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Dear Alex

CSSI 9487 Narromine to Narrabri Project – Five-clawed Worm Skink Management Plan Minister's Condition of Approval E30

I refer to the Minister's Conditions of Approval (MCoA) issued for the Critical State Significant Infrastructure (CSSI) Project No. 9487 Narromine to Narrabri (N2N), on 21 February 2023, and specifically the requirement for a Five-clawed Worm Skink Management Plan (FCWS MP) to be prepared and submitted to the Planning Secretary in accordance with MCoA E30.

ARTC Inland Rail seeks the Secretary's approval for the enclosed Five-clawed Worm Skink Species Management Plan (Revision D dated 22 August 2023) (the Plan) which has been prepared in accordance with MCoA E30. The Plan has been revised from Revision C to Revision D in response to the Department's request for additional information on 22 August 2023. The sole update to the Revision D Plan is Appendix D – Five-clawed Worm Skink Encounter Procedure – Figure 2: FCWS Outside FCWS Habitat Find Flow Chart.

This Plan relates to Low Impact Works (LIW). The Plan will be updated prior to the commencement of Construction activities and resubmitted to the Department for review and approval at this time. The Plan is enclosed in Attachment 1.

If you wish to discuss any of the above further, please contact Jasmine Walden, A/ Program Environment Lead – Regulatory Engagement and Compliance on JWalden@artc.com.au on 0456 661 257 or myself on Rhamilton3@artc.com.au on 0419 799 699.

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Yours sincerely



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Attachment 1 – Five-clawed Worm Skink Management Plan Revision D

Five-clawed Worm Skink Management Plan

Inland Rail – Southern Civil Works Program

Project number:	N81120
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Revision:	D

Document Approval

Rev.	Date	Prepared by	Reviewed by	Approved by	Remarks
A	30/5/23	Rasuejah Achior / Gregor Wilson	Various	Jason Moran	Draft for ARTC review
B	18/7/23	Gregor Wilson	Various	Martin Harris	ARTC comments addressed
C	10/8/23	Gregor Wilson	Martin Harris	Martin Harris	BCS comments addressed
D	22/8/23	Gregor Wilson	Martin Harris	Martin Harris	Correction to Appendix D

Plan control and amendment

Details of Revision Amendments

Plan Control

The Environment and Sustainability Manager is responsible for the preparation and ongoing updates of this document. The Environment and Sustainability Manager is responsible for updating this plan to reflect changes to the project, legal and other requirements, as required.

Amendments

Any revisions or amendments must be approved by the Program Director and/or client before being distributed/implemented.

Revision Details

Revision History	Date	Pages	Revised by	Description
A	30/5/23	All	Rasuejah Achior / Gregor Wilson	Draft for ARTC review
B	18/7/23	All	Gregor Wilson	ARTC comments addressed
C	10/8/23	All	Gregor Wilson	BCS comments addressed
D	22/8/23	Appendix D	Gregor Wilson	Correction to Appendix D

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Abbreviations/definitions

Term or Abbreviation	Definition
ACA CPB JV	ACCIONA CPB Joint Venture
ARTC	Australian Rail Track Corporation
ASC	Australian Soil Classification
BC Act	<i>Biodiversity Conservation Act 2016</i>
BDAR	Biodiversity Development Assessment Report
BCS	Biodiversity, Conservation and Science Directorate
CEMP	Construction Environmental Management Plan
CFA	Collaborative Framework Agreement
CIZ	Construction Impact Zone
CoA	Conditions of Approval
CPB	CPB Contractors Pty Ltd
CRN	Country Rail Network
CSSI	Critical State Significant Infrastructure
DAWE	Commonwealth Department of Agriculture, Water and the Environment
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DPE	Department of Planning and Environment
ECP	Environmental Control Plans
EIS	<i>Environmental Impact Statement</i>
EPBC Act	<i>Environmental Protection and Biodiversity Conservation Act 1999</i>
FCWS	Five Claw Worm Skink
IR	Inland Rail
JGHD	Jacobs GHD
LIW	Low Impact Works
N2N	Narromine to Narrabri
N2NS	Narrabri to North Star
NPW Act	<i>National Parks and Wildlife Act 1974</i>
NSW	New South Wales
PCT	Plant Community Type
PIAR	<i>Preferred Infrastructure and Amendment Report</i>

Term or Abbreviation	Definition
POEO Act	<i>Protection of Environmental Operations Act 1997</i>
SCWP	Southern Civil Works Program
SPRAT	Species Profile and Threats Database
TEC	Threatened Ecological Community
UEMM	Updated Environmental Management Measures

1 Executive Summary

This Five-Clawed Work Skink Management Plan (FCWS Management Plan) provides a structured approach to the management and mitigation of potential impacts to the threatened FCWS during the delivery of the Inland Rail Southern Civil Works Program (SCWP) scope of works described in Section 2.2 of this document. This Plan demonstrates how ARTC's Contractor, Acciona CPB Joint Venture (ACA CPB JV), will comply with Conditions of Approval (CoA) E30 and E31, during the delivery of Low Impact Works (LIW).

LIW will be undertaken prior to Construction to obtain information for design and de-risk the overall delivery program. The Plan will be updated prior to the commencement of Construction activities and resubmitted to DPE for review and approval at this time.

In accordance with CoA E30, this Plan has been adapted from the FCWS Management Plan prepared for the North Star to NSW/Queensland Border Project (SSI-9371), approved on 5 June 2023.

Findings from the Inland Rail - Narrabri to North Star Separable Portion 1 N2NS SP1 (SSI-7474) project, indicate that FCWS Habitat Areas are determined by soil type (cracking clays) and not vegetation types, with this finding also supported by DCCEEW Species Profile and Threats (SPRAT) Database records. Extensive geotechnical investigation (GI) campaigns were undertaken during the EIS and reference design phase of the N2N project. During Plan preparation, an extensive desktop review of existing GI logs and publicly available geological/soil information was completed to validate potential FCWS habitat mapping for the Project. The findings of the review are reflected in the mapping in Appendix A.

The potential FCWS habitat mapping Project has been divided into three categories:

- Confirmed FCWS habitat - Where GI data has verified/ground-truthed vertosol soils. This Plan and associated mitigation measures apply.
- Potential FCWS habitat - where publicly available geological/soil information identifies potential vertosols, however, GI data is unavailable to verify/ground truth this information. This Plan and associated mitigation measures apply.
- Confirmed non-FCWS habitat - where GI data has verified/ground-truthed there is no vertosols that would support FCWS habitat. The FCWS Encounter Procedure applies.

The Plan uses a risk-based approach to assess proposed works potential impact on the FCWS, determined by scope of the activity and extent of ground disturbance; with mitigation measures assigned based on level of risk.

Given the nature of the LIW, they are considered to have a low-moderate risk of impacting the FCWS after mitigation measures have been implemented, as detailed in Section 6.2 and Appendix B Activity Risk Matrix.

2 Introduction

2.1 Purpose and scope

Acciona CPB Joint Venture (ACA CPB JV) have been engaged by Australian Rail Track Corporation (ARTC) to undertake the Inland Rail Southern Civil Works Program (SCWP) under a Collaborative Framework Agreement (CFA).

The purpose of this Five-Clawed Work Skink Management Plan (FCWS Management Plan) is to provide a structured approach to the management of potential impacts to the threatened FCWS during the delivery of the SCWP scope of works described in Section 2.2.1 of this document. This FCWS Management Plan will also serve to demonstrate how ACA CPB JV will comply with Conditions of Approval (CoA) E30 and E31, during the delivery of Low Impact Works (LIW).

LIW will be undertaken prior to Construction to inform Project design and provide more certainty on key delivery aspects such as:

- Construction material supply by undertaking geotechnical investigations at potential additional borrow pit sites
- Construction water supply by undertaking groundwater investigations
- Design of major structures such as viaducts by undertaking geotechnical investigations.

These further investigations and completion of the detailed design process will confirm the Project footprint. Prior to Construction, the FCWS Management Plan will be updated for Construction activities and submitted to DPE for review and approval.

Detail on the ecology of the FCWS (*Anomalopus mackayi*) is provided in Section 5. Detail on potential FCWS Habitat Areas is provided in Appendix A.

2.2 Project scope

Inland Rail (IR) is a 1,700-kilometre freight rail line that will connect Melbourne and Brisbane via regional Victoria, New South Wales (NSW) and Queensland. The Commonwealth has appointed the ARTC to deliver the IR Program. The IR Program has been divided into 13 sections, one of these being the Narromine to Narrabri (N2N) section referred to as the Southern Works Program.

The N2N section of Inland Rail is located in north-western NSW and comprises 306 km of greenfield railway Construction between Narromine and Narrabri. The rail corridor starts at the southern point of the Narrabri to North Star section of IR and travels south, on the west side of the Narrabri township. It then continues south parallel to the Newell Highway and then south-west through the Pilliga Forest. It then continues south-west near Baradine and through Curban where there is an at grade junction with the Country Rail Network (CRN) Dubbo to Coonamble line. The corridor continues south then around Narromine to the East, where it joins the Parkes to Narromine line. The alignment is shown in Figure 2-1 and Figure 2-2.

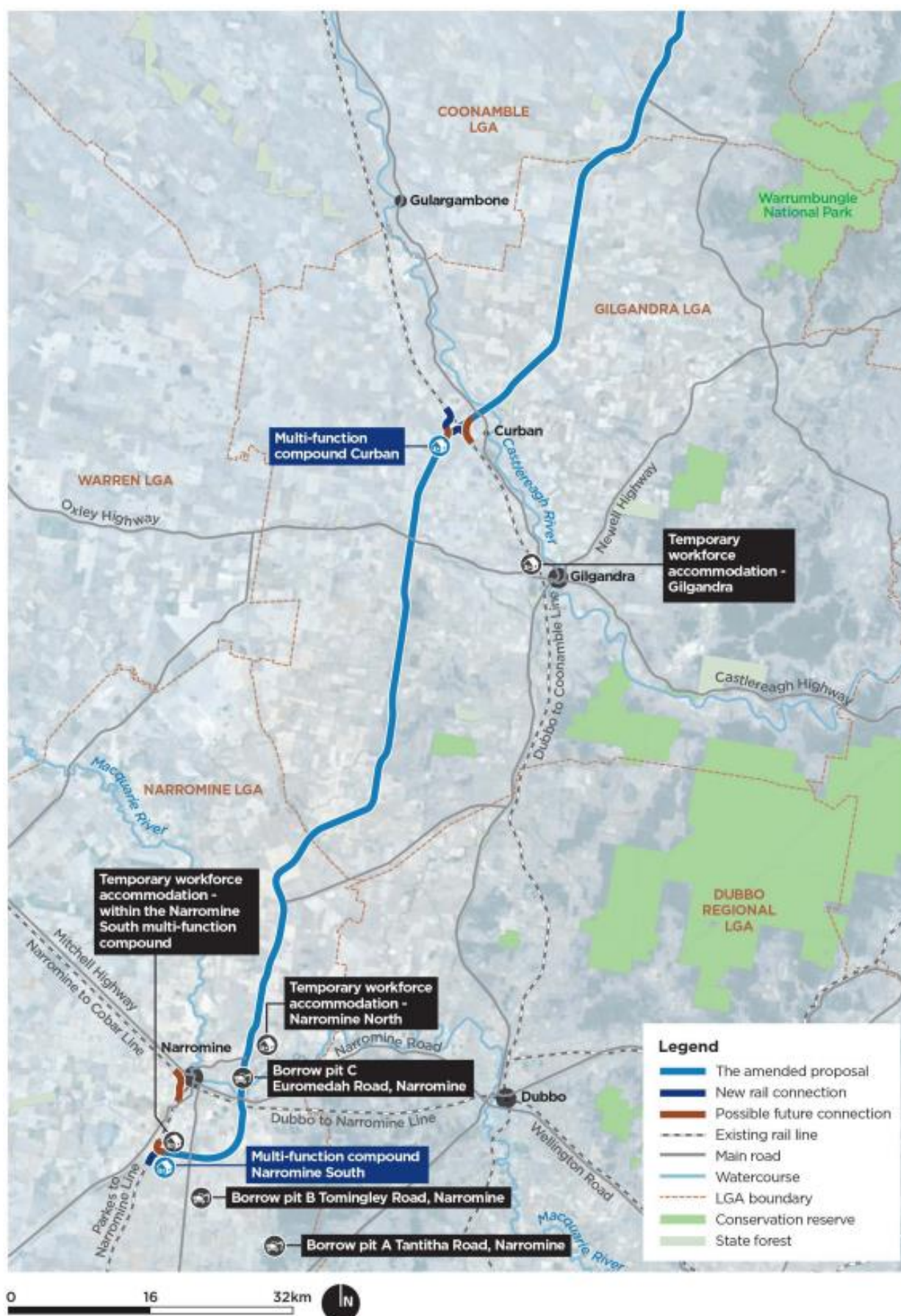


Figure 2-1: N2N Construction features Map 1 (source: Preferred Infrastructure and Amendment Report Figure 1-4)

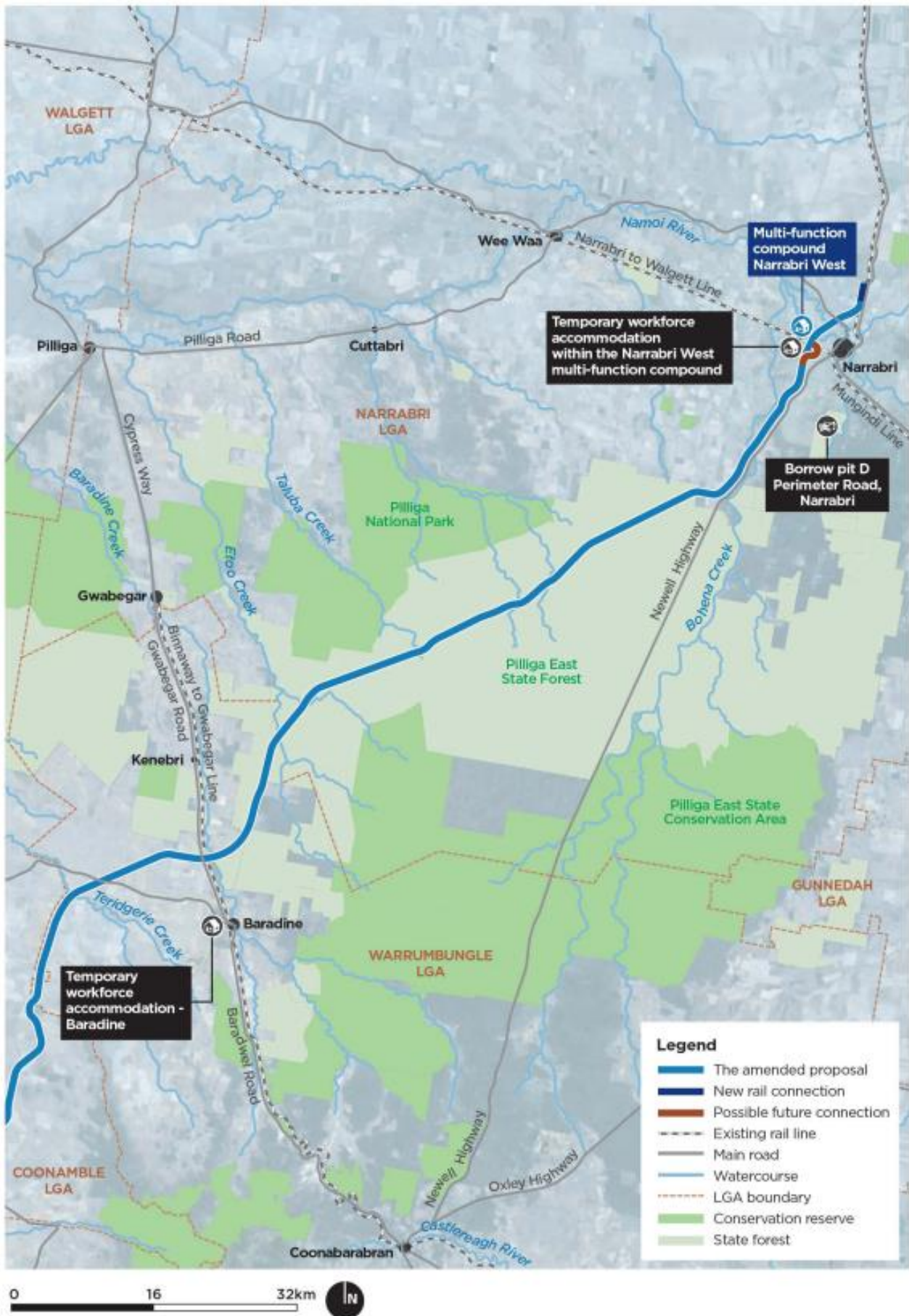


Figure 2-2: N2N Construction features Map 2 (source: Preferred Infrastructure and Amendment Report Figure 1-5)

2.2.1 Low Impact Works

As noted in Section 2.1, this FCWS Management Plan only addresses LIW at this stage, as per the definition of LIW in the CoA Schedule 1, Table 1 (refer to Figure 2-3). The LIW will be undertaken early and prior to Construction to obtain information for design and to de-risk the overall delivery program.

Term	Definition
Low Impact work	Work defined as low impact includes: (a) survey works including carrying out general alignment surveys, installing survey controls (including installation of global positioning system (GPS)), installing repeater stations, carrying out surveys of existing and future utilities and building and road dilapidation surveys; (b) investigations including investigative drilling, contamination investigations and excavation; (c) site establishment work approved under a Site Establishment Management Plan in accordance with Condition A24; (d) operation of ancillary facilities if the ER has determined the operational activities will have minimal impact on the environment and community; (e) treatment of contaminated sites subject to the recommendations of a Remediation Report prepared in accordance with Condition E165; (f) minor clearing and relocation of native vegetation, as identified in the documents listed in Condition A1; (g) installation of mitigation measures including erosion and sediment controls, temporary exclusion fencing for sensitive areas and acoustic treatments; (h) property acquisition adjustment work including installation of property fencing; (i) relocation and connection of utilities where the relocation or connection has been determined by the ER to have a minor impact to the environment; (j) establishing minor ancillary facilities in accordance with Condition A28; (k) archaeological testing under the <i>Code of practice for archaeological investigation of Aboriginal objects in NSW</i> (Department of Environment Climate Change and Water, 2010) or archaeological monitoring undertaken in association with Low Impact work to ensure that there is no impact on heritage items; (l) archaeological and cultural salvage undertaken in accordance with a strategy or salvage operation required by the conditions of this approval; (m) maintenance work to existing buildings and structures as required to facilitate the carrying out of the CSSI; and (n) other activities determined by the ER to have minimal environmental impact which may include construction of minor access roads (other than access roads' connection to the road network), temporary relocation of pedestrian paths and the provision of property access. Despite the above, the following works are not Low Impact Work: (i) where heritage items, or threatened species or their habitat, or threatened ecological communities (within the meaning of the <i>Biodiversity Conservation Act 2016</i>), are adversely affected or potentially adversely affected by any low impact work as defined in (a) to (n) above, that work is construction, unless otherwise determined by the Planning Secretary in consultation with Heritage NSW, EHG or DPI Fisheries (in the case of impact upon fish, aquatic invertebrates or marine vegetation); and (ii) any night time work that exceeds noise management levels as defined in the ICNG. The low impact work described in this definition becomes Construction with the approval of a CEMP. Where low impact work has already commenced, this is considered to remain as low impact work and is managed in accordance with the framework under which it commenced.

Figure 2-3: Activities defined as Low Impact Works in CoA for CSSI 9487

ARTC Inland Rail has approved the delivery of the following LIW scopes for the N2N Project, with scheduled commencement in August 2023 (subject to approval of this Plan):

- Geotechnical and soil investigations
- Construction water investigations.

These approved LIW scopes are well developed and detailed descriptions are provided below.

ARTC Inland Rail is currently assessing the following LIW scopes, which may be delivered prior to Construction:

- Archaeological test excavation and salvage
- Utilities investigations
- Installation of mitigation measures including erosion and sediment controls and temporary exclusion fencing for sensitive areas
- Contamination investigations and treatment of contaminated sites
- Site establishment work
- Property acquisition adjustment work
- Minor ancillary facility establishment
- General survey investigations
- Other non-intrusive investigations
- Other activities determined by the ER to have minimal environmental impact.

These LIW scopes are in the early stages of development and general descriptions are provided below.

A desktop review of existing GI soil classification data and publicly available geological information has been undertaken. This was undertaken to validate potential FCWS habitat mapping for the Project and to prepare the mapping included in Appendix A. Mitigation measures will be applied at additional LIW work sites within potential FCWS Habitat Areas, as detailed in Appendix B Activity Risk Matrix.

Note that additional information about the extents of FCWS habitat will be collected during LIW via implementation of the management and mitigation measures contained in this plan. The additional information will be obtained through LIW geotechnical and soil investigations described in Section 2.2.1.1

Prior to Construction, the Project may conduct supplementary soil sampling investigations to accurately classify the extent of vertosol soils in areas mapped as 'Potential' FCWS habitat. This Plan would then be updated if the mapping in Appendix B can be refined based on the data collected. Updates would be undertaken in accordance with Section 6.2.8.

This additional information will be utilised to enhance the Project's understanding of FCWS habitat to ensure adaptive management strategies outlined in Sections 2.2.1.1, 1.6 and 7 can be refined to more accurate locations.

Given the nature of these LIW, they are considered to have a low-moderate risk of impacting the FCWS after mitigation measures have been implemented, as detailed in Appendix B Activity Risk Matrix. Control measures outlined in Section 6.2 applicable to the LIW have been identified Table 2-1, which provides a summary of the Appendix B Activity Risk Matrix.

Control measures identified as applicable (green) will be implemented as per Section 6.2. Where control measures are identified as partial applicability (orange), elements of the measures from Section 6.2 will be implemented as reasonable and practical. Determination as to what measures are reasonable and practical is based on a risk assessment of the proposed activities (Appendix B) looking at scope of working including footprint of impact, type of impact, plant and machinery utilised. Some activities will be excluded from required measures (as Not applicable) due to low level of risk and/or control measure not being reasonable based on the activities impact.

Table 2-1: LIW Management Actions Matrix

Section	Control Measure	Heritage Test Excavations	Geotechnical Investigations	Construction water investigations	Utilities Investigations	Installation of mitigation measures	Contamination investigations and treatment	Property acquisition adjustment work	Minor ancillary facility establishment	General Survey	Other Non-Intrusive	Site establishment
6.2.1	FCWS Habitat Areas identified on Environmental Control Plans	Applicable	Applicable	Applicable	Applicable	Applicable	Applicable	Applicable	Applicable	Applicable	Applicable	Applicable
6.2.2	Specific FCWS Induction	Applicable	Applicable	Applicable	Applicable	Applicable	Applicable	Applicable	Applicable	Applicable	Applicable	Applicable
6.2.3	Survey Prescription – Before & During activities.	Applicable	Applicable	Applicable	Applicable	Applicable	Applicable	Applicable	Applicable	Applicable	Not applicable	Applicable
6.2.4	Data Collection Requirements for Captured FCWS	Applicable	Applicable	Applicable	Applicable	Applicable	Applicable	Applicable	Applicable	Applicable	Partial	Applicable
6.2.5	Identifying and Establishing FCWS Relocation Sites	Applicable	Applicable	Applicable	Applicable	Applicable	Applicable	Applicable	Applicable	Applicable	Partial	Applicable
6.2.6	Habitat Enhancement and Refuge Replacement	Applicable	Applicable	Applicable	Applicable	Applicable	Applicable	Applicable	Applicable	Applicable	Not applicable	Applicable
6.2.7	Five Claw Worm Skink Encounter Procedure	Applicable	Applicable	Applicable	Applicable	Applicable	Applicable	Applicable	Applicable	Applicable	Applicable	Applicable

2.2.1.1 Geotechnical and soil investigations

In order to inform Project design, geotechnical investigations will be undertaken at multiple locations both within the Construction Impact Zone (CIZ) and at potential borrow pit locations (located within the CIZ). The investigations include drilling boreholes and test pit excavations. As part of this activity, soil investigations will also be undertaken to determine the presence of cracking clay soils referred to as vertosols.

Information gathered from these investigations would be used to refine the Project's mass haul strategy, which would result in a shortlist of proposed borrow sites. Any sites selected as proposed borrow sites during Construction would be assessed for consistency with the current Project Approvals and may or may not require further approval. These further approvals are outside the scope of this FCWS Management Plan.

In addition to these above activities, temporary minor access tracks (4m – 6m) need to be created to allow the safe, all-weather passage of plant and equipment. This will include slashing of ground cover and in some cases minor earthworks to cut safe level working pads including placement of rock mattress. Full details on number of tracks required and ground penetration works required for track establishment is to be determined based upon on-site conditions. Boreholes will be drilled to depths between approximately 15m and 35m with a diameter of approximately 400mm. A footprint of approximately 20m x 9m is required to be slashed to provide a safe working area.

Test pits will be excavated with dimensions of approximately ~300mm x 1000mm to an approximate depth of ~3m by a 5-12t excavator. Material will be backfilled post investigation. A footprint of approximately 10m x 5m is required to be slashed to provide a safe working area.

2.2.1.2 Construction water investigations

In order to assess the potential suitability of potential Construction water supply sources, four water bores within the Pilliga Forest, two within the Warrumbungle Shire Council and two within the Coonamble Shire Council. Existing water infrastructure within the Pilliga will also be assessed for suitability as Construction water. The purpose of performing these works is to ensure the water demand can be secured for the Construction phase of the Project. The methodology would be similar to that of the geotechnical and soil investigations described in Section 2.2.1.1, however, the depths of the bores would be up to 400m. Once drilled, the bores would be subject to water quality tests and a 48 hour constant flow rate pump test.

2.2.1.3 Archaeological test excavation and salvage

Archaeological excavations are required prior to Construction to further characterise, and if required salvage (preservation and record) any cultural materials across the Project footprint. For the purposes of test excavations, test pits would be required to investigate the locations. Test pits are approximately 0.25m² (0.5m x 0.5m).

Slashing will be required to provide a safe working area. Test excavations pits will be dug carefully using hand tools in 10cm stages to a depth of approximately 1.5m with shovels, mattocks and other hand tools in such a way to avoid damage to potential artefacts and also potential FCWS. The excavated material is then passed through a sieve, with artefacts recovered for analysis in collaboration with the Registered Aboriginal Parties.

Due to the slow and careful hand tool excavation process associated with this archaeological test excavation methodology, supervision of this ground disturbance activity by ecologist/fauna spotter catcher is not considered warranted based on low risk of FCWS impact. This will be ensured via training of the supervising archaeologists and participating Registered Aboriginal Parties as per the applicable management actions in Table 2-1 and Appendix B.

2.2.1.4 Utilities investigations and relocation

In order to inform detailed design, a series of utilities investigations will occur to identify and confirm locations of services. These investigations include service scanning and tracing with handheld scanning devices that incur no ground penetration.

Some locations would require non-destructive digging (potholing with a vac track) to physically locate known services. An area of 1m² is required to be slashed to provide a safe working area (pending grass height) with the truck opening ~400mm diameter pothole or 1000mm by 400mm slit trench. Any potholes or slit trenches would be backfilled post service identification.

Relocation of utilities would likely involve a variety of potential methods, including trenching, horizontal directional drilling and/or micro tunnelling for underground services, to relocation of poles for overhead services.

2.2.1.5 Installation of mitigation measures

Installation of mitigation measures, including erosion and sediment control measures, fencing/delineation of sensitive areas and potentially installation of acoustic mitigation measures. These activities may require clearing of vegetation and ground disturbance.

2.2.1.6 Contamination investigations and treatment of contaminated sites

Contamination investigations would likely consist of similar activities to that outlined in Section 2.2.1.1, with drilling boreholes and test pit excavations required. This may also require temporary minor access tracks (4m – 6m) to be created to allow the safe, all-weather passage of plant and equipment. This will include slashing of ground cover and in some cases minor earthworks to cut safe level working pads including placement of rock mattress. Treatment of contaminated sites would vary depending on the results of investigations. Potential treatments, if required, would be determined in accordance with Updated Environmental Management Measure SC6 and CoA's E164 to E167 and are out with the scope of this plan.

2.2.1.7 Property acquisition adjustment work

As part of the property acquisition process, property adjustment work may require the installation of fencing along property boundaries, which would cause limited ground disturbance where fence posts are located. In addition, the formalisation of site access and egress points may also be undertaken. This is likely to involve clearing of vegetation and the establishment of hardstand and/or bitumen areas.

2.2.1.8 Minor ancillary facility establishment

In order to support work activities to be undertaken, the establishment of minor ancillary facilities may be required, which would include items such as sheds and portable toilets. In order to establish such facilities minor amounts of clearing, grubbing and the formation of hardstand may be required.

2.2.1.9 General survey investigations

Detailed surveys will be undertaken along the alignment to inform detailed design. The only ground disturbance associated with this, is installation of survey markers, pegs and the set-out of control points. Survey control locations involve hand digging a penetration (approximately 250mm x 250mm), placement of precast box with a driven steel rod, backfilled with soil, to remain in place for the duration of the project.

In addition, road and building dilapidation surveys may also be carried out. These typically consist of visual inspections only and are non-intrusive in nature.

2.2.1.10 Other non-intrusive investigations

A series of other non-intrusive / non-ground disturbing activities are required as part of the LIW. This may include but is not limited to the continuation of environmental baseline monitoring activities, seasonal biodiversity surveys, general site walkovers and field inspections.

2.2.1.11 Site establishment work

Site establishment may include any combination of the activities listed in Section 2.2.1.1 to Section 2.2.1.10. In addition to this, it may also involve the following activities:

- Installation/establishment of construction infrastructure, including but not limited to:
 - Office buildings
 - Staff amenities
 - Precast facilities
 - Borrow pits
 - Workforce accommodation
 - Stockpile locations
- Establishment of access roads
- Formalisation of site parking
- Installation of lighting.

The scope of all site establishment activities would be documented within the Site Establishment Management Plan (as per CoA A24) and/or the Construction Environmental Management Plan (CoA C1).

2.3 Site overview

The N2N Project occurs between Narromine and Narrabri and consists of about 306km of new single-track standard-gauge railway with crossing loops. It includes changes to some roads to facilitate Construction and Operation of the Project and ancillary infrastructure.

The land requirements for the Project include a new rail corridor with a minimum width of 40m, with some variation to include particular infrastructure and/or to cater for local topography. The corridor is proposed to be of sufficient width to accommodate Construction infrastructure, whilst also possibly accommodating future expansion of crossing loops for 3,600m long trains. Clearing of the Project site would occur where required to allow for Construction.

As described in Chapter B1 of the EIS, the majority of the southern and central portions of the Project site are located in land cleared for agriculture with areas of native grasslands and native woodland. Large sections of the northern end of the Project site are located in areas dominated by vegetation associated with State forests, particularly the Pilliga State Forest. The Project also passes through vegetated areas associated with travelling stock reserves, such as at Bohena Creek near Narrabri and the Macquarie River at Narromine.

Native vegetation cover represents about 52 per cent of the Project site. The Project site includes about 1,125ha of native woodland and forest vegetation in good condition, which contains an overstorey of mature trees. In addition, about 600ha of native grassland and seven hectares of shrubland wetland is present.

2.3.1 Watercourses

The Project site is located within the major water catchments of the Macquarie-Bogan River, the Castlereagh River and the Namoi River. In total, the Project site crosses 47 watercourses (include the three rivers described previously). The majority of the watercourses are non-perennial (i.e. either intermittent or ephemeral). Intermittent watercourses cease flowing for weeks or months at a time, while ephemeral watercourses flow for short durations following rainfall. The stream flow characteristics in the Project area are a result of the size of the contributing watercourse catchment areas, rainfall, limited groundwater baseflow and evaporation patterns in the region.

2.3.2 Soil

Soil mapping data, sourced from the Australian Soil Classification, indicates that soil types along the Project site can be best described as follows:

- Narromine to the Oxley Highway—dominated by red brown earths, red earths and solodic soils
- Oxley Highway to Baradine—dominated by cracking clays (vertisols), red and red brown earths (non-cracking clays) and non-calcic brown soils (duplex soils)
- Baradine to Narrabri—dominated by solodic soils (duplex soils) and earthy sands (non-cracking clays)
- Narrabri—dominated by solodic soils (duplex soils) south of Narrabri and cracking clays (vertisols) close to Narrabri.

2.3.3 Biodiversity – Flora

During preparation of the Biodiversity Development Assessment Report (BDAR) to support the EIS, a total of 34 Plant Community Types (PCTs) were identified in the Project site. Five threatened ecological communities listed under the *Biodiversity Conservation Act 2016* (BC Act), and five listed under the EPBC Act were identified during field surveys. Native vegetation in the Project site generally comprises a woodland community, with the dominant canopy species including Pilliga Grey Box (*Eucalyptus pilligaensis*), Baradine Gum (*Eucalyptus chloroclada*), Poplar Box (*Eucalyptus populnea*) and White Cypress Pine (*Callitris glaucophylla*). Scattered areas of derived natural grasslands also occur.

Four threatened flora species, Cobar Greenhood (*Pterostylis cobarensis*), Pine Donkey Orchid (*Diuris tricolor*), *Commersonia procumbens* and *Tylophora linearis* were identified within the Pilliga forests. Potential habitat for an additional nine threatened flora species listed under the BC Act and/or EPBC Act is also present in the Project site. Twenty-four threatened fauna species were recorded during surveys, and potential habitat for an additional 40 threatened fauna species listed under the BC Act and/or EPBC Act is also present in the Project site.

The FCWS was assessed in the BDAR, however, no FCWS were identified during field surveys. Regardless, the Project area is located entirely within areas of likely predicted species distribution as mapped within the SPRAT database profile for the species (Department of the Environment, 2023), refer to Section 5.3.

2.4 Planning framework

The New South Wales Minister for Planning approved the N2N Project (SSI-9487) under Section 5.19 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) on the 21st of February 2023.

2.5 FCWS at N2NS Separable Portion 1

A significant population of FCWS was discovered at Inland Rail - Narrabri to North Star Separable Portion 1 (SSI-7474) (N2NS SP1) following an initial unexpected find, with the final population size encountered constituting the largest population in NSW or Queensland. Details of this population including locations of finds and analysis of habitat types is included in the Inland Rail Narrabri to North Star Phase 1: Five-clawed Worm Skink (*Anomalopus mackayi*) Species Management Plan (Lewis, 2022), as approved by the Planning Secretary on 1 February 2023. A summary of the initial find and subsequent process and total finds of FCWS is detailed below. 248 specimens were recorded in 2021-22 at Bellata, Croppa Creek at the Inland Rail Narrabri to North Star SP1 project. For complete details including map references and summary of all FCWS finds at N2NS SP1 refer to

<https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=SSI-7474-PA-223%2120230303T065758.439 GMT>.

