were assessed in association with a change in the volume and frequency of water releases from the dam and the associated changes to water flows within Cabbage Tree Creek. A report was prepared to describe the potential impacts of the proposed works upon the two listed species in accordance with the relevant guidelines to inform approval requirements. Lauren provided technical advice for this project.

Urannah Water Scheme EIS
Bowen River Utilities | Mackay Region, QLD.

GHD was engaged by Bowen River Utilities to undertake environmental investigations of the Urannah Dam study area. The project footprint, wider study area and desktop survey extent were assessed for ecological values including protected areas, waterways providing for fish passage, aquatic habitat and condition, macrophytes and riparian vegetation, aquatic fauna and conservation significant species. Several baseline reports were written with subsequent EIS chapters currently in development. Lauren undertook the fieldwork, data entry and analysis and reporting for this project.

Capricornia PHES Project
Capricornia Energy Hub | Mackay Region, QLD.

Capricornia Energy Hub engaged GHD to complete environmental approvals and ecological baseline assessments for a proposed new pumped hydro-electric scheme north-west of Eungella. Lauren led the field surveys for the baseline ecology surveys and prepared baseline aquatic ecology reports to support the EIS. This included targeted surveys for MNES, MSES and MLES matters including the estuarine crocodile, platypus, Irwin's turtle, softspine catfish, small head grunter and waterways providing for fish passage. Lauren also completed data analysis and significant impact assessments for inclusion in the reports.

Big Rocks Weir Business Case & EIS
Townsville Enterprise Limited | Charters Towers Region, QLD

Townsville Enterprise Limited required aquatic ecology assessments of the Burdekin River where Big Rocks Weir and associated saddle dams are proposed to be constructed. These surveys included habitat assessment, in-situ water quality and surveys for fish, turtle and platypus. Surveys were carried out during pre-wet and post-wet conditions with targeted surveys for the endemic fish species small-headed grunter and softspine catfish also completed. Lauren led the fieldtrips, completed data entry and analysis and reporting. Reporting involved desktop reviews, interpretation of field results, impact assessment and mitigation measures.

Confidential Project EIS
CPB | Charters Towers Region, QLD.

CPB commissioned GHD to conduct an aquatic ecological assessment to identify environmental values, inform design decisions and recommend appropriate mitigation of potential ecological constraints of a confidential project. Surveys include habitat assessments, water quality monitoring, fish, turtle and stygofauna surveys. Lauren subsequently completed a technical report and EIS. Lauren led the field surveys, completed data entry and analysis and reporting for this project.

Environmental Impact Statement, Aquatic Ecology Assessment
Walton Coal | Central Highlands Region, QLD.

This project involved an assessment of aquatic ecology for baseline monitoring of a mining lease. Aquatic ecology (aquatic habitat, aquatic plants, macroinvertebrates, stygofauna and freshwater fish), and water quality (in situ and analytical water quality) were surveyed. The assessment considered aquatic matters of national, state and local environmental significance, and included both desktop and field survey assessment methods. Lauren was the fieldtrip leader and completed data analysis for this project.

BLUE EARTH ENVIRONMENTAL



Education / Qualifications

- Bachelor of Applied Science, Southern Cross University, 2004
- Australian River Assessment System (AUSRIVAS) Accreditation, University of Canberra, 2013
- Senior electrofishing operator (>1000 starts)
- Commercial vessel operator (Coxswain grade 3)
- Commercial drone operator (RePL & ReOC)

Areas of Expertise

- Assessment of freshwater ecosystems
- Environmental impact assessment
- Water quality and stream sediment assessment
- Electrofishing (boat and backpack)
- Implementation of large scale freshwater monitoring programs
- Remote field logistics
- Macroinvertebrate taxonomy
- Dewatering / Aquatic salvage

Chris Pietsch

Principal Aquatic Ecologist

Blue Earth Environmental Pty Ltd, Ninderry QLD

Career Overview

Chris is an aquatic ecologist with over nineteen years' experience working in both private enterprise and state government. During this period he has been integrally involved within a diverse range of projects assessing aquatic ecosystems throughout Queensland, New South Wales, Papua New Guinea and Indonesia.

Chris's passion and main field of knowledge is within the research and management of freshwater ecosystems. He has substantial experience in baseline aquatic surveys for major infrastructure development projects, environmental impact assessments, also small to large scale stream health assessments, including a key role on Southeast Queensland's Ecosystem Health Monitoring Program (EHMP) and many Receiving Environment Monitoring Programs (REMPs).

Chris has had considerable experience within the assessment of freshwater EVNT turtle, fish and crayfish species within Queensland. Additionally, he is a qualified senior electrofisher, accredited in AUSRIVAS, and is skilled within the collection and interpretation of data for surface waters, stream sediments and chemical concentrations of biota samples.

Career History

2017 to Present - Director / Principal Aquatic Ecologist at *Blue Earth Environmental Pty Ltd*

2014 to 2017 - Senior Aquatic Ecologist / Aquatic Product Manager at *Ecosure Pty Ltd*

2012 to 2014 - Freshwater Scientist on the *Ecosystem Health Monitoring Program (EHMP, Queensland Government)*

2006 to 2012 - Aquatic Ecologist at *BMT WBM Pty Ltd*

PO BOX 387 Yandina QLD 4561 chris@blueearthenvironmental.com.au mobile: 0421 713 900

Relevant freshwater turtle project experience

Chris has undertaken a vast array of projects involving the capture of freshwater turtles over the course of his nineteen-year career, including over 30 aquatic ecology baseline studies at an EIS level of assessment. He has extensive experience in applying suitable capture techniques and identification of freshwater turtle species. He has captured of a number of species of conservation significance, including Irwin's turtle (*Elseya irwini*) (Urannah Project 2020 – 2022), white throated snapping turtle (*Elseya albagula*) (Rookwood Weir Project 2017-present, Mount Rawdon pumped hydro EIS 2021-2023, Arrow Bowen Pipeline Assessment 2014 – 2015, Baralaba South Coal Mine EIS 2010) and Fitzroy River turtle (*Rheodytes leukops*) (Rookwood Weir Project 2017-present). Chris has also been involved in refining specific techniques to capture of *R. leukops* in sections of river where traditional snorkelling and muddling techniques are not suitable due to the occurrence of estuarine crocodile.

Chris has also work alongside several freshwater turtle specialist and been provided training in a number of aspects, including:

- Turtle measurement and tagging procedures by Professor Craig Franklin (University of Queensland) and Dr Natalie Clarke (GHD);
- *R. leukops and E albagula* nest identification, nest data collection and nest protection techniques by Dr Natalie Clarke (GHD) and Paul Humphreys (Paul's previous role as supervisor on Greening Australia's Alligator Creek nest protection project for *R. leukops*)

Since 2017, Chris has been integrally involved within the Rookwood Weir Project within the lower Fitzroy River Basin, Central Queensland. Chris has been tasked as field team lead, responsible for:

- Capture of two freshwater turtle species of conservation significance (*R. leukops and E albagula*);
- Attaching tracking equipment, including acoustic tags, pit tags, monel foot tags and carapace notching
- Nesting bank assessments to determine both the suitability and occurrence of nesting within the weir footprint and proposed offset areas.

Over the course of the project, Chris has independently identified 1000's of predated and non-predated turtle nests. He has also identified many suitable nesting banks for both *R. leukops* and *E albagula* outside the known key banks of Rookwood, Hanrahan's and The Pocket. Chris has also walked extensive sections of bank within the inundation area and has identified alternate sections of bank that localised populations *E albagula* utilise.

Selected Project Experience

Aquatic baseline and impact assessments

Northern Silica Project – EIS Baseline surveys (2023 – 2024), Cape Flattery, BMT / Diatreme, *Role: aquatic ecology field assessments*

Senex Range Gas Project, EIS Baseline Surveys (2024), Client: DPM EnviroSciences / Senex, *Role: Aquatic ecology field assessments, macroinvertebrate processing*

Boomer Green Energy Hub – EIS Baseline Surveys (2023), central Queensland, Client: DPM EnviroSciences / Attexo, *Role: Aquatic ecology field assessments, macroinvertebrate processing*

Mt Rawdon Pumped Hydro project (2021- 2023), south-east Queensland, Client: Freshwater Ecology, *Role: field ecologist*

Wandoan Coal Project (2022 - 2023), central Queensland, Client: DPM EnviroSciences / Glencore, *Role: Aquatic ecology field assessments, macroinvertebrate processing*

Atlas baseline aquatic ecological surveys (2022) central Queensland, Client: Freshwater Ecology / Senex, *Role: Aquatic ecology field assessments*

Urannah Project - EIS Baseline Surveys (2020 – 2022), central Queensland, Client: GHD, *Role: Aquatic field lead responsible for survey design and surveys, technical review.*

Greater Valeria and Valeria South – EIS Baseline Surveys (2019- 2021), central Queensland, Client: DPM EnviroSciences / Glencore, *Role: Aquatic ecology and ground water dependant ecosystem field assessments, macroinvertebrate processing and reporting*

Inland Rail – EIS Baseline Surveys for: Gowrie to Helidon; Helidon to Calvert, and; Calvert to Kagaru (2020-2021), south-east Queensland, Client: Freshwater Ecology / ARTC, *Role: field ecologist*

Wide Bay Pipeline – Gregory River Aquatic Ecological Assessment (2020-2021), Wide Bay–Burnett, Client: Arcadis, *Role: Aquatic technical lead responsible for aquatic field surveys and reporting*

Urannah Dam EIS Baseline Surveys - aquatic ecology (2020), central Queensland, Client: GHD, *Role: Aquatic ecologist responsible for survey design and post-wet surveys*

Middlemount Coal – Southern extension EIS – Baseline Surveys (2019-2020) central Queensland, Client: DPM EnviroSciences / Resource Strategies, *Role: Aquatic ecology and ground water dependant ecosystem field assessments and macroinvertebrate processing*

Somerset Dam Upgrade – Aquatic Ecological Assessment (2019) south-east Queensland, Client: AECOM, *Role: Undertake field and desktop assessments to determine likely impacts of Somerset Dam on aquatic biota communities and benefits for providing enhanced fish passage within upgrade works*

Beerwah East MDA – Environmental Assessment and Strategy (2018 - 2019), south-east Queensland, Client: NGH Environmental, *Role: Aquatic technical lead responsible for aquatic field surveys and reporting*

Environmental Assessment – Albert River Catchment Rehabilitation Program (2018), south-east Queensland, Client: City of Gold Coast, *Role: Technical lead - Field lead, Data analysis; Lead author*

Olive Downs South and Wilunga Project – EIS Baseline Surveys (2017 -2018), central Queensland, Client: DPM EnviroSciences / Pembroke Resources, *Role: Aquatic ecology field assessments, macroinvertebrate processing and reporting*

Facing Island Environmental Surveys (2017), central Queensland, Client: Gladstone Ports Corporation, *Role: Aquatic technical lead, Primary author (aquatic ecology)*

Luscombe Weir Baseline (2014 – 2015), south-east Queensland, Client: City of Gold Coast, *Technical lead - Field lead, Data analysis; Lead author*

Arrow Bowen Pipeline Environmental Assessment (2014 – 2015), central Queensland, Client: Arrow Energy. *Role: Aquatic discipline lead, Data analysis, Lead author of AVSR (Aquatic Values Survey Report)*

Gladstone New Fuels Development Project - Stage 2A EIS (2014), central Queensland, Client: Resource Strategies, *Role: Aquatic technical lead - Field lead, Data analysis, Lead author*

Baralaba South Coal Mine EIS, Baralaba North EMP, Baralaba TEP (2011 – 2012), central Queensland, Client: The Minserve Group & Cockatoo Coal Limited, *Role: Aquatic field lead, Data analysis, Co-author*

Pacific Highway Upgrade – Devils Pulpit EIS (2009-2010), northern New South Wales, Client: Hyder Consulting and NSW Roads and Traffic Authority, *Role: Field lead, Data analysis, Co-author*

Woori Coal Mine EIS (2010 – 2012) south-west Queensland, Client: The Minserve Group & Cockatoo Coal

Limited, *Role: Field operator, Data analysis, Co-author*

Bloodwood Creek EIS- Baseline data collection (2010), central Queensland, Client: The Minserve Group & Cockatoo Coal Limited, *Role: Field operator, Data analysis, Co-author*

Coal Mine Expansion Feasibility Study (2010), Kalimantan, Indonesia, Client: Straits Asia, *Role: Field operator; Data analysis, Logistics, Co-author*

Landsborough to Nambour Rail Alignment EIS (2007 – 2008), south-east Queensland, Client: ARUP, *Role: Field lead, Data analysis, Co-author*

North Stradbroke Bore Field and Pipeline EIS (2007), south-east Queensland, Client: Southern Regional Pipeline Pty Ltd, *Role: Field lead, Data analysis, Co-author of baseline report*

Caboolture to Maroochydore Corridor Study (CAMCOS) – REF and EIS (2007), south-east Queensland, Client: ARUP, *Role: Aquatic Ecology Field lead, Data analysis, Co-author*

Gladstone to Fitzroy Pipeline EIS (2007 – 2008), central Queensland, Client: ARUP, *Role: Field lead, Data analysis, Co-author*

Wyaralong Dam EIS (2006 – 2007), south-east Queensland, Client: Parsons Brinckerhoff, *Role: Field operator, Data analysis, Co-author*

State Government

Ecosystem Health Monitoring Program (2012 – 2014), south-east Queensland, DSITI / Healthy Waterways, *Role: Scientist, responsible for leading field teams, data cohesion and QAQC, EHMP Report Card data analysis and reporting; training of electrofishing operators*

Fitzroy Enhanced Environmental Monitoring Program (2012 – 2013), central Queensland, DSITI, *Role: Field operator, Co-author, Trainer*

Freshwater Fish Assessments

Targeted boat electrofishing surveys (2023), south-east Queensland, Client: Department of Agriculture and Fisheries, *Role: responsible for undertaking targeted surveys for cod on various impoundments within south-east Queensland and subsequent reporting*

Thomson River Weir boat electrofishing surveys (2023), central-west Queensland, Client: NGH, *Role: responsible for undertaking targeted boat-based electrofishing surveys for EIS baseline.*

Big Rocks Weir EIS Baseline Surveys - aquatic ecology (2021), central Queensland, Client: GHD, *Role: Aquatic subcontractor responsible for boat and backpack electrofishing*

Wide Bay Pipeline – Gregory River Aquatic Waterway Barrier Assessment (2020-2021), Wide Bay–Burnett, Client: Arcadis, *Role: Aquatic technical lead responsible for aquatic field surveys and reporting*

Cressbrook and Cooby Dam Upgrades (2020), south-east Queensland, GHD, *Role: Boat based electrofishing surveys to determine fish species assemblages and occurrence of angling species.*

Somerset Dam Upgrade – Aquatic Ecological Assessment (2019) south-east Queensland, Client: AECOM, *Role: Undertake field and desktop assessments to determine likely impacts of Somerset Dam on aquatic biota communities and benefits for providing enhanced fish passage within upgrade works*

Tilapia control programs (2019 – 2020), south-east Queensland, Various clients, *Role: Field work undertaking capture of Mozambique Tilapia*

Byron Bay Development Application – Assessment of EVNT fish species (2017), Northern New South Wales, Client: Australian Wetlands Consulting, *Role: Field assessment, Desktop assessment of likelihood of occurrence*

Calliope River Fish Habitat Restoration Project (2017), central Queensland, Client: DAF, *Role: Desktop assessments*

Robina West Lake Tilapia Electrofishing – proof of concept (2014), south-east Queensland, Client: City of Gold Coast, *Role: Project manager, Field lead, Data analysis, Primary author*

Sunshine Coast Airport Expansion IAS (2010), south-east Queensland, Client: ARUP, *Role: Field lead for freshwater fish assessment, Primary author for freshwater fish assessments*

Targeted aquatic fauna assessments

Turtle Movement Study (2017- present), central Queensland, Client: GHD / SunWater, *Role: Field lead in an ongoing study using acoustic tracking to determine the movement patterns of two freshwater turtle species of conservation significance (Rheodytes leukops and Elseya albagula)*

Peel River Drought Protection Works – Platypus assessments (2021), Client: DPM EnviroSciences, *Role: Field surveys*

Species Management Program Addendum - Swamp Crayfish *Tenuibranchiurus glypticus* (2017), south-east Queensland, Client: CR2SM / Fulton Hogan Seymour Whyte Joint Venture, *Role: Primary author, Site investigations lead*

Halfway Creek Platypus Management Plan (2016), northern New South Wales, Client: Civil, Mining and Construction Pty Ltd, *Role: Field investigations, Primary Author*

Fish tissue collection

Viva Energy Australia PFAS assessment (2018 - 2020), south-east Queensland, Client: AECOM, *Role: Collection of biota, water and sediment samples, reporting*

Cairns Airport – Targeted PFAS sampling program (2019), north Queensland, Client: AECOM, *Role: Collection of biota, water and sediment samples*

Army Aviation Centre Oakey (AACO) PFAS Environmental Investigation (2018), south-east Queensland, Client: AECOM, *Role: Aquatic ecologist subcontracted to capture fish and retain tissue samples*

Diet and concentration of contaminants within captured Mozambique Tilapia (2016), south-east Queensland, Client: City of Gold Coast, *Role: Project manager, Field lead, Data analysis, Primary author*

Port of Botany Fish Tissue Collection Program (2015), Sydney, Client: WSP Group, *Role: Aquatic discipline lead, Field logistics, Data quality and collection, Statistical analysis, Reporting*

OK Tedi Mining Limited Pipeline Rupture Investigation (2011 – 2012), PNG, Client: PNG Mineral Resources Authority, *Role: Aquatic field lead, Data analysis, Co-author*

Frieda River Baseline Aquatic Biology Monitoring Program (2011 – 2012), PNG, Client: Xstrata Copper, *Role: Aquatic field lead, Data analysis, Co-author*

Mining

Orbelo Mine REMP (2022 - 2023), south-east Queensland, Client: Orbelo Pty Ltd, *Role: Design and implementation of REMP*

QCoal Northern Hub Mines (Sonoma, Cows, Jax and Drake Mines) – REMP (2018 - 2023), central Queensland, Client: Freshwater Ecology / QCoal, *Role: field ecologist*

Cameby Downs REMP (2019 - 2023), Surat Basin, Client: DPM EnviroSciences, *Role: Field personnel and macroinvertebrate processing*

Lady Annie REMP (2019, 2022), north Queensland, Client: Ecosure, *Role: lead field ecologist*

Capcoal REMP (2019) central Queensland, Client: GHD / Anglo America, *Role: Lead field ecologist*

Middlemount Coal REMP (2019) central Queensland, Client: GHD / Middlemount Coal, *Role: Lead field ecologist*

Eagle Downs REMP (2018), central Queensland, Client: Freshwater Ecology / AMEC, *Role: Field ecologist*

Gregory Crinum Mine REMP (2010 – 2011), central Queensland, Client: BMA Coal, *Role: Project manager, Field lead, Data analysis, Primary author*

Goonyella Riverside Mine ongoing aquatic assessments / TEP / REMP (2006 -2011), central Queensland, Client: BMA Coal, *Role: Field operator, Data analysis, Reporting*

Peak Downs Mine REMP (2010), central Queensland, Client: BMA Coal, *Role: Field operator, Data analysis, Reporting*

Poitrel Mine REMP (2010), central Queensland, Client: BMA Coal, *Role: Field operator, Data analysis, Reporting*

Goonyella Riverside Mine Local Water Quality Guidelines Development (2009), central Queensland, Client: BMA Coal, *Role: Data analysis, Reporting*

Aquatic salvage and other freshwater assessments

Mt Crosby aquatic fauna relocation (salvage) (2023), south-east Queensland, Client: Wild Environmental, *Role: Boat based electrofishing to capture and translocate lungfish and other species.*

Emerald WWTP fauna recovery (salvage) (2021), central Queensland, Client: GHD / Central Highlands Regional Council, *Role: Field lead responsible for the capture and relocation of 2,000 freshwater turtles within settling ponds.*

Black Swan Lake fauna relocation (salvage) (2021) south-east Queensland, Client: Biodiversity Australia, *Role: Lead Aquatic Ecologist, lead author of an Aquatic Biota Salvage Strategy.*

Burleigh to Palm Beach Motorway Upgrade (salvage) (2021) south-east Queensland, Client: Biodiversity Australia, *Role: Lead Aquatic Ecologist, lead author of an Aquatic Biota Salvage Strategy.*

North Pine aquatic fauna relocation (salvage) (2020) south-east Queensland, Client: Freshwater Ecology on behalf of Seqwater, *Role: Field Aquatic Ecologist*

Somerset Dam aquatic fauna relocation (salvage) (2020) south-east Queensland, Client: Freshwater Ecology on behalf of Seqwater, *Role: Field Aquatic Ecologist*

Ewen Maddock aquatic fauna salvage (salvage) (2020) south-east Queensland, Client: Freshwater Ecology on behalf of Seqwater, *Role: Field Aquatic Ecologist*

Sideling Creek aquatic fauna relocation (salvage) (2020) south-east Queensland, Client: PCA ground engineering, *Role: Field Aquatic Ecologist, lead author of an Aquatic Biota Salvage Strategy, reporting*

Sideling Creek fish survey and aquatic fauna relocation (salvage) (2020) south-east Queensland, Client: Ecosure on behalf of Seqwater and Fulton Hogan, *Role: Field Aquatic Ecologist*

Paradise Dam aquatic fauna salvage (salvage) (2020) south-east Queensland, Client: Freshwater Ecology on behalf of SunWater, *Role: Field Aquatic Ecologist*

Bruce Highway Upgrade – Aquatic Fauna Relocation Program (salvage) (2017 – 2018) south-east Queensland, Client: CR2SM / Fulton Hogan Seymour Whyte Joint Venture, *Role: Lead Aquatic Ecologist, Lead author of an Aquatic Biota Salvage Strategy and dewatering reports.*

Paradise Road Upgrade (salvage) (2017) south-east Queensland, Ecosure / Georgiou, *Role: Dewatering lead, Primary Author for Aquatic Biota Salvage Strategy and dewatering repots*

Holcim dewatering (salvage) (2016) New South Wales, Ecosure / Holcim Pty Ltd, *Role: Lead Aquatic Ecologist undertaken dewatering of several on-site storage facilities, reporting*

Paradise road Upgrade (salvage) (2016) south-east Queensland, Ecosure / Georgiou, *Role: Dewatering large dam in development footprint, Primary Author for dewatering repots*

Training

- AUSRIVAS accreditation, University of Canberra
- Senior Operator Electrofishing (>1000 starts), Completed 'Principles and Techniques of Electrofishing' provided by the US Fish and Wildlife Service
- Project Management Short Course, BMT Group
- Primer Multivariate Analysis Short Course, La Trobe University
- Standard 11 Induction
- Advanced 4WD Training (TLIC2025A; RIIVEH305D; PMASUP236B)
- Defensive Driver Training (TLIC1051A; RIIVEH201D)
- Senior First Aid Certificate, First Aid First (HLTFA211A, completed January 2023)
- CPR Refresher Course, First Aid First (HLTCPR211A, completed February 2025)
- Advanced Remote Area First Aid (PUAOPE010A, SRXFAD005A)
- HUET Helicopter Underwater Escape Training (PMA OHS 214B)
- Elements of Shipboard Safety

Licences

- Queensland Driver's License (Marine, Medium Rigid Truck, Car)
- Commercial vessel certificate (Coxswain grade 3, near coastal)
- Commercial drone licence, <7Kg Remote Pilot Licence (RePL)
- Construction Card (White Card 2079391)
- Marine Radio License (OMC 036715)
- Advanced Open Water Diving License (PADI)



ROSS DWYER CURRICULUM VITAE

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https://github.com/RossDwyer
CITIZENSHIP: United Kingdom & Australia
STATUS: Australian Citizen

ACADEMIC QUALIFICATIONS

2010 PhD	Ecology, University of Exeter, UK Advisors: Prof. David Bryant and Prof. Stuart Bearhop *Ecological and anthropogenic constraints on waterbirds of the Forth Estuary: Population and behavioural responses to disturbance*
2005 MRes	Environmental Biology, University of St Andrews, UK Advisors: Prof. John Harwood and Prof. Jason Matthiopoulos *The spatial distribution and movement ecology of the harbour seal*
2004 BSc (Hons)	Zoology, University of Dundee, UK Advisors: Prof. Xavier Lambin and Prof. Steve Hubbard *Water vole metapopulations and the consequences for parasite prevalence*

EMPLOYMENT HISTORY

2020 - Present	Lecturer, Animal Ecology School of Science, Technology & Engineering, University of the Sunshine Coast, AU
2018 - 2021	Research Fellow School of Biological Sciences, The University of Queensland, AU
2018 - 2019	Research Fellow Center for Sustainable Tropical Fisheries and Aquaculture, James Cook University, AU
2015 - 2018	ARC Post-doctoral Fellow School of Biological Sciences, The University of Queensland, AU
2012 - 2015	Post-doctoral Fellow School of Biological Sciences, The University of Queensland, AU
2011 - 2012	Endeavour Post-doctoral Fellow School of Biological Sciences, The University of Queensland, AU
2010 - 2011	Ornithologist and Marine Mammal Specialist APEM Ltd, Stockport, UK
2010	Post-doctoral Fellow Centre for Ecology and Conservation, The University of Exeter, UK
2006	Research Assistant Bahamas Marine Mammal Research Organisation, The Bahamas

A SHORT BIOGRAPHY

Dr Ross Dwyer is a Lecturer in Animal Ecology at the University of the Sunshine Coast (UniSC), Australia. Originally from Scotland, Ross moved to Australia in 2011 as an Australia Award-Endeavour Scholar to continue his

research into the environmental, physiological and behavioural drivers of animal movements and space utilisation. He is regarded as one of the leading proponents of the emerging field of movement ecology and has published 45 scientific articles, including articles in Science, Current Biology, Functional Ecology, Conservation Biology, and the Journal of Applied Ecology. He has developed four open-source analytical tools for analysing animal movement data, which collectively have been downloaded >10,000 times and cited by >300 publications.

Ross is an experienced field ecologist and has coordinated a number of long-term research programs in aquatic and terrestrial environments. This includes a continuing 13-year study into crocodile and elasmobranch movement behaviour in the Gulf of Carpentaria, and programs investigating environmental flow requirements for fish and freshwater turtles in regulated river systems. He regularly collaborates with industry partners and has ongoing collaborations with external agencies including AIMS, Australia Zoo, SeqWater, CSIRO, Rio Tinto, SunWater, and the Queensland Government. He is an active member of Australia's animal tracking community, and sits on the Scientific Steering Committee and the Data Subcommittee for the Integrated Marine Observing System (IMOS) Animal Tracking Facility.

Ross currently lectures on the Bachelor of Animal Ecology program at UniSC, where he develops and delivers course materials that introduces ecological concepts, and statistical and spatial analysis using the R software. He is course coordinator for two capstone 3rd year courses at UniSC (Global-Change Ecology and Animal Behaviour), is an Associate Fellow of the Higher Education Academy (AFHEA), and has a SeCaT Score for Teaching of 4.8. Ross has a large role in mentoring graduate students and has been Principal or Associate Advisor for 9 PhD, 3 Masters, and 8 Honours students.

TEACHING

Teaching Philosophy and Practice

My teaching philosophy and practice centres around capturing the synergy that can be generated between teaching and research. In class, I use contextual examples from current research and news articles to illustrate key concepts in ecology and conservation. This includes providing a historical perspective in my lectures on how ideas or laws central to ecological theory came to be, running online discussion groups and breakout rooms where students can debate modern global conservation challenges, and integrating real world datasets that students evaluate in computer-based workshops to build their capacity and independence as data analysts. This approach underpins my commitment in being an effective tertiary educator, where I aim to inspire students about the creativity, intrigue, and excitement of scientific research and discovery.

