INLAND RAIL – NARRABRI TO NORTH STAR PHASE 1: FIVE-CLAWED WORM SKINK (*Anomalopus mackayi*) CONSTRUCTION SPECIES MANAGEMENT PLAN (Rev 6)

August 2024

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ACKNOWLEDGEMENTS

Ben Lewis (Lewis Ecological Surveys) – Field surveys and report author.

Greg Lollback (Tweed Shire Council) – Discussions on occupancy analysis.

Peter Borrelli (ARTC – Inland Rail) – Project management.

Justin Bate (ARTC – Inland Rail) – Project management and on site assistance.

Grant Brown (ARTC – Inland Rail) – Assistance with access to GIS.

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Cover – Topsoil stripping with dozer and ecologist at 599.72 in Stage 1 of N2NS – Phase 1 (main) and Five-clawed Worm Skink (*Anamolopus mackayi*) Steve K Wilson © (insert)

Report to be cited as - Lewis, B.D (2024). Inland Rail Narrabri to North Star Phase 1: Five-clawed Worm Skink (*Anomalopus mackayi*) Species Management Plan Version 6. Report prepared for the Australian Rail Track Corporation – Inland Rail by Lewis Ecological Surveys. ©

Contract Number/Identifier - SC-2600C0059

Document Control

Distribution History

Date	Status	No. Copies	Format	Dispatched	Organisation	Client Contact
19.05.2022	Rev 0	1	PDF	Email	ARTC	Peter Borrelli
12.08.2022	Rev 1	1	PDF	Email	ARTC	Peter Borrelli
23.12.2022	Rev 2	1	PDF	Email	ARTC	Peter Borrelli
29.08.2024	Rev 6	1	Word	Email	ARTC	Tyler Warren

Revision History

Date	Status	Format	Organisation	Reviewer
10.06.2022	Rev0	PDF	Biodiversity, Conservation and Science Directorate	Renee Shepherd
12.08.2022	Rev 1	PDF	Biodiversity, Conservation and Science Directorate	Renee Shepherd
06.08.2024	Rev 6	PDF	Biodiversity, Conservation and Science Directorate	Renee Shepherd

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Abbreviations & Glossary of Terms

Abbreviation	Description
ARs	Artificial Refuges
ARTC	Australian Rail Track Corporation
BACI	Before-After-Control-Impact
BAM	Biodiversity Assessment Method
BAR	Biodiversity Assessment Report
BC Act (2017)	Biodiversity Conservation Act (2016)
BCT	Biodiversity Conservation Trust
BDAR	Biodiversity Development Assessment Report
BMP	Biodiversity Management Plan
BoM	Bureau of Meteorology
CEMP	Construction Environmental Management Plan
CIZ	Construction Impact Zone
CSSI	Critical State Significant Infrastructure
DAWE	Commonwealth Department of Agriculture, Water and the Environment
DECCW	Department of Environment Climate Change and Water
DPE	NSW Department of Planning and Environment
DPIE EES	DPIE Environment, Energy and Science
EA	Environmental Adviser
ECPs	Environmental Control Plans
EES	Environmental Effects Statement
EIS	Environmental Impact Statement
EM	Environmental Manager
EMS	Environmental Management System
EP&A Act (1979)	*Environmental Planning and Assessment* Act (1979)
EPA	Environmental Protection Authority
EPBC Act (1999)	*Environment Protection and Biodiversity Conservation* Act (1999)
ER	Environmental Representative
FCWS	Five-clawed Worm Skink (*Anomalopus mackayi*)
FFB	Framework for Biodiversity
GIS	Geographic Information Systems
IfC	Issued for Construction
LES	Lewis Ecological Surveys Pty Ltd
LGA	Local Government Area
LLS	Local Land Services (formerly LHPA)
MCoA	Minister's Conditions of Approval
MNES	Matters of National Environmental Significance
N2NS	Narrabri to North Star
NSW	New South Wales
PAS	Priorities Action Statement
PCT	Plant Community Type
PoM	Plan of Management
REMMs	Revised Environmental Management Measure
RFI	Request for Information

Abbreviation	Description
RtS	Response to Submissions
SSI	State Significant Infrastructure
SPIR	Submissions and Preferred Infrastructure Report
OEH	Office of Environment and Heritage
Threatened	Species listed on either the NSW *Biodiversity Conservation* Act (2016) and/or Commonwealth *Environment Protection and Biodiversity Conservation* Act (1999).
TBDC	Threatened Biodiversity Data Collection
TSR	Travelling Stock Reserves
FCWS	Five-clawed Worm Skink (*Anamolopus mackayi*)
Endangered	Species listed as endangered under the NSW *Biodiversity Conservation* Act (2016)
Vulnerable	Species listed as vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation* Act (1999).

1.0 INTRODUCTION

1.1 Purpose and Scope

Australian Rail Track Corporation Limited (ARTC – Inland Rail) has obtained approval to construct and operate Phase 1 of the Narrabri to North Star (N2NS) section of the Inland Rail (Figure 1-1). The project involves the upgrading of 185 kilometres of existing rail corridor and the construction of 1.7 kilometres of new track near Moree, New South Wales. The project is being delivered in two phases. Phase 1 of the Narrabri to North Star section is one of the most advanced sections of Inland Rail, and will comprise:

- upgrade of approximately 171 kilometres of track between Narrabri and North Star via Moree;
- constructing five new crossing loops;
- upgrading, relocating or consolidating almost 80 level crossings and five pedestrian crossings;
- installing 220 rail culverts;
- installing 98 road culverts and irrigation crossings;
- relocating power and telecommunications utilities, and
- minor changes to track alignments at Bellata, Gurley and Moree Stations.

More details are provided in Section 1-3 or alternatively accessing the following link:

https://inlandrail.artc.com.au/where-we-go/projects/narrabri-to-north-star/

The Project will provide a new freight rail project that will connect Melbourne and Brisbane through regional Victoria, New South Wales and Queensland. It is needed to complete the missing link in our national freight network, providing a fast and reliable connection between our regional centres and our capital cities transforming the way goods are transported around our country, strengthening our supply chain, and keeping our supermarket shelves stocked.

1.2 Construction Scope

The Project involves:

- upgrading the track, track formation, culverts and underbridges within the existing rail corridor, in two sections:
    - between Narrabri and Alice Street in Moree (a distance of about 93 kilometres), and
    - between Camurra North and North Star (a distance of about 80 kilometres);
- realigning the track within the existing rail corridor at Gurley and Moree stations;
- providing five new crossing loops within the existing rail corridor at Bobbiwaa, Waterloo Creek, Tycannah Creek, Coolleearllee, and Murgo;

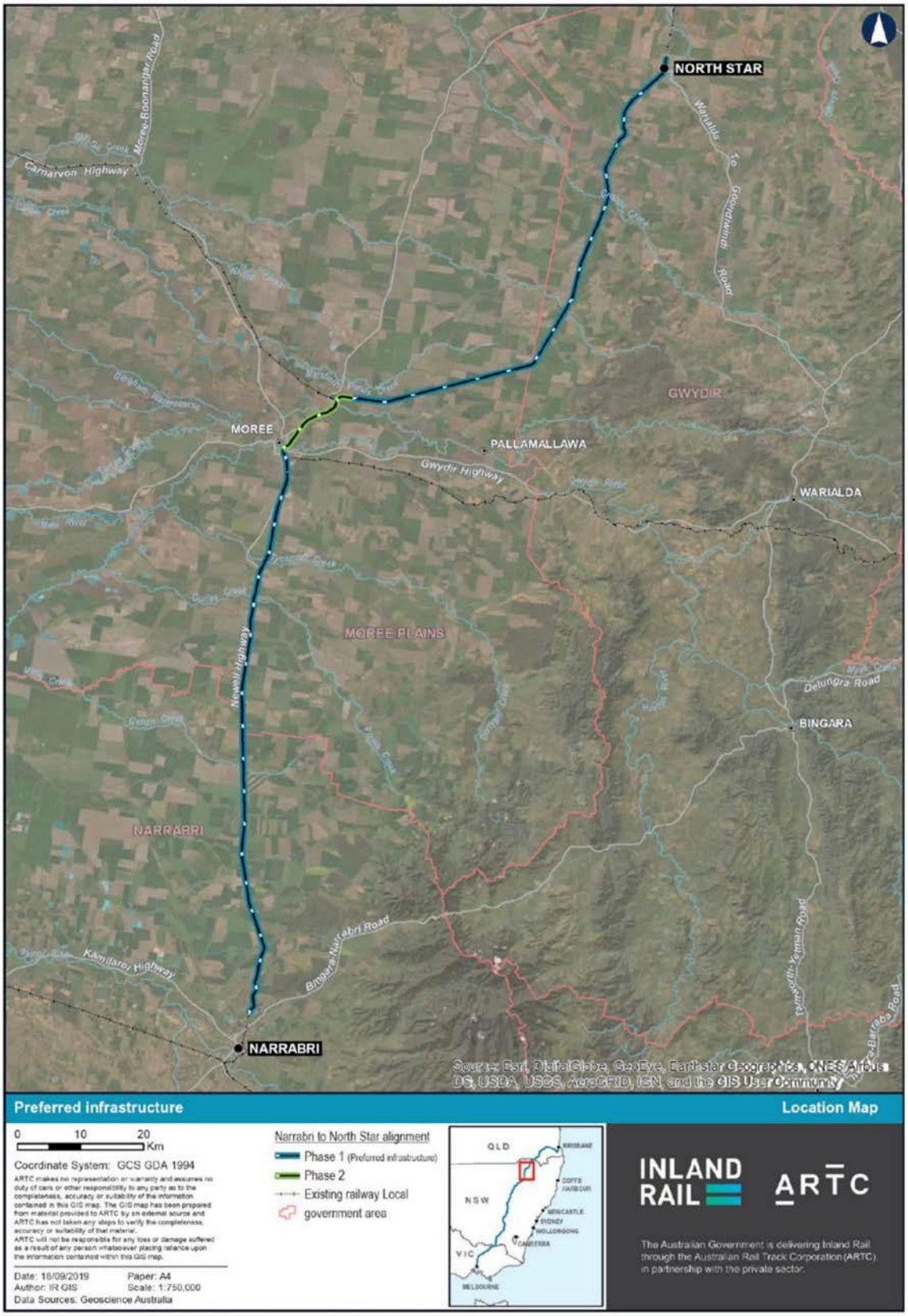

Figure 1-1. Location and route of the Inland Rail Project between Narrabri to North Star – Phase 1.

- removing the existing bridge and providing a new rail bridge over Croppa Creek; realigning about 1.5 kilometres of the Newell Highway near Bellata, and providing a new road bridge over the existing rail corridor ("the Newell Highway overbridge");
- providing a new road bridge over the existing rail corridor at Jones Avenue in Moree ('the Jones Avenue overbridge'), and
- Ancillary works to level crossings, signalling and communications, signage, fencing, noise attenuation structures, rail maintenance access roads, services and utilities.

The preferred infrastructure consists of two sections of single-track standard gauge railway, with crossing loops to accommodate double-stacked freight trains up to 1800 metres long. The preferred infrastructure includes components to accommodate possible future augmentation, including a possible future requirement for 3600 metres long trains (subject to a separate approval process).

1.3 Site Overview

1.3.1 Location and Environment

The Project is generally located within the existing rail corridor between Narrabri and North Star in north-western NSW. It traverses three local government areas (LGAs), with the southern section located in the Narrabri LGA, the middle section in the Moree Plains LGA, and the northern section in the Gwydir LGA. All three LGAs are predominantly rural, with the main local industries based around agriculture (mainly cotton and grains) and grazing. Moree Plains and Gwydir Shire both adjoin the NSW-Queensland border.

Construction is generally defined by fences located approximately 20 metres either side of the rail line, however, in some sections where fences are not present, construction may be wider extending out to about 30 to 40 metres from the rail line or wider where site compounds are proposed. Overall, the site is approximately 1,563 hectares.

The Project site is typical of the Border Rivers/Gwydir and Darling Riverine Plains Bioregions. The southern end is located immediately north of Narrabri on an embankment above the Namoi River before traversing the Gwydir River floodplain. At the northern end, North Star is located south of the Macintyre River within the Border Rivers basin. Between these two localities, the project crosses 90 watercourses. These include the Mehi River and Gwydir River, creeks including Mulgate Creek, Bobbiwa Creek, Gehan Creek, Tookey Creek and Gil Gil Creek along with a number of intermittent watercourses and irrigation channels and canals.

The Project also traverses the alluvial floodplain associated with the Mehi River and the Gwydir River. The terrain in this area is typically near level to gently undulating. The project also traverses the Gunnedah Basin crossing the Goondiwindi

thrust fault into the New England Fold Belt east of Camurra. The subsurface conditions of the Gunnedah Basin are dominated by Quaternary and Tertiary aged river plain sediments including black and red clayey silt and black and yellow brown clay soils. Exceptions to this include the Jurassic aged clayey sandstone unit north of Narrabri and partially consolidated polymictic gravel around Bellata. East of the Goondiwindi fault, variable soil conditions are mapped including deep reactive clays, basaltic soils along with red brown sandy and silty clay soils. Tertiary aged mafic volcanics outcrop intermittently from south of Moree to North Star.

The majority of the project has been heavily modified by past and ongoing disturbances associated with the rail reserve and surrounding agricultural activities. Clearance and maintenance of the rail corridor has resulted in the fragmentation and subsequent high level of disturbance and degradation of vegetation communities within the rail corridor. Patches of native vegetation still occur sporadically along the Project and are generally associated with riparian corridors, Travelling Stock Reserves (TSRs), road reserves or farm woodland remnants. These patches generally comprised a woodland community with the dominant canopy species including Bimble Box (*Eucalyptus populnea*), Belah (*Casuarina cristata*), Silver-leaved Ironbark (*Eucalyptus melanophloia*) and White Cypress Pine (*Callitris glaucophylla*). Extensive areas of natural grasslands also exist along the Project.

1.4 Planning Framework

The NSW Minister for Planning and Public Spaces approved the N2NS (Phase 1) Project under Section 5.19 of the *Environmental Planning and Assessment* Act 1979 (EP&A Act) on 13 August 2020, which is referred to as the Division 5.2 Approval herein. ARTC Inland Rail are currently in the final planning and environmental approvals stage for Phase 2. The approval for N2NS Phase 1 incorporated the Minister's Conditions of Approval (MCoA).

Other documents which are part of the Division 5.2 Approval as set out in the MCoA for the approved project are the Inland Rail – Narrabri to North Star Submissions Preferred Infrastructure Report (ARTC, dated December 2019) and the updated Biodiversity Development Assessment Report (BDAR), Response to Submissions (RtS) on the Submissions and Preferred Infrastructure Report (SPIR) and Request for Information (RFI) responses.

The Project Environmental Impact Statement (EIS) was referred to the Australian Government Minister for the Environment under the Commonwealth *Environment Protection and Biodiversity Conservation* Act 1999 (EPBC Act) as the project was determined to be a 'controlled action' and was subject to assessment via the bilateral agreement. The Australian Government Minister's approval was received on 1 October 2020 (EPBC 2016/7729) subject to a number of conditions being met and is here on referred to as the EPBC Approval.

The FCWS was assessed in the EIS Technical Report 2 Biodiversity Assessment Report (BAR; Umwelt 2017). As part of the assessment, targeted surveys were carried out for FCWS at all fauna survey locations except Site 8. FCWS were

not recorded within the original development footprint during the surveys informing the BAR (Umwelt 2017) and as such, was not considered further.

1.5 Unexpected Find of the FCWS

During construction, a spotter-catcher contractor conducting pre-clearing surveys in the Stage 3 section of N2NS recorded a potential FCWS at chainage 741.225 on the 5 July 2021. Specifically, the location was within Zone 4 - PCT52 (BR191, NA187) Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains of the northern- eastern Darling Riverine Plains Bioregion.

Through consultation with the NSW Department of Planning and Environment (DPE) and the Commonwealth Department of Agriculture, Water and the Environment (DAWE), a clearing procedure for the FCWS was agreed on following the requirements of the 'unexpected finds procedure' as detailed in the approved Construction Biodiversity Management Subplan – N2NS (Trans4m 2021). Following this clearance procedure, an additional 194 individuals have been recorded up to 21 March 2022 during pre-clearing and post-clearing works between chainage 609 and 614 in Stage 1, vicinity of chainage 629 in Stage 2 and between chainage 736 and 742 in Stage 3. Of these, 74 individuals (38% total records) have been recorded as dead as a result of the clearing works, 85 individuals relocated and 35 recorded as dropped tails. More details are provided in Section 4.12.

In order to manage this new threatened species finding, ARTC Inland have contracted Lewis Ecological Surveys to prepare a species management plan to formalise the agreed to management actions so that impacts can be minimised during construction.

Refer to Figure 9-4 for an overview of Project Stage extents.

1.6 Construction Environmental Management Plan – Framework

The CEMP is the overarching 'road map' and management tool in relation to environmental performance during Project delivery. The CEMP links the relevant legislative and client requirements to the project's Environmental Management System (EMS) and describes the construction environmental management framework for the Project and the system for minimising and managing environmental risks. The CEMP and relevant management plans have been prepared in consideration of the MCoA, the Revised Environmental Management Measure's (REMMs) presented in the SPIR and Trans4m Rail's EMS. The CEMP provides the overall framework for the system and procedures to ensure environmental impacts are minimised and legislative and other requirements are fulfilled. A number of environmental management sub-plans are required to support the CEMP and have been outlined in Figure 1-2.

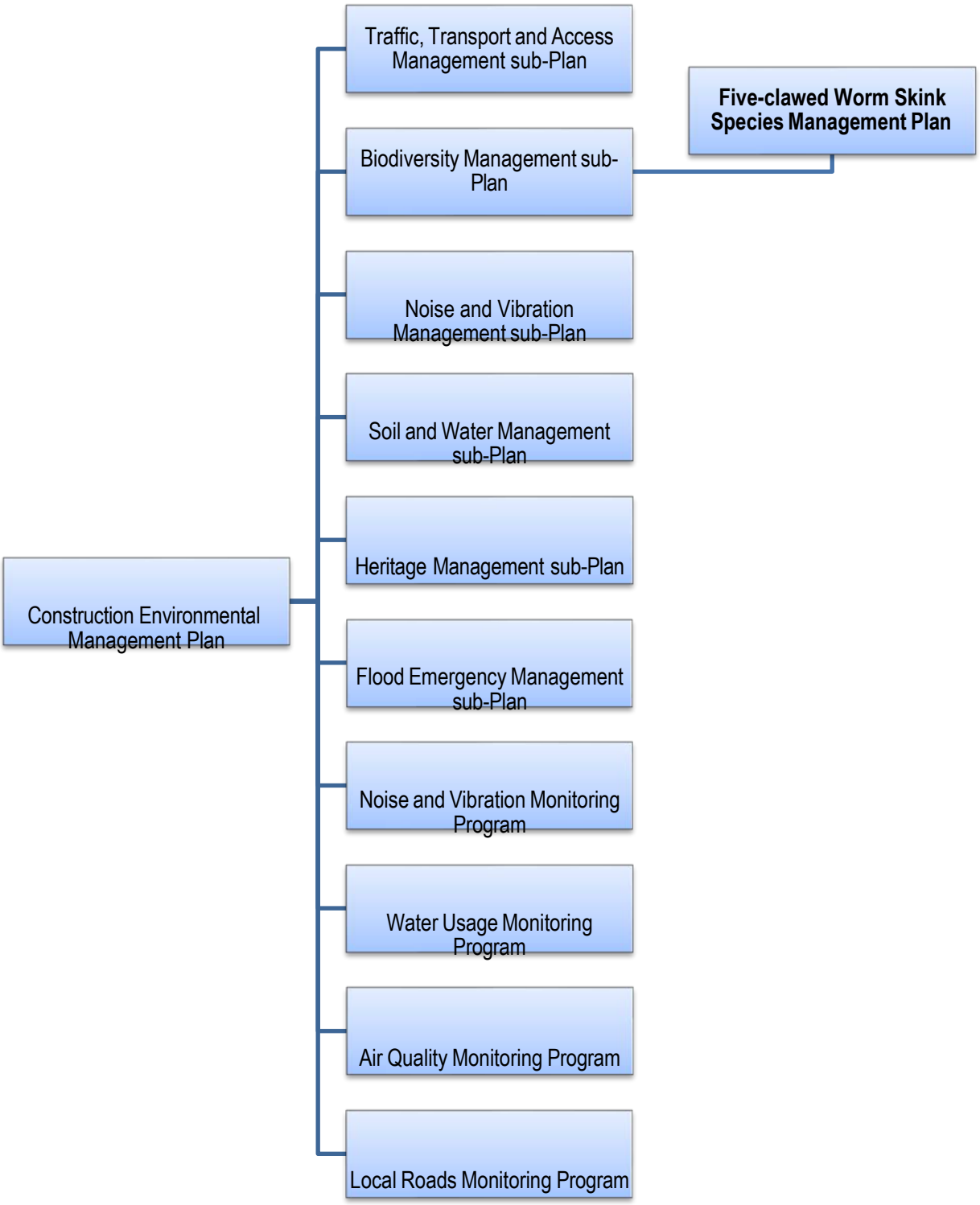

Figure 1-2. Construction Environmental Management Plan framework.

2.0 PROJECT CONDITIONS AND MANAGEMENT MEASURES APPLICABLE TO FCWS

The most relevant Project conditions and how the management actions proposed in this management plan relate to each condition is summarised in Table 2-1.

Table 2-1. Compliance summary of all conditions of approval and statements of commitments.

<table>
<tr><th>Source</th><th>Condition</th><th>Details of Compliance</th></tr>
<tr><td colspan="3">Inland Rail – Narrabri to North Star Phase 1</td></tr>
<tr><td>NSW Minister for

Planning and Public Spaces (Approved 13/08/2020)</td><td>E17 - The Proponent must minimise impacts to plant community types and not exceed the total areas impacted as identified in Table E1 (see below).
Table E1: Native Vegetation Impacted
<table>
<tr><th>Vegetation Zone and Plant Community Type –PCT: ID and Type</th><th>TEC under the EPBC Act (Ha)</th><th>Total Area Impacted (Ha)</th></tr>
<tr><td>Zone 1 - PCT27 (BR233, NA219) Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion</td><td>Weeping Myall Woodlands – 9.16</td><td>9.40</td></tr>
<tr><td>Zone 2 - PCT35 (BR120, NA117) Brigalow – Belah open forest / woodland on alluvial often gilgaied clay from Pilliga Scrub to Goondiwindi, Brigalow Belt South Bioregion</td><td>Brigalow (Acacia harpophylla dominant and codominant) – 16.13</td><td>6.48</td></tr>
<tr><td>Zone 3 - PCT39 (BR130, NA129) Coolabah – River Coolabah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion</td><td>Coolabah - Black Box Woodland of the Darling Riverine Plains and the Brigalow Belt South Bioregions – 1.74</td><td>0.91</td></tr>
<tr><td>Zone 4 - PCT52 (BR191, NA187) Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion</td><td>Natural Grasslands on Basalt and Fine-textured Alluvial Plains of Northern NSW and Southern Qld – 432.07</td><td>290.67</td></tr>
<tr><td>Zone 5 - PCT56 (BR186, NA182) Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW</td><td>Not listed</td><td>61.38</td></tr>
<tr><td>Zone 6 - PCT56 (BR186, NA182) Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW (Derived - Native Grasslands)</td><td>Not listed</td><td>125.64</td></tr>
<tr><td>Zone 7 - PCT71 (BR127, NA126) Carbeen – White Cypress Pine - River Red Gum - bloodwood tall woodland on sandy loam alluvial and aeolian soils in the northern Brigalow Belt South Bioregion and Darling Riverine Plains Bioregion</td><td>Not listed</td><td>0.00</td></tr>
<tr><td>Zone 8 - PCT 78 River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion</td><td>Not listed</td><td>5.32</td></tr>
<tr><td>Zone 9 - PCT 135 Coobah - Western Rosewood low open tall shrubland or woodland mainly on outwash areas in the Brigalow Belt South Bioregion</td><td>Not listed</td><td>4.80</td></tr>
<tr><td>Zone 10 - PCT 413 Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland of the Pilliga Scrub - Warialda region, Brigalow Belt South Bioregion</td><td>Not listed</td><td>1.87</td></tr>
<tr><td>Total Area Impacted</td><td>459.10</td><td>506.47</td></tr>
</table></td><td>Section 5.1.2</td></tr>
<tr><td></td><td>E18 - The Proponent must meet the biodiversity offset obligations for ecosystem and species credits as set out in Tables E2 and E3, within two (2) years of the CSSI approval. The retirement of the biodiversity credits must be carried out in accordance with the NSW Biodiversity Offsets Policy for Major Projects and can be achieved by a combination of:</td><td>Section 7.0</td></tr>
</table>

Source	Condition	Details of Compliance
	(a) acquiring and retiring "biodiversity credits" within the meaning of the *Biodiversity Conservation Act 2016*; and/or (b) making a payment into the Biodiversity Conservation Fund; and/or (c) outlining in a Biodiversity Offset Strategy the provision of supplementary measures. The Strategy must be prepared in consultation with EES and DAWE.	
	E19 - The Proponent may review and update the ecosystem and species credit requirements in **Tables E2** and **E3**, except as required by **Condition E25**, to reflect the final construction footprint and resulting extent and type of plant community types to be cleared. Amendments to the ecosystem and species credit requirements must be undertaken in consultation with EES and DAWE and submitted to the Planning Secretary for approval within six (6) months after the commencement of construction or as agreed in writing by the Planning Secretary.	Section 5.1.2; Section 7.0
	E20 - The review and update of credit requirements must be undertaken by: (a) using the vegetation mapping, and the extent of impact in the revised development footprint (Table 3.4) in the *July 2020 Addendum to the Inland Rail – Narrabri to North Star Biodiversity Assessment Report*; and/or (b) completing verification surveys to confirm the extent, type and condition of native vegetation to be impacted. Where verification surveys are required, they must be undertaken in consultation with EES. Any additional surveys must be undertaken at the time of year when groundcover is most likely to be predominantly native. If evaluation is not possible at a time when groundcover is most likely to be native, the assumed presence of any relevant species and ecosystems may be applied to conservatively evaluate impacts and associated credit requirements.	Section 5.1.1; Section 5.1.2; Section 7.0
	E22- Reuse of Timber Prior to vegetation clearing, the Proponent must consult with community and landcare groups and government agencies to determine if retained timber and root balls can be reused in habitat enhancement and rehabilitation work, before pursuing other disposal options. The retained timber and root balls may be used on or off the CSSI site.	5.2.6
Commonwealth Minister for the Department of Agriculture, Water and the Environment (Approved 1/10/2020)	Part A 1 (a) Implement conditions C4 and C9 of Part C, Schedule 2 of the **State Infrastructure approval,** where they relate to monitoring, managing, avoiding, mitigating, offsetting, recording, or reporting on, impacts to **protected matters,** with the exception of C9(a).	This document.
	Part A 1 (b) Ensure that the Weed Management Plan included in the Biodiversity Management Subplan required under condition C9 of Part C, Schedule 2 of the **State Infrastructure approval,** includes appropriate weed control measures to prevent the introduction and/or spread of weeds from construction areas to any retained area of Belson's Panic (*Homopholis belsonii*), Natural Grassland on Basalt and Fine-textured Alluvial Plains of Northern New South Wales and Southern Queensland, Brigalow (*Acacia harpophylla* dominant and codominant) and Weeping Myall Woodlands ecological communities.	5.2.6
	Part A 1 (c) Implement biodiversity conditions El 7-E21 arid E23-E26 of Part E, Schedule 2 of the **State Infrastructure approval,** where they relate to monitoring, managing, minimising, reducing, avoiding, mitigating, offsetting, recording, or reporting on, impacts to **protected matters.**	Section 5.0 Section 6.0

3.0 PROJECT ROLES AND RESPONSIBILITIES

The key roles associated with this FCWS Management Plan include:

- Project Director;
- Construction Manager;
- Environmental Manager;
- Project Ecologist; and
- Environmental Representative.

Their roles have been summarised in Table 3-1, and as a team, they are responsible for the successful implementation of this plan. ARTC Inland Rail will work closely with the construction contractor in managing this plan and managing compliance with this plan, incident investigation and learning.

Table 3-1. Summary of roles and responsibilities for key personnel associated with this FCWS Construction Plan of Management.

Role	Responsibility	Organisation
Project Director	Ensure that all personnel including sub-contractors complete an induction prior to mobilising for work. Provide necessary resources / facilities for the protection of the FCWS and its associated habitat as directed by the Environmental Manager. Ensure that all environmental incidents involving habitat disturbance, relocation or death are reported appropriately to the nominated ARTC Inland Rail representative. Ensure that corrective actions including FCWS management, communicated by the Environmental Manager are closed out within the stipulated timeframe.	Construction Contractor
Construction Manager	Confirm as part of inductions/pre-start and toolbox meetings that all personnel are familiar with the requirements for management of FCWS protection. Confirm with and report to the Environmental Manager, any suspected non-compliance by subcontractors or any contractor employees and site visitors over protection methods as per the Project CEMP and specifically, this FCWS Construction Management Plan. Follow instructions from Environmental Manager and Environmental Adviser in relation to the requirements for the management of habitat removal/relocation, open excavations, structural demolition/removal and FCWS relocation.	Construction Contractor
Environmental Manager	Undertake the investigation of any FCWS environmental incidents involving unplanned habitat disturbance, relocation failure or accidental death and incident reporting requirements in consultation with ARTC Inland Rail.	Construction Contractor

Role	Responsibility	Organisation
	Provide senior support to the Environmental Adviser(s) and site staff to ensure environmental works are carried out in accordance with the FCWS Management Plan. Ensure tool box talks cover procedures associated with FCWS including its identification. Consult as necessary, with ARTC Inland Rail Representative and Project Environmental Representative on matters relating to the FCWS. Control access into FCWS Relocation Sites	
Environmental Adviser	Assist in the delivery of Project specific inductions, environmental awareness training sessions, pre-starts and toolbox meetings. Ensure all employees and sub-contractors are aware of the protocols relating to habitat removal/relocation, open excavations and FCWS relocation in accordance with this FCWS Construction Management Plan. Submit incident reports when required for due diligence and communicate with the Environment Manager and client's Environmental Representative as necessary.	Construction Contractor
Project Ecologist	Be present during the removal or disturbance of all known or potential FCWS habitat Determine appropriate relocation points for captured FCWS in accordance with the FCWS Management Plan. Assist both the Environmental Manager and Environmental Adviser. Prepare a summary report following the completion of habitat removal and disturbance works.	Construction Contractor
Environmental Representative	Monitor the implementation of this FCWS Management Plan. Approve or reject minor amendments of the Construction Environmental Management Plan. Approve or reject out of hours works in accordance with MCoA E3 for matters relating to FCWS surveys and implementation of this construction management plan.	Consultant

4.0 FIVE-CLAWED WORM SKINK (*ANOMALOPUS MACKAYI*)

4-1 Taxonomy

Scientific name: *Anomalopus mackayi*

Common name: Five-clawed Worm Skink

Plate 4-1. Adult Five-clawed Worm Skink (Photo – Steve K Wilson ©).

4-2 Description

The Five-clawed Worm-skink (*Anomalopus mackayi*) is a burrowing lizard with a worm-like body that can grow up to 270 mm total length. It tends to be dark brown above with a green-yellow underside (Swan 1990). This skink has short limbs with three fingers and two toes, and this feature is used to distinguish this species from the more common Two-clawed Worm Skink (*Anomalopus leuckartii*) which only has two toes on the front limbs (Cogger 1993; OEH 2017).

4.3 Distribution

The FCWS has been recorded along the western slopes of the Great Dividing Range, in north-eastern NSW and south-eastern Queensland (Wilson and Knowles 1988; Swan 1990; Sadlier *et al.* 1996; Figure 4-1). Within this distribution, the skink generally inhabits grassy white box woodlands supported by moist black soils and river red gum – Coolibah – Bimble box woodland on deep cracking clay soils (OEH 2017), and lives in tunnel-like burrows within the soil, coming to the surface under fallen timber and leaf litter.