A spotter-catcher contractor conducting pre-clearing surveys in the Stage 3 section of N2NS SP1 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 (GeoLink 2021).

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 SP1 (Trans4m Rail, 2021). Following 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. 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. More details are provided in Section 5.12.

2.6 N2N LIW Environmental Management Plan

The N2N Low Impact Work Environmental Management Plan (LIW EMP) is the overarching 'road map' and management tool in relation to environmental performance during commencement of LIW as per the requirements of ARTC Specification – Construction Environmental Management Framework – Civil Works (0-0000-900-EEC-00-SP-0001). The LIW EMP 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.

It should be noted that for this version of the FCWS Management Plan, that the Construction Environmental Management Plan (CEMP) and Biodiversity Management Plan, which are required prior to Construction are not yet finalised. The FCWS Management Plan is required to be approved by the Planning Secretary prior to Works commencing, and as such has been developed prior to the CEMP and Biodiversity Management Plan. The FCWS Management Plan will form part of the CEMP and subplan suite of documentation once approved.

This FCWS Management Plan will be reviewed, and updated utilising additional information gathered during the initial LIW in accordance with adaptive management principles (refer to Section 7). The target information to be obtained during LIW scope is in relation to cracking clay habitat type, which analysis of N2NS SP1 data shows accounts for 97.2% of FCWS records at N2NS SP1, with this finding also supported by SPRAT database habitat notes. This cracking clay habitat type will be collected via the Geotechnical and Soil Investigation LIW activity, refer to Sections 2.2.1.1 and 7; following approval of this FCWS Management by the Planning Secretary which is a Hold Point prior to commencing these Works in accordance with CoA E30.

2.7 Objectives and targets

In order to assess delivery of the Project objectives and targets have been established. These objectives and targets have been developed with the aim of measuring the success of the mitigation measures outlined in this plan. Table 2-2 below provides a summary of the environmental objectives and targets from Chapter D5 of the EIS related to flora and fauna management. Specific objectives for FCWS management are outlined in Section 6.3.

Table 2-2: Objectives and targets

Objective	Targets
Avoid harm to FCWS	- Minimise disturbance of FCWS potential Habitat Areas as far as practicable during detailed design - FCWS Habitat Areas to be identified on 100% of Environmental Control Maps - Induction and Training of 100% of N2N site workforce with respect to FCWS Habitat Areas and the requirements of this FCWS MP.
Achieve data collection and reporting requirements	- Target 100% data collection in accordance with Section 6.2.4 - Meet reporting requirements and timeframes as per E31(f) and Section 9.1 - All FCWS specimens be provided to the Australian Museum within six months of collection.

2.8 Acknowledgments

As documented in CoA E30, the FCWS Management Plan may be adapted from an existing FCWS Management Plan prepared by the Proponent. As such, this plan has been adapted from the FCWS Management Plan prepared for the North Star to NSW/Queensland Border Project (SSI-9371), approved on 5 June 2023.

3 Project Conditions and Management Measures Applicable to FCWS

CoA's E30-E33 for SSI-9487 specifies the requirements for the FCWS Management Plan, as outlined in Table 3-1 below.

Table 3-1: CoA compliance information

CoA no.	CoA requirements	Where addressed
E30	The Proponent must prepare a Five-clawed Worm Skink Management Plan (the FCWS Management Plan) to detail how impacts on the Five-clawed Worm Skink and its habitat will be managed and minimised during the Construction and operation of the CSSI. The FCWS Management Plan may be adapted from an existing FCWS Management Plan prepared by the Proponent. The FCWS Management Plan must be prepared in consultation with BCS and DCCEEW. The FCWS Management Plan must be submitted to and approved by the Planning Secretary prior to Work commencing within potential FCWS habitat or prior to commencement of Construction, whichever is earlier. The approved FCWS Management Plan must be implemented.	This document
E31	The FCWS Management Plan must include: (a) Identification of potential habitat prior to Work commencing; (b) details of potential impacts on the species and its habitat from the Construction and operation of the CSSI; (c) details of proposed management and mitigation measures that would be implemented during the Construction and operation of the CSSI to minimise impacts to the species; (d) procedure for the relocation of individuals recovered before and during Construction and details of the relocation sites; (e) goals and performance indicators to measure the success of the mitigation measures; (f) a procedure for recording discoveries of individuals and regular reporting to BCS and DCCEEW; and (g) ongoing monitoring of the species and its habitat and Construction, and for a minimum of five monitoring events post-Construction in suitable conditions with timing for each monitoring event being agreed with the Planning Secretary in consultation with BCS and DCCEEW.	a) Section 5.6.5 Section 7.1 Appendix A b) Section 5.10 c) Section 6 d) Section 6.2.5 Appendix D e) Section 2.7 Section 6.3 f) Section 6.2.4 Section 9 Appendix C g) Section 8
E32	In the event that Work encounters the FCWS and the FCWS Management Plan required under Condition E30 has not been approved by the Planning Secretary, the Proponent must stop all Work which may impact the FCWS. The Planning Secretary and BCS (and DCCEEW where relevant) must be notified in writing and Work must only recommence in accordance with Condition E25.	Noted – CoA become not applicable on approval of the FCWS Management Plan
E33	Should individual FCWS be harmed during Work, the Proponent must notify the Planning Secretary of such incidents in accordance with Conditions A56 and A57.	Section 9.1

4 Project Roles and Responsibilities

The key roles associated with this FCWS Management Plan include:

- Project Director
- Construction Manager
- Environment and Sustainability Manager
- Environmental Advisor
- Project Ecologist
- Environmental Representative.

Their roles have been summarised in Table 4-1, and as a team, they are responsible for the successful implementation of this plan. ARTC Inland Rail will work closely with ACA CPB JV in managing this plan and managing compliance with this plan, incident investigation and learning.

The key roles pertaining to this plan are outlined in Table 4-1.

Table 4-1: Summary of roles and responsibilities for key personnel associated with this FCWS Management Plan

Role	Responsibility	Organisation
ARTC Inland Rail Representative	Notifying relevant agencies of all environmental incidents, and live captures of FCWS in accordance with reporting process in Section 9.1.	ARTC
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 area as directed by the Environment and Sustainability Manager ▪ Ensure that all environmental incidents involving FCWS Habitat Area 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 and Sustainability Manager are closed out within the stipulated timeframe.	ACA CPB JV
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 Environment and Sustainability Manager, any suspected non-compliance by subcontractors or any contractor employees and site visitors over protection methods as per this FCWS Management Plan ▪ Follow instructions from Environment and Sustainability Manager and Environmental Adviser in relation to the requirements for the management of FCWS Habitat Area removal/relocation, open excavations, structural demolition/removal and FCWS relocation.	ACA CPB JV
Environment and Sustainability Manager	▪ Undertake the investigation of any FCWS environmental incidents involving unplanned FCWS Habitat Area disturbance, relocation failure or accidental death and incident reporting requirements in consultation with ARTC Inland Rail ▪ Coordinate with Project Ecologist, obtain advice where needed and ensure appropriate resources are made available to the Project Ecologist ▪ 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 toolbox talks cover procedures associated with FCWS including its identification ▪ Consult as necessary, with ARTC Inland Rail Representative and external stakeholders on matters relating to the FCWS ▪ Control access into FCWS Relocation Sites.	ACA CPB JV

Role	Responsibility	Organisation
Environmental Advisor	- 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 FCWS Habitat Area removal/relocation, open excavations and FCWS relocation in accordance with this FCWS Management Plan - Submit incident reports when required for due diligence and communicate with the Environment and Sustainability Manager and client's Environmental Representative as necessary.	ACA CPB JV
Project Ecologist	- Be present during the removal or disturbance of all known or potential FCWS Habitat Area in accordance with the FCWS Management Plan - Determine appropriate relocation points for captured FCWS in accordance with the FCWS Management Plan - Assist both the Environment and Sustainability Manager and Environmental Advisor - Prepare a summary report following the completion of FCWS Habitat Area removal and disturbance works.	ACA CPB JV / Contractor
Environmental Representative	- Monitor the implementation of this FCWS Management Plan - Endorse updates the FCWS Habitat Areas.	Independent Consultant

5 Five-clawed Worm Skink (*Anomalopus Mackayi*)

5.1 Taxonomy

Scientific name: *Anomalopus mackayi*

Common name: Five-clawed Worm Skink



Figure 5-1: Adult five-clawed worm skink (Photo – Steve K Wilson ©)

5.2 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).

5.3 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). 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.

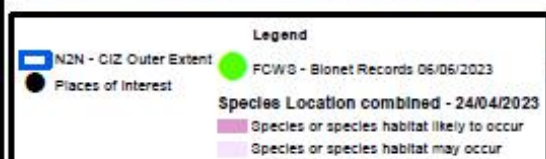
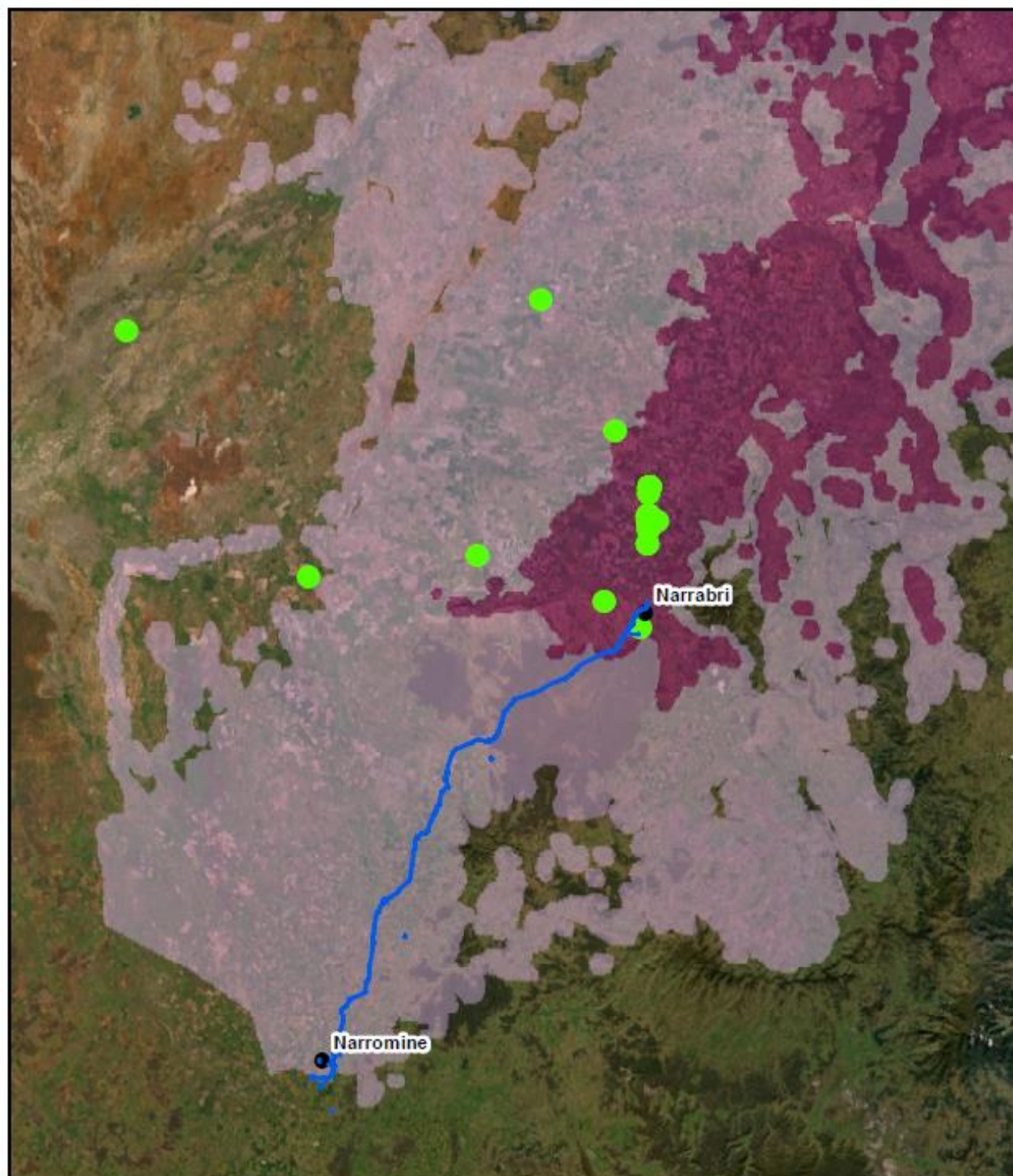
In New South Wales, FCWS is confined to the Namoi River and Gwydir River floodplains and the lower north-western slopes of the Great Dividing Range. The species ranges from the Wallangra-Masterman Range area in the east, south-west to the Narrabri-Wee Waa area, west along the northern edge of the Pilliga 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 and 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).

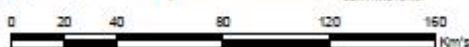
Specimens have been recorded from Old Burren, Goodooga, Burren Junction, Culgoora, Yetman Road 6.9km north- north west of Wallangra, Wee Waa, Millie, Terry Hie Hie and Bellata (Greer and Cogger 1985; Shea *et al.* 1987; NSW DECCW cited in Sass *et al.* 2009). In addition, between 2021 and 2022 248 specimens were found on the N2NS SP1 Project, as described in Section 2.5.

Updates to the SPRAT species listing at http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=25934 (accessed May 2023) includes a distribution map as shown in Figure 5-2. Note that this map includes closure of a prior gap between the predicted populations in NSW and Queensland and expansion of the zone FCWS habitat may occur. The result being that the alignment of N2N is wholly located within an area where FCWS “species or species habitat may occur” to an area where FCWS “species or species habitat likely to occur.” This is likely associated with the significant FCWS population encountered at the N2NS SP1 project and other updates to available species information. This status is addressed for N2N SSI-9487 via inclusion of CoA E30 and the preparation of this FCWS Management Plan. Figure 5-2 also includes the existing NSW Bionet records for recorded finds of FCWS (data extracted on 6 June 2023).

Inland Rail N2N



Potential Five Clawed Worm Skink Distribution Overview Mapping



Coordinate System: GDA2020 MGA Zone 55

Figure 5-2: Updated distribution map known and predicted distribution of Five-clawed Worm Skink (source: Department of Climate Change, Energy, the Environment and Water 2023)

5.4 Population information

Prior to works on the N2NS SP1, 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 SP1 project contributes to the species knowledge with some population density estimates provided in Section 5.12.

5.5 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 5-2). Potential distribution and habitat associations for the FCWS are described further at Section 5.3 and Section 5.6 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, Burrall Yurrul National Park, Burrall Yurrul Nature Reserve, Boomi Nature Reserve, Dhinna Dhinawan 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.

5.6 Habitat associations

5.6.1 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 135–200m above sea level (Sadler and 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. *bimble*) - Weeping Myall (*Acacia pendula*) grassy woodlands to open forests with grasses typically of the genera *Rytidosperma*, *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).

5.6.2 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; Sadler and 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.

5.6.3 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 (Sadler and Pressey 1994; NSW DECCW 2005ab).

5.6.4 N2NS SP1 Inland Rail Project observations

Refer to Section 5.12 for details of FCWS habitat associations observed during the Construction of the N2NS SP1 Inland Rail Project. These learnings have been used to determine FCWS Habitat Area for this FCWS Management Plan.

5.6.5 N2N Inland Rail FCWS habitat areas

FCWS Habitat Area identification is based on soil type, and in particular cracking clays. This cracking clay soil type is represented by Vertosols, and it is these areas which are identified as potential FCWS habitat area as shown in mapping in Appendix A, with 250m buffers also applied. These areas define the extents of FCWS habitat area and therefore the extents to which the management measures in the Activity Risk Assessment (Appendix B) and Section 6 shall apply. Note, in consultation with BCS, it was agreed that vertosols south of Gilgandra can be considered as non FCWS habitat. This is due to the low likelihood of encountering FCWS in these areas as a result of differing climatic conditions and because existing FCWS records are around and to the north / northwest of Narrabri. Therefore, all areas to the south of Gilgandra have been mapped as non FCWS habitat.

5.7 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.

5.8 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.

5.9 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.

5.10 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).

Additionally, potential indirect impacts include removal of potential Habitat Areas for the FCWS. Potential impacts to FCWS species and its habitat from work related to the Project are described in Table 5-1.

Table 5-1: Project activities potential impacts to FCWS & FCWS Habitat

Potential impacts	Evidence from N2NS SP1	Mitigation Measures (Refer to Appendix B)
Vehicle movement causing compaction	Zero recorded injuries / mortalities of 248 records (N2NS SP1)	Vehicles remain on designated accesses.
Slashing causing habitat reduction or injury / mortality	Zero injuries and two mortalities = 0.8% of 248 records (N2NS SP1)	- Ecologist or Fauna Spotter undertake pre-clearing survey prior to slashing - Ecologist or Fauna Spotter supervise slashing activity.
Drilling / test pitting causing habitat reduction or injury / mortality	Zero recorded injuries / mortalities of 248 records (N2NS SP1)	Ecologist or Fauna Spotter observe ground penetration of drilling location. Not required for duration of drilling. Drilling location can be prepared in days leading up to works by hand excavating a 500mm x 500mm pit in the borehole location. Pit to be excavated to change in soil horizon / end of vertosol soil layer under Ecologist / Fauna Spotter observation. Excavation becomes a hostile FCWS environment, is covered as an end of day control and does not require Ecologist / Fauna Spotter presence for drilling mechanism penetration.
Hand excavation causing habitat reduction or injury / mortality	Zero recorded injuries / mortalities of 248 records (N2NS SP1)	- Ecologist or Fauna Spotter undertake pre-clearing survey prior to commencing works - Work crews tool-boxed on how to search for and avoid impact to FCWS prior to commencing hand tool archaeological test pit digging; then self-management of archaeological excavation program by archaeologists and Registered Aboriginal Parties.
Habitat removal (logs, sleepers etc)	Zero injuries and one mortality = 0.4% of 248 records (N2NS SP1)	- Ecologist or Fauna Spotter undertake pre-clearing survey prior to commencing works - Relocation sites to be established based on capture sites.
Topsoil Stripping causing habitat reduction or injury / mortality	84 mortalities = 34% of 248 records	All mitigation measures as per FCWS Management Plan Section 6.2 and Appendix B.

5.11 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
- 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
- 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
- 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 (DEWHA 2008) 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
- Devise and implement water management, sediment erosion and pollution control plans.

5.12 Current context of FCWS and the N2N Project

The FCWS was assessed in the N2N BDAR (Amendment Report, Updated Technical Paper 1, JacobsGHD 2022). The species was not detected during active surveys for reptiles (where FCWS were targeted) which were completed which were completed between 2018-2022; however, this is not considered definitive due to the cryptic nature of the species and corresponding difficulty in detection through targeted surveys. Accordingly, the precautionary principle has been applied with the management measures and controls specified in this plan developed to minimise risk of harm to FCWS in habitat areas.

An unexpected ecological find was made on the 5 July 2021 at the N2NS SP1 Project when a spotter-catcher contractor recorded a FCWS (GeoLink 2022). An additional 247 FCWS were recorded in the 14-months following the initial July 2021 record. Analysis undertaken for the N2NS SP1 FCWS Management Plan indicates 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). A summary of the PCTs at capture sites is shown in Table 5-2.

Table 5-2: Plant Community Types at N2NS SP1 Project FCWS capture sites (GeoLink 26/05/2022)

PCT at capture site	Number	Percentage
27 Weeping Myall Woodland	3	1.2%
52 QLD Bluegrass/ Mitchell Grass Grassland	156	62.9%
56 Poplar Box-Belah Woodland	20	8.1%
Exotic Grassland	69	27.8%
Total	248	-

The GeoLink 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 as per records in Table 5-3. On the basis of this finding, soil types of cracking clays have been utilised to identify FCWS habitat in this FCWS Management Plan for N2N SSI-9487, refer to Appendix A.

Table 5-3: Soil Type at N2NS SP1 Project FCWS capture sites (GeoLink 26/05/2022) Soil Type

Soil type at capture site	Number	Percentage
Black Cracking Clay (inc Dark Clay Soils)	234	94.4%
Red Cracking Clay	7	2.8%
Red Gravel Loam	1	0.4%
Other	6	2.4%
Total	248	-

To address potential impacts, a series of management actions have been proposed and are outlined in Section 5. The application of these management actions is addressed based on the risk profile of the activity impacting any FCWS. The GeoLink records in Table 5-4 demonstrate high risk activities being related to mass ground disturbance as opposed to small footprint ground disturbance activities.

Table 5-4: Construction activities resulting in FCWS capture

Construction activity	Number	Percentage
Topsoil removal	229	92.4%
Topsoil ripping	4	1.6%
Slashing	9	3.6%
Tree Clearing	2	0.8%
Other	4	1.6%
Total	248	-

6 Five-Clawed Worm Skink Management

ARTC – Inland Rail propose the following management actions to reduce impacts on the FCWS population during LIW. The management actions fall into three broad categories.

1. Planning management actions to be implemented in accordance with this plan, which include:
 - a. Performing additional studies to understand the potential for FCWS encounters in accordance with Section 7
 - b. Investigate opportunities to reduce clearing of FCWS Habitat Area
 - c. Completing Activity Risk matrix to control application of mitigation measures proportionate to identified risks; particularly with respect to LIW in accordance with Appendix B and Section 6.2
 - d. Developing a species management plan (i.e. this report) for FCWS that can assist the N2N Project and provide the platform for FCWS consideration at other locations where the species may occur.
2. Work management actions to be implemented in accordance with this plan, which include:
 - a. Known and likely FCWS Habitat Area identified on Environmental Control Plans (ECPs)
 - b. Implementation of mitigation measures based on Activity Risk matrix for LIW in accordance with Appendix B and Section 6.2
 - c. Adequately survey areas prior to and during LIW
 - d. Collect required data for all captured FCWS
 - e. Develop management initiatives for the protection of FCWS habitat adjacent to LIW sites and protection of relocation sites
 - f. Develop guidelines that provide improved opportunities for habitat augmentation of relocation sites and areas nominated for landscape treatments
 - g. Outline a framework for allowing this plan to be progressively updated in light of new findings and information
 - h. Implementation of identified mitigation measures.
3. Operational management actions include (outside scope – will be addressed by ARTC prior to operation of SSI-9487):
 - a. Implementation of the FCWS monitoring program as required.

6.1 Planning management actions

6.1.1 Reduce clearing in FCWS habitat areas

The Project team would explore opportunities to reduce the LIW clearing footprint. This would be managed by ACA CPB JV and the design contractors JGHD, in collaboration with ARTC, through the detailed design process. There will be multiple design gateways through the detailed design period which will include interrogation and challenge to the LIW clearing footprint, targeting reduction in clearing impact to sensitive areas including FCWS Habitat Area, threatened species and Threatened Ecological Community (TEC).

6.1.2 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 in accordance with CoA E30.

6.2 Work management actions for FCWS

6.2.1 Identification of FCWS habitat area on Environmental Control Plans

Locations of potential FCWS Habitat Areas (in accordance with CoA E31(a) – refer to Appendix A) will be updated on ECPs. This will assist in the implementation of agreed to management actions outlined in this plan of management. ECPs would be updated from time to time or on an as required basis as new information informs the project.

Additionally, ECPs will be updated periodically to include 'Known' FCWS Habitat Areas as determined from FCWS finds during the project, refer to Appendix A and Section 7.

Where FCWS habitat is identified outside of the nominated FCWS Habitat Areas based on field assessments, the nominated extents will be updated in required documentation. This includes information in sensitive area plans, inductions, signage and toolbox talks.

6.2.2 Specific FCWS induction

All personnel including sub-contractors are required to undergo an induction to work on the Project. This induction will address FCWS and provide information in relation to:

- A general description of the FCWS (including photos and key identification features)
- Locations where FCWS Habitat Area is located on the project site (refer to Appendix A), and key mitigation measures as per Section 6.2
- Activity based risk assessment and corresponding proportionate mitigation measures (refer Appendix B)
- Records kept from the induction / toolbox training
- Visitors and delivery personnel are to be accompanied by a full inducted person at all times. Signage is also provided at work sites.

6.2.3 Adequately survey areas prior to and during various LIW activities

Adequately surveying the area before and during work 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. Targeted pre-clearing surveys would comprise a minimum of 1.5 person hours per hectare for FCWS Habitat Areas of average complexity (scaled up or down depending on site complexity as detailed in preceding sentences as determined by Project Ecologist). 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.
- 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 (<100mm) 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 6.2.4)
- Slashed vegetation should be wind rowed to the edge of the work area to provide temporal refuge sites. The slashed area reduces the suitability / creates a hostile habitat for FCWS within the work area and encourages the FCWS to move into the remaining vegetation / windrowed material. 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.



Figure 6-1: Slashing of vegetation prior to stripping at N2NS SP1

- 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 LIW site (Figure 6-2)
- Once the above works are completed within a given area, a minimum waiting period of two days/nights and up to five days/nights is proposed before topsoil stripping can commence (where required for access tracks and drilling pads etc). 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.



Figure 6-2: Example of a FCWS relocation hub installed at N2NS SP1 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 Project 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 LIW site. This survey would occur within two 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 (Figure 6-3). 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 6.2.4.



Figure 6-3: Example of topsoil stripping to 100 mm depth at N2NS SP1

6.2.4 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:

- Capture reference number
- 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

- Deceased or euthanised individuals, or parts thereof will be forwarded to the Australian Museum for research purposes
- ARTC IR will endeavour, notwithstanding practical and safety considerations, to collect samples and send to the relevant independent, publicly owned museum (Australian museum as a priority) to verify if they are FCWS or not. IR will fund further analysis by the museum where the Australian Museum is willing and able to accept the specimens.
- Specimens should be preserved as follows (as advised by the Australian Museum):
 - Each specimen to be placed in an individual ziplocked bag with location (including lat/long) and date of collection written on the bag in permanent marker
 - Stored frozen
 - Provided to the Australian Museum in a maximum of six months.

The following habitat data would be collected from a 100m² area from the capture site if it is undisturbed from LIW site, otherwise the adjacent area outside of the LIW site:

- 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 100m²
- Ground moisture levels (including recent rainfall amount if known/relevant).

The Project Ecologist or the Environment and Sustainability Manager for ACA CPB JV 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 C.

6.2.5 Identifying and establishing FCWS relocation sites

1. 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 LIW so as to assist in the scheduling of field 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 – noting that due to the distances involved each LIW location will have an individual relocation site (where FCWS are identified), unless LIW sites are in such close proximity to one another that relocation sites can practically be combined
- 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 100m² in area
- Relocation of up to 10 adults and 5 sub adult skinks per 100m². If this density is reached additional relocation sites would be established
- Relocation sites will be mapped and a GIS layer developed.

2. Site establishment

Establishing a FCWS relocation site will involve:

- Creating a minimum 100m² relocation area containing suitable FCWS habitat
- The relocation areas should be located in publicly accessible land such as Crown Land/Travelling Stock Reserves (e.g. Bohena Creek and along the Newell Highway).

6.2.6 Habitat enhancement and refuge replacement

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

- 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 stage of works (Figure 6-4).

- 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 LIW for FCWS.

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

More permanent habitat enhancement in Phase 2 will include the placement of coarse 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-Works landscape where opportunity is identified by Project Ecologist.



Figure 6-4: Example temporary habitat enhancement works in N2NS SP1 Stage 3 using timber and hay biscuits to increase ground cover for relocated FCWS

6.2.7 Five-clawed Worm Skink Encounter Procedure

The FCWS Encounter Procedure (Appendix D) has been developed to manage instances where FCWS is detected during Works within the Project boundary. For clarity, anywhere identified as FCWS habitat or potential FCWS habitat are to be considered FCWS habitat for the purposes of this plan. Section 1 of the procedure manages FCWS encounters at areas of FCWS habitat and potential FCWS habitat as shown in Appendix A.

For instances where a FCWS is identified outside of FCWS Habitat Area, the management strategies outlined in Section 6 of this plan will be adopted for up to 200m on either side of the capture, with an applicable FCWS Habitat Area update determined by the Project Ecologist, and include:

- Implement FCWS Encounter Procedure
- Relocation of individuals using the framework developed in this Plan
- Data capture of the individual and habitat data outlined in this Plan
- Project Ecologist assess and advise if FCWS Habitat Area needs to be updated based on inspection of Habitat / Soil type within 200m of encounter, with reference to SPRAT listing and Section 2 FCWS MP regarding FCWS Habitat Areas
- Any refinements to FCWS Habitat Area would be addressed as per Section 7; with the Environmental Representative considering the Project Ecologist advice. Where the Environmental Representative

endorses the Project Ecologist advice the FCWS Habitat Area shall be updated, and the Environmental Representative will include any endorsements of refined FCWS Habitat Areas in monthly reports to DPE.

- Updating of relocation sites, FCWS register, Construction drawings and ECPs
- A periodic examination and review of the adequacy of the proposed mitigation measures proposed in consultation with DPE, BCS and DCCEEW.

6.2.8 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. DPE; BCS, DCCEEW), including adaptive management principles as per Sections 7 and 2.6. Should the document review process identify any issues or items within the FCWS Management Plan that are either redundant or in need of updating, it is the responsibility of the ACA CPB JV Environment and Sustainability Manager to revise the documents. The revised document will then be issued to ARTC, BCS and DCCEEW for consultation and DPE for approval.

The only exception to the above would be the mapping of potential habitat areas provided in Appendix A. Updates to the mapping would be an ongoing process (as per the adaptive management principles) and would be undertaken as outlined in Section 6.2.7.

Project subcontractors will be advised when this FCWS Management Plan is updated. They will be required to review their own environmental management documentation and make the necessary amendments to remain compliant with this FCWS Management Plan.

6.3 FCWS Management Performance Indicators

The following performance indicators have been developed based on SMART principles as shown in Table 6-1.

Table 6-1: FCWS Management SMART Performance Indicators

No.	Specific	Measurable	Achievable	Relevant	Time-bound
1.	Induction and Training of 100% of N2N workforce with respect to FCWS Habitat Areas and the requirements of this FCWS MP	Induction and Training records	All Project Workforce required to attend Project Induction (including FCWS MP requirements) prior to commencement. Ongoing training via Toolbox training with records of attendance maintained	Training of workforce essential to ensure protection of FCWS and implementation of FCWS Mitigation Measures	Project induction (including FCWS MP requirements) for 100% of workforce prior to commencement on site. Toolbox training prior to commencement of activity within FCWS Habitat Area.
2.	Target 100% data collection in accordance with Section 6.2.4	FCWS register	The N2N delivery team are appropriately resourced as per Section 4 and trained as above	FCWS data capture and sharing with regulatory agencies important to ensure increase in knowledge for this cryptic threatened species	For each and every FCWS encounter
3.	Meet reporting requirements and timeframes as per Section 9.1	Section 9.1 defines what information needs to be reported and required timeframes for each type of information	The N2N delivery team are appropriately resourced as per Section 4	Reporting to regulatory agencies important to ensure increase in knowledge for this cryptic threatened species and compliance the CoA	Section 9.1 defines what information needs to be reported and required timeframes for each type of information

No.	Specific	Measurable	Achievable	Relevant	Time-bound
4.	Collection of additional soil type data to refine FCWS Habitat Areas based on dominant cracking clay soil correlation	Data collected in accordance with Section 7	Geotechnical investigations at potential borrow pits are intending to collect this data	Cracking clay soil confirmed as dominant determinant of FCWS Habitat Areas; with this spatial, finer scale refinement improving definition of FCWS Habitat Areas	The Geotechnical investigations and Archaeological test pits LIW are programmed to be completed after approval of this FCWS Management Plan, in the second half of 2023; prior to commencement of "Construction"
5.	Flexibility to refine FCWS Habitat Area to incorporate new data	Updates endorsed by Environmental Representative and included in ER monthly report to DPE	ER has been approved by DPE as per CoA A33. ER endorsed refinements will be consolidated into any FCWS MP update as per Section 7	Refinement of FCWS Habitat Area with refined and finer scale cracking clay soil data important for protection of FCWS	Progressive as new information available as per previous SMART goal, updates in ER monthly report
6.	FCWS Mitigation measures proportionate to risk	FCWS Risk measured and mitigated via Appendix B	Implementation of Mitigation measures as per Appendix B	Scale of activities and associated risks are vastly different (eg Archaeological Test excavation vs N2N Topsoil stripping), proportionate application of mitigation measures to the large order of magnitude difference in risk is relevant and appropriate	Applicable for duration of each LIW activity within FCWS Habitat as per Appendix B

7 Additional Studies and Adaptive Management

On the basis of the strong cracking clay soil type association at N2NS SP1 (97.2% of total records) which is also supported by the DCCEE SPRAT habitat notes, it has been determined that cracking clays should be utilised to identify FCWS Habitat Area for the purposes of this Plan.

It is recognised that the identification of FCWS Habitat Area prior to Work commencing as per CoA 31(a) is subject to refinement and continuous improvement as Project delivery progresses. As part of continuous improvement, the principle of adaptive management shall be applied to FCWS and identification of potential Habitat Areas.

Extensive GI campaigns were undertaken during the EIS and reference design phase of the N2N project. In 2019, test pits and boreholes were completed within the N2N study area to inform the route selection process. In 2021/22, further test pits and boreholes were completed at targeted locations along the preferred rail corridor to further inform design development. The findings of the review of this GI data are reflected in the mapping in Appendix A.

As further investigations are undertaken the extent of knowledge on cracking clays will evolve to support the Project in determining the extent of potential FCWS habitat as described below.

7.1 Analysis of Available Soil Data to Inform Habitat Mapping

Geological desktop studies were also undertaken to compile existing data from Geotechnical Factual Reports and Soil Landscape Maps. In addition, ARTC Inland Rail's geotechnical engineers have combined the above information with available information contained on the NSW Government Mining, Exploration and Geoscience and NSW Department of Planning and Environment websites:

<https://meg.resourcesregulator.nsw.gov.au/geoscience/products-and-data/maps/geological-maps>

<https://www.environment.nsw.gov.au/topics/land-and-soil/information/espade>

ARTC Inland Rail's geotechnical engineers have used this information to predict expected ground conditions. Appendix E contains a summary of the existing test pit and bore hole data (i.e. ground-truthed data).

The Project also has a good understanding of areas where soils have developed from basalt formations that commonly weather to form thicker high plasticity reactive clay soils that shrink and swell with changes in moisture content. These are known as vertosols or sometimes 'black soils' owing to their often-dark colour.