My main goal in teaching is to stimulate and open the minds of a new generation of students to science. I strongly advocate that fundamental to teaching science is ensuring that we not only convey information and impart knowledge/understanding, but that we stimulate and encourage students to critically evaluate, synthesise, and question. This includes developing in the students the confidence to plan, implement, analyse and interpret their own ecological studies, as well as critiquing other approaches studies in the published scientific literature. As such, I am part-teacher and part-facilitator and with the objective of promoting independence, creativity, and self-confidence in my students. My philosophy and approach to teaching post-graduates revolves around developing in them an enquiring mind, and that sound research is built around a strong conceptual framework or question.

Teaching Duties

2021 - Present	Course Coordinator. Animal Behaviour (ANM301; Bachelor of Animal Ecology). University of the Sunshine Coast. ~70 students
2020 - Present	Course Coordinator. Global-Change Ecology (ANM302; Bachelor of Animal Ecology). University of the Sunshine Coast. ~70 students
2020 - Present	Lecturer. Statistics with Teeth (ANM203; Bachelor of Animal Ecology). University of the Sunshine Coast. ~100 students
2020 - 2021	Lecturer. Marine Vertebrate Ecology (ANM104; Bachelor of Animal Ecology). University of the Sunshine Coast. ~200 students
2017 - 18	Lecturer. Conservation and Wildlife Biology (Master of Conservation). The University of Queensland. ~50 students
2018	Coordinator. Analysis and visualisation of animal movement data with R. Moreton Bay Research Station. 2-day workshop. ~50 participants

2017	Coordinator. Analysis and visualisation of animal movement data with R. James Cook University. 2 x 2-day workshops. ~90 participants
2016	Invited speaker. Conservation and Wildlife Biology (Master of Conservation). The University of Queensland. 2-hr lecture. ~30 students
2016	Coordinator. Introduction to R. School of Geography Planning and Environmental Management. The University of Queensland. 1-day workshop. ~40 participants
2014	Coordinator. Analysis and visualisation of animal movement data with R. Sydney Institute of Marine Sciences. 1-day workshop. ~40 participants
2013 - 14	Tutor. Conservation and Wildlife Biology (Master of Conservation). The University of Queensland. ~50 students
2012 - 13	Coordinator. Spatial analysis with R. Ecology Centre, The University of Queensland 2-day workshop
2009 - 10	Lab Instructor. Analysis of Biological Data. (MSc Conservation and Biodiversity). The University of Exeter. 8 x 2-hr practical
2004 - 05	Lab Instructor. Vertebrate Zoology. (BSc Zoology) The University of Dundee.

POSTGRADUATE SUPERVISION

My philosophy and approach to mentoring post-graduates revolves around developing in them an enquiring mind. That sound research is built upon a strong conceptual framework or question, and prospers through understanding and creativity. I feel that my roles as a post-graduate supervisor are as a teacher, mentor, motivator and colleague.

Projects

2022 - present	Doctor Philosophy — Diego Bezerra (Associate Advisor) *Migratory movements of sharks in the Great Barrier Reef: strengthening connectivity across national jurisdictions*
2021 - present	Doctor Philosophy — Felicity Osborne (Associate Advisor) *Ecology of the Dolphinfish on Australia's east coast*
2021 - present	Doctor Philosophy — Georgina Dawson (Associate Advisor) *The Blue Biosphere: understanding human-wildlife interactions with iconic marine species in Noosa Biosphere Reserve*
2021 - present	Doctor Philosophy — Kaitlin Barnham (Joint Principal Advisor) *Physiological costs of behavioural movement strategies in estuarine crocodiles*
2021 - present	Doctor Philosophy — Caio Santos (Joint Principal Advisor) *Can we help koalas survive our cities? A multi-prong approach to koala conservation in the urban environment*
2019 - Present	Doctor Philosophy — Chantelle Derez (Associate Advisor) *Success of mitigated translocations in urban coastal carpet pythons to reduce human-wildlife conflict*
2018 - Present	Doctor Philosophy — Cameron Baker (Joint Principal Advisor) *The movement ecology, behaviour and social structure of the estuarine crocodile*
2018 - Present	Doctor Philosophy — Samantha Reynolds (Joint Principal Advisor) *Intraspecific and anthropogenic influences on whale shark movement ecology*
2014 - 2018	Doctor Philosophy — Juan Lei (Associate Advisor) *The impact of varanid predation on sea turtle nests at Deepwater National Park*
2013 - 2017	Doctor Philosophy — Essie Rodgers (Associate Advisor)

Diving in hot water: how will ectothermic vertebrates fare in warmer environments?

2013 - 2017 Doctor Philosophy — Hsien-Yung Lin (Associate Advisor)
Designing reserves system that connect freshwater and marine system: diadromous fish conservation in Australian coastal areas

2018 Research Masters — Charles Townsin (Joint Principal Advisor)
Using acoustic telemetry to inform the conservation management of a data-deficient species: the warrior catfish Hemarius dioctes

2016 Research Masters — Colin Lee Burke (Joint Principal Advisor)
Does environmental salinity contribute to niche segregation among cohabiting river sharks?

2014 - 2019 Master Philosophy — Barry Lyon (Joint Principal Advisor)
The movement and ecology of the speartooth shark in the Wenlock and Ducie Rivers, Cape York

2013 - 2014 Research Masters — José Pontón-Cevallos (Joint Principal Advisor)
Niche partitioning of two related species of Sulidae in the Far Northern Great Barrier Reef

2021 - 2022 Honours — Loz Tasker (Principal Advisor)
Investigating the movements and interactions of mature male estuarine crocodiles

2021 - 2022 Honours — Ben Mackereth (Principal Advisor)
Identifying flow regime drivers for Murray cod and golden perch

2018 - 2019 Honours — Kaitlin Barnham (Joint Principal Advisor)
Telemetry reveals distinct behavioural movement strategies in male estuarine crocodiles

2017 - 2018 Honours — Cameron Baker (Joint Principal Advisor)
Ontogenetic shifts in nesting behaviour in female estuarine crocodiles

2016 - 2017 Honours — Sam Reynolds (Joint Principal Advisor)
Pathways for protection: using spatial data to benchmark conservation outcomes for Western Australia's whale sharks

2015 - 2016 Honours — Lily Bentley (Joint Principal Advisor)
Interactions between movement behaviour and body temperature in estuarine crocodiles

2012 - 2013 Honours — Luke Carpenter-Bundhoo (Associate Advisor)
The causal factors of road mortality in the southern cassowary

2011 - 2012 Honours — Jeffery Hanson (Associate Advisor)
The interaction between diet, movement and body size in estuarine crocodiles

OTHER PROFESSIONAL ACTIVITIES

2020 - Present Scientific Steering Committee– *Animal Tracking Facility - Integrated Marine Observing System*

2019 - Present Data Subcommittee – *Animal Tracking Facility - Integrated Marine Observing System*

2010 - Present Journal Referee
Ecology Letters, Proceedings B: Biological Sciences, BioScience, Marine Ecology Progress Series, Marine and Freshwater Research, PLoS ONE, Frontiers in Ecology and the Environment, Marine Biology, Journal of Field Ornithology, Methods in Ecology and Evolution, Functional Ecology, Animal Biotelemetry, Wildlife Research, Austral Ecology, Aquatic Conservation: Marine and Freshwater Ecosystems

2016 Grant Referee – *Center for the Synthesis and Analysis of Biodiversity, French Foundation for Research on Biodiversity (FRB)*

2015 - Present Member - *Ecological Society of Australia*

2015 - Present Member - *Society for Conservation Biology*

2015 - Present Member - the *International Bio-logging Society*

RESEARCH

I have developed a strong research program in which I seek broadly to understand the environmental, physiological, and behavioural drivers for movement and space utilisation among wild animals. The underlying emphasis and direction of my research is to reveal the mechanisms driving animal dispersal and habitat use, where the information gained can be used in an applied framework to help inform and mitigate human-wildlife conflict. This includes the impacts of road infrastructure and instream structures on habitat connectivity, the biological effectiveness of spatial management measures (e.g. marine protected areas and fishery closures), and the potential for negative human wildlife interactions.

My research is primarily field-based, utilising survey methodologies and biotelemetry technology to investigate the spatial ecology and behaviour of animals in relation to environmental conditions. I enjoy collaborating with academic researchers and industry professionals to address a wide range of contemporary issues in ecosystem science, conservation and management. I take a truly integrative approach that combines empirical studies with physiological measurements, remote sensing, quantitative data-analysis, and individual-based population models to gain novel insights into my study species.

Support *(Total Funding = $2,100,000 AUD)*

2017 - 2022	Rio Tinto *Movements of Threatened Elasmobranchs in the Eastern Gulf of Carpentaria*
2017 - 2022	Gladstone Water Authority & GHD *Lower Fitzroy River Infrastructure Project Turtle Movement Study*
2020 - 2022	Sydney Institute of Marine Sciences *An R package to facilitate the Rapid Extraction of Marine Observations for Roving Animals*
2017 - 2019	Rockefeller Philanthropy Advisors Inc/ JCU *Maximising Conservation Outcomes for Shark and Ray MPAs*
2014 - 2017	Australian Research Council Linkage Project *Investigating movement, distribution, abundance and diet to support management objectives for threatened riverine predators in Northern Australia*
2015 – 2016	National Environmental Research Program (NERP) workshop grants *Connecting telemetry of highly mobile threatened species and spatial conservation decision science*
2015 – 2016	Australian National Data Service (ANDS) eResearch Infrastructure Connectivity Project *CoESRA: Collaborative environment for ecosystem science research and analysis*
2013 – 2016	Queensland Bulk Water Supply Authority trading as Seqwater *Optimising fishways and environmental water release strategies*
2014 – 2015	Queensland Department of Environment and Heritage Protection *Does variation in the diet of seabirds breeding in the Great Barrier Reef reveal drivers of population declines?*
2013	Queensland Bulk Water Supply Authority trading as Seqwater *Optimising hydrology and asset management regimes in the Logan and Mary river systems*
2012 – 2014	Queensland Department of Environment and Heritage Protection *Scientific review of the DEHP's estuarine crocodile abundance and distribution data and methodology*

PUBLICATIONS

Summary

47 refereed publications & 1 book chapter. Google Scholar: h index = 21; i10 index = 34.

Published Articles **- *** denotes published student thesis chapter.

*Clarke, T.M., Whitmarsh, S.K., **Dwyer, R.G.,** Udyawer, V., Pederson, H., Huveneers, C. (2022) Effects of shark tourism on the daily residency and movements of a non-focal pelagic teleost. *Marine Ecology Progress Series* 687: 133-146.

*Reynolds, S.D., Norman, B.M., Franklin, C.E., Bach, S.S., Comezzi, F.G., Diamant, S., Jaidah, M.Y., Pierce, S.J., Richardson, A.J., Robinson, D.P., Rohner, C.A., **Dwyer, R.G.** (2022) Regional variation in anthropogenic threats to Indian Ocean whale sharks. *Global Ecology and Conservation* e01961.

*Baker, C.J., Frère, C.H., Franklin, C.E., Campbell, H.A., Irwin, T.R., **Dwyer, R.G.** (2022) Crocodile social environments dictated by male philopatry. *Behavioral Ecology* 33: 156-166.

Butt, N., Halpern, B., O'Hara, C., Allcock, L., Polidoro, B., Sherman, S., Byrne, M., Birkeland, C., **Dwyer, R.G.,** Frazier, M., Woodworth, B., Arango, C., Kingsford, M., Udwayer, V., Hutchings, P., Scanes, E., McLaren, E. J., Maxwell, S., Diaz-Pulido, G., Dugan, E., Simmons, B., Wenger, A., Linardich, C., Klein, C. (2022) A trait-based framework for assessing the vulnerability of marine species to human impacts. *Ecosphere* 13, e3919

Lédée, E.J.I., Heupel, M.R., Taylor, M.D., Harcourt, R.G., Jaine, F.R.A., Huveneers, C., Udyawer, V., Campbell, H.A., Babcock, R.C., Hoenner, X., Barnett, A., Braccini, M., Brodie, S., Butcher, P.A., Cadiou, G., **Dwyer, R.G.,** Espinoza, M., Ferreira, L.C., Fetterplace, L., Fowler, A., Harborne, A.R., Knott, N.A., Lowry, M., McAllister, J., McAuley, R., Meekan, M., Mills, K., Peddemors, V.M., Pillans, R., Semmens, J., Smoothey, A.F., Speed, C., Stehfest, K., van der Meulen, D., Simpfendorfer, C.A. (2021) Continental-scale acoustic telemetry and network analysis reveal new insights into stock structure. *Fish and Fisheries* 22, 987-1005. https://doi.org/10.1111/faf.12565

Bates, A.E., Primack, R.B., Biggar, B.S., … and Duarte, C.M., 2021. Global COVID-19 lockdown highlights humans as both threats and custodians of the environment. Biological Conservation 263, 109175. https://doi.org/10.1016/j.biocon.2021.109175

Huveneers, C., Jaine, F.R.A., Barnett, A., Butcher, P.A., Clarke T.M., Currey-Randall, L.M., **Dwyer, R.G.,** ...(2021) The power of national acoustic tracking networks to assess the impacts of human activity on marine organisms during the COVID-19 pandemic. *Biological Conservation* 256: 108995.

***Dwyer, R.G.**, Campbell, H.A., Cramp, R.L., Burke, C.L., Micheli-Campbell, M.A., Pillans, R.D., Lyon, B.J., Franklin, C.E. (2020) Niche partitioning between river shark species is driven by seasonal fluctuations in environmental salinity. *Functional Ecology* 34: 2170-2185.

Dwyer, R.G., Krueck, N.C., Udyawer, V., Heupel, M.R, Chapman, D., Pratt, H.L., Garla, R., Simpfendorfer, C.A. (2020) Individual and population benefits of marine reserves for reef sharks. *Current Biology* 30: 480-489.

Grosell, M., Heuer, R.M., Wu, N., Cramp, R.L., Wang, Y., Mager, E., **Dwyer, R.G.,** Franklin, C.E. (2020) Salt-water acclimation of the estuarine crocodile Crocodylus porosus involves enhanced ion transport properties of the urodaeum and rectum. *Journal of Experimental Biology* 223: jeb210732.

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ECOLOGICAL SOFTWARE

2021 - Present **remora** –An R package to facilitate the Rapid Extraction of Marine Observations for Roving

Animals. https://imos-animaltracking.github.io/remora/

2020 - Present **Australian Animal Acoustic Telemetry Database** – A national, centralised passive acoustic telemetry repository maintained by the IMOS Animal Tracking Facility and the Australian Ocean Data Network (AODN). https://animaltrackingnew-systest.aodn.org.au/about.

2018 - Present **The Shark Explorer App** – An RShiny application to help identify global priority areas for sharks and rays. https://rossdwyer.shinyapps.io/sharkray_mpa/.

2013 – Present **Digiroo2** – An R package for generating null models of social contacts based on animal space use. https://cran.r-project.org/web/packages/Digiroo2/index.html.

2012 – Present **V-Track** – An R package for the analysis of remote acoustic telemetry data. https://cran.r-project.org/web/packages/VTrack/index.html

2012 – Present **ZoaTrack.org** (formally OzTrack.org) – a centralised GPS-based telemtery repository for calculating movement metrics and space use for individually marked animals. Maintained by the Atlas of Living Australia. http://www.zoatrack.org/

CONFERENCE PRESENTATIONS

2019 Dwyer et al. Saving reef sharks with marine parks. *International Conference of Fish Telemetry*, Arendal, Norway.

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2016 Dwyer et al. Using individual-based movement information to identify spatial conservation priorities for mobile species. *Society of Conservation Biology*, Brisbane, Australia.

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Appendix B

In-situ water quality results

Table 7.1 Raw in-situ water quality results from Year 2 2025-26 monitoring

Event	Site	Date	Depth (m)	Temperature (°C)	Electrical conductivity (µS/cm)	pH	Dissolved oxygen (% saturation)	Dissolved oxygen (mg/L)	Turbidity (NTU) (FNU for Sunwater samples)
Pre-construction Baseline for Fitzroy River catchment – Sunwater Water Quality Monitoring and Reporting Program (Sunwater Limited 2024) (75th%ile unless indicated as a range)					269	7.3-8.4	89-101%	-	190.5
EPP Water Quality Objectives for Fitzroy River Sub-basin – fresh waters[1]					<445 µS/cm (base flow) <250 µS/cm (high flow)	6.5-8.5	85-110%	-	<50 NTU
EPP Water Quality Objectives for Fitzroy Sub-basin – freshwater lakes/reservoirs[2]					<250 µS/cm (no flow/base flow)	6.5-8.0	90-110%	-	1-20 NTU
Hydrophone survey Sep 2025	Upstream approach channel[2]	04/09/2025	0.3	20.9	224	7.8	87.9	7.9	21.6
	USRP5[2]	04/09/2025	0.3	19.5	213	7.8	95.5	8.8	25.7
	USRP3[2]	04/09/2025	0.3	19.0	211	7.2	60.3	5.6	24.3
	DSRP1[2]	04/09/2025	0.3	18.4	210	7.1	42.5	4.0	23.0
	DSRP6[2]	04/09/2025	0.3	19.8	214	7.5	86.6	7.9	23.9
	DSRP8[2]	04/09/2025	0.3	19.1	208	8.6	103.8	9.7	22.5
	Ramp entrance downstream[1]	04/09/2025	0.3	17.8	208	7.1	68.5	6.6	23.0
	Downstream approach channel[1]	04/09/2025	0.3	17.7	208	7.3	68.0	6.5	23.1
	The Pocket upstream[2]	02/09/2025	0.3	19.9	214	7.7	87.9	8.0	23.7
	Rookwood weir pool at camping reserve[2]	02/09/2025	0.3	20.6	221	7.6	88.9	8.0	14.8
	Hanrahan's crossing[1]	03/09/2025	0.3	20.7	238	7.8	85.2	7.7	26.4
	Hanrahan's crossing[1]	03/09/2025	0.3	23.4	249	7.8	95.8	8.1	21.6
Turtle capture survey Nov 2025	USRP5[2]	07/11/2025	0.3	28.2	261	8.1	71.9	5.6	8.0
	USRP2[2]	07/11/2025	0.3	24.7	253	7.1	23.9	1.9	8.3
	DSRP2[2]	07/11/2025	0.3	24.1	251	7.1	31.4	2.6	7.1
	DSRP5[2]	07/11/2025	0.3	26.2	267	9.2	149.8	12.1	5.9
	DSRP8[2]	07/11/2025	0.3	26.2	274	8.7	91.2	7.2	3.5

Event	Site	Date	Depth (m)	Temperature (°C)	Electrical conductivity (µS/cm)	pH	Dissolved oxygen (% saturation)	Dissolved oxygen (mg/L)	Turbidity (NTU) (FNU for Sunwater samples)
Pre-construction Baseline for Fitzroy River catchment – Sunwater Water Quality Monitoring and Reporting Program (Sunwater Limited 2024) (75th%ile unless indicated as a range)					269	7.3-8.4	89-101%	-	190.5
EPP Water Quality Objectives for Fitzroy River Sub-basin – fresh waters[1]					<445 µS/cm (base flow) <250 µS/cm (high flow)	6.5-8.5	85-110%	-	<50 NTU
EPP Water Quality Objectives for Fitzroy Sub-basin – freshwater lakes/reservoirs[2]					<250 µS/cm (no flow/base flow)	6.5-8.0	90-110%	-	1-20 NTU
	Ramp entrance downstream[1]	04/11/2025	0.3	21.7	237	7.2	66.2	5.8	10.3
	Downstream approach channel[1]	04/11/2025	0.3	23.4	245	7.1	74.1	6.3	9.8
	Gogango Creek[2]	08/11/2025	0.3	29.8	290	8.0	88.8	6.7	13.4
	Gogango Creek[2]	09/11/2025	0.3	27.8	279	8.0	77.6	6.1	13.0
	Hanrahan upstream[1]	11/11/2025	0.3	28.4	274	7.8	72.3	5.6	16.8
	Hanrahan's crossing[1]	11/11/2025	0.3	29.2	274	8.0	85.7	5.6	13.2
	Rookwood downstream pool[1]	03/11/2025	0.3	23.3	245	7.1	81.3	7.0	10.5
	Rookwood downstream pool[1]	04/11/2025	0.3	23.0	244	7.1	72.4	6.2	8.9
Hydrophone survey Dec 2025	Upstream approach channel[2]	17/12/2025	0.3	27.8	269	6.9	80.1	6.2	46.5
	USRP5[2]	17/12/2025	0.3	28.0	270	6.8	86.6	6.7	53.2
	USRP3[2]	17/12/2025	0.3	27.3	270	6.8	60.0	4.8	43.5
	DSRP1[2]	17/12/2025	0.3	26.8	267	6.7	36.5	2.9	42.0
	DSRP6[2]	17/12/2025	0.3	27.5	268	7.2	99.2	7.9	41.9
	DSRP8[2]	17/12/2025	0.3	27.5	270	7.2	98.6	7.8	46.0
	Ramp entrance downstream[1]	17/12/2025	0.3	28.3	272	7.8	106.1	8.2	43.9
	Downstream approach channel[1]	17/12/2025	0.3	27.3	270	6.8	79.6	6.2	46.2
	Gogango Creek[2]	16/12/2025	0.3	28.9	284	7.3	107.2	8.3	13.7

Event	Site	Date	Depth (m)	Temperature (°C)	Electrical conductivity (µS/cm)	pH	Dissolved oxygen (% saturation)	Dissolved oxygen (mg/L)	Turbidity (NTU) (FNU for Sunwater samples)
Pre-construction Baseline for Fitzroy River catchment – Sunwater Water Quality Monitoring and Reporting Program (Sunwater Limited 2024) (75th%ile unless indicated as a range)					269	7.3-8.4	89-101%	-	190.5
EPP Water Quality Objectives for Fitzroy River Sub-basin – fresh waters[1]					<445 µS/cm (base flow) <250 µS/cm (high flow)	6.5-8.5	85-110%	-	<50 NTU
EPP Water Quality Objectives for Fitzroy Sub-basin – freshwater lakes/reservoirs[2]					<250 µS/cm (no flow/base flow)	6.5-8.0	90-110%	-	1-20 NTU
	Rookwood weir pool at camping reserve[2]	16/12/2025	0.3	26.0	265	6.9	73.1	5.9	45.3
	Hanrahan's crossing[1]	17/12/2025	0.3	27.9	268	6.9	71.8	5.6	35.3
Hydrophone survey Mar 2026	Upstream approach channel[2]	05/03/2026	0.3	27.5	236	7.4	67.3	5.3	188
	USRP5[2]	05/03/2026	0.3	27.7	234	7.7	88.8	7.0	191
	USRP3[2]	05/03/2026	0.3	27.8	235	7.5	75.5	5.9	189
	DSRP1[2]	05/03/2026	0.3	27.6	214	7.4	64.0	5.0	187
	DSRP6[2]	05/03/2026	0.3	27.3	233	7.8	82.7	6.5	188
	DSRP8[2]	05/03/2026	0.3	26.5	228	7.9	88.4	7.1	177
	Ramp entrance downstream[1]	05/03/2026	0.3	27.2	237	7.5	96.7	7.6	187
	Rookwood weir pool at camping reserve[2]	03/03/2026	0.3	27.4	244	7.1	66.3	5.2	173
	Gogango Creek[2]	03/03/2026	0.3	29.7	200	7.3	70.4	5.3	181
	Rookwood downstream pool[1]	04/03/2026	0.3	27.4	219	7.4	96.6	7.6	194
	Hanrahan's crossing[1]	04/03/2026	0.3	26.9	209	7.6	92.1	7.3	182
Turtle capture survey May 2026	USRP5[2]	08/05/2026	0.3	22.8	138	8.1	65.2	5.6	147
	USRP2[2]	08/05/2026	0.3	23.3	220	7.6	57.4	4.9	142
	DSRP2[2]	08/05/2026	0.3	23.4	221	7.6	66.2	5.6	157
	DSRP5[2]	08/05/2026	0.3	18.4	202	8.1	67.8	6.4	171
	DSRP7[2]	08/05/2026	0.3	20.4	204	8.4	79.1	7.2	145
	DSRP8[2]	08/05/2026	0.3	17.3	195	8.3	82.3	7.9	141

Event	Site	Date	Depth (m)	Temperature (°C)	Electrical conductivity (µS/cm)	pH	Dissolved oxygen (% saturation)	Dissolved oxygen (mg/L)	Turbidity (NTU) (FNU for Sunwater samples)
Pre-construction Baseline for Fitzroy River catchment – Sunwater Water Quality Monitoring and Reporting Program (Sunwater Limited 2024) (75th%ile unless indicated as a range)					269	7.3-8.4	89-101%	-	190.5
EPP Water Quality Objectives for Fitzroy River Sub-basin – fresh waters[1]					<445 µS/cm (base flow) <250 µS/cm (high flow)	6.5-8.5	85-110%	-	<50 NTU
EPP Water Quality Objectives for Fitzroy Sub-basin – freshwater lakes/reservoirs[2]					<250 µS/cm (no flow/base flow)	6.5-8.0	90-110%	-	1-20 NTU
	Rookwood downstream riffle[1]	07/05/2026	0.3	22.9	218	7.5	77.6	6.7	136
	Rookwood downstream riffle[1]	07/05/2026	0.3	24.1	224	7.6	87.0	7.3	141
	Rookwood downstream riffle[1]	08/05/2026	0.3	22.4	217	7.7	82.2	7.2	132
	Rookwood downstream pool[1]	07/05/2026	0.3	22.9	220	7.6	84.3	7.3	141
	Rookwood downstream pool[1]	07/05/2026	0.3	24.3	226	7.6	84.8	7.1	141
	Rookwood weir pool at camping reserve[2]	09/05/2026	0.3	22.4	216	7.4	56.8	4.9	154
	Gogango Creek[2]	11/05/2026	0.3	22.4	218	7.4	47.8	4.2	126
	Gogango Creek[2]	11/05/2026	0.3	23.0	221	7.4	62.6	5.4	136
	Hanrahan upstream[1]	13/05/2026	0.3	20.8	222	7.7	82.1	7.4	125
	Hanrahan upstream[1]	13/05/2026	0.3	21.3	221	7.7	85.3	7.6	119
	Hanrahan's crossing[1]	13/05/2026	0.3	20.8	219	8.0	95.8	8.6	123

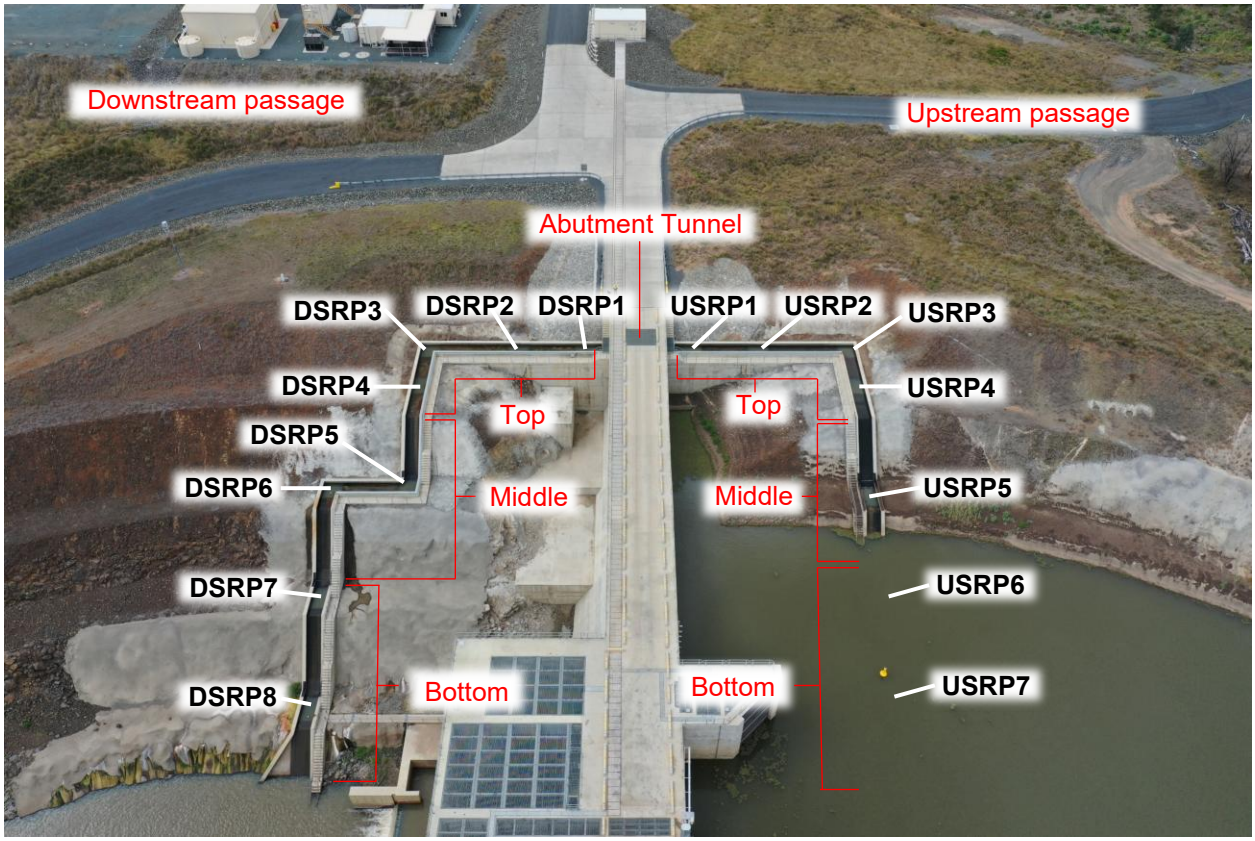
Cells shaded blue denote values outside of both the baseline conditions and relevant EPP WQO
Cells shaded orange denote values within baseline conditions but outside of the relevant EPP WQO
Cells shaded yellow denote values outside of the baseline conditions, but within the relevant EPP WQO

Appendix C

Turtle passage inspection forms

Turtle Passage Inspection Form

Inspection details	
Project Name	Rookwood Weir Operations Phase Turtle Monitoring
Project Number	12633406
Survey	May 2026
Date	08/05/2026
Time	12:27 PM
Team Members	Lauren Pratt



Maintenance		
Type	**Maintenance required**	**Details**
Hand operated globe valves (HOGV)	**Yes**	Handles are missing from all globe valves
Variable speed driver (VSD) pump	**Yes**	Water velocity to be increased downstream to provide sufficient flow on ramps and within pools.
Supervisory Control and Data Acquisition (SCADA)	N/A	N/A – Sunwater to assess
Turtle passage cleaning & maintenance	**Yes**	Remove sediment from resting pools, particularly on the lower resting pools. Fix the lip on the vertical ramp at USRP5 to remove the risk of turtles injuring their plastrons.