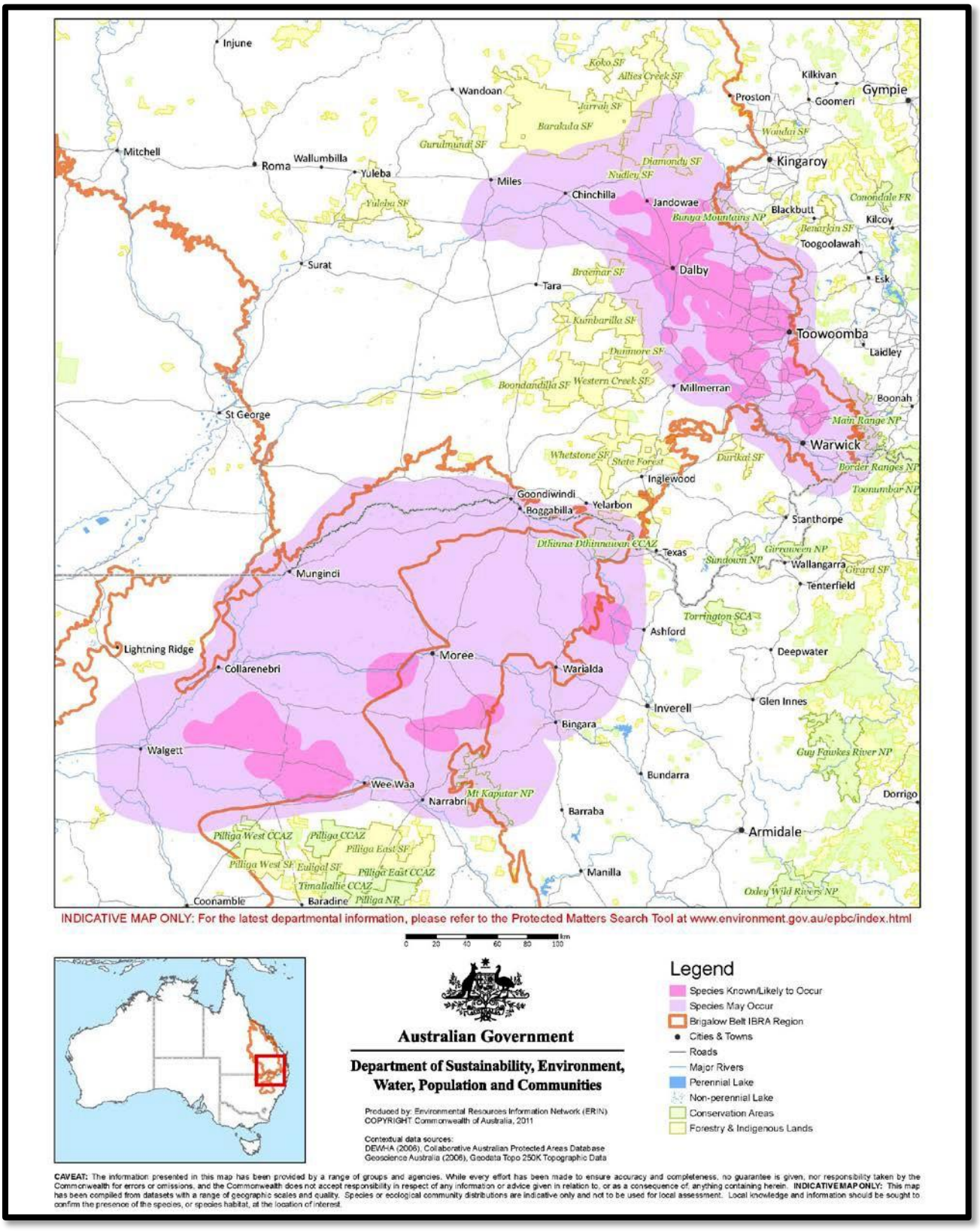

Figure 4-1. Known and predicted distribution of Five-clawed Worm Skink (source: DAWE 2022).

In New South Wales, FCWS is confined to the Namoi River and Gwydir River floodplains and the lower north-western slopes of the Great Dividing Range. The species ranges from the Wallangra-Masterman Range area in the east, south-west to the Narrabri-Wee Waa area, west along the northern edge of the Pilliga outwash demarcation to the south-west corner of the Namoi catchment south of Walgett, and bordered by the Barwon River in the west to the Mungindi area near the Queensland border (Spark 2010).

There is some thought of a range contraction eastwards. The most western record was made in the Goodooga area approximately 80 km west-north-west of Lightning Ridge sometime prior to 1970 (Sadlier & Pressey 1994; Spark 2010). Another specimen was found approximately 20 km south of Walgett in 1905. Until Spark's survey of the Namoi catchment in late 2009–early 2010, no specimens had been found in the Namoi catchment since 1976 when the species was found at a site in the Narrabri-Wee Waa area (Cogger *et al.* 1993; NSW DECCW 2005ab; Spark 2010).

Specimens have been recorded from Old Burren, Goodooga, Burren Junction, Culgoora, Yetman road 6.9 km north-north west of Wallangra, Wee Waa, Millie, Terry Hie Hie and Bellata (Greer & Cogger 1985; Shea *et al.* 1987; NSW DECCW cited in Sass *et al.* 2009).

4.4 Population Information

Prior to works on the N2NS, there were no population or density estimates for the FCWS. This is most probably due to its cryptic habits which has also made its detection difficult. The N2NS project contributes to the species knowledge with some population density estimates provided in Section 4.12.

4.5 Land Tenure of Populations

Most known populations of FCWS occur outside of the reserve system on private lands and within transport corridors and travelling stock reserves. A population is known from within the Terry Hie Hie Community Conservation Area (BioNet 2022).

Potential habitat may be inferred based on the presence of soil types and PCTs known to support FCWS within a region where FCWS is predicted to occur (refer Figure 4-1). Potential distribution and habitat associations for the FCWS are described further at Section 4.3 and Section 4.6 respectively.

Potential habitat exists at Lake Broadwater Conservation Park, Southwood National Park, Narran Lake Nature Reserve, Killamey State Conservation Area, Bobbiwa State Conservation Area, Couradda State Conservation Area, Moema State Conservation Area, Bullala, Burral Yurrul National Park, Burral Yurrul Nature Reserve, Boomi Nature Reserve, Dthinna Dthinnawan National Park, Kwiambal National Park, Careunga Nature Reserve, Budelah Nature Reserve, Gwydir Wetlands State Conservation Area, Kirramingly Nature Reserve, Barwon Nature Reserve, Barwon State Conservation Area, Midkin Nature Reserve, Gamilaroi Nature Reserve and Taringa Nature Reserve (Cogger *et al.* 1993; pers. obs).

Some other public reserves such as Yetman, Culgoora and Jacks Creek State Forest also provide potential habitat for FCWS.

4.6 Habitat Associations

4.6.1 Habitat on the Floodplains

On the floodplains of northern New South Wales, the FCWS occurs in grasslands and grassy, open woodlands on heavy black and grey, alluvial cracking clay soils from 135–200 m above sea level (Sadlier & Pressey 1994; NSW DECCW 2005ab; Spark 2010). During dry periods, the species tends to shelter where moisture is available. For example, they may take refuge in deep cracks within alluvial clay soils. Sufficient rainfall following extended dry conditions is likely to bring the skink to the surface (Brigalow Belt Reptiles Workshop 2010). The species has been recorded in grasslands dominated by Mitchell Grass (*Astrebla* spp.) and River Red Gum (*Eucalyptus camaldulensis*) - Coolibah (*E. coolabah* subsp*. coolabah*) - Bimble/Poplar Box (*E. populnea* subsp. *bimbil*) - Weeping Myall (*Acacia pendula*) grassy woodlands to open forests with grasses typically of the genera *Austrodanthonia*, *Austrostipa*, *Bothriochloa*, *Chloris*, *Enteropogon* and *Themeda* (Brigalow Belt Reptiles Workshop 2010).

Floodplain surveys have shown, however, that the species has no preference for particular vegetation types on alluvial cracking clays. Cracking clay soils on the Namoi and Gwydir floodplains support a wide variety of vegetation communities which can be considered suitable habitat for the FCWS (Spark 2010; GeoLink 2022).

4.6.2 Habitat on the lower western slopes of the Great Dividing Range

On the lower north-western slopes of the Great Dividing Range in New South Wales, the species occurs in White Box (*Eucalyptus albens*) and sometimes ironbark-mixed, grassy woodland on self-mulching, friable, basalt derived, red-black to black clay-loam soils. The species has been found occurring in burrows in open paddocks with few trees, cropped grass and moist black soil (Swan 1990; Sadlier & Pressey 1994; Spark 2010). Shea *et al.* (1987) found five specimens under logs in open paddocks surrounded by open eucalypt woodland, and one specimen under a log in a largely cleared woodland in the vicinity of granite outcrops.

4.6.3 Microhabitat Observations

FCWS tends to shelter at the soil surface where moisture is sufficiently retained under decaying leaf litter, coarse woody debris or artificial debris. The species also lives in cavities in rotting tree bases, logs and in tussock bases. It is known to dig permanent tunnel-like burrows in loose, friable, humic soils in woodlands on slight basalt rises (Sadlier & Pressey 1994; NSW DECCW 2005ab).

4.6.4 N2NS Inland Rail Project Observations

Refer to Section 4.12 for details of FCWS habitat associations observed during the construction of the N2NS Inland Rail Project.

4.7 Life Cycle

Very little is known about the biology of FCWS. Average clutch size or mortality rates for newborns is unknown. One specimen was observed laying three eggs in spring (NSW DECCW 2005ab). The few known adults collected in spring were reproductively active, with females carrying one or two eggs.

4.8 Feeding

No information is available about the species' feeding behaviour in the wild; however, it is believed to feed on arthropods, such as white ants. Captive specimens have been recorded eating mealworms (NSW DECCW 2005ab; Brigalow Belt Reptiles Workshop 2010). In captivity, it has been known to eat crawling insects and insect larvae.

4.9 Movement Patterns

Nothing is known on the movement patterns of the FCWS. The Department of Environment and Conservation has prepared a Priorities Action Statement (PAS) that identifies studying the movement patterns and habitat use of FCWS through mark-recapture techniques as having a 'medium' priority.

4.10 Threats and Conservation Status

The FCWS has undergone a decline in the past few decades. A number of factors that may contribute to this decline have been identified as (Cogger *et al.* 1993; NSW DECCW 2005ab; TSN 2008b):

- **Land clearing** for agriculture has been particularly severe within the species' range (Brigalow Belt Reptiles Workshop 2010).
- **Overgrazing** which compacts soil, making it difficult for the species to find suitable shelter (Brigalow Belt Reptiles Workshop 2010).
- **Removal of ground debris** including ground litter, fallen timber and logs that results in reduced soil moisture. This means the soils are drier, making it harder for the species to access suitable habitat. Removing logs and timber also reduces the amount of shelter available for the species (Brigalow Belt Reptiles Workshop 2010).
- **Use of agricultural chemicals** that poison and pollute the soil which may adversely affect the species (Brigalow Belt Reptiles Workshop 2010).
- **Feral species** resulting in their predation from cats and foxes, is a threat facing much of Australia's native wildlife including the FCWS (NSW NPWS 1999av).

4.11 Threat Abatement and Recovery

The *Action Plan for Australian Reptiles* states that knowledge of the FCWS is inadequate. More research into the species is needed in order to define objectives and actions to assist in recovery (Cogger *et al*. 1993). The report identifies three crucial research areas:

- ground surveys to determine the full geographic range and habitat requirements of the species;
- research into basic biology and ecology of the species, and
- research into the species' decline and major factors behind the decline.

Six management actions were identified in the plan. These include:

- deferring of licenses to clear remnant woodland within the species' known range;
- surveying known habitat in reserves;
- surveying known habitat outside of reserves;
- developing and promoting guidelines for landowners to help reduce the impact of current land use;
- establishing appropriate reserves if the existing reserves are deemed inadequate, and
- developing community awareness of the species (Cogger *et al.* 1993).

These actions are combined with three objectives also detailed in the plan. The objectives include:

- conducting the research required;
- ensuring existing populations are managed in reserve systems, and
- implementing land management practices which promote the maintenance of secure, viable populations outside of reserve systems (Cogger *et al.* 1993).

Approved conservation advice given by the Department (TSSC 2008di) outlines a number of actions essential to the conservation of the FCWS. The actions and objectives of the advice are sourced from various State agencies, hence they are consistent with those mentioned above. Mitigation measures or approaches that have been developed for the FCWS are (Brigalow Belt Reptiles Workshop 2010):

- alternative project locations;
- avoid clearing/ retain habitat;
- design proposed action to avoid habitat disturbance;
- establish adequate buffer zones to protect habitat;
- implement measures to exclude cattle from habitats;

- maintain habitat connectivity across the landscape, e.g., along roadside reserves, uncultivated lands between cropped and pasture-improved areas;
- retain shelter habitat features in place;
- devise and implement a habitat management plan specific to the FCWS;
- implement measures to reduce the risk of invasive and predatory species accessing reptile habitat species habitat, e.g. Buffel Grass;
- devise and implement an appropriate fire management plan, and
- devise and implement water management, sediment erosion and pollution control plans.

4.12 Current Context of FCWS and the Project

The entire N2NS project is located within the Department of Agriculture, Water and the Environment (DAWE 2022) FCWS distribution map (Figure 4-1), with:

- Stage 1 chainage 603.000 to 625.000: mapped as 'Species Known / Likely to Occur'
- The remainder of the site: mapped as 'Species may Occur'.

The FCWS was assessed in EIS Technical Report 2 Biodiversity Assessment Report (BAR; Umwelt 2017). As part of the assessment, targeted surveys were carried out for FCWS at all fauna survey locations except Site 8. No FCWS were recorded during these surveys informing the BAR (Umwelt 2017) and as such, was not considered further.

An unexpected ecological find was made on the 5 July 2021 when a spotter-catcher contractor recorded a FCWS at chainage 741.225 within Zone 4 (GeoLINK 2021). Habitat at this location was summarised as PCT52 (BR191, NA187) Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains (northern-eastern Darling Riverine Plains Bioregion). The habitat condition was noted as Moderate – Good Natural Grassland.

In response to the unexpected find, the contractor initiated the 'unexpected finds' procedure as detailed within the Construction Biodiversity Management Subplan – N2NS (Trans4m Rail 2021, Revision 1). Specifically, this involved:

- Stopping all work within the vicinity of the find and notifying relevant contract and ARTC Inland Rail personnel;
- Consultation with DPIE – BCS and DAWE in relation to the unexpected find, and
- Preparation of a test of significance pursuant to both the *EPBC* Act (1999) and *BC* Act (2016; Appendix B).

Subsequent consultation with DPIE – BCS and DAWE resulted in the development of a specific clearing procedure for the FCWS as detailed in Section 5. Habitat areas were identified within the project boundary (Stage 1: Chainage 603.000 to 625.000 and Stage 3: Chainage 735.000 to 754.250) for implementation of targeted FCWS mitigation measures.

Following the adoption of this clearance procedure, an additional 248 individuals have been recorded up to 16 September 2022 during pre-clearing and post-clearing works between chainage 609 and 614 in Stage 1, vicinity of chainage 629 in

Stage 2 and between chainage 736 and 742 in Stage 3 (ARTC 2022). Of these, 87 individuals (35% total records) have been recorded as dead as a result of the clearing works, 116 individuals relocated and 45 recorded as dropped tails.

Some population density estimates have been provided from earlier works conducted on Stage 3 of the N2NS project between chainage 736 and 742 where 116 individuals were recorded from approximately 6.6 hectares of stripped habitat in the construction impact zone (ARTC 2022; GeoLINK 2022). This was summarised further according to plant community type and included:

- Non-native vegetation – 23 individuals in 2.6 hectares of stripped habitat. This equates to a density of almost 9 individuals per hectare.
- Zone - 1 - PCT-27 BVT-BR233, NA219-Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion – Moderate to Good condition – 1 individual in 0.07 hectares of stripped habitat. The area of habitat is too small to provide a reliable form of density.
- Zone - 4 - PCT-52 BVT-BR191, NA187-Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion – 87 individuals within 2.9 hectares of stripped habitat. This equates to 30 individuals per hectare.
- Zone - 5 - PCT-56 BVT-BR186, NA182-Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW – Moderate to Good condition – 2 individuals within 0.4 hectares of stripped habitat. This equates to 5 individuals per hectare.
- Zone - 6 - PCT-56 BVT-BR186, NA182-Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW-Derived Native Grasslands – 3 individuals within 0.6 hectares of stripped habitat. This equates to 5 individuals per hectare.

The highest density of FCWS tends to occur in Zone - 4 - PCT-52 BVT-BR191, NA187-Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains (GeoLink 2022). Their surveys found soil types rather than plant community type tends to form an important microhabitat feature with the highest densities occurring in cracking black clays although lower densities do occur on red cracking clays and seldom red gravel loam.

The following vegetation zones are also considered habitat for the FCWS according to the Threatened Biodiversity Data Collection (TBDC):

- Zone - 2 - PCT-35 BVT-BR120, NA117-Brigalow - Belah open forest / woodland on alluvial often gilgaied clay from Pilliga Scrub to Goondiwindi, Brigalow Belt South Bioregion– Moderate to Good condition, and
- Zone - 3 - PCT-39 BVT-BR130, NA129-Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion – Moderate to Good condition

An updated Test of Significance carried out for the species concluded the N2NS section of the Inland Rail Project is likely to have a significant impact on the species (Umwelt 2021). To alleviate some of these impacts, a series of management actions have been proposed and are outlined in Section 5.

5.0 FIVE-CLAWED WORM SKINK MANAGEMENT

ARTC – Inland Rail propose the following management actions to reduce impacts on the FCWS population during the planning, construction and operation of the Project. The management actions fall into three broad categories.

1. Planning management actions which include:
    - Performing additional studies to understand the potential for FCWS encounters during construction;
    - Investigate opportunities to reduce clearing of FCWS habitat;
    - Updating significance assessment pursuant to the *Biodiversity Conservation* Act (2016) and the *Environment Protection and Biodiversity Conservation* Act (1999), and
    - Developing a species management plan (i.e. this report) for FCWS that can assist the current project and provide the platform for FCWS consideration at other locations where the species may occur.

2. Construction management actions include:
    - Known and likely FCWS habitat identified on Environmental Control Plans (ECPs);
    - Develop a survey prescription for adequately surveying areas prior to and during various construction activities;
    - Outline the data collection requirements for all captured FCWS;
    - Develop management initiatives for the protection of FCWS habitat adjacent to the construction impact zone and protection of relocation sites;
    - Develop guidelines that provide improved opportunities for habitat augmentation of relocation sites and areas nominated for landscape treatments;
    - Outline the 'expected finds' procedure (Appendix I Five-clawed Worm-skink Encounter Procedure as included in the N2NS Construction Biodiversity Sub-plan), and
    - Outline a framework for allowing this management plan to be progressively updated in light of new findings and information.
    - Implementation of identified mitigation measures.

3. Operational management actions include:
    - Implementation of the FCWS monitoring program.
    - See Section 6.5 for monitoring site management measures

5.1 Planning Management Actions

5.1.1 Additional Studies

Additional studies will be performed to assist in identifying the potential for FCWS encounters during construction. This would focus on engaging a soil scientist (i.e. Elder Enviro 2022) to assess soil types throughout the project given that

earlier investigations (i.e. GeoLINK 2021; 2022) have shown FCWS prefer black cracking clays but may also inhabit red cracking clays and rarely red gravel loam. The Biodiversity Management Plan has also been updated to Version 3 and includes a Section 5 that specifically relates to FCWS.

5.1.2 Reduce Clearing in FCWS Habitat Areas

The project team would explore opportunities to reduce the CIZ clearing footprint. This would be managed by both Trans4mRail and ARTC. An addendum FBA BAR has already been completed which has assessed impacts to biodiversity values including FCWS within the refined Issued for Construction (IFC) Construction Impact Zone (Umwelt 2021). This approach accords with MCoA E19:

*The Proponent may review and update the ecosystem and species credit requirements in **Tables E2** and **E3**, except as required by **Condition E25**, to reflect the final construction footprint and resulting extent and type of plant community types to be cleared. Amendments to the ecosystem and species credit requirements must be undertaken in consultation with EES and DAWE and submitted to the Planning Secretary for approval within six (6) months after the commencement of construction or as agreed in writing by the Planning Secretary.*

Observations of reduced clearing in FCWS habitat areas was observed by the author in Stage 3 of the project. The CIZ was revised in June 2022 and approved by DPE (*see* Table E1 in Table 2-1).

5.1.3 Test of Significance Assessments for FCWS

Both the 5 part test pursuant to the *Biodiversity Conservation* Act (2016) and the Test of Significance pursuant to the *Environment Protection and Biodiversity Conservation* Act (1999) have been completed.

The 5 part test completed by Trans4mRail sub contractor ecologists relied on the pre cautionary principal and concluded a significant impact on FCWS populations may occur (Umwelt 2021; Appendix B). In reaching this conclusion they relied on the NSW Office of Environment and Heritage *Threatened Species Test of Significance Guidelines* (OEH 2018). The Test of Significance reached a similar conclusion, suggesting the project is likely to result in a significant impact on an important population of the FCWS (Umwelt 2021; Appendix B).

5.1.4 Developing a Species Management Plan

This document represents the species management plan and is designed to bring together the available information including the commitments and management actions that have been formulated between stakeholder groups since the unexpected finds procedure was implemented in July 2021 (Appendix C). This document also has the capacity to provide a platform for FCWS consideration at other locations where the species may occur along the route of the Inland Rail Project.

5.2 Construction Management Actions for FCWS

5.2.1 Identification of FCWS Habitat on Environmental Control Plans

During construction, Locations of 'known' and 'likely to occur' FCWS habitat areas (as defined within Figure 4-1 *FCWS distribution map* (DAWE 2022)) will be updated on Environmental Control Plans (ECPs) in accordance with the Construction Biodiversity Management Subplan (pp 25). This will assist in the implementation of agreed to management actions outlined in this plan of management. Environmental Control Plans would be updated from time to time or on an as required basis as new information informs the project.

Additionally, Environmental Control Plans will be updated periodically to include 'Known' FCWS habitat as determined from FCWS finds during the construction of the Narrabri to North Star Inland Rail Project. Known FCWS habitat identified in this way will include a 100m buffer around any FCWS find record, as identified in relevant construction mapping.

5.2.2 Specific FCWS Induction

All personnel including sub-contractors are required to undergo an induction to work on the project. This induction addresses FCWS and provides information in relation to:

- A general description of the FCWS (including photos and key identification features).
- Locations where FCWS surveys are required on the project site (i.e. Stage 1 and Stage 3 CH735.000 to CH754.250).
- Records kept from the induction / toolbox training.

Visitors and delivery personnel are to be accompanied by a full inducted person at all times in accordance with the CEMP (Trans4Rail 2021). Signage is also provided at the various site offices (Plate 5-1).

5.2.3 Develop a Survey Prescription to Adequately Survey Area Before and During Construction Activities

Developing a survey prescription to adequately survey the area before and during construction activities would involve the following in FCWS habitat areas:

- An ecologist would perform a pre-clearing inspection to determine the suitability of the site for pre-clearing surveys before slashing commences. A pre-clearing survey involving active searches under logs and shelter sites would only be undertaken where these attributes occur. No pre-clearing survey involving active search would be undertaken in areas that comprise only dense tall grasses given there is little opportunity for the surveyor to actively search and locate FCWS. The same approach would occur where the area is inundated. Skinks captured during this stage would need to be retained until such a time the slashing has been completed adjacent to the relocation site. In most cases, this should not last for more than a few hours and accord with the Ecologists Animal Care and Ethics Approval Permit.

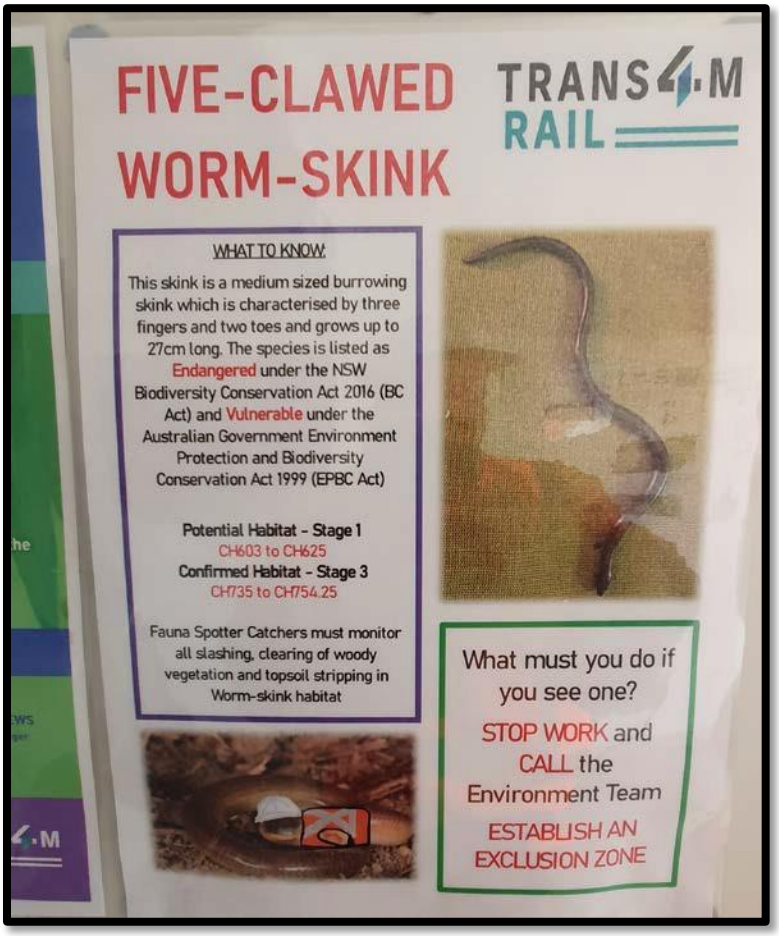

Plate 5-1. Example of FCWS signage at site offices in Stage1 and 3.

- An ecologist or spotter-catcher to perform clearing supervision when the slasher is mowing vegetation. The slasher should be set at a cutting height that is near to the ground (<100 mm) in order to reduce the suitability of the retained habitat. The ecologist/spotter-catcher would turn suitable materials such as logs, disused sleepers, refuse whilst looking for dispersing skinks. Skinks captured during this stage would need to be retained until such a time the slashing has been completed adjacent to the relocation site noting that a series of measurements and habitat information is to be recorded (*see* Section 5.2.4).
- Slashed vegetation should be wind rowed to the edge of the CIZ to provide temporal refuge sites. This should be performed in a way so as to reduce the suitability of the habitat for FCWS within the CIZ. Ideally, slashing should seek to windrow the slashing material with each up and down pass so that it concentrates the windrowed material to enable more efficient FCWS checks prior to soil disturbance works.

Plate 5-2. Slashing on vegetation prior to stripping in Stage 1.

- Relocation sites should be established based on the capture sites. Silt fence is proposed to assist in delineating these areas and to reduce habitat permeability between the relocation site and the CIZ (Plate 5-3).
- Once the above works are completed within a given area, a minimum waiting period of 2 days/nights and up to 5 days/nights is proposed before topsoil stripping can commence. This adopted period should enable sufficient time for uncaptured FCWS to move of their own accord and be determined in consultation with Project Ecologist. The Project Ecologist should consider site-specific conditions at the time of clearing including the outcomes of any pre-clearing surveys, soil conditions (presence of moisture / cracking / baking), daytime temperatures and other factors that in the opinion of the Project Ecologist may or may not contribute to hostile ground conditions for the FCWS.

Plate 5-3. Example of a FCWS relocation hub installed in Stage 1 supported by environmental signage.

Once the adopted period has elapsed within a slashed area, the ecologist/spotter-catcher will implement the following measures during soil disturbance activities (e.g. topsoil stripping):

- A site assessment by a senior ecologist to determine the site suitability for FCWS. This survey is to determine if the area contains suitable habitat as opposed to unsuitable habitat which could include inundated or saturated areas or simply non-black cracking soils or highly trafficked areas such as driveways and road verges. Area still deemed as suitable habitat for FCWS would have the following procedures:
    - A daytime pre-stripping survey for FCWS focusing on the most likely micro habitat components in the CIZ. This survey would occur within 2 days of the topsoil stripping with the completed survey area being clearly demarcated by either plastic bollards, witches hats or pennant flagging to ensure no topsoil stripping occurs in areas not yet surveyed.
    - Topsoil stripping surveys to a depth of 100 mm would then be performed to capture and relocate displaced FCWS (Plate 5-4). At least one ecologist or spotter catcher will be assigned per machine (i.e. excavator, dozer, grader or scrapper). Should a scrapper be used, an ecologist or spotter catcher will be present to inspect the material at the recipient site.
    - Salvaged FCWS would be assessed for signs of injury, measurements recorded and habitat data collected as per Section 5.2.4.

Plate 5-4. Example of top soil stripping to 100 mm depth at 599.02 in Stage 1.

5.2.4 Data Collection Requirements for Captured FCWS

Any FCWS captured during the course of implementing this plan would have the following data collected and recorded in the register:

- Stage of project and chainage;
- Capture date and time;
- Condition of the skink (Good, Injured, Deceased);
- Microhabitat at capture site;
- Soil at the capture site;
- Activity undertaken at time of find;
- Detection method (e.g. survey);
- GPS coordinates for capture and relocation site;
- Details of the person/s who made the discovery;
- Description of vegetation / PCT;

- Where practicable, validation photos from on top, side, below and close-up photos of forelimbs and hind limbs;
- Series of measurements including; snout-vent length, tail length and total length,
- Photographs of the site (general location, vegetation, habitat features where the individual/s was discovered) were captured each day for each work area, and
- Deceased or euthanised individuals will be forwarded to the *Australian Museum* for research purposes.

The following habitat data would be collected from a 100m^2 area from the capture site if it is undisturbed from construction otherwise the adjacent area outside of the CIZ:

- Soil crack density and size range (depth if possible);
- Percentage (%) litter cover;
- Percentage (%) bare ground;
- Percentage (%) grass cover and/or tussock spacing;
- Three most abundant groundcover species;
- Soil type, soil structure (blocky, small peds, massive) and pH if possible;
- Large surface debris abundance expressed as percentage (%) cover over 100m^2, and
- Ground moisture levels (including recent rainfall amount if known/relevant).

The Project Ecologist or the Environmental Manager for Trans4M Rail will manage this register. The register will be provided with each incident notification and live FCWS find report, and it will be made available to regulatory agencies. A copy of the register is provided in Appendix D.

5.2.5 Identifying and Establishing FCWS Relocation Sites

i. Site Identification

Relocation sites will be identified based on the captures from pre clearing and clearing supervision surveys. This will ensure FCWS are moved a minimal distance from their capture site and still potentially within their home range. In some cases, FCWS relocation sites may be identified based on suitable habitat along the alignment and before the commencement of construction works so as to assist in the scheduling of construction resources. When this occurs, a relocation site will be selected using the following criteria:

- The area is adjacent to or comprises native grassland or woodland on public land;
- A relocation site must be as close as possible to the capture site;
- Sites must support suitable microhabitat of loose friable soil, with areas of leaf litter, mulch or dense vegetative groundcover which provides cover and foraging resources at least 100m^2 in area, and
- Relocation sites will be mapped and a GIS layer developed.

ii. Site Establishment

Establishing a FCWS relocation site will involve:

- Creating a minimum 100 m^2 relocation area at 200 m intervals (where possible);
- Installing hay bales (minimum one per 25m^2) with each bale measuring approximately 1m x 0.4 x .46. Slashed vegetation and/or woody debris should also be used as an alternative;
- Erection of an exclusion fence (silt fence) along the CIZ boundary at the hub plus 10 m either side of the relocation hub where practicable. If this is not possible, it must be documented within the FCWS capture register (*see* Section 5.2.4).
- Appropriate signage and a high visibility boundary at every relocation site, where practicable.
- Relocation of up to 10 adults and 5 sub adult skinks per 100m^2.
- Sites that receive captured/relocated FCWS will be GPS and a register created as part of an environmental sensitive zone for ARTC operations.

5.2.6 Habitat Enhancement and Refuge Replacement

Two phases of habitat enhancement / refuge placement would be implemented during construction:

- Phase 1: temporary habitat enhancement comprising works undertaken during clearing and grubbing activities.

Its key objective is to enhance the retained habitat and assist in the relocation of FCWS captured during the clearing and topsoil stripping stage of works (Plate 5-5).

- Phase 2: permanent habitat enhancement with works scheduled to be undertaken during landscaping activities.

Its key objective is to encourage re-colonisation of the site and improve or at least restore areas impacted by construction for FCWS.

Phase 1 temporary habitat enhancement includes the placement of hay bales at 100 m intervals on land within the construction boundary.

More permanent habitat enhancement in Phase 2 will include the placement of course woody debris (e.g. logs, sleepers, or mulched woody vegetation piles) within the construction boundary. Where available, woody debris will be placed in a manner that is reflective of the pre-construction landscape. As an example, at Yallaroi Creek (CH740.59), woody debris were placed at an average rate of one piece per 10m^2, whereas in open areas where no vegetation was removed, no woody debris were placed.

Plate 5-5. Temporary habitat enhancement works in Stage 3 using timber and hay biscuits to increased ground cover for relocated FCWS.

5.2.7 Unexpected Five-clawed Worm Skink Finds Procedure

An Unexpected Threatened Species Find Protocol is outlined in Appendix G of the Construction BMP (Appendix E). In addition, an unexpected finds procedure has been developed to manage instances where FCWS may be detected during pre-clearing surveys, clearing operations or at any other time throughout construction outside of the following:

- Stage 1: All of Stage 1, including Chainage 603.000 to 625.000 identified through DAWE predictive modelling,
- Stage 2B: Chainage 641.08 – 647.00 following finds and extrapolating likely habitat and
- Stage 3: Chainage 735.000 to 754.250 following finds and extrapolating likely habitat.