The desktop review has been undertaken by reviewing existing GI logs and publicly available geological/soil information to validate potential FCWS habitat mapping across and adjacent to the CIZ. This has resulted in the mapping provided in Appendix A. The project has been divided into three categories:

- Confirmed FCWS habitat (coloured red in Appendix A). This is where GI data has verified/ground-truthed vertosol soils. This FCWS Management Plan and associated mitigation measures apply.
- Potential FCWS habitat (coloured orange in Appendix A). This is where publicly available geological/soil information identifies potential vertosols, however, GI data is unavailable to verify/ground truth this information. This FCWS Management Plan and associated mitigation measures apply.
- Confirmed non-FCWS habitat (coloured green in Appendix A). This is where GI data has verified/ground-truthed there is no vertosols that would support FCWS habitat. The FCWS Encounter Procedure applies.

It should be noted that in certain locations, particularly where the Project alignment is wider than typical (such as at multi-function compounds), there are areas where all three categories occur in close proximity to one another. This is largely a function of geological desktop studies identifying very small patches of potential vertosols that have not been subject to GI investigations to date. These areas are therefore categorised as 'Potential FCWS habitat'.

As additional GI site locations are confirmed by the Project, an ongoing exercise will be undertaken as results are obtained to validate and potentially further refine the mapping if required. Areas coloured orange will be prioritised for further soil testing in order to verify the presence or absence of vertosols in these areas.

Table 7-1 FCWS habitat by chainage

Chainage	FCWS habitat (yes, potential, no)	Mitigation measures apply (yes, no)
547.000-634.563	No	No
634.563-638.287	Potential	Yes
638.287-639.713	Yes	Yes
639.713-641.903	No	No
641.903-642.890	Potential	Yes
642.890-643.309	Yes	Yes
643.309-644.431	No	No
644.431-646.755	Potential	Yes
646.755-648.829	Yes	Yes
648.829-655.117	No	No
655.117-656.292	Potential	Yes
656.292-656.733	No	No
656.733-657.364	Yes	Yes
657.364-661.352	No	No
661.352-661.952	Potential	Yes
661.952-662.540	No	No
662.540-663.354	Potential	Yes
663.354-673.536	No	No
673.536-677.492	Yes	Yes
677.492-677.945	No	No
677.945-679.510	Yes	Yes
679.510-681.467	Potential	Yes
681.467-682.555	No	No
682.555-685.511	Potential	Yes
685.511-692.662	No	No
692.662-693.209	Yes	Yes
693.209-693.613	No	No
693.613-695.581	Potential	Yes
695.581-696.605	No	No
696.605-697.067	Potential	Yes
697.067-704.262	No	No

Chainage	FCWS habitat (yes, potential, no)	Mitigation measures apply (yes, no)
704.262-706.166	Potential	Yes
706.166-706.899	No	No
706.899-708.503	Potential	Yes
708.503-709.509	No	No
709.509-709.918	Potential	Yes
709.918-710.811	No	No
710.811-712.106	Potential	Yes
712.106-712.564	Yes	Yes
712.564-712.951	Potential	Yes
712.951-714.771	No	No
714.771-717.233	Yes	Yes
717.233-717.905	No	No
717.905-719.281	Potential	Yes
719.281-721.051	Yes	Yes
721.051-722.278	Potential	Yes
722.278-722.579	No	No
722.579-729.717	Potential	Yes
729.717-730.329	Yes	Yes
730.329-745.129	No	No
745.129-745.594	Yes	Yes
745.594-821.040	No	No
821.040-825.861	Potential	Yes
825.861-828.661	No	No
828.661-829.221	Yes	Yes
829.221-834.586	No	No
834.586-834.941	Potential	Yes
834.941-835.357	No	No
835.357-835.919	Yes	Yes
835.919-836.319	Potential	Yes
836.319-836.813	No	No
836.813-838.179	Potential	Yes

Chainage	FCWS habitat (yes, potential, no)	Mitigation measures apply (yes, no)
838.179-838.661	No	No
838.661-839.749	Potential	Yes
839.749-841.858	Yes	Yes
841.858-841.922	No	No
841.922-853.000	Yes	Yes

Field investigations at targeted locations

For LIW, as noted in Section 2.2.1.1, soil investigations will be undertaken as part of the LIW GI scope.

Field investigations will be undertaken at targeted locations to further verify soil types. A soil sampling program for the N2N Project area will be developed and completed with the aim of confirming the total extent of cracking clays that typically support the FCWS.

Project Ecologists

Projects Ecologists will be available to assist with the identification of unexpected FCWS finds, including development of FCWS monitoring and/or Habitat Area in accordance with CoA E31(g) and Section 6.2.7.

Updating Project Information

The combination of desktop review of existing GI data and soil sampling at targeted locations will assist the project in further refining potential FCWS habitat mapping and managing risk during LIW and Construction. Where the extents of identified FCWS Habitat Area are refined by the activities described above, the project will update extents on FCWS in the General Project Induction slides, the FCWS Toolbox talk, ECPs and any on site signage. The Environmental Representative will include any endorsements of refined FCWS Habitat Areas in monthly reports to DPE, with any refinements to FCWS Habitat Areas consolidated into this FCWS MP at formal revisions as per Section 6.2.8.

Adaptive management shall be considered and applied at reviews of the FCWS Management Plan in accordance with Section 6.2.8.

8 Five-Clawed Worm Skink Monitoring Program

As at the time of this revision of the FCWS Management Plan no FCWS individuals have been detected within the Project Construction Boundary / CIZ. If this changes during delivery of the Project, where individual FCWS are recorded, monitoring during and post Construction shall be developed in consultation with BCS and DCCEEW in accordance with CoA E31(g) and adaptive management principles, refer to Section 7. The monitoring program may be subject to change dependant on the success or otherwise of the N2NS SP1 monitoring program.

ARTC IR will consult with BCS prior to developing any monitoring program for FCWS within the N2N Project area. ARTC IR considers that any monitoring program should be designed following consideration of Project specific finds data and success therein of the N2NS SP1 operational monitoring program.

The FCWS Management Plan will be revised and re-issued accordingly including the agreed monitoring provisions.

9 Inspection, monitoring and reporting in relation to the FCWS

The table below summarise important actions relevant to FCWS management.

Table 9-1: Environmental monitoring requirements relevant to FCWS management

Inspection	Objectives	Responsibility	Output	Timing
Site inspection	Review status of all controls and general environmental performance	Environmental Advisor/s	Weekly environmental checklist	Weekly (and post rainfall events that trigger runoff)
Site inspection	Observe general environmental performance	Environment and Sustainability Manager / Environmental Advisor/s	Correct any observed non-conformances as they arise	As required to coincide with inspections
Site surveys	Ensure surveys are being completed 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	Pre-clearing checklist and post clearing report	Daily and at completion of activities that may disturb or remove known and potential FCWS habitat

9.1 Regulator notification and reporting requirements for the Five-clawed Worm Skink

9.1.1 Incident notification requirements – mortality or injury of FCWS

In the event of a Five-clawed Worm Skink mortality or injury ACA CPB JV will immediately notify the nominated ARTC Representative/s who will arrange regulatory notification/s in accordance with CoA A56 and A57 of the CSSI, and relevant conditions of any EPBC Approval. ARTC will notify DPE, BCS and DCCEEW of all FCWS mortalities and injuries. Notification timeframes will be in accordance with CoA A56 and A57 of the CSSI, and relevant conditions of any EPBC Approval.

Incident notifications relating to mortality or injury of a Five-clawed Worm Skink should address:

- Capture date and time
- GPS Coordinates for capture and relocation site
- Condition (good, injured, deceased)
- Microhabitat at capture site
- Soil at capture site
- Activity undertaken at time of find
- Detection method (e.g. survey).

9.1.2 Reporting of live capture and relocation of FCWS

In the event of a live capture and relocation of a FCWS ACA CPB JV will provide details of the live capture and relocation within 24 hours of the event to the nominated ARTC Representative/s who will arrange reporting to BCS and DCCEEW within 48 hours after the proponent (ARTC) becoming aware of the live capture and relocation, or as otherwise agreed at the time with the Agencies.

Recording by the Project Ecologist or Fauna Spotter relating to the live capture and relocation of a FCWS will address:

- Capture date and time
- GPS Coordinates for capture and relocation site
- Condition
- Microhabitat at capture site
- Soil at capture site
- Activity undertaken at time of find

- Detection method (e.g. survey).

Where Five-clawed Worm-skink is found outside of identified FCWS Habitat Areas, ACA CPB JV will also notify in accordance with CoA Condition E25, "...all work which may impact the identified species or community must stop to prevent further impact and the Planning Secretary and BCS (and DCCEEW where relevant) notified in writing. Work must not recommence until the relevant agencies have been consulted and any required management plans or approvals have been obtained."

9.1.3 Monthly updates – BCS and DCCEEW

A copy of the Five-clawed Worm Skink Register detailing all FCWS encounters as outlined in Section 6.2.4 will be provided to BCS and DCCEEW monthly from the first FCWS encounter, or upon request by either Agency.

9.1.4 Summary Report – DPE, BCS, DCCEEW

A final report will be prepared for submission to BCS, DCCEEW and DPE at the conclusion of Construction works detailing all Five-clawed Worm-skink finds. The report should include:

- A copy of the fauna register, including information outlined in Section 6.2.4
- A detailed description of all survey methods and mitigation measures and subsequent outcomes
- A description of all relocation sites and the number of skinks relocated into each site
- Any other relevant information collected, or activities/procedures undertaken, including adaptive management
- Updates to FCWS Habitat Area following field data (Appendix A).

10 References

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Appendix A – FCWS Mapping

Analysis of results for the N2NS SP1 records (248 in total) of FCWS found soil types rather than plant community type tends to form an important microhabitat feature with the highest densities occurring in cracking black clays (94.4%) although lower densities do occur on red cracking clays (2.8%) and seldom red gravel loam (0.4%). It is noted that the single record of FCWS associated with red gravel loam represents 0.4% of total encounters of FCWS at N2NS SP1; therefore, this soil type is not considered to represent a FCWS Habitat Area for the purposes of this plan, with this soil type managed via the FCWS Encounter Procedure included in (Appendix D). This procedure addresses the measures in place where FCWS are found within identified Habitat Areas, as well as measures and requirements in place for where FCWS are found outside of identified FCWS Habitat Areas.

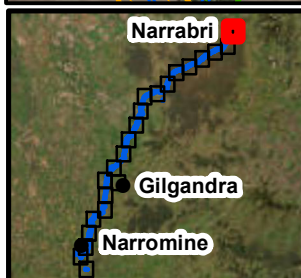
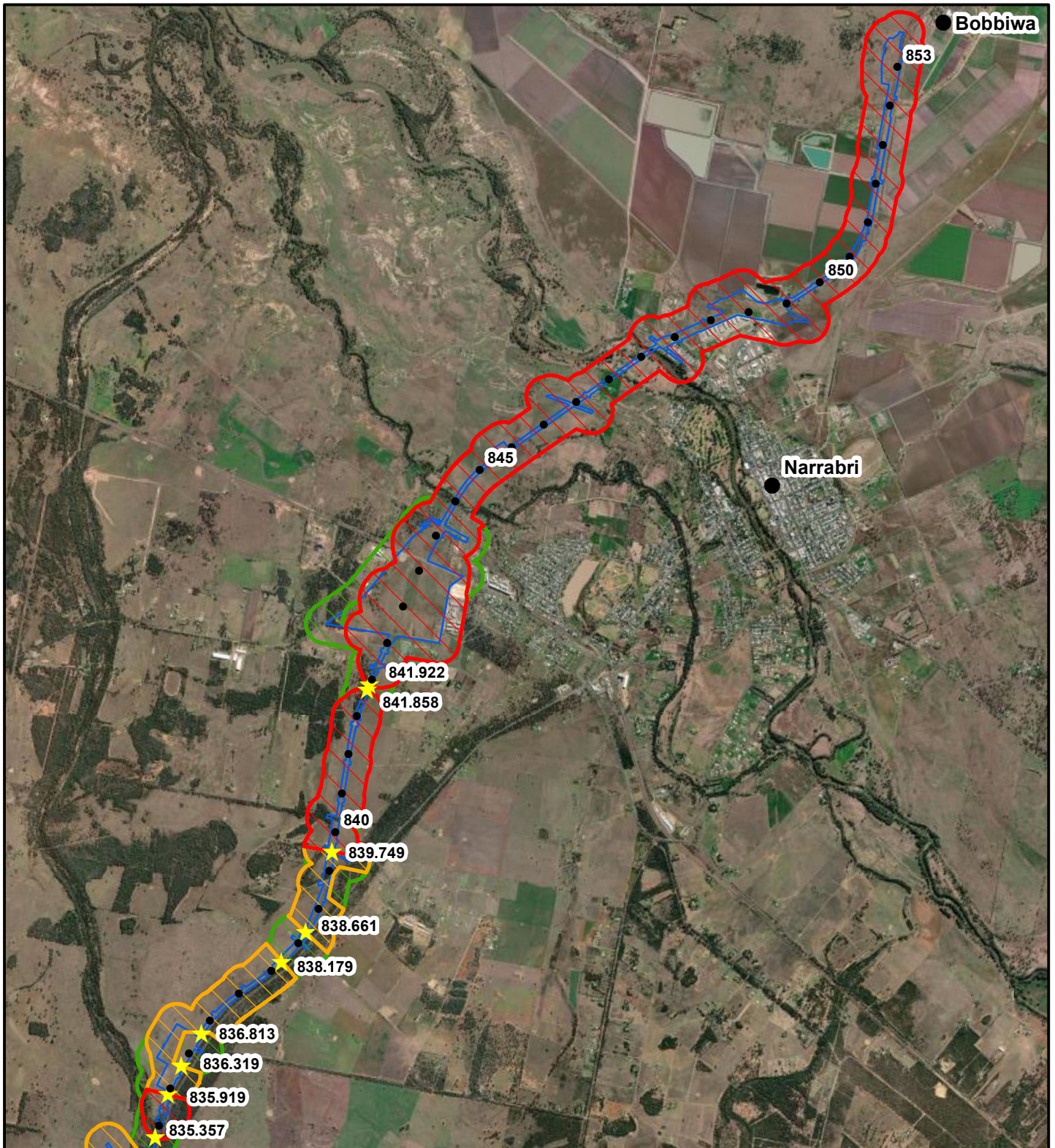
Review of the DCCEEW Species Profile and Threats Database (SPRAT @ http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=25934) for NSW habitat on the floodplains such as the Namoi, Macquarie and Castlereagh River and tributaries floodplain for the N2N project “On the floodplains within its range in north-eastern New South Wales, the Five-clawed Worm-skink occurs in grasslands and grassy, open woodlands on heavy black and grey, alluvial cracking clay soils from 135–200 m above sea level (NSW DECCW 2005ab; Sadlier and Pressey 1994; Spark 2010). During dry periods, the species is likely 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).” Further the SPRAT habitat on NSW floodplains listing also notes “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 floodplain support a wide variety of vegetation communities which can be considered suitable habitat for the Five-clawed Worm-skink (Spark 2010).” Further information regarding potential FCWS habitat is included in the Queensland part of the SPRAT listing including “the species is not likely to be found in soils in which deep cracks do not form, such as hard-setting brown clays or sandy soils types (Spark 2010).”, this also supports the N2NS SP1 findings that cracking clays represent the defining microhabitat type for FCWS; and that non-cracking or for example hard-setting brown clays or red gravel loam do not represent FCWS habitat of significance.

On the basis of this dominant cracking clay soil type correlation at N2NS SP1 (97.2% of total records at N2NS SP1) which is also supported by the DCCEEW SPRAT habitat notes above, it has been determined that cracking clays should be utilised to identify FCWS Habitat Areas for the purposes of this plan. Extensive GI campaigns were undertaken during the EIS and reference design phase of the N2N project. In 2019, test pits and boreholes were completed within the N2N study area to inform the route selection process. In 2021/22, further test pits and boreholes were completed at targeted locations along the preferred rail corridor to further inform design development. The findings of the review of this GI data are reflected in the mapping. Note, in consultation with BCS, it was agreed that vertosols south of Gilgandra can be considered as non FCWS habitat. This is due to the low likelihood of encountering FCWS in these areas as a result of differing climatic conditions and because existing FCWS records are around and to the north / northwest of Narrabri. Therefore, all areas to the south of Gilgandra have been mapped as non FCWS habitat.

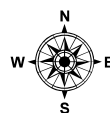
As part of continuous improvement, the principle of adaptive management shall be applied to FCWS and identification of habitat areas. Refer to Section 7 for further details. The collection of additional data during LIW and prior to Construction will enhance the soil type data set and correspondingly improve and may contribute to finer scale resolution of this soil-type based definition of FCWS Habitat Area. It should also be noted that this additional data cannot be collected until this FCWS Management Plan is approved, as the FCWS Management Plan is a Hold Point prior to Works (with Works including LIW and therefore the collection of this data).

The FCWS Habitat Areas identified in Appendix A will be included in Project induction, ECP, EWMS and ongoing Toolbox training so that all staff are aware of the FCWS Habitat Areas and requirements of this FCWS Management Plan.

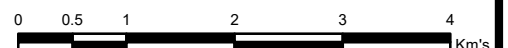
Inland Rail N2N



Potential Five Clawed Worm Skink Distribution

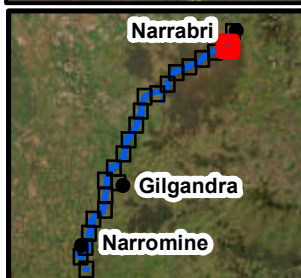
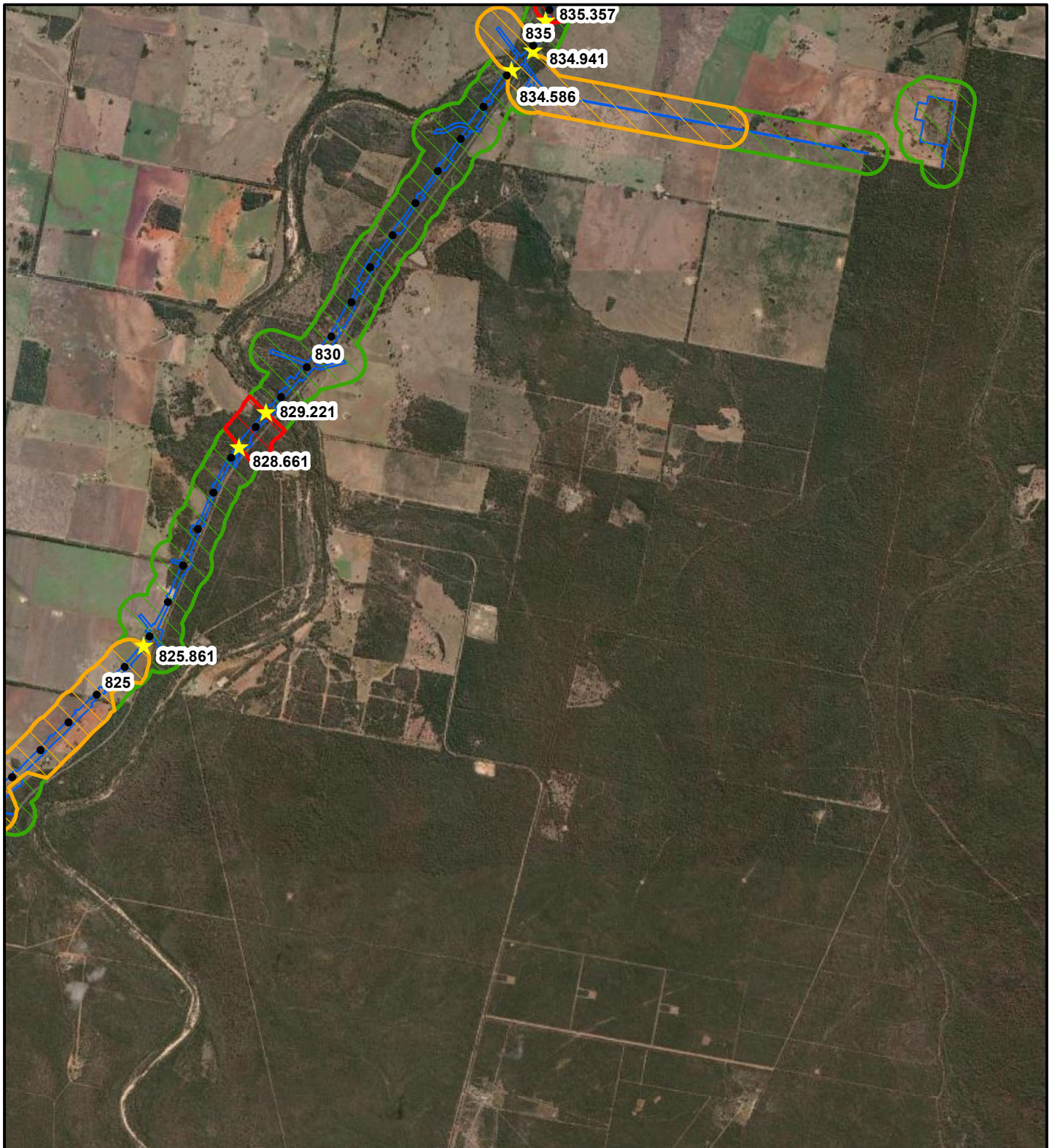


Map 1 of 23

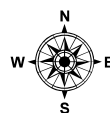


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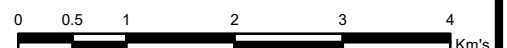
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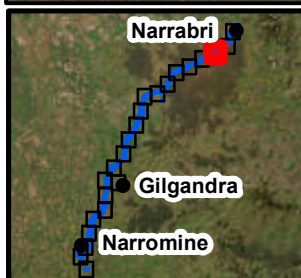
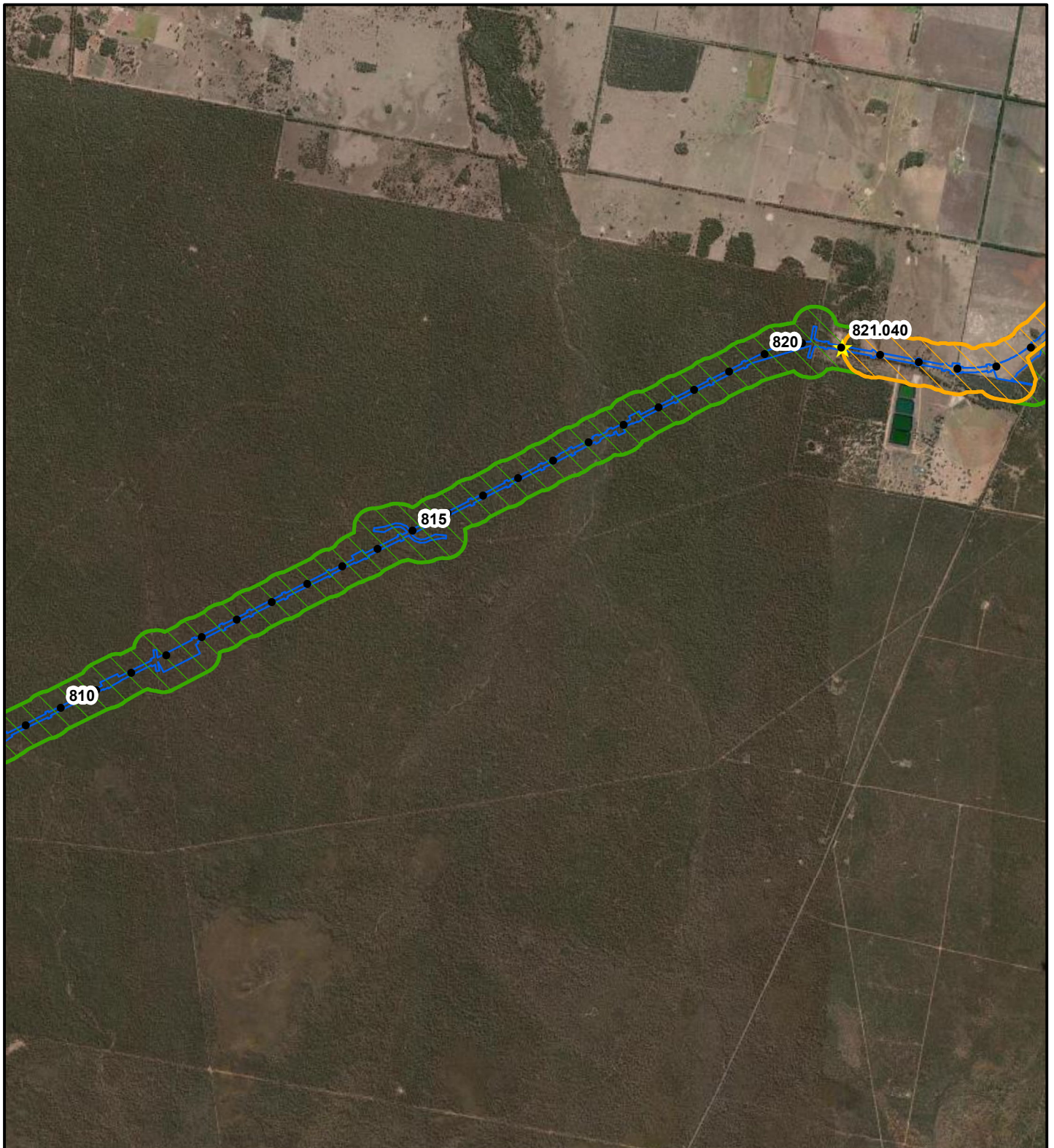


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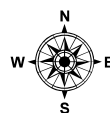


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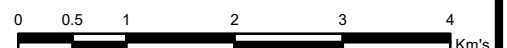
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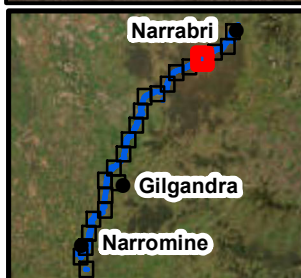
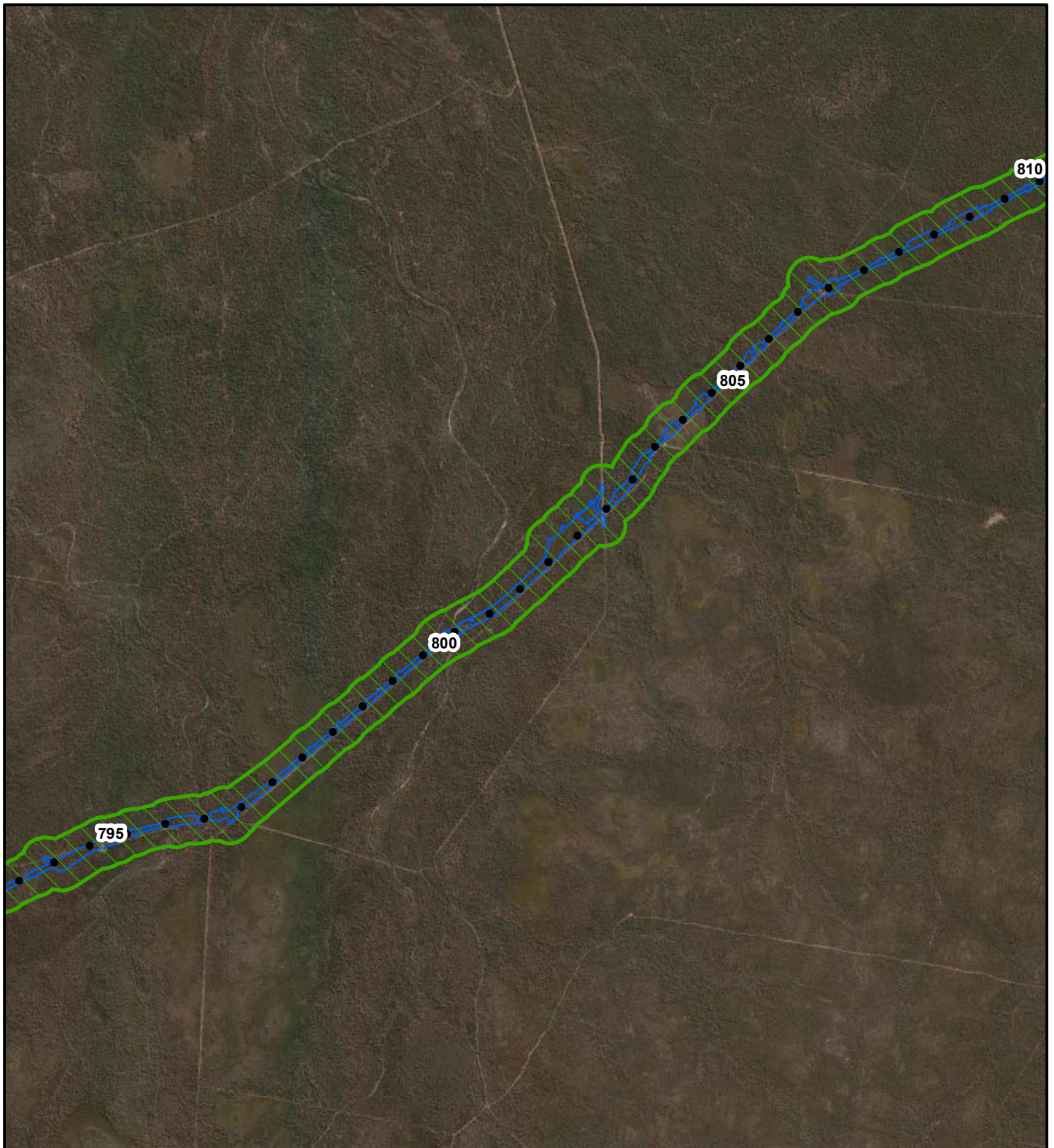


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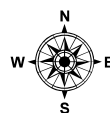


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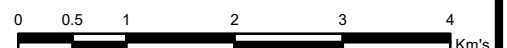
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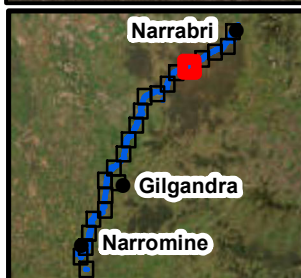


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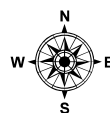


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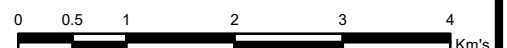
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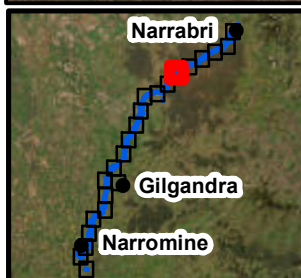


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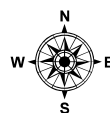


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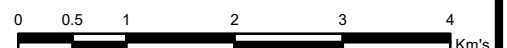
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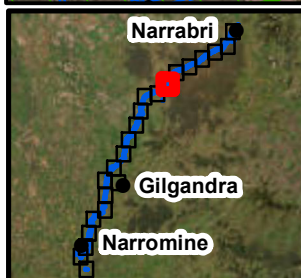
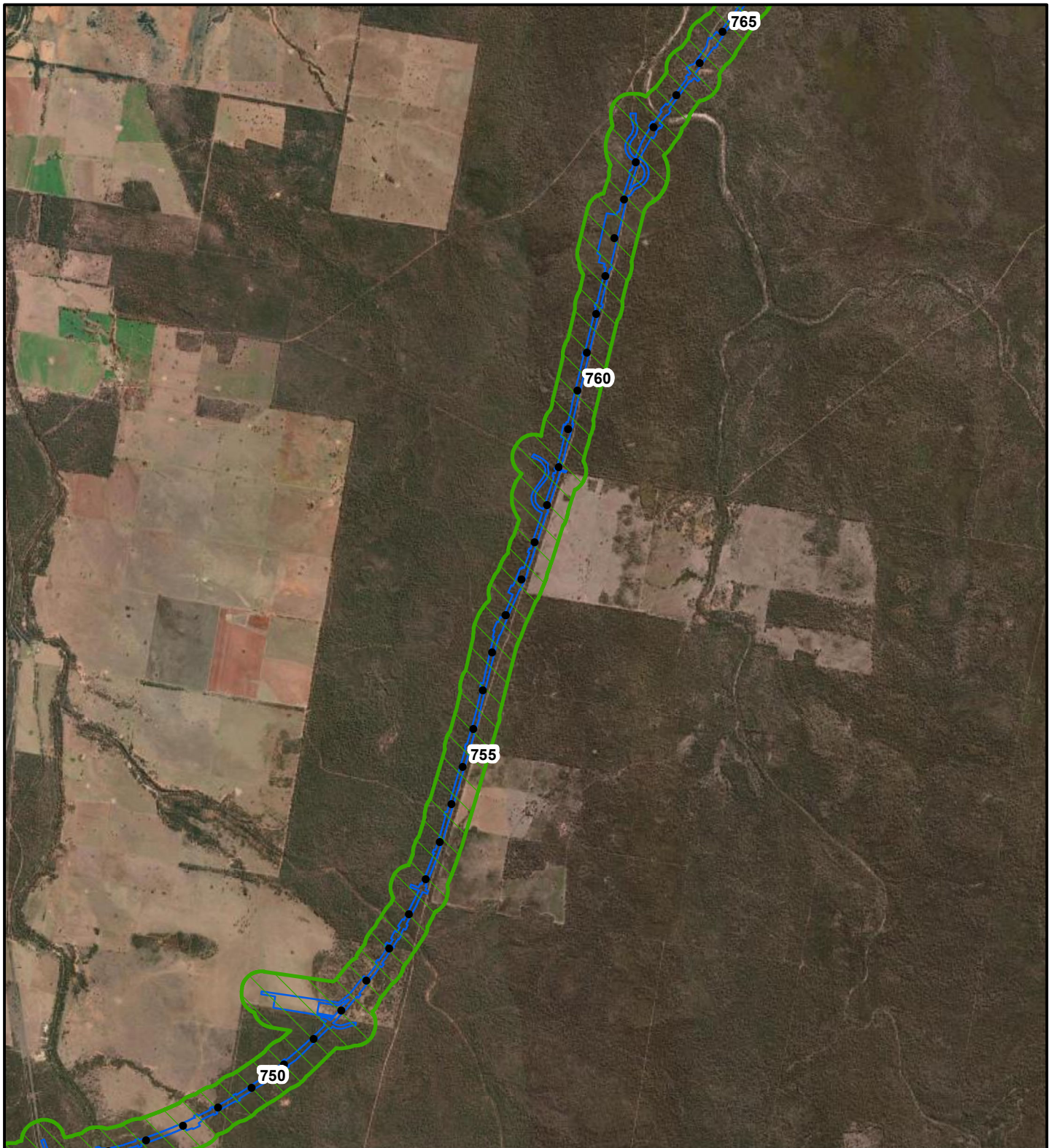