Maintenance		
Type	**Maintenance required**	**Details**
Photos		



Hand operated globe valve with missing handle

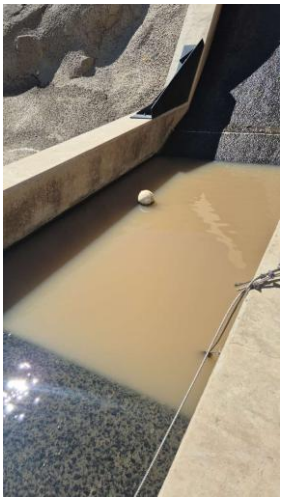


'Lip' created on ramp from concrete covering the PIT tag reader at USRP5



Minimal water flow on downstream side of turtle passage

Downstream passage – bottom (DSRP8 to DSRP7)		
	Within ramps	**Within resting pools**
Flow depth (m)	0.01	0.3
Flow velocity (m/s)	0.3	0.02
Aggregate condition	Good	Good
Algae	Some	None
Sedimentation	None	Moderate
Debris	None	None
Comments	Some algae build up on ramp	0.2 m of sediment build up (approx) in DSRP8.





Downstream passage – middle (DSRP6 to DSRP5)		
	Within ramps	**Within resting pools**
Flow depth (m)	0.01	0.5
Flow velocity (m/s)	0.02	0.02
Aggregate condition	Good	Good
Algae	Little	None
Sedimentation	Little	Little
Debris	None	None
Comments	Only half the ramp has water and is running slowly	20cm of silt build up in DSRP5





Downstream passage – top (DSRP4 to DSRP1)		
	Within ramps	**Within resting pools**
Flow depth (m)	0.02	0.5
Flow velocity (m/s)	0.02	0.02
Aggregate condition	Good	Good
Algae	Little	None
Sedimentation	Some	Little
Debris	None	None
Comments	Sediment build up on horizontal ramp	





Abutment tunnel	
	Within tunnel
Grating condition	Good
Debris	None
Sedimentation	Moderate
Comments	Build up of sediment in tunnel





Upstream passage – top (USRP1 to DSRP4)		
	Within ramps	**Within resting pools**
Flow depth (m)	0.02	0.5
Flow velocity (m/s)	0.05	0.02
Aggregate condition	Good	Good
Algae	Little	None
Sedimentation	Some	Little
Debris	None	None
Comments	Build up of silt on horizontal ramps	–





Upstream passage – middle (USRP5)		
	Within ramps	**Within resting pools**
Flow depth (m)	0.02	0.15
Flow velocity (m/s)	0.3	0.03
Aggregate condition	Good	Good
Algae	None	None
Sedimentation	Little	Extensive
Debris	None	None
Comments	Lip on ramp where PIT tag reader installed yet to be fixed	Heavy sediment build up in USRP5



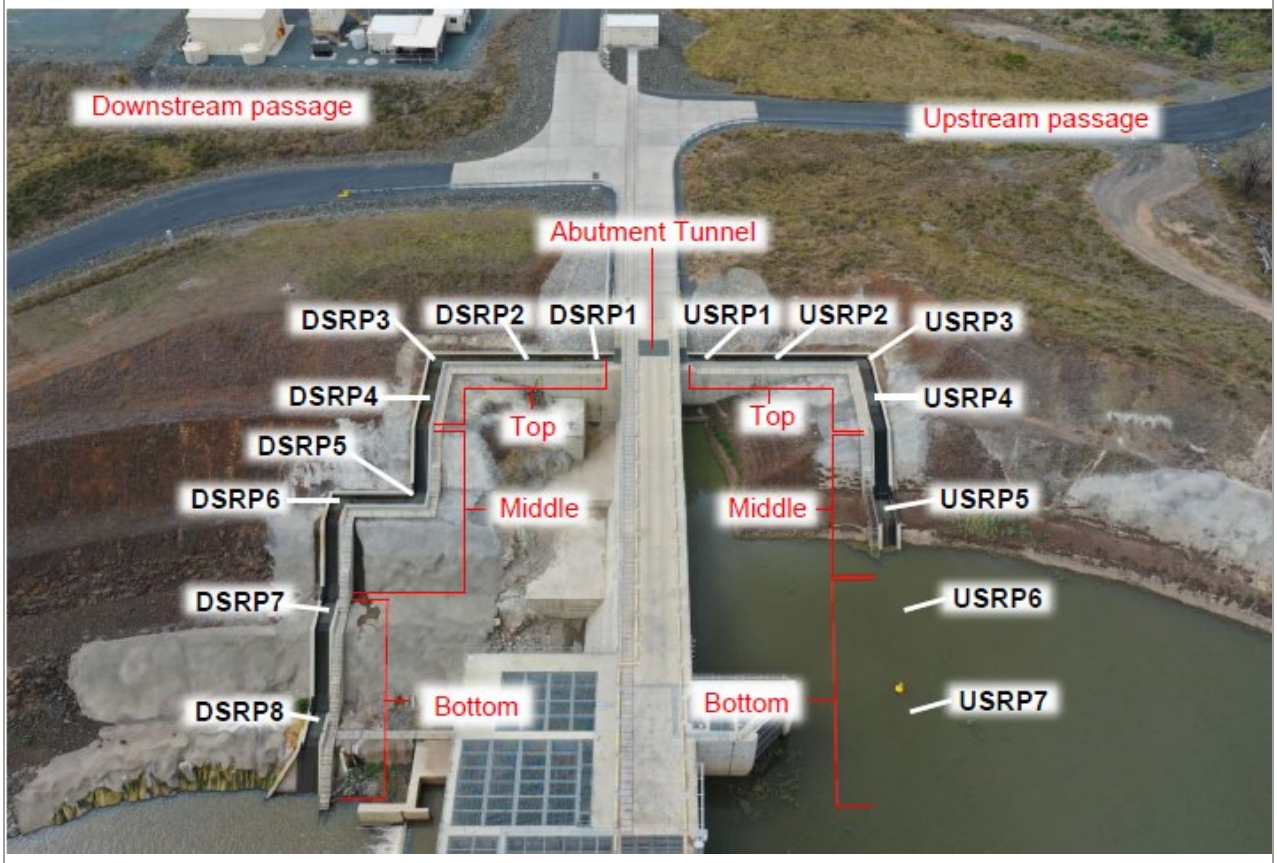


Upstream passage – bottom (USRP6 to USRP7)		
	Within ramps	**Within resting pools**
Flow depth (m)	N/A	N/A
Flow velocity (m/s)	N/A	N/A
Aggregate condition	N/A	N/A
Algae	N/A	N/A
Sedimentation	N/A	N/A
Debris	N/A	N/A
Comments	Not assessed - Pools submerged	



Turtle Passage Inspection Form

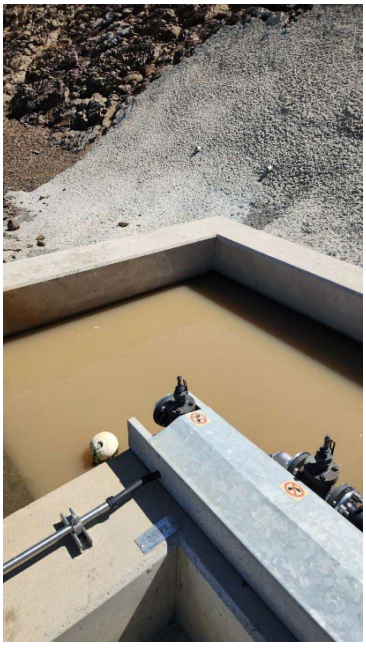
Inspection details	
Project Name	Rookwood Weir Operations Phase Turtle Monitoring
Project Number	12633406
Survey	Mar-26
Date	04/03/2026
Time	07:45 AM
Team Members	Haydn Turner



Maintenance		
Type	**Maintenance required**	**Details**
Hand operated globe valves (HOGV)	**Yes**	Handles are missing from all globe valves and need to be replaced
Variable speed driver (VSD) pump	No	Operational
Supervisory Control and Data Acquisition (SCADA)	N/A	N/A – Sunwater to assess
Turtle passage cleaning & maintenance	**Yes**	Flush out sediment from resting pools DSRP8, DSRP4 – DSRP1, USRP1 – USRP4 and USRP5. Remove sediment from abutment tunnel and horizontal ramp at USRP5. Remove algae growth from vertical and horizontal ramps. Fix the lip on the vertical ramp at USRP5 and DSRP8 to stop turtles from injuring their plastrons.

Maintenance		
Type	**Maintenance required**	**Details**
Other maintenance required	**No**	

Photos



Hand operated globe valves with missing handle



'Lip' created on ramp from concrete covering the PIT tag reader at USRP5 (left) and DSRP8 (right)

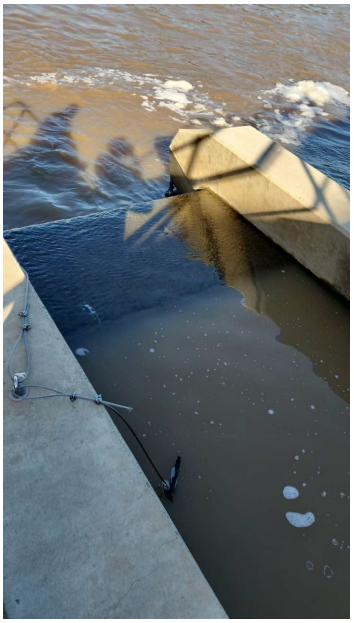


Sediment and vegetation build up on ramp at USRP5



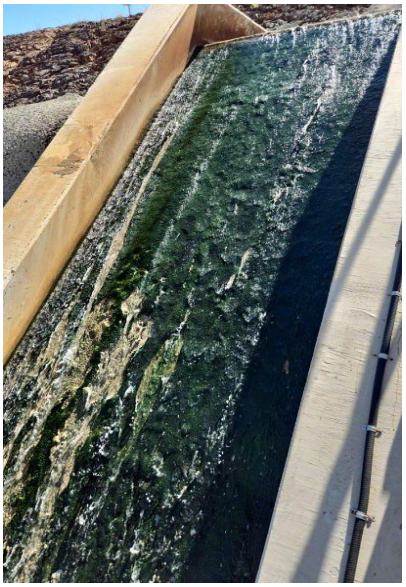
Thick algae growth on vertical ramps

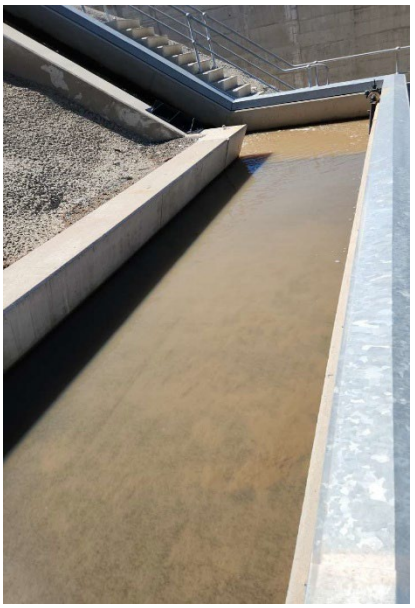
Downstream passage – bottom (DSRP8 to DSRP7)		
	Within ramps	**Within resting pools**
Flow depth (m)	0.001	0.4-0.5
Flow velocity (m/s)	2.0	0.03
Aggregate condition	Good	Good
Algae	Moderate	Little
Sedimentation	Little	Some (DSRP8), None (DSRP7)
Debris	None	None
Comments	Slight algae film on Panel P2; slight sediment build-up right hand side of ramp	DSRP8 – filamentous algae; ~300 mm fine sediment RHS; pool depth 350–500 mm. DSRP7 – filamentous algae; no sediment; ~550 mm depth.

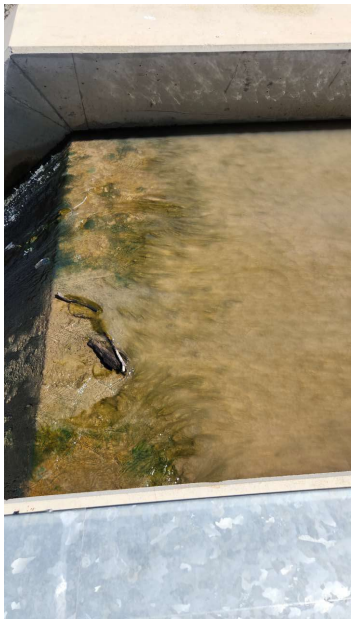




Downstream passage – middle (DSRP6 to DSRP5)		
	Within ramps	**Within resting pools**
Flow depth (m)	0.002	0.5
Flow velocity (m/s)	2.0	0.02
Aggregate condition	Good	Good
Algae	Extensive	Little
Sedimentation	None	Little
Debris	None	None
Comments	Panel E has extensive algae sheeting	DSRP6/DSRP5 – no sediment in base; ~500 mm depth; little algae/sediment on flat ramp between pools





Downstream passage – top (DSRP4 to DSRP1)		
	Within ramps	**Within resting pools**
Flow depth (m)	0.005	0.5
Flow velocity (m/s)	0.01	0.01
Aggregate condition	Good	Good
Algae	Some	None
Sedimentation	Little	None
Debris	Some	None
Comments	Flat ramps between pools have some filamentous algae and light sediment; taps running	No sediment, turbid water
		

Abutment tunnel	
	Within tunnel
Grating condition	Good
Debris	None
Sedimentation	Moderate
Comments	~50 mm sediment on edges; moderate sand/gravel through center limiting depth to ~10 mm





Upstream passage – top (USRP1 to DSRP4)		
	Within ramps	**Within resting pools**
Flow depth (m)	0.06	0.6
Flow velocity (m/s)	0.01	0.01
Aggregate condition	Good	Good
Algae	Some	None
Sedimentation	Little	Little
Debris	None	None
Comments	Moderate filamentous algae between USRP2–USRP3 and after USRP4	Little sand/gravel sediment in pools USRP1–USRP4; pumps running





Upstream passage – middle (USRP5)		
	Within ramps	**Within resting pools**
Flow depth (m)	0.001	0.5
Flow velocity (m/s)	2.0	0.1
Aggregate condition	Good	Good
Algae	Extensive	None
Sedimentation	Moderate	Moderate
Debris	Some	None
Comments	Panel L has extensive algae sheeting; small lip/hollow at base where PIT tag reader is; sediment/vegetation at exit	~200 mm fine sediment in pool



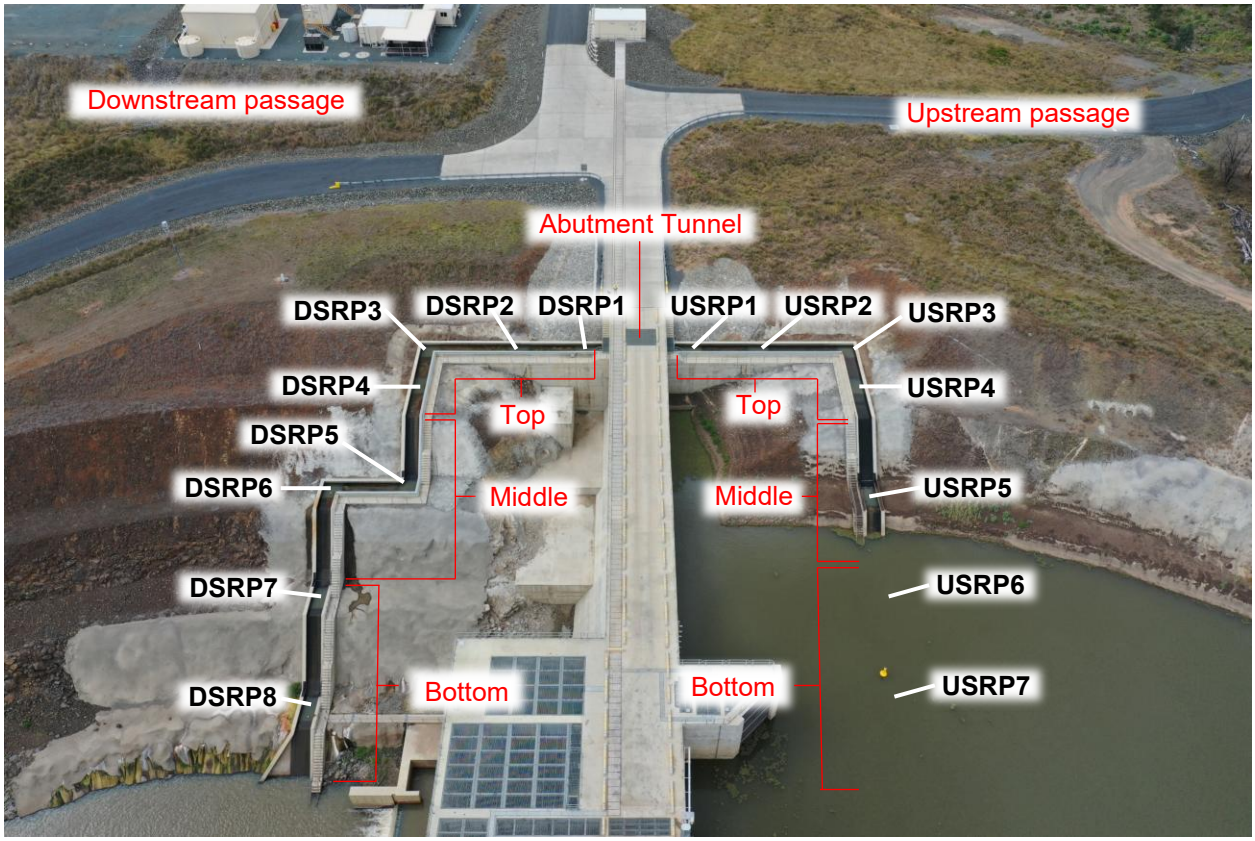


Upstream passage – bottom (USRP6 to USRP7)		
	Within ramps	**Within resting pools**
Flow depth (m)	N/A	N/A
Flow velocity (m/s)	N/A	N/A
Aggregate condition	N/A	N/A
Algae	N/A	N/A
Sedimentation	N/A	N/A
Debris	N/A	N/A
Comments	Pools submerged	



Turtle Passage Inspection Form

Inspection details	
Project Name	Rookwood Weir Operations Phase Turtle Monitoring
Project Number	12633406
Survey	Nov-25
Date	7/11/2025
Time	11:20 AM
Team Members	Lauren Pratt



Maintenance		
Type	**Maintenance required**	**Details**
Hand operated globe valves (HOGV)	**Yes**	Handles are missing from all globe valves
Variable speed driver (VSD) pump	No	Operational
Supervisory Control and Data Acquisition (SCADA)	N/A	N/A – Sunwater to assess
Turtle passage cleaning & maintenance	**Yes**	Flush out sediment from resting pools DSRP8 and USRP7. Remove sediment from abutment tunnel and horizontal ramp at USRP5. Fix the lip on the vertical ramp at USRP5 to stop turtles from injuring their plastrons.

Maintenance		
Type	**Maintenance required**	**Details**
Other maintenance required	**Yes**	Inrease water velocity slightly on downstream side passage.

Photos



Hand operated globe valve with missing handle



'Lip' created on ramp from concrete covering the PIT tag reader at USRP5



Sediment build up on ramp at USRP5



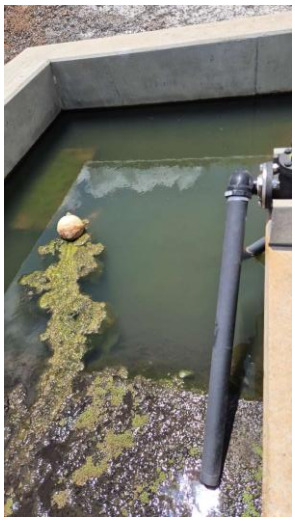
Minimal water flow on downstream side of turtle passage

Downstream passage – bottom (DSRP8 to DSRP7)		
	Within ramps	**Within resting pools**
Flow depth (m)	0.02	0.5
Flow velocity (m/s)	0.3	0.03
Aggregate condition	Good	Good
Algae	Some	Some
Sedimentation	None	Extensive
Debris	None	None
Comments	–	0.19 m of sediment build up in DSRP8. Gambusia in resting pool





Downstream passage – middle (DSRP6 to DSRP5)		
	Within ramps	**Within resting pools**
Flow depth (m)	0.03	0.54
Flow velocity (m/s)	0.2	0.01
Aggregate condition	Good	Good
Algae	Some	Some
Sedimentation	None	Little
Debris	None	None
Comments	0.01 m depth and 0.2 m/sec on vertical ramp	Gambusia present



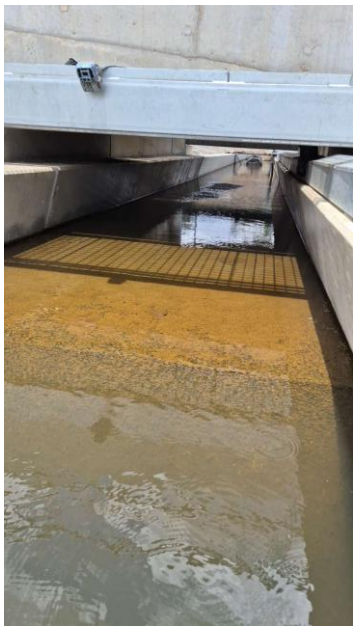


Downstream passage – top (DSRP4 to DSRP1)		
	Within ramps	**Within resting pools**
Flow depth (m)	0.03	0.53
Flow velocity (m/s)	0.01	0.01
Aggregate condition	Good	Good
Algae	Moderate	Little
Sedimentation	None	None
Debris	None	None
Comments	–	Gambusia present





Abutment tunnel	
	Within tunnel
Grating condition	Good
Debris	None
Sedimentation	Little
Comments	Build up of sediment



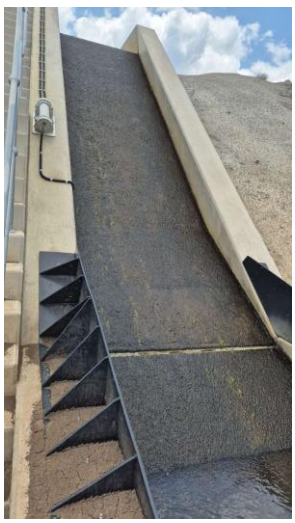


Upstream passage – top (USRP1 to DSRP4)		
	Within ramps	**Within resting pools**
Flow depth (m)	0.02	0.52
Flow velocity (m/s)	0.03	0.01
Aggregate condition	Good	Good
Algae	Some	Little
Sedimentation	None	None
Debris	None	None
Comments	–	–





Upstream passage – middle (USRP5)		
	Within ramps	**Within resting pools**
Flow depth (m)	0.1	0.52
Flow velocity (m/s)	0.6	0.03
Aggregate condition	Good	Good
Algae	Some	Little
Sedimentation	None	Extensive
Debris	None	None
Comments	Fix the lip on the ramp where the PIT tag reader was installed	0.14 m of silt in the resting pool.