In an unexpected finds instance, the management strategies outlined in this plan will be adopted for up to 500m on either side of the capture and include:

- Additional pre-clearing and topsoil stripped surveys as deemed appropriate by the Project Ecologist;
- Relocation of individuals using the framework developed in this plan;
- Data capture of the individual and habitat data outlined in this plan;
- Updating of relocation sites, FCWS register, construction drawings and environmental control plans; and
- A periodic examination and review of the adequacy of the proposed mitigation measures proposed in consultation with DPE and DAWE.

5.2.8 Updates to this Plan

This plan should be updated in circumstances where new information necessitates such an update is required in consultation with the relevant departments (i.e. DPHI; BCS DCCEEW - NSW). For example, once all the monitoring sites have been finalised for the trial survey (*see* Section 6.0).

6.0 FIVE-CLAWED WORM SKINK MONITORING PROGRAM

The following FCWS monitoring program has taken into account the principles outlined in the NSW Office of Environment and Heritage publication *Saving our Species Monitoring, Evaluation and Reporting: Guidelines for conservation projects* (OEH 2018).

Monitoring the response of FCWS populations to management actions on the N2NS, project such as pre-clearing surveys, habitat augmentation and skink relocations is an important process. For rare cryptic species like the FCWS, obtaining estimates of absolute abundance would be time consuming, labour intensive and disappointingly imprecise. When estimates of absolute abundance are not necessary in order to track changes over time or responses to management interventions, then a relatively simple and efficient method involving the collection of presence–absence data can be used (MacKenzie *et al.* 2006). This entails surveying the area of interest and noting whether the target species is present (Peres-Neto *et al.* 2001).

The FCWS was found during construction of the project and reported as an unexpected find. With this in mind, a survey design such as the Before-After-Control-Impact (BACI) survey design cannot be performed, simply because there is no data available before the impact occurred, and finds are happening during the construction or impact phase of the project. In response to this, it is possible to develop a more simplified design that monitors an impact site or a series of impact sites against an adjacent reference site provided they can have sufficient physical separation to enable data independence.

A key consideration in this monitoring program is the fact that FCWS were encountered during the ground disturbance works with live captures being relocated into adjacent relocation hubs (Treatment Type A), some skinks evading capture altogether and some skinks being injured resulting in their mortality (Treatment Type C). In an attempt to measure how the FCWS population has responded to the project, a monitoring program has been developed on three treatment classes detailed below.

- **Treatment Type A – Relocation Hub.** This type of monitoring site is typically at the edge of the disturbance work zone and contains intact vegetation, received a range of construction related management actions including but not limited to being at or close to a relocation hub that received captured skinks, had habitat augmentation installed in the form of hay bales, timber and a skink protection fence constructed (Plate 6-1).

Plate 6-1. Treatment Type A (10A) where relocation hub within area immediately adjacent to the disturbance zone.

•**Treatment Type C (Impact) – Disturbance Zone.** This type of monitoring site was heavily disturbed as part of the project with vegetation being cleared and grubbed and the soils either being excavated, trafficked or compacted. Typically, these sites are located within 10 m of the rail line and feature disturbed soils and low growing plants such as grasses (Plate 6-2). They are often located within 100-200 m of the relocation hubs, rarely closer (i.e. Site 11A & C). This treatment type has been included into the program at the request of BCS given the department wanted to understand if FCWS would recolonize these areas post construction. They are considered an impact site.

Plate 6-2. Treatment Type C (10C) where disturbance works removed vegetation and disturbed soil during construction.

- **Treatment Type B – Reference.** This type of monitoring site has been located at least 200 m away and at times a number of kilometres from the impact site but within the same PCT and local area (Plate 6-3). As these sites were unaffected by the project they are considered control or reference sites and are used to measure external factors such as seasonality (i.e. drought/flood) and assist with other abiotic cues (i.e. air temperatures, rainfall).

Plate 6-3. Treatment Type B (Site 10B) where sites were established in adjacent habitat of the same plant community type.

6.1 Site Selection

Fifteen (15) sites have been established between Stage 1 (Clump Road Ch.603430) and Stage 3 (Tackinbri Creek Ch.744.00; Table 6-1). At each of these locations there are three treatment sites, that being:

- **Treatment Type A**
- **Treatment Type C**
- **Treatment Type B** .

The distribution of the 15 monitoring sites can be summarised as follows:

- Seven (7) sites in Stage 1 between The Clump Road (Ch.603430) to just north of Bellata (Ch.616.05);
- One (1) site in Stage 2 between Waterloo Creek and Kanimbla Lane at Ch.629.55 and
- Seven (7) sites in Stage 3 between Tumba Road (Ch.739.70) to Tackinbri Creek (Ch.744.00).

Maps depicting the monitoring sites locations is provided in Figure 6-1 and 6-2.

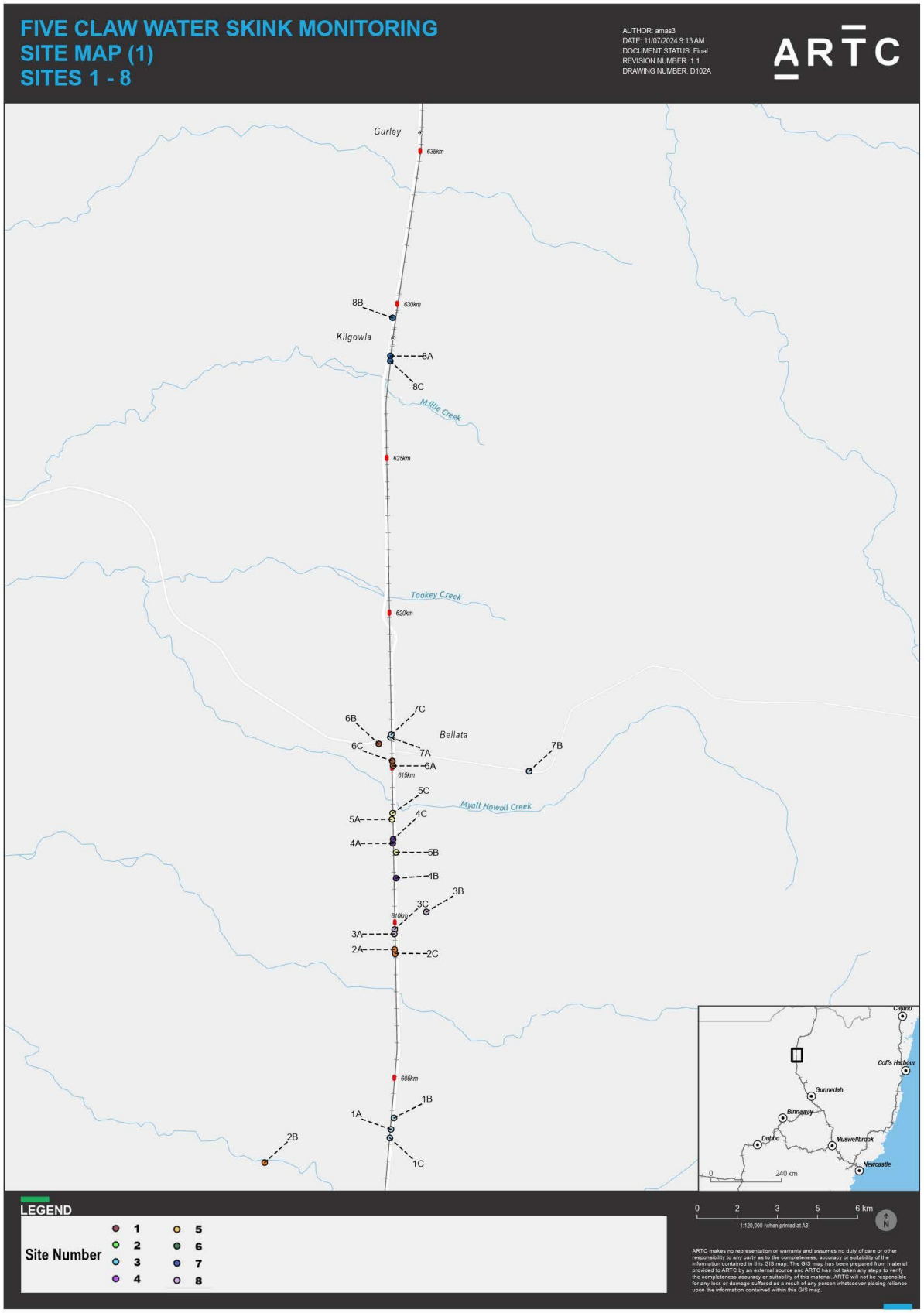

Figure 6-1. Monitoring sites (1-8) between Narrabri and Moree.

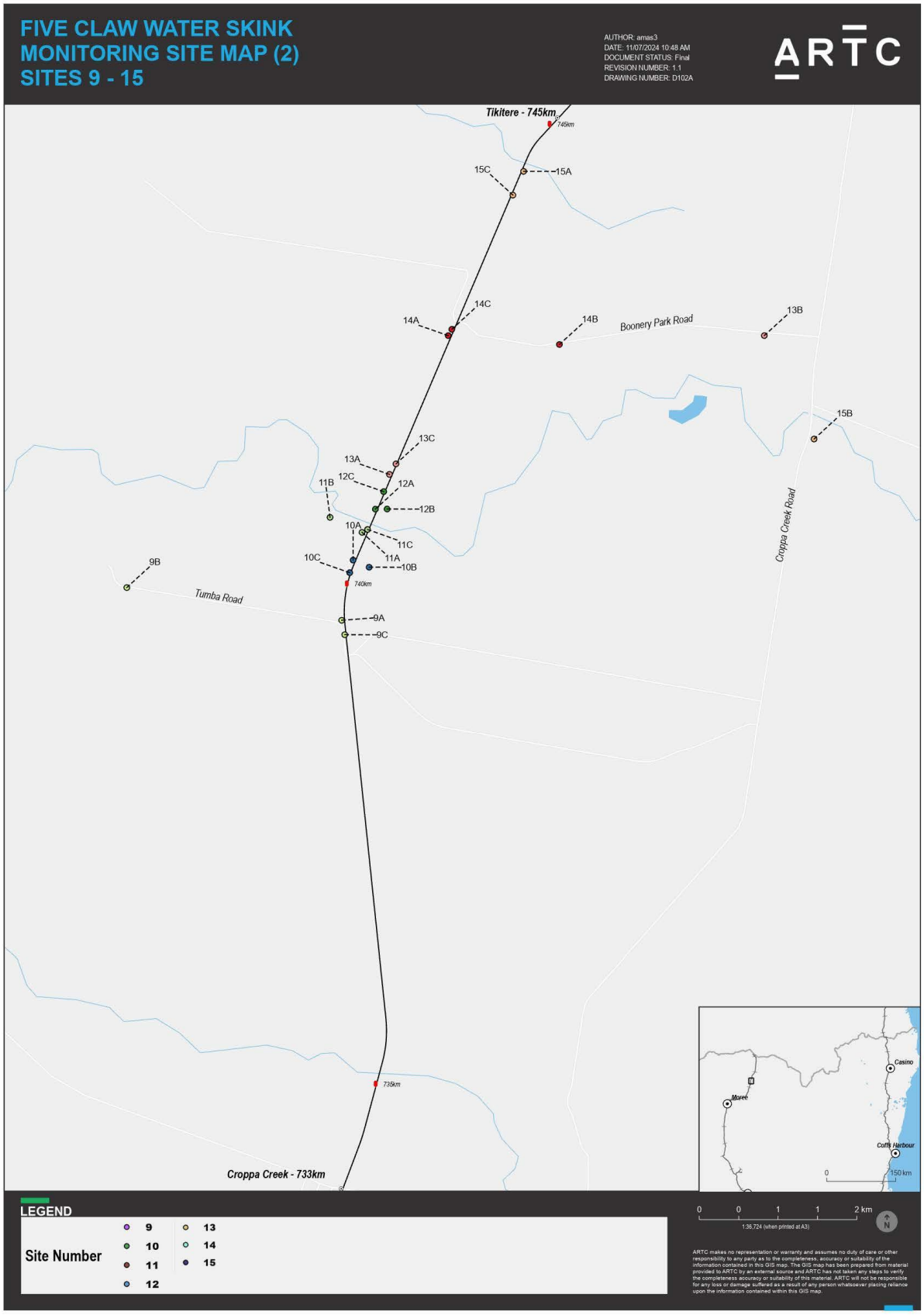

Figure 6-2. Monitoring sites (9-15) between Moree and North Star.

Table 6-1. Proposed FCWS monitoring sites for N2NS Section of the Inland Rail Project.

Site Number	N2NS Stage	Treatment Type A	PCT	No. FCWS Relocated	Treatment Type C	Treatment Type B
1	1	Ch.603.43 E- 769086 N- 6674933 Relocation Hub 1-2	52/135	2	Ch. 603.02 E - 769046 N - 6674656	East of Newell Highway and south of Bulldog Creek in PCT52/135 E- 769197 N- 6675299
2	1	Ch. 609.30 E- 769355 N- 6680715 Relocation Hub S1-23	56	1	Ch. 609.34 E - 769361 N - 6680584	10 Mile Lane Road Reserve where it bisects Ten Mile Creek with PCT 56. E- 764901 N- 6673962
3	1	Ch.609.73 E- 769362 N- 6681212 Relocation Hub 1-24	52	1	Ch. 609.75 E - 769365 N - 6681357	Valorban Lane east of Newell Highway in PCT52 E- 770404 N- 6681899
4	1	Ch.612.60 E- 769378 N- 6684136 Relocation Hub 1-35	52	1	Ch. 612.63 E - 769385 N - 6684266	East side of Newell Highway with PCT 52 in the vicinity of: E-769464 N-6683009
5	1	Ch.613.48 E- 769381 N - 6684910 Relocation Hub S1-39	52	1	Ch. 613.45 E - 769391 N - 6685112	East side of Newell Highway with PCT 52 in the vicinity of: E-769471 N-6683849
6	1	Ch.615.15 in Exotic Grassland	EG	9	Ch.615.10	~800m along Millie Road on southern side at

Site Number	N2NS Stage	Treatment Type A	PCT	No. FCWS Relocated	Treatment Type C	Treatment Type B
		E- 7694432 N- 6686623 Relocation Hub S1-44			E - 769419 N - 6686793	approximate: E- 768997 N- 6687358
7	1	Ch.616.05 E- 769380 N- 6687560 Relocation Hub S1-45	52	6	Ch. 616.07 E - 769406 N - 6687649	2 km along Berrigal Road and locate most suitable PCT52 to establish site around: E- 773981 N- 6686353
8	2	Ch.629.55 E- 769681 N- 6699875	56	8	Ch. 629.58 E - 769665 N - 6699711	West side of Newell Highway in PCT 56 E- 769775 N- 6701107
9	3	Ch.739.70 (Tumba Road) E-237808 N-6780797 Relocation Hub 1	27,52	13	Ch. 739.58 E - 237842 N - 6780654	1.5 km west along Tumba Road from impact site within road reserve. E-235653 N-6781073
10	3	Ch.740.30 West (between Tumba Road and Yallaroi Creek) E-237908 N-6781398 Relocation Hub 3	27	13	Ch. 740. 27 E - 237878 N - 6781272	200 m east of the impact site on eastern side of rail line on Myala Feedlot land in PCT 27. E- 238070 N- 6781331
11	3	Ch.740.59 Yallaroi Creek South E- 237991 N- 6781676 Relocation Hub 5	56	4	Ch. 740.54 E - 238046 N - 6781706	300 m to the west of impact site in PCT56. E- 237668 N- 6781818
12	3	Ch.740.72 Yallaroi Creek (north) E- 238119 N- 6781910	78	4	Ch. 740.75 E - 238199 N - 6782086	Yallaroi Creek (east of rail) E- 238236 N- 6781914

Site Number	N2NS Stage	Treatment Type A	PCT	No. FCWS Relocated	Treatment Type C	Treatment Type B
		Relocation Hub 7				
13	3	Ch.740.94 (East) E- 238252 N- 6782259 Relocation Hub 9	27	6	Ch. 741.05 E - 238315 N - 6782365	Croppa Creek Road in PCT27 E- 241967 N- 6783725
14	3	Ch.742.26 (East) E- 238808 N- 6783653 Relocation Hub 12	56	7	Ch. 742.70 E - 238843 N - 6783717	Boonery Park Road in PCT56 E- 239921 N- 6783590
15	3	Ch.744.00 (East) E- 239524 N- 6785305 Relocation Hub 14	56	2	Ch. 743.95 E - 239423 N - 6785066	Eastern side of Croppa Creek Road in PCT56 E- 242487 N- 6782707

6.2 Sampling Design and Regime

Conventional survey methods comprising pitfall traps and active searches are likely to produce unreliable results for FCWS (Spark 2010; DAWE 2022). Meanwhile, the use of artificial refuges (ARs) are increasingly used to survey for this species (i.e. Spark 2010) and for other kinds of cryptic herpetofauna (Michael *et al.* 2012).

Given the above considerations, sampling will rely on the use of artificial refuges with each site comprising:

- 5 rubber tiles made from industrial conveyor belt at least 5 mm in thickness (~1.5m L x 0.75 m W).
- 5 x 1m^2 light coloured carpet (similar type rather than a specific type or brand).

This approach would account for variation in both ambient temperature and moisture availability. For example, cooler weather conditions may result in increased captures beneath rubber tiles whilst sampling during hot weather may result in increased detection beneath the carpet tiles. This will avoid confounding sampling situations such as surveying during unsuitable weather.

The current configuration or arrangement of rubber and carpet tiles is the result of directive from BCS DCCEEW – NSW in 2024, that being to clump the carpet and rubber tiles together in an overlapping nature to create a single continuous covering. (Figure 6-1).

Figure 6-3. Artificial shelter site configuration using the clumped configuration as directed by DCCEEW NSW.

Artificial refuge sites should be installed 12 weeks ahead of scheduled monitoring. Monitoring will generally be performed in early autumn (i.e. March-May) and late spring (i.e. mid September-November), however may be carried outside of these periods where favourable seasonal conditions permit. This time period has been selected to compensate for the variability in ambient temperature whilst accounting for periods of rainfall based on the long-term climatic averages for Moree (BoM 2022). Surveying at this time of the year should also alleviate concerns associated with excessive heat (>35 degrees Celsius) or it being too cold (<20 degrees Celsius), thereby increasing the likelihood of detection. In determining appropriate survey periods, consideration will also be given to factors such as preceding rainfall conditions and soil moisture levels. Soil moisture content is considered a key trigger for monitoring events.

The survey would require the surveyor (i.e. ecologist) to inspect each artificial site on one morning occasion (0630-1200hrs) and again on an afternoon occasion (1300-1930hrs) on a separate day with two visits per sampling period. A third visit during Year 1 may be considered appropriate based on the type of analysis proposed in Section 6.3. Maintenance works in the form of replacing missing rubber and carpet tiles would be performed during each of the monitoring events (i.e. twice per annum; see Section 7). Simarliy, in the event the carpet or rubber tiles begin to decompose or breakdown, additional tiles will be placed within the configuration (rather than replacement of) where the existing decomposing tiles have been identified. The original tiles will be left in situ, to retain the artificial habitat.

Monitoring surveys will require a protection officer in accordance with ARTC's workplace health and safety requirements for on ground works within the rail corridor.

A number of other parameters will need to be collected at each site and survey. They include:

- Rainfall - raining, within past 7 days, greater than 7 days;
- Temperature – measured at the start of the survey with a portable thermometer;
- Habitat – impacted by construction or not impacted;
- Year – Sampling year;
- Season – autumn and spring, and
- Some micro habitat measurements estimated from a 5 x 5 m area:
    - Soil Cracks – extensive (evident in most nested 1m2 quadrats), present (present within the 25m2 quadrat) and absent;
    - Groundcover attributes - % log, % vegetative cover, % bare soil % litter. Again this is estimated using a rapid assessment approach.

The value to each of the above attributes or covariates in the overall monitoring program is tied to the statistical analysis used to measured occupancy and detectability between the two treatments discussed below.

6.3 Statistical Analysis

Occupancy models were developed to solve the problems created by imperfect detectability (MacKenzie *et al.* 2002, 2003, 2004). That is surveying for a species and not finding it at a site when it is in fact present, a common outcome for field biologists. This makes occupancy models particularly suitable for cryptic or rare species like the FCWS. Often it is

impossible or simply not practicable to estimate abundance of rare species, but the estimation of occupancy for these species is still possible (MacKenzie *et al.* 2006).

Occupancy models use information from repeated surveys at each site to estimate detectability which is always a measure of <1. Detectability may vary with site characteristics (e.g. habitat variables) or survey characteristics (e.g. weather conditions), whereas occupancy relates only to site characteristics. The technique is very similar to estimating abundance from mark-recapture data but does not require any marking of animals which is applicable here as we focus on population persistence at the relocation hubs. Necessary information for occupancy models is simply a record of whether a species was detected or not detected during each survey of each site, often referred to as detection history which can be converted to mathematical statements.

There are a number of software packages available to assist in occupancy analysis. The software program PRESENCE was created exclusively for occupancy analysis and is available at http://www.mbr-pwrc.usgs.gov/software.html. Occupancy analysis has also been incorporated into MARK, which is available at http://www.phidot.org/software/mark/. Another is the statistical computing environment, R which is available at https://www.r-project.org/ (R Core Team 2018).

A monitoring program of this nature will need to account for heterogeneity, or simply variation that can arise whilst field biologists perform their sampling. For example, the variation in detection probability caused by rainfall leading up to and during the survey can easily be incorporated to obtain unbiased estimates of occupancy using a model based approach. It is this model based approach that will assist in our understanding of impacts and management actions arising from the project.

The first year of monitoring should be a 'trial period' for the purpose of assessing sample design. This trial period should be analysed using single-season occupancy and consider methods such as artificial shelter type (the detection rate can be compared between the two), time of day (detection rate comparison) and sample size effect (to determine how many replicates (# sites plus # repeat visits) are needed in subsequent monitoring events. The advantage of treating the first season as a trial is the monitoring program will have a chance to optimise the survey design, thereby increasing cost efficiencies. Importantly, it will still be possible for the data from the trial to be used in the final analysis and thereby contribute to the overall monitoring program.

The advantage of implementing the FCWS monitoring program as a multi-season approach, in contrast to running single-season analysis each season, is that ARTC will become informed about population processes (colonisation/extinction) and test theories of population dynamics (equilibrium/non-equilibrium, random/Markovian). Markovian is where what occurs in period t influences what occurs in t+1, something that is quite plausible in ecology. Estimating occupancy tends to be more robust when population dynamics are included, especially when the monitoring program will extend over a number of years.

With occupancy modelling, covariates either influence occupancy, detection or in rarer cases, both. Variables such as habitat can influence both, but probably not in this case given the program proposes to use artificial refuges. Site level variables such as the extent of vegetative ground cover, litter cover, extent of cracking in the soils will influence occupancy. Variables that change frequently and are measured at the survey level, usually only influence detection rate. E.g. temperature, artificial shelter type, cloud cover, rainfall. In the event that environmental factors affect all sites equally, these should be estimated separately using a generalised linear model, plotting occupancy on the y-scale and rainfall on the x-scale. For example, no rainfall being recorded across the survey period.

As a guide, the following models should be considered for analysis that are influenced by population dynamics:

- Occupancy (1st time), Colonisation (.), Extinction (.) p (.);
- Occupancy (1st time), Colonisation (relocation), Extinction (relocation) p (.);
- Occupancy (1st time), Colonisation (relocation*year), Extinction (relocation*year) p (.);
- Occupancy (1st time), Colonisation (habitat), Extinction (habitat) p (.);
- Occupancy (1st time), Colonisation (year), Extinction (year) p (.);
- Occupancy (1st time), Colonisation (relocation*habitat), Extinction (relocation*habitat) p (.);

1st time = occupancy is only directly estimated for the first period and then is derived from colonisation and extinction estimates. (.) = constant.

By using an appropriate model selection method (most likely Akaike information criterion - AIC), it will enable the monitoring program to find out if the parameters vary between the relocation site and the reference site. By measuring over years, you can find out the dynamics of this influence. For e.g. the FCWS may become gradually extinct Occupancy (relocation*year) from the relocation sites compared to reference sites. Again, a program like this benefits so much more when estimating over time and it is why sampling has been proposed over a number of years.

6.4 How Many Years to Monitor

The monitoring period will commence in Spring 2024 (Year 1) with this year being the trial period or trial study. The proposed FCWS monitoring schedule is set out in Table 6-2 below. Monitoring should continue until Year 4 (Trial in Year 1 and Refined Design for Years 2-4) when the overall effectiveness of the program and the management actions can be reviewed and assessed. It is intended that a minimum of five monitoring events be carried out under favourable conditions, as described at Section 6-2. Should unfavourable conditions persist within the scheduled monitoring period, monitoring actions may be suspended, and if necessary the monitoring schedule revised for years beyond 2028.

Table 6-2. Proposed FCWS monitoring schedule for N2NS.

Year	Spring	Autumn*	Output
1 (2024/25) Spring 2024 Autumn 2025	2024 – survey 45 sites (15 each treatment)	2025 – survey 45 sites (15 each treatment)	Survey Year 1 Report 'Trial Period'. Make key recommendations on future survey design informed by statistical analysis.
2 (2025/26) Spring 2025 Autumn 2026	TBA based on Year 1 Trial	TBA based on Year 1 Trial	Survey Year 2 Report Optimal Survey
3 (2026/27) Spring 2026 Autumn 2027	TBA based on Year 1 Trial	TBA based on Year 1 Trial	Survey Year 3 Report – Optimal Survey
4 (2027/28) Spring 2027 Autumn 2028	TBA based on Year 1 Trial	TBA based on Year 1 Trial	Survey Year 4 Report – Optimal Survey Key Outcome – Determine outcomes from the project in terms of quantifying and qualifying impacts to FCWS

** Monitoring events may be carried out outside of autumn / spring periods where favourable seasonal conditions permit.*

6.5 Monitoring Site Management Measures

Site Protection Measures:

- Delineation / demarcation (such as safety flagging/tape, pennant tape etc.) *
- Star Pickets
- Signposted with appropriate site details included (including details of what the site is, monitoring site number, details of FCWS generally and ARTC contact details)
- Woody debris added on and around the monitoring site to ensure security of the carpet tiles and enhance the habitat

Further Management Measures:

- All ARTC staff who work in these locations will have appropriate awareness of the FCWS habitat distribution and specific monitoring site locations. This awareness will be in the form of a toolbox talk or similar.
- FCWS monitoring sites and FCWS habitat distribution will be identifiable on ARTC Maps, to ensure the monitoring site locations and potential FCWS habitat is considered as part of future Environmental Impact Assessments for all operational maintenance activities in the rail corridor.

Furthermore, consultants who undertake future monitoring will be required to ensure the integrity of the individual site protective measures, as well as ensure the individual site layout during the twice-yearly monitoring events. Any rectification works required will be noted within the consultants post monitoring summary report and rectified immediately.

**Site demarcation may vary throughout the monitoring period, especially for public facing sites. If it is found the demarcation flagging is attracting unwanted attention to the sites by the public, ARTC reserves the right to adjust the type of demarcation to avoid further issues.*

7.0 INSPECTION AND MONITORING IN RELATION TO THE FCWS

Inspection, monitoring and surveillance regimes are detailed in the main CEMP document prepared by Trans4m Rail. The table below summarise important actions relevant to FCWS management.

Table 7-1. Environmental monitoring requirements relevant to FCWS management.

Inspection	Objectives	Responsibility	Output	Timing
Site Inspection (During Construction)	Review status of all controls and general environmental performance	Environmental Coordinator/s	Weekly Environmental Checklist	Weekly (and post rainfall events that trigger runoff)
Site Inspection (During Construction)	Observe general environmental performance	Environmental Manager/ Environmental Advisor	Correct any observed Non- Conformances as they arise	As required to coincide with inspections
Site surveys (During Construction and Operations)	Ensure surveys are being completed as required prior to and during the disturbance and removal of known and potential FCWS habitat and relocating individual FCWS in accordance with this plan	Project Ecologist / Contracted Ecologist / Project Manager	Daily pre-clearing checklist and post clearing report	Daily and at completion of construction activities that seek to disturb and remove known and potential FCWS habitat
Operational Monitoring Surveys	Monitor FCWS population stability across 15 sites with 3 treatment classes (45 sites total). Ensure 5 rubber and 5 carpet tiles are present at each monitoring site along with signage and site delineation markers as required within Section 6.	Contracted Ecologist Contracted Ecologist Contracted Ecologist	Bi-annual FCWS Surveys Post Monitoring Summary Annual Monitoring Report	Spring / Autumn monitoring event each year After each monitoring event – within 4 weeks of field survey completion Annually

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9.0 APPENDIX A – FCWS SIGNIFICANCE ASSESSMENTS

9.1 Five-part Test of Significance under the BC Act (2016)

The following was prepared by Umwelt (2021).

The five-clawed worm-skink (*Anomalopus mackayi*) is a burrowing lizard with a worm-like body that can grow up to 27 centimetres long (OEH 2017). The five-clawed worm-skink is dark brown above with a green yellow underside (Swan 1990). This skink has short limbs with three fingers and two toes. This feature is used to distinguish this species from the more common two-clawed worm-skink which only has two toes on the front limbs (OEH 2017).

The five-clawed worm-skink has been recorded along the western slopes of the Great Dividing Range, in north-eastern NSW and south-eastern Queensland (Sadlier et al. 1996; Swan 1990; Wilson and Knowles 1988). Within this distribution, the five-clawed worm-skink inhabits grassy white box woodlands supported by moist black soils and river red gum – Coolibah – Bimble box woodland on deep cracking clay soils (OEH 2017). The five-clawed worm-skink lives in tunnel-like burrows within the soil, coming to the surface under fallen timber and leaf litter.

The local population of a threatened fauna species is defined in the Threatened Species Test of Significance Guidelines as '*The population that occurs in the study area'* (OEH 2018). This may be extended to include '*those individuals known or likely to occur in the study area, as well as any individuals occurring in adjoining areas (contiguous or otherwise) that are known or likely to utilise habitats in the study area*' (OEH 2018).

For the purposes of this assessment, the local population has been defined as occurring within the extent of ground-truthed vegetation mapping prepared by Umwelt (2020) as part of the broader approved Submissions and Preferred Infrastructure Report (SPIR) Construction Impact Zone (CIZ). It is noted that the local population may extend further than the SPIR CIZ as part of adjoining habitat.

This test of significance is based on the following datasets provided by ARTC and prepared by GeoLink:

- five-clawed worm-skink register – excel spreadsheet labelled as "3753_FCWS RegisterMaster_Geolink06122021"
- five-clawed worm-skink soil stripping area – excel spreadsheet labelled "FCWS RFI Calculations as of November 30 2021". Note that the density of five-clawed worm-skinks within each vegetation zone is based on this soil stripping spreadsheet which reports 98 individuals recorded. For this test of significance, the additional 18 individuals subsequently recorded have been attributed to vegetation zones within the 6.6 hectares of stripped area as noted in the spreadsheet "3753_FCWS RegisterMaster_Geolink06122021".
- The IFC CIZ as detailed in Umwelt (2021).

a. in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

According to the BioNet atlas of NSW wildlife (accessed 1/12/2021), there are two records (1992 and 2008) of the five-clawed worm-skink within 10 kilometres of the IFC CIZ. A potential record of the five-clawed worm-skink was made during pre-clearance surveys on 5 July 2021 (GeoLink 2021) in the northern section of the CIZ at chainage 741.225. Since this initial potential detection, a total of 116 individuals have been recorded by GeoLink as part of pre-clearing and post-clearing works between chainage 736 and 742. Of the 116 individuals recorded, 55 individuals have been recorded as dead as part of clearing works, 18 detected as dropped tails and 43 individuals relocated. These works have resulted in the potential death of approximately 47% to 63% (if dropped tails are counted as mortality) per cent of the recorded individuals.

The 116 individuals have been recorded from approximately 6.6 hectares of stripped habitat in the CIZ, comprising the following breakdown:

- Non-native vegetation – 23 individuals in 2.6 hectares of stripped habitat
- Zone - 1 - PCT-27 BVT-BR233, NA219-Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion – Moderate to Good condition – 1 individual in 0.07 hectares of stripped habitat
- Zone - 4 - PCT-52 BVT-BR191, NA187-Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion – 87 individuals within 2.9 hectares of stripped habitat
- Zone - 5 - PCT-56 BVT-BR186, NA182-Poplar Box - Belah woodland on clay-loam soils on alluvial plains of northcentral NSW – Moderate to Good condition – 2 individuals within 0.4 hectares of stripped habitat.
- Zone - 6 - PCT-56 BVT-BR186, NA182-Poplar Box - Belah woodland on clay-loam soils on alluvial plains of northcentral NSW-Derived Native Grasslands – 3 individuals within 0.6 hectares of stripped habitat.

Further to these vegetation zones the following vegetation zones are also considered habitat based according to the Threatened Biodiversity Data Collection (TBDC):

- Zone - 2 - PCT-35 BVT-BR120, NA117-Brigalow - Belah open forest / woodland on alluvial often gilgaied clay from Pilliga Scrub to Goondiwindi, Brigalow Belt South Bioregion– Moderate to Good condition
- Zone - 3 - PCT-39 BVT-BR130, NA129-Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion – Moderate to Good condition.