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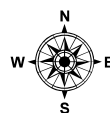


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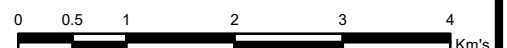
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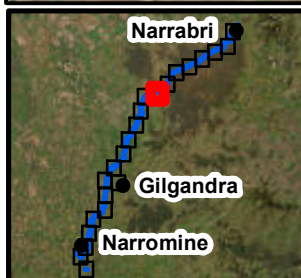
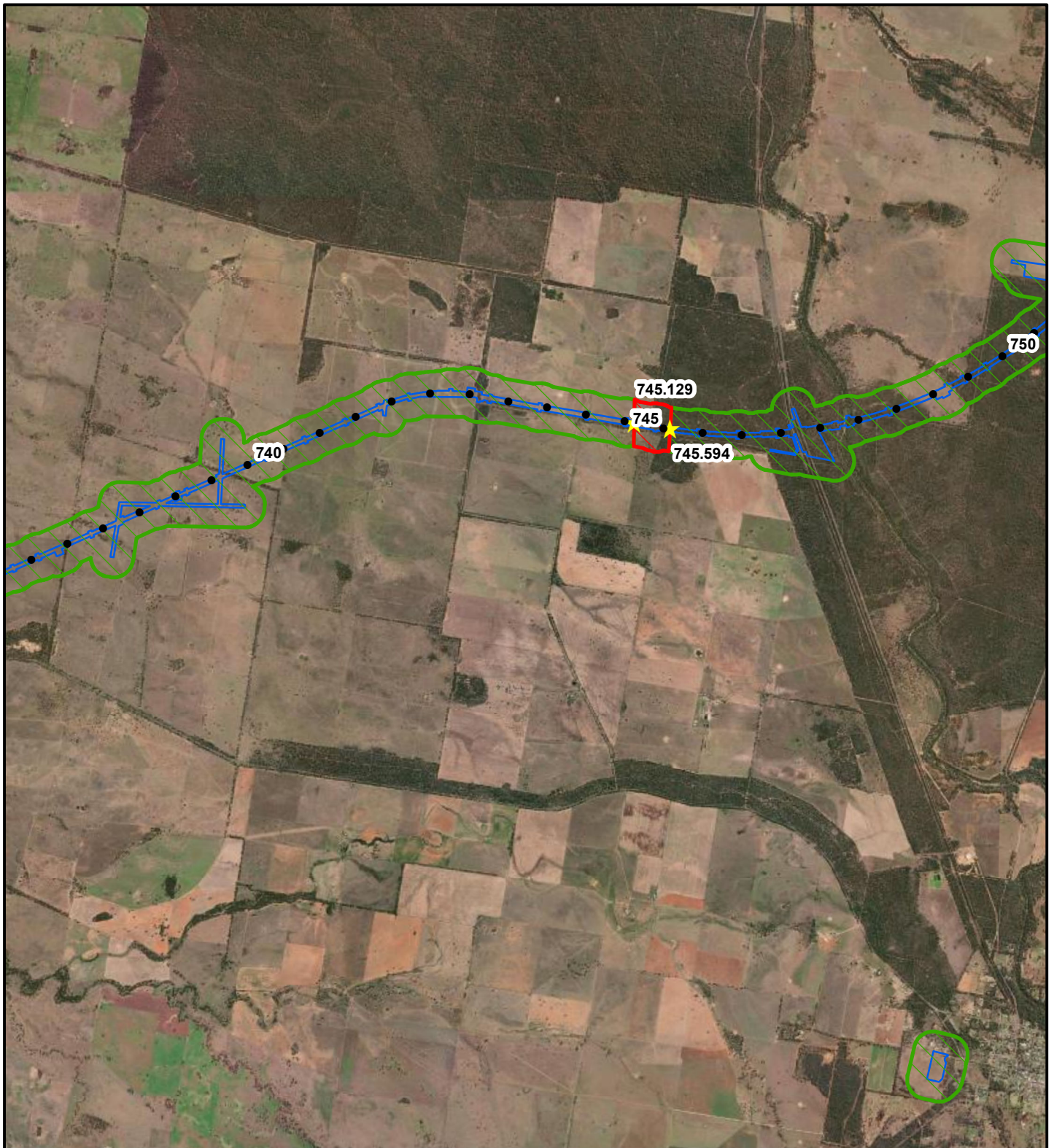


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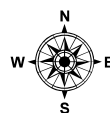


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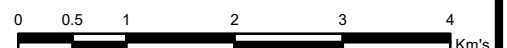
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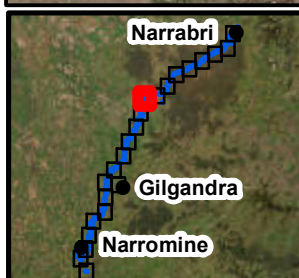
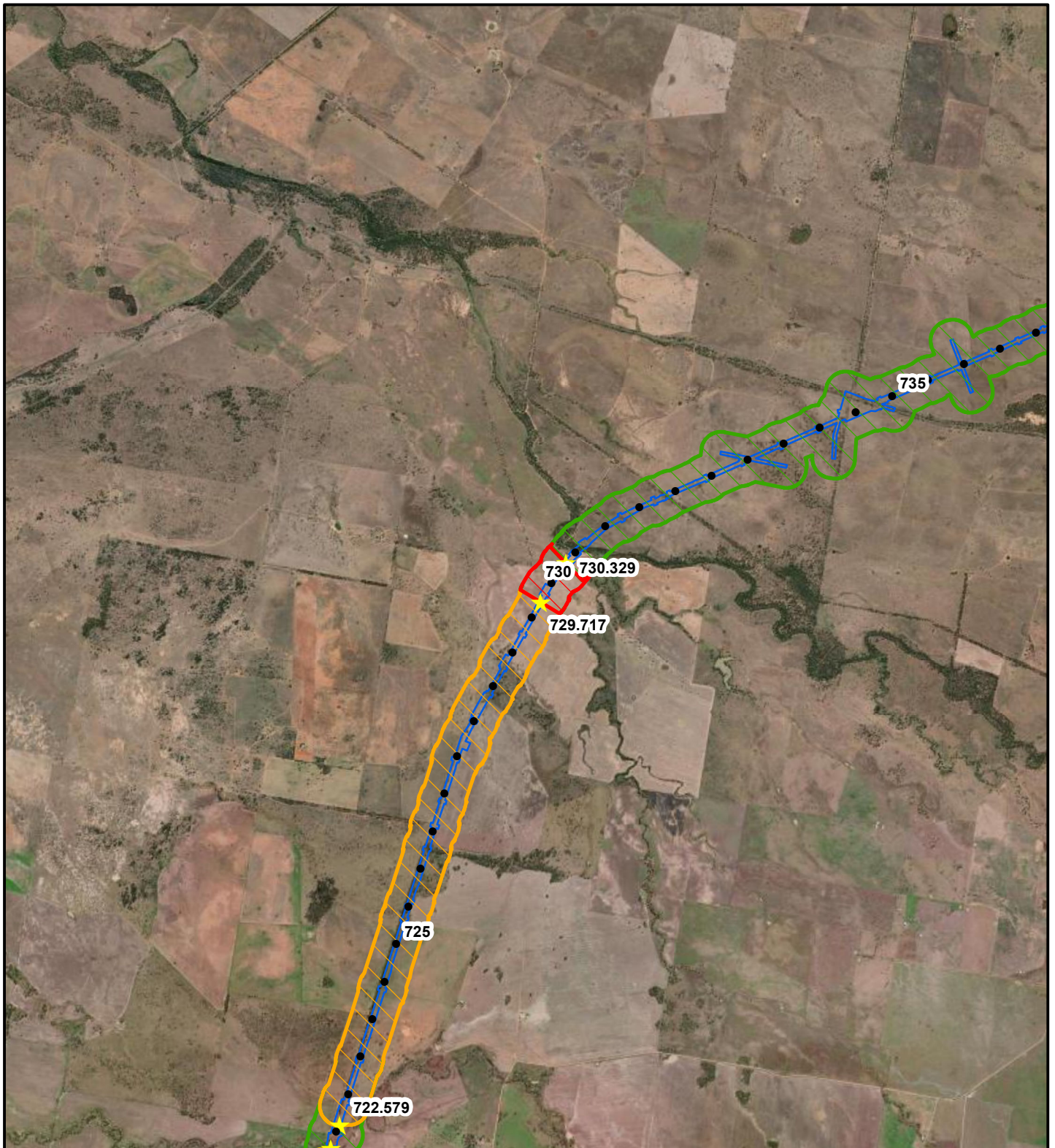


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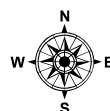


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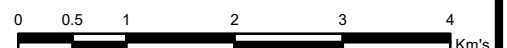
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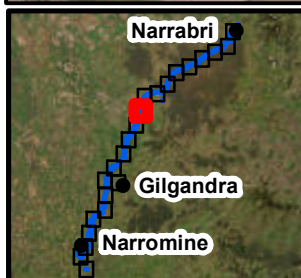
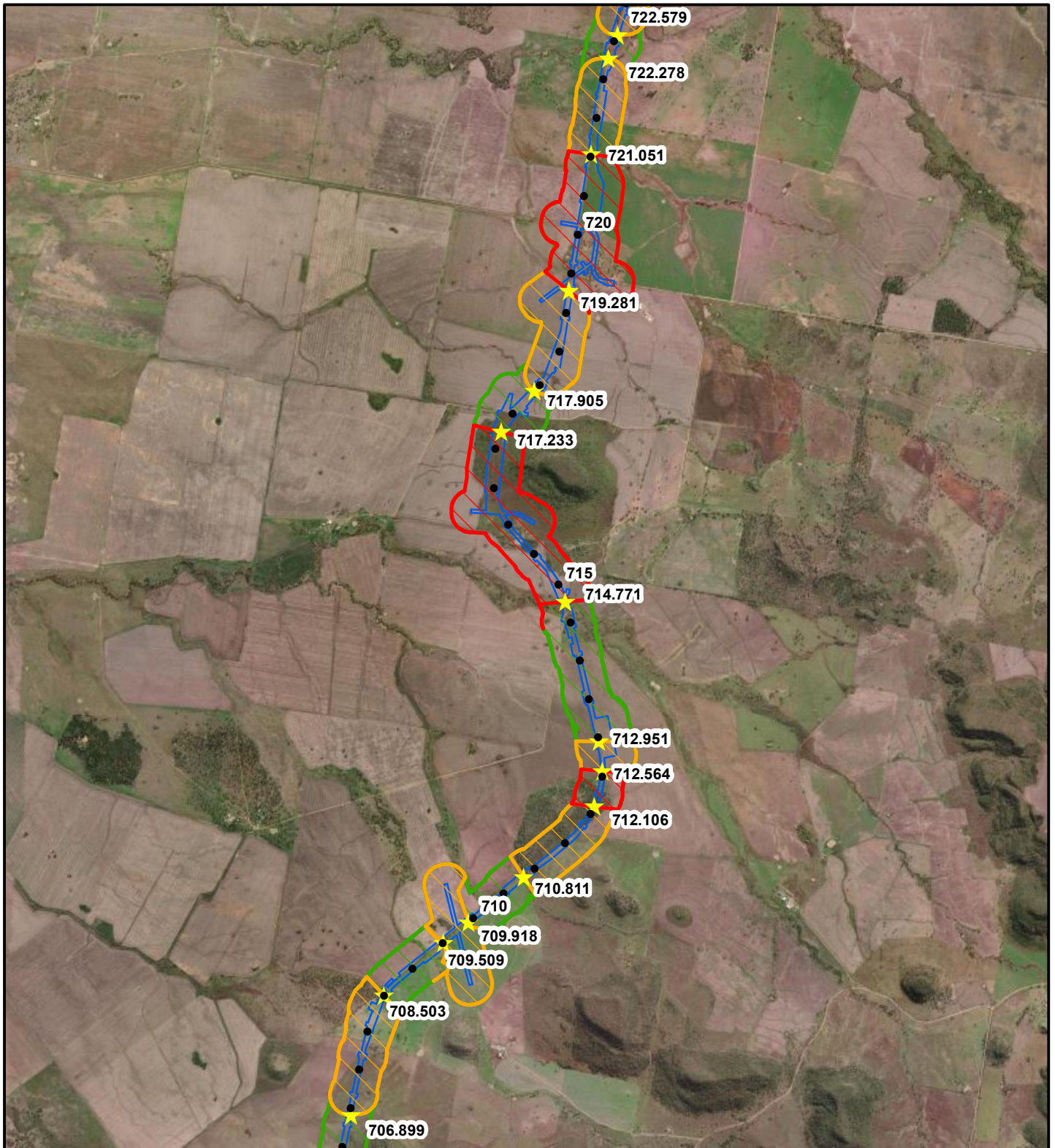


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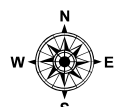


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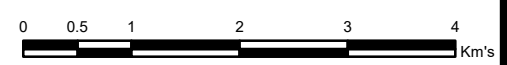
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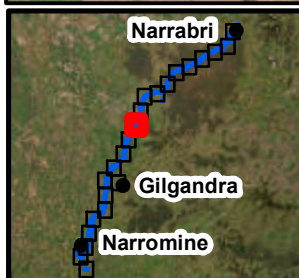
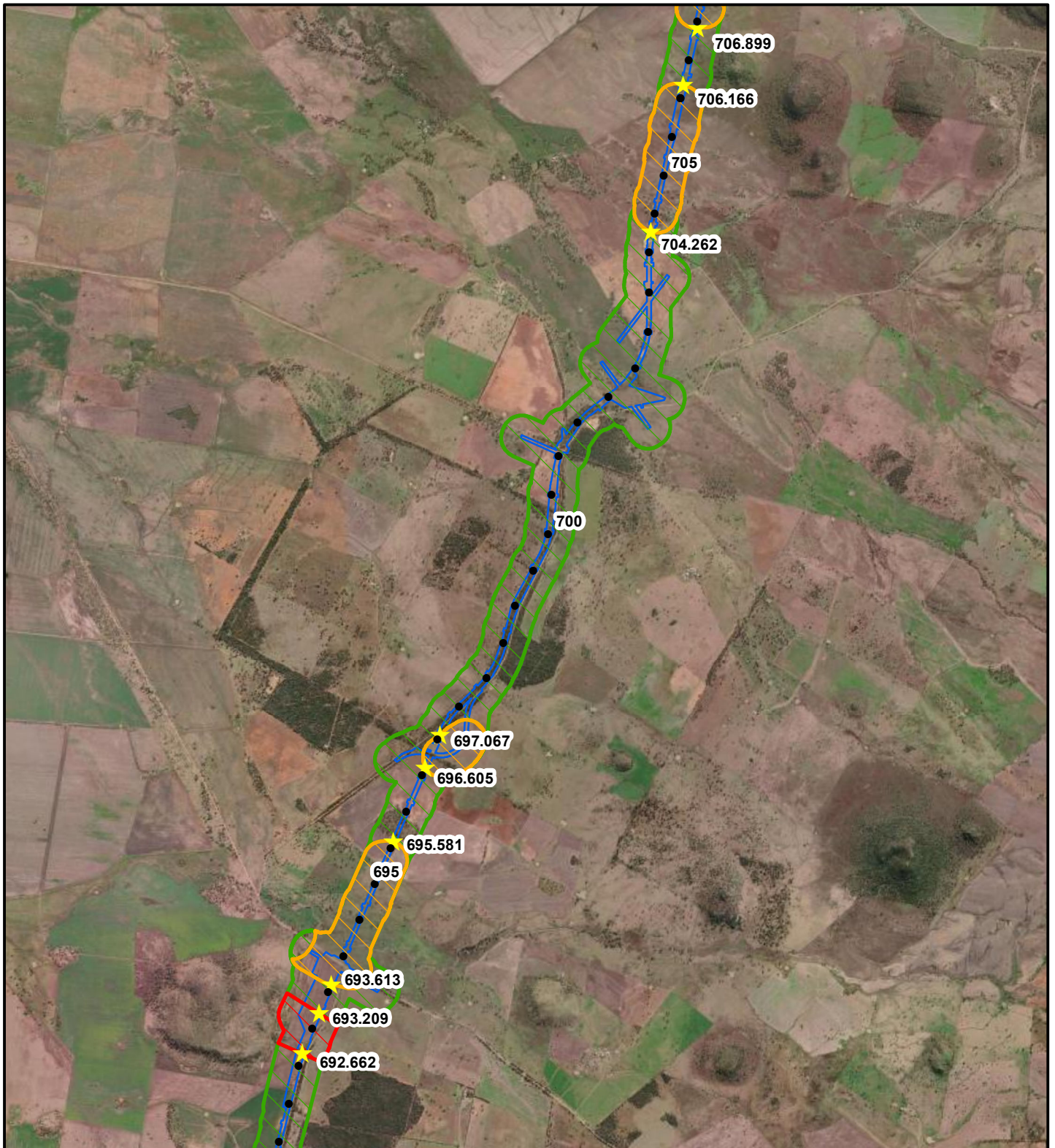


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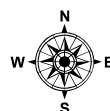


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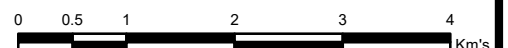
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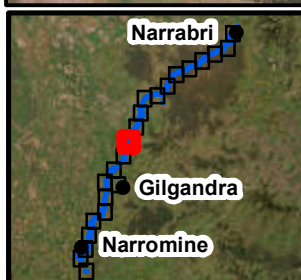
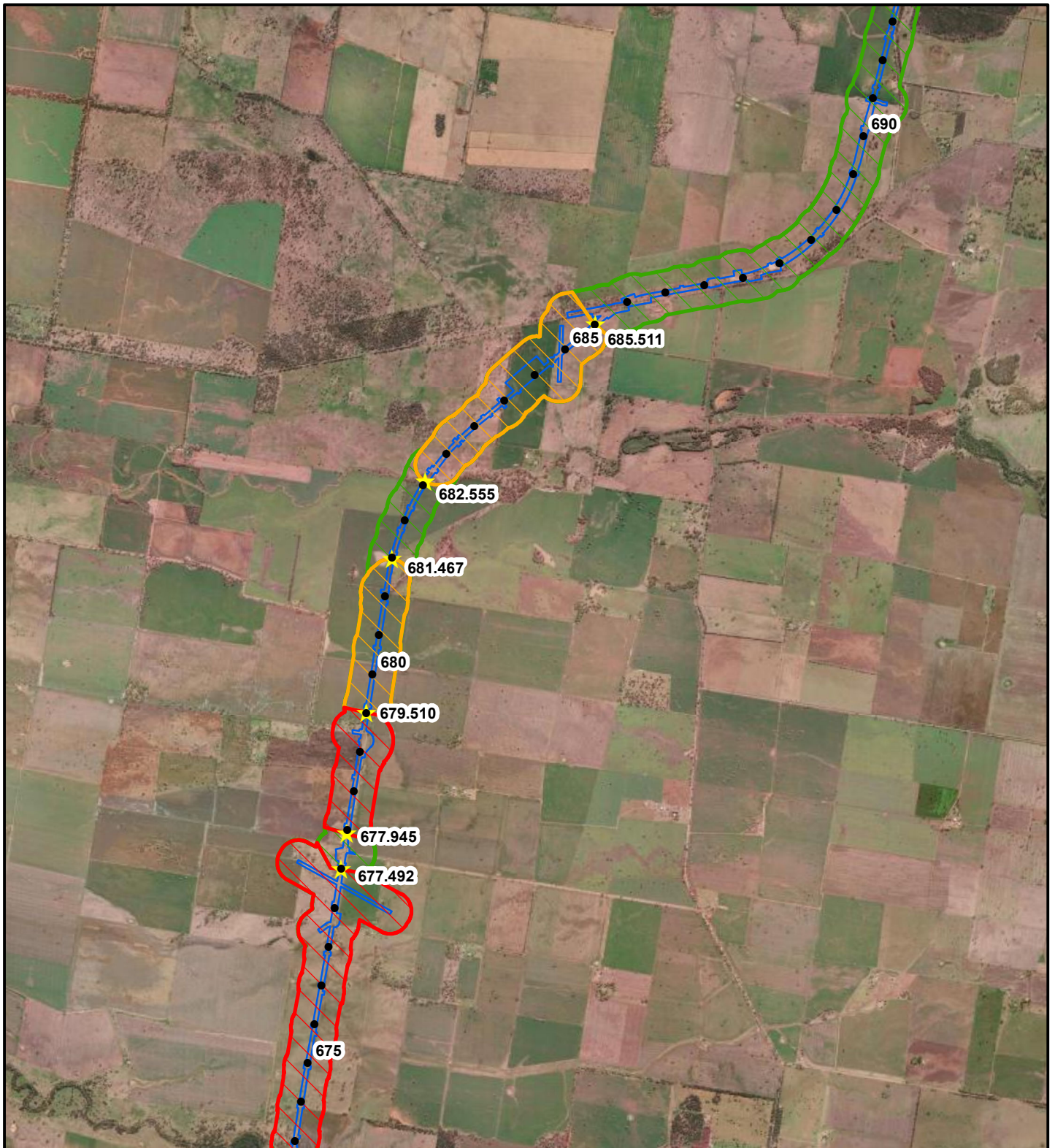


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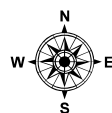


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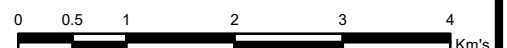
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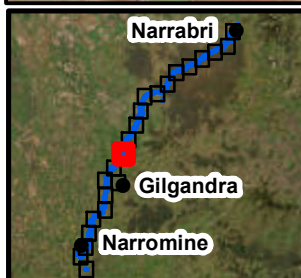
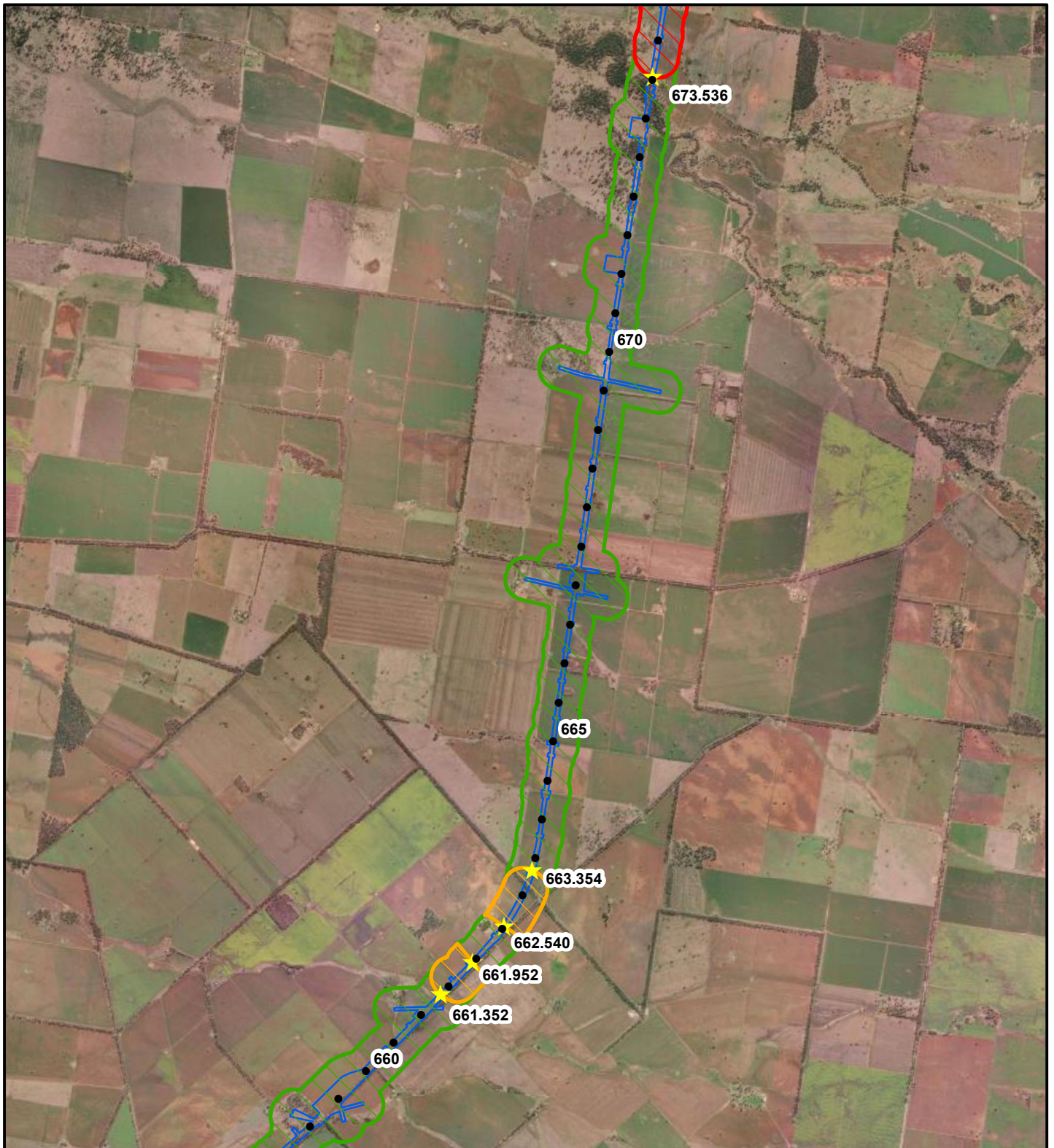


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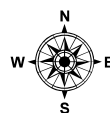


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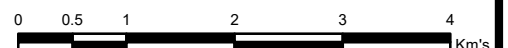
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Potential Five Clawed Worm Skink Distribution

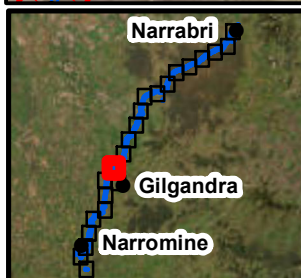
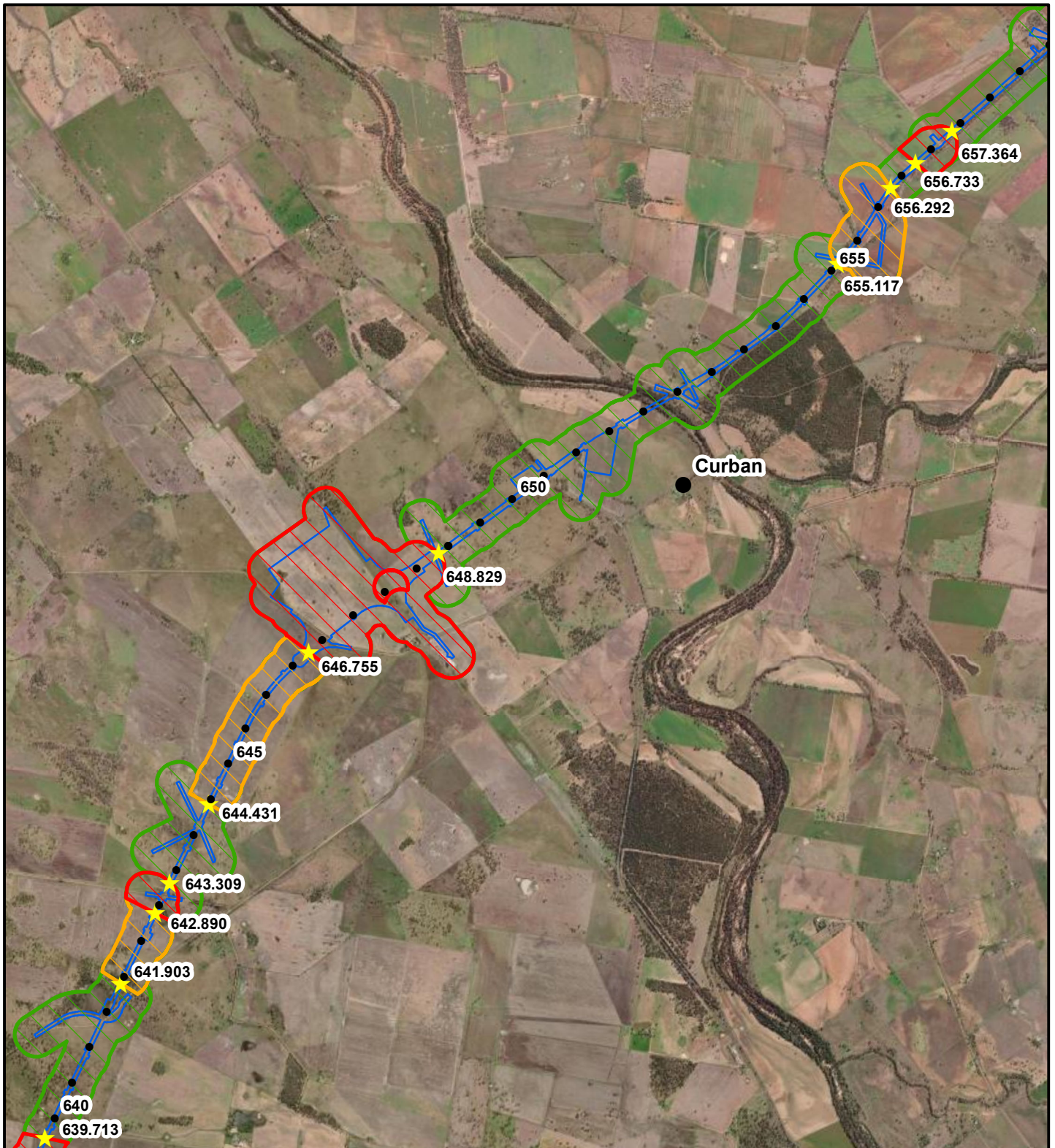


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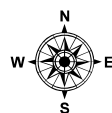


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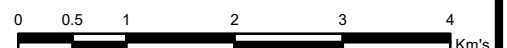
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Potential Five Clawed Worm Skink Distribution

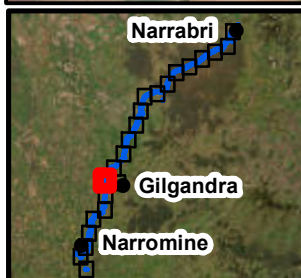
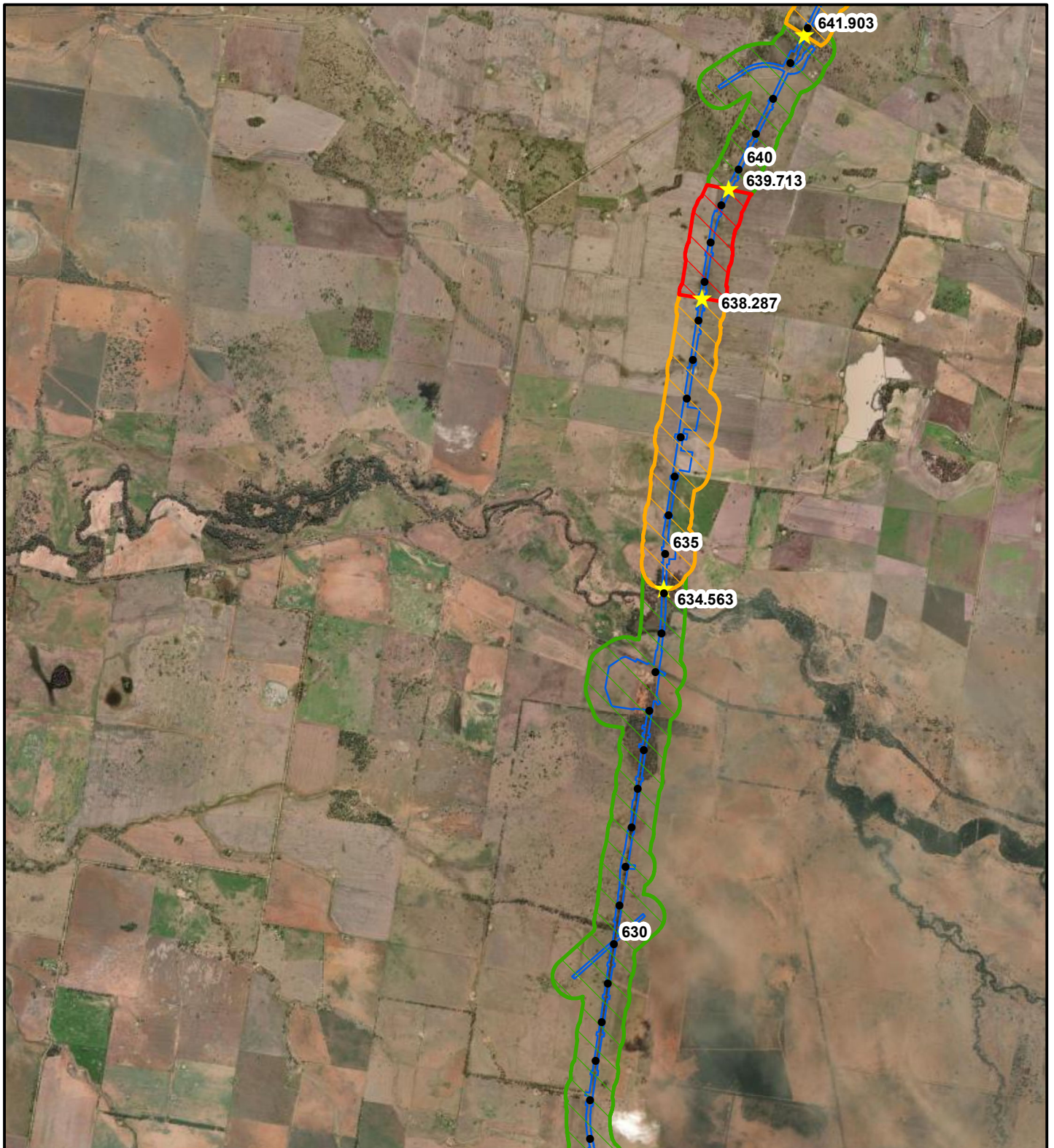


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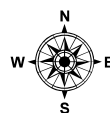


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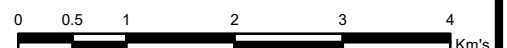
Inland Rail N2N



Potential Five Clawed Worm Skink Distribution

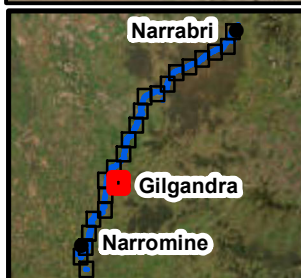


Map 15 of 23

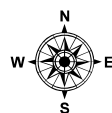


Coordinate System: GDA2020 MGA Zone 55

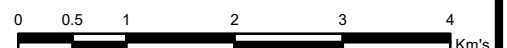
Inland Rail N2N



Potential Five Clawed Worm Skink Distribution

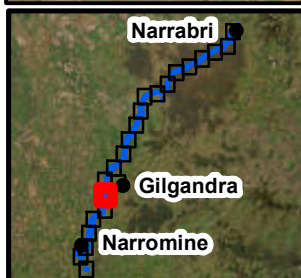


Map 16 of 23

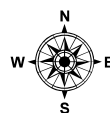


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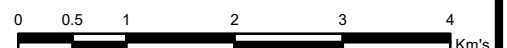
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Potential Five Clawed Worm Skink Distribution

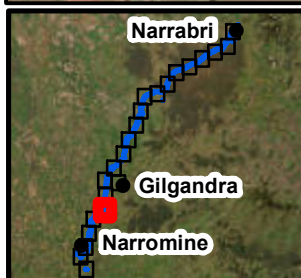


Map 17 of 23

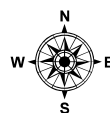


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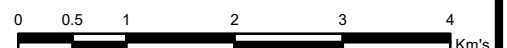
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Potential Five Clawed Worm Skink Distribution

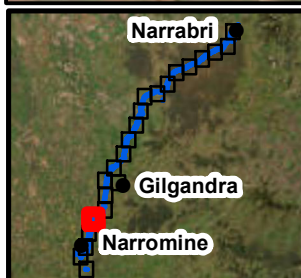


Map 18 of 23

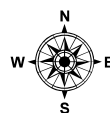


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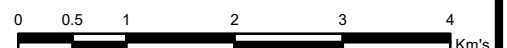
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Potential Five Clawed Worm Skink Distribution

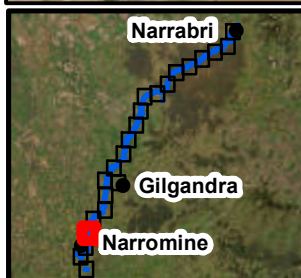


Map 19 of 23

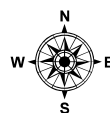


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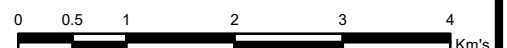
Inland Rail N2N



Potential Five Clawed Worm Skink Distribution

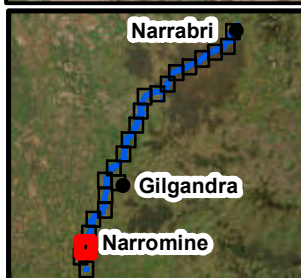


Map 20 of 23

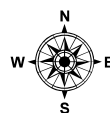


Coordinate System: GDA2020 MGA Zone 55

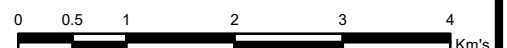
Inland Rail N2N



Potential Five Clawed Worm Skink Distribution

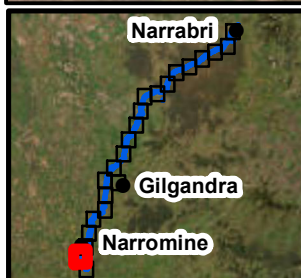


Map 21 of 23

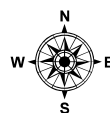


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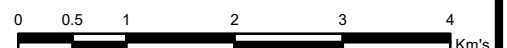
Inland Rail N2N



Potential Five Clawed Worm Skink Distribution

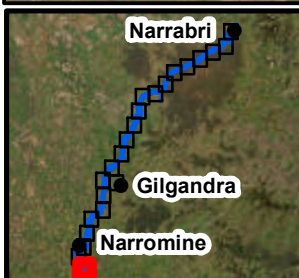


Map 22 of 23

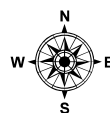


Coordinate System: GDA2020 MGA Zone 55

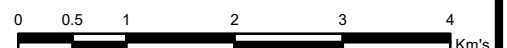
Inland Rail N2N



Potential Five Clawed Worm Skink Distribution



Map 23 of 23



Coordinate System: GDA2020 MGA Zone 55

Appendix B – Activity Risk Matrix

The following mitigation measures are applicable to the nominated works within areas identified as potential FCWS Habitat Area (see Appendix A).