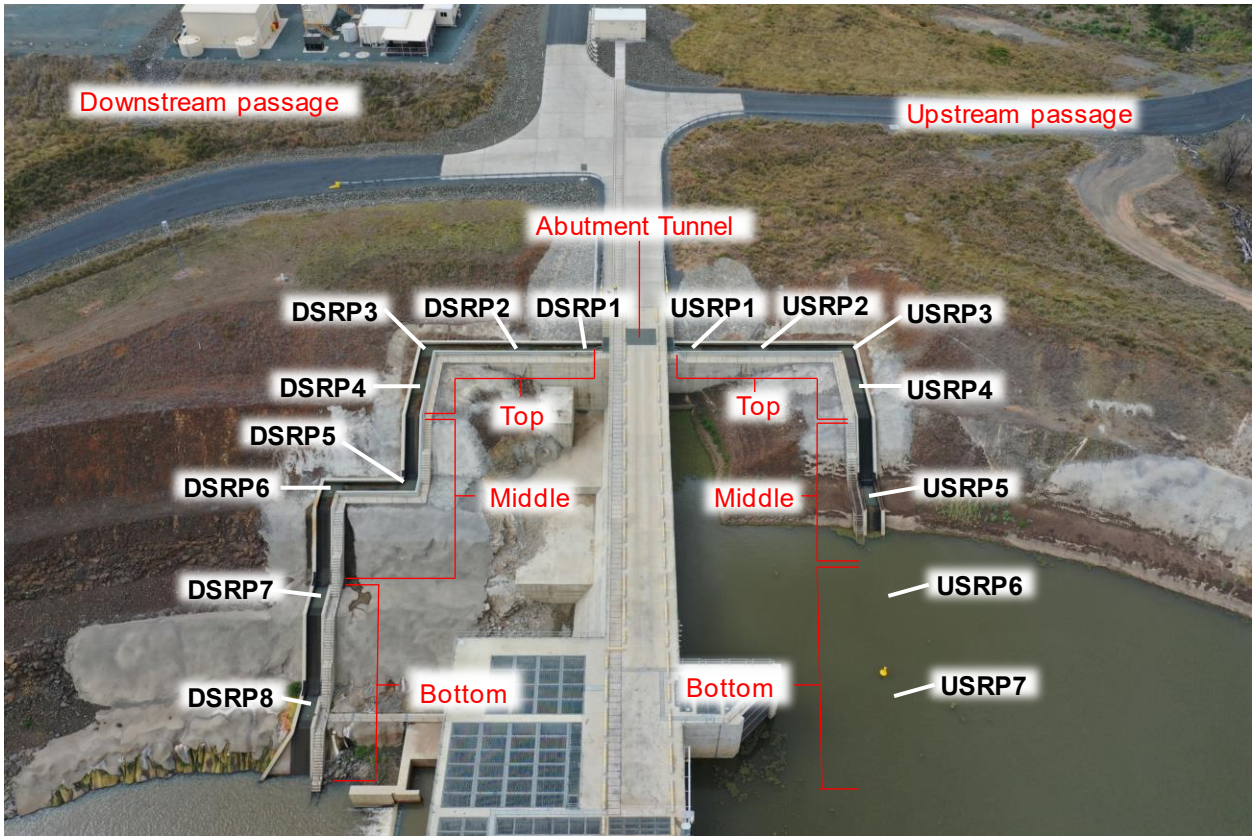
Upstream passage – bottom (USRP6 to USRP7)		
	Within ramps	**Within resting pools**
Flow depth (m)	N/A	N/A
Flow velocity (m/s)	N/A	N/A
Aggregate condition	N/A	N/A
Algae	N/A	N/A
Sedimentation	N/A	N/A
Debris	N/A	N/A
Comments	Pools submerged	





Turtle Passage Inspection Form

Inspection details	
Project Name	Rookwood Weir Operations Phase Turtle Monitoring
Project Number	12633406
Survey	Sep-25
Date	4/09/2025
Time	11:00 AM
Team Members	Lauren Pratt



Maintenance		
Infrastructure	**Maintenance required**	**Details**
Hand operated globe valves (HOGV)	**Yes**	Operational but multiple HOGVs are noisy, review options to reduce noise
Variable speed driver (VSD) pump	No	Operational, no maintenance required
Supervisory Control and Data Acquisition (SCADA)	N/A	N/A – Sunwater to assess
Turtle passage cleaning & maintenance	**Yes**	Clear sediment and aquatic plants from the ramp at USRP5 (Upstream passage – middle)
Other maintenance required	**Yes**	Concrete 'lip' on turtle ramp where the PIT tag readers are installed need to be smoothed over

Downstream passage – bottom (DSRP8 to DSRP7)		
	Within ramps	**Within resting pools**
Flow depth (m)	0.015	0.41
Flow velocity (m/s)	0.2	0.03
Aggregate condition	Good	Good
Algae	Little	Little
Sedimentation	Little	Extensive
Debris	Little	None
Comments	Small amount of water lettuce present	Thick sediment DSRP8, approximately 10cm deep. No sediment in DSRP7





Downstream passage – middle (DSRP6 to DSRP5)		
	Within ramps	**Within resting pools**
Flow depth (m)	0.015	0.53
Flow velocity (m/s)	0.2	0.02
Aggregate condition	Good	Good
Algae	Little	Little
Sedimentation	None	None
Debris	Some	None
Comments	Azolla and algae on flat ramp sections	Noisy HOGVs. Small fish in resting pool





Downstream passage – top (DSRP4 to DSRP1)		
	Within ramps	**Within resting pools**
Flow depth (m)	0.05	0.54
Flow velocity (m/s)	0.04	0.02
Aggregate condition	Good	Good
Algae	Moderate	Little
Sedimentation	None	None
Debris	Some	None
Comments	Algae and azolla on flat sections	Small amount of filamentous algae on the bottom, small fish in resting pools, one Palaemonidae sp. observed





Abutment tunnel	
	Within tunnel
Grating condition	Good
Debris	None
Sedimentation	Some
Comments	Algae and small amount of silt that has an aquatic plant growing out of it. There is a little amount of algae





Upstream passage – top (USRP1 to DSRP4)		
	Within ramps	**Within resting pools**
Flow depth (m)	0.04	0.46
Flow velocity (m/s)	0.05	0.02
Aggregate condition	Good	Good
Algae	Some	Little
Sedimentation	Little	Some
Debris	None	None
Comments	Filamentous algae	Gravel and sand in resting pool USRP1





Upstream passage – middle (USRP5)		
	Within ramps	**Within resting pools**
Flow depth (m)	0.2	0.5
Flow velocity (m/s)	1.0 (vertical section)	0.02
Aggregate condition	Good	Good
Algae	Little	Some
Sedimentation	Little	Extensive
Debris	Little	None
Comments	Sediment with plants obstructing flow to exit ramp. 'Lip' where PIT tag reader installed. Water lettuce and duck weed at exit ramp.	Approximately 15cm of silt build up with some filamentous algae





Upstream passage – bottom (USRP6 to USRP7)		
	Within ramps	**Within resting pools**
Flow depth (m)	N/A	N/A
Flow velocity (m/s)	N/A	N/A
Aggregate condition	N/A	N/A
Algae	N/A	N/A
Sedimentation	N/A	N/A
Debris	N/A	N/A
Comments	Upstream passage – bottom was submerged during survey	

Turtle & Turtleway Observation Form - Rookwood

#000048 Submitted

Hierarchy

Company
Sunwater

Division
Operations

Region
Fitzroy

Location
Rockhampton

Site
Rookwood Weir

Observation Type

Observation Type
Turtleway Inspection

Turtleway Inspection

Inspected by
Humphreys Bradley

Inspection Date
15 Apr, 2026

Inspection Time
13:48

Flow Depth (m)

Upstream passage – within ramp, top
0.002

Upstream passage – within ramp, middle
0

Upstream passage – within ramp, bottom
0

Downstream passage – within ramp, top
0.002

Downstream passage – within ramp, middle
0.002

Downstream passage – within ramp, bottom
0.002

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Upstream passage – within pools, top 0.5
Upstream passage – within pools, middle 0.5
Upstream passage – within pools, bottom 0.5
Downstream passage – within pools, top 0.5
Downstream passage – within pools, middle 0.5
Downstream passage – within pools, bottom 0.5

Flow Velocity (meters per second)

Upstream – within ramp, top 0.1
Upstream – within ramp, middle 0
Upstream – within ramp, bottom 0
Downstream – within ramp, top 0
Downstream – within ramp, middle 0
Downstream – within ramp, bottom 0.1
Upstream – within pools, top 0
Upstream – within pools, middle 0
Upstream – within pools, bottom 0
Downstream – within pools, top 0
Downstream – within pools, middle 0
Downstream – within pools, bottom 0

Conditions

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Conditions within resting pools

Algae

Conditions within resting pools details

High turbidity, some algae

Conditions within ramp sections - aggregate

Algae

Conditions within ramp sections details

Moderate algae growth

Conditions within abutment tunnel - grating

Debris

Conditions within abutment tunnel details

minor road debris

Maintenance required

Other

Maintenance required details

possible clean of algae

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Date	Name	Signature

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Turtle & Turtleway Observation Form - Rookwood

#000022 Submitted

Hierarchy

Company
Sunwater

Division
People, Environment & Portfolio

Region
Central

Location
Rockhampton

Site
Rookwood Weir

Observation Type

Observation Type
Turtleway Inspection

Turtleway Inspection

Inspected by
Jeffrey Josef

Inspection Date
13 Aug, 2025

Inspection Time
10:59

Flow Depth (m)

Upstream passage – within ramp, top
0.005

Upstream passage – within ramp, middle
0

Upstream passage – within ramp, bottom
0

Downstream passage – within ramp, top
0.005

Downstream passage – within ramp, middle
0.005

Downstream passage – within ramp, bottom
0.3

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Upstream passage – within pools, top 0
Upstream passage – within pools, middle 0
Upstream passage – within pools, bottom 0
Downstream passage – within pools, top 0.3
Downstream passage – within pools, middle 0.3
Downstream passage – within pools, bottom 0.3

Flow Velocity (meters per second)

Upstream – within ramp, top 1.5
Upstream – within ramp, middle 0
Upstream – within ramp, bottom 0
Downstream – within ramp, top 1.5
Downstream – within ramp, middle 1.5
Downstream – within ramp, bottom 1.5
Upstream – within pools, top 0.05
Upstream – within pools, middle 0
Upstream – within pools, bottom 0
Downstream – within pools, top 0.05
Downstream – within pools, middle 0.05
Downstream – within pools, bottom 0.05

Conditions

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Conditions within resting pools	Debris, Algae
Conditions within resting pools details	Unanswered
Conditions within ramp sections - aggregate	Algae
Conditions within ramp sections details	Unanswered
Conditions within abutment tunnel - grating	Debris
Conditions within abutment tunnel details	Unanswered
Maintenance required	Other
Maintenance required details	Clean/Maintenance

Date	Name	Signature

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Turtle & Turtleway Observation Form - Rookwood

#000030 Submitted

Hierarchy

Company
Sunwater

Division
Operations

Region
Fitzroy

Location
Rockhampton

Site
Rookwood Weir

Observation Type

Observation Type
Turtleway Inspection

Turtleway Inspection

Inspected by
Humphreys Bradley

Inspection Date
02 Dec, 2025

Inspection Time
10:58

Flow Depth (m)

Upstream passage – within ramp, top
0.002

Upstream passage – within ramp, middle
0

Upstream passage – within ramp, bottom
0.001

Downstream passage – within ramp, top
0

Downstream passage – within ramp, middle
0

Downstream passage – within ramp, bottom
0

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Upstream passage – within pools, top 0.5
Upstream passage – within pools, middle 0
Upstream passage – within pools, bottom 0.5
Downstream passage – within pools, top 0.5
Downstream passage – within pools, middle 0.5
Downstream passage – within pools, bottom 0.5

Flow Velocity (meters per second)

Upstream – within ramp, top 0.004
Upstream – within ramp, middle 0
Upstream – within ramp, bottom 0.002
Downstream – within ramp, top 0
Downstream – within ramp, middle 0
Downstream – within ramp, bottom 0
Upstream – within pools, top 0
Upstream – within pools, middle 0
Upstream – within pools, bottom 0
Downstream – within pools, top 0
Downstream – within pools, middle 0
Downstream – within pools, bottom 0

Conditions

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Conditions within resting pools	Algae
Conditions within resting pools details	algae growth, sediment building
Conditions within ramp sections - aggregate	Algae
Conditions within ramp sections details	algae growth, sediment building
Conditions within abutment tunnel - grating	Debris
Conditions within abutment tunnel details	minor build up dirt
Maintenance required	Other
Maintenance required details	adjust flow on valve

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Date	Name	Signature

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Turtle & Turtleway Observation Form - Rookwood

#000039 Submitted

Hierarchy

Company
Sunwater

Division
Operations

Region
Fitzroy

Location
Rockhampton

Site
Rookwood Weir

Observation Type

Observation Type
Turtleway Inspection

Turtleway Inspection

Inspected by
Humphreys Bradley

Inspection Date
26 Feb, 2026

Inspection Time
13:04

Flow Depth (m)

Upstream passage – within ramp, top
0.005

Upstream passage – within ramp, middle
0.005

Upstream passage – within ramp, bottom
0.005

Downstream passage – within ramp, top
0.005

Downstream passage – within ramp, middle
0.005

Downstream passage – within ramp, bottom
Unanswered

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Upstream passage – within pools, top

0.55

Upstream passage – within pools, middle

0.55

Upstream passage – within pools, bottom

Unanswered

Downstream passage – within pools, top

0.55

Downstream passage – within pools, middle

0.55

Downstream passage – within pools, bottom

Unanswered

Flow Velocity (meters per second)

Upstream – within ramp, top

0.7

Upstream – within ramp, middle

Unanswered

Upstream – within ramp, bottom

Unanswered

Downstream – within ramp, top

0.6

Downstream – within ramp, middle

0.7

Downstream – within ramp, bottom

Unanswered

Upstream – within pools, top

0

Upstream – within pools, middle

Unanswered

Upstream – within pools, bottom

Unanswered

Downstream – within pools, top

0

Downstream – within pools, middle

0

Downstream – within pools, bottom

Unanswered

Conditions

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Conditions within resting pools

Other

Conditions within resting pools details

high turbidity.

Conditions within ramp sections - aggregate

Algae

Conditions within ramp sections details

Heavy algae growth down stream passage

Conditions within abutment tunnel - grating

Debris

Conditions within abutment tunnel details

Minor debris/sediment

Maintenance required

Other

Maintenance required details

Suggest turtle passage algae/ sediment clean.

myosh safety management software

Date	Name	Signature

myosh safety management software

Turtle & Turtleway Observation Form - Rookwood

#000031 Submitted

Hierarchy

Company
Sunwater

Division
Operations

Region
Fitzroy

Location
Unanswered

Site
Unanswered

Observation Type

Observation Type
Turtleway Inspection

Turtleway Inspection

Inspected by
Stokes Chad

Inspection Date
08 Jan, 2026

Inspection Time
08:51

Flow Depth (m)

Upstream passage – within ramp, top
0.025

Upstream passage – within ramp, middle
0.025

Upstream passage – within ramp, bottom
0.025

Downstream passage – within ramp, top
0.035

Downstream passage – within ramp, middle
0.35

Downstream passage – within ramp, bottom
0.35

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Upstream passage – within pools, top 0.55
Upstream passage – within pools, middle 0.55
Upstream passage – within pools, bottom 0.55
Downstream passage – within pools, top 0.555
Downstream passage – within pools, middle 0.57
Downstream passage – within pools, bottom 0.57

Flow Velocity (meters per second)

Upstream – within ramp, top 0.9
Upstream – within ramp, middle 0.9
Upstream – within ramp, bottom 0.9
Downstream – within ramp, top 1.1
Downstream – within ramp, middle 1.2
Downstream – within ramp, bottom 1.2
Upstream – within pools, top 0.1
Upstream – within pools, middle 0.1
Upstream – within pools, bottom 0.1
Downstream – within pools, top 0.2
Downstream – within pools, middle 0.3
Downstream – within pools, bottom 0.2

Conditions

myosh safety management software

Conditions within resting pools

Other

Conditions within resting pools details

Sediment build up bottom of resting pools is 70mm

Conditions within ramp sections - aggregate

Algae

Conditions within ramp sections details

Roughly 10mm algae build up on ramps

Conditions within abutment tunnel - grating

Other

Conditions within abutment tunnel details

Same as ramp algae build up on horizontal pathway

Maintenance required

Other

Maintenance required details

One construction joint is leaking photo attached

Attachments

Attachment 1

cdv_photo_1767827629.jpg



Attachment 2

cdv_photo_1767827636.jpg

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Attachment 3

cdv_photo_1767827653.jpg



myosh safety management software

Date	Name	Signature

myosh safety management software

Turtle & Turtleway Observation Form - Rookwood

#000019 Submitted

Hierarchy

Company
Sunwater

Division
People, Environment & Portfolio

Region
Central

Location
Rockhampton

Site
Rookwood Weir

Observation Type

Observation Type
Turtleway Inspection

Turtleway Inspection

Inspected by
Jeffrey Josef

Inspection Date
31 Jul, 2025

Inspection Time
10:28

Flow Depth (m)

Upstream passage – within ramp, top
0.005

Upstream passage – within ramp, middle
0

Upstream passage – within ramp, bottom
0

Downstream passage – within ramp, top
0.005

Downstream passage – within ramp, middle
0.005

Downstream passage – within ramp, bottom
0.005

myosh safety management software

Upstream passage – within pools, top 0.3
Upstream passage – within pools, middle 0
Upstream passage – within pools, bottom 0
Downstream passage – within pools, top 0.3
Downstream passage – within pools, middle 0.3
Downstream passage – within pools, bottom 0.3

Flow Velocity (meters per second)

Upstream – within ramp, top 1.5
Upstream – within ramp, middle 0
Upstream – within ramp, bottom 0
Downstream – within ramp, top 1.5
Downstream – within ramp, middle 1.5
Downstream – within ramp, bottom 1.5
Upstream – within pools, top 0.05
Upstream – within pools, middle 0
Upstream – within pools, bottom 0
Downstream – within pools, top 0.05
Downstream – within pools, middle 0.05
Downstream – within pools, bottom 0.05

Conditions

myosh safety management software

Conditions within resting pools

Debris, Algae

Conditions within resting pools details

Algal build up

Conditions within ramp sections - aggregate

Algae

Conditions within ramp sections details

Algal/sediment build up

Conditions within abutment tunnel - grating

Debris

Conditions within abutment tunnel details

Gravel from vehicles passing over grate

Maintenance required

Other

Maintenance required details

clean/flushed out

Attachments

Attachment 1

IMG_1791.jpg



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Attachment 2

IMG_1777.jpg



Attachment 3

IMG_1782.jpg



Attachment 4

IMG_1795.jpg



myosh safety management software

Attachment 5

IMG_1786.jpg



Attachment 6

IMG_1776.jpg



Attachment 7

IMG_1781.jpg



myosh safety management software

Attachment 8

IMG_1790.jpg



Attachment 9

IMG_1780.jpg



Attachment 10

IMG_1785.jpg



myosh safety management software

Attachment 11

IMG_1794.jpg



Attachment 12

IMG_1784.jpg



Attachment 13

IMG_1789.jpg



myosh safety management software

Attachment 14

IMG_1775.jpg



Attachment 15

IMG_1788.jpg



Attachment 16

IMG_1793.jpg



myosh safety management software

Attachment 17

IMG_1779.jpg



Attachment 18

IMG_1783.jpg



Attachment 19

IMG_1792.jpg



Attachment 20

IMG_1797.jpg

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Attachment 21

IMG_1787.jpg



Attachment 22

IMG_1796.jpg

myosh safety management software



Attachment 23

IMG_1778.jpg



myosh safety management software

Date	Name	Signature

myosh safety management software

Turtle & Turtleway Observation Form - Rookwood

#000018 Submitted

Hierarchy

Company
Sunwater

Division
People, Environment & Portfolio

Region
Central

Location
Rockhampton

Site
Rookwood Weir

Observation Type

Observation Type
Turtleway Inspection

Turtleway Inspection

Inspected by
Kehoe Paddy

Inspection Date
16 Jun, 2025

Inspection Time
10:12

Flow Depth (m)

Upstream passage – within ramp, top
0.005

Upstream passage – within ramp, middle
0

Upstream passage – within ramp, bottom
0

Downstream passage – within ramp, top
0.005

Downstream passage – within ramp, middle
0.005

Downstream passage – within ramp, bottom
0.005

myosh safety management software

Upstream passage – within pools, top 0.3
Upstream passage – within pools, middle 0
Upstream passage – within pools, bottom 0
Downstream passage – within pools, top 0.3
Downstream passage – within pools, middle 0.3
Downstream passage – within pools, bottom 0.3

Flow Velocity (meters per second)

Upstream – within ramp, top 1.5
Upstream – within ramp, middle 0
Upstream – within ramp, bottom 0
Downstream – within ramp, top 1.5
Downstream – within ramp, middle 1.5
Downstream – within ramp, bottom 1.5
Upstream – within pools, top 0.05
Upstream – within pools, middle 0
Upstream – within pools, bottom 0
Downstream – within pools, top 0.05
Downstream – within pools, middle 0.05
Downstream – within pools, bottom 0.05

Conditions

myosh safety management software

Conditions within resting pools

Debris, Algae

Conditions within resting pools details

algae build up at edges of resting pools

Conditions within ramp sections - aggregate

Algae

Conditions within ramp sections details

algal build up on ramp sections

Conditions within abutment tunnel - grating

Debris

Conditions within abutment tunnel details

gravel and soil debris in tunnel

Maintenance required

Other

Maintenance required details

clean or good flush out

Attachments

Attachment 1

Image (49).jpg



Attachment 2

Image (50).jpg



myosh
safety management software

Date	Name	Signature

myosh safety management software

Turtle & Turtleway Observation Form - Rookwood

#000043 Submitted

Hierarchy

Company
Sunwater

Division
Integrated Services

Region
Fitzroy

Location
Rockhampton

Site
Rookwood Weir

Observation Type

Observation Type
Turtleway Inspection

Turtleway Inspection

Inspected by
Humphreys Bradley

Inspection Date
10 Mar, 2026

Inspection Time
14:30

Flow Depth (m)

Upstream passage – within ramp, top
0.015

Upstream passage – within ramp, middle
0.015

Upstream passage – within ramp, bottom
0

Downstream passage – within ramp, top
0.02

Downstream passage – within ramp, middle
0.01

Downstream passage – within ramp, bottom
0.01

myosh safety management software

Upstream passage – within pools, top 0.55
Upstream passage – within pools, middle 0.55
Upstream passage – within pools, bottom 0.55
Downstream passage – within pools, top 0.55
Downstream passage – within pools, middle 0.55
Downstream passage – within pools, bottom 0.55

Flow Velocity (meters per second)

Upstream – within ramp, top 0.6
Upstream – within ramp, middle 0.6
Upstream – within ramp, bottom 0
Downstream – within ramp, top 0.6
Downstream – within ramp, middle 0.6
Downstream – within ramp, bottom 0.7
Upstream – within pools, top 0
Upstream – within pools, middle 0
Upstream – within pools, bottom 0
Downstream – within pools, top 0
Downstream – within pools, middle 0
Downstream – within pools, bottom 0

Conditions

myosh safety management software

Conditions within resting pools	Debris, Algae
Conditions within resting pools details	high turbity
Conditions within ramp sections - aggregate	Algae
Conditions within ramp sections details	Thick algae
Conditions within abutment tunnel - grating	Debris
Conditions within abutment tunnel details	Minor debris
Maintenance required	Other
Maintenance required details	Possible clean out if professionals recommend

Turtle & Turtleway Observation Form - Rookwood

#000049 Submitted

Hierarchy

Company
Sunwater

Division
Operations & Customers

Region
Fitzroy

Location
Rockhampton

Site
Rookwood Weir

Observation Type

Observation Type
Turtleway Inspection

Turtleway Inspection

Inspected by
Humphreys Bradley

Inspection Date
07 May, 2026

Inspection Time
12:40

Flow Depth (m)

Upstream passage – within ramp, top
0.001

Upstream passage – within ramp, middle
0

Upstream passage – within ramp, bottom
0

Downstream passage – within ramp, top
0.001

Downstream passage – within ramp, middle
0.002

Downstream passage – within ramp, bottom
0.002

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Upstream passage – within pools, top 0.5
Upstream passage – within pools, middle 0.5
Upstream passage – within pools, bottom 0.5
Downstream passage – within pools, top 0.5
Downstream passage – within pools, middle 0.5
Downstream passage – within pools, bottom 0.5

Flow Velocity (meters per second)

Upstream – within ramp, top 0.1
Upstream – within ramp, middle 0
Upstream – within ramp, bottom 0
Downstream – within ramp, top 0
Downstream – within ramp, middle 0
Downstream – within ramp, bottom 0.1
Upstream – within pools, top 0
Upstream – within pools, middle 0
Upstream – within pools, bottom 0
Downstream – within pools, top 0
Downstream – within pools, middle 0
Downstream – within pools, bottom 0

Conditions

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Conditions within resting pools	Algae
Conditions within resting pools details	Some algae present
Conditions within ramp sections - aggregate	Algae
Conditions within ramp sections details	algae growth on ramps
Conditions within abutment tunnel - grating	Debris
Conditions within abutment tunnel details	road base
Maintenance required	Other
Maintenance required details	possible cleaning

Date	Name	Signature

myosh safety management software

Turtle & Turtleway Observation Form - Rookwood

#000028 Submitted

Hierarchy

Company
Sunwater

Division
Operations

Region
Fitzroy

Location
Rockhampton

Site
Rookwood Weir

Observation Type

Observation Type
Turtleway Inspection

Turtleway Inspection

Inspected by
Humphreys Bradley

Inspection Date
18 Nov, 2025

Inspection Time
12:08

Flow Depth (m)

Upstream passage – within ramp, top
0.002

Upstream passage – within ramp, middle
0

Upstream passage – within ramp, bottom
0.001

Downstream passage – within ramp, top
0

Downstream passage – within ramp, middle
0

Downstream passage – within ramp, bottom
0

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Upstream passage – within pools, top 0.5
Upstream passage – within pools, middle 0
Upstream passage – within pools, bottom 0.5
Downstream passage – within pools, top 0.5
Downstream passage – within pools, middle 0.5
Downstream passage – within pools, bottom 0.5

Flow Velocity (meters per second)

Upstream – within ramp, top 0.004
Upstream – within ramp, middle 0
Upstream – within ramp, bottom 0.002
Downstream – within ramp, top 0
Downstream – within ramp, middle 0
Downstream – within ramp, bottom 0
Upstream – within pools, top 0
Upstream – within pools, middle 0
Upstream – within pools, bottom 0
Downstream – within pools, top 0
Downstream – within pools, middle 0
Downstream – within pools, bottom 0

Conditions

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Conditions within resting pools	Debris, Algae
Conditions within resting pools details	sediment build up, algae growth
Conditions within ramp sections - aggregate	Algae
Conditions within ramp sections details	limited algae growth
Conditions within abutment tunnel - grating	Other
Conditions within abutment tunnel details	sediment
Maintenance required	Other
Maintenance required details	sediment flush

Date	Name	Signature

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Turtle & Turtleway Observation Form - Rookwood

#000027 Submitted

Hierarchy

Company
Sunwater

Division
Integrated Services

Region
Fitzroy

Location
Unanswered

Site
Unanswered

Observation Type

Observation Type
Turtleway Inspection

Turtleway Inspection

Inspected by
Jeffrey Josef

Inspection Date
22 Oct, 2025

Inspection Time
14:56

Flow Depth (m)

Upstream passage – within ramp, top
0

Upstream passage – within ramp, middle
0.2

Upstream passage – within ramp, bottom
0.1

Downstream passage – within ramp, top
0.2

Downstream passage – within ramp, middle
0.1

Downstream passage – within ramp, bottom
0.1

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Upstream passage – within pools, top 0
Upstream passage – within pools, middle 0
Upstream passage – within pools, bottom 0
Downstream passage – within pools, top 0
Downstream passage – within pools, middle 0.1
Downstream passage – within pools, bottom 0.1

Flow Velocity (meters per second)

Upstream – within ramp, top 0.1
Upstream – within ramp, middle 0.1
Upstream – within ramp, bottom 0.2
Downstream – within ramp, top 0.1
Downstream – within ramp, middle 0.1
Downstream – within ramp, bottom 0.1
Upstream – within pools, top 0
Upstream – within pools, middle 0
Upstream – within pools, bottom 0
Downstream – within pools, top 0
Downstream – within pools, middle 0
Downstream – within pools, bottom 0

Conditions

myosh safety management software

Conditions within resting pools

Other

Conditions within resting pools details

Sediment

Conditions within ramp sections - aggregate

Unanswered

Conditions within abutment tunnel - grating

Other

Conditions within abutment tunnel details

Sediment

Maintenance required

Other

Maintenance required details

Sediment flush

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Date	Name	Signature

myosh safety management software

Turtle & Turtleway Observation Form - Rookwood

#000025 Submitted

Hierarchy

Company
Sunwater

Division
People, Environment & Portfolio

Region
Central

Location
Rockhampton

Site
Rookwood Weir

Observation Type

Observation Type
Turtleway Inspection

Turtleway Inspection

Inspected by
Jeffrey Josef

Inspection Date
04 Sep, 2025

Inspection Time
10:30

Flow Depth (m)

Upstream passage – within ramp, top
0.005

Upstream passage – within ramp, middle
0

Upstream passage – within ramp, bottom
0

Downstream passage – within ramp, top
0.005

Downstream passage – within ramp, middle
0.005

Downstream passage – within ramp, bottom
0.3

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Upstream passage – within pools, top

0

Upstream passage – within pools, middle

0

Upstream passage – within pools, bottom

0

Downstream passage – within pools, top

0.3

Downstream passage – within pools, middle

0.3

Downstream passage – within pools, bottom

0.3

Flow Velocity (meters per second)