For the purposes of this assessment, the local population has been defined as occurring within the extent of ground-truthed vegetation mapping prepared by Umwelt as part of the broader approved SPIR CIZ (Umwelt 2020). Based on this area and the detection rates per hectare as part of clearing surveys, it is estimated that the local population could comprise 21,100 individuals. This is based on the density of individuals recorded within each vegetation zone. In the absence of recorded individuals within a vegetation zone the overall average density has been applied. Of this, an estimated 12,000 individuals occur in the IFC CIZ. The IFC CIZ will be subject to different levels of disturbance. Topsoil stripping will result in direct disturbance to approximately 1,500 individuals. The remainder of the IFC CIZ will not result in topsoil stripping and will include laydown areas and slashing for sight lines. The area of the IFC CIZ which will not have topsoil stripped is estimated to contain 10,500 individuals.

Based on a mortality rate of 47%, the proposed development would result in the removal of an estimated 705 individuals, whilst based on a mortality rate of 63%, the proposed development would result in the removal of an estimated 945 individuals. Furthermore, the proposal would result in the disturbance of habitat to an estimated 10,500 individuals from a local population size of 21,100. This represents removal of approximately 3%-4% of the local population and the disturbance of habitat of 50% of the local population. Based on this assessment the proposed development is considered likely to have an adverse effect on the lifecycle of the five-clawed worm-skink such that a viable local population of the species is likely to be placed at risk of extinction.

b. in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction, c. in relation to the habitat of a threatened species or ecological community:

Not applicable to a threatened species.

c. in relation to the habitat of a threatened species or ecological community:

i. the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,

(i) Five-clawed worm-skinks have been recorded within five vegetation zones within the IFC CIZ, namely:

- Cleared/Non-native vegetation
- Zone - 1 - PCT-27 BVT-BR233, NA219-Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion (Moderate to Good)
- Zone - 4 - PCT-52 BVT-BR191, NA187-Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion (Moderate to Good Natural Grassland)
- Zone - 5 - PCT-56 BVT-BR186, NA182-Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW (Moderate to Good condition)
- Zone - 6 - PCT-56 BVT-BR186, NA182-Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW-Derived Native Grasslands (Moderate to Good Derived Native Grassland).

In addition, the species is associated with two PCTs within the TBDC, which comprise two vegetation zones within the IFC CIZ as follows:

- Zone 2 - PCT35 (BR120, NA117) Brigalow - Belah open forest/woodland on alluvial often gilgaied clay from Pilliga Scrub to Goondiwindi, Brigalow Belt South Bioregion (Moderate to Good)
- Zone 3 - PCT39 (BR130, NA129) Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion (Moderate to Good)

Based on the known and predicted habitat detailed above, approximately 95.6 hectares of five-clawed worm-skink habitat would be directly removed (topsoil stripped) by the development and disturbance (slashing and laydown areas) to approximately 692.5 hectares of habitat within the IFC CIZ. Of this, 333.9 hectares is comprised of cleared/non-native vegetation which in addition to exotic vegetation includes areas of cropping land and built environments such as internal roads and farm infrastructure. This species has been recorded in open paddocks with few trees, cropped grass and moist black soils (DAWE 2021). For this assessment, cleared/non-native vegetation representing potential habitat for the five-clawed worm-skink has been defined as occurring within 130 metres from native vegetation zones associated with this species. The 130-metre buffer is based on the maximum distance of recorded individuals to date from the edge of native vegetation zones into cleared/non-native vegetation. The railway centre line has also been buffered by three metres and this area removed as potential habitat. It is likely that only a proportion of land mapped within this vegetation zone would provide suitable habitat for five-clawed worm-skink. Specifically, areas of suitable habitat within cleared/non-native vegetation would include areas of exotic grassland, or areas of cropping land on cracking black clay immediately adjacent to retained native or exotic vegetation. The adjacent cropped land comprises regularly disturbed soil and is consider lower quality habitat than the exotic grasslands present in the corridor where the current records of the five-clawed worm- skink have been made. As a result, the area of suitable five-clawed worm-skink habitat expected to be cleared is likely an overestimate.

(ii) The native vegetation within the IFC CIZ has been subject to high levels of fragmentation due to land use and vegetation clearance from agricultural land use practices. As a result, it is likely that the previous extent of the species has been reduced and fragmented. The individuals recorded during clearing works occur in both retained native vegetation as well as within disturbed non-native vegetation, indicating that the species possesses an ability to persist in fragmented landscapes. Whilst the development would reduce the size of the patches of suitable habitat for the species within and adjacent to the IFC CIZ, this reduction is unlikely to result in a significant increase in fragmentation of habitat for the species, given the level of fragmentation of the species habitat across the local population. No new or additional areas of five-clawed worm-skink habitat would be fragmented or isolated as a result of the development.

(iii) The development would result in the direct removal (topsoil stripped) of approximately 95.6 hectares of five-clawed worm-skink habitat and disturbance (slashing and laydown areas) to approximately 692.5 hectares of five-clawed worm-skink habitat within the IFC CIZ. As discussed above, the local population has been defined as occurring within the extent of ground-truthed vegetation mapping prepared by Umwelt as part of the broader approved SPIR CIZ. Based on this area and the detection rates per hectare as part of clearing surveys, it is estimated that the local population could comprise 21,100 individuals occurring across approximately 1,526.8 hectares of suitable habitat within the SPIR CIZ. As such, clearing impacts from the development would result in the direct removal of approximately 6% of the local population's habitat and the disturbance of approximately 45% of suitable habitat for the local population.

As discussed above, areas of suitable habitat for five-clawed worm-skink include Cleared/Non-native vegetation which in addition to exotic vegetation includes areas of cropping land and built environments such as internal roads and farm infrastructure. As such, it is likely that only a proportion of land mapped within this vegetation zone would provide suitable habitat for five-clawed worm-skink and as a result, the area of suitable five-clawed worm-skink habitat expected to be cleared is likely an overestimate. Furthermore, GeoLink has recorded 23 individuals of the species within non-native vegetation from approximately 2.6 hectares of clearing, whereas 93 individuals have been recorded within native vegetation from approximately 4.1 hectares of clearing. This indicates that not only is the suitable habitat within cleared/non-native vegetation likely to be overestimated, the available habitat within the zone itself is likely to be more marginal in quality and condition compared to areas of native vegetation. As such, areas of native vegetation are likely to be more important to the long survival of the local population of five-clawed worm-skink than areas of non-native vegetation.

The development would remove/disturb 333.9 hectares of suitable five-clawed worm-skink habitat within cleared/non-native vegetation, of 679 hectares of this zone occurring across the SPIR CIZ. This represents a 49% reduction of the poorer quality, more marginal habitat within the local population. The development would result in the direct removal (topsoil stripped) of approximately 95.6 hectares of five-clawed worm-skink habitat and disturbance (slashing and laydown areas) to approximately 692.5 hectares of habitat within the IFC CIZ comprised of the following vegetation zones:

- Zone - 1 - PCT-27 BVT-BR233, NA219-Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion (Moderate to Good)
- Zone 2 - PCT35 (BR120, NA117) Brigalow - Belah open forest/woodland on alluvial often gilgaied clay from Pilliga Scrub to Goondiwindi, Brigalow Belt South Bioregion (Moderate to Good)
- Zone 3 - PCT39 (BR130, NA129) Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion (Moderate to Good condition)
- Zone - 4 - PCT-52 BVT-BR191, NA187-Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion (Moderate to Good Natural Grassland)
- Zone - 5 - PCT-56 BVT-BR186, NA182-Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW (Moderate to Good condition)
- Zone - 6 - PCT-56 BVT-BR186, NA182-Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW-Derived Native Grasslands (Moderate to Good Derived Native Grassland).

Approximately 847.7 hectares of this better quality five-clawed worm-skink habitat comprising the zones listed above occurs across the SPIR CIZ. The direct removal (topsoil stripping) of 50.8 hectares of native vegetation within these vegetation zones represents approximately a 6% reduction in the better-quality habitat across the local population. Further to this, disturbance (slashing and laydown areas) to approximately 403.4 hectares of habitat within the IFC CIZ represents disturbance of approximately 48% of the better-quality habitat.

The better quality habitat across the local occurrence is considered important to the long-term survival of the five-clawed worm-skink in the locality.

d. whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),

The declared areas of outstanding biodiversity value (AOBV) are as follows:

- Gould's Petrel – critical habitat declaration
- Little penguin population in Sydney's North Harbour – critical habitat declaration
- Mitchell's Rainforest Snail in Stotts Island Nature Reserve – critical habitat declaration
- Wollemi Pine – critical habitat declaration.

The development would not impact any of the declared AOBVs.

e. whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

Threatening process means a process that threatens or may have the capability to threaten the survival or evolutionary development of species, populations or ecological communities. Key threatening processes are listed under the BC Act.

The Proposal constitutes, and/or is part of, and/or would be likely to result in the operation of, and/or increase the impact of, a number of key threatening process that particularly relate to five-clawed worm-skink:

- Clearing of native vegetation
- Invasion of native plant communities by exotic perennial grasses
- Removal of dead wood and dead trees.

Conclusion

The local population of five-clawed worm-skink is estimated to be approximately 21,100 individuals, based on the area of suitable habitat within the SPIR CIZ and species detection rates per hectare as defined by the clearance work already commenced as part of the project. Of the total local population size, it is estimated that 12,000 individuals occur in the IFC CIZ. Based on the estimated density rates per hectare, the development would remove approximately 705 individuals (based on a mortality rate of 47%) to 945 individuals (based on a mortality rate of 63%), representing a reduction of approximately 3%-4% of the local population. Further to this, areas of the IFC CIZ where topsoil will not be stripped (comprising slashing and laydown areas) would disturb habitat for approximately 10,500 individuals or 50% of the local population.

Based on the known and predicted habitat within the IFC CIZ, approximately 95.6 hectares of five-clawed worm-skink habitat would be directly removed (topsoil stripped) by the development and disturbance (slashing and laydown areas) to approximately 692.5 hectares of habitat within the IFC CIZ, which represents approximately a 6% direct removal of the local population's habitat and the disturbance of approximately 45% of suitable habitat for the local population. Whilst the species has been found to occur within both native and exotic vegetation, five-clawed worm-skink have been more frequently found within areas of native vegetation such that the density per hectare within these areas are substantially higher than within areas of exotic vegetation, indicating that areas of native vegetation are likely to be more important to the long survival of the local population of five-clawed worm-skink than areas of non-native vegetation. The proposed development would remove 7% (topsoil stripping) and disturb (slashing and laydown areas) a further 43% five-clawed worm-skink habitat comprised of exotic vegetation within the SPIR CIZ. Whilst the proposed development would remove 6% (topsoil stripping) and disturb (slashing and laydown areas) a further 48% five-clawed worm-skink habitat comprised of native vegetation. As a result, the development would significantly impact areas of habitat important to the survival of the local population.

In light of the above, the proposed works are likely to have a significant impact the local population of five-clawed worm-skink.

9.2 Test of Significance under the EPBC Act (1999)

The following was prepared by Umwelt (2021).

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will: *(a) lead to a long-term decrease in the size of an important population of a species.*

According to the *Draft Referral guidelines for the nationally listed Brigalow Belt reptiles* (DoSEWPAC, 2011), important habitat for five-clawed worm-skink is considered to be a surrogate for an important population due to the difficult nature of their detection and lack of knowledge regarding population size. Suitable habitat is considered to be important habitat if it is:

- habitat where the species has been identified during a survey
- near the limit of the species' known range
- large patches of contiguous, suitable habitat and viable landscape corridors (necessary for the purposes of breeding, dispersal or maintaining the genetic diversity of the species over successive generations) a habitat type where the species is identified during a survey, but which was previously thought not to support the species.

Given that the species has been identified within suitable habitat, the suitable habitat within the IFC CIZ is considered to be important habitat and therefore, the local population within the IFC CIZ meets the requirements of an important population under the *EPBC* Act.

A potential record of the Five-clawed Worm-skink was made during pre-clearance surveys on 5 July 2021 (GeoLink 2021) in the northern section of the CIZ at chainage 741.225. Since this initial potential detection, a total of 116 individuals have been recorded by GeoLink as part of pre-clearing and post-clearing works between chainage 736 and 742. Of the 116 individuals recorded, 55 individuals have been recorded as dead as part of clearing works, 18 detected as dropped tails and 43 individuals relocated. These works have resulted in the potential death of approximately 47% to 63% (if dropped tails are counted as mortality) per cent of the recorded individuals.

The 116 individuals have been recorded from approximately 6.6 hectares of stripped habitat in the CIZ, comprising the following breakdown:

• Non-native vegetation – 23 individuals in 2.6 hectares of stripped habitat.

• Zone - 1 - PCT-27 BVT-BR233, NA219-Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion – Moderate to Good condition – 1 individual in 0.07 hectares of stripped habitat.

• Zone - 4 - PCT-52 BVT-BR191, NA187-Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion – 87 individuals within 2.9 hectares of stripped habitat.

• Zone - 5 - PCT-56 BVT-BR186, NA182-Poplar Box - Belah woodland on clay-loam soils on alluvial plains of northcentral NSW – Moderate to Good condition – 2 individuals within 0.4 hectares of stripped habitat.
• Zone - 6 - PCT-56 BVT-BR186, NA182-Poplar Box - Belah woodland on clay-loam soils on alluvial plains of northcentral NSW-Derived Native Grasslands – 3 individuals within 0.6 hectares of stripped habitat.

Further to these vegetation zones the following vegetation zones are also considered habitat based according to the Threatened Biodiversity Data Collection (TBDC):
• Zone - 2 - PCT-35 BVT-BR120, NA117-Brigalow - Belah open forest / woodland on alluvial often gilgaied clay from Pilliga Scrub to Goondiwindi, Brigalow Belt South Bioregion– Moderate to Good condition.
• Zone - 3 - PCT-39 BVT-BR130, NA129-Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion – Moderate to Good condition.

For the purposes of this assessment, the important population has been defined as occurring within the extent of ground-truthed vegetation mapping prepared by Umwelt as part of the broader approved SPIR CIZ (Umwelt 2020). Based on this area and the detection rates per hectare as part of clearing surveys, it is estimated that the important population could comprise 21,100 individuals. This is based on the density of individuals recorded within each vegetation zone. In the absence of recorded individuals within a vegetation zone the overall average density has been applied. Of this, an estimated 12,000 individuals occur in the IFC CIZ. The IFC CIZ will be subject to different levels of disturbance. Topsoil stripping will result in direct disturbance to approximately 1,500 individuals. The remainder of the IFC CIZ will not be subject to topsoil stripping but will include laydown areas and slashing for sight lines. The area of the IFC CIZ which will not have topsoil stripped is estimated to contain 10,500 individuals. Based on a mortality rate of 47%, the proposed development would result in the removal of an estimated 705 individuals, whilst based on a mortality rate of 63%, the proposed development would result in the removal of an estimated 945 individuals. Furthermore, the proposal would result in the disturbance of habitat to an estimated 10,500 individuals from a local population size of 21,100. This represents removal of approximately 3%-4% of the local population and the disturbance of habitat of 50% of the local population. Given this, the project is considered to have the potential to lead to a long-term decrease in the size of an important population of the five-clawed worm-skink.

b) reduce the area of occupancy of an important population

Five-clawed worm-skinks have been recorded within five vegetation zones within the IFC CIZ, namely:

- Cleared/Non-native vegetation.
- Zone - 1 - PCT-27 BVT-BR233, NA219-Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion (Moderate to Good).

- Zone - 4 - PCT-52 BVT-BR191, NA187-Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion (Moderate to Good Natural Grassland).
- Zone - 5 - PCT-56 BVT-BR186, NA182-Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW (Moderate to Good condition).
- Zone - 6 - PCT-56 BVT-BR186, NA182-Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW-Derived Native Grasslands (Moderate to Good Derived Native Grassland).

In addition, the species is associated with two Plant Community Types (PCTs) within the TBDC, which comprise two vegetation zones within the IFC CIZ as follows:

- Zone 2 - PCT35 (BR120, NA117) Brigalow - Belah open forest/woodland on alluvial often gilgaied clay from Pilliga Scrub to Goondiwindi, Brigalow Belt South Bioregion (Moderate to Good).
- Zone 3 - PCT39 (BR130, NA129) Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion (Moderate to Good).

Based on the known and predicted habitat detailed above, approximately 95.6 hectares of five-clawed worm-skink habitat would be directly removed (topsoil stripped) by the development and disturbance (slashing and laydown areas) to approximately 692.5 hectares of habitat within the IFC CIZ. Of this, 333.9 hectares is comprised of cleared/non-native vegetation which in addition to exotic vegetation includes areas of cropping land and built environments such as internal roads and farm infrastructure. This species has been recorded in open paddocks with few trees, cropped grass and moist black soils (DAWE 2021). For this assessment, cleared/non-native vegetation representing potential habitat for the five-clawed worm-skink has been defined as occurring within 130 metres from native vegetation zones associated with this specie. The 130-metre buffer is based on the maximum distance of recorded individuals to date from the edge of native vegetation zones into cleared/non-native vegetation. The railway centre line has also been buffered by three metres and this area removed as potential habitat. It is likely that only a proportion of land mapped within this vegetation zone would provide suitable habitat for five-clawed worm-skink. Specifically, areas of suitable habitat within cleared/non-native vegetation would include areas of exotic grassland, or areas of cropping land on cracking black clay immediately adjacent to retained native or exotic vegetation. The adjacent cropped land comprises regularly disturbed soil and is consider lower quality habitat than the exotic grasslands present in the corridor where the current records of the five-clawed worm- skink have been made. As a result, the area of suitable five-clawed worm-skink habitat expected to be cleared is likely an overestimate.

(c) fragment an existing important population into two or more populations

The native vegetation within the IFC CIZ has been subject to high levels of fragmentation due to land use and vegetation clearance from agricultural land use practices and maintenance as an existing railway corridor. As a result, it is likely that the previous extent of the species has been reduced and fragmented. The individuals recorded during clearing works occur in both retained native vegetation as well as within disturbed non-native vegetation, indicating that the species possesses an ability to persist in fragmented landscapes. Whilst the development would reduce the size of the patches of suitable habitat for the species within and adjacent to the IFC CIZ, this reduction is unlikely to result in a significant increase in fragmentation of habitat for the species, given the level of fragmentation of the species habitat across the local population. As a result, it is considered unlikely that the project will fragment an existing important population into two or more populations.

(d) adversely affect habitat critical to the survival of a species

'Habitat critical to the survival of a species or ecological community' refers to areas that are necessary:

- for activities such foraging, breeding, roosting, or dispersal;
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators);
- to maintain genetic diversity and long-term evolutionary development, or
- for the reintroduction of populations or recovery of the species or ecological community.

Whilst the five-clawed worm-skink has been determined to be an important population within the IFC CIZ, it is not considered to comprise habitat critical to the survival of this species. A substantial amount of similarly suitable habitat occurs in the locality which will not be disturbed by the project.

(e) disrupt the breeding cycle of an important population

Given the details discussed above regarding the amount of habitat and estimated number of individuals, the project is likely to interfere with the breeding cycle of the five-clawed worm-skink.

(f) modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

Of the 116 individuals recorded, 55 individuals have been recorded as dead as part of clearing works, 18 detected as dropped tails and 43 individuals relocated. These works have resulted in the potential death of approximately 47% to 63% (if dropped tails are counted as mortality) of the recorded individuals. These figures indicate that the project may be causing the species to decline in the locality.

(g) result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

The potential for indirect impacts and deterioration of remaining habitat is considered low, given the existing site disturbance and presence of weeds from historical management as a rail corridor and proximity to adjacent agricultural land. The project is considered unlikely to result in invasive species that are harmful to the five-clawed worm-skink becoming further established in the species habitat.

(h) introduce disease that may cause the species to decline, or

The project is unlikely to result in the introduction of a disease that may cause the species to decline.

(i) interfere substantially with the recovery of the species.

Given the high mortality rate of the species recorded to date, the project is considered likely to substantially interfere with the recovery of the species.

Conclusion

Based on the above, the project is likely to result in a significant impact on an important population of the five-clawed worm-skink.

10.0 APPENDIX B – REGULATOR CORRESPONDENCE RECORDS

11.0 APPENDIX C – FCWS REGISTER

Table 12-1. The FCWS Register up until the 07th October 2022

RefNo	Capture Date and Time	Capture Easting GDA94	Capture Northing GDA94	SVL (mm)	Tail Length (mm)	Total Length (mm)	Age	Condition	Microhabitat at capture site	PCT at capture site	Soil at capture site	Capture Soil Crack Density	Capture Largest Soil Crack	CaptureSoil Crack Depth	Capture Perc Litter Cover	Capture Perc Bare Ground	Capture Perc Ground Veg Cover	Capture 3 most abundant groundcover	Capture Large Surface Debris Abunda	Capture Wetness Ground	ConstructionActivity	FCWS detection method	Equipment	Chainage	Condition Analysis	Surveyor Initials	Photograph of Animal	Photograph of capture site	Release Easting GDA94	Release Northing GDA94	Why is site suitable for reloca	Microhabitat at release site	PCT at release site	Soil at release site	Is temporary exclusion fencing	Justification for no fence	Photograph of release site	Comment	Approval	Time o Recome ncement
1	05/07/2021 2:30	238269.13	6782267.72	80.00	50.00	130.00	Adult	Good (tail dropped)	Log	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Slashing	Diurnal - pre-clearing/ disturbance active searches		741.23	Alive	QG, BK	No	No	238219.90	6781983.96	Similar habitat in proximity to capture site	Dense vegetation	56 Poplar Box Belah Woodland	Black cracking clay	Yes		No	First project find triggering unexpected find procedure		
2	16/10/2021 13:45	238035.23	6779304.18	93.87	105.74	199.61	Adult	Good	Under sleeper, black clay cracking soil, heavily disturbed and weeded, 2m east of rail ballist	52 QLD Bluegrass/ Mitchell Grass Grassland	Dark clay soil										Slashing	Diurnal - pre-clearing/ disturbance active searches		738.17	Alive	QG, VP	Yes	Yes	237928.59	6781890.16	Similar habitat to discovery site, with black clay soils. Woodland habitat outside of CIZ boundary. Close to previous FCWS capture.	Cracking black clay soil, Under log	78 River Red Gum Riparian Woodland	Dark clay soil	Yes		Yes	Veg heavily weeded, crop land either side of CIZ		
3	17/10/2021 9:50	237993.60	6779657.88	114.07			Adult	Good (tail dropped)	Cracking black clay soils - found after being dug up by slasher	52 QLD Bluegrass/ Mitchell Grass Grassland	Dark clay soil										Slashing	Diurnal - pre-clearing/ disturbance active searches		738.54	Alive	VP	Yes	Yes	238221.61	6781965.60	Similar habitat to discovery site, with black clay soils. Habitat outside of CIZ boundary. Close to previous FCWS capture.	Cracking black clay soil, Under log	56 Poplar Box Belah Woodland	Dark clay soil	Yes		Yes	Veg heavily weeded, crop land either side of CIZ		
4	17/10/2021 10:46	237965.40	6779874.79				Adult	Dead	Cracking black clay soils - found after being dug up by slasher	52 QLD Bluegrass/ Mitchell Grass Grassland	Dark clay soil										Slashing	Diurnal - post clearing search	Slasher	738.75	Dead	VP	Yes	Yes								No			
5	18/10/2021 8:29	237910.63	6780272.12	79.29	74.21	153.50	Adult	Fair	Black cracking clay soils; found during grubbing surveys	52 QLD Bluegrass/ Mitchell Grass Grassland	Dark clay soil										Topsoil removal	Diurnal - post topsoil removal search	Dozer	739.15	Alive	VP	Yes	Yes	237937.50	6781794.23	Similar habitat to discovery site, with black clay soils. Habitat outside of CIZ boundary. Close to previous FCWS capture.	Black cracking clay soils. Remnant red gum woodland	78 River Red Gum Riparian Woodland	Dark clay soil	Yes		No			
6	18/10/2021 8:58	237935.34	6780098.54	78.62	99.38	178.00	Adult	Dead	Black cracking clay soils; found during grubbing surveys	52 QLD Bluegrass/ Mitchell Grass Grassland	Dark clay soil										Topsoil removal	Diurnal - post topsoil removal search	Dozer	738.98	Dead	VP	Yes	Yes								NA			
8	18/10/2021 10:00	237965.49	6779890.91				Adult	Dead	Black cracking clay soils; found during grubbing surveys	52 QLD Bluegrass/ Mitchell Grass Grassland	Dark clay soil										Topsoil removal	Diurnal - post topsoil removal search	Dozer	738.76	Dead	VP	Yes	Yes								N/A	Head =9.31mm		
7	18/10/2021 9:15	237927.86	6780186.71	107.29			Adult	Dead	Black cracking clay soils; found during grubbing surveys	52 QLD Bluegrass/ Mitchell Grass Grassland	Dark clay soil										Topsoil removal	Diurnal - post topsoil removal search	Dozer	739.06	Dead	VP	Yes	Yes								No			
9	18/10/2021 12:13	238204.44	6782074.52	99.23	64.40	163.27	Adult	Good	Black cracking clay soils; found during grubbing surveys	52 QLD Bluegrass/ Mitchell Grass Grassland	Dark clay soil										Topsoil removal	Diurnal - post topsoil removal search	Dozer	741.02	Alive	QG	Yes	Yes	238385.79	6782436.99	Similar habitat to discovery site, with black clay soils. Habitat outside of CIZ boundary. Close to previous FCWS capture.	Woodland, soft soil, good cover, plenty of leaf litter	56 Poplar Box Belah Woodland	Dark clay soil	Yes		Yes	Head=8.8mm		
10	18/10/2021 14:13	237948.64	6779993.04				Adult	Good	Black cracking clay soils; found during grubbing surveys	52 QLD Bluegrass/ Mitchell Grass Grassland	Dark clay soil										Topsoil removal	Diurnal - post topsoil removal search	Dozer	738.87	Alive	VP	Yes	Yes	237957.12	6781798.77	Similar habitat to discovery site, with black clay soils. Habitat outside of CIZ boundary. Close to previous FCWS capture.	Woodland, soft soil, good cover, plenty of leaf litter	78 River Red Gum Riparian Woodland	Dark clay soil	Yes		Yes	Measurement data loss due to GIS program error		
11	18/10/2021 14:19	237948.72	6779990.03				Adult	Dead	Black cracking clay soils; found during grubbing surveys	52 QLD Bluegrass/ Mitchell Grass Grassland	Dark clay soil										Topsoil removal	Diurnal - post topsoil removal search	Dozer	738.87	Dead	VP	Yes	Yes								No	-		
12	18/10/2021 14:34	237929.52	6780125.13	78.51			Adult	Dead	Black cracking clay soils; found during grubbing surveys	52 QLD Bluegrass/ Mitchell Grass Grassland	Dark clay soil										Topsoil removal	Diurnal - post topsoil removal search	Dozer	739	Dead	VP	Yes	Yes								Yes	Tail missing		
13	18/10/2021 14:53	237939.23	6780077.25	89.42			Adult	Dead	Black cracking clay soils; found during grubbing surveys	52 QLD Bluegrass/ Mitchell Grass Grassland	Dark clay soil										Topsoil removal	Diurnal - post topsoil removal search	Dozer	738.95	Dead	VP	Yes	Yes								No	Missing tail. SV length approx		
14	18/10/2021 16:09	237958.87	6779887.00	68.52			Adult	Dead	Black cracking clay soils; found during grubbing surveys	52 QLD Bluegrass/ Mitchell Grass Grassland	Dark clay soil										Topsoil removal	Diurnal - post topsoil removal search	Dozer	737.76	Dead	VP	Yes	Yes								No	-		
15	19/10/2021 9:04	238019.10	6779452.80	68.36			Subadult	Good	Black cracking clay soils; found during grubbing surveys	52 QLD Bluegrass/ Mitchell Grass Grassland	Dark clay soil										Topsoil removal	Diurnal - post topsoil removal search	Dozer	738.33	Alive	VP	Yes	Yes	237957.12	6781798.77	Similar habitat to discovery site, with black clay soils. Habitat outside of CIZ boundary. Close to previous FCWS capture.	Woodland, soft soil, good cover, plenty of leaf litter	78 River Red Gum Riparian Woodland	Dark clay soil	Yes		Yes	Tail missing		
16	19/10/2021 9:28	238023.20	6779424.95	108.02			Adult	Dead	Black cracking clay soils; found during grubbing surveys	52 QLD Bluegrass/ Mitchell Grass Grassland	Dark clay soil										Topsoil removal	Diurnal - post topsoil removal search	Dozer	738.3	Dead	VP	Yes	Yes								No	Dead following dozer		
17	19/10/2021 9:57	238007.09	6779567.45	80.24			Adult	Fair	Black cracking clay soils; found during grubbing surveys	52 QLD Bluegrass/ Mitchell Grass Grassland	Dark clay soil										Topsoil removal	Diurnal - post topsoil removal search	Dozer	738.45	Alive	VP	Yes	Yes	237980.32	6781796.02	Similar habitat to discovery site, with black clay soils. Habitat outside of CIZ boundary. Close to previous FCWS capture.		78 River Red Gum Riparian Woodland	Dark clay soil	Yes		Yes	Missing tail		
18	19/10/2021 11:41	238049.86	6779223.68	93.01			Adult	Fair	Black cracking clay soils; found during grubbing surveys	52 QLD Bluegrass/ Mitchell Grass Grassland	Dark clay soil										Topsoil removal	Diurnal - post topsoil removal search	Dozer	738.1	Alive	VP	Yes	Yes	237938.87	6781682.04	Similar habitat to discovery site, with black clay soils. Habitat outside of CIZ boundary. Close to previous FCWS capture.		56 Poplar Box Belah Woodland	Dark clay soil	Yes		Yes	Tail missing		
19	19/10/2021 12:03	238033.55	6779322.94	109.83			Adult	Dead	Black cracking clay soils; found during grubbing surveys	52 QLD Bluegrass/ Mitchell Grass Grassland	Dark clay soil										Topsoil removal	Diurnal - post topsoil removal search	Dozer	738.19	Dead	VP	No	No								No			
20	19/10/2021 12:08	238034.80	6779332.97				Adult	Dead	Black cracking clay soils; found during grubbing surveys	52 QLD Bluegrass/ Mitchell Grass Grassland	Dark clay soil										Topsoil removal	Diurnal - post topsoil removal search	Dozer	738.2	Dead	VP	No	No								No	Bottom half of body missing		
22	19/10/2021 12:40	238073.66	6779001.63	92.44			Adult	Fair	Black cracking clay soils; found during grubbing surveys	Exotic Grassland	Dark clay soil										Topsoil removal	Diurnal - post topsoil removal search	Dozer	737.87	Alive	VP	Yes	Yes	237985.73	6781748.65	Similar habitat to discovery site, with black clay soils. Habitat outside of CIZ boundary. Close to previous FCWS capture.		78 River Red Gum Riparian Woodland	Dark clay soil	Yes		No			
24	19/10/2021 13:01	238085.49	6778912.96	85.72	105.20	190.92	Adult	Good	Black cracking clay soils; found during grubbing surveys	Exotic Grassland	Dark clay soil										Topsoil removal	Diurnal - post topsoil removal search	Dozer	737.78	Alive	VP	Yes	Yes	237962.40	6781756.47	Similar habitat to discovery site, with black clay soils. Habitat outside of CIZ boundary. Close to previous FCWS capture.	Dense groundcover	78 River Red Gum Riparian Woodland	Dark clay soil	Yes		Yes			
25	19/10/2021 13:15	238064.59	6779052.85				Adult	Dead (euthanised)	Black cracking clay soils; found during grubbing surveys	52 QLD Bluegrass/ Mitchell Grass Grassland	Dark clay soil										Topsoil removal	Diurnal - post topsoil removal search	Dozer	737.92	Dead	VP	No	No								No	Broken back - euthenased		
26	19/10/2021 13:31	238071.72	6778972.58	105.77			Adult	Dead	Black cracking clay soils; found during grubbing surveys	Exotic Grassland	Dark clay soil										Topsoil removal	Diurnal - post topsoil removal search	Dozer	737.85	Dead	VP	No	No								No			
21	19/10/2021 12:38	238077.46	6778924.34				Adult	Dead	Black cracking clay soils; found during grubbing surveys	Exotic Grassland	Dark clay soil										Topsoil removal	Diurnal - post topsoil removal search	Dozer	737.8	Dead	VP	Yes	Yes								No	Cut in half		
23	19/10/2021 12:58	238071.20	6779034.75	80.69	91.40	172.09	Adult	Dead	Black cracking clay soils; found during grubbing surveys	52 QLD Bluegrass/ Mitchell Grass Grassland	Dark clay soil										Topsoil removal	Diurnal - post topsoil removal search	Dozer	737.9	Dead	VP	No	No								No			
27	19/10/2021 14:40	238072.68	6779019.91	114.99			Adult	Dead	Black cracking clay soils; found during grubbing surveys	52 QLD Bluegrass/ Mitchell Grass Grassland	Dark clay soil										Topsoil removal	Diurnal - post topsoil removal search	Dozer	737.88	Dead	VP	Yes	Yes								No			
28	19/10/2021 14:59	238067.38	6779022.58	84.18			Adult	Dead	Black cracking clay soils; found during grubbing surveys	52 QLD Bluegrass/ Mitchell Grass Grassland	Dark clay soil										Topsoil removal	Diurnal - post topsoil removal search	Dozer	737.89	Dead	VP	Yes	Yes								No			
29	19/10/2021 15:38	238080.55	6778892.82	114.77			Adult	Dead	Black cracking clay soils; found during grubbing surveys	Exotic Grassland	Dark clay soil										Topsoil removal	Diurnal - post topsoil removal search	Dozer	737.77	Dead	VP	Yes	Yes								No			
31	05/11/2021 21:36	237959.52	6779723.02	109.00			Adult	Good, old tail damage	Old rail metal	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Nocturnal - active searches		738.6	Alive	DSA, VP	No	No	237977.76	6781844.67	Same soil, close to capture veg cover, log	Log, dense ground cover	78 River Red Gum Riparian Woodland	Black clay	Yes		No	Active search during nocturnal survey trial		