Risk Matrices (CPB EMS)

Step 1 - What is the Most Credible Consequence?					
Consequence Rating	1 Negligible	2 Minor	3 Moderate	4 Major	5 Substantial
Safety and Health	First Aid Treatment (or No treatment)	Medical Treatment Injury	Lost Time Injury	Permanent Injury (Paraplegia, Amputation)	Fatality (Single or multiple)
Environment and Heritage	Small, contained localised impact / Low level repairable damage	Short lived, well contained environmental impact / Minor remedial action required	Medium term, contained impact / Significant remedial action required	Impacts extend off-site / external ecosystem. Considerable remediation required	Long Term irreversible damage / Long Term Remediation required
Plant Damage	Little or No Damage	Damage less than \$15,000	Damage between \$15,000 and \$50,000	Damage between \$50,000 and \$100, 000	Damage greater than \$100, 000
Reputation	Brief local negative media coverage.	Local negative media coverage. Site or project problem.	Regional/short negative media coverage. Loss of Client / project.	Sustained national negative media coverage. Loss of long term key client.	International negative media coverage. Loss of business from key sector.
Time	Delay / Business interruption <1% of program days	Delay / Business interruption between 1%-3% of program days	Delay / Business interruption between 4%-6% of program days	Delay / Business interruption between 7%-10% of program days	Delay / Business interruption >10% of program days
Cost	Additional cost to the business / project <1% revenue	Additional cost to the business / project between 1%-3% revenue	Additional cost to the business / project between 4%-6% of revenue	Additional cost to the business / project between 7%-10% of revenue	Additional cost to the business / project >10% of revenue

Step 2 - What is the likelihood of that Consequence occurring in the circumstances?

Likelihood Ranking				
Score	Description		Percentage	Expected Frequency
5	Almost Certain	Common / Frequent Occurrence	Can be expected to occur 75% - 99%	More than 1 event per month
4	Likely	Is known to occur or "It has happened regularly"	Can quite commonly occur 50% - 75%	More than 1 event per year
3	Possible	Could occur or "I've heard of it happening"	May occasionally occur 25% - 50%	1 event per 1 to 10 years
2	Unlikely	Not likely to occur very often	May infrequently occur 10% - 25%	1 event per 10 to 100 years
1	Rare	Conceivable but only in exceptional circumstances	May occur in exceptional circumstances 0% - 10%	Less than 1 event per 100 years

Step 3 – Determine the Risk Level

Determine the risk score by combining most credible consequence with likelihood

		Consequence	Negligible	Minor	Moderate	Major	Substantial
Likelihood	Rating	1	2	3	4	5	
	Almost Certain	5 (Low)	10 (Moderate)	18 (Very High)	23 (Extreme)	25 (Extreme)	
	Likely	4 (Low)	9 (Moderate)	17 (Very High)	20 (Very High)	24 (Extreme)	
	Possible	3 (Low)	8 (Moderate)	13 (High)	19 (Very High)	22 (Very High)	
	Unlikely	2 (Low)	7 (Low)	12 (High)	15 (High)	21 (Very High)	
	Rare	1 (Low)	6 (Low)	11 (Moderate)	14 (High)	16 (High)	

Table B-1: LIW Activity Risk Matrix

Work phase	Activity	Aspect / impact	Likelihood	Impact	Initial risk	Mitigation measures	Likelihood	Impact	Residual risk	Additional Comments or Documents / Procedures / Training Required
Low Impact Works	Geotechnical investigations and construction water investigations	1. Slashing	Likely	Moderate	High	1.1 Identification of FCWS Habitat Area on Environmental Control Plans 1.2 Specific FCWS Induction 1.3 Ecologist or Fauna Spotter undertake pre-clearing survey prior to slashing 1.4 Ecologist & Fauna Spotter supervise slashing activity 1.5 Slashed material windrowed 1.6 Relocation sites to be established based on capture sites 1.7 The above mitigations (1.3 – 1.6) are not applicable to handheld slashing (lawn trimmer) activity 1.8 Work crews tool-boxed on how to search for FCWS prior to commencing fencing (where Ecologist or Fauna Spotter is not required) 1.9 Data Collection of captured FCWS as per Appendix C 1.10 Five Clawed Worm Encounter Skink Procedure as per Appendices D 1.11 Vehicles to remain on designated accesses.	Possible	Minor	Medium	
		2. Ground penetration (Drill Rig / Excavator)	Possible	Moderate	Medium	2.1 Identification of FCWS Habitat Area on Environmental Control Plans. 2.2 Specific FCWS Induction 2.3 Site review of soil types and implementation of appropriate measures by Project Ecologist / Fauna Spotter Catcher / Environmental Team / Project Archaeologist. Report by exception. 2.4 Relocation sites to be established based on capture sites 2.5 Any Five Clawed Worm Skink found during works to be managed per Appendix D 2.6 Ecologist or Fauna Spotter observe ground penetration of drilling location. Not required for duration of drilling. Drilling location can be prepared in days leading up to works by hand excavating a 500mm x 500mm pit in the borehole location. Pit to be excavated to change in soil horizon / end of vertosol soil layer under Ecologist / Fauna Spotter observation. Excavation becomes a hostile FCWS environment, is covered as an end of day control and does not require Ecologist / Fauna Spotter presence for drilling mechanism penetration. 2.7 Data Collection of captured FCWS as per Appendix C (FCWS Register) and Appendix D (FCWS Encounter Procedure) 2.8 Where FCWS observed in during these works, ACACPB Supervisor and/or Environmental Team can self-perform the relocation and recording of the find 2.9 Vehicles to remain on designated accesses.	Unlikely	Minor	Low	
		3. Minor Access Tracks and Levelling Off of Drilling Pads for Safe and All-Weather working areas	Likely	Moderate	High	3.1 Identification of FCWS Habitat Area on Environmental Control Plans 3.2 Specific FCWS Induction 3.3 Site review of soil types and implementation of appropriate measures by Project Ecologist / Fauna Spotter Catcher / Environmental Team / Project Archaeologist. Report by exception. 3.4 Ecologist or Fauna Spotter undertake pre-clearing survey prior to minor earthworks 3.5 Relocation sites to be established based on capture sites 3.6 Waiting period prior to topsoil stripping or rock placement of two (2) nights post slashing but no more than five (5) nights post slashing 3.7 Project Ecologist to determine site suitability for FCWS. Where site deemed as suitable FCWS Habitat: Ecologist or Fauna Spotter daytime pre-stripping survey. Extent of survey to be delineated with high-vis markers 3.8 Ecologist or Fauna Spotter supervise stripping activity (where not in rail embankment) or prior to placing rock material 3.9 Topsoil stripping to depth of 100mm with one ecologist or fauna spotter per machine 3.10 Any Five Clawed Worm Skink found during works to be managed per Appendix D 3.11 Salvaged FCWS assessments for injury by project ecologist or fauna spotter 3.12 Data Collection of captured FCWS as per Appendix C (FCWS Register) and Appendix D (FCWS Encounter Procedure) 3.13 Vehicles to remain on designated accesses.	Possible	Moderate	Medium	Full details on required ground penetration works required for track establishment is to be determined based on-site conditions.

Work phase	Activity	Aspect / impact	Likelihood	Impact	Initial risk	Mitigation measures	Likelihood	Impact	Residual risk	Additional Comments or Documents / Procedures / Training Required
	Archaeological Test Excavation and Salvage	4. Ground penetration (hand tools)	Possible	Moderate	Medium	4.1 Identification of FCWS Habitat Area on Environmental Control Plans 4.2 Specific FCWS Induction 4.3 Site review of soil types and implementation of appropriate measures by Project Ecologist / Fauna Spotter Catcher / Environmental Team / Project Archaeologist. Report by exception. 4.4 Ecologist or Fauna Spotter undertake pre-clearing survey prior to commencing works 4.5 Work crews tool-boxed on how to search for and avoid impact to FCWS prior to commencing hand tool archaeological test pit digging; then self-management of archaeological excavation program by archaeologists and Registered Aboriginal Parties 4.6 Any Five Clawed Worm Skink found during works to be managed per Appendix D 4.7 Relocation sites to be established based on capture sites 4.8 Data Collection of captured FCWS as per Appendix C (FCWS Register) and Appendix D (FCWS Encounter Procedure) 4.9 Where FCWS observed in during these works, ACACPB Supervisor and/or Environmental Team can self-perform the relocation and recording of the find 4.10 Vehicles to remain on designated accesses.	Unlikely	Minor	Low	
	Utilities investigations	5. Non-destructive digging	Likely	Moderate	High	5.1 Identification of FCWS Habitat Area on Environmental Control Plans 5.2 Specific FCWS Induction 5.3 Site review of soil types and implementation of appropriate measures by Project Ecologist / Fauna Spotter Catcher / Environmental Team / Project Archaeologist. Report by exception. 5.4 Ecologist or Fauna Spotter undertake pre-clearing survey prior to slashing 5.5 Ecologist & Fauna Spotter supervise slashing activity 5.6 Slashed material windrow 5.7 Work crews' tool-boxed on how to search for and avoid impact to FCWS prior to commencing pothole digging; then self-management of non-destructive digging program by utilities work crew 5.8 Any Five Clawed Worm Skink found during works to be managed per Appendix E 5.9 Relocation sites to be established based on capture sites 5.10 The above mitigations (5.3 - 5.5) are not applicable to handheld slashing (lawn trimmer) activity 5.11 Data Collection of captured FCWS as per Appendix C (FCWS Register) and Appendix D (FCWS Encounter Procedure) 5.12 Where FCWS observed in during these works, ACACPB Supervisor and/or Environmental Team can self-perform the relocation and recording of the find 5.13 Vehicles to remain on designated accesses.	Unlikely	Minor	Low	Toolbox by Ecologist or Fauna Spotter for Utilities Non-Destructive Digging crews on searching for FCWS & FCWS Habitat Area.
	Installation of mitigation measures	6. Slashing	Fencing	Possible	Medium	6.1 Identification of FCWS Habitat Area on Environmental Control Plans 6.2 Specific FCWS Induction 6.3 Ecologist or Fauna Spotter undertake pre-clearing survey prior to slashing 6.4 Ecologist & Fauna Spotter supervise slashing activity 6.5 Slashed material windrowed 6.6 Relocation sites to be established based on capture sites 6.7 The above mitigations (6.3 – 6.6) are not applicable to handheld slashing (lawn trimmer) activity 6.8 Work crews tool-boxed on how to search for FCWS prior to commencing fencing (where Ecologist or Fauna Spotter is not required) 6.9 Data Collection of captured FCWS as per Appendix C 6.10 Five Clawed Worm Encounter Skink Procedure as per Appendices D 6.11 Vehicles to remain on designated accesses.	Possible	Minor	Medium	

Work phase	Activity	Aspect / impact	Likelihood	Impact	Initial risk	Mitigation measures	Likelihood	Impact	Residual risk	Additional Comments or Documents / Procedures / Training Required
		7. Ground penetration	Possible	Moderate	Medium	7.1 Identification of FCWS Habitat Area on Environmental Control Plans. 7.2 Specific FCWS Induction 7.3 Site review of soil types and implementation of appropriate measures by Project Ecologist / Fauna Spotter Catcher / Environmental Team / Project Archaeologist. Report by exception. 7.4 Relocation sites to be established based on capture sites 7.5. Ecologist or Fauna Spotter observe ground penetration of installation location. Ground penetration to be excavated to change in soil horizon / end of vertosol soil layer under Ecologist / Fauna Spotter observation. Excavation becomes a hostile FCWS environment, is covered as an end of day control and does not require Ecologist / Fauna Spotter presence for drilling mechanism penetration. 7.6. Any Five Clawed Worm Skink found during works to be managed per Appendix D 7.7. Data Collection of captured FCWS as per Appendix C (FCWS Register) and Appendix D (FCWS Encounter Procedure) 7.8 Where FCWS observed in during these works, ACACPB Supervisor and/or Environmental Team can self-perform the relocation and recording of the find 7.9 Vehicles to remain on designated accesses.	Unlikely	Minor	Low	
	Contamination investigations and treatment of contaminated sites	8. Clearing/grubbing/topsoil stripping	Almost Certain	Moderate	High	8.1 All mitigation measures as per FCWS MP Section 5.2. 8.2. Identification of FCWS Habitat Area on Environmental Control Plans 8.3. Specific FCWS Induction 8.4. Adequately survey areas 8.5. Ecologist or Fauna Spotter undertake pre-clearing survey prior to slashing 8.6. Ecologist & Fauna Spotter supervise slashing activity 8.7. Slashed material windrow 8.8. Relocation sites to be established based on capture sites 8.9. Waiting period prior to topsoil stripping 8.10. Site Assessment by a Project ecologist to determine FCWS Habitat Area 8.11. Daytime stripping & associated controls 8.12. Ecologist or Fauna Spotter Catcher to supervise ground disturbance works 8.13. Salvaged FCWS assessments for injury by project ecologist or fauna spotter 8.14. Data Collection of captured FCWS as per Appendix C 8.15. Identify and establish FCWS relocation Sites by project ecologist or fauna spotter 8.16. Habitat Enhancement & Refuge Replacement 8.17. Five Clawed Worm Skink Encounter Procedure as per Appendices D.	Likely	Moderate	High	
		9. Ground penetration (Drill Rig / Excavator)	Possible	Moderate	Medium	9.1 Identification of FCWS Habita Area on Environmental Control Plans. 9.2 Specific FCWS Induction 9.3 Site review of soil types and implementation of appropriate measures by Project Ecologist / Fauna Spotter Catcher / Environmental Team / Project Archaeologist. Report by exception. 9.4 Relocation sites to be established based on capture sites 9.5. Ecologist or Fauna Spotter observe ground penetration of drilling location. Not required for duration of drilling. Drilling location can be prepared in days leading up to works by hand excavating a 500mm x 500mm pit in the borehole location. Pit to be excavated to change in soil horizon / end of vertosol soil layer under Ecologist / Fauna Spotter observation. Excavation becomes a hostile FCWS environment, is covered as an end of day control and does not require Ecologist / Fauna Spotter presence for drilling mechanism penetration. 9.6. Any Five Clawed Worm Skink found during works to be managed per Appendix D 9.7. Relocation sites to be established based on capture sites 9.8. Data Collection of captured FCWS as per Appendix C (FCWS Register) and Appendix D (FCWS Encounter Procedure)	Unlikely	Minor	Low	

Work phase	Activity	Aspect / impact	Likelihood	Impact	Initial risk	Mitigation measures	Likelihood	Impact	Residual risk	Additional Comments or Documents / Procedures / Training Required
						9.9 Where FCWS observed in during these works, ACACPB Supervisor and/or Environmental Team can self-perform the relocation and recording of the find 9.10. Vehicles to remain on designated accesses.				
		10. Minor Access Tracks & and Levelling Off of Drilling Pads for Safe and All-Weather working areas	Likely	Moderate	High	10.1 Identification of FCWS Habitat Area on Environmental Control Plans 10.2 Specific FCWS Induction 10.3 Site review of soil types and implementation of appropriate measures by Project Ecologist / Fauna Spotter Catcher / Environmental Team / Project Archaeologist. Report by exception. 10.4 Ecologist or Fauna Spotter undertake pre-clearing survey prior to minor earthworks 10.5 Relocation sites to be established based on capture sites 10.6 Waiting period prior to topsoil stripping or rock placement of two (2) nights post slashing but no more than five (5) nights post slashing 10.7 Project Ecologist to determine site suitability for FCWS. Where site deemed as suitable FCWS Habitat: Ecologist or Fauna Spotter daytime pre-stripping survey. Extent of survey to be delineated with high-vis markers 10.8 Ecologist or Fauna Spotter supervise stripping activity (where not in rail embankment) or prior to placing rock material 10.9 Topsoil stripping to depth of 100mm with one ecologist or fauna spotter per machine 10.10 Any Five Clawed Worm Skink found during works to be managed per Appendix D 10.11 Salvaged FCWS assessments for injury by project ecologist or fauna spotter 10.12 Data Collection of captured FCWS as per Appendix C (FCWS Register) and Appendix D (FCWS Encounter Procedure) 10.13 Vehicles to remain on designated accesses.	Possible	Moderate	Medium	
	Site establishment work	11. Clearing/grubbing/topsoil stripping	Almost Certain	Moderate	High	11.1 All mitigation measures as per FCWS MP Section 5.2. 11.2 Identification of FCWS Habitat Area on Environmental Control Plans 11.3 Specific FCWS Induction 11.4 Adequately survey areas 11.5 Ecologist or Fauna Spotter undertake pre-clearing survey prior to slashing 11.6 Ecologist & Fauna Spotter supervise slashing activity 11.7 Slashed material windrow 11.8 Relocation sites to be established based on capture sites 11.9 Waiting period prior to topsoil stripping 11.10 Site Assessment by a Project ecologist to determine FCWS Habitat Area 11.11 Daytime stripping & associated controls 11.12 Ecologist or Fauna Spotter Catcher to supervise ground disturbance works 11.13 Salvaged FCWS assessments for injury by project ecologist or fauna spotter 11.14 Data Collection of captured FCWS as per Appendix C 11.15 Identify and establish FCWS relocation Sites by project ecologist or fauna spotter 11.16 Habitat Enhancement & Refuge Replacement 11.17 Five Clawed Worm Skink Encounter Procedure as per Appendices D.	Likely	Moderate	High	
	Property acquisition adjustment work	12. Ground penetration (fence posts)	Possible	Moderate	Medium	12.1 Identification of FCWS Habita Area on Environmental Control Plans. 12.2 Specific FCWS Induction 12.3 Site review of soil types and implementation of appropriate measures by Project Ecologist / Fauna Spotter Catcher / Environmental Team / Project Archaeologist. Report by exception. 12.4 Relocation sites to be established based on capture sites 12.5 Work crews tool-boxed on how to search for and avoid impact to FCWS prior to commencing fence post installation 12.6 Any Five Clawed Worm Skink found during works to be managed per Appendix D	Unlikely	Minor	Low	

Work phase	Activity	Aspect / impact	Likelihood	Impact	Initial risk	Mitigation measures	Likelihood	Impact	Residual risk	Additional Comments or Documents / Procedures / Training Required
						12.7 Data Collection of captured FCWS as per Appendix C (FCWS Register) and Appendix D (FCWS Encounter Procedure) 12.8 Where FCWS observed in during these works, ACACPB Supervisor and/or Environmental Team can self-perform the relocation and recording of the find 12.9 Vehicles to remain on designated accesses.				
	Minor ancillary facility establishment	13. Clearing/grubbing/hardstand	Almost Certain	Moderate	High	13.1 All mitigation measures as per FCWS MP Section 5.2. 13.2 Identification of FCWS Habitat Area on Environmental Control Plans 13.3 Specific FCWS Induction 13.4 Adequately survey areas 13.5 Ecologist or Fauna Spotter undertake pre-clearing survey prior to slashing 13.6 Ecologist & Fauna Spotter supervise slashing activity 13.7 Slashed material windrow 13.8 Relocation sites to be established based on capture sites 13.9 Waiting period prior to topsoil stripping 13.10 Site Assessment by a Project ecologist to determine FCWS Habitat Area 13.11 Daytime stripping & associated controls 13.12 Ecologist or Fauna Spotter Catcher to supervise ground disturbance works 13.13 Salvaged FCWS assessments for injury by project ecologist or fauna spotter 13.14 Data Collection of captured FCWS as per Appendix C 13.15 Identify and establish FCWS relocation Sites by project ecologist or fauna spotter 13.16 Habitat Enhancement & Refuge Replacement 13.17 Five Clawed Worm Skink Encounter Procedure as per Appendices D.	Likely	Moderate	High	
	General survey investigations	14. Survey control set-out	Possible	Moderate	Medium	14.1 Identification of FCWS Habitat Area on Environmental Control Plans 14.2 Specific FCWS Induction 14.3 Site review of soil types and implementation of appropriate measures by Project Ecologist / Fauna Spotter Catcher / Environmental Team / Project Archaeologist. Report by exception. 14.4 Ecologist or Fauna Spotter undertake pre-clearing survey prior to slashing 14.5 Ecologist & Fauna Spotter supervise slashing activity 14.6 Slashed material windrowed 14.7 Relocation sites to be established based on capture sites 14.8 The above mitigations (14.3 – 14.7) are not applicable to handheld slashing (lawn trimmer) activity 14.9 Survey crew tool-boxed on how to search for and avoid impact to FCWS prior to commencing works (minor control install); then self-management of survey work crew 14.10 Hand Auger control installation location 14.11 Any Five Clawed Worm Skink found during works to be managed per Appendix D. Data Collection of captured FCWS as per Appendix C FCWS Register) and Appendix D (FCWS Encounter Procedure) 14.12 Where FCWS observed in during these works, ACACPB Supervisor / Environmental Team can self-perform the relocation and recording of the find 14.13 Vehicles to remain on designated accesses.	Unlikely	Minor	Low	
	Other non-intrusive investigations	15. Activities without ground disturbance	Rare	Moderate	Low	15.1 Identification of FCWS Habitat Area on Environmental Control Plans 15.2 Specific FCWS Induction 15.3 Any Five Clawed Worm Skink found during works to be managed per Appendix D 15.4 Vehicles to remain on designated accesses.	Rare	Minor	Low	

Appendix C – FCWS Register

Table C-1: FCWS Register

Reference Number								
Capture date and time								
Capture northing GDA94								
Capture easting GDA94								
Chainage								
SVL (mm)								
Tail length (mm)								
Total length (mm)								
Age								
Condition								
Microhabitat at capture site								
PCT at capture site								
Soil at capture site								
Capture largest soil crack								
Capture soil crack depth								
Capture % litter cover								
Capture % bare ground								
Capture % ground veg cover								
Capture 3 most abundant Groundcover								
Capture large surface debris abundance								
Capture wetness ground								
Work activity								
FCWS detection method								
Equipment								

Condition analysis								
Surveyor initials								
Photograph of animal								
Photograph of capture site								
Release easting GDA94								
Release northing GDA94								
Why is site suitable for relocation								
Microhabitat at release site								
PCT at release site								
Soil at release site								
Temporary exclusion fencing								
Justification for no fence								
Photograph of release site								
Comment								
Approval								
Time of Time of recommencement								

Appendix D – Five-Clawed Worm Skink Encounter Procedure

Purpose

This procedure addresses the measures in place where FCWS are found within identified Habitat Areas, as well as measures and requirements in place for where FCWS are found outside of identified FCWS Habitat Areas.

Induction / Training

All Project personnel will undergo a project induction including specific Five-clawed Worm skink information that includes:

- A general description of the Five-clawed Worm-skink (including photos and key identification features)
- Locations where Five-clawed Worm skink habitat is located on the Project site
- Information on and reference to this Five-clawed Worm Skink Encounter Procedure.

Records of induction / toolbox training would be retained.

Scope

This procedure is applicable to all work activities conducted by ACA CPB JV, sub-Contractor personnel and ARTC that have the potential to come into contact with Five-clawed Worm Skinks.

- Where FCWS are found inside of identified FCWS Habitat Areas – follow Procedure Section 1
- Where FCWS are found outside of identified FCWS Habitat Areas – follow Procedure Section 2.

Identified habitat areas are shown in Appendix A. For clarity, anywhere identified as FCWS habitat or potential FCWS habitat are to be considered FCWS habitat for the purposes of this procedure.

Procedure

1. Five-clawed Worm-skink encountered during works – inside of identified FCWS Habitat Areas

If a Five-clawed Worm-skink is encountered prior to or during work activities, inside FCWS Habitat Areas:

- STOP ALL WORK in close vicinity of the find, or that would impact upon the find
- Notify the ACA CPB JV Supervisor and Environmental Team. ACA CPB JV Environment team to notify ARTC and contact Ecologist and/or Fauna Spotter.
- The Project Ecologist or Fauna Spotter-Catcher will confirm the species, and record details of the find as per FCWS Management Plan (Appendix C), including:
 - Reference number
 - Section and Chainage
 - Capture date and time
 - Condition (Good, Injured, Deceased)
 - Microhabitat at capture site
 - Soil at 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 microhabitat at capture site
 - Description of vegetation/PCT
 - Where practicable, validation photos from on top, side, below and close-up photos of forelimbs and hindlimbs
 - Series of measurements including; snout-vent length, tail length and total length
- Microhabitat details of find location:

- Soil crack density and size range (depth if possible)
- % litter cover
- % bare ground
- % 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
- Ground moisture levels (including recent rainfall amount if known/relevant).

Photographs of the site (general location, vegetation, habitat features where the individual/s was discovered) shall be captured for each individual discovered. Photographs to be taken by the Project Ecologist or Fauna Spotter as part of the recording the data of the find.

- The Project Ecologist or Fauna Spotter Catcher will assess the condition of the Five-clawed Worm skink and determine whether it can be relocated.
 - If relocated, the details of the relocation site and condition will be recorded
 - If injured and unable to be relocated, the Project Ecologist or Fauna Spotter Catcher would determine requirement for euthanasia, rest period or veterinary treatment
 - If deceased, specimens shall be preserved and sent to the Australian Museum at regular intervals, where reasonable and practical (as per the approved FCWS Management Plan)
- Report on the finding, alive and relocated or deceased must be in accordance with Section 4 of this procedure (Section 7.1 of the FCWS Management Plan).

NOTE: Five-clawed Worm skink finds will be immediately notified to ARTC and ARTC will notify the relevant regulatory agencies as per Section 9.1.1 of the FCWS Management Plan, and Section 4 below.

2. Five-Clawed Worm-Skink identified during all project activities – Outside of identified FCWS Habitat Areas

If a Five-clawed Worm-skink is encountered prior to or during project activities, outside identified FCWS Habitat Areas:

- STOP ALL WORK within 200m of the find
- The ACA CPB JV Supervisor and any other personnel working in the area must be immediately notified of the find and the area surrounding the find must be protected.
- The ACA CPB JV Environment Team must also be notified immediately who will contact ARTC and the Project Environmental Representative (ER) with initial report:
 - Date & Time of discovery
 - Details of discovery site (GPS Points, description of vegetation, soil, microhabitat features present)
 - Proposed Relocation site
 - Details of person making discovery
- ACA CPB JV team to contact Ecologist and/or Fauna Spotter.
- The Project Ecologist will determine if the FCWS Habitat Area needs to be updated and following steps to be followed:
 - Relocation of individuals using the framework developed as per Section 6.2.5 of the FCWS MP;
 - Data capture of the individual and habitat data outlined in Appendix C of the FCWS MP and as outlined in Step 1 for encounters inside of identified FCWS Habitat Areas;
 - The Project Ecologist or Fauna Spotter Catcher will assess the condition of the Five-clawed Worm skink and determine whether it can be relocated.
 - If relocated, the details of the relocation site and condition will be recorded
 - If injured and unable to be relocated, the Project Ecologist or Fauna Spotter Catcher would determine requirement for euthanasia, rest period or veterinary treatment

- If deceased, specimens shall be preserved and sent to the Australian Museum at regular intervals where reasonable and practical (as outlined in section 6.2.4 of the approved FCWS Management Plan).
- Where practicable, validation photos from on top, side, below and close-up photos of forelimbs and hind limbs;
- Photographs of the site (general location, vegetation, habitat features where the individual/s was discovered) shall be captured for each individual discovered. Photographs to be taken by the Project Ecologist or Fauna Spotter as part of the recording the data of the find;
- 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, BCS and DCCEEW
- Any refinements to FCWS Habitat Area would be addressed as per Section 7.1 of the FCWS MP; with the Environmental Representative considering the Project Ecologist advice. Where the Environmental Representative endorses the Project Ecologist advice the FCWS Habitat Area shall be updated, and the Environmental Representative will include any endorsements of refined FCWS Habitat Areas in monthly reports to DPE
- Report on the finding, alive and relocated or deceased must be in accordance with Section 4 of this procedure (Section 7.1 of the FCWS Management Plan) and CoA E25 – “...all work which may impact the identified species or community must stop to prevent further impact and the Planning Secretary and BCS (and DCCEEW where relevant) notified in writing. Work must not recommence until the relevant agencies have been consulted and any required management plans or approvals have been obtained.

3. Recommencement of works

- Where Five-clawed Worm-skink is encountered prior to or during all project activities, **inside** identified FCWS Habitat Areas – works may recommence following advice from the ACA CPB JV Environmental Team that all information required in Section 1 has been captured.
 - Where Five-clawed Worm-skink is encountered prior to or during all project activities, **outside** identified FCWS Habitat Areas – works may recommence following advice from the ACA CPB JV Environmental Team that all information required in Section 2 has been captured.

4. Reporting

In the event of a Five-clawed Worm Skink mortality or injury ACA CPB JV will immediately notify the nominated ARTC Representative/s who will arrange regulatory notification/s in accordance with CoA A56 and A57 of the CSSI, and relevant conditions of any EPBC Approval. ARTC will notify DPE, BCS and DCCEEW of all FCWS mortalities and injuries. Notification timeframes will be in accordance with CoA A56 and A57 of the CSSI, and relevant conditions of any EPBC Approval.

Incident notifications relating to mortality or injury of a Five-clawed Worm Skink should address:

- Capture date and time
- GPS Coordinates for capture and relocation site
- Condition (Injured, Deceased)
- Microhabitat at capture site
- Soil at capture site
- Activity undertaken at time of find
- Detection method (e.g. survey).

IR will endeavour, notwithstanding practical and safety considerations, to collect all samples and send to the relevant independent, publicly owned museum (Australian Museum as a priority). IR will fund further analysis by the museum where the Australian Museum is willing and able to accept the specimens.

In the event of a live capture and relocation of a Five-Clawed Worm Skink ACA CPB JV will provide details of the live capture and relocation within 24 hours of the event to the nominated ARTC Representative/s who will

arrange reporting to BCS and DCCEEW within 48 hours of ARTC becoming aware of the live capture and relocation, or as otherwise agreed at the time with the Agencies.

Where FCWS is located within project boundary but outside of identified Habitat Areas, ACA CPB JV will report on the finding in accordance with MCoA E25 – “...all work which may impact the identified species or community must stop to prevent further impact and the Planning Secretary and BCS (and DCCEEW where relevant) notified in writing. Work must not recommence until the relevant agencies have been consulted and any required management plans or approvals have been obtained.

Reporting relating to the live capture and relocation of a Five-Clawed Worm Skink should address:

- Capture date and time
- GPS Coordinates for capture and relocation site
- Condition
- Microhabitat at capture site
- Soil at capture site
- Activity undertaken at time of find
- Detection method (e.g. survey).