Upstream – within ramp, top

1.5

Upstream – within ramp, middle

0

Upstream – within ramp, bottom

0

Downstream – within ramp, top

1.5

Downstream – within ramp, middle

1.5

Downstream – within ramp, bottom

1.5

Upstream – within pools, top

0.05

Upstream – within pools, middle

0

Upstream – within pools, bottom

0

Downstream – within pools, top

0.05

Downstream – within pools, middle

0.05

Downstream – within pools, bottom

0.05

Conditions

myosh safety management software

Conditions within resting pools

Debris, Algae

Conditions within resting pools details

Unanswered

Conditions within ramp sections - aggregate

Algae

Conditions within ramp sections details

Unanswered

Conditions within abutment tunnel - grating

Debris

Conditions within abutment tunnel details

Unanswered

Maintenance required

Other

Maintenance required details

Flush out/clean

Attachments

Attachment 1

20250903_004246567_iOS.heic

Attachment 2

20250903_004752647_iOS.heic

Attachment 3

20250903_003937879_iOS.heic

Attachment 4

20250903_004740246_iOS.heic

Attachment 5

20250903_004045591_iOS.heic

Attachment 6

20250903_004235256_iOS.heic

Attachment 7

20250903_004010113_iOS.heic

Attachment 8

20250903_004239410_iOS.heic

Attachment 9

20250903_004639041_iOS.heic

Attachment 10

20250903_004733332_iOS.heic

Attachment 11

20250903_004108180_iOS.heic

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Attachment 12 20250903_004019169_iOS.heic
Attachment 13 20250903_004737972_iOS.heic
Attachment 14 20250903_004726698_iOS.heic
Attachment 15 20250903_004730267_iOS.heic
Attachment 16 20250903_004054602_iOS.heic
Attachment 17 20250903_004317362_iOS.heic
Attachment 18 20250903_004228916_iOS.heic
Attachment 19 20250903_003930768_iOS.heic
Attachment 20 20250903_004209343_iOS.heic
Attachment 21 20250903_004310946_iOS.heic
Attachment 22 20250903_004106941_iOS.heic
Attachment 23 20250903_003920482_iOS.heic
Attachment 24 20250903_004626074_iOS.heic
Attachment 25 20250903_004259162_iOS.heic
Attachment 26 20250903_004051303_iOS.heic
Attachment 27 20250903_004749019_iOS.heic
Attachment 28 20250903_004630327_iOS.heic
Attachment 29 20250903_004758384_iOS.heic
Attachment 30 20250903_003912512_iOS.heic
Attachment 31 20250903_004636952_iOS.heic

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Attachment 32	20250903_004244423_iOS.heic
Attachment 33	20250903_004654150_iOS.heic

Date	Name	Signature

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Appendix D

Turtle observation forms

Turtle & Turtleway Observation Form - Rookwood

#000020 Submitted

Hierarchy

Company
Sunwater

Division
People, Environment & Portfolio

Region
Central

Location
Rockhampton

Site
Rookwood Weir

Observation Type

Observation Type
Turtle Sighting

Sighting Details

Date
31 Jul, 2025

Time
11:33

Team member(s) involved
Jeffrey Josef

Location
Turtle Passage - First resting pool on top of tail water side

Turtle species
Unknown

Age class
Unknown

Sex
Unknown

Turtle size
13 - 20 cm

Observation
Head

Observation Details
Suspected Saw - shelled Turtle or male White throated snapping turtle

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Turtle Behaviour

Basking

Health / Injury / Mortality:

Unanswered

Actions

No action required

Attachments

Attachment 1

IMG_4341.jpg



Attachment 2

IMG_4343.jpg



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Attachment 3

IMG_4342.jpg



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Date	Name	Signature

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Turtle & Turtleway Observation Form - Rookwood

#000024 Submitted

Hierarchy

Company
Sunwater

Division
Operations

Region
Central

Location
Unanswered

Site
Unanswered

Observation Type

Observation Type
Turtle Sighting

Sighting Details

Date
01 Sep, 2025

Time
10:00

Team member(s) involved
Stokes Chad

Location
Rockhampton

Turtle species
White-throated snapping turtle

Age class
Adult

Sex
Female

Turtle size
20 cm +

Observation
Carapace (top of shell)

Observation Details
In catchment pond left bank Rookwood

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Turtle Behaviour

Basking

Health / Injury / Mortality:

Appears to be fine

Actions

No action required

Attachments

Attachment 1

cdv_photo_1756692110.jpg



Attachment 2

cdv_photo_1756692108.jpg

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Attachment 3

cdv_photo_1756692105.jpg



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Date	Name	Signature

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Turtle & Turtleway Observation Form - Rookwood

#000029 Submitted

Hierarchy

Company
Sunwater

Division
Operations

Region
Fitzroy

Location
Rockhampton

Site
Rookwood Weir

Observation Type

Observation Type
Turtle Sighting

Sighting Details

Date
18 Nov, 2025

Time
12:17

Team member(s) involved
Humphreys Bradley

Location
turtle ladder tail water

Turtle species
Unknown

Age class
Unknown

Sex
Unknown

Turtle size
13 - 20 cm

Observation
Carapace (top of shell)

Observation Details
Content, moving slowly in second pool up from tail water river level

myosh safety management software

Turtle Behaviour

Swimming

Health / Injury / Mortality:

healthy, small chip in shell

Actions

No action required

Attachments

Attachment 1

turtle..jpeg



Attachment 2

turtle.jpeg



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Date	Name	Signature

myosh safety management software

Turtle & Turtleway Observation Form - Rookwood

#000032 Submitted

Hierarchy

Company
Sunwater

Division
Operations

Region
Fitzroy

Location
Unanswered

Site
Unanswered

Observation Type

Observation Type
Turtle Sighting

Sighting Details

Date
08 Jan, 2026

Time
09:19

Team member(s) involved
Stokes Chad

Location
Rockhampton

Turtle species
Fitzroy River turtle

Age class
Juvenile

Sex
Unknown

Turtle size
13 - 20 cm

Observation
Head

Observation Details
Downstream resting pool top DSRP1 pool

myosh safety management software

Turtle Behaviour

Basking

Health / Injury / Mortality:

Unanswered

Actions

No action required

Attachments

Attachment 1

cdv_photo_1767828147.jpg



Attachment 2

cdv_photo_1767828136.jpg



myosh
safety management software

Date	Name	Signature

myosh safety management software

Turtle & Turtleway Observation Form - Rookwood

#000034 Submitted

Hierarchy

Company
Sunwater

Division
Operations

Region
Fitzroy

Location
Unanswered

Site
Unanswered

Observation Type

Observation Type
Turtle Sighting

Sighting Details

Date
14 Jan, 2026

Time
14:25

Team member(s) involved
Humphreys Bradley

Location
Headwater top pool

Turtle species
Unknown

Age class
Adult

Sex
Unknown

Turtle size
20 cm +

Observation
Head

Observation Details
Unanswered

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Turtle Behaviour

Swimming

Health / Injury / Mortality:

Healthy

Actions

No action required

Attachments

Attachment 1

cdv_photo_001.jpg



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Date	Name	Signature

myosh safety management software

Turtle & Turtleway Observation Form - Rookwood

#000033 Submitted

Hierarchy

Company
Sunwater

Division
Operations

Region
Fitzroy

Location
Unanswered

Site
Unanswered

Observation Type

Observation Type
Turtle Sighting

Sighting Details

Date
15 Jan, 2026

Time
10:50

Team member(s) involved
Humphreys Bradley

Location
Downstream weir pool

Turtle species
Unknown

Age class
Adult

Sex
Unknown

Turtle size
20 cm +

Observation
Carapace (top of shell), Head

Observation Details
Unanswered

myosh safety management software

Turtle Behaviour

Swimming

Health / Injury / Mortality:

Healthy

Actions

No action required

Attachments

Attachment 1

cdv_photo_003.jpg



Attachment 2

cdv_photo_002.jpg

myosh safety management software



myosh
safety management software

Date	Name	Signature

myosh safety management software

Turtle & Turtleway Observation Form - Rookwood

#000036 Submitted

Hierarchy

Company
Sunwater

Division
Integrated Services

Region
Fitzroy

Location
Unanswered

Site
Unanswered

Observation Type

Observation Type
Turtle Sighting

Sighting Details

Date
29 Jan, 2026

Time
15:00

Team member(s) involved
Humphreys Bradley

Location
Rockhampton

Turtle species
White-throated snapping turtle

Age class
Adult

Sex
Unknown

Turtle size
20 cm +

Observation
Carapace (top of shell), Plastron (bottom of shell), Limbs, Head

Observation Details
Turtle observed on left bank concrete weir structure tail water, appears to be attempting to travel upstream

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Turtle Behaviour

Climbing

Health / Injury / Mortality:

Healthy

Actions

No action required

Attachments

Attachment 1

1770073918357_8808.jpg



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Date	Name	Signature

myosh safety management software

Turtle & Turtleway Observation Form - Rookwood

#000038 Submitted

Hierarchy

Company
Sunwater

Division
Operations

Region
Fitzroy

Location
Unanswered

Site
Unanswered

Observation Type

Observation Type
Turtle Sighting

Sighting Details

Date
17 Feb, 2026

Time
11:30

Team member(s) involved
Humphreys Bradley

Location
Turtle on weir structure next to tail water turtle ladder

Turtle species
Unknown

Age class
Unknown

Sex
Unknown

Turtle size
13 - 20 cm

Observation
Carapace (top of shell)

Observation Details
Climbing

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Turtle Behaviour

Climbing

Health / Injury / Mortality:

Healthy

Actions

No action required

Attachments

Attachment 1

1771805946926_3646.jpg



myosh safety management software

Date	Name	Signature

myosh safety management software

Turtle & Turtleway Observation Form - Rookwood

#000037 Submitted

Hierarchy

Company
Sunwater

Division
Operations

Region
Fitzroy

Location
Unanswered

Site
Unanswered

Observation Type

Observation Type
Turtle Sighting

Sighting Details

Date
23 Feb, 2026

Time
13:30

Team member(s) involved
Humphreys Bradley

Location
Rockhampton

Turtle species
Unknown

Age class
Unknown

Sex
Unknown

Turtle size
13 - 20 cm

Observation
Head

Observation Details
Breathing up near tail water turtle ladder

myosh safety management software

Turtle Behaviour

Swimming, Other

Other

Breathing

Health / Injury / Mortality:

Healthy

Actions

No action required

Attachments

Attachment 1

1771804548037_5868.jpg



Attachment 2

1771804548052_4433.jpg

myosh safety management software



myosh
safety management software

Date	Name	Signature

myosh safety management software

Turtle & Turtleway Observation Form - Rookwood

#000040 Submitted

Hierarchy

Company	Sunwater
Division	Integrated Services
Region	Fitzroy
Location	Rockhampton
Site	Rookwood Weir

Observation Type

Observation Type	Turtle Sighting

Sighting Details

Date	26 Feb, 2026
Time	12:45
Team member(s) involved	Humphreys Bradley, Quinlan Jo
Location	DSRP5
Turtle species	Unknown
Age class	Juvenile
Sex	Unknown
Turtle size	6 - 12 cm
Observation	Head
Observation Details	Breathing up in pool

myosh safety management software

Turtle Behaviour

Swimming

Health / Injury / Mortality:

healthy

Actions

No action required

Attachments

Attachment 1

ed9a548d-5d17-403c-a63b-0af019c2b521.jpg



myosh safety management software

Date	Name	Signature

myosh safety management software

Turtle & Turtleway Observation Form - Rookwood

#000042 Submitted

Hierarchy

Company
Sunwater

Division
Integrated Services

Region
Fitzroy

Location
Rockhampton

Site
Rookwood Weir

Observation Type

Observation Type
Turtle Sighting

Sighting Details

Date
03 Mar, 2026

Time
11:21

Team member(s) involved
Humphreys Bradley

Location
DSRP3

Turtle species
Unknown

Age class
Juvenile

Sex
Unknown

Turtle size
13 - 20 cm

Observation
Head

Observation Details
breathing up

myosh safety management software

Turtle Behaviour

Swimming

Health / Injury / Mortality:

healthy

Actions

No action required

Attachments

Attachment 1

32257f3e-bb09-439c-adae-44ed443850c3.jpg



Attachment 2

8d73bd37-d406-4d10-b342-cb31ff1729f1.jpg

myosh safety management software



Attachment 3

b178a2f1-a115-4b8f-9cf5-b0e9977296fd.jpg



myosh safety management software

Date	Name	Signature

myosh safety management software

Turtle & Turtleway Observation Form - Rookwood

#000041 Submitted

Hierarchy

Company	Sunwater
Division	Integrated Services
Region	Fitzroy
Location	Rockhampton
Site	Rookwood Weir

Observation Type

Observation Type	Turtle Sighting

Sighting Details

Date	03 Mar, 2026
Time	10:51
Team member(s) involved	Humphreys Bradley
Location	DSPR2
Turtle species	Unknown
Age class	Adult
Sex	Unknown
Turtle size	13 - 20 cm
Observation	Head
Observation Details	Breathing up

myosh safety management software

Turtle Behaviour

Swimming

Health / Injury / Mortality:

healthy

Actions

No action required

Attachments

Attachment 1

83f3e330-8fa1-41e3-829a-ad9d5be1bbbc.jpg



myosh safety management software

Date	Name	Signature

myosh safety management software

Turtle & Turtleway Observation Form - Rookwood

#000044 Submitted

Hierarchy

Company
Sunwater

Division
Integrated Services

Region
Fitzroy

Location
Rockhampton

Site
Rookwood Weir

Observation Type

Observation Type
Turtle Sighting

Sighting Details

Date
10 Mar, 2026

Time
13:07

Team member(s) involved
Humphreys Bradley

Location
Downstream resting pool

Turtle species
Unknown

Age class
Unknown

Sex
Unknown

Turtle size
6 - 12 cm

Observation
Head

Observation Details
downstream movement within pool

Turtle Behaviour

Swimming

Health / Injury / Mortality:

healthy

Actions

No action required

Attachments

Attachment 1

ff6c22cc-7dc5-4fd0-b417-2a683ecb94fb.jpg



myosh safety management software

Date	Name	Signature

myosh safety management software

Turtle & Turtleway Observation Form - Rookwood

#000045 Submitted

Hierarchy

Company
Sunwater

Division
Integrated Services

Region
Fitzroy

Location
Unanswered

Site
Unanswered

Observation Type

Observation Type
Turtle Sighting

Sighting Details

Date
17 Mar, 2026

Time
10:30

Team member(s) involved
Humphreys Bradley

Location
Rockhampton

Turtle species
Krefft's River turtle

Age class
Unknown

Sex
Unknown

Turtle size
13 - 20 cm

Observation
Other

Observation Details
Turtle found on tail water boat ramp resting, possibly exhausted from hi flows going over weir

myosh safety management software

Turtle Behaviour

Other

Other

Resting at waters edge

Health / Injury / Mortality:

Healthy/ quite

Actions

No action required

Attachments

Attachment 1

1773727231302_8560.jpg



Attachment 2

1773727231312_9724.jpg

myosh safety management software



myosh
safety management software

Date	Name	Signature

myosh safety management software

Turtle & Turtleway Observation Form - Rookwood

#000046 Submitted

Hierarchy

Company
Sunwater

Division
Integrated Services

Region
Fitzroy

Location
Unanswered

Site
Unanswered

Observation Type

Observation Type
Turtle Sighting

Sighting Details

Date
23 Mar, 2026

Time
12:15

Team member(s) involved
Humphreys Bradley

Location
Rockhampton

Turtle species
Unknown

Age class
Adult

Sex
Unknown

Turtle size
20 cm +

Observation
Carapace (top of shell), Head

Observation Details
Turtle seen inside awaiting chamber of fishway. Resting on gate structure

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Turtle Behaviour

Other

Other

Resting

Health / Injury / Mortality:

Healthy

Actions

No action required

Attachments

Attachment 1

1774242714018_18.jpg



Date	Name	Signature

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Appendix E

Turtle injury/mortality forms

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Turtle Injury / Mortality Form

Date	22/08/25		
Team Members	Paddy Kehoe		
	Bradley Humphries		
Location of incident	Site (e.g turtle ramp, trash screens, stilling basin): Left bank, down stream of wall within rock scour protection.		
	(1) Latitude: -23.540052,	(2) – 23.542123	(3) -23.540394
	(1) Longitude: 150.016520,	(2) 150.014431	(3) 150.013494
Turtle Species	Fitzroy River turtle	X	
	White – throated snapping turtle	X	
	Krefft's river turtle		
	Saw-shelled turtle		
	Broad-shelled river turtle		
	Long- necked turtle		
Age class	Adult	X	
	Juvenile		
	Hatchling		
Gender	Female	X	
	Male		
	Unknown	X	
Health / injuries	Carapace: X	Details: 3 x turtle carapaces found within downstream scour protection rock at Rookwood Weir. Identification Turtle (1) - *Elseya albagula* (White Throated Snapping turtle) Turtle (2) – *Rheodytes leukops* (Fitzroy River turtle) Turtle (3) - Gravid, *Elseya albagula* (White Throated Snapping turtle)	
	Plastron:		
	Limbs:		
	Head:		
	Cause: Unknown		
Deceased	Details: Advanced stages of decay		

Actions	Taken to nearest vet: ☐ No action required: X Others: Turtle deceased, carcass left in-situ	Details: Turtles found in advanced stages of decay, presumed dead for some time. Carcass left in-situ. Carapaces show no sign of fracturing, all found +10m above existing water level.
Photographs / photograph reference numbers	Fig 1. Turtle (1)	

	Fig 2. Turtle (1)	
	Fig 3. Turtle (2)	

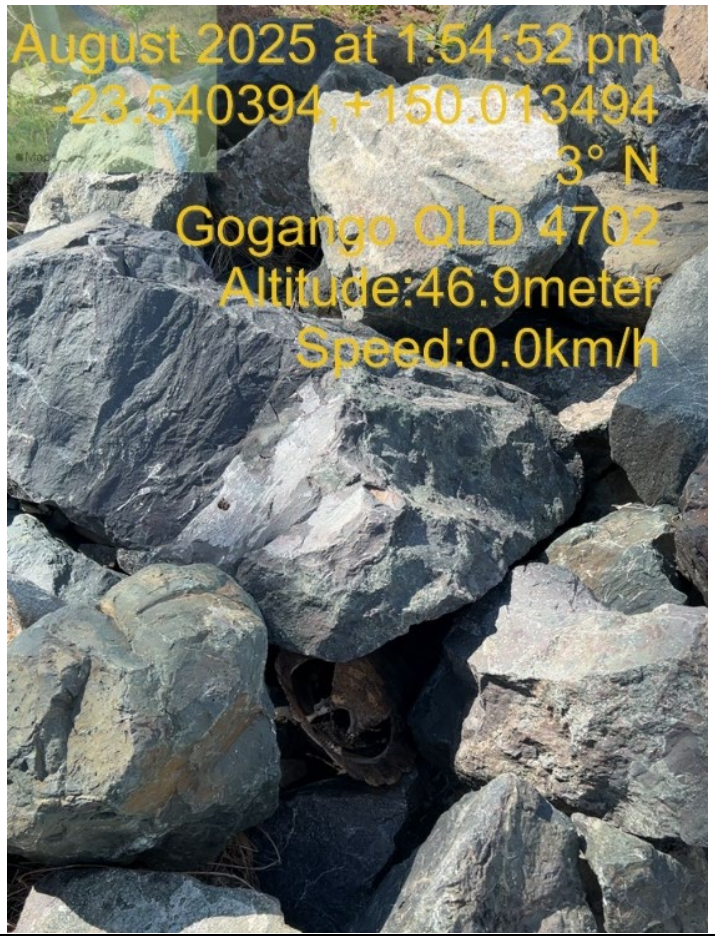
	Fig 4 Turtle (2)	
	Fig 5 Turtle (3)	

	Fig 6 Turtle (3)	
Adaptive management actions recommended	Action 1: Internal investigation to occur 25AU25m, including site inspection, to determine any corrective actions required.	
	Action 2	
	Action 3	
	Action 4	
Comments	Turtles carapaces have been identified on the scour protection rock on left bank, downstream of wall within rock scour protection. An operator identified the carapaces during weed management activities in the location and immediately reported the finding. Turtle (1) had an acoustic tracking tag, used by Sunwater to track movement of *Elseya albagula* and *Rheodytes leukops.* Time of death of the individuals is unknown. Identification of individuals by Sunwater Environment Staff & general location: Turtle (1) – *Elseya albagula* (White Throated Snapping turtle), upstream left bank. Turtle (2) – *Rheodytes leukops* (Fitzroy River turtle), upstream left bank. Turtle (3) – *Elseya albagula* (White Throated Snapping turtle), gravid female, downstream left bank.	

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Turtle Injury / Mortality Form

Date	25/08/25		
Team Members	Josef Jeffrey		
	Paddy Kehoe		
	Emma Owbridge		
Location of incident	Site: Left bank, downstream of wall within rock scour protection, on upper bank		
	(1) **Latitude:** -23.54102 (1) **Longitude:** 150.01384	(2) -23.54047 (2) 150.01358	
	(3) -23.54042 (3) 150.01338	(4) -23.54040 (4) 150.01341	
	(5) -23.54043 (5) 150.01337	(6) -23.54043 (6) 150.01337	
Turtle Species	Fitzroy River turtle		
	White – throated snapping turtle		X
	Krefft's river turtle		X
	Saw-shelled turtle		
	Broad-shelled river turtle		
	Long- necked turtle		
Age class	Adult		X
	Juvenile		
	Hatchling		
Gender	Female		X
	Male		
	Unknown		X
Health / injuries	Carapace		
	Plastron		
	Limbs		
	Head		

Details:
6 x turtle carapaces found within downstream scour protection rock at Rookwood Weir.

Identification, confirmed by Sunwater Central Environment Team:
Turtle (1) - Gravid, *Elseya albagula* (White Throated Snapping turtle)
Turtle (2) - *Elseya albagula* (White Throated Snapping turtle)
Turtle (3) - Gravid, *Elseya albagula* (White Throated Snapping turtle)
Turtle (4) - *Emydura krefftii* (Krefft's Turtle)
Turtle (5) - *Elseya albagula* (White Throated Snapping turtle)
Turtle (6) - *Elseya albagula* (White Throated Snapping turtle)

		The *Elseya albagula* (White Throated Snapping turtle) carapaces were greater than 350mm in size and the *Emydura krefftii* (Krefft's Turtle) carapace was approximately 150mm in size.
	Cause: Unknown	
Deceased	Details: Advanced stages of decay	
Actions	Taken to nearest vet: [ ]	Details: Turtles found in advanced stages of decay, presumed dead for some time. Carcasses left in-situ.
	No action required: [X]	
	Others:	
Photographs / photograph reference numbers	Fig 1. Turtle (1)	
	Fig 2. Turtle (1)	

	Fig 3. Turtle (2)	
	Fig 4 Turtle (3)	

	Fig 5 Turtle (4)	
	Fig 6 Turtle (5)	

	Fig 6 Turtle (6)	
Adaptive management actions recommended	Action 1: Initial Incident Review (5 Whys) undertaken 27/08/2025. Action 2: Review of Rookwood Weir project risk assessment to confirm appropriate controls in place, including engineering controls. Determine any further corrective actions required. Action 3: Undertake inspections of scour protection post high flow events, where safe to do so.	
Comments	On 22/08/2025, three (3) threatened turtle carapaces were identified by an operator during routine weed management activities, who promptly reported the finding (refer Incident Notification provided to DCCEEW and DETSI on 25/08/2025). In response to the above incident, the Central Environmental Team attended the site on 25/08/2025 and conducted a thorough inspection of the scour protection area both upstream and downstream on the left bank to identify any additional turtle remains. An additional six (6) turtle carapaces were observed within the scour protection rock on the left bank, downstream of the wall. The turtles were discovered 5-10 m above the current water level (31.861 m) of the tail water. Carapaces show no sign of fracturing. Identification of individuals by Sunwater Environment Staff and general location:	

	Turtle (1) - Gravid, *Elseya albagula* (White Throated Snapping turtle) -23.54102 150.01384 Turtle (2) *Elseya albagula* (White Throated Snapping turtle) -23.54047 150.01358 Turtle (3) Gravid, *Elseya albagula* (White Throated Snapping turtle) -23.54042 150.01338 Turtle (4) - *Emydura kfefftii* (Krefft's Turtle) -23.54040 150.01341 Turtle (5) - *Elseya albagula* (White Throated Snapping turtle) -23.54043 150.01337 Turtle (6) - *Elseya albagula* (White Throated Snapping turtle) -23.54043 150.01337 From initial evidence, it appears that the turtles may have become entrapped in scour protection during the most recent high flow event (01/04/2025 – 20/04/2025). It is believed the time of death of the individuals would be within that most recent high flow period.

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Incident Report

Turtle Mortalities

Lower Fitzroy Infrastructure Project, Rookwood Weir, EPBC 2009/5173

Report Date: 5 September 2025



Phone: 13 15 89
Email: customersupport@sunwater.com.au
Visit: www.sunwater.com.au

Summary

A total of nine turtle mortalities were identified on the left bank or Rookwood Weir on 22 and 25 August 2025. This included one (1) Fitzroy River turtle (*Rheodytes leukops*) and seven (7) White-throated snapping turtles (*Elseya albagula*), of which three (3) were gravid. The time of death is unknown, however may be related to a high flow event during the period 1 to 20 April 2025. Rookwood Weir is approved to operate under EPBC Approval 2009/5173.

Background

In accordance with Condition 20 of EPBC Approval 2009/5173, the approval holder must report non-compliances to the Department as follows:

Reporting non-compliance

19. The approval holder must notify the **Department** in writing of any: **incident**; non-compliance with the conditions; or non-compliance with the commitments made in approved plans. The notification must be given as soon as practicable, and no later than **two business days** after becoming aware of the **incident** or non-compliance.
    The notification must specify:
    a) any condition which is or may be in breach;
    b) a short description of the **incident** and/or non-compliance; and
    c) the location (including co-ordinates), date, and time of the **incident** and/or non-compliance. In the event the exact information cannot be provided, provide the best information available.

20. The approval holder must provide to the **Department** the details of any incident or non-compliance with the conditions or commitments made in an approved plan as soon as practicable and no later than **10 business days** after becoming aware of the **incident** or non-compliance, specifying:
    a) any corrective action or investigation which the approval holder has already taken or intends to take in the immediate future;
    b) the potential impacts of the **incident** or non-compliance; and
    c) the method and timing of any remedial action that will be undertaken by the approval holder.

Definitions attached to approval

Incident means any event which has potential to, or does, impact on one or more **MNES**.

Matters of national environmental significance (MNES): matters listed under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) for the following controlling provisions: listed threatened species and ecological communities, world heritage properties, national heritage places, and migratory species.

The Fitzroy River turtle (*Rheodytes leukops*) and White-throated snapping turtle (*Elseya albagula*) are listed threatened species under the EPBC Act and are **MNES**.

Incident Details

On 22/08/2025, three (3) threatened turtle carapaces were identified by an operator during routine weed management activities, who promptly reported the finding.

In response to the above incident, the Central Environmental Team attended the site on 25/08/2025 and conducted a thorough inspection of the scour protection area both upstream and downstream on the left bank to identify any additional turtle remains. An additional six (6) turtle carapaces were observed within the scour protection rock on the left bank, downstream of the wall. The turtles were discovered 5-10 m above the current water level (31.861 m) of the tail water. Carapaces showed no sign of fracturing. Identification of individuals by Sunwater Environment Staff and locations are outlined in Table 1 below.

Table 1 Identification of turtle mortalities.

Date	Turtle No.*	Species; additional information	Location Description	Latitude	Longitude
22/08/2025	1	Male White-throated snapping turtle (*Elseya albagula*) (acoustic tag present)	Upstream left bank	-23.54201	150.01438
22/08/2025	2	Fitzroy River turtle (*Rheodytes leukops*)	Upstream left bank	-23.542123	150.014431
22/08/2025	3	Gravid White-throated snapping turtle (*Elseya albagula*)	Downstream left bank	-23.540394	150.013494
25/08/2025	1	Gravid White-throated snapping turtle (*Elseya albagula*)	Downstream left bank	-23.54102	150.01384
25/08/2025	2	White-throated snapping turtle (*Elseya albagula*)	Downstream left bank	-23.54047	150.01358
25/08/2025	3	Gravid White-throated snapping turtle (*Elseya albagula*)	Downstream left bank	-23.54042	150.01338
25/08/2025	4	Krefft's Turtle (*Emydura kfefftii*)	Downstream left bank	-23.54040	150.01341
25/08/2025	5	White-throated snapping turtle (*Elseya albagula*)	Downstream left bank	-23.54043	150.01337
25/08/2025	6	White-throated snapping turtle (*Elseya albagula*)	Downstream left bank	-23.54043	150.01337

* Turtle number as per Turtle Injury or Mortality Forms.