RefNo	Capture Date and Time	Capture Easting GDA94	Capture Northing GDA94	SVL (mm)	Tail Length (mm)	Total Length (mm)	Age	Condition	Microhabitat at capture site	PCT at capture site	Soil at capture site	Capture Soil Crack Density	Capture Largest Soil Crack	CaptureSoil Crack Depth	Capture Perc Litter Cover	Capture Perc Bare Ground	Capture Perc Ground Veg Cover	Capture 3 most abundant groundcover	Capture Large Surface Debris Abunda	Capture Wetness Ground	Constructio nActivity	FCWS detection method	Equipment	Chainage	Condition Analysis	Surveyor Initials	Photograph of Animal	Photograph of capture site	Release Easting GDA94	Release Northing GDA94	Why is site suitable for reloca	Microhabitat at release site	PCT at release site	Soil at release site	Is temporary exclusion fencing	Justification for no fence	Photograph of release site	Comment	Approva	Time o Recome ncement
30	05/11/2021 20:02	238004.02	6779375.93	81.00	92.00	173.00	Adult	Good	Below large rock	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Nocturnal - active searches		738.25	Alive	DSA, VP	No	No	237977.76	6781844.67	Same soil, close to capture, veg cover log	Log, dense ground cover	78 River Red Gum Riparian Woodland	Black clay	Yes		No	Active search during nocturnal survey trial		
34	15/11/2021 13:50	237863.30	6781206.98	83.00	108.00	191.00	Adult	Good	Soil crack	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	740.1	Alive	BK	Yes	No	237954.40	6781753.88	Similar soils, close proximity to other FCWS finds		78 River Red Gum Riparian Woodland	Black cracking clay	Yes		Yes			
32	15/11/2021 6:49	237914.52	6781380.24	110.00			Adult	Good (tail dropped)	Mulched vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil ripping	Diurnal - post ripping search	Grader	740.27	Alive	DSA	No	No	237887.43	6781355.93	Same habitat	Dense vegetation	27 Weeping Myall Woodland	Black cracking clay	Yes		No			
33	15/11/2021 13:42	237861.81	6781192.77	115.00	133.00	248.00	Adult	Good	Dense vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil ripping	Diurnal - post ripping search	Grader	740.08	Alive	BK	Yes	No	237947.27	6781752.01	Good native vegetation with dead wood laying around	Dense vegetation	78 River Red Gum Riparian Woodland	Black cracking clay	Yes		No			
35	15/11/2021 14:20	237969.56	6779621.46	85.00			Adult	Good (tail dropped)	Dense vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Red cracking clay										Topsoil ripping	Diurnal - post ripping search	Grader	738.5	Alive	BJM, DSA	Yes	No	237950.94	6781758.01	Native vegetation with dead wood available	Dense vegetation	78 River Red Gum Riparian Woodland	Black cracking clay	Yes		No			
37	15/11/2021 22:15	238139.36	6778374.89	90.00	100.00	190.00	Adult	Good	Mulched vegetation	Exotic Grassland	Black cracking clay										Topsoil removal	Nocturnal - active searches		737.25	Alive	VP and BJM	Yes	Yes	237957.59	6781676.11	Similar soil, close to other FCWS finds	Tree root	78 River Red Gum Riparian Woodland	Black cracking clay	Yes		No	Higher sand content with black clay. Found under mulched grass while pre - clearing.		
36	15/11/2021 16:24	237882.62	6780324.41					Tail only	Soil crack	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Grader	739.21	Tail only	VP and BJM	No	No									No	Likely FCWS death		
38	16/11/2021 5:40	237859.47	6780618.84	108.00			Adult	Good	Mulched vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - pre-clearing/ disturbance active searches		739.5	Alive	DSA	No	No	237796.00	6780812.08	Same habitat and soil	Dense vegetation	27 Weeping Myall Woodland	Black cracking clay	Yes		No			
40	16/11/2021 9:45	238075.93	6778800.43					Tail only	N/A	Exotic Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Grader	737.67	Alive	DSA	No	No									No	Tail only, found post topsoil stripping after area had been ripped. Non native grassland		
45	16/11/2021 16:30	238169.29	6778308.56	110.00	120.00	230.00	Adult	Dead (euthanised)	N/A	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Grader	737.17	Dead	BJM	Yes	No									No	Found with broken spine on an area that had been ripped, while topsoil stripping was occurring. Had to be Euthanised via blunt force trauma. Area was ripped earlier that day. Grader used.		
44	16/11/2021 16:20	238145.24	6778366.66					Tail only	N/A	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Grader	737.23	Tail only	BJM	No	No									No	Found FCWS tail during topsoil stripping after ripping		
39	16/11/2021 9:30	237899.49	6781327.64					Dead	Dense vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	740.22	Dead	BK	No	No									No	Found during vegetation/topsoil removal on steep batter in cutting. Excavator was undertaking work as it was too steep for a grader.		
41	16/11/2021 11:30	237873.80	6781260.79					Dead	Dense vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	740.14	Dead	BK	No	No									No	Found during vegetation/topsoil removal on steep batter in cutting. Excavator was undertaking work as it was too steep for a grader.		
42	16/11/2021 11:40	237852.20	6781201.47	60.00			Subadult	Dead (euthanised)	Dense vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	740.08	Dead	BK	No	No									No	Found during vegetation/topsoil removal on steep batter in cutting. Excavator was undertaking work as it was too steep for a grader.		
43	16/11/2021 13:40	237832.25	6781080.89					Dead	Dense vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	739.95	Dead	BK	No	No									No	Found during vegetation/topsoil removal on steep batter in cutting. Excavator was undertaking work as it was too steep for a grader.		
49	17/11/2021 15:15	238172.62	6778306.85				Adult	Good	Log	Exotic Grassland	Black cracking clay										Slashing	Diurnal - post clearing search	Slasher	737.17	Alive	BK	No	No	238172.69	6778306.86			Exotic Grassland				No	Self relocated out of corridor, pile of wooden sleeps made so it has suitable habitat away from construction. Exotic grassland.		
46	17/11/2021 8:22	238273.30	6777457.72					Tail only	N/A	52 QLD Bluegrass/ Mitchell Grass Grassland	Red cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Grader	736.3	Tail only	DSA	No	No									No	Fcws tail, likely mortality in wind-rowed topsoil (body not found). In topsoil ripping trial area.		
47	17/11/2021 8:37	238256.25	6777376.18					Tail only	N/A	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Grader	736.24	Tail only	DSA	No	No									No	Exotic grassland. Tail only found.		
48	17/11/2021 15:07	238196.68	6777854.20					Dead	N/A	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Grader	736.72	Dead	DSA	No	No									No	Exotic grassland. Dead (not complete skink). Ripping not undertaken due to underground utilities		
50	17/11/2021 15:29	238162.01	6778163.50					Dead	N/A	Exotic Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Grader	737.03	Dead	DSA	No	No									No	Exotic grassland. Dead (not complete skink). Ripping not undertaken due to underground utilities		
52	18/11/2021 14:26	238120.23	6778405.32	89.00			Adult	Dead	N/A	Exotic Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Grader	737.275	Dead	DSA	No	No									No	Grader.		
51	18/11/2021 14:09	238117.58	6778494.08				Adult	Tail only	N/A	Exotic Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Grader	737.36	Tail only	DSA	No	No									No	Tail only detected, significant soil compaction, likely dead		

RefNo	Capture Date and Time	Capture Easting GDA94	Capture Northing GDA94	SVL (mm)	Tail Length (mm)	Total Length (mm)	Age	Condition	Microhabitat at capture site	PCT at capture site	Soil at capture site	Capture Soil Crack Density	Capture Largest Soil Crack	CaptureSoil Crack Depth	Capture Perc Litter Cover	Capture Perc Bare Ground	Capture Perc Ground Veg Cover	Capture 3 most abundant groundcover	Capture Large Surface Debris Abunda	Capture Wetness Ground	ConstructionActivity	FCWS detection method	Equipment	Chainage	Condition Analysis	Surveyor Initials	Photograph of Animal	Photograph of capture site	Release Easting GDA94	Release Northing GDA94	Why is site suitable for reloca	Microhabitat at release site	PCT at release site	Soil at release site	Is temporary exclusion fencing	Justification for no fence	Photograph of release site	Comment	Approva	Time o Recome ncement
53	18/11/2021 15:21	238166.90	6778338.89	110.00			Subadult	Good (tail dropped)	Mulched vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	737.2	Alive	BK	No	No	238116.32	6778409.77			52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	No	Dispersed animal in habitat outside of topsoil stripping area. Topsoil stripping complete.	No	Found during excavator stripping in 'V' drain. Animal dispersed during processing outside of the grubbing area, within SPIR		
54	18/11/2021 16:01	238127.30	6778577.68					Dead	Soil crack	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Grader	737.45	Dead	VP	No	No									No	Tail only - body could not be located (see photo). Grubbing with grader		
55	18/11/2021 16:10	238125.82	6778602.73	105.00	124.00	229.00	Adult	Dead	Soil crack	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Grader	737.47	Dead	VP	Yes	Yes									No	Grader		
56	18/11/2021 16:19	238118.67	6778640.41					Tail only	Soil crack	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Grader	737.52	Tail only	VP	Yes	Yes									No	Grader		
57	18/11/2021 16:25	238120.68	6778628.93	108.00				Dead	Soil crack	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Grader	737.49	Dead	VP	Yes	No									No	Grader. Half of tail missing.		
58	18/11/2021 16:33	238125.84	6778617.89	85.00			Subadult	Fair	Soil crack	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Grader	737.48	Alive	VP	Yes	Yes	238192.25	6777479.91	Similar soil, close to other FCWS finds	Mulched vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	No	Topsoil stripping completed.	No	Grader. Tail missing		
59	18/11/2021 16:38	238127.05	6778590.36	112.00			Adult	Dead	Soil crack	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Grader	737.45	Dead	VP	Yes	Yes									Yes	Grader		
60	19/11/2021 8:07	238153.67	6778224.22					Dead	Soil crack	Exotic Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	737.08	Dead	BK	No	No									No	Excavator		
65	19/11/2021 11:24	238098.10	6778616.17	105.00			Adult	Dead	Mulched vegetation	Exotic Grassland	Red cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	737.48	Dead	BK	No	No									No	-		
66	19/11/2021 11:32	237832.82	6780867.03	130.00			Adult	Good (tail dropped)	Mulched vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - pre-clearing/ disturbance active searches		739750	Alive	QG, DA	No	No	237758.96	6780789.11	Cover, soil, close to capture sight	Dense vegetation	27 Weeping Myall Woodland	Black cracking clay	Yes		No	Grader		
67	19/11/2021 11:35	237839.09	6780778.13	90.00			Subadult	Good (tail dropped)	Mulched vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Grader	739.66	Alive	QG, DA	No	No	237758.96	6780789.11	Cover, soil, close capture site	Dense vegetation	27 Weeping Myall Woodland	Black cracking clay	Yes		No	Grader		
61	19/11/2021 8:37	238120.68	6778690.23	125.00			Adult	Good (tail dropped)	Mulched vegetation	Exotic Grassland	Black cracking clay										Slashing	Diurnal - pre-clearing/ disturbance active searches		737.56	Alive	QG	No	No	237749.65	6780795.03	Cover, vegetation, soil	Dense vegetation	27 Weeping Myall Woodland	Black cracking clay	Yes		No	Lost tail		
69	19/11/2021 12:14	238047.96	6781675.57	111.00			Adult	Good (tail dropped)	Dense vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Grader	740.59	Alive	DSA	No	No	237983.10	6781663.24	Similar habitat, soil and proximity	Log	56 Poplar Box Belah Woodland	Black cracking clay	Yes		No	Grader		
73	19/11/2021 13:19	237879.09	6781221.30	89.00			Adult	Good (tail dropped)	Dense vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Grader	740.11	Alive	DSA	No	No	237969.63	6781635.40	Similar habitat, soil and proximity	Log	56 Poplar Box Belah Woodland	Black cracking clay	Yes		No	Grader		
63	19/11/2021 11:00	237880.71	6780539.19					Dead	Dense vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Grader	739.42	Dead	DSA	No	No									No	Grader.		
62	19/11/2021 9:40	237852.51	6781002.91					Dead	Dense vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Grader	739.88	Dead	DSA	No	No									No	Grader.		
64	19/11/2021 11:01	237962.04	6781466.45					Dead	Dense vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Grader	740.37	Dead	DSA	No	No									No	Grader.		
72	19/11/2021 13:12	238018.32	6781579.05					Dead	Dense vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Grader	740.49	Dead	DSA	No	No									No	Grader.		
70	19/11/2021 12:30	237901.25	6781256.24					Dead	Dense vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Grader	740.15	Dead	DSA	No	No									No	Grader.		
71	19/11/2021 12:41	237996.86	6781532.20					Dead	Dense vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Grader	740.44	Dead	DSA	No	No									No	Grader.		
68	19/11/2021 12:01	237916.85	6781340.67					Dead	Dense vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Grader	740.23	Dead	DSA	No	No									No	Grader.		
75	19/11/2021 14:48	237953.54	6781487.73					Dead	N/A (found during topsoil removal)	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Grader	740.38	Dead	BJM	No	No									No	Grader		
77	19/11/2021 15:13	237978.62	6781517.70					Dead	Soil crack	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Grader	740.42	Dead	BJM	No	No									No	Grader		
78	19/11/2021 15:22	237943.30	6781449.17	99.00	111.00	210.00	Adult	Good	Dense vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Grader	740.35	Alive	BJM	No	No	237923.54	6781497.52	Similar habitat, soil and proximity	Log	27 Weeping Myall Woodland	Black cracking clay	Yes		No	Grader		
79	19/11/2021 15:55	238004.62	6781598.36	85.00			Adult	Dead	N/A	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Grader	740.52	Dead	BJM	Yes	Yes									No	Grader		
76	19/11/2021 15:10	238005.31	6781591.15				Adult	Dead	Soil crack	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Grader	740.5	Dead	BJM	Yes	Yes									No	Grader		
74	19/11/2021 13:53	238031.31	6781598.69					Tail only	N/A (found during topsoil removal)	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Grader	740.51	Tail only	BJM	No	No									No	Grader		
80	19/11/2021 16:40	237929.24	6781403.77				Adult	Dead	N/A	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Grader	740.3	Dead	BJM	Yes	No									No	Grader		
90	20/11/2021 10:04	238261.97	6782251.28	85.00	115.00	200.00	Adult	Good	Log	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Grader	741.21	Alive	QG, DA	No	No	238208.53	6781987.45	Cover, soil, close capture site	Log	56 Poplar Box Belah Woodland	Black cracking clay	Yes		No	Grader, found under railway sleeper.		
98	20/11/2021 14:56	238592.99	6783055.83	85.00	85.00	170.00	Adult	Good	Mulched vegetation	56 Poplar Box-Belah Woodland	Black cracking clay										Topsoil removal	Diurnal - pre-clearing/ disturbance active searches		742.07	Alive	QG	No	No	238554.93	6782739.72	Cover, soil, outside CIZ	Log	56 Poplar Box Belah Woodland	Black cracking clay	No	Topsoil stripping completed. Large area o offsite habitat	No	No machines, raking ahead		
81	20/11/2021 7:10	238110.39	6781821.11	120.00	110.00	230.00	Adult	Good	Log	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Slashing	Diurnal - pre-clearing/ disturbance active searches		740.75	Alive	BK	No	No	237967.56	6781801.79	In proximity to capture	Leaf litter	78 River Red Gum Riparian Woodland	Black cracking clay	Yes		No	Approx. measurements.		
82	20/11/2021 7:41	238111.53	6781879.05	102.00				Dead	Dense vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Grader	740.82	Dead	DSA	No	No									No	Grader. Euthanased		
83	20/11/2021 7:46	238150.32	6781965.41	82.00	102.00	184.00	Subadult	Dead	Dense vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Grader	740.91	Dead	DSA	No	No									No	Grader. Euthanased		
84	20/11/2021 7:46	238086.90	6781730.95	87.00			Subadult	Dead	Dense vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Grader	740.65	Dead	DSA	No	No									No	Grader. Euthanased		
88	20/11/2021 9:46	238005.70	6781608.66				Subadult	Dead	Dense vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Grader	740.52	Dead	DSA	No	No									No	Grader.		
95	20/11/2021 12:46	238418.61	6782553.78				Subadult	Dead	Dense vegetation	56 Poplar Box-Belah Woodland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Grader	741.54	Dead	DSA	No	No									No	Grader.		
94	20/11/2021 11:46	238281.00	6782229.28				Subadult	Dead	Dense vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Grader	741.19	Dead	DSA	No	No									No	Grader.		
93	20/11/2021 11:30	238370.89	6782458.42					Dead	N/A	56 Poplar Box-Belah Woodland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Grader	741.43	Dead	DSA	No	No									No	Grader		
85	20/11/2021 9:15	238171.60	6782034.99					Dead	N/A	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Grader	740.97	Dead	DSA	No	No									No	Grader		
97	20/11/2021 14:15	238179.14	6781998.03					Dead	N/A	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Grader	740.94	Dead	DSA	No	No									No	Grader		
92	20/11/2021 11:15	238168.65	6781958.37					Tail only	N/A	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Grader	740.9	Tail only	DSA	No	No									No	Grader		

RefNo	Capture Date and Time	Capture Easting GDA94	Capture Northing GDA94	SVL (mm)	Tail Length (mm)	Total Length (mm)	Age	Condition	Microhabitat at capture site	PCT at capture site	Soil at capture site	Capture Soil Crack Density	Capture Largest Soil Crack	CaptureSoil Crack Depth	Capture Perc Litter Cover	Capture Perc Bare Ground	Capture Perc Ground Veg Cover	Capture 3 most abundant groundcover	Capture Large Surface Debris Abunda	Capture Wetness Ground	Constructio nActivity	FCWS detection method	Equipment	Chainage	Condition Analysis	Surveyor Initials	Photograph of Animal	Photograph of capture site	Release Easting GDA94	Release Northing GDA94	Why is site suitable for reloca	Microhabitat at release site	PCT at release site	Soil at release site	Is temporary exclusion fencing	Justification for no fence	Photograph of release site	Comment	Approva	Time o Recome ncement
96	20/11/2021 13:30	238121.01	6781847.03					Tail only	N/A	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Grader	740.78	Tail only	DSA	No	No									No	Grader		
86	20/11/2021 9:30	238094.75	6781897.91					Tail only	N/A	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Grader	740.82	Tail only	DSA	No	No									No	Grader		
87	20/11/2021 9:45	238096.47	6781914.08					Tail only	N/A	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Grader	740.84	Tail only	DSA	No	No									No	Grader		
89	20/11/2021 10:00	238159.28	6781993.00					Tail only	N/A	27 Weeping Myall Woodland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Grader	740.93	Tail only	DSA	No	No									No	Grader		
91	20/11/2021 10:30	238179.63	6782045.16					Tail only	N/A	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Grader	740.98	Tail only	DSA	No	No									No	Grader		
99	30/11/2021 7:00	237867.63	6781160.54	102.00	95.00	197.00	Adult	Good	Mulched vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - pre-clearing/ disturbance active searches		740.04	Alive	DSA, GH	No	No	237864.89	6781335.42	Suitable habitat; proximate to capture site	Dense vegetation	27 Weeping Myall Woodland	Black cracking clay	Yes		No	Grader previously partially removed topsoil from		
100	30/11/2021 8:15	237858.17	6781098.95	75.00	100.00	175.00	Subadult	Good	N/A (found during topsoil removal)	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	739.98	Alive	DSA, GH	No	No	237856.88	6781338.14	Suitable habitat proximate to capture site	Dense vegetation	27 Weeping Myall Woodland	Black cracking clay	Yes		No	Excavator topsoil removal to complete works attempted by grader		
101	30/11/2021 9:30	238001.01	6781546.13	90.00	130.00	220.00	Adult	Good	N/A (found during topsoil removal)	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	740.45	Alive	DSA, GH	No	No	237869.28	6781363.18	Suitable habitat proximate to capture site	Dense vegetation	27 Weeping Myall Woodland	Black cracking clay	Yes		No	Excavator topsoil removal on batter impacted by grader		
102	30/11/2021 9:30	237834.34	6781098.83					Tail only	N/A (found during topsoil removal)	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	739.98	Tail only	DSA	No	No									No	Excavator topsoil removal on batter. Tail only found. Soil not compacted so survival possible. No further disturbance to soil pile		
103	30/11/2021 9:45	237941.59	6781392.08					Tail only	N/A (found during topsoil removal)	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	740.28	Tail only	DSA, GH	No	No									No	Excavator topsoil removal. Soil not compacted and no further disturbance to relocated topsoil.		
104	30/11/2021 19:58	238029.42	6781636.95	100.00			Adult	Good (tail dropped)	Mulched vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Nocturnal - active searches		740.55	Alive	QG, BM	No	No	237969.43	6781731.32	Close capture site, soil, outside CIZ	Dense vegetation	78 River Red Gum Riparian Woodland	Black cracking clay	Yes		No	Tail regrowing		
105	30/11/2021 21:15	238647.11	6783184.13	90.00			Subadult	Good (tail dropped)	Mulched vegetation	56 Poplar Box-Belah Woodland	Black cracking clay										Topsoil removal	Nocturnal - active searches		742.22	Alive	QG, BM	No	No	238700.52	6783212.39	Soil, close capture site, cover, outside CIZ	Dense vegetation	56 Poplar Box-Belah Woodland	Black cracking clay	Yes		No			
110	02/12/2021 11:38	237984.75	6781488.37					Tail only	Soil crack	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	740.39	Tail only	VP	No	No									No	Excavator		
107	02/12/2021 9:00	238565.58	6782941.41	110.00	125.00	235.00	Adult	Good	Mulched vegetation	56 Poplar Box-Belah Woodland	Black cracking clay										Topsoil removal	Diurnal - pre-clearing/ disturbance active searches		741.95	Alive	QG	No	No	238538.25	6782696.40	Cover, soil, close capture site	Log	56 Poplar Box-Belah Woodland	Black cracking clay	No	Topsoil stripping completed. Large area o offsite habitat	No	Pre-clear no machines		
106	02/12/2021 8:37	237951.76	6781486.69	80.00	95.00	175.00	Adult	Good	Soil crack	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - pre-clearing/ disturbance active searches		740.38	Alive	DSA	No	No	237913.36	6781499.24	Proximate to capture site	Dense vegetation	27 Weeping Myall Woodland	Black cracking clay	Yes		No			
108	02/12/2021 10:45	237965.38	6781428.10				Adult	Tail only	N/A (found during topsoil removal)	52 QLD Bluegrass/ Mitchell Grass Grassland	Red cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	740.33	Tail only	GH	No	No									No			
111	02/12/2021 12:00	237957.09	6781414.64	85.00	80.00	165.00	Subadult	Good	N/A (found during topsoil removal)	52 QLD Bluegrass/ Mitchell Grass Grassland	Red cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	740.3	Alive	GH	No	No	237863.85	6781350.45	Cover, soil, close capture site	Dense vegetation	27 Weeping Myall Woodland	Black cracking clay	Yes		No			
112	02/12/2021 14:54	238027.44	6781719.74	120.00	80.00	200.00	Adult	Good	N/A (found during topsoil removal)	52 QLD Bluegrass/ Mitchell Grass Grassland	Red cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	740.63	Alive	GH	No	No	237993.73	6781829.10	Cover, soil, close capture site	Dense vegetation	78 River Red Gum Riparian Woodland	Black cracking clay	Yes		No			
109	02/12/2021 21:30	238222.29	6782149.64	80.00	112.00	192.00	Adult	Good	Mulched vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Nocturnal - active searches		741.1	Alive	QG	No	No	237972.94	6781793.36	Cover, close capture site	Log	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	Yes		No	No machines		
113	03/12/2021 12:10	238277.81	6782271.34					Dead	Soil crack	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	741.23	Dead	VP	No	No									No	Back of tail and mid body section detected - cut by excavator		
114	03/12/2021 18:14	238480.62	6782722.39	105.00	25.00	130.00	Adult	Good	N/A (found during topsoil removal)	56 Poplar Box-Belah Woodland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	741.72	Alive	GH	No	No	238548.93	6782723.40		Dense vegetation	56 Poplar Box-Belah Woodland	Black cracking clay	No	Topsoil stripping completed. Large area o offsite habitat	No	Healthy, tail dropped not long ago but healed		
115	04/12/2021 16:11	239022.33	6784110.87	125.00	55.00	175.00	Adult	Good	Tree root	Exotic Grassland	Black cracking clay										Tree clearing	Diurnal - post topsoil removal search	Excavator	743.22	Alive	GH, QG	No	No	238698.33	6783223.08	Closest to capture site, outside CIZ	Dense vegetation	56 Poplar Box-Belah Woodland	Black cracking clay	Yes		No	Tail regrowing		
116	06/12/2021 21:41	238603.91	6783026.41	110.00	115.00	225.00	Adult	Good	Log	56 Poplar Box-Belah Woodland	Black cracking clay										Topsoil removal	Nocturnal - active searches		742.05	Alive	QG, BM	No	No	238719.91	6783252.71	Cover, soil, outside CIZ, close capture site	Dense vegetation	56 Poplar Box-Belah Woodland	Black cracking clay	Yes		No	No machines		
117	07/12/2021 11:05	238830.44	6783609.86					Tail only	Soil crack	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	742.68	Tail only	VP	No	No									No	Excavator - body could not be located		
118	07/12/2021 15:04	238559.31	6782929.79	55.00	25.00	80.00	Subadult	Good	N/A (found during topsoil removal)	56 Poplar Box-Belah Woodland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	741.94	Alive	GH	No	No	238570.19	6782768.75	Heavy vegetation, plenty of cover	Dense vegetation	56 Poplar Box-Belah Woodland	Black cracking clay	No	Topsoil stripping completed. Large area o offsite habitat	No			
119	07/12/2021 15:10	238587.38	6782996.40	0.00			Adult	Dead	N/A (found during topsoil removal)	56 Poplar Box-Belah Woodland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	742.02	Dead	GH	No	No									No			
120	07/12/2021 15:31	238607.33	6783051.56	90.00	55.00	145.00	Adult	Good	N/A (found during topsoil removal)	56 Poplar Box-Belah Woodland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	742.07	Alive	GH	No	No	238720.84	6783207.14	Plenty of cover, good vegetation	Dense vegetation	56 Poplar Box-Belah Woodland	Black cracking clay	Yes		No			
121	07/12/2021 15:40	238674.57	6783214.54	75.00	90.00	165.00	Adult	Good	N/A (found during topsoil removal)	56 Poplar Box-Belah Woodland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	742.25	Alive	GH	No	No	238712.06	6783220.58	Good vegetation, covered area	Dense vegetation	56 Poplar Box-Belah Woodland	Black cracking clay	Yes		No			
122	07/12/2021 16:37	238691.80	6783273.59					Tail only	Mulched vegetation	56 Poplar Box-Belah Woodland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	742.31	Tail only	QG, BM	No	No									No			
123	07/12/2021 16:40	238718.40	6783343.18					Dead	Mulched vegetation	56 Poplar Box-Belah Woodland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	742.39	Dead	GH	No	No									No	Unsure age, only recovered half of body		
124	07/12/2021 16:45	238696.30	6783331.78	105.00		105.00	Adult	Good (tail dropped)	Mulched vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	742.37	Alive	QG BM	No	No	238736.05	6783215.32	Cover, outside CIZ, close capture site	Dense vegetation	56 Poplar Box-Belah Woodland	Black cracking clay	Yes		No			
125	08/12/2021 14:31	238831.72	6783663.75				Adult	Dead (euthanised)	N/A (found during topsoil removal)	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	742.73	Dead	GH	No	No									No			
126	08/12/2021 14:34	238814.80	6783626.65				Adult	Dead (euthanised)	N/A (found during topsoil removal)	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	742.7	Dead	GH	No	No									No			
127	09/12/2021 9:40	238095.18	6778698.09	117.00	122.00	237.00	Adult	Good	Soil crack	Exotic Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	737.56	Alive	VP	No	No	237731.33	6780796.30	Closest suitable habitat outside CIZ, within SPIR	Dense vegetation	27 Weeping Myall Woodland	Black cracking clay	Yes		No			
129	09/12/2021 13:53	237884.28	6781207.57	80.00	110.00	190.00	Adult	Good	N/A (found during topsoil removal)	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	740.1	Alive	GH	No	Yes	237760.42	6780785.12	Good thick vegetation	Dense vegetation	27 Weeping Myall Woodland	Black cracking clay	Yes		Yes	Successfully relocated, unable to get photo of animal		