A copy of the Five-clawed Worm Skink Register detailing all FCWS encounters as outlined in Appendix C of the FCWS MP will be provided to BCS and DCCEEW each monthly from the first encounter, or upon request by either Agency.

5. Contact details

- ACA CPB JV Environmental Team:
 - John Keenan, Environment and Sustainability Manager – 0447 029 566
 - Kristian Hancock, Environment Lead – 0456 740 970
 - Gregor Wilson, Environmental Approvals Lead – 0432 089 430
- Project Ecologist:
 - Maddy Young (Umwelt) – 0474 474 704
- WIRES: 1300 094 737

Figure 1: FCWS Inside FCWS Habitat Find Flow Chart

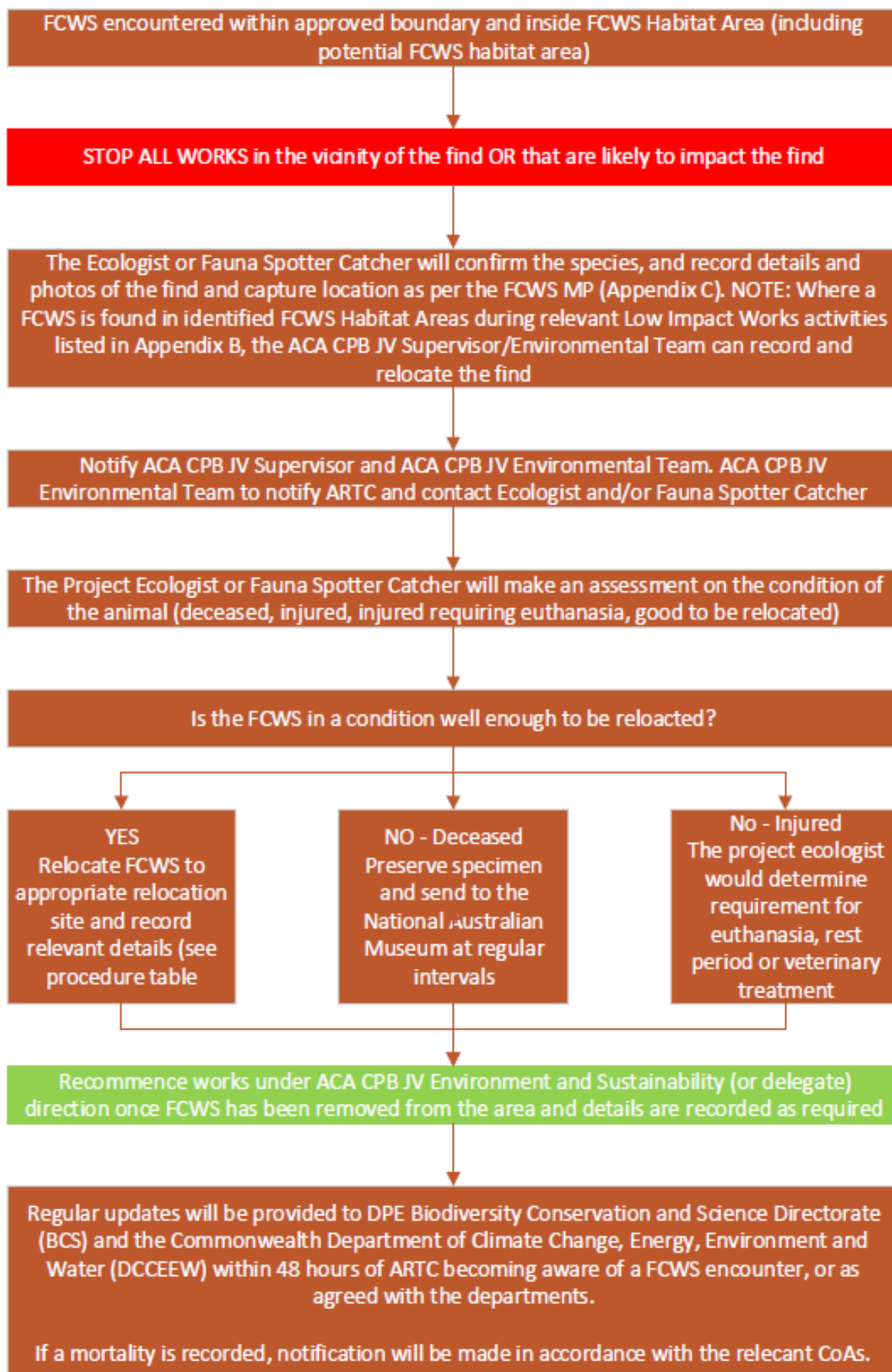
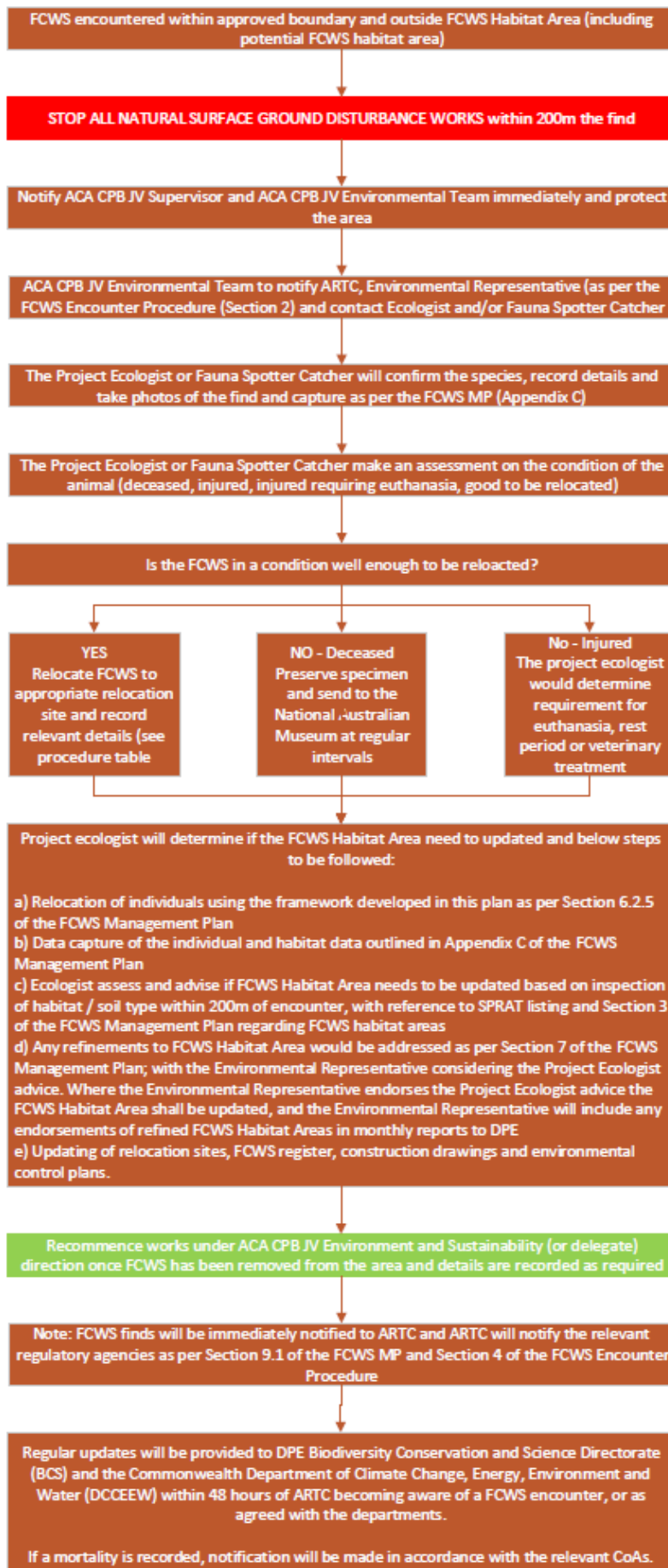


Figure 2: FCWS Outside FCWS Habitat Find Flow Chart



Appendix E – Soil Classification Data

Alignment

ID / chainage	Soil / Geological Description	FCWS Habitat	FCWS Mitigation Measures to be applied (Yes/No)
547.485	0.15m - TOPSOIL Silty CLAY: high plasticity, dark brown; rootlets < 5mm. 0.15m -Silty CLAY trace sand: high plasticity, dark brown; sand fine grained	No	No
547.999	0.2m TOPSOIL CLAY: medium to high plasticity, dark brown; with rootlets <2mm. 1m-Silty CLAY: high plasticity, pale brown.	No	No
548.18	0.2m-TOPSOIL CLAY: dark brown; with roots <2mm. 0.5 - CLAY trace sand: medium plasticity, brown mottled orange; sand fine to medium grained.	No	No
548.5	0.1m-TOPSOIL CLAY: high plasticity, dark brown; with rootlets <2mm. 1.1m - Silty CLAY trace sand trace gravel: high plasticity, pale brown; sand fine grained; gravel fine to medium sub rounded gravel.	No	No
549.214	0.2m-TOPSOIL CLAY: dark brown; with roots <2mm. 0.5 - CLAY trace sand: medium plasticity, brown mottled orange; sand fine to medium grained.	No	No
549.503	0.2m-TOPSOIL Sandy CLAY: low plasticity, pale brown; sand fine to medium grained; trace rootlets (<2mm). 0.3m - Sandy CLAY trace gravel: low plasticity, brown; sand fine to medium grained; gravel fine sub angular gravel.	No	No
550.003	0.2 -TOPSOIL Silty CLAY: medium plasticity, pale brown; with rootlets (<2mm). 0.4m - Sandy CLAY: low plasticity, pale brown; sand fine grained.	No	No
550.477	0.2m - TOPSOIL Silty CLAY: medium plasticity, pale brown; with rootlets (<2mm). 0.4m - Silty CLAY: medium plasticity, dark brown mottled orange.	No	No
551.004	0.2m- TOPSOIL Silty CLAY with sand: high plasticity, pale brown; sand fine to coarse grained.	No	No

ID / chainage	Soil / Geological Description	FCWS Habitat	FCWS Mitigation Measures to be applied (Yes/No)
	0.8 - Sandy CLAY: high plasticity, grey and orange; sand medium to coarse grained.		
554.423	0.2m - TOPSOIL Gravelly SAND trace silt: fine to coarse grained, brown; gravel fine to coarse, angular to sub-angular; silt low plasticity; with rootlets <2mm. 0.8m-Silty GRAVEL with sand: fine to coarse grained, sub-angular to angular, brown; sand fine to coarse grained; derived from granite.	No	No
554.43	0.2m - TOPSOIL SAND trace silt: fine to medium grained, brown; silt low plasticity; with rootlets <2mm. 0.4 - Gravelly SAND trace silt: fine to coarse grained, brown; gravel fine to coarse, rounded to angular; silt low plasticity.	No	No
554.44	0.5 - TOPSOIL Sandy CLAY trace gravel: low plasticity, brown; sand fine to coarse; gravel fine; rootlets. 1.5 - Clayey SAND trace gravel: fine to coarse grained, brown; gravel fine, subangular.	No	No
554.469	0.5 - TOPSOIL Silty CLAY trace gravel: low to medium plasticity, pale brown; gravel fine to medium, sub round to sub angular; rootlets < 2mm. 0.95 - Silty CLAY trace sand: medium to high plasticity, pale brown; sand fine to medium grained.	No	No
561.843	0.5-TOPSOIL Clayey SILT trace sand: brown; clay low to medium plasticity; sand fine grained; trace rootlets < 2mm. 0.95-Silty CLAY trace sand: low plasticity, brown; sand fine grained.	No	No
564.389	0.2m TOPSOIL Silty CLAY: medium plasticity, brown; with rootlets (<5mm). 0.6m Sandy CLAY trace gravel: medium plasticity, brown mottled yellow; sand fine grained; gravel fine to medium sub-angular.	No	No
564.444	0.5 TOPSOIL Sandy CLAY: medium plasticity, pale red brown; sand fine to coarse grained; rootlets < 2mm.	No	No
564.508	0.2m TOPSOIL Silty CLAY trace sand: medium plasticity, dark brown; sand fine grained; with rootlets (<5mm).	No	No

ID / chainage	Soil / Geological Description	FCWS Habitat	FCWS Mitigation Measures to be applied (Yes/No)
	0.6m Clayey GRAVEL with sand: fine to coarse grained, sub-angular, brown mottled orange and yellow; clay medium plasticity; sand fine to coarse grained sand.		
564.734	0.2m TOPSOIL Silty CLAY: medium plasticity, brown; with rootlets (<2mm). 0.5m Silty CLAY: medium plasticity, pale brown.	No	No
565.515	0.2m TOPSOIL Silty CLAY: medium plasticity, pale brown. 0.5 Silty CLAY: medium plasticity, pale brown. ALLUVIAL SOIL	No	No
565.602	0.5m TOPSOIL Silty CLAY: low plasticity, orange; with rootlets (<2mm). 0.95m Silty CLAY trace sand: medium to high plasticity, red brown; sand fine to coarse grained. ALLUVIAL SOIL	No	No
565.799	0.2m TOPSOIL Sandy SILT: pale brown; sand fine grained; with rootlets (<5mm). 0.2m Sandy CLAY: medium plasticity, pale brown; sand fine grained. ALLUVIAL SOIL	No	No
566.164	0.15m TOPSOIL Silty CLAY: medium plasticity, brown; with rootlets (<2mm). 0.4m Gravelly Sandy CLAY: medium plasticity, dark brown mottled orange; sand fine to coarse grained; gravel fine to coarse sub-angular to angular.	No	No
566.195	0.3 TOPSOIL Gravelly Silty CLAY: low plasticity, brown. 0.7 Silty GRAVEL trace sand trace cobbles: fine to coarse grained, sub-angular, brown; sand fine to coarse grained; cobbles <100mm.	No	No
566.238	0.5m TOPSOIL Gravelly CLAY with sand trace silt: low to medium plasticity, pale brown, red, grey; gravel fine to coarse grained, sub rounded to sub angular; sand fine to medium grained. 1.7m Silty CLAY trace sand: low plasticity, pale brown, grey; sand fine grained.	No	No
566.343	0.4m TOPSOIL Silty CLAY: medium plasticity, brown. 0.8m SILTSTONE: brown mottled pale grey, highly weathered, very low strength. Recovered as Clayey GRAVEL with sand.	No	No

ID / chainage	Soil / Geological Description	FCWS Habitat	FCWS Mitigation Measures to be applied (Yes/No)
566.534	0.2m TOPSOIL Silty CLAY: medium plasticity, brown; with rootlets (<2mm). 0.8m Silty CLAY: medium plasticity, dark brown. ALLUVIAL SOIL	No	No
566.858	0.2 TOPSOIL Sandy CLAY: medium plasticity, pale brown; sand fine to coarse grained; trace rootlets (<2mm). 0.5m Sandy CLAY: medium plasticity, pale brown; sand fine to medium grained. ALLUVIAL SOIL	No	No
566.963	0.5m TOPSOIL Silty CLAY with sand trace gravel: low to medium plasticity, orange brown; sand fine to coarse grained; gravel fine to medium, sub angular to angular; 0.95m Silty CLAY with gravel: medium to high plasticity, brown; gravel fine to medium, sub angular to angular; trace of rootlets.	No	No
570.907	0.2m TOPSOIL Silty CLAY with sand: low plasticity, brown; occasional ironstone gravel and cobbles (100 mm, sub angular), roots and rootlets to 30mm. 0.8m Silty CLAY with sand: low plasticity, brown; occasional ironstone gravel and cobbles (100 mm, sub angular).	No	No
572.5	0.2m TOPSOIL Silty CLAY: medium plasticity, pale brown; with rootlets (<2mm). 0.6m Sandy CLAY: medium to high plasticity, dark brown; sand fine to medium grained. COLLUVIAL SOIL	No	No
580.499	0.1m FILL Silty Sandy CLAY: low to medium plasticity, brown; sand fine to coarse grained. 1.3m Silty CLAY with sand: medium plasticity, red brown; sand fine to coarse grained.	No	No
588.811	0.12m TOPSOIL Sandy CLAY trace silt: medium plasticity, orange; sand fine to medium grained. 1.1m Silty CLAY with sand: medium plasticity, red; sand fine to coarse grained.	No	No
590.821	0.15m TOPSOIL Silty CLAY trace sand: low to medium plasticity, orange brown; sand fine to coarse grained.	No	No

ID / chainage	Soil / Geological Description	FCWS Habitat	FCWS Mitigation Measures to be applied (Yes/No)
	0.4m Silty CLAY trace sand: low to medium plasticity, red brown; sand fine grained.		
591.815	0.18m TOPSOIL Silty CLAY trace sand: low to medium plasticity, brown; sand fine grained. 0.8m Gravelly CLAY with sand: low plasticity, red; gravel fine to coarse, rounded to sub rounded; sand fine to coarse grained.ALLUVIAL SOIL	No	No
592.765	0.2m TOPSOIL Silty CLAY: medium plasticity, brown; with rootlets (<5mm). 0.3m Sandy CLAY trace gravel: medium plasticity, orange; sand fine grained; gravel fine to coarse sub-rounded to sub-angular.	No	No
593.299	0.03m TOPSOIL Silty CLAY trace sand: medium plasticity, dark brown; sand fine to coarse grained; rootlets (<3mm). 1.66m Silty CLAY trace sand: medium to high plasticity, red orange mottled yellow; sand fine to medium grained. ALLUVIAL SOIL	No	No
593.775	0.2m TOPSOIL Silty CLAY: medium plasticity, brown; with rootlets. 1.0m GRAVEL with sand trace clay: fine to coarse grained, sub-angular, red brown; sand fine to coarse grained sand; clay medium plasticity.	No	No
603.057	0.5m TOPSOIL Gravelly Clayey SAND: fine to coarse grained, pale brown grey; clay low to medium plasticity; gravel fine to coarse. 0.95m Clayey SAND trace gravel: fine to coarse grained, brown white grey; clay low plasticity; gravel fine, round to subround.	No	No
606.779	0.15m TOPSOIL Silty SAND: fine grained, dark brown; with rootlets < 5mm. 0.4m Sandy CLAY: high plasticity, dark brown; sand fine to coarse grained ALLUVIAL SOIL	No	No
607.13	0.2m TOPSOIL Sandy SILT: low plasticity, orange brown; sand fine to medium grained. 0.5m Silty SAND: fine to coarse grained, brown. ALLUVIAL SOIL	No	No

ID / chainage	Soil / Geological Description	FCWS Habitat	FCWS Mitigation Measures to be applied (Yes/No)
607.163	0.02m TOPSOIL Silty Clayey SAND: fine to coarse grained, brown; clay low to medium plasticity; trace rootlets<2mm. 0.5m Clayey SAND: fine to coarse grained, brown; clay low to medium plasticity.	No	No
607.233	0.5m TOPSOIL Silty CLAY with sand: low to medium plasticity, dark brown; sand fine grained; trace rootlets plasticity, dark brown; sand fine grained; trace rootlets < 2mm. 0.95m Sandy SILT: medium plasticity, red and pale grey brown; sand fine to coarse grained.	No	No
607.275	0.1m TOPSOIL Sandy CLAY: high plasticity, dark brown; sand fine to coarse grained 0.6m Sandy CLAY: low plasticity, pale grey; sand fine to coarse grained ALLUVIAL SOIL	No	No
607.352	0.02m TOPSOIL Sandy CLAY trace silt: low to medium plasticity, dark brown; sand fine to coarse grained; rootlets < 2mm. 0.5m Clayey SAND trace silt: fine to coarse grained, brown pale grey; clay low to medium plasticity.	No	No
607.889	0.15m TOPSOIL Sandy CLAY: high plasticity, dark brown; sand fine to coarse grained. 0.9m CLAY with sand: high plasticity, dark brown mottled pale grey; sand fine to coarse grained. ALLUVIAL SOIL	No	No
608.928	0.2m TOPSOIL Sandy SILT trace clay trace gravel: low plasticity, brown; sand fine to coarse grained; gravel fine sub angular to angular; rootlets < 2mm. 0.5m Sandy CLAY trace gravel: medium plasticity, brown grey; sand fine to coarse grained; gravel fine sub rounded.	No	No
609.012	0.2m TOPSOIL Sandy SILT: dark brown; sand fine grained; trace rootlets (<2mm). 0.95m Clayey SAND: fine to coarse grained, pale brown and yellow; clay low plasticity.	No	No
609.047	0.15m TOPSOIL Silty SAND: fine to coarse grained, dark brown; with rootlets (<2mm).	No	No

ID / chainage	Soil / Geological Description	FCWS Habitat	FCWS Mitigation Measures to be applied (Yes/No)
	0.5m Clayey SAND: fine to coarse grained, pale grey and brown; clay low plasticity.		
609.362	0.2m TOPSOIL Silty SAND: fine grained, dark brown; with rootlets < 5mm 1.2m Sandy CLAY: low plasticity, brown and pale grey; sand fine to coarse grained.	No	No
609.932	0.5m TOPSOIL Silty CLAY trace sand: low to medium plasticity, dark brown; sand fine to coarse; with rootlets 0.95m Silty CLAY: medium to high plasticity, brown.	No	No
616.166	0.2m TOPSOIL Sandy CLAY: medium to high plasticity, dark brown; sand fine grained; trace rootlets <5mm. 0.4m CLAY with sand: low plasticity, brown; sand fine grained.	No	No
616.679	0.2m TOPSOIL Silty CLAY trace sand: low to medium plasticity, pale brown; sand fine to medium grained; rootlets <2mm. 0.5m Sandy CLAY trace gravel: low to medium plasticity, brown; sand fine grained; gravel fine sub rounded. ALLUVIAL SOIL	No	No
616.733	0.5m TOPSOIL Sandy SILT: brown; sand fine to medium grained, with rootlets. 0.95m Silty SAND trace gravel: fine to coarse grained, brown; gravel fine, rounded to sub-rounded.	No	No
616.799	0.15m TOPSOIL Sandy SILT: dark brown; sand fine to coarse grained; with rootlets < 2mm. 0.95m Sandy CLAY: medium plasticity, brown; sand fine to medium grained.	No	No
616.877	0.3m TOPSOIL CLAY: high plasticity, dark brown; trace rootlets <5mm. 2m Sandy CLAY: low plasticity, pale brown mottled grey-orange; sand fine to medium grained.	No	No
617.163	0.3m TOPSOIL Silty GRAVEL: sub-rounded to sub-angular, pale brown; rootlets < 5mm. 1m Clayey Gravelly SAND: medium to coarse grained, red; gravel fine to coarse, sub rounded to angular; with roots. RESIDUAL SOIL	No	No

ID / chainage	Soil / Geological Description	FCWS Habitat	FCWS Mitigation Measures to be applied (Yes/No)
617.415	0.2m TOPSOIL Sandy CLAY: high plasticity, pale brown; sand fine grained; trace rootlets <5mm. 0.5m Sandy CLAY trace gravel: low plasticity, dark brown mottled grey; RESIDUAL SOIL sand fine grained; gravel medium to coarse sub-angular to angular.	No	No
617.494	0.1m TOPSOIL Sandy CLAY: low to medium plasticity, brown; sand fine to coarse grained; with rootlets. 0.5m Sandy CLAY trace gravel: low to medium plasticity, brown; sand fine to coarse grained; gravel fine, sub angular to angular. COLLUVIAL SOIL	No	No
617.676	0.2m TOPSOIL Silty CLAY: low plasticity, brown; rootlets < 5mm. 1.0m Gravelly Sandy CLAY: medium plasticity, grey, orange, red; sand fine to coarse grained; gravel sub rounded to angular; derived with sandstone. EXTREMELY WEATHERED MATERIAL	No	No
618.18	0.2m TOPSOIL Sandy CLAY: high plasticity, dark brown; sand fine grained; trace rootlets <5mm. 0.6m Sandy CLAY: high plasticity, brown mottled pale grey; sand fine grained. RESIDUAL SOIL	No	No
618.444	0.2m TOPSOIL Clayey SILT trace sand: dark brown; clay low to medium plasticity; sand fine grained; with rootlets (<2mm). 0.5m Silty CLAY trace sand: low to medium plasticity, dark brown; sand fine to coarse grained.	No	No
618.509	0.2m TOPSOIL Clayey SAND trace silt: fine to medium grained, pale brown; clay low to medium plasticity; with rootlets (<2mm). 0.5m Sandy CLAY trace silt: medium to high plasticity, dark brown mottled orange; sand fine to coarse grained.	No	No
618.686	0.2m TOPSOIL CLAY: medium to high plasticity, dark brown; trace rootlets <2mm. 0.4m Silty CLAY: medium to high plasticity, pale brown. RESIDUAL SOIL	No	No

ID / chainage	Soil / Geological Description	FCWS Habitat	FCWS Mitigation Measures to be applied (Yes/No)
623.885	0.15m TOPSOIL Sandy CLAY: medium plasticity, dark brown; sand fine to coarse grained; with rootlets < 5mm. 1.1m Sandy CLAY trace gravel: medium plasticity, dark brown mottled pale ALLUVIAL SOIL grey; sand fine to coarse grained; gravel fine to medium grained, sub rounded to angular.	No	No
624.342	0.15M TOPSOIL SAND: fine to medium grained, brown; with rootlets <5mm. 0.6m SAND: fine to coarse grained, brown. ALLUVIAL SOIL	No	No
624.708	0.28m TOPSOIL Clayey SAND trace gravel: fine to coarse grained, pale to dark brown; clay medium to low plasticity; gravel fine, sub round to sub angular; rootlets < 2mm. 0.95 Clayey SAND: fine to coarse grained, dark brown; clay low plasticity.	No	No
624.845	0.15m TOPSOIL Silty SAND: fine grained, dark brown. 0.4m Silty SAND: fine to medium grained, dark brown. ALLUVIAL SOIL	No	No
625.179	0.15m TOPSOIL Silty SAND: fine grained, dark brown; with rootlets < 5mm. 0.4m Silty SAND: fine to medium grained, brown. ALLUVIAL SOIL	No	No
626.409	0.15m TOPSOIL Sandy CLAY: high plasticity, dark brown; sand fine to coarse grained; with rootlets < 5mm. 1.0m Sandy CLAY: high plasticity, brown mottled pale grey; sand fine to coarse grained. RESIDUAL SOIL	No	No
627.322	0.1m TOPSOIL Sandy CLAY: high plasticity, brown; sand fine to coarse grained. 0.5m Sandy CLAY: medium plasticity, brown; sand fine to coarse grained. ALLUVIAL SOIL	No	No
628.999	0.2m TOPSOIL Sandy Silty CLAY: pale brown; sand fine grained; rootlets < 5mm. 0.4 Sandy Silty CLAY: high plasticity, pale brown; sand fine grained; trace rootlets < 5mm.	No	No
631.501	0.17 TOPSOIL Silty CLAY with sand: dark brown; rootlets < 5mm.	No	No

ID / chainage	Soil / Geological Description	FCWS Habitat	FCWS Mitigation Measures to be applied (Yes/No)
	0.5m Sandy Silty CLAY: high plasticity, brown and pale grey; sand fine to medium grained; with calcaroas noddles.		
632.5	0.3 TOPSOIL Silty SAND: fine to medium grained, brown; root ~ 30mm. 0.7 Silty SAND: fine to medium grained, brown, red.	No	No
632.766	0.5 TOPSOIL Silty SAND: fine to coarse grained, dark brown; with rootlets. 0.75 Silty SAND trace gravel: fine to coarse grained, dark brown; gravel fine, sub rounded to sub angular.	No	No
633	0.17m TOPSOIL Silty SAND: fine grained, pale brown; rootlets < 5mm. 1.m Silty SAND trace gravel: fine to medium grained, brown; gravel fine sub angular; roots < 2mm.	No	No
633.394	0.15m TOPSOIL Silty SAND: fine to medium grained, brown; rootlets < 5mm. 0.5m Gravelly Clayey SAND: medium to coarse grained, red and grey; clay low plasticity clay; gravel fine sub angular.	No	No
633.678	0.5m TOPSOIL Silty SAND: fine to coarse grained, dark brown; with rootlets (<2mm).	No	No
633.778	0.5m TOPSOIL Clayey SILT trace sand: brown; clay low to medium plasticity; sand fine to medium grained.	No	No
633.875	0.5m TOPSOIL Silty CLAY trace sand: medium to high plasticity, dark grey; sand fine to coarse grained; with rootlets < 2 mm.	No	No
638.5	0.15m TOPSOIL Sandy CLAY: high plasticity, dark grey; sand fine to coarse grained; with rootlets (<2mm). 1.0m Sandy CLAY with sand: high plasticity, dark grey; sand fine to coarse grained; sand fine to coarse grained.	Yes	Yes
639.498	0.05m TOPSOIL Sandy CLAY: high plasticity, brown; sand fine to coarse grained. 0.6m Sandy CLAY: high plasticity, dark brown; sand fine to coarse grained	Potential	Yes
640.5	0.15mTOPSOIL Silty SAND: fine to medium grained, brown.	No	No

ID / chainage	Soil / Geological Description	FCWS Habitat	FCWS Mitigation Measures to be applied (Yes/No)
	2.5m Clayey SAND: fine to coarse grained, pale grey and orange; clay medium plasticity.		
641.413	0.2-TOPSOIL CLAY: high plasticity, dark brown; trace rootlets <2mm. 1.6m-Sandy CLAY: high plasticity, dark grey mottled pale grey; sand fine to coarse grained	No	No
643.115		Potential	Yes
643.73	0.2m-TOPSOIL Sandy CLAY: high plasticity, dark brown; sand fine to medium grained; trace rootlets <2mm. 1m-Sandy CLAY trace gravel: high plasticity, pale brown mottled orange; sand fine to medium grained; gravel fine to coarse.	No	No
644.205	0.15m-TOPSOIL Sandy Sandy CLAY: high plasticity, dark brown; sand fine to coarse grained; sand fine to coarse. 0.5m-FILL Gravelly Sandy CLAY: medium plasticity, brown mottled pale grey; sand fine to coarse grained; gravel fine to coarse.	No	No
647.072	TOPSOIL Sandy CLAY trace silt: low to medium plasticity, black; sand fine to medium grained; rootlets	Yes	Yes
648.068	TOPSOIL Silty Sandy CLAY: medium to high plasticity, dark brown; sand fine to coarse grained; silt low plasticity; with rootlets < 1mm. 0-0.2m: Cubical structure with 5-20 mm cube size fissures 1-2 mm	Yes	Yes
657.147	TOPSOIL Sandy SILT with gravel: brown; sand fine to coarse grained; gravel fine to coarse, rounded to subrounded; cobbles < 150mm with rootlets < 2mm	Potential	Yes
674.684	TOPSOIL Silty CLAY with sand: medium to high plasticity, brown; sand fine to medium grained	Yes	Yes
675.173	TOPSOIL Silty CLAY trace sand: medium to high plasticity, dark brown; silt .; sand fine to coarse grained	Yes	Yes
675.697	TOPSOIL CLAY trace sand: medium to high plasticity, brown; silt; sand fine to medium sand	Yes	Yes
676.207	TOPSOIL Silty CLAY trace sand: medium to high plasticity, dark brown; sand fine to coarse grained	Yes	Yes

ID / chainage	Soil / Geological Description	FCWS Habitat	FCWS Mitigation Measures to be applied (Yes/No)
676.667	TOPSOIL Sandy Silty CLAY: medium plasticity, brown; sand fine to medium grained	Yes	Yes
677.305	TOPSOIL Silty CLAY: medium plasticity, brown; trace rootlets	Yes	Yes
678.186	TOPSOIL Silty CLAY trace sand: medium to high plasticity, dark brown; sand fine to medium grained; trace rootlets	Yes	Yes
678.692	TOPSOIL Silty CLAY trace sand: medium plasticity, brown; sand fine grained	Yes	Yes
679.269	TOPSOIL Silty CLAY trace sand: medium to high plasticity, black; sand fine grained; rootlets < 2mm	Yes	Yes
686.849	TOPSOIL Silty SAND: fine to coarse grained, dark brown; with rootlets < 2mm	No	No
687.332	TOPSOIL Silty SAND trace gravel: fine to coarse grained, brown; gravel fine to medium rounded to sub rounded; with rootlets < 2mm	No	No
687.907	Silty SAND: fine to coarse grained, brown	No	No
688.056	TOPSOIL SAND: fine to coarse grained, red brown; with rootlets	No	No
688.177	TOPSOIL Sandy SILT trace gravel: low plasticity, brown; sand fine to coarse grained; gravel fine to medium rounded to sub rounded; with rootlets < 2mm	No	No
688.498	TOPSOIL Silty SAND: fine to coarse grained, dark brown; with rootlets < 2mm	No	No
688.999	TOPSOIL Silty SAND: fine to medium grained, brown; with rootlets < 2mm	No	No
689.29	TOPSOIL Clayey SILT with sand: low plasticity, black; clay low plasticity; sand fine to medium grained; rootlets < 2mm	No	No
689.498	TOPSOIL Silty SAND: fine to coarse grained, brown; silt low plasticity; with rootlets < 2mm	No	No
699.477	TOPSOIL Silty SAND with gravel: fine to coarse grained, pale brown white; gravel fine to coarse rounded to sub-rounded; some rootlets (<2mm)	No	No
716.036	TOPSOIL Silty CLAY trace sand: medium to high plasticity, dark brown; sand fine to coarse grained; trace rootlets < 2mm	Potential	Yes

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730.001	TOPSOIL CLAY with silt trace sand: high plasticity, dark brown; sand fine to coarse grained	Potential	Yes
730.452	TOPSOIL Silty SAND trace clay: fine to coarse grained, pale brown; rootlets < 2 mm	Yes	No
730.526	TOPSOIL Silty SAND: fine to medium grained, pale brown; trace rootlets < 2mm	Yes	No
732.5	TOPSOIL Silty CLAY trace sand: medium to high plasticity, dark brown; sand fine to coarse grained; trace rootlets < 1mm	No	No
732.996	TOPSOIL Silty SAND: fine to coarse grained, brown; with rootlets < 2mm	No	No
733.477	TOPSOIL Clayey SAND: fine to coarse grained, brown; clay low to medium plasticity; with rootlets < 2mm	No	No
734	TOPSOIL Silty SAND: fine to coarse grained, brown; trace rootlets < 2mm	No	No
734.522	TOPSOIL Sandy CLAY: medium plasticity, dark brown; sand fine to coarse grained	No	No
735.497	TOPSOIL Clayey SAND: fine to coarse grained, dark brown; clay low to medium plasticity; trace rootlets	No	No
736.498	TOPSOIL Silty SAND: fine to coarse grained, brown; trace rootlets < 2mm	No	No
737.031	TOPSOIL Clayey Silty SAND: fine to coarse grained, brown; clay low plasticity; trace rootlets	No	No
737.62	TOPSOIL Silty SAND: fine to coarse grained, dark brown; silt low plasticity; trace rootlets < 1mm	No	No
738.141	TOPSOIL Silty CLAY: high plasticity, dark brown; with rootlets < 1mm	No	No
743.497	TOPSOIL Silty SAND: fine to coarse grained, brown; trace rootlets	No	No
744.497	TOPSOIL Silty SAND: fine to coarse grained, brown; trace rootlets < 1mm	No	No
746.32	TOPSOIL Silty SAND: fine to coarse grained, brown.	No	No
747.131	TOPSOIL Silty SAND: fine to coarse grained, brown	No	No
749.252	TOPSOIL Sandy SILT: low plasticity, dark brown; sand fine grained.	No	No
749.338	TOPSOIL SAND trace silt: fine to coarse grained, red-orange and dark brown	No	No
749.862	TOPSOIL Silty SAND: fine to coarse grained, brown; with rootlets < 4mm.	No	No