Figure 1 below shows the locations of the turtle mortalities outlined Table 1. Note that Rookwood Weir is in operation, however no current imagery is available at this time.

Time of death is unable to be confirmed. From initial evidence, it appears that the turtles may have become entrapped in scour protection during the most recent high flow event between 1 to 20 April 2025. However, it cannot be confirmed whether the turtles were deceased at this time or had died prior to the high flow event. Figure 2 below shows the water level during this event, which correlates with locations of identified turtle mortalities.

Turtle Monitoring has been undertaken since 2017 as part of the Rookwood Weir construction and operation. In the period to March 2025, a total of 97 White-throated snapping turtles and 76 Fitzroy River turtles had been captured and acoustic tags deployed. The population size of both species cannot be determined based on current available data and the current monitoring programs are not designed to ascertain this.

Only one (1) of the eight (8) mortalities identified during this incident, which were threatened species, had an acoustic tag deployed. In Year 1 of the Turtle Monitoring Program, 41% of white-throated snapping turtles and 24% of Fitzroy River turtles were recaptured. This suggests that the full population has not yet been sampled.

With the information available, the turtle mortalities identified during this incident represent 7.2% and 1.3% of the current sampled population of White-throated snapping turtles and Fitzroy River turtles respectively, noting that the full population size will be higher.



Figure 1. Locations of the turtle mortalities.

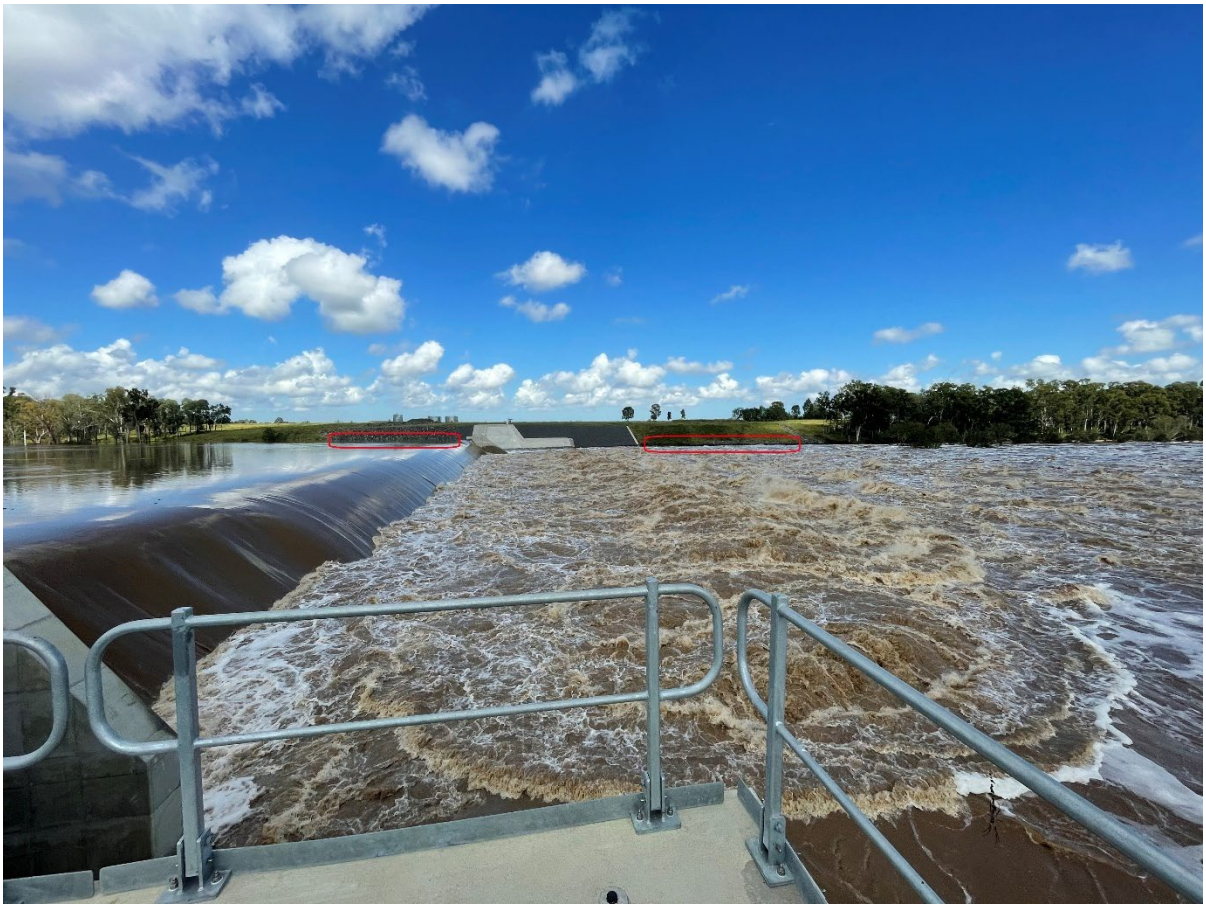


Figure 2. Water level during recent flow event, taken 8 April 2025, with indicative location of turtle mortalities in red.

Corrective Actions

Sunwater have committed to undertaking a number of corrective actions in response to this incident, as outlined in Table 2 below.

Table 2 Corrective actions.

No.	Action	Timeframe	Outcome
1	Undertake site inspection to ascertain extent of impact.	Within 1 Business Day	Completed 25/08/2025.
2	Notify the Department in writing of incidents.	As soon as practicable and no later than two business days after becoming aware of the incident.	Completed 25/08/2025 and 27/08/2025 respectively.
3	Provide the Department a report outlining the details of any incident including corrective actions, investigations, potential impacts and method and timing of any remedial actions.	As soon as practicable and no later than 10 business days after becoming aware of the incident.	Completed 05/09/2025.
4	Undertake daily site inspections (or as required) during and post high flow events to check for and resolve any fauna entrapment in scour protection at Rookwood Weir, if practical and safe to do so. This may be undertaken via drone or other method. Include this requirement as a work order in the Rookwood Weir Maintenance Schedule.	During and post high flow events. Include in Maintenance Schedule by 30 September 2025.	In progress.
5	Seek advice from a suitably qualified person to determine the potential impacts of the incident, under the Rookwood Weir Turtle Monitoring Program.	2 October 2025	In progress.
6	Investigate options for rock scour protection appropriate for turtles, in the area of impact.	30 October 2025	In progress.
7	Undertake remediation works as per investigative options, if practicable and appropriate.	Currently scheduled to be completed by December 2025, pending seasonal conditions.	Not started.

References

- Incident Report: Turtle Injury or Mortality Form – Rookwood Weir 22-08-2025
- Incident Report: Turtle Injury or Mortality Form – Rookwood Weir 25-08-2025
- Rookwood Weir: Operations Phase – Annual Turtle Monitoring Report 2024-25, 20 June 2025.

sunwater

Incident Report

Turtle Mortalities

Lower Fitzroy Infrastructure Project, Rookwood Weir, EPBC 2009/5173

Report Date: 5 September 2025



Phone: 13 15 89
Email: customersupport@sunwater.com.au
Visit: www.sunwater.com.au

Summary

A total of nine turtle mortalities were identified on the left bank or Rookwood Weir on 22 and 25 August 2025. This included one (1) Fitzroy River turtle (*Rheodytes leukops*) and seven (7) White-throated snapping turtles (*Elseya albagula*), of which three (3) were gravid. The time of death is unknown, however may be related to a high flow event during the period 1 to 20 April 2025. Rookwood Weir is approved to operate under EPBC Approval 2009/5173.

Background

In accordance with Condition 20 of EPBC Approval 2009/5173, the approval holder must report non-compliances to the Department as follows:

Reporting non-compliance

19. The approval holder must notify the **Department** in writing of any: **incident**; non-compliance with the conditions; or non-compliance with the commitments made in approved plans. The notification must be given as soon as practicable, and no later than **two business days** after becoming aware of the **incident** or non-compliance.
    The notification must specify:
    a) any condition which is or may be in breach;
    b) a short description of the **incident** and/or non-compliance; and
    c) the location (including co-ordinates), date, and time of the **incident** and/or non-compliance. In the event the exact information cannot be provided, provide the best information available.

20. The approval holder must provide to the **Department** the details of any incident or non-compliance with the conditions or commitments made in an approved plan as soon as practicable and no later than **10 business days** after becoming aware of the **incident** or non-compliance, specifying:
    a) any corrective action or investigation which the approval holder has already taken or intends to take in the immediate future;
    b) the potential impacts of the **incident** or non-compliance; and
    c) the method and timing of any remedial action that will be undertaken by the approval holder.

Definitions attached to approval

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The Fitzroy River turtle (*Rheodytes leukops*) and White-throated snapping turtle (*Elseya albagula*) are listed threatened species under the EPBC Act and are **MNES**.

Incident Details

On 22/08/2025, three (3) threatened turtle carapaces were identified by an operator during routine weed management activities, who promptly reported the finding.

In response to the above incident, the Central Environmental Team attended the site on 25/08/2025 and conducted a thorough inspection of the scour protection area both upstream and downstream on the left bank to identify any additional turtle remains. An additional six (6) turtle carapaces were observed within the scour protection rock on the left bank, downstream of the wall. The turtles were discovered 5-10 m above the current water level (31.861 m) of the tail water. Carapaces showed no sign of fracturing. Identification of individuals by Sunwater Environment Staff and locations are outlined in Table 1 below.

Table 1 Identification of turtle mortalities.

Date	Turtle No.*	Species; additional information	Location Description	Latitude	Longitude
22/08/2025	1	Male White-throated snapping turtle (*Elseya albagula*) (acoustic tag present)	Upstream left bank	-23.54201	150.01438
22/08/2025	2	Fitzroy River turtle (*Rheodytes leukops*)	Upstream left bank	-23.542123	150.014431
22/08/2025	3	Gravid White-throated snapping turtle (*Elseya albagula*)	Downstream left bank	-23.540394	150.013494
25/08/2025	1	Gravid White-throated snapping turtle (*Elseya albagula*)	Downstream left bank	-23.54102	150.01384
25/08/2025	2	White-throated snapping turtle (*Elseya albagula*)	Downstream left bank	-23.54047	150.01358
25/08/2025	3	Gravid White-throated snapping turtle (*Elseya albagula*)	Downstream left bank	-23.54042	150.01338
25/08/2025	4	Krefft's Turtle (*Emydura kfefftii*)	Downstream left bank	-23.54040	150.01341
25/08/2025	5	White-throated snapping turtle (*Elseya albagula*)	Downstream left bank	-23.54043	150.01337
25/08/2025	6	White-throated snapping turtle (*Elseya albagula*)	Downstream left bank	-23.54043	150.01337

* Turtle number as per Turtle Injury or Mortality Forms.

Figure 1 below shows the locations of the turtle mortalities outlined Table 1. Note that Rookwood Weir is in operation, however no current imagery is available at this time.

Time of death is unable to be confirmed. From initial evidence, it appears that the turtles may have become entrapped in scour protection during the most recent high flow event between 1 to 20 April 2025. However, it cannot be confirmed whether the turtles were deceased at this time or had died prior to the high flow event. Figure 2 below shows the water level during this event, which correlates with locations of identified turtle mortalities.

Turtle Monitoring has been undertaken since 2017 as part of the Rookwood Weir construction and operation. In the period to March 2025, a total of 97 White-throated snapping turtles and 76 Fitzroy River turtles had been captured and acoustic tags deployed. The population size of both species cannot be determined based on current available data and the current monitoring programs are not designed to ascertain this.

Only one (1) of the eight (8) mortalities identified during this incident, which were threatened species, had an acoustic tag deployed. In Year 1 of the Turtle Monitoring Program, 41% of white-throated snapping turtles and 24% of Fitzroy River turtles were recaptured. This suggests that the full population has not yet been sampled.

With the information available, the turtle mortalities identified during this incident represent 7.2% and 1.3% of the current sampled population of White-throated snapping turtles and Fitzroy River turtles respectively, noting that the full population size will be higher.



Figure 1. Locations of the turtle mortalities.

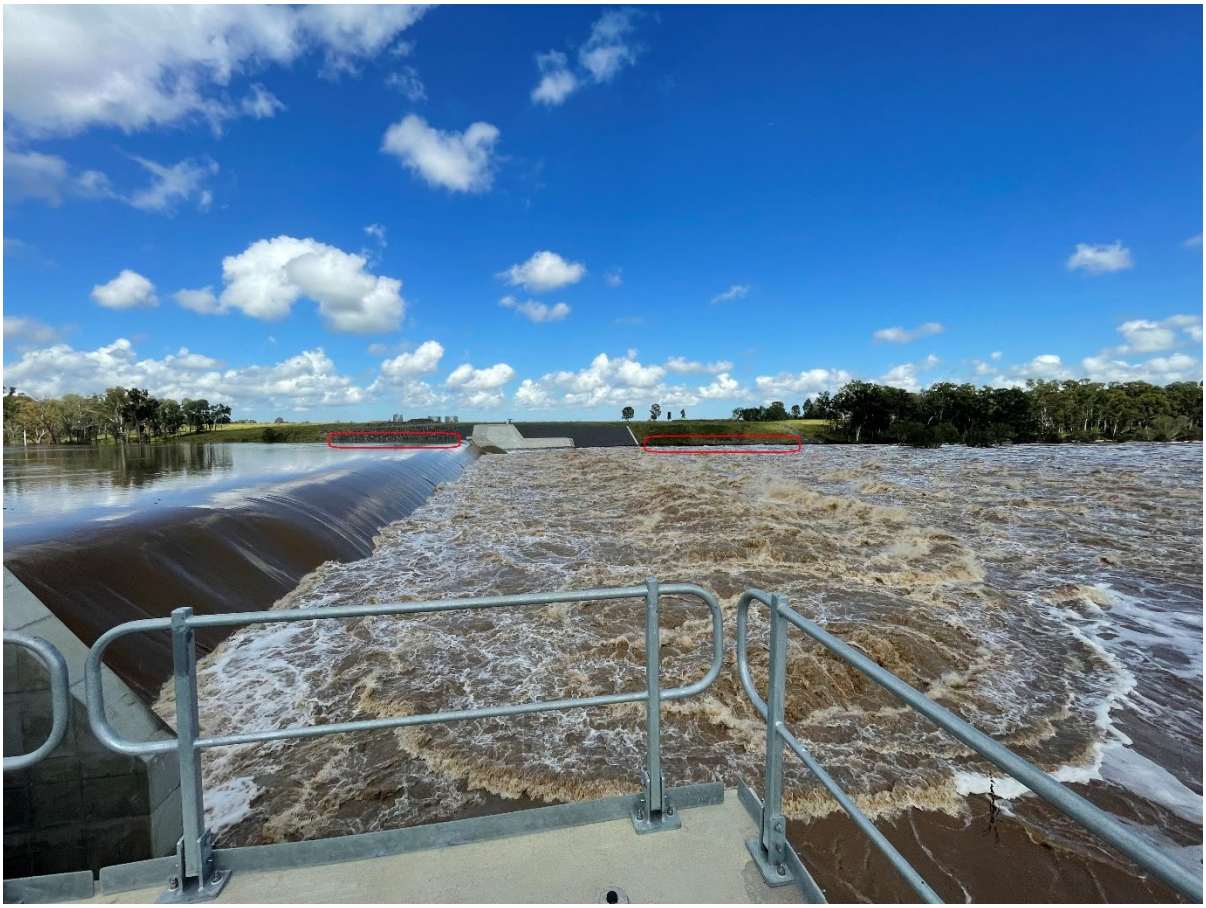


Figure 2. Water level during recent flow event, taken 8 April 2025, with indicative location of turtle mortalities in red.

Corrective Actions

Sunwater have committed to undertaking a number of corrective actions in response to this incident, as outlined in Table 2 below.

Table 2 Corrective actions.

No.	Action	Timeframe	Outcome
1	Undertake site inspection to ascertain extent of impact.	Within 1 Business Day	Completed 25/08/2025.
2	Notify the Department in writing of incidents.	As soon as practicable and no later than two business days after becoming aware of the incident.	Completed 25/08/2025 and 27/08/2025 respectively.
3	Provide the Department a report outlining the details of any incident including corrective actions, investigations, potential impacts and method and timing of any remedial actions.	As soon as practicable and no later than 10 business days after becoming aware of the incident.	Completed 05/09/2025.
4	Undertake daily site inspections (or as required) during and post high flow events to check for and resolve any fauna entrapment in scour protection at Rookwood Weir, if practical and safe to do so. This may be undertaken via drone or other method. Include this requirement as a work order in the Rookwood Weir Maintenance Schedule.	During and post high flow events. Include in Maintenance Schedule by 30 September 2025.	In progress.
5	Seek advice from a suitably qualified person to determine the potential impacts of the incident, under the Rookwood Weir Turtle Monitoring Program.	2 October 2025	In progress.
6	Investigate options for rock scour protection appropriate for turtles, in the area of impact.	30 October 2025	In progress.
7	Undertake remediation works as per investigative options, if practicable and appropriate.	Currently scheduled to be completed by December 2025, pending seasonal conditions.	Not started.

References

- Incident Report: Turtle Injury or Mortality Form – Rookwood Weir 22-08-2025
- Incident Report: Turtle Injury or Mortality Form – Rookwood Weir 25-08-2025
- Rookwood Weir: Operations Phase – Annual Turtle Monitoring Report 2024-25, 20 June 2025.

Turtle Injury and Mortality Form

Inspection details	
Project Name	Rookwood Weir Operations Phase Turtle Monitoring
Project Number	12633406
Survey	May-26
Date	05/05/2026
Time	09:45 AM
Team Members	Lauren Pratt
Location of incident	
Site (e.g. turtle ramp, trash screens, stilling basin etc.)	Downstream left bank, downstream of Rookwood Weir
Latitude	-23.537835
Longitude	150.011713



Turtle details	
Turtle species	Fitzroy River turtle (*Rheodytes leukops*)
Age class	Adult
Gender	Unknown
Gravid	Unknown
Tagged	No
Notch code	–
Foot tag number	–
PIT tag number	–
Acoustic tag number	–
Health / injury / mortality details	
Health / Injuries	Nil
Details	No obvious injuries to carapace, plastron, limbs or head
Cause	N/A
Deceased	Yes
Details	Deceased turtle, partially decomposed
Cause	Cause of mortality unable to be determined as there were no visible injuries on the turtle

Photos







Actions	
Actions	Confirm there are no other sick, injured or deceased turtles in the vicinity
Details	Survey the banks from Rookwood Weir downstream to Rookwood riffle for any additional sick, injured or deceased turtles
Adaptive management actions recommended	
Action 1	–
Action 2	–
Action 3	–
Action 4	–
Comments	No adaptive management is recommended at this time, as there is insufficient evidence to attribute the turtle mortality to the operation of Rookwood Weir. The absence of observable physical injury, combined with a lack of information on the turtle's pre-existing health, limits the ability to determine cause of death with confidence.

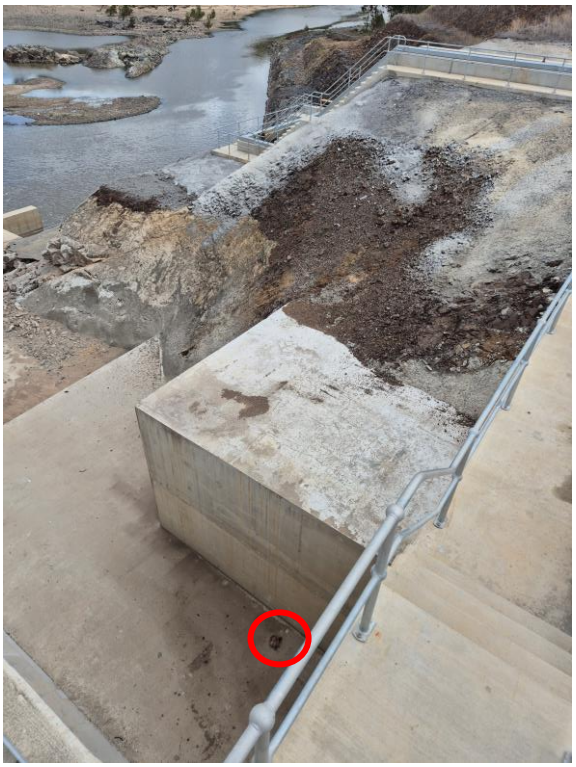
Turtle Injury and Mortality Form

Inspection details	
Project Name	Rookwood Weir Operations Phase Turtle Monitoring
Project Number	12633406
Survey	Sep-25
Date	4/09/2025
Time	11:00 AM
Team Members	Lauren Pratt
Location of incident	
Site (e.g. turtle ramp, trash screens, stilling basin etc.)	Downstream side of ramp, outside of turtle passage
Latitude	-23.54007
Longitude	150.01671
Turtle details	
Turtle species	Fitzroy River turtle
Age class	Adult
Gender	Female
Gravid	Unknown
Tagged	Unknown
Notch code	–
Foot tag number	–
PIT tag number	–
Acoustic tag number	–
Health / injury / mortality details	
Health / Injuries	Plastron
Details	Large cracks in the plastron. Unable to see if there is carapace damage too.
Cause	Falling from a height of approximately 5 m
Deceased	Yes
Details	Recent fall (<1 week?) as there are no signs of decay
Cause	Appears to have climbed the bank outside of the turtle passage and fallen from height when it reached the top
Actions	
Actions	Other
Details	Sunwater to retrieve the turtle, check if the turtle has been ID tagged, take photos
Adaptive management actions recommended	
Action 1	Sunwater to review camera footage (including trail cameras and security cameras) for evidence of the fall to inform management actions

Action 2	Meeting with Sunwater, Tunuba and GHD to discuss management actions. Look at barricading the bank area downstream
Action 3	Monitor the area regularly for other turtles that are not within the turtle passage
Action 4	–
Comments	–

Photos









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Incident Report

Turtle Mortalities

Lower Fitzroy Infrastructure Project, Rookwood Weir, EPBC 2009/5173

Report Date: 26 September 2025



Phone: 13 15 89
Email: customersupport@sunwater.com.au
Visit: www.sunwater.com.au

Summary

One (1) female Fitzroy River turtle (*Rheodytes leukops*) mortality was identified on the right bank, downstream of Rookwood Weir on 14 September 2025. The time and cause of death is unknown. Rookwood Weir is approved to operate under EPBC Approval 2009/5173.

Background

In accordance with Condition 20 of EPBC Approval 2009/5173, the approval holder must report non-compliances to the Department as follows:

Reporting non-compliance

19. The approval holder must notify the **Department** in writing of any: **incident**; non-compliance with the conditions; or non-compliance with the commitments made in approved plans. The notification must be given as soon as practicable, and no later than **two business days** after becoming aware of the **incident** or non-compliance.
    The notification must specify:
    a) any condition which is or may be in breach;
    b) a short description of the **incident** and/or non-compliance; and
    c) the location (including co-ordinates), date, and time of the **incident** and/or non-compliance. In the event the exact information cannot be provided, provide the best information available.

20. The approval holder must provide to the **Department** the details of any incident or non-compliance with the conditions or commitments made in an approved plan as soon as practicable and no later than **10 business days** after becoming aware of the **incident** or non-compliance, specifying:
    a) any corrective action or investigation which the approval holder has already taken or intends to take in the immediate future;
    b) the potential impacts of the **incident** or non-compliance; and
    c) the method and timing of any remedial action that will be undertaken by the approval holder.

Definitions attached to approval

Incident means any event which has potential to, or does, impact on one or more **MNES**.

Matters of national environmental significance (MNES): matters listed under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) for the following controlling provisions: listed threatened species and ecological communities, world heritage properties, national heritage places, and migratory species.

The Fitzroy River turtle (*Rheodytes leukops*) and White-throated snapping turtle (*Elseya albagula*) are listed threatened species under the EPBC Act and are **MNES**.

Incident Details

On 14 September 2025, one (1) female Fitzroy River turtle (*Rheodytes leukops*) mortality was identified on the concrete on the downstream right bank of Rookwood Weir. Identification was confirmed by Sunwater Central Environment Team, as shown in Figure 1. The carapace length was approximately 27cm and fracturing was observed in both carapace and plastron. The incident was reported immediately and Sunwater staff undertook a thorough inspection of the area.

Time and cause of death is unable to be confirmed. Fractures observed on the carapace and plastron indicate trauma and that the turtle may have suffered a fall from height. The turtle may have climbed the downstream right bank and then fallen from higher ground. It is also possible that the turtle was predated by a bird and dropped from height. Daily inspections of the area are undertaken by operations staff and the individual had not been located on previous days.



Figure 1. Turtle fractures observed.



Figure 2. Turtle fractures observed.



Figure 3. Indicative location of where the turtle was found dead in red.

Corrective Actions

Sunwater have committed to undertaking the following corrective actions in response to this incident, as outlined in Table 2 below.

Table 1 Corrective actions.

No.	Action	Timeframe	Outcome
1	Notify the Department in writing of incidents.	As soon as practicable and no later than two business days after becoming aware of the incident.	Completed 16/09/2025.
2	Provide the Department a report outlining the details of any incident including corrective actions, investigations, potential impacts and method and timing of any remedial actions.	As soon as practicable and no later than 10 business days after becoming aware of the incident.	Completed 26/09/2025.
3	Repairs will be undertaken on the eroded areas of the shotcrete post wet season. The new design shall consider turtle access to this area. Where access cannot be prevented, barriers will be considered.	30 June 2026	In progress.

References

- Incident Report: Turtle Injury or Mortality Form – Rookwood Weir 14-09-2025

sunwater

Turtle Injury / Mortality Form

Date	14/09/2025	
Team Members	Josef Jeffrey	
	Adam Parsons	
Location of incident	Site (e.g turtle ramp, trash screens, stilling basin): Concrete adjacent to the turtle passage, downstream right bank of Rookwood Weir	
	Latitude: 23.54009° S Longitude: 150.01674° E	
Turtle Species	Fitzroy River turtle	X
	White – throated snapping turtle	
	Krefft's river turtle	
	Saw-shelled turtle	
	Broad-shelled river turtle	
	Long- necked turtle	
Age class	Adult	X
	Juvenile	
	Hatchling	
Gender	Female	X
	Male	
	Unknown	
Health / injuries	X Carapace	Details: One (1) observed turtle mortality found on concrete adjacent to the turtle passage, downstream right bank of weir. Identification confirmed by Sunwater Central Environment Team as Female *Rheodytes leukops* (Fitzroy River Turtle). Carapace length approximately 27cm. Fracturing observed in both carapace and plastron.
	X Plastron	
	Limbs	
	Head	
Deceased	Details: Moderate stages of decay	
Actions	Taken to nearest vet:	Details: Turtle found in moderate stage of decay. Time of death is unknown. Incident reported immediately.

	No action required: X	Report incident
	Others:	
Photographs / photograph reference numbers	Fig 1.	
	Fig 2.	