RefNo	Capture Date and Time	Capture Easting GDA94	Capture Northing GDA94	SVL (mm)	Tail Length (mm)	Total Length (mm)	Age	Condition	Microhabitat at capture site	PCT at capture site	Soil at capture site	Capture Soil Crack Density	Capture Largest Soil Crack	CaptureSoil Crack Depth	Capture Perc Litter Cover	Capture Perc Bare Ground	Capture Perc Ground Veg Cover	Capture 3 most abundant groundcover	Capture Large Surface Debris Abunda	Capture Wetness Ground	Constructio nActivity	FCWS detection method	Equipment	Chainage	Condition Analysis	Surveyor Initials	Photograph of Animal	Photograph of capture site	Release Easting GDA94	Release Northing GDA94	Why is site suitable for reloca	Microhabitat at release site	PCT at release site	Soil at release site	Is temporary exclusion fencing	Justification for no fence	Photograph of release site	Comment	Approva	Time o Recome ncement
130	09/12/2021 14:01	237884.01	6781208.77	115.00	8.00	123.00	Adult	Good (tail dropped)	N/A (found during topsoil removal)	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	740.1	Alive	GH	Yes	N/A	237757.83	6780783.86	Good thick vegetation	Dense vegetation	27 Weeping Myall Woodland	Black cracking clay	Yes		Yes	Successfully relocated		
131	09/12/2021 14:05	237855.80	6781065.12	125.00	130.00	255.00	Adult	Good	Mulched vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - pre-clearing/ disturbance active searches		739.52	Alive	GH	Yes	Yes	237748.52	6780786.89		Dense vegetation	27 Weeping Myall Woodland	Black cracking clay	Yes		Yes	Successfully relocated		
128	09/12/2021 13:45	238075.48	6778830.08	89.00			Subadult	Good (tail dropped)	Soil crack	Exotic Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	737.7	Alive	VP	Yes	Yes	237869.11	6781343.77	Soil, veg, proximity to other finds	Tree root	27 Weeping Myall Woodland	Black cracking clay	Yes		Yes	Water reeds around culvert		
132	09/12/2021 14:30	238101.83	6778761.15	85.00	110.00	195.00	Adult	Good	N/A (found during topsoil removal)	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	737.65	Alive	QG	Yes	Yes	237755.99	6780785.54	Outside CIZ, soil, close capture site,	Dense vegetation	27 Weeping Myall Woodland	Black cracking clay	Yes		No			
133	09/12/2021 14:45	238099.94	6778765.95					Tail only	N/A (found during topsoil removal)	Exotic Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	737.64	Tail only	QG	No	Yes									No			
134	09/12/2021 14:45	238104.48	6778762.48					Dead (euthanised)	N/A (found during topsoil removal)	Exotic Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	737.63	Dead	QG	Yes	Yes									No			
136	10/12/2021 7:29	237847.40	6780970.47	110.00	130.00	240.00	Adult	Good	Soil crack	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - pre-clearing/ disturbance active searches		739.85	Alive	GH	Yes	Yes	237752.82	6780786.69	Good thick vegetation	Dense vegetation	27 Weeping Myall Woodland	Black cracking clay	Yes		No	Gravid, healthy		
137	10/12/2021 7:53	238095.56	6778792.25					Tail only	Soil crack	Exotic Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	737.66	Tail only	VP	Yes	Yes									No			
138	10/12/2021 8:06	238092.82	6778798.12				Adult	Dead (euthanised)	Soil crack	Exotic Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	737.67	Dead	VP	Yes	Yes									No			
139	10/12/2021 8:12	238098.56	6778805.59				Adult	Dead (euthanised)	Soil crack	Exotic Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	737.65	Dead	VP	Yes	Yes									No			
140	10/12/2021 8:26	238095.12	6778811.85					Dead	Soil crack	Exotic Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	737.67	Dead	VP	Yes	Yes									No			
141	10/12/2021 8:33	238093.64	6778823.95					Tail only	Soil crack	Exotic Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	737.68	Tail only	VP	Yes	Yes									No			
142	10/12/2021 8:37	238096.11	6778828.64					Dead	Soil crack	Exotic Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	737.69	Dead	VP	Yes	Yes									No	Back half of body only		
143	10/12/2021 8:49	238089.09	6778832.21					Tail only	Soil crack	Exotic Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	737.7	Tail only	VP	Yes	Yes									No			
144	10/12/2021 9:26	238091.05	6778848.61	85.00	93.00	178.00	Subadult	Good	Soil crack	Exotic Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	737.72	Alive	VP	Yes	Yes	237868.30	6781353.55			27 Weeping Myall Woodland	Black cracking clay	Yes		No			
145	10/12/2021 9:45	238088.40	6778842.76	115.00			Adult	Good	Soil crack	Exotic Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	737.71	Alive	VP	Yes	Yes	237883.47	6781366.41		Tree root	27 Weeping Myall Woodland	Black cracking clay	Yes		No	Part tail missing		
146	10/12/2021 9:45	238091.29	6778837.54	121.00			Adult	Good (tail dropped)	Soil crack	Exotic Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	737.71	Alive	VP	Yes	Yes	237868.80	6781360.77		Tree root	27 Weeping Myall Woodland	Black cracking clay	Yes		N/A			
147	10/12/2021 11:47	237860.92	6780710.02					Tail only	N/A (found during topsoil removal)	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil ripping	Diurnal - post topsoil removal search	Excavator	739.6	Tail only	GH	No	No									N/A			
148	10/12/2021 11:54	237853.58	6780697.39					Tail only	N/A (found during topsoil removal)	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	739.58	Tail only	GH	No	No									N/A			
149	10/12/2021 13:49	237868.65	6780620.88	109.00	110.00	219.00	Adult	Good	Soil crack	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	739.5	Alive	VP and GH	Yes	Yes	237858.84	6781346.94		Tree root	27 Weeping Myall Woodland	Black cracking clay	Yes		No			
150	10/12/2021 13:57	237868.07	6780613.70	92.00	112.00	204.00	Adult	Good	Soil crack	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	739.5	Alive	VP and GH	Yes	Yes	237857.87	6781352.20		Leaf litter	27 Weeping Myall Woodland	Black cracking clay	Yes		No			
151	10/12/2021 15:03	237844.93	6780796.44	85.00	5.00	90.00	Subadult	Good	N/A (found during topsoil removal)	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	739.67	Alive	GH	N/A	Yes	237924.72	6781289.67		Dense vegetation	27 Weeping Myall Woodland	Black cracking clay	No	Topsoil stripping completed. Large area o offsite habitat	No			
152	10/12/2021 15:05	237847.08	6780779.22	106.00	142.00	248.00	Adult	Good	N/A (found during topsoil removal)	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	739.65	Alive	GH	N/A	Yes	237912.46	6781253.40		Dense vegetation	27 Weeping Myall Woodland	Black cracking clay	No	Topsoil stripping completed. Large area o offsite habitat	No			
135	09/12/2021 15:45	237854.09	6780733.62	104.00	115.00	219.00	Adult	Good	N/A (found during topsoil removal)	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	739.64	Alive	GH	No	No	237915.99	6781239.14		Dense vegetation	27 Weeping Myall Woodland	Black cracking clay	No	Topsoil stripping completed. Large area o offsite habitat	No			
153	10/12/2021 15:10	237847.79	6780768.94	112.00	5.00	117.00	Adult	Good	N/A (found during topsoil removal)	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	739.65	Alive	GH	N/A	Yes	237925.82	6781261.21		Dense vegetation	27 Weeping Myall Woodland	Black cracking clay	No	Topsoil stripping completed. Large area o offsite habitat	No			
154	10/12/2021 15:33	237886.30	6780478.03	87.00	95.00	182.00	Adult	Good	N/A (found during topsoil removal)	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay										Topsoil removal	Diurnal - post topsoil removal search	Excavator	739.35	Alive	VP and GH	Yes	Yes	237865.05	6781366.37		Leaf litter	27 Weeping Myall Woodland	Black cracking clay	Yes		No			
155	14/12/2021 16:34	238913.28	6783850.85					Tail only	Mulched vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Red gravel loam										Topsoil removal	Diurnal - pre-clearing/ disturbance active searches		742.94	Tail only	DSA	N/A	Yes				Dense vegetation		Red gravel loam	N/A		N/A	Tail only; found during DPIE inspection. Black clay topsoil with red subsoil in cutting with gravel component.		
156	11/01/2022 7:48	237865.14	6780497.35				Adult	Tail only	N/A (found during topsoil removal)	Exotic Grassland	Black cracking clay	1-20%	0.5	3	N/A	61-80%	1-20%		21-40%	Dry	Topsoil removal	Diurnal - post topsoil removal search	Excavator	739.37	Tail only	GH	No	Yes							N/A		N/A		Yes	
157	11/01/2022 8:23	237842.76	6780560.54				Subadult	Good	N/A (found during topsoil removal)	Exotic Grassland	Black cracking clay	0%	3	15	0%	81-100%	1-20%		1-20%	Moist (crumb textured)	Topsoil removal	Diurnal - post topsoil removal search	Excavator	739.45	Alive	GH	No	Yes							N/A		N/A	Dispersed down soil crack and could not be found. Area left overnight to enable fauna to disperse.	Yes	
158	11/01/2022 12:50	237826.18	6780985.31					Tail only	Soil crack	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	N/A	3	8	21-40%	1-20%	41-60%	Queensland bluegrass, Mitchell grass, Johnson grass	21-40%	Dry	Topsoil removal	Diurnal - post topsoil removal search	Excavator	739.9	Tail only	VP	Yes	Yes							N/A		N/A	Tail only - regrowth tail. Tail sample collected (ref. 1.).	Yes	
159	11/01/2022 16:15	238214.22	6777605.07	89.00	109.00	198.00	Adult	Dead	Dense vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	1-20%	2	4	41-60%	1-20%	41-60%	Rhodes grass, fleabane, exotic grass	21-40%	Dry	Topsoil removal	Diurnal - post topsoil removal search	Excavator	736.5	Dead	BK	Yes	Yes							N/A		N/A		Yes	
160	12/01/2022 7:16	238212.23	6777604.14	75.00	20.00	95.00	Subadult	Good (tail dropped)	N/A (found during topsoil removal)	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	1-20%	0.5	0.5	1-20%	1-20%	41-60%		1-20%	Moist (crumb textured)	Topsoil removal	Diurnal - post topsoil removal search	Excavator	736.46	Alive	GH	No	Yes	237932.27	6781336.28	Suitable habitat	Dense vegetation	27 Weeping Myall Woodland	Black cracking clay	No	Topsoil removal in area complete	No		Yes	
161	12/01/2022 9:35	238213.09	6777592.58	40.00	40.00	80.00	Juvenile	Fair	N/A (found during topsoil removal)	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	1-20%	0.5	2	1-20%	1-20%	41-60%		1-20%	Moist (crumb textured)	Topsoil removal	Diurnal - post topsoil removal search	Excavator	736.45	Alive	GH	Yes	No	237924.56	6781270.38	Suitable habitat	Dense vegetation	27 Weeping Myall Woodland	Black cracking clay	No	Topsoil removal in area complete	Yes		Yes	
162	12/01/2022 9:46	238207.44	6777572.82	90.00	80.00	170.00	Adult	Good	N/A (found during topsoil removal)	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	1-20%	1	5	1-20%	1-20%	41-60%		1-20%	Dry	Topsoil removal	Diurnal - post topsoil removal search	Excavator	736.44	Alive	GH	No	No	237930.45	6781276.07	Suitable habitat	Dense vegetation	27 Weeping Myall Woodland	Black cracking clay	No	Topsoil removal in area complete	Yes		Yes	
163	12/01/2022 9:53	238216.93	6777573.11					Tail only	N/A (found during topsoil removal)	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	1-20%	0.5	3	1-20%	1-20%	41-60%		1-20%	Dry	Topsoil removal	Diurnal - post topsoil removal search	Excavator	736.43	Tail only	GH	Yes	Yes							N/A		Yes	GH12012022_A	Yes	

RefNo	Capture Date and Time	Capture Easting GDA94	Capture Northing GDA94	SVL (mm)	Tail Length (mm)	Total Length (mm)	Age	Condition	Microhabitat at capture site	PCT at capture site	Soil at capture site	Capture Soil Crack Density	Capture Largest Soil Crack	CaptureSoil Crack Depth	Capture Perc Litter Cover	Capture Perc Bare Ground	Capture Perc Ground Veg Cover	Capture 3 most abundant groundcover	Capture Large Surface Debris Abunda	Capture Wetness Ground	Constructio nActivity	FCWS detection method	Equipment	Chainage	Condition Analysis	Surveyor Initials	Photograph of Animal	Photograph of capture site	Release Easting GDA94	Release Northing GDA94	Why is site suitable for reloca	Microhabitat at release site	PCT at release site	Soil at release site	Is temporary exclusion fencing	Justification for no fence	Photograph of release site	Comment	Approva	Time o Recome ncement
164	12/01/2022 9:57	238211.83	6777548.27	105.00	38.00	143.00	Adult	Dead	N/A (found during topsoil removal)	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	1-20%	0.5	0.5	1-20%	1-20%	41-60%		1-20%	Moist (crumb textured)	Topsoil removal	Diurnal - post topsoil removal search	Excavator	736.42	Dead	GH	Yes	No								N/A		No	GA12012022_B	Yes	
165	12/01/2022 14:34	238380.60	6782617.47	84.00	6.00	90.00	Adult	Dead	N/A (found during topsoil removal)	56 Poplar Box-Belah Woodland	Black cracking clay	0%			1-20%	41-60%	21-40%		0%	Dry	Topsoil removal	Diurnal - post topsoil removal search	Excavator	741.6	Dead	GH	Yes	Yes								N/A		N/A	GH120122_C	Yes	
168	14/01/2022 8:35	238067.76	6778902.94					Tail only	Soil crack	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	N/A			1-20%	1-20%	61-80%	Q b g; m g; Johnson grass	21-40%	Moist (crumb textured)	Topsoil removal	Diurnal - post topsoil removal search	Excavator	737.77	Tail only	VP	Yes	No								N/A		No	VP_14122_A	Yes	
169	14/01/2022 9:53	238071.26	6778869.05	80.00	70.00	150.00	Subadult	Good	N/A (found during topsoil removal)	Exotic Grassland	Black cracking clay	N/A			1-20%	1-20%	61-80%	Johnson grass, nigura burr,	1-20%	Moist (crumb textured)	Topsoil removal	Diurnal - post topsoil removal search	Excavator	737.74	Alive	VP	Yes	Yes	237774.44	6780786.30	Similar soil, others found nearby	Tree root	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	Yes		Yes	VP_140122_B	Yes	
166	14/01/2022 8:20	238898.80	6783829.61	70.00			Subadult	Good	N/A (found during topsoil removal)	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	1-20%	1	4	1-20%	0%	81-100%		0%	Moist (crumb textured)	Topsoil removal	Diurnal - post topsoil removal search	Excavator	742.91	Alive	GH	Yes	Yes	238798.96	6783461.53	Suitable habitat	Dense vegetation	27 Weeping Myall Woodland	Black cracking clay	Yes	Topsoil removal in area complete	No		Yes	
167	14/01/2022 8:30	238903.13	6783839.16					Dead	N/A (found during topsoil removal)	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	1-20%	1	4	1-20%	0%	81-100%		0%	Moist (crumb textured)	Topsoil removal	Diurnal - post topsoil removal search	Excavator	742.93	Dead	GH	No	Yes								N/A		No	GH14012022_A	Yes	
170	14/01/2022 10:45	238994.88	6784049.78					Dead	N/A (found during topsoil removal)	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	21-40%	3	30	1-20%	0%	61-80%		0%	Dry	Topsoil removal	Diurnal - post topsoil removal search	Excavator	743.14	Dead	GH	No	Yes								N/A		No	GH14012022_B	Yes	
171	14/01/2022 13:05	238089.65	6778717.94				Adult	Dead	N/A (found during topsoil removal)	Exotic Grassland	Black cracking clay	1-20%	3	5	21-40%	1-20%	1-20%	Johnson grass, neguru burr, Flea bane	21-40%	Moist (crumb textured)	Topsoil removal	Diurnal - post topsoil removal search	Excavator	737.6	Dead	VP	Yes	Yes								N/A		No	VP_120122_C	Yes	
172	14/01/2022 13:50	238079.04	6778709.42				Adult	Good (tail dropped)	N/A (found during topsoil removal)	Exotic Grassland	Black cracking clay	N/A			1-20%	1-20%	81-100%	Johnson grass, fleabane. Queensland bluegrass	1-20%	Moist (crumb textured)	Topsoil removal	Diurnal - post topsoil removal search	Excavator	737.56	Alive	VP	Yes	Yes	237756.75	6780788.76	Similar soils, has been fenced	Tree root	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	Yes		No	VP_140122_D	Yes	
173	14/01/2022 14:13	238091.66	6778728.13	80.00			Adult	Good (tail dropped)	N/A (found during topsoil removal)	Exotic Grassland	Black cracking clay	N/A			21-40%	1-20%	61-80%	Johnson grass, neguru burr, fleabane	21-40%	Moist (crumb textured)	Topsoil removal	Diurnal - post topsoil removal search	Excavator	737.55	Alive	VP	Yes	Yes	237762.37	6780799.19	Suitable habitat	Leaf litter	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	Yes		No		Yes	
174	14/01/2022 15:56	238085.37	6778740.56	96.00			Adult	Fair	Dense vegetation	Exotic Grassland	Black cracking clay	1-20%	3	10	21-40%	1-20%	21-40%	Rhodes grass, fools parsley, Urochloa grass	21-40%	Dry	Topsoil removal	Diurnal - post topsoil removal search	Excavator	737.61	Alive	BK	Yes	Yes	237913.76	6780028.85	Lots of leaf litter and Woody debris	Dense vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	No	Relocated to a dense vegetation area out of work corridor	Yes	Dropped tail	Yes	
175	15/01/2022 11:18	238084.26	6778756.12	112.00			Adult	Dead (euthanised)	N/A (found during topsoil removal)	Exotic Grassland	Black cracking clay	N/A			1-20%	1-20%	61-80%	Johnson grass. Fleabane	1-20%	Moist (crumb textured)	Topsoil removal	Diurnal - post topsoil removal search	Excavator	737.625	Dead	VP	Yes	Yes								N/A		No		Yes	
177	15/01/2022 14:00	238936.02	6783921.36	100.00			Adult	Good (tail dropped)	N/A (found during topsoil removal)	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	1-20%	0.2	0.5	1-20%	61-80%	1-20%		0%	Dry	Topsoil removal	Diurnal - post topsoil removal search	Excavator	743.01	Alive	GH	No	Yes	238795.22	6783452.44	Suitable habitat	Dense vegetation	27 Weeping Myall Woodland	Black cracking clay	No	Relocated to a dense vegetation area out of work corridor	No		Yes	
176	15/01/2022 12:14	239239.30	6784674.21				Adult	Tail only	N/A (found during topsoil removal)	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	1-20%	0.2	1	1-20%	41-60%	21-40%		0%	Dry	Topsoil removal	Diurnal - pre-clearing/ disturbance active searches	Excavator	743.83	Tail only	GH	No	No								N/A		No	GH15012022_A	Yes	
179	17/01/2022 11:29	239191.58	6784506.65	116.00			Adult	Good (tail dropped)	Mulched vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	N/A			61-80%	1-20%	21-40%	Queensland bluegrass, Mitchell grass, fleabane	61-80%	Moist (crumb textured)	Topsoil removal	Diurnal - post topsoil removal search	Excavator	743.65	Alive	VP	Yes	Yes	239337.48	6784811.94	Established release hub	Leaf litter	56 Poplar Box Belah Woodland	Black cracking clay	Yes		Yes	VP_170122_A	Yes	
178	17/01/2022 11:00	238111.39	6778596.05	120.00	110.00	230.00	Adult	Good	N/A (found during topsoil removal)	Exotic Grassland	Black cracking clay	21-40%	1	4	1-20%	0%	81-100%		0%	Moist (crumb textured)	Topsoil removal	Diurnal - post topsoil removal search	Excavator	737.46	Alive	GH	Yes	No	237984.31	6781431.48	Suitable habitat	Dense vegetation	27 Weeping Myall Woodland	Black cracking clay	No	Relocated to a dense vegetation area out of work corridor	Yes	Cleared zone at capture site	Yes	
180	17/01/2022 13:10	238118.88	6778558.38				Adult	Dead	N/A (found during topsoil removal)	Exotic Grassland	Black cracking clay	41-60%	1.5	5	1-20%	0%	81-100%		0%	Moist (crumb textured)	Topsoil removal	Diurnal - post topsoil removal search	Excavator	737.425	Dead	GH	No	No								N/A		No	GH17012022_A found in cleared zone	Yes	
181	18/01/2022 10:12	239193.59	6784509.21	96.00	20.00	116.00	Adult	Good (tail dropped)	N/A (found during topsoil removal)	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	0%			81-100%	1-20%	0%		1-20%	Saturated	Topsoil removal	Diurnal - post topsoil removal search	Grader	743.65	Alive	GH	No	Yes	239331.21	6784792.74	Suitable habitat	Dense vegetation	56 Poplar Box Belah Woodland	Black cracking clay	Yes		Yes		Yes	
182	18/01/2022 12:45	239030.36	6784092.51	50.00	55.00	105.00	Juvenile	Dead	N/A	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	N/A			1-20%	21-40%	41-60%	Qld bluegrass, Mitchell grass,	1-20%	Moist (crumb textured)	Topsoil removal	Diurnal - post topsoil removal search	Grader	743.2	Dead	VP	Yes	Yes								N/A		N/A	VP_180122_A	Yes	
183	18/01/2022 15:40	238022.36	6779247.72					Tail only	N/A (found during topsoil removal)	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	0%			1-20%	21-40%	1-20%	Urochloa grass, Rhodes grass,fleaban e	1-20%	Dry	Topsoil removal	Diurnal - post topsoil removal search	Excavator	738.125	Tail only	BK	Yes	Yes								N/A		N/A	BK18012022_A	Yes	
184	20/01/2022 19:30	238154.53	6781981.30	96.24	122.27	218.51	Adult	Good	Mulched vegetation	27 Weeping Myall Woodland	Black cracking clay	0%	0	0	0%	0%	81-100%	Mitchel grass, greens panic, flea bane	0%	Surface water present	Topsoil removal	Nocturnal - active searches	Other (see comments)	740.92	Alive	QG	No	No	238208.65	6781971.16	Suitable adjacent habitat	Dense vegetation	56 Poplar Box Belah Woodland	Black cracking clay	Yes		No	Rain and wet conditions are likely to have improved detection probability	Yes	
185	21/01/2022 10:29	238151.50	6781988.10	105.00	114.00	219.00	Adult	Good	N/A (found during topsoil removal)	27 Weeping Myall Woodland	Black cracking clay	21-40%	1	1	21-40%	1-20%	41-60%	Native grass, Urochloa grass, fools parsley	1-20%	Saturated	Topsoil removal	Diurnal - post topsoil removal search	Excavator	740.925	Alive	BK	Yes	Yes	238201.78	6781975.97	Suitable adjacent habitat	Dense vegetation	56 Poplar Box Belah Woodland	Black cracking clay	Yes		Yes	Bk21012022A	Yes	
186	21/01/2022 11:28	239450.27	6785182.10	103.00	121.00	124.00	Adult	Dead (euthanised)	N/A	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay				21-40%	21-40%	41-60%	Qld bluegrass, Mitchell grass, Buffel grass	1-20%	Saturated	Topsoil removal	Diurnal - post topsoil removal search	Grader	744.375	Dead	VP	Yes	Yes								N/A				Yes	
187	21/01/2022 13:49	238181.06	6782056.11	114.00	102.00	216.00	Adult	Good	N/A (found during topsoil removal)	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	1-20%	1	1	1-20%	1-20%	41-60%	Urochloa grass, fools parsley, native grass	1-20%	Saturated	Topsoil removal	Diurnal - post topsoil removal search	Excavator	740.99	Alive	BK	Yes	Yes	238217.95	6781970.37	Relocation hub, fencing in place, dense vegetation	Dense vegetation	56 Poplar Box Belah Woodland	Black cracking clay	Yes		Yes	Bk21012022B	Yes	
188	22/01/2022 8:11	239113.05	6784292.57	102.00	105.00	207.00	Adult	Good	N/A (found during topsoil removal)	Exotic Grassland	Black cracking clay	1-20%	1	1	1-20%	1-20%	41-60%		1-20%	Saturated	Topsoil removal	Diurnal - post topsoil removal search	Excavator	743.42	Alive	BK	Yes	Yes	237892.10	6781387.81	Relocation hub in area of know habitat; construction activities limited access to closer hubs	Dense vegetation	27 Weeping Myall Woodland	Black cracking clay	Yes		Yes	Bk22012022A	Yes	
189	22/01/2022 8:28	239098.22	6784269.23					Tail only	N/A (found during topsoil removal)	Exotic Grassland	Black cracking clay	1-20%	1	1	1-20%	1-20%	41-60%		1-20%	Saturated	Topsoil removal	Diurnal - post topsoil removal search	Excavator	743.39	Tail only	Bk	No	Yes								N/A		N/A	Bk22012022B	Yes	
190	22/01/2022 12:45	237969.87	6779618.52					Tail only	Mulched vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	1-20%	2	1	41-60%	1-20%	1-20%		41-60%	Saturated	Topsoil removal	Diurnal - post topsoil removal search	Excavator	738.48	Tail only	BK	Yes	Yes								N/A		N/A	Bk22012022C	Yes	
191	22/02/2022 8:15	189818.83	6699942.43	95.00	0.00		Adult	Good (tail dropped)	Leaf litter	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	1-20%	1	0.5	41-60%	21-40%	21-40%	Area slashed Mimosa Bush Box Thorn	1-20%	Dry	Tree clearing	Diurnal - post clearing search	Other (see comments)	629.55	Alive	QG,BK	Yes	Yes	189882.98	6699938.10	Soil cracks, same soil as capture spot, woody debris, grass cover	Soil crack	56 Poplar Box Belah Woodland	Black cracking clay	No	No other construction works required on eastern side or rail corridor	Yes	Bobcat clearing veg/loose soil around tree		

RefNo	Capture Date and Time	Capture Easting GDA94	Capture Northing GDA94	SVL (mm)	Tail Length (mm)	Total Length (mm)	Age	Condition	Microhabitat at capture site	PCT at capture site	Soil at capture site	Capture Soil Crack Density	Capture Largest Soil Crack	CaptureSoil Crack Depth	Capture Perc Litter Cover	Capture Perc Bare Ground	Capture Perc Ground Veg Cover	Capture 3 most abundant groundcover	Capture Large Surface Debris Abunda	Capture Wetness Ground	Constructio nActivity	FCWS detection method	Equipment	Chainage	Condition Analysis	Surveyor Initials	Photograph of Animal	Photograph of capture site	Release Easting GDA94	Release Northing GDA94	Why is site suitable for reloca	Microhabitat at release site	PCT at release site	Soil at release site	Is temporary exclusion fencing	Justification for no fence	Photograph of release site	Comment	Approva	Time o Recome ncement
192	25/02/2022 16:40	189771.80	6699612.43	89.00	120.00	209.00	Adult	Good	Mulched vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	1-20%	0	0	41-60%	1-20%	1-20%	Mulched veg, area slashed prior	1-20%	Saturated	Other (see comments)	Diurnal - pre-clearing/ disturbance active searches	Other (see comments)	629.22	Alive	SG, BK	Yes	Yes	189846.50	6699696.48	Woody layer under a fallen tree, not flooded, higher then the pooled water	Log	56 Poplar Box Belah Woodland	Black cracking clay	No	No works on east side, private property fence exists	Yes			
193	15/03/2022 13:10	190409.41	6679887.89	60.00	75.00	135.00	Subadult	Good	PitfallTrapping	56 Poplar Box-Belah Woodland	Black cracking clay	41-60%	1.5	10	61-80%	1-20%	21-40%		1-20%	Dry	Other (see comments)	Other (see comments)	Other (see comments)	609.3	Alive	BM, CH	Yes	Yes	190372.67	6679491.86	Same soil and vegetation as capture site	Dense vegetation	56 Poplar Box Belah Woodland	Black cracking clay	Yes		Yes	Pitfall trapping as part of trial. Pitfall trap night 1. Entered trap between morning check (7.50am) and midday check (1.10pm). Photos not on collector		
194	18/03/2022 16:00	190203.65	6683709.20	121	64	185	Adult	Dead	Mulched vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	0%	0	0	0%	1-20%	81-100%	Mitchell grass, Rhodes grass, flea bane	0%	Moist (crumb textured)	Slashing	Diurnal - post clearing search	Slasher	613.3	Dead	SG	Yes	No								N/A	A1	Yes	########
195	03/04/2022 11:00	190394.20	6680142.20	100			Adult	Good (tail dropped)	Dense vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	21-40%	1	1	41-60%	1-20%	1-20%	Saltbush		Moist (crumb textured)	Topsoil removal	Diurnal - post clearing search	Excavator	609.73	Alive	BK	Yes	Yes	190419.70	6680140.98	Same soil and vegetation as capture site	Dense vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	Yes		Yes	FCWS found during silt fence installation at relocation hub	Yes	########
196	07/04/2022 7:20	189863.59	6700235.32	95	159	209	Adult	Good (tail dropped)	Mulched vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	1-20%	0	0	0%	1-20%	81-100%	Mimosa	1-20%	Saturated	Topsoil removal	Diurnal - pre-clearing/ disturbance active searches	Excavator	629.85	Alive	SG	Yes	No	189919.17	6700234.20	Proximal to location woodland	Mulched vegetation	56 Poplar Box Belah Woodland	Black cracking clay	No	Relocated east of rail where no work is proposed.	Yes	Dropped tail fragment 45mm included in tail length. Photos unable to be attached.	Yes	########
197	08/04/2022 8:44	189830.68	6699944.98				Adult	Tail only	Leaf litter	52 QLD Bluegrass/ Mitchell Grass Grassland	Red cracking clay	0%	0	0	0%	1-20%	81-100%		1-20%	Moist (crumb textured)	Topsoil removal	Diurnal - pre-clearing/ disturbance active searches	Excavator	629.55	Tail only	SG	Yes	Yes			N/A	N/A			N/A			Temporary buffer around sites fenced off	Yes	########
198	08/04/2022 15:30	189729.24	6698950.60	103	120	223	Adult	Good	Dense vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	0%	0	0	0%	0%	81-100%	blah unidentified grasses	0%	Saturated	Topsoil removal	Diurnal - pre-clearing/ disturbance active searches	Excavator	628.55	Alive	SG	Yes	Yes	189788.99	6698952.57	adjacent myall woodland across rail where no works is proposed	Leaf litter	27 Weeping Myall Woodland	Black cracking clay	No	No works on east side of rail	Yes	-	Yes	########
199	09/04/2022 10:25	189820.35	6699945.63	103	125	228	Adult	Good	Other (see comments)	52 QLD Bluegrass/ Mitchell Grass Grassland	Other (see comment)	0%	0	0	41-60%	0%	21-40%	belah wilga	1-20%	Moist (crumb textured)	Topsoil removal	Diurnal - pre-clearing/ disturbance active searches	Excavator	629.55	Alive	SG	Yes	Yes	189876.35	6699948.90	Suitable soil and habitat. No work on eastern side of rail.	Leaf litter	56 Poplar Box Belah Woodland	Black cracking clay	No	No works on eastern side of rail	Yes	microhabitat soil rich humus at base of belah tree	Yes	########
200	09/04/2022 10:25	189819.21	6699942.19	93	120	213	Subadult	Good	Other (see comments)	56 Poplar Box-Belah Woodland	Other (see comment)	0%	0	0	41-60%	21-40%	1-20%	belah wilga	1-20%	Moist (crumb textured)	Topsoil removal	Diurnal - post topsoil removal search	Excavator	629.55	Alive	SG	Yes	Yes	189876.80	6699947.05	Suitable soil and habitat. No work on eastern side of rail.	Leaf litter	56 Poplar Box Belah Woodland	Black cracking clay	No	No works on eastern side of rail	Yes	soil micro habitats rich humus under belah	Yes	########
201	09/04/2022 10:45	189825.54	6699947.14	64	75	139	Juvenile	Good	Other (see comments)	52 QLD Bluegrass/ Mitchell Grass Grassland	Other (see comment)	0%	0	0	41-60%	21-40%	21-40%	belah wilga	1-20%	Moist (crumb textured)	Topsoil removal	Diurnal - post topsoil removal search	Excavator	629.55	Alive	SG	Yes	Yes	189875.89	6699947.09	Suitable soil and habitat. No work on eastern side of rail.	Leaf litter	56 Poplar Box Belah Woodland	Black cracking clay	No	No works on eastern side of rail	Yes	soil micro habitat rich hummus	Yes	########
202	09/04/2022 14:02	189820.52	6699948.44	59	71	130	Juvenile	Fair	Other (see comments)	52 QLD Bluegrass/ Mitchell Grass Grassland	Other (see comment)	0%	0	0	41-60%	21-40%	41-60%	belah wilga	21-40%	Moist (crumb textured)	Topsoil removal	Diurnal - post clearing search	Excavator	629.55	Alive	SG	Yes	Yes	189875.95	6699951.72	Suitable soil and habitat. No work on eastern side of rail.	Leaf litter	56 Poplar Box Belah Woodland	Black cracking clay	No	No works on eastern side of rail	Yes	soil micro habitat rich hummus	Yes	########
203	09/04/2022 14:03	189821.79	6699947.44	125	65	190	Adult	Good (tail dropped)	Other (see comments)	52 QLD Bluegrass/ Mitchell Grass Grassland	Other (see comment)	0%	0	0	41-60%	21-40%	1-20%	belah wilga	21-40%	Moist (crumb textured)	Topsoil removal	Diurnal - post clearing search	Excavator	629.55	Alive	SG	Yes	Yes	189875.46	6699953.08	Suitable soil and habitat. No work on eastern side of rail.	Leaf litter	56 Poplar Box Belah Woodland	Black cracking clay	No	No works on eastern side of rail	Yes	soil micro habitat rich humus	Yes	########
204	09/04/2022 14:03	189822.72	6699942.08	112	56	168	Adult	Good (tail dropped)	Other (see comments)	52 QLD Bluegrass/ Mitchell Grass Grassland	Other (see comment)	0%	0	0	41-60%	21-40%	21-40%	belah wilga	21-40%	Moist (crumb textured)	Topsoil removal	Diurnal - post clearing search	Excavator	629.55	Alive	SG	Yes	Yes	189875.29	6699954.21	Suitable soil and habitat. No work on eastern side of rail.	Leaf litter	56 Poplar Box Belah Woodland	Black cracking clay	No	No works on eastern side of rail	Yes	soil micro habitat rich humus	Yes	########
205	12/04/2022 8:26	189723.23	6698933.98	115	55	170	Adult	Dead	Log	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	0%	0	0	1-20%	81-100%	1-20%	Johnson grass, blue grass, Mitchell grass	61-80%	Moist (crumb textured)	Other (see comments)	Diurnal - post clearing search	Other (see comments)	628.53	Dead	GG	Yes	Yes										A1. Found when removing old timber slippers with a bobcat	Yes	########
206	22/04/2022 12:35	190396.90	6673416.31	120	80	200	Adult	Good (tail dropped)	Soil crack	56 Poplar Box-Belah Woodland	Black cracking clay	21-40%	3	5	1-20%	21-40%	41-60%	Johnson grass, Rhodes grass, wattle	1-20%	Moist (crumb textured)	Topsoil removal	Diurnal - post topsoil removal search	Excavator	602.95	Alive	CH	Yes	Yes	190433.26	6673877.69	Suitable habitat in proximity to find	Tree root	Other (see comments)	Black cracking clay	Yes		Yes	Relocated to PCT 135. Closest established relocation hub	Yes	########
207	22/04/2022 13:00	190405.29	6673412.33	100	70	170	Adult	Good	Tree root	56 Poplar Box-Belah Woodland	Black cracking clay	1-20%	3	5	1-20%	21-40%	41-60%	Johnson grass, Rhodes grass, wattle	1-20%	Moist (crumb textured)	Topsoil removal	Diurnal - post topsoil removal search	Excavator	602.95	Alive	CH	Yes	Yes	190436.99	6673877.73	Suitable habitat in proximity to find	Tree root	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	Yes		No	Relocated to PCT 135.Closest established relocation hub; relocation site same as FCWS 206	Yes	########
208	06/05/2022 11:00	190060.36	6686722.59	110	140	250	Adult	Good	Dense vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	1-20%	1	1	21-40%	1-20%	21-40%	Exotic grasses	1-20%	Moist (crumb textured)	Topsoil removal	Diurnal - post topsoil removal search	Excavator	616.32	Alive	MH	Yes	Yes	190032.13	6686976.70	Suitable habitat in proximity to find	Dense vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	Yes		Yes		Yes	########
209	06/05/2022 15:00	190091.33	6686725.52	80	140	220	Adult	Good	Dense vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	1-20%	1	1	1-20%	1-20%	21-40%	Exotic Grasses	1-20%	Moist (crumb textured)	Topsoil removal	Diurnal - post clearing search	Excavator	616.32	Alive	MH	Yes	Yes	190029.49	6686995.54	Suitable habitat in proximity to find	Dense vegetation	27 Weeping Myall Woodland	Black cracking clay	Yes		Yes		Yes	########
210	09/05/2022 16:08	190250.81	6682899.62	60	80	140	Juvenile	Good (tail dropped)	Soil crack	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	21-40%	5	20	21-40%	41-60%	1-20%	couche, Rhodes, flea bane	1-20%	Moist (crumb textured)	Slashing	Diurnal - post clearing search	Slasher	612.6	Alive	CH	Yes	Yes	190283.30	6682895.39	Suitable habitat in proximity to find	Dense vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	Yes		Yes		Yes	########
211	10/05/2022 11:45	189606.90	6696849.16	90	100	190	Adult	Good (tail dropped)	N/A (found during topsoil removal)	56 Poplar Box-Belah Woodland	Black cracking clay	1-20%	3	2	1-20%	41-60%	21-40%	Johnson grass, two toned green panic	1-20%	Moist (crumb textured)	Topsoil removal	Diurnal - pre-clearing/ disturbance active searches	Dozer	626.45	Alive	CH, QG	Yes	Yes	189670.28	6696866.15	Log, black cracking clay, outside ciz,	Dense vegetation	56 Poplar Box Belah Woodland	Black cracking clay	No	Relocated on opposite side of rail where no works are proposed	No		Yes	########
212	15/05/2022 7:48	190241.14	6683263.41	100	80	180	Adult	Dead (euthanised)	Soil crack	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	1-20%	20	50	1-20%	1-20%	41-60%	Rhodes grass, couche grass, button grass	1-20%	Moist (crumb textured)	Topsoil removal	Diurnal - post topsoil removal search	Dozer	612.82	Dead	BM, AR, LS	Yes	No										A1	Yes	########
213	15/05/2022 8:27	190277.05	6682574.87	100	100	200	Adult	Dead	Soil crack	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	21-40%	2	5	1-20%	21-40%	41-60%	Rhodes grass, couche grass, Mimosa bush	1-20%	Moist (crumb textured)	Topsoil removal	Diurnal - post clearing search	Dozer	612.13	Dead	BM, LS, AR	Yes	No										A2	Yes	########
214	15/05/2022 12:06	190247.69	6682898.00				Adult	Tail only	Soil crack	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	21-40%	2	4	21-40%	1-20%	41-60%	Mimosa bush, Rhodes grass, couche	1-20%	Saturated	Topsoil removal	Diurnal - post topsoil removal search	Dozer	612.49	Tail only	CH, BM, LS, AR	No	No										A3	Yes	########
215	15/05/2022 13:24	190202.71	6683837.24	120	100	220	Adult	Good	Soil crack	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	1-20%	3	5	21-40%	1-20%	61-80%	Rhodes grass, Mimosa bush, fools Parsley	1-20%	Surface water present	Topsoil removal	Diurnal - post topsoil removal search	Dozer	613.43	Alive	BM	Yes	Yes	190216.14	6683975.57	Suitable habitat in proximity to find	Dense vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	No		Yes		Yes	########
216	15/05/2022 16:03	190210.28	6684046.71	80		80	Adult	Dead	Soil crack	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	21-40%	15	10	1-20%	21-40%	41-60%	Johnson, Mimosa bush, Rhodes grass	1-20%	Surface water present	Topsoil removal	Diurnal - post topsoil removal search	Dozer	613.625	Dead	LS, CH	Yes	Yes							N/A			A4	Yes	########