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750.257	TOPSOIL Sandy SILT: low plasticity, brown; sand fine to coarse grained; with rootlets	No	No
750.516	TOPSOIL Sandy SILT: low plasticity, dark brown black; sand fine to coarse grained; rootlets < 2mm.	No	No
750.682	TOPSOIL Sandy SILT: low plasticity, brown; sand fine to medium grained; with roots and rootlets	No	No
752.149	TOPSOIL Clayey SAND with gravel: fine to coarse grained, pale brown; gravel fine to medium, rounded to sub rounded	No	No
753.11	TOPSOIL Silty SAND: fine to coarse grained, brown; with roots and rootlets < 3mm	No	No
754.499	TOPSOIL Sandy SILT: brown; sand fine to coarse grained; with rootlets < 3mm	No	No
755.505	TOPSOIL Sandy SILT: low plasticity, dark grey; sand fine to coarse grained.	No	No
756.228	TOPSOIL Silty SAND: fine to coarse grained, brown; with rootlets < 5mm	No	No
757.553	TOPSOIL Silty SAND: fine to medium grained, brown; trace rootlets < 1mm	No	No
758.13	TOPSOIL Silty SAND: fine to coarse grained, brown; trace rootlets	No	No
758.205	TOPSOIL Silty SAND with clay: fine to medium grained, red brown	No	No
758.605	TOPSOIL Sandy SILT: low plasticity, brown; sand fine to coarse grained; trace rootlets	No	No
759.211	TOPSOIL Gravelly SAND: fine to medium grained, red; gravel fine to coarse, sub round to sub angular.	No	No
759.471	TOPSOIL Silty SAND: fine to coarse grained, orange brown; trace rootlets < 2mm	No	No
760.001	TOPSOIL Sandy SILT: low plasticity, dark brown; sand fine to coarse grained; with rootlets < 5mm	No	No
760.215	TOPSOIL Silty CLAY with sand: low plasticity, brown; sand fine to coarse grained; rootlets	No	No
760.584	TOPSOIL Silty SAND: fine to coarse grained, brown; trace rootlets < 3mm	No	No
760.997	TOPSOIL Silty SAND: fine to coarse grained, brown; with rootlets < 3mm	No	No
762.705	TOPSOIL Silty SAND: fine to coarse grained, brown; with rootlets < 3mm	No	No

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763.839	TOPSOIL Silty SAND: fine to coarse grained, brown; trace rootlets and roots	No	No
764.678	TOPSOIL Silty SAND: fine to coarse grained, orange brown; trace rootlets < 5mm	No	No
765.175	TOPSOIL Silty SAND: fine to coarse grained, brown; trace rootlets.	No	No
766.32	TOPSOIL Silty SAND: fine to coarse grained, brown; rootlets < 2mm.	No	No
767.339	TOPSOIL Silty SAND: fine to coarse grained, brown; trace rootlets < 1mm	No	No
767.611	TOPSOIL Silty SAND: fine to coarse grained, brown; trace rootlets < 1mm	No	No
767.934	TOPSOIL SAND with silt: fine to coarse grained, pale brown	No	No
767.962	TOPSOIL Silty SAND: fine to coarse grained, pale brown; trace rootlets (< 2mm)	No	No
767.988	TOPSOIL Silty SAND: fine to coarse grained	No	No
768.015	TOPSOIL SAND with silt: fine to coarse grained, pale brown; trace rootlets	No	No
768.318	TOPSOIL Silty SAND: fine to coarse grained, brown; with rootlets	No	No
768.615	TOPSOIL Sandy SILT: low plasticity, dark brown; sand fine grained	No	No
768.722	TOPSOIL Gravelly SAND: fine to coarse grained, brown; gravel fine to medium, rounded to sub rounded; with roots and rootlets	No	No
769.132	TOPSOIL Silty SAND: fine to coarse grained, brown; trace rootlets < 3mm	No	No
769.146	TOPSOIL Silty SAND: fine to medium grained, brown mottled grey orange	No	No
769.181	TOPSOIL Silty SAND: fine grained, brown yellow	No	No
769.208	TOPSOIL SAND: fine to medium grained, brown.	No	No
769.23	TOPSOIL Silty SAND: fine to coarse grained, orange brown	No	No
769.256	TOPSOIL Silty SAND trace clay: fine to medium grained, brown; clay low plasticity	No	No
769.271	TOPSOIL Silty SAND: fine to coarse grained, brown; trace roots and rootlets. 0-0.8m: roots upto 80mm diameter obsered	No	No

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769.916	TOPSOIL Silty SAND: fine to coarse grained, brown; trace rootlets < 5mm	No	No
771.942	TOPSOIL Silty SAND: fine to coarse grained, brown; trace rootlets < 2mm	No	No
772.727	TOPSOIL Clayey SILT with sand: low plasticity, brown; clay low plasticity; sand fine to medium grained	No	No
773	TOPSOIL Sandy SILT: low plasticity, brown; sand fine to coarse grained; with root < 5mm.	No	No
773.373	TOPSOIL Sandy SILT trace clay: low plasticity, pale brown grey; sand fine grained	No	No
773.429	TOPSOIL Silty SAND: fine to medium grained, pale brown mottled white; with rootlets (<2mm)	No	No
774.502	TOPSOIL Silty SAND: fine to medium grained, dark brown; trace rootlets <2mm	No	No
774.756	TOPSOIL Silty SAND: fine to coarse grained, brown.	No	No
774.999	TOPSOIL Clayey Sandy SILT: low plasticity, brown mottled black; sand fine grained; clay low plasticity	No	No
775.279	TOPSOIL Silty SAND: fine to coarse grained, brown; with roots and rootlets	No	No
775.561	TOPSOIL Silty SAND trace clay: fine grained, brown red orange	No	No
775.795	TOPSOIL Silty SILT: brown; with roots and rootlets (<5mm)	No	No
776.008	TOPSOIL Clayey SAND: fine to medium grained, dark brown; clay low to medium plasticity; trace rootlets (<2mm)	No	No
776.26	TOPSOIL Silty SAND: fine to coarse grained, brown; trace rootlets and roots	No	No
776.511	TOPSOIL Sandy SILT: low plasticity, dark grey; sand fine grained; rootlets <2mm	No	No
776.998	Silty SAND: fine to coarse grained, brown; trace rootlets < 3mm	No	No
777.997	TOPSOIL Silty SAND: fine to coarse grained, brown; trace rootlets	No	No
779.14	TOPSOIL Silty SAND: fine to coarse grained, brown; with rootlets	No	No
779.637	TOPSOIL SAND trace silt: fine to coarse grained, pale grey	No	No
779.694	TOPSOIL SAND with silt: fine to coarse grained, grey pale brown	No	No

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779.767	TOPSOIL Silty SAND: fine to coarse grained, brown; with rootlets and roots	No	No
779.825	TOPSOIL SAND trace silt: fine to coarse grained, dark brown	No	No
779.853	TOPSOIL SAND trace silt: fine to coarse grained, brown	No	No
779.88	FILL Gravelly SAND with silt: fine to coarse grained, brown grey; gravel sub round, sub angular to angular, fine to coarse	No	No
779.902	TOPSOIL Silty SAND: fine to coarse grained, dark brown mottled grey orange	No	No
780.498	TOPSOIL Sandy SILT: low plasticity, brown; sand fine to coarse grained; with roots	No	No
780.673	TOPSOIL SAND trace gravel: fine to coarse grained, brown; gravel fine to medium, rounded to sub-rounded	No	No
781.035	TOPSOIL Gravelly Sandy SILT: brown; sand fine to coarse grained; gravel fine to medium, sub rounded to sub angular; with rootlets < 2mm	No	No
781.523	TOPSOIL SAND: fine to coarse grained, brown yellow	No	No
781.55	TOPSOIL SAND: fine to medium grained, pale brown	No	No
781.58	TOPSOIL Silty SAND: fine to coarse grained, dark brown; trace rootlets	No	No
781.607	TOPSOIL SAND: fine to medium grained, pale brown	No	No
781.729	TOPSOIL Sandy SILT: low plasticity, brown; sand fine to coarse grained; with rootlets and root	No	No
783.44	TOPSOIL Silty SAND trace gravel: fine to coarse grained, brown; gravel fine to medium, rounded to sub rounded; with rootlets < 3mm	No	No
783.652	TOPSOIL SAND trace silt: fine to medium grained, orange brown; trace rootlets	No	No
783.685	TOPSOIL Silty SAND trace gravel: fine to medium grained, brown; gravel fine to coarse, sub-rounded; rootlets (<2mm)	No	No
783.71	TOPSOIL SAND: fine grained, brown; organic matter	No	No
783.739	TOPSOIL Silty SAND trace gravel: fine to medium grained, dark brown; gravel round to sub round, fine; rootlets<1mm	No	No

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783.767	TOPSOIL Sandy SILT trace clay: low plasticity, dark brown; sand fine grained; clay low plasticity	No	No
783.84	TOPSOIL Silty SAND: fine to coarse grained, brown; with rootlets < 2mm	No	No
784	TOPSOIL SAND trace silt: fine to medium grained, brown	No	No
784.295	TOPSOIL Sandy SILT: low plasticity, brown; sand fine to coarse grained	No	No
785.001	TOPSOIL Clayey SILT with sand trace gravel: low plasticity, dark brown; clay low plasticity; sand fine grained; gravel fine to medium, sub round to sub angular	No	No
785.073	TOPSOIL Silty SAND: fine to coarse grained, brown; with rootlets < 5mm	No	No
785.52	TOPSOIL Silty SAND: fine to medium grained, brown; trace rootlets < 1mm	No	No
785.784	TOPSOIL Silty SAND trace gravel: fine to coarse grained, brown; gravel fine to medium, sub-rounded to sub-angular; trace rootlets (<2mm)	No	No
786.001	TOPSOIL Silty Clayey SAND: fine grained, brown; clay low plasticity; trace rootlets (<3mm)	No	No
786.468	TOPSOIL Silty SAND: fine to coarse grained, brown; trace rootlets < 2mm	No	No
786.808	TOPSOIL Silty SAND trace gravel: fine grained, dark brown mottled grey; gravel fine sub-rounded to sub-angular; rootlets (<2mm)	No	No
786.837	TOPSOIL Silty SAND: fine to medium grained, brown	No	No
786.865	TOPSOIL Clayey SAND: fine grained, dark brown; clay medium plasticity	No	No
786.889	TOPSOIL Silty SAND: fine to medium grained, dark brown yellow	No	No
786.954	TOPSOIL Silty SAND: fine to coarse grained, brown; trace roots and rootlets	No	No
787.53	TOPSOIL Clayey SAND: fine to coarse grained, brown; clay low to medium plasticity; trace roots and rootlets	No	No
788.109	TOPSOIL Silty SAND: fine to coarse grained, brown; trace rootlets and roots	No	No
788.279	TOPSOIL Silty SAND with gravel: fine grained, dark brown; gravel fine to coarse, sub round	No	No

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788.62	TOPSOIL Silty SAND: fine to coarse grained, brown; with roots and rootlets	No	No
788.965	TOPSOIL Sandy SILT: low plasticity, dark brown; sand fine grained; rootlets (<2mm)	No	No
789.131	TOPSOIL Silty SAND: fine to coarse grained, brown; trace rootlets	No	No
789.379	TOPSOIL Silty SAND: fine to medium grained, dark brown-grey; rootlets (<1mm).	No	No
789.43	TOPSOIL Silty SAND: fine to medium grained, brown; rootlets (<1mm)	No	No
789.48	TOPSOIL SAND trace silt: fine to medium grained, dark brown; rootlets (<1mm)	No	No
789.526	TOPSOIL Sandy SILT: low plasticity, dark brown; sand fine to coarse grained; rootlets (<2mm)	No	No
789.57	TOPSOIL Silty SAND: fine to medium grained, brown; rootlets (<2mm)	No	No
789.616	TOPSOIL Silty SAND: fine to coarse grained, brown; with roots and rootlets.	No	No
789.865	TOPSOIL Silty SAND: fine to coarse grained, brown; trace rootlets (<2mm)	No	No
789.997	TOPSOIL Silty SAND: fine to coarse grained, dark brown; trace rootlets	No	No
790.417	TOPSOIL Silty SAND: fine to coarse grained, brown; trace rootlets <2mm	No	No
790.65	TOPSOIL Silty SAND: fine to coarse grained, brown; trace rootlets	No	No
790.78	TOPSOIL Sandy SILT with gravel: low plasticity, grey brown; sand fine to coarse grained; gravel fine to medium, sub-rounded; trace rootlets <2mm	No	No
790.998	TOPSOIL Silty SAND: fine to coarse grained, brown; trace rootlets (<2mm)	No	No
791.286	TOPSOIL Silty SAND: fine to coarse grained, orange brown	No	No
791.499	TOPSOIL SAND: fine to coarse grained, brown; trace rootlets (<2mm)	No	No
791.727	TOPSOIL Silty SAND: fine to coarse grained, brown; trace roots and rootlets	No	No
793	TOPSOIL Silty SAND: fine to coarse grained, brown; with rootlets < 5mm	No	No
794	TOPSOIL Clayey SAND: fine to coarse grained, orange brown; clay low plasticity; trace rootlets	No	No

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795.997	TOPSOIL Clayey SAND: fine to coarse grained, orange brown; clay low plasticity; with rootlets < 2mm	No	No
796.405	TOPSOIL SAND: fine to coarse grained, pale grey brown; rootlets (<3mm)	No	No
796.464	TOPSOIL SAND trace silt: fine to medium grained, brown; roots <2mm	No	No
796.505	TOPSOIL SAND: fine to coarse grained, poorly graded, brown; rootlets (<5mm)	No	No
796.554	TOPSOIL SAND: fine to medium grained, brown; rootlets<5mm	No	No
796.597	TOPSOIL SAND trace silt: fine to coarse grained, poorly graded, pale brown; rootlets (<5mm)	No	No
797.573	TOPSOIL Silty SAND: fine to coarse grained, brown; with roots and rootlets	No	No
799.11	TOPSOIL Silty SAND: fine to coarse grained, brown; trace rootlets	No	No
800.443	TOPSOIL Sandy SILT: low plasticity, brown mottled black, yellow; sand fine grained; with rootlets (<2mm)	No	No
800.473	TOPSOIL SAND: fine to coarse grained, grey pale brown; roots and rootlets <5mm	No	No
800.51	TOPSOIL SAND: fine to coarse grained, pale to dark brown	No	No
800.537	TOPSOIL Silty SAND: fine to medium grained, yellow brown; trace rootlets <2mm	No	No
800.59	TOPSOIL SAND with silt: fine to coarse grained, brown; trace rootlets and root	No	No
801.102	TOPSOIL SAND with silt: fine to coarse grained, brown	No	No
802.038	TOPSOIL Silty SAND: fine to coarse grained, brown	No	No
803.947	TOPSOIL Silty SAND: fine to coarse grained, brown; trace rootlets	No	No
804.975	TOPSOIL Silty SAND: fine to coarse grained, brown	No	No
805.743	TOPSOIL Sandy Clayey SILT: low plasticity, orange brown; clay medium plasticity; sand fine to medium grained; rootlets >2mm	No	No
805.785	TOPSOIL Silty SAND: fine to coarse grained, pale brown	No	No
806	TOPSOIL Silty SAND: fine to coarse grained, dark brown; trace roots and rootlet	No	No

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806.497	TOPSOIL Silty SAND: fine to coarse grained, brown	No	No
807.677	TOPSOIL Silty SAND: fine to coarse grained, brown	No	No
808.698	TOPSOIL Silty SAND: fine to coarse grained, brown; treace roots and rootlets	No	No
809.115	TOPSOIL SAND: fine to medium grained, pale brown	No	No
809.17	TOPSOIL Sandy Clayey SILT: low plasticity, brown; clay low plasticity; sand fine to medium grained, sub-angular to angular; trace organic soil	No	No
810.999	TOPSOIL Sandy SILT: brown; sand fine to coarse grained.	No	No
811.704	TOPSOIL Sandy SILT: brown; sand fine to coarse grained; trace rootlets <2mm	No	No
812.722	TOPSOIL Sandy SILT: brown; sand fine to coarse grained	No	No
813.447	TOPSOIL Sandy SILT: brown; sand fine to coarse grained; trace rootlets	No	No
813.948	TOPSOIL Sandy Clayey SILT: brown; clay medium plasticity; sand fine to medium grained; trace rootlets	No	No
816.059	TOPSOIL Sandy Clayey SILT: brown; clay low to medium plasticity; sand fine to coarse grained	No	No
817.059	TOPSOIL Silty SAND: fine to medium grained, brown; roots and rootlets (<3mm)	No	No
817.086	TOPSOIL Silty SAND: fine to coarse grained, brown; with rootlets <3mm	No	No
817.259	TOPSOIL SAND: fine to medium grained, pale brown	No	No
817.288	TOPSOIL Silty SAND: fine to medium grained, brown; rootlets (<2mm)	No	No
817.322	TOPSOIL SAND trace silt: fine to coarse grained, poorly graded, dark brown; trace rootlets (<2mm)	No	No
817.376	TOPSOIL Silty SAND: fine grained, brown; rootlets <2mm	No	No
817.424	TOPSOIL Silty SAND: fine to medium grained, brown; rootlets (<2mm)	No	No
817.475	TOPSOIL Sandy SILT: dark brown; sand fine grained; rootlets <1mm	No	No
817.535	TOPSOIL SAND: fine to medium grained, pale brown; rootlets (<3mm)	No	No

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817.573	TOPSOIL SAND: fine to medium grained, pale brown; rootlets (<5mm)	No	No
817.601	TOPSOIL Sandy SILT: low plasticity, dark brown; sand fine grained; trace rootlets (<2mm)	No	No
817.65	TOPSOIL SAND: fine to medium grained, grey	No	No
817.686	TOPSOIL SAND trace silt: fine to medium grained, grey; with rootlets <5mm	No	No
817.717	TOPSOIL SAND: fine to medium grained, pale brown; rootlets (<3mm)	No	No
817.754	TOPSOIL SAND: fine to medium grained, pale brown; rootlets (<3mm)	No	No
817.788	TOPSOIL Silty SAND: fine to medium grained, brown; rootlets (<2mm)	No	No
817.82	TOPSOIL Silty SAND: fine to coarse grained, brown.	No	No
819.497	TOPSOIL Silty SAND: fine to coarse grained, brown; silt low plasticity. 0-0.6m: with rootlets	No	No
828.2	SAND: fine to medium grained, pale brown.	No	No
828.2	TOPSOIL: SAND with rootlets: fine to medium grained, pale orange brown, rootlets (<2mm)	No	No
828.3	SAND: fine to medium grained, pale brown	No	No
828.4	TOPSOIL Silty SAND trace rootlets: fine grained, pale brown	No	No
828.5	SAND: fine to medium grained, pale brown	No	No
828.6	Silty SAND: fine to medium grained, dark red, low plasticity silt	No	No
828.7	TOPSOIL: Silty SAND: fine to medium grained, pale brown, trace rootlets	No	No
828.8	TOPSOIL: Sandy silty CLAY: medium plasticity, grey brown, fine to medium grained sand, trace rootlets	No	No
828.9	TOPSOIL: Silty CLAY with sand: medium high plasticity, purple brown, fine to medium grained sand, trace rootlets	Yes	Yes
829	Silty CLAY with sand: medium plasticity, grey and brown, fine to medium grained sand (continued)	Yes	Yes
829.1	TOPSOIL: Sandy SILT: low plasticity, red-brown, fine grained sand	No	No

ID / chainage	Soil / Geological Description	FCWS Habitat	FCWS Mitigation Measures to be applied (Yes/No)
829.3	TOPSOIL: SAND: fine grained sand, brown to pale brown.	No	No
829.45	TOPSOIL: SAND: fine to coarse grained, dark-brown to brown, trace roots.	No	No
829.55	TOPSOIL: SAND trace silt and clay: fine to medium grained, black brown, low to medium plasticity clay, trace rootlets	No	No
829.85	TOPSOIL: Silty SAND: fine to medium grained, brown, with roots <10mm	No	No
830.35	0.05m TOPSOIL: SAND with clay: fine to medium grained, pale orange brown, low plasticity clay 0.05m - 0.5m SAND trace clay: fine to coarse grained pale orange, trace rootlets (<5mm)	No	No
830.5	0-0.05m TOPSOIL: SAND trace clay: fine to medium grained, orange-brown, low plasticity clay, trace rootlets (<2mm) 0.05m - 0.9m SAND trace clay and gravel: fine to medium grained, pale red-brown to orange, low plasticity clay, fine to medium grained sub-rounded to rounded gravel.	No	No
830.7	0-0.1m TOPSOIL: Clayey SAND trace gravel: fine to medium grained, pale orange, low plasticity clay, fine to medium sub-rounded gravel Clayey 0.1 - 0.4m SAND: fine grained, pale red to orange, low plasticity clay	No	No
831	0-0.1m TOPSOIL: SAND with clay: fine to medium grained, pale orange, low plasticity clay, trace rootlets (<2mm) 0.1 - 2.3m TOPSOIL: SAND with clay: fine to medium grained, pale orange, low plasticity clay, trace rootlets (<2mm)	No	No
831.5	0-0.15m TOPSOIL: SAND with clay: fine grained, pale grey to grey, low plasticity clay, with organics and rootlets (<2mm)	No	No
832	TOPSOIL: SAND with clay: fine to medium grained, pale brown to brown, low plasticity clay, with rootlets (<2mm)	No	No
833	TOPSOIL: SAND with clay, fine to medium grained, dark grey to dark brown, medium plasticity clay, with rootlets (<2mm)	No	No
834.1	TOPSOIL: Clayey SAND: orange brown, fine to medium grained, low-plasticity clay, with rootlets	No	No

ID / chainage	Soil / Geological Description	FCWS Habitat	FCWS Mitigation Measures to be applied (Yes/No)
834.45	TOPSOIL: Silty CLAY: low to medium plasticity, brown, trace rootlets <2mm	No	No
834.55	TOPSOIL: Silty CLAY: low to medium plasticity, brown, trace rootlets <2mm	No	No
834.75	TOPSOIL: Silty SAND: fine to medium grained, brown, with roots <10mm	No	No
834.85	TOPSOIL: Silty CLAY: low to medium plasticity, brown, trace rootlets <2mm	No	No
834.95	TOPSOIL: SAND: fine to medium grained, brown to pale brown, trace roots	No	No
835.05	TOPSOIL: Silty CLAY: low to medium plasticity, brown, trace rootlets <2mm	No	No
835.15	TOPSOIL: Silty SAND: fine grained, brown, trace rootlets (<2mm)	No	No
835.3	TOPSOIL: Sandy CLAY: low plasticity, dark brown, fine grained sand, trace rootlets (<2mm).	No	No
835.4	TOPSOIL: Silty CLAY trace roots: low plasticity, dark-brown	No	No
835.5	TOPSOIL: Sandy silty CLAY; medium plasticity, red brown, fine to coarse grained sand, trace rootlets	No	No
835.65	TOPSOIL: Silty CLAY trace roots: low plasticity, dark-brown	Potential	Yes
835.65	TOPSOIL: Sandy silty CLAY trace gravel: low to medium plasticity, black brown, fine to coarse grained sand, fine grained sub-angular to angular gravel, trace rootlets	Potential	Yes
840	0-0.1m TOPSOIL: Silty CLAY trace sand: medium-plasticity, brown to dark brown, fine grained sand, with rootlets. 0.1m - 0.45m CLAY with silt: high-plasticity, dark grey, trace rootlets, trace sub-vertical to vertical fissures (1-10mm aperture brown, fine grained sand, with rootlets.	Yes	Yes
840.6	TOPSOIL: Clayey SILT with roots: low plasticity, dark brown	Yes	Yes
841	0-0.1m TOPSOIL: CLAY with sand: medium-plasticity, dark brown, fine grained sand, with rootlets. 0.1m - 0.5m CLAY trace sand: high-plasticity, dark brown to dark grey, fine grained sand.	Yes	Yes

ID / chainage	Soil / Geological Description	FCWS Habitat	FCWS Mitigation Measures to be applied (Yes/No)
841.4	0-0.1m TOPSOIL: Clayey SAND: pale brown to brown, fine to medium grained, medium-plasticity clay, with rootlets. 0.1m - 1.2m Sandy CLAY: low to medium-plasticity, brown, fine to medium grained sand.	Yes	Yes
842.2	0-0.3m TOPSOIL: SAND with clay: brown and dark brown, fine to medium grained, low-plasticity clay, with rootlets. 0.3m - 1m CLAY with sand: medium-plasticity, pale brown and orange, fine grained sand	Potential	Yes
842.7	0-0.1m TOPSOIL: SAND trace clay: fine to medium grained, brown, low plasticity clay, trace rootlets 0.1 - 1.6m SAND trace clay: fine to medium grained, pale brown to orange brown, low plasticity clay	No	No
842.7	0.015m TOPSOIL: Silty CLAY trace sand: medium plasticity, dark brown, fine grained sand, trace rootlets (<2mm) 0.15m - 0.9m CLAY: high plasticity, dark grey, trace organics	Yes	Yes
843	0-0.2m TOPSOIL: CLAY with sand: high plasticity, brown, fine grained sand, trace rootlets (<2mm). 0.2 - 1.3m CLAY trace gravel: high plasticity, dark grey, fine sub-rounded gravel, trace rootlets (<2mm)	Yes	Yes
843.1	0-0.15m TOPSOIL: CLAY trace gravel: medium to high plasticity, grey to dark grey, fine sub-rounded gravel, trace rootlets (<2mm). 0.15-0.7m CLAY trace gravel: high plasticity, dark grey, fine sub-rounded gravel, with sub-vertical to vertical cracks (5-15mm) open, clean, trace calcareous concretions, trace organics	Yes	Yes
843.3	0-0.15m TOPSOIL: Silty SAND with clay: fine to medium grained, pale brown to brown, low plasticity fines, with rootlets (<2mm) 0.16m - 0.4m CLAY with sand: medium to high plasticity, brown to dark brown, fine grained sand, trace rootlets (<2mm)	Potential	Yes

ID / chainage	Soil / Geological Description	FCWS Habitat	FCWS Mitigation Measures to be applied (Yes/No)
843.5	0-0.2m TOPSOIL: CLAY trace sand: high plasticity, dark brown to dark grey, fine to coarse grained sand, trace rootlets (<2mm). 0.2 - 0.8m CLAY trace sand and gravel: high plasticity, brown to dark brown, fine to coarse grained sand, fine to medium sub-rounded gravel, with calcareous concretions and sub-vertical to vertical cracks (2-10mm) open, clean, randomly orientated	Yes	Yes
843.6	TOPSOIL: Silty CLAY medium plasticity, brown, trace rootlets <2mm	Yes	Yes
843.7	TOPSOIL: Silty CLAY with rootlets: high plasticity, black, rootlets (<2mm)	Yes	Yes
843.9	0-0.15m TOPSOIL: CLAY with silt: medium to high-plasticity, brown and dark brown, with rootlets. 0.15-0.6m CLAY trace silt: high-plasticity, dark brown, trace rootlets.	Yes	Yes
843.9	0-0.1m TOPSOIL: Silty CLAY with sand: medium-plasticity, dark brown, fine to medium grained sand, with rootlets. 0.1 - 1.75m CLAY with sand: medium-plasticity, brown to dark brown, fine grained sand	Yes	Yes
844.1	TOPSOIL: CLAY trace gravel: medium plasticity, dark brown, trace roots	Yes	Yes
844.2	TOPSOIL: Silty CLAY with rootlets: high plasticity, black, rootlets (<2mm)	Yes	Yes
844.3	TOPSOIL: Silty CLAY with rootlets: low to medium plasticity, grey, rootlets (<2mm)	Yes	Yes
844.4	TOPSOIL: Silty CLAY: medium to high plasticity, brown, trace rootlets (	Yes	Yes
846.6	TOPSOIL Silty CLAY with rootlets: high plasticity, black, rootlets (<2mm)	Yes	Yes
847.9	Silty CLAY: low to medium plasticity, black and grey, trace rootlets <2mm	Yes	Yes
848	TOPSOIL Silty CLAY with rootlets: high plasticity, black, rootlets (<2mm)	Yes	Yes
848.2	0-0.05m TOPSOIL: CLAY: high-plasticity, grey to dark grey, with rootlets. 0.05-1.2m CLAY trace gravel: high-plasticity, grey to dark grey, fine, sub-rounded gravel.	Yes	Yes
848.4	TOPSOIL: Silty CLAY: high plasticity, brown-black, with rootlets	Yes	Yes

ID / chainage	Soil / Geological Description	FCWS Habitat	FCWS Mitigation Measures to be applied (Yes/No)
848.9	0-0.1m TOPSOIL: CLAY with gravel: medium-plasticity, brown to dark brown, fine, sub-rounded gravel, trace rootlets. 0.1-1.2m CLAY: high-plasticity, dark grey to dark brown, trace rootlets	Yes	Yes
849.1	TOPSOIL: CLAY with gravel: medium plasticity, dark brown, fine to coarse grained angular to sub-angular gravel, trace rootlets	Yes	Yes
849.3	TOPSOIL: Silty CLAY: medium to high plasticity, black brown, with roots <5mm	Yes	Yes
849.7	TOPSOIL: CLAY trace gravel: high plasticity, dark brown, fine grained sub-rounded gravel, with roots	Yes	Yes
850	0-0.05m TOPSOIL: CLAY: medium to high-plasticity, brown to dark brown, with rootlet. 0.05-1.8m CLAY: high-plasticity, dark brown and grey, trace fine and medium gravel sized calcareous nodules	Yes	Yes
851	0-0.05m TOPSOIL: CLAY trace silt: high-plasticity, grey to dark grey, with rootlets. 0.05-0.9m CLAY: high-plasticity, grey to dark grey, trace rootlets.	Yes	Yes
851.5	0-0.1m TOPSOIL: CLAY trace gravel: high-plasticity, dark grey, fine to medium, sub-rounded to rounded gravel, with rootlets. 0.1-1.9m CLAY trace gravel: high-plasticity, dark grey, fine to medium, sub-rounded to rounded gravel.	Yes	Yes
852	0-0.15m TOPSOIL: CLAY: high-plasticity, dark grey, with rootlets. 0.15-1.4m CLAY trace gravel: high-plasticity, dark grey, fine to medium, sub-rounded to rounded gravel, trace sub vertical fissures (1-3mm aperture)	Yes	Yes
852.5	0-0.1m TOPSOIL: medium to high-plasticity, dark grey, with rootlets. 0.1-1.4m CLAY trace gravel: high-plasticity, dark grey, fine to medium, sub-rounded to rounded gravel, trace rootlets. From 0.20m: with sub-vertical to vertical fissures (1-3mm aperture)	Yes	Yes

ID / chainage	Soil / Geological Description	FCWS Habitat	FCWS Mitigation Measures to be applied (Yes/No)
852.9	0-0.15m CLAY: high plasticity, dark grey, trace organics 0.15m - 1.2m CLAY: high plasticity, dark grey, trace sub vertical to vertical cracks (1-3mm), open, randomly orientated.	Yes	Yes
547.5895	TOPSOIL: Silty CLAY trace sand: medium plasticity, dark brown, trace rootlets <2mm	No	No
547.5895	TOPSOIL: Silty CLAY trace sand: medium plasticity, grey brown, fine to coarse grained sand, with roots and rootlets <15mm	No	No
549.5	TOPSOIL: Gravelly CLAY trace sand: medium-plasticity, grey brown, fine to coarse sub-angular gravel, fine to coarse sand, trace rootlets <2mm diameter	No	No
551	TOPSOIL: Silty CLAY trace sand: medium plasticity, brown, fine to coarse grained sand, with roots and rootlets <5mm diameter	No	No
551.5	TOPSOIL: Sandy CLAY trace gravel: low to medium plasticity, red brown, fine to coarse grained sand, fine sub-angular to angular, trace rootlets (<2mm)	No	No
551.5	TOPSOIL: Sandy CLAY with gravel: medium to high plasticity, dark brown, fine to coarse grained sand, fine to medium sub-rounded to sub-angular gravel, trace roots (<1mm)	No	No
551.5	Sandy CLAY: medium plasticity clay, red brown, fine to medium grained sand.	No	No
551.5	TOPSOIL: Silty CLAY trace sand: medium plasticity, grey brown, with roots and rootlets <10mm	No	No
557.5	TOPSOIL: Silty SAND trace gravel: pale grey brown, fine grained sand, low-plasticity fines, fine to coarse sub-angular gravel, trace rootlets <2mm diamet	No	No
558.5	TOPSOIL: Silty SAND: pale brown, fine to coarse grained sand, low-plasticity fines, with rootlets <2mm diameter	No	No
559.5	Silty CLAY trace sand: medium-plasticity, grey brown, fine grained sand, trace rootlets <2mm diameter	No	No