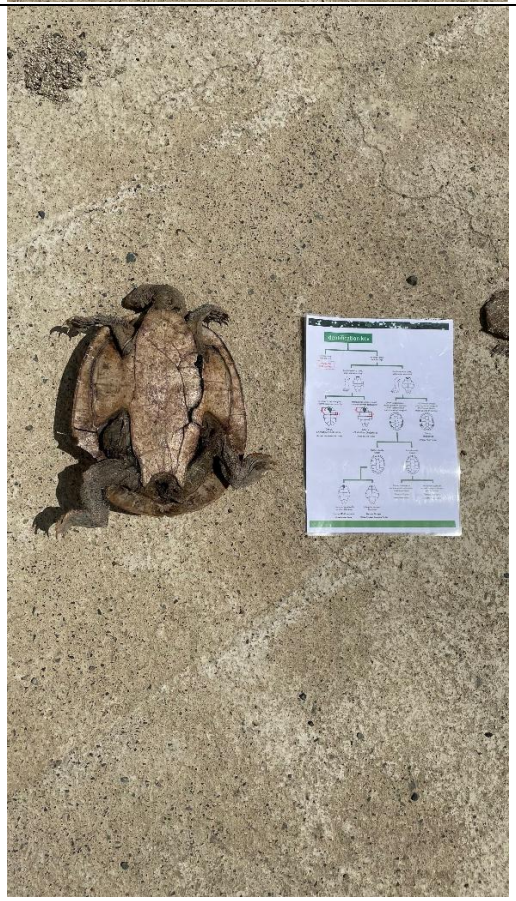
Fig 3.	
Fig 4	

	Fig 5	
Adaptive management actions recommended	Action 1: Initial Incident Review (5 Whys) scheduled to determine further correction actions, if required.	
	Action 2:	
	Action 3:	
Comments	On 14/09/2025, at approximately 10:00am, one (1) dead turtle was observed by a member of public during the Rookwood Weir Public Tour Day, who reported the finding to Sunwater staff. Sunwater Environment Staff immediately conducted a thorough inspection of the area. The carapace and plastron showed signs of fracturing. Identification of individual by Sunwater Environment Staff and general location: Female *Rheodytes leukops* (Fitzroy River Turtle); 23.54009° S 150.01674° E. Time or cause of death can not be confirmed. Fractures on the carapace and plastron may indicate trauma. The turtle was located 5-10 m above the current water level (31.750 m) of the tail water which may indicate a fall from heights and/or predation from birds.	

Appendix F

Hydrophone data summary

Table 7.1 Summary table of 163 white-throated snapping turtles tracked via acoustic telemetry

Sex	SCL (mm)	Acoustic tag code	No. detections	First detection	Last detection	First receiver	Last receiver	Duration (days)
F	360	16167	636	2025-05-11	2025-05-18	Rookwood downstream	Hanrahan pool	7
F	365	16143	538	2025-05-13	2025-05-27	Rookwood downstream	Rookwood far downstream	14
F	370	16231	572	2025-05-14	2025-05-30	Rookwood Weir site	Hanrahan pool	16
F	269	16209	5501	2025-11-04	2025-12-18	Rookwood Weir site	Rookwood Weir site	44
F	352	13106	5237	2025-11-07	2026-01-10	Rookwood downstream	Ramp entrance downstream	64
F	372	13116	9399	2025-11-07	2026-01-14	Rookwood downstream	Riverslea downstream	68
F	390	15786	23182	2020-02-18	2020-04-26	Rookwood upstream riffle	Rookwood upstream riffle	68
F	337	16195	6840	2025-11-05	2026-01-12	Rookwood Weir site	Lawries bend mid	68
F	395	16030	11632	2017-05-03	2017-07-11	Hanrahan pool	Hanrahan downstream	69
F	410	15798	9042	2017-09-15	2017-11-27	Hanrahan pool	Hanrahan upstream	73
F	382	13118	2969	2025-11-08	2026-02-07	Rookwood Weir site	Rookwood far downstream	91
F	292	16249	1526	2025-11-05	2026-02-06	Rookwood Weir site	Rookwood downstream	93
F	400	13076	3192	2025-11-06	2026-02-08	Rookwood Weir site	Lawries bend mid	94
F	368	13132	13933	2025-11-08	2026-02-14	Rookwood Weir site	Lawries bend far downstream	98
F	352	13094	1887	2025-11-07	2026-02-15	Rookwood downstream	Rookwood far downstream	100
F	395	13120	7788	2025-11-08	2026-03-02	Rookwood Weir site	Rookwood far downstream	114
F	392	16251	4656	2025-11-05	2026-03-01	Rookwood Weir site	Rookwood downstream	116
F	392	13100	6857	2025-11-07	2026-03-04	Ramp entrance downstream	Lawries bend downstream	117
F	377	13078	5602	2025-11-06	2026-03-04	Rookwood Weir site	Lawries bend mid	118
F	362	16197	8017	2025-11-05	2026-03-04	Rookwood Weir site	Rookwood downstream	119
F	365	16253	6942	2025-11-05	2026-03-04	Rookwood Weir site	Rookwood far downstream	119

Sex	SCL (mm)	Acoustic tag code	No. detections	First detection	Last detection	First receiver	Last receiver	Duration (days)
F	370	16221	14757	2025-11-04	2026-03-04	Ramp entrance downstream	Rookwood far downstream	120
F	379	16229	347	2025-05-14	2025-10-12	Rookwood Weir site	Lawries bend mid	151
F	384	10272	26014	2024-10-31	2025-04-03	Left bank weir pool	Gogango creek	154
F	393	16227	30646	2025-05-14	2025-10-18	Rookwood Weir site	Lawries bend mid	157
F	375	16153	2017	2025-05-11	2025-10-16	Rookwood downstream	Lawries bend mid	158
F	366	16137	1770	2025-05-12	2025-10-26	Rookwood far upstream	Rookwood far downstream	167
F	340	473	20575	2019-08-26	2020-02-11	Rookwood downstream	Gogango creek	169
F	400	16010	29851	2017-09-09	2018-02-28	Rookwood upstream	Gogango creek	172
F	410	16155	10939	2025-05-12	2025-11-10	Rookwood downstream	Lawries bend mid	182
F	385	16225	3698	2025-05-14	2025-12-02	Rookwood Weir site	Rookwood far downstream	202
F	410	16169	30396	2025-05-10	2026-01-12	Rookwood downstream	Lawries bend far downstream	247
F	370	16159	7223	2025-05-12	2026-01-30	Rookwood downstream	Rookwood far downstream	263
F	380	16139	29923	2025-05-13	2026-02-07	Rookwood downstream	Lawries bend far downstream	270
F	390	16161	4064	2025-05-11	2026-02-06	Rookwood downstream	Ramp entrance downstream	271
F	400	16157	14678	2025-05-12	2026-02-08	Rookwood downstream	Rookwood far downstream	272
F	380	16185	23655	2025-05-08	2026-02-08	Rookwood downstream	Lawries bend mid	276
F	375	16245	10163	2025-05-13	2026-02-18	Rookwood downstream	Rookwood downstream	281
F	354	16243	32094	2025-05-13	2026-02-19	Rookwood downstream	Rookwood far downstream	282
F	380	16141	101540	2025-05-13	2026-03-01	Rookwood downstream	Lawries bend downstream	292
F	365	16247	5143	2025-05-13	2026-03-02	Rookwood Weir site	Rookwood far downstream	293
F	348	16233	107159	2025-05-14	2026-03-04	Rookwood Weir site	Lawries bend downstream	294

Sex	SCL (mm)	Acoustic tag code	No. detections	First detection	Last detection	First receiver	Last receiver	Duration (days)
F	376	16235	85288	2025-05-14	2026-03-04	Rookwood Weir site	Rookwood far downstream	294
F	366	16237	23187	2025-05-14	2026-03-04	Rookwood Weir site	Lawries bend downstream	294
F	393	16239	11549	2025-05-14	2026-03-04	Rookwood downstream	Hanrahan far upstream	294
F	395	16163	29437	2025-05-11	2026-03-02	Rookwood downstream	Lawries bend mid	295
F	242	16165	190045	2025-05-11	2026-03-04	Left bank weir pool	Approach channel upstream	297
F	375	16179	48963	2025-05-09	2026-03-03	Rookwood downstream	Lawries bend downstream	298
F	405	16177	28163	2025-05-09	2026-03-04	Rookwood Weir site	Lawries bend mid	299
F	385	16183	68501	2025-05-08	2026-03-04	Rookwood downstream	Hanrahan pool	300
F	395	16024	62395	2017-09-08	2018-08-08	Rookwood upstream	Rookwood far upstream	334
F	291	11326	185118	2024-10-31	2025-11-24	Left bank weir pool	The Pocket upstream	389
F	430	11564	19344	2024-11-03	2025-12-06	Rookwood Weir site	Rookwood far downstream	398
F	380	11294	99124	2022-07-20	2023-08-29	Rookwood crossing	Rookwood Weir site	405
F	393	11562	67344	2024-11-03	2025-12-15	Rookwood Weir site	Rookwood crossing	407
F	385	10262	30993	2024-11-01	2026-02-02	Rookwood Weir site	Rookwood downstream	458
F	385	10266	36791	2024-11-01	2026-02-08	Rookwood Weir site	Rookwood downstream	464
F	388	15802	43435	2018-10-16	2020-01-29	Riverslea downstream	Riverslea downstream	470
F	378	10240	56722	2024-11-03	2026-02-26	Rookwood Weir site	Rookwood downstream	480
F	372	10260	53463	2024-11-01	2026-02-28	Left bank weir pool	Gogango creek	484
F	360	10270	147033	2024-10-31	2026-03-02	Left bank weir pool	Rookwood mid	487
F	271	11328	133004	2024-10-31	2026-03-03	Left bank weir pool	Rookwood crossing	488
F	244	11711	202034	2020-06-11	2021-11-12	Riverslea upstream	Riverslea riffle downstream	519
F	408	16016	77989	2017-08-27	2019-02-02	Lawries bend downstream	Lawries bend mid	524
F	375	16358	3688	2020-10-06	2022-05-09	Hanrahan pool	Riverslea riffle downstream	580

Sex	SCL (mm)	Acoustic tag code	No. detections	First detection	Last detection	First receiver	Last receiver	Duration (days)
F	395	16360	21411	2020-10-04	2022-05-19	Hanrahan pool	Gogango creek	592
F	385	14289	89321	2019-06-16	2021-06-26	Rookwood riffle	Lawries bend downstream	741
F	375	11310	194873	2023-03-07	2025-04-06	Rookwood far downstream	Gogango creek	761
F	400	12856	77399	2019-09-13	2021-11-12	Hanrahan creek	Hanrahan far downstream	791
F	378	16008	65553	2017-05-06	2019-10-06	Lawries bend downstream	Lawries bend far downstream	883
F	363	14291	137034	2019-06-27	2022-01-13	Rookwood riffle	Lawries bend upstream	931
F	365	16026	106504	2017-09-08	2020-03-29	Rookwood upstream	Gogango creek mouth	933
F	404	12862	238209	2019-09-14	2022-05-22	Rookwood crossing	Rookwood Weir site	981
F	350	12858	160771	2019-09-16	2022-05-28	Rookwood mid	Rookwood far downstream	985
F	390	11304	293763	2023-03-01	2026-01-11	Rookwood downstream	Ramp entrance downstream	1047
F	213	11290	508157	2023-02-28	2026-01-13	Rookwood downstream	Rookwood far downstream	1050
F	407	15810	121962	2018-10-12	2021-09-24	Rookwood riffle	Rookwood upstream riffle	1078
F	398	16336	3997	2021-04-14	2024-04-06	Hanrahan creek	Hanrahan far downstream	1088
F	375	16342	228913	2022-02-28	2025-02-27	Rookwood Weir site	Rookwood Weir site	1095
F	330	16366	160832	2020-09-29	2023-09-29	Rookwood downstream	Hanrahan pool	1095
F	388	15796	129718	2019-03-18	2022-04-13	Rookwood downstream	Rookwood far downstream	1122
F	420	16040	266485	2017-05-10	2020-06-11	Lawries bend downstream	Lawries bend mid	1128
F	392	11717	60920	2020-06-11	2023-11-05	Riverslea upstream	Riverslea upstream	1242
F	377	15820	99228	2018-06-19	2022-12-22	Rookwood upstream	Riverslea upstream	1647
M	270	11296	714	2022-03-02	2022-03-09	Rookwood downstream	Hanrahan far downstream	7
M	266	11324	5943	2023-12-06	2024-01-21	Rookwood crossing	Hanrahan far downstream	46
M	268	13070	5115	2025-11-06	2026-01-12	Rookwood Weir site	Gogango creek	67

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Sex	SCL (mm)	Acoustic tag code	No. detections	First detection	Last detection	First receiver	Last receiver	Duration (days)
M	271	16038	19892	2017-04-28	2017-07-13	Rookwood downstream	Rookwood downstream	76
M	281	13080	7605	2025-11-06	2026-01-28	Rookwood Weir site	Hanrahan pool	83
M	284	13110	6568	2025-11-08	2026-02-03	Rookwood Weir site	Hanrahan pool	87
M	280	13146	7054	2025-11-09	2026-02-07	Rookwood Weir site	Ramp entrance downstream	90
M	282	13114	3844	2025-11-08	2026-02-08	Rookwood Weir site	Rookwood downstream	92
M	296	13130	8087	2025-11-08	2026-02-09	Rookwood Weir site	Hanrahan pool	93
M	268	16219	2651	2025-11-04	2026-02-08	Rookwood Weir site	Lawries bend mid	96
M	261	16207	2772	2025-11-05	2026-02-14	Rookwood Weir site	Hanrahan pool	101
M	280	13112	5196	2025-11-08	2026-03-02	Rookwood Weir site	Lawries bend far downstream	114
M	268	16255	5403	2025-11-05	2026-02-27	Rookwood Weir site	Rookwood far downstream	114
M	283	13108	5209	2025-11-07	2026-03-02	Rookwood Weir site	Rookwood downstream	115
M	296	16213	9196	2025-11-05	2026-03-01	Rookwood Weir site	Lawries bend far downstream	116
M	280	13086	5395	2025-11-06	2026-03-03	Rookwood Weir site	Hanrahan far upstream	117
M	249	16201	7856	2025-11-05	2026-03-02	Rookwood Weir site	Lawries bend mid	117
M	273	13074	4204	2025-11-06	2026-03-04	Rookwood Weir site	Lawries bend mid	118
M	297	13096	4459	2025-11-06	2026-03-04	Rookwood Weir site	Lawries bend mid	118
M	276	13102	4603	2025-11-07	2026-03-05	Rookwood downstream	Approach channel upstream	118
M	282	16203	8951	2025-11-05	2026-03-04	Rookwood Weir site	Hanrahan far upstream	119
M	278	16217	7814	2025-11-04	2026-03-03	Rookwood Weir site	Gogango creek mouth	119
M	264	12860	12140	2019-09-13	2020-02-08	Hanrahan pool	Lawries bend upstream	148
M	269	16012	24783	2017-05-08	2017-10-07	Lawries bend upstream	Hanrahan creek	152
M	280	10254	9074	2024-11-02	2025-04-09	Rookwood Weir site	Gogango creek	158

Sex	SCL (mm)	Acoustic tag code	No. detections	First detection	Last detection	First receiver	Last receiver	Duration (days)
M	289	16022	23541	2017-05-07	2017-10-27	Lawries bend upstream	Rookwood far downstream	173
M	279	16028	7155	2017-05-02	2017-11-06	Lawries bend downstream	Hanrahan downstream	188
M	285	16036	23911	2017-05-06	2017-11-23	The Pocket downstream	The Pocket upstream	201
M	296	15824	41617	2018-06-23	2019-02-23	Rookwood upstream	Gogango creek	245
M	252	16356	70421	2022-01-20	2022-09-25	Rookwood crossing	The Pocket upstream	248
M	283	1084	10450	2019-06-16	2020-04-01	Rookwood mid	The Pocket upstream	290
M	257	16187	38201	2025-05-08	2026-03-02	Rookwood downstream	Rookwood crossing	298
M	270	11747	52740	2020-06-13	2021-04-19	Riverslea upstream	Riverslea riffle downstream	310
M	299	11566	153330	2024-11-03	2025-09-10	Rookwood Weir site	Rookwood crossing	311
M	269	16006	48954	2017-04-30	2018-05-10	Rookwood downstream	Gogango creek mouth	375
M	264	16032	56828	2017-09-08	2018-10-14	Rookwood upstream	Rookwood upstream	401
M	285	11568	19920	2024-11-03	2025-12-26	Rookwood Weir site	Ramp entrance downstream	418
M	281	11729	21748	2020-06-11	2021-08-24	Riverslea upstream	Riverslea upstream	439
M	283	10268	56252	2024-10-31	2026-01-26	Left bank weir pool	The Pocket upstream	452
M	297	10258	82043	2024-11-02	2026-02-09	Rookwood Weir site	Rookwood far downstream	464
M	292	10264	46226	2024-11-01	2026-02-13	Rookwood Weir site	Hanrahan pool	469
M	256	10256	69823	2024-11-02	2026-02-19	Rookwood Weir site	Rookwood downstream	474
M	264	10246	26552	2024-11-02	2026-02-21	Rookwood Weir site	Rookwood far downstream	476
M	271	12864	7322	2019-09-12	2021-01-06	Hanrahan creek	Hanrahan far downstream	482
M	279	16042	91345	2017-05-06	2018-09-01	The Pocket downstream	The Pocket upstream	483
M	269	10238	38504	2024-11-03	2026-03-03	Rookwood Weir site	Riverslea upstream	485
M	261	10242	81858	2024-11-03	2026-03-04	Rookwood Weir site	Rookwood far downstream	486

Sex	SCL (mm)	Acoustic tag code	No. detections	First detection	Last detection	First receiver	Last receiver	Duration (days)
M	258	10248	49054	2024-11-02	2026-03-03	Rookwood Weir site	Rookwood downstream	486
M	282	11322	248611	2023-08-15	2025-01-04	Rookwood crossing	Rookwood downstream	508
M	272	16334	80049	2021-04-10	2022-11-03	Rookwood far upstream	Rookwood far upstream	572
M	285	16004	116882	2017-04-29	2018-12-11	Rookwood downstream	Rookwood mid	591
M	267	16020	124155	2017-05-02	2018-12-24	Lawries bend downstream	Lawries bend downstream	601
M	294	16364	16870	2021-06-01	2023-03-09	Lawries bend far downstream	The Pocket upstream	646
M	278	14295	12428	2019-03-06	2021-01-06	Rookwood downstream	Gogango creek	672
M	275	16346	67822	2022-03-01	2024-02-16	Rookwood Weir site	Hanrahan far downstream	717
M	278	16340	33958	2021-04-12	2023-04-02	Lawries bend mid	Hanrahan far downstream	720
M	282	15814	135857	2018-07-02	2020-11-11	Rookwood downstream	Rookwood far upstream	863
M	274	12854	62406	2020-03-31	2022-11-23	Rookwood mid	Lawries bend downstream	967
M	281	11320	114847	2023-03-03	2025-10-29	Rookwood downstream	Lawries bend mid	971
M	285	14293	165558	2019-03-07	2021-11-10	Rookwood downstream	Rookwood far downstream	979
M	290	12834	149167	2020-04-01	2022-12-12	Rookwood mid	Gogango creek upstream	985
M	303	16368	89811	2020-09-29	2023-07-08	Hanrahan downstream	Hanrahan far downstream	1012
M	272	11308	434081	2023-03-09	2026-02-21	Rookwood far downstream	Riverslea downstream	1080
M	276	16338	178365	2022-03-03	2025-03-01	Rookwood far downstream	Rookwood Weir site	1094
M	260	16370	176266	2020-09-29	2023-09-28	Hanrahan downstream	Hanrahan creek	1094
M	290	16372	273170	2020-09-29	2023-09-28	Hanrahan downstream	Hanrahan pool	1094
M	257	15822	143612	2018-07-10	2021-07-31	Rookwood downstream	Rookwood downstream	1117
M	255	15812	109780	2018-10-11	2021-11-05	Riverslea downstream	Riverslea downstream	1121
M	269	15816	204215	2018-10-07	2021-11-03	Rookwood upstream	Rookwood upstream	1123
M	269	11725	312931	2020-06-11	2023-11-10	Riverslea upstream	Riverslea upstream	1247

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Sex	SCL (mm)	Acoustic tag code	No. detections	First detection	Last detection	First receiver	Last receiver	Duration (days)
M	268	13098	5218	2022-08-25	2026-03-04	Rookwood Weir site	Rookwood downstream	1287
M	261	11721	67281	2020-06-19	2024-01-16	The Pocket downstream	Riverslea riffle upstream	1306
M	270	11316	71905	2021-08-18	2026-03-02	Riverslea downstream	Lawries bend far downstream	1657
J	187	465	33632	2017-09-09	2019-03-04	Rookwood upstream	Rookwood upstream	541
J	190	469	32469	2017-09-09	2019-04-16	Rookwood upstream	Rookwood far upstream	584
J	218	10274	84209	2023-11-09	2026-03-04	Rookwood downstream	Rookwood far downstream	846

Blue shading indicates turtles active on the array in Year 2

Table 7.2 Summary table of 108 Fitzroy River turtles (Fitzroy River turtle) tracked via acoustic telemetry

Sex	SCL (mm)	Acoustic tag code	No. detections	First detection	Last detection	First receiver	Last receiver	Duration (days)
F	271	13090	352	2025-11-06	2025-11-07	Rookwood Weir site	Rookwood downstream	1
F	242	16171	5989	2025-05-10	2025-05-29	Rookwood downstream	Rookwood far downstream	19
F	264	16193	7480	2025-11-06	2026-01-25	Rookwood Weir site	Hanrahan pool	80
F	238	16223	249	2025-11-04	2026-01-28	Rookwood Weir site	Hanrahan pool	85
F	232	13126	3811	2025-11-09	2026-02-06	Rookwood Weir site	Ramp entrance downstream	89
F	273	13136	11614	2025-11-09	2026-02-08	Rookwood Weir site	Ramp entrance downstream	91
F	275	13082	3005	2025-11-06	2026-02-06	Rookwood Weir site	Ramp entrance downstream	92
F	224	13104	14516	2025-11-07	2026-02-18	Rookwood Weir site	Hanrahan pool	103
F	297	13138	7569	2025-11-09	2026-02-24	Rookwood Weir site	Rookwood downstream	107
F	253	13148	6561	2025-11-09	2026-02-28	Rookwood Weir site	Lawries bend mid	111
F	248	13084	20610	2025-11-06	2026-02-28	Rookwood Weir site	Rookwood downstream	114
F	269	13122	5063	2025-11-08	2026-03-03	Rookwood Weir site	Rookwood downstream	115
F	274	13092	1466	2025-11-06	2026-03-03	Rookwood Weir site	Rookwood far downstream	117

Sex	SCL (mm)	Acoustic tag code	No. detections	First detection	Last detection	First receiver	Last receiver	Duration (days)
F	263	16205	4328	2025-11-05	2026-03-04	Rookwood Weir site	Rookwood far downstream	119
F	274	16014	51636	2017-05-01	2017-11-18	Lawries bend downstream	Hanrahan upstream	201
F	273	12852	2987	2020-03-31	2020-10-24	Rookwood crossing	Lawries bend downstream	207
F	226	1082	45004	2019-06-17	2020-01-19	Rookwood riffle	Rookwood downstream	216
F	258	16151	55072	2025-05-12	2025-12-16	Rookwood downstream	Rookwood Weir site	218
F	262	14285	33447	2019-06-15	2020-01-29	Rookwood riffle	Rookwood crossing	228
F	262	16149	14750	2025-05-12	2026-01-11	Rookwood downstream	Ramp entrance downstream	244
F	269	11570	25541	2024-11-03	2025-07-07	Rookwood Weir site	Rookwood downstream	246
F	266	16147	46145	2025-05-12	2026-02-20	Rookwood downstream	Rookwood far downstream	284
F	260	14297	73207	2019-06-17	2020-03-28	Rookwood riffle	Rookwood upstream riffle	285
F	267	16173	20094	2025-05-11	2026-02-26	Rookwood downstream	Lawries bend downstream	291
F	254	1088	248	2019-06-17	2020-04-29	Rookwood mid	Lawries bend upstream	317
F	247	16344	21277	2022-02-28	2023-01-31	Rookwood Weir site	The Pocket upstream	337
F	255	10244	12240	2024-11-02	2025-10-22	Rookwood Weir site	Rookwood far downstream	354
F	261	10236	25188	2024-11-02	2026-02-17	Rookwood Weir site	Ramp entrance downstream	472
F	187	1086	13048	2019-06-17	2020-10-01	Rookwood mid	Riverslea downstream	472
F	279	10252	15559	2024-11-02	2026-03-04	Rookwood Weir site	Hanrahan upstream	487
F	246	11302	65505	2023-03-01	2024-09-20	Rookwood downstream	Hanrahan far downstream	569
F	254	11715	131632	2020-06-12	2022-04-01	Riverslea upstream	Riverslea riffle downstream	658
F	272	14273	92650	2019-06-16	2021-05-08	Rookwood mid	Rookwood riffle	692
F	254	11727	25533	2020-06-11	2022-07-06	Riverslea upstream	Riverslea upstream	755
F	271	14283	36458	2019-06-15	2021-09-11	Rookwood mid	Rookwood downstream	819
F	273	14279	285710	2019-06-17	2021-12-04	Rookwood downstream	Rookwood mid	901

Sex	SCL (mm)	Acoustic tag code	No. detections	First detection	Last detection	First receiver	Last receiver	Duration (days)
F	265	14263	175142	2019-08-28	2022-02-25	Rookwood mid	Rookwood mid	912
F	271	15804	51665	2019-06-15	2022-01-07	Rookwood riffle	Rookwood riffle	937
F	279	14269	180435	2019-06-16	2022-02-08	Rookwood downstream	Riverslea riffle upstream	968
F	282	14277	238098	2019-06-17	2022-02-16	Rookwood downstream	Rookwood crossing	975
F	262	14261	19487	2019-06-17	2022-02-25	Rookwood riffle	Rookwood upstream riffle	984
F	268	12846	125602	2020-03-31	2022-12-11	Rookwood crossing	Rookwood upstream riffle	985
F	235	11312	224210	2023-03-02	2026-01-13	Rookwood downstream	Hanrahan pool	1048
F	266	11298	191187	2023-03-01	2026-02-10	Rookwood downstream	Rookwood downstream	1077
F	257	11306	386869	2023-03-01	2026-02-18	Rookwood downstream	Rookwood far downstream	1085
F	265	11318	24687	2023-03-04	2026-02-21	Rookwood downstream	Rookwood downstream	1085
F	264	11300	29425	2023-02-28	2026-02-21	Rookwood downstream	Rookwood far downstream	1089
F	236	11737	46904	2020-06-12	2023-06-06	Riverslea upstream	Gogango creek upstream	1089
F	270	11314	51573	2023-03-04	2026-03-01	Rookwood downstream	Rookwood downstream	1093
F	261	11292	1284751	2022-07-20	2025-07-18	Rookwood crossing	Left bank weir pool	1094
F	253	16352	222258	2021-07-24	2024-07-23	Rookwood crossing	Rookwood riffle	1095
F	249	16354	307640	2021-07-24	2024-07-23	Rookwood crossing	Rookwood Weir site	1095
F	260	15818	283520	2018-10-23	2021-11-10	Rookwood riffle	Rookwood riffle	1114
F	294	15806	220414	2019-06-15	2022-07-24	Rookwood riffle	Rookwood crossing	1135
F	262	11713	43739	2020-06-12	2023-10-01	Riverslea upstream	Riverslea downstream	1206
F	267	11743	63621	2020-06-13	2023-10-30	Riverslea upstream	Riverslea downstream	1234
F	262	16350	166346	2021-07-24	2024-12-10	Rookwood crossing	Rookwood downstream	1235
F	270	11735	215372	2020-06-12	2023-11-08	Riverslea upstream	Riverslea upstream	1244
F	241	11739	301356	2020-06-12	2023-11-10	Riverslea upstream	Riverslea upstream	1246
F	250	11723	270114	2020-06-11	2023-11-10	Riverslea upstream	Riverslea upstream	1247