RefNo	Capture Date and Time	Capture Easting GDA94	Capture Northing GDA94	SVL (mm)	Tail Length (mm)	Total Length (mm)	Age	Condition	Microhabitat at capture site	PCT at capture site	Soil at capture site	Capture Soil Crack Density	Capture Largest Soil Crack	CaptureSoil Crack Depth	Capture Perc Litter Cover	Capture Perc Bare Ground	Capture Perc Ground Veg Cover	Capture 3 most abundant groundcover	Capture Large Surface Debris Abunda	Capture Wetness Ground	Constructio nActivity	FCWS detection method	Equipment	Chainage	Condition Analysis	Surveyor Initials	Photograph of Animal	Photograph of capture site	Release Easting GDA94	Release Northing GDA94	Why is site suitable for reloca	Microhabitat at release site	PCT at release site	Soil at release site	Is temporary exclusion fencing	Justification for no fence	Photograph of release site	Comment	Approval	Time o Recome ncement
217	16/05/2022 9:58	190182.50	6684529.00	100			Adult	Good (tail dropped)	Dense vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	21-40%	5	8	21-40%	1-20%	41-60%	Johnson grass, Rhodes grass, fools Parsley	1-20%	Saturated	Topsoil removal	Diurnal - post topsoil removal search	Dozer	614.125	Alive	MR, AR, QG	Yes	Yes	190146.00	6684544.25	Suitable habitat in proximity to find	Dense vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	Yes		Yes		Yes	########
218	16/05/2022 11:48	190163.23	6684754.81	110	90	200	Adult	Dead	Soil crack	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	41-60%	2	10	1-20%	1-20%	1-20%	Field parsley, African thorn bush, casuarina	1-20%	Moist (crumb textured)	Topsoil removal	Diurnal - post topsoil removal search	Dozer	614.35	Dead	BM, MR	No	No							N/A			A1	Yes	########
219	16/05/2022 12:14	190169.54	6684910.27	100	80	180	Adult	Dead	Soil crack	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	21-40%	5	8	21-40%	1-20%	41-60%	Johnson grass, Rhodes grass and couche grass	1-20%	Moist (crumb textured)	Topsoil removal	Diurnal - post topsoil removal search	Dozer	614.5	Dead	CH, LS	Yes	No										A2	Yes	########
220	16/05/2022 15:17	190139.99	6685524.52	110	90	200	Adult	Good	Soil crack	Exotic Grassland	Black cracking clay	21-40%	3	7	21-40%	1-20%	61-80%	Rhodes grass, Johnson grass, chouche	1-20%	Moist (crumb textured)	Topsoil removal	Diurnal - post topsoil removal search	Dozer	615.1	Alive	AR, LS, QG	Yes	Yes	190061.23	6685474.27	Suitable habitat in proximity to find	Soil crack	Exotic Grassland	Black cracking clay	Yes		No		Yes	########
221	16/05/2022 15:28	190139.79	6685473.04	120	90	210	Adult	Fair	Soil crack	Exotic Grassland	Black cracking clay	21-40%	3	7	21-40%	1-20%	41-60%	Johnson, Rhodes, couche	1-20%	Moist (crumb textured)	Topsoil removal	Diurnal - post topsoil removal search	Dozer	615.05	Alive	CH, LS	Yes	Yes	190062.03	6685469.59	Suitable habitat in proximity to find	Soil crack	Exotic Grassland	Black cracking clay	Yes		No		Yes	########
222	16/05/2022 15:29	190122.93	6685481.49				Subadult	Tail only	Soil crack	Exotic Grassland	Black cracking clay	21-40%	3	7	21-40%	1-20%	41-60%	Johnson grass, Rhodes grass, invasive weed (unidentified)	1-20%	Moist (crumb textured)	Topsoil removal	Diurnal - post topsoil removal search	Dozer	615.075	Tail only	CH, QG	No	No										A3		########
223	16/05/2022 15:29	190122.11	6685480.60				Adult	Tail only	Soil crack	Exotic Grassland	Black cracking clay	21-40%	3	7	21-40%	1-20%	41-60%	Johnson grass, Rhodes grass, invasive weed (unidentified)	1-20%	Moist (crumb textured)	Topsoil removal	Diurnal - post topsoil removal search	Dozer	615.075	Tail only	CH, QG	No	No										A4	Yes	########
224	16/05/2022 15:36	190141.81	6685522.43	110			Adult	Good (tail dropped)	Soil crack	Exotic Grassland	Black cracking clay	21-40%	3	7	21-40%	1-20%	41-60%	Johnson grass, Rhodes grass, couche	1-20%	Moist (crumb textured)	Topsoil removal	Diurnal - post topsoil removal search	Dozer	615.125	Alive	CH, LS	Yes	Yes	190059.33	6685464.33	Suitable habitat in proximity to find	Soil crack	Exotic Grassland	Black cracking clay	Yes		No		Yes	########
225	16/05/2022 15:51	190124.84	6685462.84	100			Subadult	Dead	N/A (found during topsoil removal)	Exotic Grassland	Black cracking clay	21-40%	3	7	0%	1-20%	61-80%	rhodes grass, johnson grass	1-20%	Saturated	Topsoil removal	Diurnal - post topsoil removal search	Dozer	615.05	Dead	QG, CH	No	No										A5	Yes	########
226	16/05/2022 15:51	190123.80	6685463.60	50	40	90	Subadult	Dead (euthanised)	N/A (found during topsoil removal)	Exotic Grassland	Black cracking clay	21-40%	3	7	0%	1-20%	61-80%	rhodes grass, johnson grass	1-20%	Saturated	Topsoil removal	Diurnal - post topsoil removal search	Dozer	615.05	Dead	QG, CH	No	Yes										A6	Yes	########
227	17/05/2022 7:58	190140.19	6685698.63		50	0	Subadult	Tail only	Soil crack	Exotic Grassland	Black cracking clay	21-40%	3	7	21-40%	1-20%	41-60%	couche grass, Johnson grass, Rhodes grass	1-20%	Moist (crumb textured)	Topsoil removal	Diurnal - post topsoil removal search	Dozer	615.3	Tail only	CH, AR	No	No										A1	Yes	########
228	18/05/2022 10:35	190111.56	6685707.76	100	40	140	Adult	Good (tail dropped)	N/A (found during topsoil removal)	Exotic Grassland	Black cracking clay	0%	1	1	21-40%	1-20%	41-60%	Johnson grass, foxtail grass, couche grass	1-20%	Moist (crumb textured)	Topsoil removal	Diurnal - post topsoil removal search	Dozer	615.3	Alive	LS, CH	Yes	Yes	190058.55	6685472.31	Suitable habitat in proximity to find	Soil crack	Exotic Grassland	Black cracking clay	Yes		No		Yes	########
229	18/05/2022 11:13	190116.59	6685670.05		40			Tail only	N/A (found during topsoil removal)	Exotic Grassland	Black cracking clay	1-20%	1	1	N/A	21-40%	61-80%	johnson grass, feather top rhodes, panic grass	N/A	Dry	Topsoil removal	Diurnal - post topsoil removal search	Excavator	615.26	Tail only	QG, CH, LS	No	Yes										Ref number on specimen bag: 18052	Yes	########
230	18/05/2022 11:52	190118.16	6685646.77				Adult	Dead	N/A (found during topsoil removal)	Exotic Grassland	Black cracking clay	21-40%	20	20	1-20%	N/A	81-100%	johnson grass, feathertop rhhodes and panic grass	1-20%	Dry	Topsoil removal	Diurnal - post topsoil removal search	Excavator	615.25	Dead	LS	Yes	Yes										Ref number on specimen bag: 18053	Yes	########
231	18/05/2022 12:09	190119.43	6685631.28	110			Adult	Good (tail dropped)	Dense vegetation	Exotic Grassland	Black cracking clay	1-20%	1	1	21-40%	1-20%	41-60%	Johnson grass, Rhodes grass, foxtail grass	1-20%	Moist (crumb textured)	Topsoil removal	Diurnal - post topsoil removal search	Excavator	615.23	Alive	QG, CH	Yes	Yes	190063.53	6685465.69	relocation hub	Soil crack	Exotic Grassland	Black cracking clay	Yes		No	18054 ref number for specimen	Yes	########
232	18/05/2022 12:20	190119.01	6685620.73	115	80	195	Adult	Good (tail dropped)	Other (see comments)	Exotic Grassland	Black cracking clay	1-20%	1	1	21-40%	1-20%	41-60%	Rhodes, Johnson & foxtail grass	21-40%	Moist (crumb textured)	Topsoil removal	Diurnal - post topsoil removal search	Excavator	615.225	Alive	LS, CH	Yes	Yes	190061.26	6685461.04	relocation hub	Soil crack	Exotic Grassland	Black cracking clay	Yes		No	Specimen ref number for tail: 18055. Found under dense vegetation on Ballast edge	Yes	########
233	18/05/2022 12:39	190124.34	6685603.08	60	70	130	Juvenile	Good	Dense vegetation	Exotic Grassland	Black cracking clay	1-20%	10	10	1-20%	0%	81-100%	johnson grass, rhodes grass, african lovegrass	0%	Moist (crumb textured)	Topsoil removal	Diurnal - post topsoil removal search	Excavator	615.2	Alive	LS	Yes	Yes	190056.40	6685476.37	relocation hub	Dense vegetation	Exotic Grassland	Black cracking clay	Yes		No	18056	Yes	########
234	18/05/2022 13:29	190131.10	6685575.62		40			Tail only	N/A (found during topsoil removal)	Exotic Grassland	Black cracking clay	0%	0	0	0%	1-20%	61-80%	johnson grass, african lovegrass, rhodes	0%	Dry	Topsoil removal	Diurnal - post topsoil removal search	Excavator	615.15	Tail only	QG, CH	No	Yes										specimen ref on bag: 18057	Yes	########
235	18/05/2022 14:09	190127.00	6685552.51		60			Dead	N/A (found during topsoil removal)	Exotic Grassland	Black cracking clay	0%	0	0	1-20%	1-20%	81-100%	johnson grass, rhodes grass, african love grass	0%	Dry	Topsoil removal	Diurnal - post topsoil removal search	Excavator	615.15	Dead	QG	No	Yes										Specimen ref no. 18058	Yes	########
236	18/05/2022 15:09	190122.92	6685543.01				Adult	Dead (euthanised)	Soil crack	Exotic Grassland	Black cracking clay	21-40%	20	30	1-20%	0%	61-80%	johnson grass, african love grass, mimosa bush	1-20%	Moist (crumb textured)	Topsoil removal	Diurnal - post topsoil removal search	Excavator	615.125	Dead	LS	No	No										no release animal euthanised. 18059	Yes	########
237	19/05/2022 9:42	190137.87	6685574.15	95			Adult	Good (tail dropped)	N/A (found during topsoil removal)	Exotic Grassland	Black cracking clay	0%	0	0	0%	1-20%	81-100%	johnson grass, rhodes,	0%	Dry	Topsoil removal	Diurnal - post topsoil removal search	Excavator	615.15	Alive	QG	Yes	Yes	190058.48	6685485.53	Suitable habitat in proximity to find	Dense vegetation	Exotic Grassland	Black cracking clay	N/A		No	ref no. 19054	Yes	########
238	19/05/2022 9:42	190136.25	6685569.64	110			Adult	Dead (euthanised)	N/A (found during topsoil removal)	Exotic Grassland	Black cracking clay	N/A			N/A	1-20%	81-100%	Johnson grass, Rhodes,	N/A	Dry	Topsoil removal	Diurnal - post topsoil removal search	Excavator	615.15	Dead	AR	No	Yes										19052	Yes	########
239	19/05/2022 9:53	190137.16	6685568.69		120		Adult	Tail only	N/A (found during topsoil removal)	Exotic Grassland	Black cracking clay	N/A			N/A	1-20%	61-80%	Johnsonâ€™s grass, Rhodes	N/A	Moist (crumb textured)	Topsoil removal	Diurnal - post topsoil removal search	Excavator	615.15	Tail only	AR	No	Yes										19053	Yes	########
240	19/05/2022 10:30	190137.61	6685552.76	60	70	130	Subadult	Good (tail dropped)	Soil crack	Exotic Grassland	Black cracking clay	41-60%	20	30	1-20%	0%	61-80%	johnson grass, sunflower, rhodes	1-20%	Moist (crumb textured)	Topsoil removal	Diurnal - post topsoil removal search	Excavator	615.15	Alive	LS	Yes	Yes	190055.84	6685480.84	Suitable habitat in proximity to find	Soil crack	Exotic Grassland	Black cracking clay			No	19051. tail fell off during measurements, bagged separately	Yes	########
241	25/05/2022 10:14	190044.90	6686464.81	120	150	270	Adult	Dead (euthanised)	N/A (found during topsoil removal)	Exotic Grassland	Black cracking clay	1-20%	1	1	1-20%	0%	81-100%	Exotic grasses	0%	Saturated	Topsoil removal	Diurnal - post topsoil removal search	Excavator	616.05	Dead	DM	No	No										25051	Yes	########
242	25/05/2022 14:21	190070.30	6686473.62	50	90	140	Subadult	Good (tail dropped)	N/A (found during topsoil removal)	Exotic Grassland	Black cracking clay	1-20%	1	1	1-20%	1-20%	1-20%	Exotic grasses	1-20%	Moist (crumb textured)	Topsoil removal	Diurnal - post clearing search	Excavator	616.06	Alive	MH	Yes	No	190024.51	6687000.37	Suitable habitat in proximity to find	Soil crack	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	Yes		No	25057	Yes	########
243	25/05/2022 14:21	190078.79	6686461.06				Juvenile	Tail only	N/A (found during topsoil removal)	Exotic Grassland	Black cracking clay	1-20%	1	1	1-20%	1-20%	1-20%	Exotic grasses	1-20%	Moist (crumb textured)	Topsoil removal	Diurnal - post clearing search	Excavator	616.05	Tail only	MH	No	No										25055	Yes	########
244	25/05/2022 14:30	190052.97	6686453.74	60	80	140	Subadult	Good	N/A (found during topsoil removal)	Exotic Grassland	Black cracking clay	1-20%	1	1	1-20%	1-20%	1-20%	Exotic Grasses	N/A	Moist (crumb textured)	Topsoil removal	Diurnal - post clearing search	Excavator	616.05	Alive	MH	Yes	Yes	190027.49	6686999.94	Suitable habitat in proximity to find	Dense vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	Yes				Yes	########

RefNo	Capture Date and Time	Capture Easting GDA94	Capture Northing GDA94	SVL (mm)	Tail Length (mm)	Total Length (mm)	Age	Condition	Microhabitat at capture site	PCT at capture site	Soil at capture site	Capture Soil Crack Density	Capture Largest Soil Crack	CaptureSoil Crack Depth	Capture Perc Litter Cover	Capture Perc Bare Ground	Capture Perc Ground Veg Cover	Capture 3 most abundant groundcover	Capture Large Surface Debris Abunda	Capture Wetness Ground	Constructio nActivity	FCWS detection method	Equipment	Chainage	Condition Analysis	Surveyor Initials	Photograph of Animal	Photograph of capture site	Release Easting GDA94	Release Northing GDA94	Why is site suitable for reloca	Microhabitat at release site	PCT at release site	Soil at release site	Is temporary exclusion fencing	Justification for no fence	Photograph of release site	Comment	Approval	Time o Recome ncement
245	25/05/2022 15:00	190170.21	6685468.30				Adult	Tail only	N/A (found during topsoil removal)	Exotic Grassland	Black cracking clay	1-20%	1	1	1-20%	1-20%	1-20%	Exotic	1-20%	Moist (crumb textured)	Topsoil removal	Diurnal - post clearing search	Excavator	615.05	Tail only	MH	Yes	No									No	25054	Yes	########
246	25/05/2022 15:00	190044.90	6686464.81	90	110	200	Adult	Good	N/A (found during topsoil removal)	Exotic Grassland	Black cracking clay	0%	0	0	0%	1-20%	81-100%	Exotic and native grasses - roadside	0%	Moist (crumb textured)	Topsoil removal	Diurnal - post topsoil removal search	Excavator	616.05	Alive	DM	No	No	190032.13	6686976.70	Suitable habitat in proximity to find	Dense vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	Yes		No	25054	Yes	########
247	25/05/2022 15:00	190037.12	6686471.07	150	100	250	Adult	Good (tail dropped)	N/A (found during topsoil removal)	Exotic Grassland	Black cracking clay	1-20%	1	1	0%	0%	81-100%	Exotic and native grasses - roadside	0%	Moist (crumb textured)	Topsoil removal	Diurnal - post topsoil removal search	Excavator	616.05	Alive	DM	No	No	190024.37	6686974.08	Suitable habitat in proximity to find	Dense vegetation	52 QLD Bluegrass/ Mitchell Grass Grassland	Black cracking clay	Yes		No	25055	Yes	########
248	16/09/2022 9:00	238508.29	6782908.95	0	0	0	Adult	Tail only	Other (see comments)	56 Poplar Box-Belah Woodland	Black cracking clay	N/A	0	0							Other (see comments)	Other (see comments)	Other (see comments)	741920	Tail only	LS	N/A	N/A				N/A			N/A		N/A			

12.0 APPENDIX D – UNEXPECTED THREATENED SPECIES FIND PROTOCOL OUTLINED IN THE CONSTRUCTION BIODIVERSITY MANAGEMENT PLAN

Appendix G Unexpected Threatened Species / Endangered Ecological Community Find Procedure

Purpose
This procedure details the actions to be taken when a threatened species (flora or fauna) or an Endangered Ecological Community (EEC) is unexpectedly encountered during construction activities associated with the N2NS SP1 / Trans4m Rail Project.

Induction / Training
During the Project Induction, all Trans4m Rail and sub-Contractor personnel will be inducted on the identification of potential threatened species occurring on site and the relevant actions to be taken with regards to this procedure.

Scope
This procedure is applicable to all activities conducted by Trans4m Rail and sub-Contractor personnel that have the potential to come into contact with threatened species and EEC.

Procedure

1. Threatened Species unexpectedly encountered during clearing, excavation or other construction activities

If a threatened species, either flora or fauna, or an EEC is encountered prior to or during construction activities:

- STOP ALL WORK in the vicinity of the find.
- The area surrounding the find must be protected and the Trans4m Rail Supervisor and any other personnel working in the area must be immediately notified of the find.
- The Trans4m Rail Environment Manager / Coordinator must also be notified immediately who will contact ARTC and the Project Environmental Representative (ER).
- The Trans4m Rail Environment Manager / Coordinator will contact an Ecologist who will confirm the species / EEC is an unexpected find and / or threatened.
- If the find is confirmed not to be a threatened species or EEC, the Trans4m Rail Environment Manager will provide written approval to recommence works.
- If the species is confirmed to be a threatened species or EEC, Step 2 applies.

NOTE: Unexpected Finds will be immediately notified to ARTC and ARTC will notify the relevant regulatory agencies within 1 business day. A draft report must be provided to ARTC within 7 days and ARTC will provide a final version of the report to the relevant regulatory agencies with 14 days. The report must include the following:

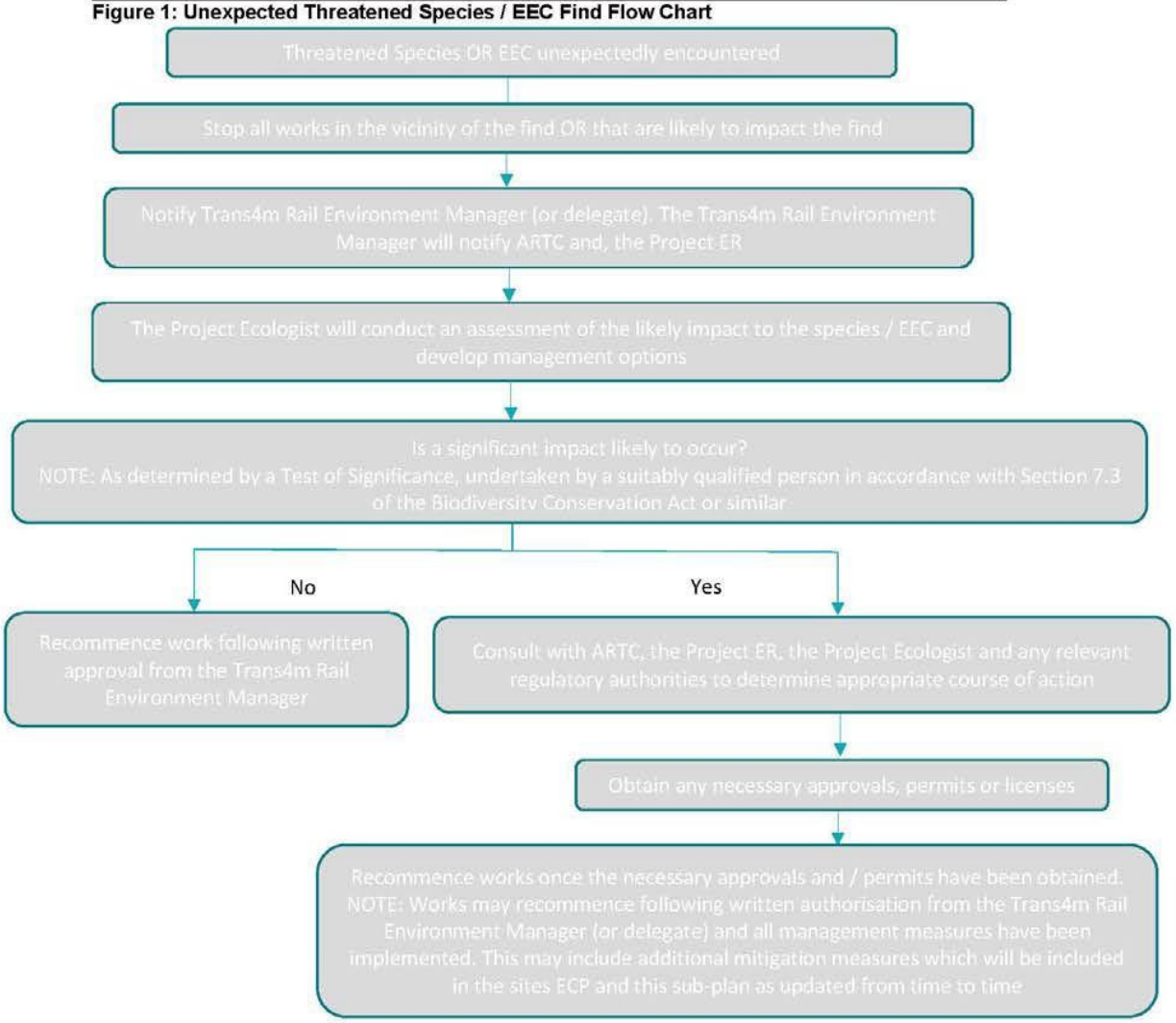
a. Date and time of discovery;
b. Details of the discovery site (GPS points, description of vegetation, soil, microhabitat features present);
c. Details of how potential relocation sites will be identified;
d. Details of the individual/s discovered, including photographs;
e. Photographs of the site (general location, vegetation, habitat features where the individual/s was discovered);
f. Maps / plans identifying the location of the discovery at an appropriate scale;
g. Details of the person/s who made the discovery; and
h. Mitigation measures to be implemented

2. Assessment of Impact

In the event that the species is confirmed to be threatened, the Ecologist will undertake an assessment to determine the likely impact to the threatened species and appropriate management options developed i.e. Test of significance, in accordance with Section 7.3 of the *Biodiversity Conservation Act* or similar. This assessment will be documented.

NOTE: Trans4m Rail's Construction and Engineering personnel will be consulted to avoid any direct impacts to the threatened species or EEC.
3. Approvals
ARTC and Trans4m Rail will obtain any licences, permits or approvals required if the species is likely to be significantly impacted by the Project works.
4. Recommencement of Works
Works will recommence once necessary advice has been sought and permits obtained (if required). If permits are not required, works can recommence following authorisation from the Trans4m Rail Environment Manager (or delegate).

Figure 1: Unexpected Threatened Species / EEC Find Flow Chart



13.0 APPENDIX E – AGENCY / KEY STAKEHOLDER COMMENTS ON THIS PLAN

Department of Planning and Environment

Our ref: DOC22/434088
Your Ref: SSI-7474

Peter Borrelli
Project Director N2NS
ARTC Inland Rail
PBorrelli@ARTC.com.au

Dear Peter

Inland Rail Narrabri to North Star Phase 1 (SSI-7474) – Five-clawed Worm Skink Construction Species Management Plan – report dated May 2022

Thank you for your email dated 19 May 2022 to the Biodiversity, Conservation and Science Directorate (BCS) of the Department of Planning and Environment (DPE) requesting feedback on the draft version of the Five-clawed Worm Skink Construction Species Management Plan (SMP).

The SMP has been written specifically for implementation on the Narrabri to North Star Phase 1 project rather than being a generic plan that applies to all relevant Inland Rail projects. As a result, parts of the SMP are redundant given that most of the topsoil stripping works have been completed for the project, but they can form the basis of SMPs that will be required for other relevant projects (North Star to Border, Narrabri to North Star Phase 2, and potentially Narromine to Narrabri).

BCS understands that Phil Spark has met with ARTC regarding the Five-clawed Worm Skink finds and it is noted in the SMP that he was contacted with regards to the development of the plan. BCS is interested in whether Mr Spark provided a report following his visit to site, and whether his feedback has been included where relevant in the SMP.

A key component of the SMP involves applying lessons learnt from Stage 3 to Stage 1. The Stage 3 Works Summary Report provides a solid basis for the relative success of different mitigation measures, and provides a preliminary analysis of habitat preference. The Summary Report should be reviewed to ensure that all relevant information has been included in the SMP.

One of the outcomes of Stage 3 was that the incidence of skink finds appeared to increase when soil moisture content increased, thus reducing soil cracks and potentially forcing skinks to the soil surface. The monitoring program should therefore be based on using soil moisture content as a trigger for a monitoring event to increase the chance of detectability.

BCS's detailed comments and recommendations are provided in **Attachment A**. If you require any further information regarding this matter, please contact Renee Shepherd, Principal Project Manager, via renee.shepherd@environment.nsw.gov.au or (02) 6883 5355.

Yours sincerely

Sarah Carr
Director North West
Biodiversity, Conservation and Science Directorate

10 June 2022

Attachment A – BCS's Detailed Comments and Recommendations
Cc: Grant Brown, Team Leader Infrastructure Assessment, DPE

Attachment A

BCS's Detailed Comments and Recommendations

Inland Rail Narrabri to North Star Phase 1 – Five-clawed Worm Skink Construction Species Management Plan – May 2022 version

Report Reference	Comment and recommendation
1.5 Unexpected Find of the FCWS	This section refers to the different Stages of the project. A diagram is required illustrating the relative location of each Stage along the alignment.
4.5 Land Tenure of Populations	Provide justification as to why the five named reserves might contain Five-clawed Worm Skinks (FCWS). Is this because of proximity, potential habitat, or other reasons? The 1993 reference provided is now quite dated. A BioNet search should show records in the Terry Hie Hie Community Conservation Area.
4.6 Habitat Associations	This section should include an analysis of the information collected in the FCWS register for the N2NS project, particularly in relation to soils and vegetation. Utilising some of the analysis from section 6 of the Stage 3 Works Summary Report would be beneficial.
4.12 Current Context of FCWS and the Project	The third paragraph should be expanded to provide detail on the specific components that are included in the "development of a specific clearing procedure". Relevant information could be inserted here from the Stage 3 Works Summary Report, particularly sections 3 and 5. The current number of FCWS finds referred to in this section should be updated. Insert a map of FCWS finds to date to illustrate the geographic distribution of records along the alignment, including highlighting the different Stages of the project.
5.0 Five-clawed Worm Skink Management	(2) Construction management actions - sixth dot point – does this "expected finds" procedure refer to Appendix I in the Construction BMP? If so, this should be stated explicitly. An additional explanation could be added to this dot point, indicating that the BMP should clearly state which parts of the alignment the full Unexpected Threatened Species Find protocol will be enacted within, and which parts will be subjected to the FCWS Encounter Protocol. Add an additional dot point which states "implementation of relevant mitigation measures".
5.1.1 Additional studies	Will a soil scientist still be engaged to assess soil types given that topsoil stripping works are largely complete?
5.1.2 Reduce clearing in FCWS Habitat Areas	Reducing clearing is the most effective measure that can be implemented to reduce impacts to the FCWS and should be considered throughout the implementation of the project.
5.1.3 Updating Test of Significance Assessments for FCWS	This section states that tests of significance have been completed, but the title implies that the tests will be updated. Is this proposed to occur? Given that both tests have concluded a significant impact, is there any benefit to completing an updated test?
5.2 Construction Management Actions for FCWS	An additional heading and commentary should be added to this section stating that deceased skinks have been collected and will be provided to the Australian Museum for research purposes.
5.2.1 Identification of FCWS Habitat on Environmental Control Plans	The "known" and "likely to occur" habitat areas should be identified and mapped in the SMP.

5.2.2 Specific FCWS Induction	The second dot point should be amended for Stage 1 to state that FCWS surveys are required for the entire Stage, not just CH603.00-625.00.
5.2.3 Develop a Survey Prescription	In addition to windrowing slashed vegetation to the edge of the Construction Impact Zone (CIZ) it has been suggested that as much of the remaining slashed vegetation in the CIZ should be removed. Several types of machinery can complete this removal. Consideration should be given to including this activity. Fifth dot point (page 24) – the second sentence should read "this should enable sufficient time for uncaptured FCWS to **move** of their own accord". Previously a 7-day period had been agreed to between topsoil stripping and slashing – BCS does not support a 2-day period without further discussion and justification. The Stage 3 report also references a period of 7 days. This section mentions the use of a scrapper. It is not clear what this machinery is or in which situations it would be used. The dot point states that where a scrapper is used, an ecologist or spotter catcher would inspect the material at the recipient site. Does this mean that a scrapper is not involved in the removal of topsoil so there is no impact site to inspect? As discussed in previous meetings, the FCWS register indicates that the use of excavators results in the highest survival rate of encountered skinks, so where possible that item of machinery is preferred.
5.2.4 Data Collection Requirements for Captured FCWS	It would be beneficial if the chainage and Stage of project could be recorded for each FCWS capture. Final paragraph (page 27) – state that the register will be provided with each incident notification and live FCWS-find report, and it will be made readily available for regulatory agencies.
5.2.5 Identifying and Establishing FCWS Relocation Sites	(i) Site Identification - although some sites will be located according to FCWS captures, other sites will be pro-actively created according to the presence of suitable habitat along the alignment – this should be articulated. (ii) Site establishment - other material has been proposed for habitat enhancement including woody debris. Will the relocation sites be demarcated in the longer term once construction has been completed? If yes, how will they be identified? Will more permanent signage be installed?
5.2.6 Habitat Enhancement and Refuge Replacement	Explanation is required as to why the placement of hay bales is only to occur on freehold land in the construction boundary – is there other tenures of land present and what precludes them from receiving habitat enhancement measures?
5.2.7 Unexpected Five-clawed Worm Skink Finds Procedure	The Stage 2B Chainage 641.08-647.00 has not been identified before as being relevant to the Unexpected FCWS Finds Procedure. Is this based on the most recent finds in Stage 2? Will the BMP be updated to be consistent with the SMP? The sentence after the first three dot points stating that the chainages in each stage have been identified because "individuals can move into these areas following the field surveys" is not correct. The chainages in Stage 3 were identified following FCWS finds and extrapolating likely habitat, and the Stage 1 chainages were identified through the DAWE predictive modelling for the FCWS. Additional text should be added to the first paragraph referring to the Unexpected Threatened Species Find Protocol in Appendix G of the Construction BMP to provide clarity around the protocol that must be enacted outside of those chainages. Consideration should be given to including the protocol as an appendix to the report.
6.0 Five-clawed Worm Skink Monitoring Program	It is not clear whether the "adjacent monitoring site" will also be located in the relocation hub, or whether these sites will be in the broader rail corridor. This needs to be clarified. A diagram of the proposed survey design would be beneficial. This comment is also relevant to section 6.2 – if "adjacent monitoring sites" are located in the broader rail corridor, consideration should be given to placing artificial refuge sites in areas that are unlikely to be disturbed by rail maintenance activities, including slashing of the corridor. Appropriate signage should be considered.

6.1 Site Selection	Are the "paired sites" referred to in this section the same as the "impact site" and "adjacent reference site" described in section 6.0? Justification is required to support why only 15 sites have been proposed – this seems to be a small number given the extent of the FCWS finds across all three Stages of the project. Consideration should be given to determining a minimum number of individuals that would be required to be captured to provide a meaningful sample size (e.g. 10 individuals) and implementing adequate sampling sites to attempt to meet that target number. The proposed initial trial period could be used to test the appropriate number of sample sites. Limiting the number of monitoring sites will limit the chance of capturing individuals, and therefore will limit the conclusions that can be made from the monitoring program and the likely impact of the project on the FCWS population. The comment stating that some sites will be removed from the monitoring program if FCWS are not located in Stage 1 can be deleted, given that finds have now been recorded in this Stage. A map of the proposed monitoring sites should be included.
6.2 Sampling Design and Regime	A diagram of the proposed artificial refuge layouts would be beneficial. Terracotta tiles are unlikely to be useful as they are small and likely to dry the ground out. They are suitable for basking species in cold weather but not likely for FCWS. Despite this, the outcomes of the trial will confirm their usefulness. Carpets should be larger than the proposed 1m² to enhance insulation and moisture retention. The carpet should be old/weathered/have water holding capacity to increase its habitat value. Phil Spark has created some artificial refuge sites for FCWS monitoring which include a range of materials – consideration should be given to adopting the same approach. BCS can provide examples of Phil's refuge sites if required. Artificial refuge sites should be installed as soon as possible after construction. Refuge sites can be placed in the relocation hubs now to enhance habitat. The current season is excellent and immediate installation would potentially allow for a spring/early summer trial to test capture rates. The artificial refuge sites should be permanent rather than temporary sites. Installing artificial refuge sites 12 weeks before scheduled monitoring limits the ability of monitoring to respond to appropriate seasonal conditions. Rather than basing the monitoring program on an autumn and spring frequency, it should be based on the presence of suitable soil moisture conditions. The FCWS records to date indicate a correlation between finds and rainfall/soil moisture, where soil cracks are minimal, and skinks move closer to the soil surface. Monitoring on a strictly seasonal basis may reduce detectability of the skinks. BCS recommends that each monitoring event be confirmed in consultation with us to ensure that conditions are selected to increase the chance of detectability. Fourth paragraph – suggest deletion of "this will result in four surveys per annum with two surveys in each season". As described above, surveys should be in response to appropriate seasonal conditions (adequate soil moisture) rather than be dictated by a calendar timing – if these seasons are dry it is unlikely that the monitoring will detect the presence of the FCWS.
6.4 How Many Years to Monitor	As previously discussed, it is recommended that the monitoring periods be amended so that they are based on soil moisture content rather than an annual event. Five monitoring events over a 10-year period would be reasonable and would account for dry periods when skinks are likely to be deep in the soil cracks rather than being at the soil surface. Monitoring events could occur in consecutive years when conditions are favourable, or monitoring could be suspended over a period while conditions are dry. The trial period should not be considered one of the five monitoring events unless it results in a favourable capture rate (e.g. more than 10 skinks). Potentially a trial could occur this spring/early summer.

Our ref: DOC22/976061
Your Ref: SSI-7474

Tim Lennon
Program Environment Lead - Regulatory
ARTC Inland Rail
TLennon@ARTC.com.au

Dear Tim

Inland Rail Narrabri to North Star Phase 1 (SSI-7474) – Five-clawed Worm Skink Construction Species Management Plan – report dated August 2022

Thank you for your email dated 24 October 2022 to the Biodiversity, Conservation and Science Directorate (BCS) requesting feedback on the August 2022 version of the Five-clawed Worm Skink Construction Species Management Plan (SMP).

BCS's detailed review and recommendations on the SMP are provided in **Attachment A**, and comments and recommendations on the Construction Biodiversity Management Sub-Plan (BMP) are provided in **Attachment B.** Our review covered the following three documents:

- the August 2022 version of the SMP
- the 21 September version of the Construction Biodiversity Management Sub-Plan
- the correspondence provided to NSW Planning from ARTC (dated 12 October 2022) summarising how BCS's comments have been addressed in the latest version of the SMP.

Many of the recommendations made by BCS in our review of the May 2022 version of the SMP have been incorporated into the August version of the SMP. However, BCS remains concerned with many details relating to the proposed monitoring program. While the monitoring design seeks to determine whether skinks remain in the relocation hubs, no monitoring is proposed to determine whether skinks have been able to recolonise the disturbed areas along the corridor. In addition, the proposed seasonal monitoring is not considering soil moisture conditions, and this will likely result in a negligible to zero chance of recording individuals, thus invalidating the survey.

BCS welcomed the opportunity to discuss these matters with ARTC on 9 November 2022 and explain our concerns. As discussed in the meeting, the BCS accountable officer for the species, Terry Mazzer, is willing to speak directly to Ben Lewis about the monitoring program to ensure that a robust survey design is created which maximises the chance of survey success.

If you require any further information regarding this matter, please contact Renee Shepherd, Principal Project Manager, via renee.shepherd@environment.nsw.gov.au or (02) 6883 5355.

Yours sincerely

Sarah Carr
Director North West
Biodiversity, Conservation and Science Directorate

11 November 2022

Attachment A – BCS's Detailed Comments and Recommendations – Five-clawed Worm Skink SMP
Attachment B – BCS's Detailed Comments and Recommendations – Construction BMP
Cc: Jess Athas, Team Leader Freight Team, DPE

BCS's Detailed Comments and Recommendations

Inland Rail Narrabri to North Star Phase 1 – Five-clawed Worm Skink Construction Species Management Plan – August 2022 version

Report Reference	BCS comment and recommendation (10 June 2022)	ARTC response (12 October 2022)	BCS response (November 2022)
1.5 Unexpected Find of the FCWS	This section refers to the different Stages of the project. A diagram is required illustrating the relative location of each Stage along the alignment.	Diagrams of locations have been provided as part of Appendix A (Figures 9-1, 9-2 and 9-3) due to the number of figures required to indicate the relative location as requested.	Figures 9-1, 9-2 and 9-3 do not depict the entire stages of the project. Detailed figures are not required – a figure contained to one (or two) pages only is sufficient. The figure could also include the chainages between stage boundaries. Not adequately addressed.
4.5 Land Tenure of Populations	Provide justification as to why the five named reserves might contain Five-clawed Worm Skinks (FCWS). Is this because of proximity, potential habitat, or other reasons? The 1993 reference provided is now quite dated. A BioNet search should show records in the Terry Hie Hie Community Conservation Area.	Section 4.5 was updated to include Bionet Record from THH and justification of where reserves may contain FCWS. Also referenced a number of new reserves with potential habitat.	This section has been amended but there is still no justification stating why the named reserves potentially provide habitat. Also note that the list of reserves has been substantially expanded, which provides a stronger reason for the SMP to provide insight into why these areas are considered to provide potential habitat. It gives the impression that the skinks are well represented in existing reserves. Not adequately addressed.
4.6 Habitat Associations	This section should include an analysis of the information collected in the FCWS register for the N2NS project, particularly in relation to soils and vegetation. Utilising some of the analysis from section 6 of the Stage 3 Works Summary Report would be beneficial.	Analysis of information collected in the FCWS register has been included in the revised in Section 4.12.	Information is presented in Section 4.12 based on the FCWS register. However, this section does not appear to have been amended since the May 2022 version. If Section 4.6 is not going to be updated to include project-based information, it should at least refer to Section 4.12 for the most recent site-based information on habitat associations. Not adequately addressed.

4.12 Current Context of FCWS and the Project	The third paragraph should be expanded to provide detail on the specific components that are included in the "development of a specific clearing procedure". Relevant information could be inserted here from the Stage 3 Works Summary Report, particularly sections 3 and 5.	Queries detailing specific components of specific clearing procedures are addressed in Section 5.	It is acknowledged that Section 5 contains specific clearing procedures. The comment made by BCS refers to providing context to the statement that a specific clearing procedure has been created. If additional information is not provided in Section 4.12 there should at least be reference to detailed information in Section 5, eg. "…resulted in the development of a specific clearing procedure for the FCWS <u>as detailed in Section 5".</u> Not adequately addressed.
	The current number of FCWS finds referred to in this section should be updated.	Not addressed.	Figures have not been updated. Not adequately addressed.
	Insert a map of FCWS finds to date to illustrate the geographic distribution of records along the alignment, including highlighting the different Stages of the project.	Maps showing distribution of FCWS are included in figures presented in Appendix A.	Appendix A inserted with all FCWS records. Stages of the project have not been identified, however this can be addressed by implementing the recommendation related to report reference 1.5 above.
5.0 Five-clawed Worm Skink Management	(2) Construction management actions - sixth dot point – does this "expected finds" procedure refer to Appendix I in the Construction BMP? If so, this should be stated explicitly. An additional explanation could be added to this dot point, indicating that the BMP should clearly state which parts of the alignment the full Unexpected Threatened Species Find protocol will be enacted within, and which parts will be subjected to the FCWS Encounter Protocol.	The requested information on construction management actions and where the Unexpected Threatened Species Find protocol will be specifically enacted is contained within Section 5.2.7 and includes an additional area Stage 2B: Chainage 641.08 – 647 that was not shown in Appendix I of the Construction BMP.	It is acknowledged that Section 5.2.7 contains information on the Unexpected Threatened Species Find protocol. However, the comment made by BCS is about providing clarifying information to the relevant dot point in Section 5.0. Additional dot point not added. Not adequately addressed.
	Add an additional dot point which states "implementation of relevant mitigation measures".	Not addressed.	Additional dot point not added. Not adequately addressed.

5.1.1 Additional studies	Will a soil scientist still be engaged to assess soil types given that topsoil stripping works are largely complete?	As detailed in this Section 5.1.1, a soil scientist will be engaged if any further topsoil stripping is required. As noted in the comment, topsoil stripping works are completed given the late stage of the Project. This was based of referenced study Elder Enviro (2022). Stage 1 - Soil Investigation Five Clawed Worm Skink Distribution. Report prepared for: Trans4m Rail.	Recommendation addressed.
5.1.2 Reduce clearing in FCWS Habitat Areas	Reducing clearing is the most effective measure that can be implemented to reduce impacts to the FCWS and should be considered throughout the implementation of the project.	Reduced clearing is noted and agreed to be the most effective measure to reduce impacts.	Recommendation addressed.
5.1.3 Updating Test of Significance Assessments for FCWS	This section states that tests of significance have been completed, but the title implies that the tests will be updated. Is this proposed to occur? Given that both tests have concluded a significant impact, is there any benefit to completing an updated test?	Amended the title of this section and removed the word "updating".	Title updated. Recommendation addressed.
5.2 Construction Management Actions for FCWS	An additional heading and commentary should be added to this section stating that deceased skinks have been collected and will be provided to the Australian Museum for research purposes.	Added comment of *"Deceased or euthanised individuals will be forwarded to the Australian Museum for research purposes"* to the last dot point of Section 5.2.4.	Additional dot point added to section 5.2.4. Recommendation addressed.
5.2.1 Identification of FCWS Habitat on Environmental Control Plans	The "known" and "likely to occur" habitat areas should be identified and mapped in the SMP.	The available GIS data with FCWS mapping, PCTs, relocation hubs etc. is shown in the figures presented in Appendix A.	Clarification is required. Does "known" and "likely to occur" habitat areas in this context refer to the Commonwealth mapping, or something different? It is not clear where these habitat areas are, and that is why BCS has requested that the maps be included in the SMP. It is acknowledged that the BMP has been updated on page 25 to reference the known and potential FCWS habitat, so again, an example of this mapping is required. Recommendation not addressed.

5.2.2 Specific FCWS Induction	The second dot point should be amended for Stage 1 to state that FCWS surveys are required for the entire Stage, not just CH603.00-625.00.	Section 5.2.2 dot point 2 was amended to include that FCWS surveys are required for the entirety of Stage 1.	Updated. Recommendation addressed.
5.2.3 Develop a Survey Prescription	In addition to windrowing slashed vegetation to the edge of the Construction Impact Zone (CIZ) it has been suggested that as much of the remaining slashed vegetation in the CIZ should be removed. Several types of machinery can complete this removal. Consideration should be given to including this activity.	Recommendations of types of machinery to remove remaining slashed vegetation in the CIZ were explored (i.e., windrowing with hay rakes, tedder rake) however these types of machinery were considered to not meet safety compliance requirements on a construction site.	ARTC commentary acknowledged. Recommendation addressed.
	Fifth dot point (page 24) – the second sentence should read "this should enable sufficient time for uncaptured FCWS to **move** of their own accord".	Sentence was amended to *"This should enable sufficient time for uncaptured FCWS to **move** of their own accord".*	Updated. Recommendation addressed.
	Previously a 7-day period had been agreed to between topsoil stripping and slashing – BCS does not support a 2-day period without further discussion and justification. The Stage 3 report also references a period of 7 days.	Comment on suitable timeframe between topsoil stripping and slashing stage is noted to be discussed further.	Discussion yet to occur. BCS's position is that the 7-day period should be reinstated. Recommendation outstanding.
	This section mentions the use of a scrapper. It is not clear what this machinery is or in which situations it would be used. The dot point states that where a scrapper is used, an ecologist or spotter catcher would inspect the material at the recipient site. Does this mean that a scrapper is not involved in the removal of topsoil so there is no impact site to inspect? As discussed in previous meetings, the FCWS register indicates that the use of excavators results in the highest survival rate of encountered skinks, so where possible that item of machinery is preferred.	Comments of queries of use of a scrapper as part of the topsoil stripping process (it is one of the options for machinery to be used). A scrapper is used to collect soil material were there is a large surplus and reposition as required to another location. Either as a fill or soil stockpile. A scrapper could be viewed as an excavator bucket on wheels, so it collects a large volume and then is able to deposit it at another location. It's this other location where it is suggested the ecologist or spotter catcher could be to supervise the removal and deposition of that material.	ARTC commentary acknowledged. Recommendation addressed.
5.2.4 Data Collection Requirements	It would be beneficial if the chainage and Stage of project could be recorded for each FCWS capture.	Have updated section to include: - stage of Project and chainage is included in data / record.	Updated. Recommendation addressed.

for Captured FCWS	Final paragraph (page 27) – state that the register will be provided with each incident notification and live FCWS-find report, and it will be made readily available for regulatory agencies.	The finds register will be included with each incident notification and live FCWS-find report will be made readily available to regulatory agencies.	Updated. Recommendation addressed.
5.2.5 Identifying and Establishing FCWS Relocation Sites	(i) Site Identification - although some sites will be located according to FCWS captures, other sites will be pro-actively created according to the presence of suitable habitat along the alignment – this should be articulated.	(i) Site Identification – updated wording within this section to articulate that although some sites will be located according to FCWS captures, other sites will be pro-actively created according to the presence of suitable habitat along the alignment.	Updated. Recommendation addressed.
	(ii) Site establishment - other material has been proposed for habitat enhancement including woody debris.	(ii) Site establishment – updated to include woody debris as a suitable material to use at relocation sites.	Updated. Recommendation addressed.
	Will the relocation sites be demarcated in the longer term once construction has been completed? If yes, how will they be identified? Will more permanent signage be installed?	To suitably capture relocation sites in the longer-term post-construction updated this section to include *"Sites that receive captured/relocated FCWS will be GPS and a register created as part of an environmental sensitive zone for ARTC operations".*	Updated. Recommendation addressed.
5.2.6 Habitat Enhancement and Refuge Replacement	Explanation is required as to why the placement of hay bales is only to occur on freehold land in the construction boundary – is there other tenures of land present and what precludes them from receiving habitat enhancement measures?	Query on why freehold tenure land within construction boundary. Word 'freehold' has been removed.	Section 5.2.6 updated and "freehold land" has been deleted – therefore hay bales will be located throughout the construction boundary, regardless of tenure. However, the placement of woody debris every 10 metres has been removed from the latest version of the SMP – request that this change to be explained.
5.2.7 Unexpected Five-clawed Worm Skink Finds Procedure	The Stage 2B Chainage 641.08-647.00 has not been identified before as being relevant to the Unexpected FCWS Finds Procedure. Is this based on the most recent finds in Stage 2? Will the BMP be updated to be consistent with the SMP?	Yes, the BMP will be updated to be consistent with the SMP as queried. Wording updated within this section "· Stage 1: Chainage 603.000 to 625.000 identified through DAWE predictive modelling, · Stage 2B: Chainage 641.08 – 647.00 following finds and extrapolating	The SMP still states Stage 1 chainages 603.00-625.00 are only subject to the FCWS-specific finds procedure – whereas the BMP states the procedure applies to all of Stage 1. It has been agreed the procedure can apply to all of Stage 1 – ensure consistency between documents.

		likely habitat and · Stage 3: Chainage 735.000 to 754.250 following finds and extrapolating likely habitat.	The BMP does not list Stage 2B CH641.08-647.00 as being applicable to the FCWS-specific finds procedure – ensure consistency between documents.
	The sentence after the first three dot points stating that the chainages in each stage have been identified because “individuals can move into these areas following the field surveys” is not correct. The chainages in Stage 3 were identified following FCWS finds and extrapolating likely habitat, and the Stage 1 chainages were identified through the DAWE predictive modelling for the FCWS.	No response.	Sentence has been deleted. Recommendation addressed.
	Additional text should be added to the first paragraph referring to the Unexpected Threatened Species Find Protocol in Appendix G of the Construction BMP to provide clarity around the protocol that must be enacted outside of those chainages. Consideration should be given to including the protocol as an appendix to the report.	The Unexpected Threatened Species Find Protocol had been included in Appendix E as suggested.	Text added regarding the Unexpected Threatened Species Find Protocol and Appendix E added. Recommendation addressed.
6.0 Five-clawed Worm Skink Monitoring Program	It is not clear whether the “adjacent monitoring site” will also be located in the relocation hub, or whether these sites will be in the broader rail corridor. This needs to be clarified. A diagram of the proposed survey design would be beneficial.	Description of “adjacent monitoring site” is noted as relocation hub is the monitored 'impact' site. This is detailed in paragraph 4 of Section 6.0. Adjacent monitoring sites are outside of areas likely to be impacted by maintenance activities (i.e. near trees and bushes beyond the CIZ and any associated buffer zones for vegetation growing near rail line).	ARTC commentary acknowledged. Location of monitoring sites included in Figures 9-1 to 9-3 in Appendix A. Now that the “impact site” and “adjacent monitoring site” locations are understood, BCS is concerned that the monitoring design as outlined is limited only to determining whether skinks are persisting in the relocation hubs (which is valid). However, equal importance should be given to determining whether skinks have recolonised the disturbed sites in the

	This comment is also relevant to section 6.2 – if “adjacent monitoring sites” are located in the broader rail corridor, consideration should be given to placing artificial refuge sites in areas that are unlikely to be disturbed by rail maintenance activities, including slashing of the corridor. Appropriate signage should be considered.	GIS layers for environmentally sensitive zones as part of ARTC operations to identify these locations.	corridor. We strongly recommend that the monitoring design is amended, and it incorporates sites in disturbed areas, focussed on where skinks were recorded during topsoil stripping works (to increase future recording success). If skinks are found in these disturbed sites, then it may be reasonable to conclude that the project is having less of an impact on the population than previously suggested.
6.1 Site Selection	Are the “paired sites” referred to in this section the same as the “impact site” and “adjacent reference site” described in section 6.0?	Difference between “paired sites” and “impact site” is elaborated in Section 6.1 with "A paired site comprises an ‘impact site’ situated at a relocation hub that received relocated FCWS’ and a ‘reference site’ located some distance away is unaffected by the project. The sites are summarised as:" Most of the finds are somewhat concentrated when considered from a biometrician perspective. It’s very important to have the following: an impact site that received a range of the prescribed management actions like it was a relocation hub with its exclusion fencing, hay bales/woody debris and it received relocated skinks. Then to pair it up with a 'reference site' that occurs near enough to your impact site yet far enough away to be considered 'independent' but was unaffected by the project. At the same time, one needs to consider land tenure so these 'reference' sites are across an area that is predominantly privately owned with a focus on cultivation agriculture. More sites within in Stage 2 would be preferable however need to be supported by that 'impact site' that has received those treatments. Remember looking at occupancy and not abundance/number of individuals.	Following from the comments in 6.0 above, if the monitoring design is amended to include disturbed sites, additional sites will be available for monitoring, thereby increasing the chance of success of recording skinks. Using the find success of Phil Spark’s monitoring program for the skinks, it is likely that the current proposed design will result in a find success rate of less than 1 percent – potentially one skink per season. This level of effort will not allow meaningful conclusions to be made from the surveys. BCS recommends that an amended design be provided for discussion.

	Justification is required to support why only 15 sites have been proposed – this seems to be a small number given the extent of the FCWS finds across all three Stages of the project. Consideration should be given to determining a minimum number of individuals that would be required to be captured to provide a meaningful sample size (e.g. 10 individuals) and implementing adequate sampling sites to attempt to meet that target number. The proposed initial trial period could be used to test the appropriate number of sample sites. Limiting the number of monitoring sites will limit the chance of capturing individuals, and therefore will limit the conclusions that can be made from the monitoring program and the likely impact of the project on the FCWS population.	Number of site suggestions – refer to comments above and the limit of sites has been the result of the way FCWS have been found, their relative concentrated nature, particularly at relocation hubs which is the focus of the impact site for monitoring and cannot have them on top of one another otherwise it simply amounts to pseudo- replication.	
	The comment stating that some sites will be removed from the monitoring program if FCWS are not located in Stage 1 can be deleted, given that finds have now been recorded in this Stage.	No response.	Sentence removed. Recommendation addressed.
	A map of the proposed monitoring sites should be included.	Mapping of proposed monitoring sites has been provided in Appendix A.	Figures 9.1-9.3 included. Table 6.1 updated with more details. Recommendation addressed.
6.2 Sampling Design and Regime	A diagram of the proposed artificial refuge layouts would be beneficial.	Each site is different in its configuration therefore difficult to provide a diagram for as requested. For example, roadside configuration would be more linear.	A generalised or idealised diagram of a site would be beneficial to understand the proposal. Recommendation not addressed.
	Terracotta tiles are unlikely to be useful as they are small and likely to dry the ground out. They are suitable for basking species in cold weather but not likely for FCWS. Despite this, the outcomes of the trial will confirm their usefulness.	The terracotta option has been replaced with industrial conveyor belt tile as suitable artificial refuge material. Current trials running have shown this material to be excellent for frogs, a range of skinks and snakes.	Update noted and supported. Recommendation addressed.

	Carpets should be larger than the proposed 1m^2 to enhance insulation and moisture retention. The carpet should be old/weathered/have water holding capacity to increase its habitat value. Phil Spark has created some artificial refuge sites for FCWS monitoring which include a range of materials – consideration should be given to adopting the same approach. BCS can provide examples of Phil's refuge sites if required.	Noted on suggestion for suitable size of carpet to be used as part artificial refuge type. However, proposed monitoring sites may prove a little more difficult with larger-sized pieces of carpet to position between the existing habitat in the relocation hub (impact treatments). Consideration is also given to those sites with exposed nature with some sites along public roads and largely more visible pieces may be prone to disturbance by the public. A more discrete approach is preferred to avoid disturbance as a number of the sites interface with public use areas like roads. Approach will enable a useful comparison between those set up and used by NES and ARTC Inland Rail approach. BSC's offer to provide examples of Phil Spark's refuge sites - an email request by the has been submitted by the ecologist (report author) for this information.	ARTC commentary acknowledged, however BCS remains concerned that the 1m^2 carpet squares will not be large enough to be as effective as they could be. Phil Spark's artificial refuge sites (examples of which were provided to the ecologist on 7 July 2022 following the request for the information) are the best-known practice for establishing habitat. Larger artificial refuge sites will retain soil moisture for longer. Noting site constraints in some locations, we would be interested to know how many monitoring sites could accommodate larger artificial habitats, which may in turn increase the chance of recording individuals.
	Artificial refuge sites should be installed as soon as possible after construction. Refuge sites can be placed in the relocation hubs now to enhance habitat. The current season is excellent and immediate installation would potentially allow for a spring/early summer trial to test capture rates.	It is the intent once the SMP is finalised, to install artificial refuge sites and be permanent locations. The 12 weeks period prior to monitoring is intended as a bedding in or minimum time and with the wetter than usual season it would enable some distinction to take place between tile and carpet options.	ARTC commentary acknowledged. Every effort should be made to install the artificial refuge sites as soon as possible so that if favourable conditions remain in autumn 2023, monitoring can occur. Recommendation addressed.
	The artificial refuge sites should be permanent rather than temporary sites. Installing artificial refuge sites 12 weeks before scheduled monitoring limits the ability of monitoring to respond to appropriate seasonal conditions.		

	Rather than basing the monitoring program on an autumn and spring frequency, it should be based on the presence of suitable soil moisture conditions. The FCWS records to date indicate a correlation between finds and rainfall/soil moisture, where soil cracks are minimal, and skinks move closer to the soil surface. Monitoring on a strictly seasonal basis may reduce detectability of the skinks. BCS recommends that each monitoring event be confirmed in consultation with us to ensure that conditions are selected to increase the chance of detectability.	Intent is to conduct monitoring at the indicated time frames which tend to coincide with the more reliable 'wetter' periods. Specific detail has been added to this section that relates to soil moisture/rainfall during monitoring.	It is not clear what information has been added to this version of the SMP relating to soil moisture/rainfall during monitoring. This section states early autumn and late spring periods have been chosen to account for rainfall based on long term climatic averages, but there is no guarantee that any given monitoring period will align with suitable soil moisture conditions. If monitoring occurs without considering the soil moisture conditions, it will invalidate the entire seasonal survey. If monitoring occurs when the soil is dry and cracks are present, it is likely no skinks will be recorded as they will be in the soil cracks, not on the soil surface. BCS strongly recommends the consideration of soil moisture forms the basis of survey timing.
	Fourth paragraph – suggest deletion of “this will result in four surveys per annum with two surveys in each season”. As described above, surveys should be in response to appropriate seasonal conditions (adequate soil moisture) rather than be dictated by a calendar timing – if these seasons are dry it is unlikely that the monitoring will detect the presence of the FCWS.		

6.4 How Many Years to Monitor	As previously discussed, it is recommended that the monitoring periods be amended so that they are based on soil moisture content rather than an annual event. Five monitoring events over a 10-year period would be reasonable and would account for dry periods when skinks are likely to be deep in the soil cracks rather than being at the soil surface. Monitoring events could occur in consecutive years when conditions are favourable, or monitoring could be suspended over a period while conditions are dry. The trial period should not be considered one of the five monitoring events unless it results in a favourable capture rate (e.g. more than 10 skinks). Potentially a trial could occur this spring/early summer.	Occupancy analysis related monitoring is the key. Surveys would be undertaken at indicated times within this section and with adequate soil moisture (reflected in long term climatic averages for past 25-30 years around Moree). The repeated surveys enable an occupancy model to be created using variables, particularly in the trial which will assist in refining the monitoring program. The point is to establish the trial survey and be guided by the statistics and let mathematics assess factors such as artificial shelter type (the detection rate can be compared between the two), time of day (detection rate comparison) and sample size effect (to determine how many replicates (number of sites plus, number of repeat visits) are needed in subsequent monitoring events.	See comments made above in relation to 6.2.

Inland Rail Narrabri to North Star Phase 1 – Five-clawed Worm Skink Construction Species Management Plan – August 2024 version

Section	ARTC Change	BCS comments 22/08/2024
Cover page	Date and version updated.	
Section 5.2.8	Department names updated.	Ensure 'BCD' is replaced by 'BCS' throughout the document.
Section 6.0	Various text updated throughout, including updated photos and explanation of Treatment A, Treatment B and Treatment C.	Treatment type A – the last sentence states 'As these sites were also disturbed they are considered an impact site'. This needs to be clarified – it is BCS's understanding that these sites should not have been disturbed as they were specifically located in areas that were not impacted by construction. The purpose of monitoring the relocation hubs is to determine whether skinks are being retained at these sites.
Section 6.1	Text updated, last sentence moved to Section 6.2.	Page 33 – suggest the wording of the first sentence is amended to - 'Fifteen (15) sites have been ~~proposed~~ established between Stage 1….'
Table 6-1	Updated specific site locations and comments. Table moved within document Section 6.1	Table 6-1 – the comments column of the table requires updating. All sites have been established – this column needs to be updated accordingly. Table 6-1 – some sites have been relocated after being affected by flooding – update lat/long accordingly if necessary. Include another reference in the 'site number' column which aligns sites 1-45 with the numbering system in Figures 6-1 and 6-2 (eg. 1A, 1B, 1C etc).
Figure 6.1 and 6.2	Monitoring location maps added.	
Section 6.2	Wording updated throughout to cover current establishment and configuration of the monitoring sites. It also includes reference to site maintenance. Note; this includes updating the timing of monitoring in regard to month of the year and temperatures. This was adjusted in line with AMBS (monitoring consultant) recommendations.	Page 41 – missing rubber and carpet tiles are proposed to be replaced during each monitoring event. This should also include the addition of (rather than replacement of) rubber and carpet tiles where existing tiles are starting to decompose (the original tiles should remain in situ with new ones being placed on tip, to retain the artificial habitat).
Figure 6-1	Generalised shelter site arrangement figure replaced by a current site photo, showing updated site configuration as per BCS verbal direction and agreement.	We now have some sites where all of the rubber and carpet tiles abut each other, and some older established sites where tiles are scattered. To ensure consistency across all sites, the older established sites should be reconfigured to align with the configuration where all tiles are abutting each other, allowing direct

		comparison of monitoring results. This should occur at least 12 weeks before the spring monitoring period.
Section 6.3	Updated wording, "would" replaced with "should". (4th paragraph, page 42).	
Section 6.4	Updated wording.	
Table 6.2	Monitoring Schedule updated. Year 2024/ 2025 is Year 1 Trial period. Final year of monitoring is Year 4, 2027/2028.	
Section 6.5	Added Monitoring Site Management Measures, including: - Site Protection Measures (demarcation, star pickets signposted, woody debris). - Further Management Measures (awareness, adding to ARTC Map). - Monitoring consultant to rectify and report missing sites.	
Table 7.1	Added timing for Inspections (Construction or Operations). Adjusted relevant responsibilities for Site Surveys. Added Operational Monitoring Surveys.	
Appendix A		What are the 'FCWS relocation hubs' and the 'FCWS habitat enhancement' areas depicted in maps 1-57? There should only be 15 relocation hubs.