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Sex	SCL (mm)	Acoustic tag code	No. detections	First detection	Last detection	First receiver	Last receiver	Duration (days)
F	283	11731	312395	2020-06-11	2024-02-01	Riverslea upstream	Riverslea riffle upstream	1330
F	274	11733	187843	2020-06-15	2024-11-15	Riverslea upstream	Riverslea upstream	1614
F	261	14267	77964	2019-06-17	2025-06-01	Rookwood mid	Rookwood mid	2176
M	271	12840	1829	2020-03-31	2020-04-04	Rookwood crossing	Rookwood far downstream	4
M	254	16211	2344	2025-11-05	2025-12-04	Rookwood Weir site	Rookwood Weir site	29
M	277	1090	11695	2019-06-17	2019-08-01	Rookwood riffle	Rookwood riffle	45
M	254	13088	4120	2025-11-06	2026-01-27	Rookwood Weir site	Rookwood downstream	82
M	262	13128	25070	2025-11-09	2026-02-28	Rookwood Weir site	Rookwood downstream	111
M	268	13134	25743	2025-11-09	2026-03-02	Rookwood Weir site	Rookwood downstream	113
M	252	13140	6108	2025-11-09	2026-03-04	Rookwood Weir site	Ramp entrance downstream	115
M	252	16199	6294	2025-11-05	2026-02-28	Rookwood Weir site	Lawries bend mid	115
M	257	13124	7603	2025-11-08	2026-03-04	Rookwood Weir site	Lawries bend far downstream	116
M	281	13072	6032	2025-11-06	2026-03-04	Rookwood Weir site	Rookwood downstream	118
M	252	16215	7999	2025-11-05	2026-03-04	Rookwood Weir site	Rookwood far downstream	119
M	252	12848	45466	2020-03-31	2020-09-02	Rookwood crossing	Lawries bend upstream	155
M	243	14287	93862	2019-06-15	2020-02-01	Rookwood riffle	Rookwood upstream	231
M	287	15788	109103	2019-06-15	2020-02-26	Rookwood riffle	Rookwood riffle	256
M	270	14265	19828	2019-06-16	2020-03-17	Rookwood riffle	Rookwood upstream riffle	275
M	262	16175	30751	2025-05-11	2026-02-17	Rookwood downstream	Rookwood downstream	282
M	274	14299	55899	2019-06-22	2020-04-03	Rookwood upstream	Rookwood upstream riffle	286
M	251	16181	47828	2025-05-09	2026-02-23	Rookwood downstream	Rookwood downstream	290
M	271	16145	29340	2025-05-12	2026-03-03	Rookwood downstream	Hanrahan far upstream	295
M	235	16241	58794	2025-05-13	2026-03-04	Rookwood downstream	Rookwood far downstream	295
M	256	16189	33349	2025-05-08	2026-03-03	Rookwood downstream	Hanrahan pool	299

Sex	SCL (mm)	Acoustic tag code	No. detections	First detection	Last detection	First receiver	Last receiver	Duration (days)
M	262	12842	8516	2020-04-01	2021-01-27	Rookwood crossing	Lawries bend upstream	301
M	256	12832	68196	2020-04-01	2021-03-22	Rookwood mid	Rookwood mid	355
M	252	10250	70509	2024-11-03	2026-01-13	Rookwood Weir site	Rookwood downstream	436
M	266	14281	109015	2019-06-16	2020-11-14	Rookwood downstream	Rookwood downstream	517
M	259	16362	42701	2021-07-24	2023-01-06	Rookwood crossing	Gogango creek mouth	531
M	250	15794	98527	2019-09-14	2021-08-07	Rookwood Weir site	Rookwood Weir site	693
M	260	12838	1159	2020-03-31	2022-03-17	Rookwood crossing	Lawries bend upstream	716
M	274	16018	260277	2018-04-16	2020-07-30	Rookwood riffle	Rookwood riffle	836
M	271	14275	141436	2019-06-16	2021-11-25	Rookwood downstream	Rookwood downstream	893
M	265	12844	194987	2020-04-01	2022-09-14	Rookwood mid	Rookwood far downstream	896
M	270	14271	231588	2019-06-17	2022-02-25	Rookwood downstream	Rookwood downstream	984
M	251	12836	44660	2020-04-01	2022-12-12	Rookwood mid	Lawries bend upstream	985
M	259	12850	33667	2020-03-31	2022-12-11	Rookwood mid	Rookwood far downstream	985
M	271	11709	243201	2020-06-11	2023-11-02	Riverslea upstream	Gogango creek upstream	1239
M	247	11745	119150	2020-06-17	2023-11-10	Riverslea upstream	Riverslea upstream	1241
M	268	11741	258908	2020-06-13	2023-11-10	Riverslea upstream	Riverslea upstream	1245
M	261	11719	168447	2020-06-11	2023-11-10	Riverslea upstream	Riverslea upstream	1247
M	267	15792	646	2017-09-26	2025-12-13	Hanrahan downstream	Rookwood downstream	3000
J	177	8322	170739	2020-04-01	2021-11-10	Rookwood mid	Rookwood Weir site	588
J	216	8320	150522	2020-04-01	2022-04-01	Rookwood crossing	Rookwood crossing	730

Blue shading indicates turtles active on the array in Year 2

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Table 7.3 Summary table of white-throated snapping turtle and Fitzroy River turtle movements and range use between April 2017 and March 2026

Species	Sex	Acoustic tag code	Duration (days)	No. unique receiver stations	Total distance moved (km)	Distance travelled/ day (km)	Linear home range (km)
White-throated snapping turtle	J	465	541.16	2	12.70	0.023	0.77
White-throated snapping turtle	J	469	584.26	3	24.23	0.041	2.66
White-throated snapping turtle	F	473	169.11	10	10.35	0.061	7.50
White-throated snapping turtle	M	1084	290.21	22	85.23	0.294	34.35
White-throated snapping turtle	M	10238	484.89	12	83.72	0.173	19.83
White-throated snapping turtle	F	10240	479.72	4	108.20	0.226	2.02
White-throated snapping turtle	M	10242	485.92	4	27.92	0.057	2.02
White-throated snapping turtle	M	10246	476.03	5	50.86	0.107	2.02
White-throated snapping turtle	M	10248	485.72	9	239.68	0.493	12.08
White-throated snapping turtle	M	10254	157.90	15	47.24	0.299	13.72
White-throated snapping turtle	M	10256	474.26	6	85.99	0.181	7.40
White-throated snapping turtle	M	10258	463.84	4	102.57	0.221	2.02
White-throated snapping turtle	F	10260	483.64	10	138.32	0.286	5.04
White-throated snapping turtle	F	10262	458.21	8	96.36	0.210	12.08
White-throated snapping turtle	M	10264	468.73	11	153.10	0.327	16.11
White-throated snapping turtle	F	10266	463.95	4	103.65	0.223	2.02
White-throated snapping turtle	M	10268	451.68	15	98.31	0.218	17.37
White-throated snapping turtle	F	10270	487.40	11	123.75	0.254	7.01
White-throated snapping turtle	F	10272	153.85	12	51.98	0.338	9.28
White-throated snapping turtle	J	10274	845.84	2	45.58	0.054	0.95
White-throated snapping turtle	F	11290	1049.83	2	59.67	0.057	0.95
White-throated snapping turtle	F	11294	404.92	5	38.86	0.096	3.34
White-throated snapping turtle	M	11296	6.73	10	13.10	1.947	17.55
White-throated snapping turtle	F	11304	1046.72	5	21.69	0.021	3.06
White-throated snapping turtle	M	11308	1080.05	16	117.58	0.109	14.67
White-throated snapping turtle	F	11310	761.18	15	139.14	0.183	11.74
White-throated snapping turtle	M	11316	1656.64	20	92.11	0.056	25.83
White-throated snapping turtle	M	11320	971.04	11	162.75	0.168	16.11
White-throated snapping turtle	M	11322	508.01	12	49.25	0.097	7.97
White-throated snapping turtle	M	11324	45.74	12	18.35	0.401	20.13
White-throated snapping turtle	F	11326	388.78	17	134.73	0.347	17.37
White-throated snapping turtle	F	11328	487.91	8	135.66	0.278	2.59
White-throated snapping turtle	F	11562	406.70	15	130.16	0.320	11.74
White-throated snapping turtle	F	11564	397.93	6	74.53	0.187	7.40
White-throated snapping turtle	M	11566	310.88	18	87.74	0.282	17.77
White-throated snapping turtle	M	11568	417.77	5	20.56	0.049	2.02
White-throated snapping turtle	F	11711	518.52	2	33.57	0.065	0.36

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Species	Sex	Acoustic tag code	Duration (days)	No. unique receiver stations	Total distance moved (km)	Distance travelled/ day (km)	Linear home range (km)
White-throated snapping turtle	F	11717	1242.01	3	50.92	0.041	3.10
White-throated snapping turtle	M	11721	1306.54	22	112.10	0.086	28.01
White-throated snapping turtle	M	11725	1246.77	6	32.36	0.026	8.09
White-throated snapping turtle	M	11729	438.64	4	23.97	0.055	3.67
White-throated snapping turtle	M	11747	310.09	3	5.94	0.019	0.92
White-throated snapping turtle	M	12834	984.93	24	122.21	0.124	32.39
White-throated snapping turtle	M	12854	966.65	22	192.61	0.199	28.53
White-throated snapping turtle	F	12856	791.03	13	168.11	0.213	18.45
White-throated snapping turtle	F	12858	984.98	13	132.50	0.135	18.75
White-throated snapping turtle	M	12860	148.02	7	13.82	0.093	11.16
White-throated snapping turtle	F	12862	980.56	6	48.46	0.049	3.53
White-throated snapping turtle	M	12864	481.70	10	30.00	0.062	13.67
White-throated snapping turtle	M	13070	66.70	12	14.63	0.219	9.90
White-throated snapping turtle	M	13074	117.98	6	25.28	0.214	8.24
White-throated snapping turtle	F	13076	93.83	5	34.10	0.363	7.40
White-throated snapping turtle	F	13078	117.79	6	52.87	0.449	8.24
White-throated snapping turtle	M	13080	83.21	9	26.07	0.313	15.94
White-throated snapping turtle	M	13086	116.82	9	40.80	0.349	15.94
White-throated snapping turtle	F	13094	100.43	4	25.02	0.249	2.02
White-throated snapping turtle	M	13096	117.39	8	56.61	0.482	12.08
White-throated snapping turtle	M	13098	1287.21	5	27.62	0.021	7.40
White-throated snapping turtle	F	13100	116.43	6	70.17	0.603	8.24
White-throated snapping turtle	M	13102	117.74	13	50.88	0.432	12.87
White-throated snapping turtle	F	13106	63.96	4	18.23	0.285	2.02
White-throated snapping turtle	M	13108	114.75	5	22.54	0.196	7.40
White-throated snapping turtle	M	13110	86.70	10	46.58	0.537	16.11
White-throated snapping turtle	M	13112	113.80	6	16.51	0.145	10.20
White-throated snapping turtle	M	13114	92.43	6	23.73	0.257	8.24
White-throated snapping turtle	F	13116	68.07	13	37.99	0.558	11.74
White-throated snapping turtle	F	13118	90.59	5	47.21	0.521	7.40
White-throated snapping turtle	F	13120	114.14	5	26.60	0.233	7.40
White-throated snapping turtle	M	13130	92.79	9	30.27	0.326	15.94
White-throated snapping turtle	F	13132	97.45	6	56.09	0.576	10.02
White-throated snapping turtle	M	13146	89.69	8	25.46	0.284	12.08
White-throated snapping turtle	F	14289	740.76	23	108.39	0.146	29.90
White-throated snapping turtle	F	14291	930.55	14	114.42	0.123	13.72
White-throated snapping turtle	M	14293	979.43	17	232.16	0.237	23.99
White-throated snapping turtle	M	14295	671.45	18	34.62	0.052	23.19
White-throated snapping turtle	F	15786	67.82	1	0.00	0.000	0.00

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Species	Sex	Acoustic tag code	Duration (days)	No. unique receiver stations	Total distance moved (km)	Distance travelled/ day (km)	Linear home range (km)
White-throated snapping turtle	F	15796	1122.09	5	172.87	0.154	5.99
White-throated snapping turtle	F	15798	72.33	4	10.22	0.141	5.91
White-throated snapping turtle	F	15802	470.32	2	11.23	0.024	2.75
White-throated snapping turtle	F	15810	1078.27	9	37.13	0.034	6.55
White-throated snapping turtle	M	15812	1120.64	3	19.06	0.017	5.02
White-throated snapping turtle	M	15814	862.12	9	136.54	0.158	9.47
White-throated snapping turtle	M	15816	1122.32	9	67.07	0.060	15.56
White-throated snapping turtle	F	15820	1646.38	15	264.67	0.161	19.86
White-throated snapping turtle	M	15822	1116.57	21	151.60	0.136	26.26
White-throated snapping turtle	M	15824	245.48	6	57.87	0.236	7.47
White-throated snapping turtle	M	16004	591.32	3	24.60	0.042	3.06
White-throated snapping turtle	M	16006	374.47	9	29.60	0.079	15.69
White-throated snapping turtle	F	16008	883.62	14	281.98	0.319	19.54
White-throated snapping turtle	F	16010	172.41	5	91.15	0.529	5.20
White-throated snapping turtle	M	16012	152.16	7	52.94	0.348	11.59
White-throated snapping turtle	F	16016	523.94	2	15.10	0.029	0.84
White-throated snapping turtle	M	16020	600.79	9	105.76	0.176	15.62
White-throated snapping turtle	M	16022	173.20	3	15.21	0.088	3.88
White-throated snapping turtle	F	16024	334.22	3	78.75	0.236	2.66
White-throated snapping turtle	F	16026	932.76	6	207.48	0.222	7.47
White-throated snapping turtle	M	16028	188.58	6	8.32	0.044	9.47
White-throated snapping turtle	F	16030	69.36	10	30.23	0.436	18.75
White-throated snapping turtle	M	16032	400.75	6	212.70	0.531	7.47
White-throated snapping turtle	M	16036	200.87	2	11.52	0.057	1.37
White-throated snapping turtle	M	16038	76.03	2	7.61	0.100	0.95
White-throated snapping turtle	F	16040	1127.73	6	80.47	0.071	9.12
White-throated snapping turtle	M	16042	483.14	4	41.91	0.087	8.09
White-throated snapping turtle	F	16137	166.65	7	6.59	0.040	5.05
White-throated snapping turtle	F	16139	269.67	10	316.39	1.173	16.11
White-throated snapping turtle	F	16141	291.93	7	66.86	0.229	10.20
White-throated snapping turtle	F	16143	14.19	4	2.76	0.195	2.02
White-throated snapping turtle	F	16153	157.63	10	34.75	0.220	16.11
White-throated snapping turtle	F	16155	181.62	6	36.73	0.202	8.24
White-throated snapping turtle	F	16157	272.25	10	147.79	0.543	16.11
White-throated snapping turtle	F	16159	263.18	7	100.45	0.382	10.20
White-throated snapping turtle	F	16161	271.17	5	67.36	0.248	7.40
White-throated snapping turtle	F	16163	294.99	10	111.25	0.377	16.11
White-throated snapping turtle	J	16165	296.53	9	100.79	0.340	5.04
White-throated snapping turtle	F	16167	6.36	8	13.87	2.180	15.04

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Species	Sex	Acoustic tag code	Duration (days)	No. unique receiver stations	Total distance moved (km)	Distance travelled/ day (km)	Linear home range (km)
White-throated snapping turtle	F	16169	247.27	7	34.50	0.140	10.20
White-throated snapping turtle	F	16177	298.84	8	57.44	0.192	12.08
White-throated snapping turtle	F	16179	297.84	8	56.32	0.189	12.08
White-throated snapping turtle	F	16183	299.75	10	40.86	0.136	16.11
White-throated snapping turtle	F	16185	275.65	6	92.00	0.334	8.24
White-throated snapping turtle	M	16187	298.18	20	92.22	0.309	11.74
White-throated snapping turtle	F	16195	68.26	6	30.80	0.451	10.02
White-throated snapping turtle	F	16197	118.78	8	76.56	0.645	12.08
White-throated snapping turtle	M	16201	116.66	5	21.71	0.186	7.40
White-throated snapping turtle	M	16203	118.82	8	28.21	0.237	12.08
White-throated snapping turtle	M	16207	101.29	10	35.96	0.355	16.11
White-throated snapping turtle	J	16209	43.58	2	1.57	0.036	0.17
White-throated snapping turtle	M	16213	116.02	10	42.93	0.370	16.11
White-throated snapping turtle	M	16217	118.85	7	16.74	0.141	8.52
White-throated snapping turtle	M	16219	96.07	4	24.99	0.260	7.22
White-throated snapping turtle	F	16221	119.71	4	35.80	0.299	2.02
White-throated snapping turtle	F	16225	201.71	4	15.50	0.077	2.02
White-throated snapping turtle	F	16227	157.42	5	23.80	0.151	8.06
White-throated snapping turtle	F	16229	151.26	5	6.04	0.040	7.40
White-throated snapping turtle	F	16231	16.11	10	15.79	0.980	16.11
White-throated snapping turtle	F	16233	294.00	7	35.95	0.122	11.91
White-throated snapping turtle	F	16235	293.93	6	43.62	0.148	8.24
White-throated snapping turtle	F	16237	293.83	6	75.46	0.257	10.02
White-throated snapping turtle	F	16239	293.88	9	36.75	0.125	14.58
White-throated snapping turtle	F	16243	281.45	8	86.58	0.308	12.08
White-throated snapping turtle	F	16245	280.66	5	34.06	0.121	8.06
White-throated snapping turtle	F	16247	292.60	4	5.99	0.020	2.02
White-throated snapping turtle	J	16249	92.65	7	14.74	0.159	7.42
White-throated snapping turtle	F	16251	116.04	4	25.19	0.217	2.02
White-throated snapping turtle	F	16253	118.78	6	60.98	0.513	8.24
White-throated snapping turtle	M	16255	113.90	10	44.31	0.389	16.11
White-throated snapping turtle	M	16334	571.63	10	108.60	0.190	14.19
White-throated snapping turtle	F	16336	1087.71	3	1.83	0.002	2.08
White-throated snapping turtle	M	16338	1093.40	22	209.62	0.192	25.21
White-throated snapping turtle	M	16340	719.58	18	104.93	0.146	21.65
White-throated snapping turtle	F	16342	1094.96	4	25.27	0.023	2.02
White-throated snapping turtle	M	16346	716.63	11	59.91	0.084	18.45
White-throated snapping turtle	M	16356	247.85	12	20.46	0.083	16.49
White-throated snapping turtle	F	16358	580.73	4	21.33	0.037	28.93

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Species	Sex	Acoustic tag code	Duration (days)	No. unique receiver stations	Total distance moved (km)	Distance travelled/ day (km)	Linear home range (km)
White-throated snapping turtle	F	16360	591.33	5	30.25	0.051	25.83
White-throated snapping turtle	M	16364	645.82	17	69.01	0.107	28.01
White-throated snapping turtle	F	16366	1094.23	10	261.81	0.239	16.64
White-throated snapping turtle	M	16368	1012.18	28	179.20	0.177	36.43
White-throated snapping turtle	M	16370	1093.97	9	214.51	0.196	16.64
White-throated snapping turtle	M	16372	1094.19	21	253.17	0.231	27.43
Fitzroy River turtle	F	1082	215.56	3	1.92	0.009	2.58
Fitzroy River turtle	J	1086	471.72	7	16.94	0.036	11.74
Fitzroy River turtle	F	1088	317.05	8	14.55	0.046	6.59
Fitzroy River turtle	M	1090	44.69	1	0.00	0.000	0.00
Fitzroy River turtle	J	8320	730.05	6	13.02	0.018	3.53
Fitzroy River turtle	J	8322	588.17	2	5.78	0.010	1.21
Fitzroy River turtle	F	10236	471.47	4	22.73	0.048	2.02
Fitzroy River turtle	F	10244	353.78	5	7.26	0.021	4.95
Fitzroy River turtle	M	10250	435.56	4	16.21	0.037	2.02
Fitzroy River turtle	F	10252	487.00	10	79.92	0.164	15.94
Fitzroy River turtle	F	11292	1093.96	7	23.43	0.021	1.81
Fitzroy River turtle	F*	11298	1077.40	5	101.05	0.094	4.95
Fitzroy River turtle	F	11300	1088.64	4	24.61	0.023	2.02
Fitzroy River turtle	F	11302	568.67	12	61.84	0.109	17.55
Fitzroy River turtle	J	11306	1084.81	3	17.06	0.016	1.85
Fitzroy River turtle	F	11312	1047.98	10	154.61	0.148	15.47
Fitzroy River turtle	F	11314	1093.12	4	107.30	0.098	2.02
Fitzroy River turtle	F	11318	1085.46	5	47.89	0.044	4.95
Fitzroy River turtle	F	11570	245.36	4	25.57	0.104	2.02
Fitzroy River turtle	M	11709	1238.58	7	43.06	0.035	8.48
Fitzroy River turtle	F	11713	1205.74	4	40.78	0.034	3.67
Fitzroy River turtle	F	11715	658.43	3	6.49	0.010	0.92
Fitzroy River turtle	M	11719	1246.77	2	2.24	0.002	0.36
Fitzroy River turtle	F	11723	1246.76	3	14.23	0.011	0.92
Fitzroy River turtle	F	11727	754.57	4	7.47	0.010	3.98
Fitzroy River turtle	F	11731	1330.12	3	36.76	0.028	0.92
Fitzroy River turtle	F	11733	1614.40	3	10.85	0.007	0.92
Fitzroy River turtle	F	11735	1243.43	3	33.63	0.027	0.92
Fitzroy River turtle	F	11737	1088.89	4	14.68	0.013	7.55
Fitzroy River turtle	F	11739	1245.49	4	30.17	0.024	3.98
Fitzroy River turtle	M	11741	1244.73	3	43.94	0.035	0.92
Fitzroy River turtle	F	11743	1233.47	9	62.22	0.050	11.14
Fitzroy River turtle	M	11745	1240.30	2	16.87	0.014	0.36

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Species	Sex	Acoustic tag code	Duration (days)	No. unique receiver stations	Total distance moved (km)	Distance travelled/ day (km)	Linear home range (km)
Fitzroy River turtle	M	12832	355.41	6	25.14	0.071	3.53
Fitzroy River turtle	M	12836	984.74	5	32.44	0.033	5.99
Fitzroy River turtle	M	12838	715.76	6	5.37	0.007	6.27
Fitzroy River turtle	M	12840	4.42	5	1.91	0.432	3.34
Fitzroy River turtle	M	12842	301.22	6	5.38	0.018	6.27
Fitzroy River turtle	M	12844	896.06	4	13.70	0.015	3.06
Fitzroy River turtle	F	12846	984.89	12	275.10	0.279	9.47
Fitzroy River turtle	M	12848	154.54	6	5.32	0.034	6.27
Fitzroy River turtle	M	12850	984.82	4	34.82	0.035	3.06
Fitzroy River turtle	F	12852	206.45	8	8.31	0.040	9.56
Fitzroy River turtle	M	13072	117.84	4	13.26	0.113	2.02
Fitzroy River turtle	F	13082	92.44	10	42.77	0.463	16.11
Fitzroy River turtle	F	13084	114.35	4	7.24	0.063	2.02
Fitzroy River turtle	M	13088	81.76	6	18.62	0.228	8.24
Fitzroy River turtle	F	13090	0.90	2	0.08	0.093	0.90
Fitzroy River turtle	F	13092	116.75	3	4.65	0.040	1.85
Fitzroy River turtle	F	13104	102.72	6	11.84	0.115	15.94
Fitzroy River turtle	F	13122	115.37	4	21.08	0.183	2.02
Fitzroy River turtle	M	13124	115.72	7	19.42	0.168	10.20
Fitzroy River turtle	F	13126	89.41	2	0.52	0.006	0.17
Fitzroy River turtle	M	13128	111.38	4	3.51	0.031	2.02
Fitzroy River turtle	M	13134	113.09	4	5.36	0.047	2.02
Fitzroy River turtle	F	13136	90.82	2	0.87	0.010	0.17
Fitzroy River turtle	F	13138	106.79	3	10.19	0.095	1.85
Fitzroy River turtle	M	13140	115.33	5	2.45	0.021	2.02
Fitzroy River turtle	F	13148	110.98	4	8.54	0.077	7.22
Fitzroy River turtle	F	14261	984.25	6	63.86	0.065	3.97
Fitzroy River turtle	F	14263	912.18	7	18.21	0.020	3.66
Fitzroy River turtle	M	14265	274.77	2	0.13	0.000	0.13
Fitzroy River turtle	F	14267	2175.24	7	31.80	0.015	3.66
Fitzroy River turtle	F	14269	967.59	11	72.71	0.075	18.47
Fitzroy River turtle	M	14271	983.83	4	41.91	0.043	3.06
Fitzroy River turtle	F	14273	691.84	8	41.63	0.060	6.59
Fitzroy River turtle	M	14275	892.32	3	10.22	0.011	1.85
Fitzroy River turtle	F	14277	974.49	6	29.87	0.031	3.53
Fitzroy River turtle	F	14279	900.65	5	42.73	0.047	3.34
Fitzroy River turtle	M	14281	516.57	5	14.90	0.029	3.34
Fitzroy River turtle	F	14283	819.06	4	41.81	0.051	3.06
Fitzroy River turtle	F	14285	227.92	2	0.56	0.002	0.19

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Species	Sex	Acoustic tag code	Duration (days)	No. unique receiver stations	Total distance moved (km)	Distance travelled/ day (km)	Linear home range (km)
Fitzroy River turtle	M	14287	230.56	3	35.16	0.153	1.52
Fitzroy River turtle	F	14297	285.35	6	22.55	0.079	6.59
Fitzroy River turtle	M	14299	286.71	4	56.11	0.196	3.28
Fitzroy River turtle	M	15788	256.20	3	1.01	0.004	0.32
Fitzroy River turtle	M	15792	2999.15	2	7.94	0.003	16.64
Fitzroy River turtle	M	15794	692.96	4	10.78	0.016	3.06
Fitzroy River turtle	F	15804	936.58	6	92.44	0.099	3.53
Fitzroy River turtle	F	15806	1134.76	7	60.32	0.053	3.66
Fitzroy River turtle	F	15818	1113.59	1	0.00	0.000	0.00
Fitzroy River turtle	F	16014	200.97	6	53.66	0.267	8.30
Fitzroy River turtle	M	16018	836.41	1	0.00	0.000	0.00
Fitzroy River turtle	M	16145	294.99	10	175.77	0.596	16.11
Fitzroy River turtle	F	16147	284.38	8	73.28	0.258	12.08
Fitzroy River turtle	F	16149	243.62	3	3.16	0.013	1.07
Fitzroy River turtle	F	16151	218.17	4	5.44	0.025	2.02
Fitzroy River turtle	F	16171	18.56	2	0.96	0.052	0.95
Fitzroy River turtle	F	16173	290.75	6	57.49	0.198	8.24
Fitzroy River turtle	M	16175	281.93	2	0.91	0.003	0.95
Fitzroy River turtle	M	16181	289.66	7	103.47	0.357	10.20
Fitzroy River turtle	M	16189	298.93	10	97.47	0.326	16.11
Fitzroy River turtle	F	16193	79.49	9	15.16	0.191	15.94
Fitzroy River turtle	M	16199	115.15	10	52.64	0.457	16.11
Fitzroy River turtle	F	16205	118.94	3	23.36	0.196	1.85
Fitzroy River turtle	M	16211	28.83	4	9.38	0.325	2.02
Fitzroy River turtle	M	16215	118.92	4	4.09	0.034	2.02
Fitzroy River turtle	F	16223	85.24	7	14.22	0.167	15.94
Fitzroy River turtle	M	16241	294.89	4	29.80	0.101	2.02
Fitzroy River turtle	F	16344	336.85	23	57.46	0.171	36.43
Fitzroy River turtle	F	16350	1235.33	17	133.03	0.108	15.41
Fitzroy River turtle	F	16352	1094.94	12	65.76	0.060	9.47
Fitzroy River turtle	F	16354	1094.97	5	22.10	0.020	3.34
Fitzroy River turtle	M	16362	530.60	15	62.48	0.118	16.77

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