ID / chainage	Soil / Geological Description	FCWS Habitat	FCWS Mitigation Measures to be applied (Yes/No)
559.5	TOPSOIL: Silty CLAY trace sand trace gravel: medium plasticity, grey brown, fine to coarse grained sand, fine sub-rounded gravel, with roots <10mm diameter	No	No
560.5	TOPSOIL: Silty CLAY trace sand: medium plasticity, dark brown, fine grained sand, with rootlets <2mm diameter	No	No
560.5	TOPSOIL: Clayey SILT trace sand: pale grey, low plasticity, fine to coarse grained sand, with roots <10mm diameter	No	No
561	TOPSOIL: Silty CLAY trace sand trace gravel: medium-plasticity, grey brown, fine to coarse grained sand, fine and medium sub-angular gravel, with roots and rootlets <10mm diameter	No	No
561.5	TOPSOIL: Silty CLAY: medium plasticity, brown and pale brown, with rootlets <2mm diameter	No	No
562	TOPSOIL: Clayey SILT trace sand: pale yellow brown, low plasticity, fine to medium grained sand, with rootlets (<2mm)	No	No
562	TOPSOIL: Silty CLAY trace sand: medium-plasticity, pale brown, fine grained sand, with roots <10mm diameter	No	No
562.5	TOPSOIL: Clayey SILT: pale grey, low to medium plasticity, with rootlets (<2mm)	No	No
562.5	FILL: Sandy silty CLAY with gravel: low to medium plasticity clay, light brown, fine to coarse grained sand, fine to coarse sub-angular to angular gravel.	No	No
563	TOPSOIL: Clayey SILT trace sand: medium plasticity silt, pale grey to dark grey, with rootlets, fine grained sand.	No	No
567	TOPSOIL: Sandy CLAY: medium plasticity, pale red brown, fine to medium grained sand, with rootlets	No	No
567	Sandy SILT: Low plasticity fines, brown to dark brown, fine grained sand, trace roots (<5mm)	No	No
568	TOPSOIL: Silty CLAY trace sand: medium plasticity, grey brown, fine to coarse grained sand, with roots and rootlets <10mm	No	No

ID / chainage	Soil / Geological Description	FCWS Habitat	FCWS Mitigation Measures to be applied (Yes/No)
568	TOPSOIL: Silty CLAY trace sand and gravel: medium plasticity, grey brown, fine to coarse grained sand, fine to coarse sub-angular gravel, with roots and rootlets <10m	No	No
569	TOPSOIL: Sandy CLAY trace gravel: medium to high plasticity clay, orange brown, fine to coarse grained sand, fine to coarse sub-rounded to sub-angular gravel, roots and rootlets (<1mm)	No	No
570.5	TOPSOIL: Silty CLAY: medium plasticity, grey brown, with roots and rootlets <10mm diameter	No	No
571.5	TOPSOIL: Silty CLAY: medium plasticity, grey brown, with roots and rootlets <10mm diameter	No	No
573.5	TOPSOIL: Silty CLAY trace sand: medium plasticity, grey brown, fine to coarse grained sand, with roots and rootlets <20mm	No	No
576	TOPSOIL: Silty CLAY trace sand and gravel: medium plasticity, grey brown, fine to coarse grained sand, fine to coarse sub-rounded gravel, with roots and rootlets <10	No	No
576.5	TOPSOIL: Silty CLAY trace sand and gravel: medium plasticity, grey brown, fine to coarse grained sand, fine to coarse sub-angular gravel, with roots and rootlets <10m	No	No
578.5	TOPSOIL: CLAY trace sand and gravel: low to medium plasticity, dark red brown, fine to coarse grained sand, fine to medium sub-rounded to sub-angular gravel, trace roots (>2mm).	No	No
578.5	FILL: Silty SAND with gravel: fine to coarse grained sand, brown orange, fine to coarse sub-rounded to sub-angular gravel,, trace rootlets (<2mm) [previous stockpile yard gravels on surface, FILL overlying residual soil]	No	No
579	Sandy CLAY with gravel: medium plasticity clay, brown red, fine to coarse grained sand, fine to medium sub-rounded to sub-angular gravel, trace roots (<1mm).	No	No
579.5	TOPSOIL: Silty CLAY: medium-plasticity, brown, with rootlets <2mm	No	No

ID / chainage	Soil / Geological Description	FCWS Habitat	FCWS Mitigation Measures to be applied (Yes/No)
581.5	TOPSOIL: Silty CLAY: medium-plasticity, brown, with roots and rootlets <10mm	No	No
583.5	TOPSOIL: Silty CLAY trace sand: medium-plasticity, grey brown, fine to coarse grained sand, with roots and rootlets <10mm	No	No
584.5	TOPSOIL: Sandy SILT trace gravel: medium to high plasticity, brown, fine to medium grained sand (trace coarse), fine to medium rounded to sub-rounded gravel, trace roots and rootlets (<10mm)	No	No
586	TOPSOIL: Silty CLAY trace sand trace gravel: medium plasticity, brown and grey brown, fine to coarse grained sand, fine sub-rounded gravel, with rootlets <2m	No	No
586.5	TOPSOIL: Silty CLAY trace sand and gravel: medium plasticity, brown, fine to coarse grained sand, fine sub-rounded gravel, with rootlets <2mm	No	No
587	TOPSOIL: SILT trace sand: low-plasticity, grey brown, fine to medium grained sand, with rootlets <2mm	No	No
592	TOPSOIL: Clayey SILT: pale red brown, medium plasticity, trace rootlets (<2mm).	No	No
595	TOPSOIL: Silty CLAY trace sand: medium-plasticity, grey brown, fine to coarse grained sand, with roots and rootlets <10mm	No	No
595.5	TOPSOIL: Silty CLAY: medium plasticity, dark brown, trace rootlets (<2mm).	No	No
597.5	TOPSOIL: Silty CLAY trace sand and gravel: medium-plasticity, grey brown and brown, fine to coarse grained sand, fine sub-angular gravel, with roots and rootlets <20m	No	No
599.5	TOPSOIL: Clayey SILT: pale red brown, low plasticity clay, with fine to medium grained sand, with rootlets (<2mm) and organic matter	No	No
601.5	TOPSOIL: Silty CLAY trace sand and gravel: medium-plasticity, grey brown, fine to coarse grained sand, fine to coarse sub-angular gravel, with roots and rootlets <10m	No	No

ID / chainage	Soil / Geological Description	FCWS Habitat	FCWS Mitigation Measures to be applied (Yes/No)
603	TOPSOIL: Sandy CLAY with gravel: low to medium plasticity, yellow red brown, fine to coarse grained sand, fine to medium sub-angular to angular gravel, trace roots <1mm.	No	No
604.5	TOPSOIL: Silty CLAY with sand trace gravel: low-plasticity, fine to coarse grained sand, grey brown, fine to coarse sub-angular gravel, with roots and rootlets <	No	No
610	TOPSOIL: Silty SAND: fine to coarse grained sand, yellow brown, low plasticity silt	No	No
615.5	TOPSOIL: Silty CLAY with sand: medium-plasticity, grey brown, fine to coarse grained sand, with roots and rootlets <15mm, trace Fe staining	No	No
620.5	TOPSOIL: SILT trace sand and gravel: yellow brown, fine to coarse grained sand, fine sub-angular gravel, with roots and rootlets <5mm	No	No
622.5	TOPSOIL: Silty CLAY trace sand: medium-plasticity, grey brown, fine to coarse grained sand, with roots and rootlets <10mm	No	No
623.5	Silty CLAY: low-plasticity, brown, with roots and rootlets <25mm	No	No
624.5	TOPSOIL: Gravelly SAND trace clay: fine to coarse grained sand, red dark brown, fine to coarse rounded to sub-rounded gravel, with roots and wood <5mm.	No	No
626	RESIDUAL SOIL: Sandy SILT: low plasticity fines, brown, fine to coarse grained sand, trace roots and rootlets (<5mm) [leaching between 0.15 - 0.25m)	No	No
628	TOPSOIL: Silty CLAY trace sand: medium-plasticity, grey brown, fine to coarse grained sand, with roots and rootlets <10mm	No	No
630.5	TOPSOIL: Silty CLAY with sand trace gravel: medium-plasticity, grey brown, fine to coarse grained sand, fine to coarse sub-rounded gravel, with roots and rootlets <10mm	No	No
632	TOPSOIL: Silty CLAY with sand trace gravel: low to medium-plasticity, grey brown, fine to coarse sand, fine sub-angular gravel, with roots and rootlets <2mm	No	No

ID / chainage	Soil / Geological Description	FCWS Habitat	FCWS Mitigation Measures to be applied (Yes/No)
633.5	TOPSOIL: SAND: fine to coarse grained sand, dark yellow brown, with rootlets, trace silt	No	No
633.5	Sandy SILT: yellow brown, fine to coarse grained sand, with roots and rootlets <20mm	No	No
633.5	Sandy GRAVEL trace silt: orange brown, fine to coarse sub-rounded and rounded gravel, fine to coarse grained sand	No	No
641.5	Sandy GRAVEL trace silt: orange brown, fine to coarse sub-rounded and rounded gravel, fine to coarse grained sand	No	No
643.5	TOPSOIL: Silty CLAY with sand trace gravel: low to medium-plasticity, grey brown, fine to coarse grained sand, fine and medium sub-rounded gravel, with roots and rootlets <5mm	No	No
647	TOPSOIL: Silty CLAY with sand trace gravel: low to medium-plasticity, grey brown, fine to coarse grained sand, fine and medium sub-rounded gravel, with roots and rootlets <5mm	No	No
648	TOPSOIL: Silty CLAY trace sand: medium to high-plasticity, fine and medium grained sand, with roots and rootlets <40mm, trace Fe staining	Potential	Yes
650.5	CLAY with sand: low to medium plasticity, dark brown, fine to medium grained sand, trace wood (<5mm) and roots (<2mm)	No	No
650.5	TOPSOIL: Silty CLAY trace sand trace gravel: medium-plasticity, grey brown, fine to coarse grained sand, fine sub-rounded gravel, with roots and rootlets <20mm	No	No
650.5	TOPSOIL: Silty CLAY trace sand trace gravel: medium-plasticity, grey brown, fine to coarse grained sand, fine sub-rounded gravel, with roots and rootlets <15mm	No	No
652.5	TOPSOIL: SAND with silt, fine grained sand, pale yellow brown, with low plasticity fines, with rootlets (<2mm)	No	No
653	TOPSOIL: Silty SAND trace gravel: yellow brown, fine to coarse grained sand, fine sub-angular gravel, with roots and rootlets <25mm	No	No

ID / chainage	Soil / Geological Description	FCWS Habitat	FCWS Mitigation Measures to be applied (Yes/No)
654.5	TOPSOIL: SAND trace silt: fine to coarse grained sand, yellow brown, trace low plasticity silt, with rootlets	No	No
654.5	COLLUVIAL SOIL: Silty SAND: fine to coarse grained sand, orange brown, low plasticity fines, trace roots (<30mm)	No	No
656.5	TOPSOIL: Silty CLAY: medium-plasticity, grey brown, with roots and rootlets <15mm	No	No
658	TOPSOIL: SILT trace sand: orange brown and grey brown, fine to coarse grained sand, with roots and rootlets <60mm	No	No
658.82	TOPSOIL: Silty CLAY trace sand: medium-plasticity, grey brown, fine to coarse grained sand, with roots and rootlets <60mm	No	No
660.5	TOPSOIL: Silty CLAY: medium-plasticity, orange brown, with roots and rootlets (<10mm)	No	No
662	TOPSOIL: Clayey SAND: fine to coarse grained sand, yellow brown to dark brown, low plasticity clay, with rootlets/roots (<2mm)	No	No
662.5	TOPSOIL: Clayey SAND: fine to coarse grained sand, yellow brown, low plasticity clay	No	No
670.5	TOPSOIL: Silty CLAY trace sand: low-plasticity, grey brown, fine to coarse grained sand, with roots and rootlets <5mm	No	No
672	TOPSOIL: Silty CLAY: medium-plasticity, grey brown, with roots and rootlets <15mm	No	No
673	TOPSOIL: SAND with clay trace gravel: fine to medium grained sand, dark brown, low to medium plasticity clay, fine sub-angular to angular gravel, with roots rootlets & wood >3mm.	No	No
677.5	TOPSOIL: Silty CLAY trace sand trace gravel: medium-plasticity, grey brown, fine to coarse grained sand, fine to coarse sub-rounded gravel, with roots and rootlets (<20mm)	No	No
679.5	TOPSOIL: Silty CLAY trace sand and gravel: medium-plasticity, grey brown, fine to coarse grained sand, fine to coarse sub-rounded gravel, with roots and rootlets (<20mm)	No	No

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685.5	TOPSOIL: Silty CLAY trace sand: medium-plasticity, grey brown and orange brown, fine to coarse grained sand, with roots and rootlets (<30mm)	No	No
686	Silty SAND: fine grained sand, brown, low plasticity fines, trace rootlets (<2mm)	No	No
686	TOPSOIL: Silty CLAY trace sand and gravel: medium-plasticity, orange brown and grey, fine to coarse grained sand, fine to coarse sub-angular gravel, with roots and rootlets (<30mm)	No	No
690	TOPSOIL: Silty SAND trace gravel: fine grained sand, grey brown, low plasticity fines, fine to medium sub-angular gravel	No	No
690.5	TOPSOIL: Sandy CLAY trace gravel: medium-plasticity, orange brown and grey brown, fine to coarse grained sand, fine to coarse sub-rounded and sub-angular gravel, with roots and rootlets (<15mm)	No	No
691.5	TOPSOIL: Silty SAND: fine to medium grained sand, dark brown, low plasticity silt.	No	No
693	Sandy CLAY trace gravel: medium to high plasticity clay, dark brown, fine to coarse grained sand, fine to coarse sub-rounded to sub angular gravel, trace roots (2mm), trace wood (<5mm)	Potential	Yes
694.5	TOPSOIL: Sandy CLAY: medium plasticity, dark brown, trace rootlets (<2mm)	No	No
694.5	TOPSOIL: silty CLAY trace sand: medium-plasticity, grey brown, fine to coarse grained sand, with roots and rootlets (<60mm)	No	No
695	TOPSOIL: Silty CLAY trace sand and gravel: medium-plasticity, grey brown, fine to coarse grained sand, fine sub-rounded gravel, with roots and rootlets (<15mm)	No	No
696.5	TOPSOIL: Silty CLAY trace sand: medium-plasticity, grey brown, fine to coarse grained sand, with roots and rootlets (<60mm)	No	No
698.5	TOPSOIL: Silty SAND: fine to coarse grained sand, orange brown, with roots and rootlets (<5mm)	No	No

ID / chainage	Soil / Geological Description	FCWS Habitat	FCWS Mitigation Measures to be applied (Yes/No)
699	TOPSOIL: SAND: fine to coarse grained sand, orange brown, with rootlets (<2mm)	No	No
700	TOPSOIL: Silty CLAY trace sand: medium-plasticity, grey brown, fine to coarse grained sand, with roots and rootlets (<60mm)	No	No
701	Silty SAND: fine to coarse sand, dark grey, low plasticity clay, with rootlets (<2mm)	No	No
701	COLLUVIAL SOIL: Silty SAND trace gravel: fine to coarse grained sand, grey brown to dark brown, fine rounded gravel, distinct laminations (to 0.03m)	No	No
708.5	TOPSOIL: Silty CLAY trace sand: medium-plasticity, orange brown and grey brown, fine to coarse grained sand, with roots and rootlets <10mm	No	No
709.5	TOPSOIL: Silty CLAY trace sand: medium-plasticity, orange brown and grey brown, fine to coarse grained sand, with roots and rootlets <10mm	No	No
710	TOPSOIL: Silty CLAY trace sand: medium-plasticity, orange brown, fine to coarse grained sand, with roots and rootlets <20mm	No	No
710.5	TOPSOIL: Silty CLAY trace sand: medium-plasticity, orange brown and grey brown, fine to coarse grained sand, with roots and rootlets <30mm	No	No
712.5	TOPSOIL: CLAY with sand: high plasticity, black, fine to medium grained sand, with roots/rootlets (<5mm)	Yes	Yes
713	TOPSOIL: Silty CLAY trace sand: medium-plasticity, orange brown and grey brown, fine to coarse grained sand, with roots and rootlets <10mm	No	No
713.5	TOPSOIL: Silty CLAY trace sand: medium-plasticity, orange brown and grey brown, fine to coarse grained sand, with roots and rootlets <10mm	No	No
714	TOPSOIL: Silty CLAY trace sand: medium-plasticity, orange brown, fine to coarse grained sand, with roots and rootlets <20mm	No	No
714.5	TOPSOIL: CLAY: high plasticity clay, black	Yes	Yes

ID / chainage	Soil / Geological Description	FCWS Habitat	FCWS Mitigation Measures to be applied (Yes/No)
714.5	TOPSOIL: Silty CLAY trace sand: medium-plasticity, orange brown, fine to coarse grained sand, with roots and rootlets <20mm	No	No
715	TOPSOIL: Silty SAND: fine grained sand, dark brown, low plasticity fines	No	No
715	TOPSOIL: Silty CLAY trace sand: medium-plasticity, grey brown, fine to coarse grained sand, with rootlets <2mm	No	No
715	TOPSOIL: Silty CLAY trace sand trace gravel: medium to high-plasticity, grey brown, fine to coarse grained sand, fine sub-rounded gravel, with rootlets <5mm	Yes	Yes
715.5	TOPSOIL: CLAY: high plasticity clay, black, trace roots/rootlets (<5mm)	Yes	Yes
715.5	TOPSOIL: Silty CLAY trace sand trace gravel: medium to high-plasticity, grey, fine to coarse grained sand, fine to coarse sub-angular gravel, with roots and rootlets <40mm	Yes	Yes
716	TOPSOIL: Sandy CLAY trace gravel: medium to high-plasticity, grey brown, fine to coarse grained sand, fine to coarse sub-angular gravel, with roots <15mm	Yes	Yes
716.5	TOPSOIL: CLAY: high plasticity clay, black, with roots/rootlets (<5mm)	Yes	Yes
716.5	TOPSOIL: Silty CLAY trace sand trace gravel: medium to high-plasticity, grey brown, fine to coarse grained sand, fine to coarse sub-rounded gravel, with rootlets <2mm	Yes	Yes
717	TOPSOIL: CLAY trace sand: high plasticity clay, black, with roots/rootlets (<2mm), fine grained sand	Yes	Yes
717	TOPSOIL: Silty CLAY with gravel and sand: medium to high-plasticity, grey brown, fine to coarse grained sand, fine to coarse sub-rounded gravel, with roots and rootlets <20mm	Yes	Yes
719.5	TOPSOIL: Silty CLAY: high-plasticity, grey brown and dark grey, with roots and rootlets (<15mm), trace surface cracking penetrating (200mm)	Yes	Yes
719.5	TOPSOIL: Silty CLAY: high-plasticity, grey brown and dark grey, with roots and rootlets (<20mm)	Yes	Yes

ID / chainage	Soil / Geological Description	FCWS Habitat	FCWS Mitigation Measures to be applied (Yes/No)
719.5	TOPSOIL: Silty CLAY: high-plasticity, grey brown and dark grey, with roots and rootlets (<20mm)	Yes	Yes
720	TOPSOIL: Silty CLAY trace sand: medium to high-plasticity, grey brown, fine to coarse grained sand, with roots and rootlets <15mm	Yes	Yes
720.5	TOPSOIL: Silty CLAY trace sand trace gravel: medium to high-plasticity, grey brown, fine to coarse grained sand, fine sub-rounded gravel, with roots and rootlets <15mm	Yes	Yes
721	TOPSOIL: Silty CLAY with sand trace gravel: medium to high-plasticity, grey brown, fine to coarse grained sand, fine to coarse sub-rounded gravel, with roots and rootlets <35mm	Yes	Yes
734.5	TOPSOIL: Sandy CLAY: low plasticity clay, pale yellow brown, fine to medium grained sand.	No	No
735	TOPSOIL: Silty CLAY trace sand trace gravel: medium-plasticity, orange brown, fine to coarse grained sand, fine and medium sub-rounded gravel, with roots and rootlets (<80mm)	No	No
745.3601	TOPSOIL: Silty CLAY: high-plasticity, grey brown and dark grey, with roots and rootlets (<15mm), trace surface cracking penetrating (200mm)	Yes	Yes
747.5	Silty SAND trace gravel: fine to coarse grained sand, pale brown to pink brown, high plasticity fines, fine rounded gravel, trace decomposed organics	No	No
748.5	TOPSOIL: Silty SAND trace gravel: yellow brown and grey brown, fine and medium grained sand, fine to coarse sub-angular gravel, with roots and rootlets (<90mm)	No	No
749.5	TOPSOIL: Silty SAND: yellow brown and grey brown, fine and medium grained sand, with roots and rootlets <80mm	No	No
750	TOPSOIL: Sandy CLAY: medium to high plasticity clay, pale yellow brown, fine to coarse grained sand	No	No
750	TOPSOIL: Silty CLAY trace sand and gravel: medium plasticity, grey brown, with roots and rootlets (<50mm)	No	No

ID / chainage	Soil / Geological Description	FCWS Habitat	FCWS Mitigation Measures to be applied (Yes/No)
751.5	TOPSOIL: Silty CLAY trace sand and gravel: medium-plasticity, grey brown, fine to coarse grained sand, fine sub-angular gravel, with roots and rootlets (<80mm)	No	No
753.5	TOPSOIL: Silty SAND trace gravel: yellow-brown and grey brown, fine to coarse grained sand, with roots and rootlets (<50mm)	No	No
755	TOPSOIL: Silty SAND trace gravel: yellow-brown and grey brown, fine to coarse grained sand, with roots and rootlets (<30mm)	No	No
757	TOPSOIL: Silty SAND trace gravel: orange-brown, fine to coarse grained sand, with roots and rootlets (<20mm)	No	No
759	Silty SAND trace gravel: grey brown, fine to coarse grained sand, fine to coarse sub-rounded and sub-angular gravel	No	No
762	TOPSOIL: Sandy CLAY trace gravel: medium-plasticity, grey brown, fine to coarse grained sand, fine to coarse sub-angular gravel, with roots and rootlets (<15mm)	No	No
764.5	Silty SAND: fine to coarse grained sand, orange brown	No	No
765.5	Silty SAND: orange brown and red brown, fine and medium grained sand, trace roots and rootlets (<10mm)	No	No
768	TOPSOIL: SAND with silt trace gravel: yellow brown, fine to coarse grained sand, fine to coarse sub-angular gravel, with roots and rootlets (<60mm)	No	No
769	TOPSOIL: SAND: fine to medium grained sand, pale grey brown	No	No
771	TOPSOIL: Silty SAND: yellow brown, fine and medium grained sand, with roots and rootlets (<50mm)	No	No
773.5	TOPSOIL: Silty SAND: yellow brown, fine and medium grained sand, with roots and rootlets (<50mm)	No	No
775	Sandy CLAY with gravel: medium plasticity clay, dark brown, fine to coarse grained sand, fine to medium sub-rounded to sub-angular gravel, with roots <4mm and wood (<8mm)	No	No

ID / chainage	Soil / Geological Description	FCWS Habitat	FCWS Mitigation Measures to be applied (Yes/No)
775.5	TOPSOIL: Silty CLAY trace sand: low-plasticity, grey brown, fine to coarse grained sand, with roots and rootlets (<80mm)	No	No
779	TOPSOIL: Silty SAND trace gravel: orange brown, fine to coarse grained sand, low plasticity fines, fine and medium sub-angular gravel, with roots and rootlets (<80mm)	No	No
780	Clayey SAND: fine to coarse grained sand, brown, low plasticity clay, with fine to coarse, sub-rounded to sub-angular gravel, trace roots (<5mm) trace wood (<5mm)	No	No
781	TOPSOIL: Sandy CLAY with gravel: low to medium plasticity, brown, fine to coarse grained sand, fine to medium sub-rounded to sub-angular gravel, trace roots (<2mm), trace wood (<5mm)	No	No
781.5	TOPSOIL: Sandy SILT: grey brown, fine to coarse grained sand, low-plasticity fines, trace rootlets (<2mm)	No	No
782.5	TOPSOIL: Sandy SILT trace gravel: grey brown, fine to coarse grained sand, low-plasticity fines, fine to coarse sub-angular gravel, with roots and rootlets (<50mm)	No	No
784	TOPSOIL: Silty CLAY trace sand trace gravel: medium-plasticity, orange brown, fine to coarse grained sand, fine to coarse sub-angular gravel, with roots and rootlets (<50mm)	No	No
784.5	TOPSOIL: Clayey SAND trace gravel: orange brown, fine to coarse grained, low-plasticity clay, fine to coarse sub-angular gravel	No	No
786	Silty SAND trace gravel: fine to coarse grained sand, brown to grey brown, high plasticity fines, fine rounded to sub-rounded gravel.	No	No
791.5	TOPSOIL: Silty SAND with gravel: fine to medium grained, grey brown, fine to medium sub-angular to angular gravel	No	No
791.5	Silty SAND trace gravel: yellow brown, fine to coarse grained sand, low-plasticity fines, fine to coarse sub-angular gravel, trace rootlets (<2mm)	No	No

ID / chainage	Soil / Geological Description	FCWS Habitat	FCWS Mitigation Measures to be applied (Yes/No)
795	Clayey SAND with gravel: fine to coarse grained sand, red brown, medium plasticity clay, fine to coarse rounded to sub-angular gravel, trace roots (<2mm), trace wood (<5mm)	No	No
795	Silty SAND trace gravel: yellow brown, fine to coarse grained sand, low-plasticity fines, fine to coarse sub-angular gravel, trace rootlets (<2mm)	No	No
796.5	TOPSOIL: Sandy SILT trace gravel: orange brown, fine to coarse grained sand, fine sub-rounded gravel, low plasticity fines, with roots and rootlets (<50mm)	No	No
798	TOPSOIL: Silty SAND trace gravel: orange brown, fine to coarse grained sand, fine to coarse sub-rounded gravel, with roots and rootlets (<15mm)	No	No
800.5	TOPSOIL: Silty SAND: yellow brown and grey brown, fine to coarse grained sand, with roots (<80mm)	No	No
803	TOPSOIL: Silty CLAY trace sand: medium-plasticity, grey brown, fine to coarse grained sand, with roots and rootlets (<45mm)	No	No
805.5	Silty SAND trace gravel: fine to medium gravel, grey brown mottled yellow, low plasticity fines, fine, rounded to sub-rounded gravel with roots and rootlets (	No	No
807	SAND with silt and gravel: fine to coarse grained, low plasticity fines, fine to coarse rounded to sub-rounded gravel, trace roots and rootlets (<2mm)	No	No
810.5	Silty SAND: fine to medium grained sand, grey brown, low plasticity silt, with roots and rootlets (<6mm)	No	No
811	TOPSOIL: Silty SAND: fine to coarse grained sand, grey brown mottled orange brown, trace roots and rootlets (	No	No
814.5	TOPSOIL: Silty CLAY: medium-plasticity, orange brown and red brown, with roots (<50mm)	No	No
815	Silty SAND: fine to medium grained sand, pale brown grey with roots and rootlets (<5mm)	No	No
815.5	TOPSOIL: Silty CLAY with sand: medium-plasticity, grey brown, fine to coarse grained sand, with roots and rootlets (<20mm)	No	No

ID / chainage	Soil / Geological Description	FCWS Habitat	FCWS Mitigation Measures to be applied (Yes/No)
817	TOPSOIL: Silty CLAY with sand: medium-plasticity, grey brown, fine to coarse grained sand, with roots and rootlets(<80mm)	No	No
818	Silty SAND: fine to coarse grained sand, brown grey, with roots and rootlets (	No	No
818.5	TOPSOIL: Silty CLAY trace sand trace gravel: medium-plasticity, grey brown, fine to coarse grained sand, fine to coarse sub-angular gravel, with roots and rootlets (	No	No
820.5	TOPSOIL: Sandy CLAY trace gravel: medium-plasticity, grey and orange brown, fine to coarse grained sand, fine to coarse sub-rounded gravel, with roots (<90mm	No	No
821.5	TOPSOIL: Silty CLAY trace sand: medium-plasticity, grey brown, fine to coarse grained sand, with roots and rootlets (<80mm	No	No
823.5	TOPSOIL: Silty SAND: fine to medium grained sand, pale grey brown, low plasticity silt, with roots (<10mm)	No	No
825	TOPSOIL: Silty SAND: fine to coarse grained sand, low plasticity fines, with roots and rootlets (<10mm)	No	No
827	Silty SAND: fine to coarse grained sand, brown to red brown, low plasticity fines, trace roots and rootlets (	No	No
828	TOPSOIL: Silty SAND: fine to medium grained sand, pale brown to brown, low plasticity, with roots and rootlets (<5mm)	No	No
828.5	SAND with silt: fine to medium grained sand, brown and yellow brown to orange brown, with roots and rootlets (<40mm)	No	No
829.5	Silty SAND: fine grained sand, yellow brown, low plasticity fines	No	No
830.0739	TOPSOIL: Silty SAND: fine to medium grained sand, pale brown, grey with roots and rootlets (	No	No
832.5	FILL: Silty SAND trace gravel: fine to coarse grained sand, brown to red, fine to coarse angular to sub-rounded gravel, bitumen fragments and sandstone	No	No

ID / chainage	Soil / Geological Description	FCWS Habitat	FCWS Mitigation Measures to be applied (Yes/No)
833.5	Sandy SILT: high plasticity fines, brown to grey, fine to medium grained sand, with rootlets, trace roots (<25mm)	No	No
835	TOPSOIL: Silty SAND: ine grained sand, dark brown, trace rootlets (<2mm)	No	No
836.5	TOPSOIL: Silty SAND trace gravel: fine to medium grained sand, brown, low plasticity fines, fine to medium sub-rounded gravel, trace rootlets (<2mm)	No	No
838.5	TOPSOIL: Silty SAND trace gravel: fine to medium grained sand, brown grey, medium to high plasiticy fines, fine to coarse roudned to sub-rounded gravel, roots and rootlets (<5mm).	No	No
839.5	m 2.30m 3.00m TOPSOIL: Silty CLAY with sand: medium plasticity, grey-dark brown, fine to medium grained sand, trace rootlets (<2mm)	No	No
840	Silty CLAY trace sand: high plasticity, brown dark grey, fine to coarse grained sand, trace roots and rootlets (	Yes	Yes
842	Silty SAND trace gravel: fine to coarse grained sand, brown and pale orange, fine rounded gravel, trace roots and rootlets (<10mm)	No	No
843	TOPSOIL: Silty SAND trace gravel: fine to medium grained sand, brown grey, medium to high plasiticy fines, fine to coarse roudned to sub-rounded gravel, roots and rootlets (<5mm).	No	No
844	TOPSOIL: Clayey SAND: fine to medium grained, yellow brown, medium plasticity with rootlets, trace fine to medium, sub-angular gravel	No	No
844.5	CLAY with sand: medium to high plasticity, black to dark brown, fine to coarse grained sand, trace roots and rootlets (<5mm)	Yes	Yes
845	TOPSOIL: SAND: fine to coarse grained sand, dark brown, with low plasticity clay, with rootlets (<2mm)	No	No
845.5	CLAY: medium to high plasticity, black, carbonate precipitates (<1mm)	Yes	Yes
846.5	Silty CLAY: high plasticity, dark brown, trace rootlets (<2mm)	Yes	Yes
848	TOPSOIL: Clayey SAND: fine to medium grained, dark grey, medium plasticity clay, with rootlets (<2mm)	Potential	Yes

ID / chainage	Soil / Geological Description	FCWS Habitat	FCWS Mitigation Measures to be applied (Yes/No)
848	Sandy CLAY with gravel: medium plasticity clay, dark brown, fine to coarse grained sand, fine to coarse sub-rounded to sub-angular gravel, trace roots (<1mm)	No	No
848	FILL: Sandy GRAVEL with clay: grey brown, fine to coarse sub-angular and sub-rounded gravel, fine to coarse grained sand, low-plasticity clay	No	No
849	TOPSOIL: Silty CLAY: medium to high-plasticity, grey brown and grey, with roots and rootlets (<30mm)	Yes	Yes
849.5	TOPSOIL: Clayey sandy SILT: high plasticity fines, dark grey brown, fine to medium grained sand, with roots and rootlets (<5mm)	Yes	Yes
850.5	Silty sandy CLAY: high plasticity, grey, fine to medium grained sand, with roots and rootlets (	Yes	Yes

Borrow pits

ID	Soil / Geological Description	FCWS Habitat	FCWS Mitigation Measures to be applied (Yes/No)
BP01			
TP2238	TOPSOIL: Silty SAND trace gravel: grey brown, fine coarse grained sand, fine sub-angular gravel	No	No
TP2239	TOPSOIL: Silty SAND trace gravel: grey brown, fine to coarse grained sand, fine sub-angular grave	No	No
TP2240	TOPSOIL: Clayey SAND trace gravel: orange brown, fine to coarse grained sand, low-plasticity clay, fine to coarse sub-angular gravel, with rootlets <2m	No	No
TP2241	TOPSOIL: Sandy CLAY with gravel: medium-plasticity, grey brown and red brown, fine to coarse grained sand, fine to coarse angular gravel	No	No
BH2093	Clayey SILT; orange-brown; medium plasticity fines. Extremely weathered material recovered as; Sandy GRAVEL with silt; orange-brown; fine to medium subrounded gravel; fine to coarse sand; low to medium plasticity fines; extremely weathered granite low to medium plasticity fine	No	No

ID	Soil / Geological Description	FCWS Habitat	FCWS Mitigation Measures to be applied (Yes/No)
BH2093A	Gravelly SAND with silt; brown; fine to coarse sand; low to medium plasticity fine	No	No
BP02			
TP2166	TOPSOIL: Silty CLAY with gravel trace sand: medium-plasticity, orange brown, fine to coarse grained sand, fine to coarse angular and sub-angular gravel, with rootlets <2mm	No	No
TP2167	TOPSOIL: Silty CLAY with gravel trace sand: medium-plasticity, orange brown, fine to coarse grained sand, fine to coarse angular and sub-angular gravel, with rootlets <2mm	No	No
TP2168	TOPSOIL: Silty CLAY trace sand trace gravel: medium-plasticity, orange brown, fine grained sand, fine sub-rounded gravel, with rootlets <2mm	No	No
TP2169	TOPSOIL: Silty CLAY with gravel: medium-plasticity, orange brown, fine to coarse sub-angular gravel, with roots and rootlets <20mm	No	No
BH2070	TOPSOIL: Clayey SILT: medium plasticity fines, red-brown, with rootlets <2mm	No	No
BP03			
TP2174	METASILTSTONE: Highly weathered, medium strength: recovered as sandy GRAVEL with cobbles: pale grey, fine to coarse angular gravel, fine to coarse grained sand	No	No
TP2175	Sandy GRAVEL with clay: grey brown, fine to coarse sub-angular gravel, fine to coarse grained sand, medium plasticity clay, with roots and rootlets <3	No	No
TP2176	GRAVEL and SAND: grey brown, fine to coarse angular gravel, fine to coarse grained sand, with roots (<30mm)	No	No
TP2177	Clayey GRAVEL with sand: grey brown, fine to coarse angular gravel, fine to coarse grained sand, predominantly coarse grained, low-plasticity clay, with roots (<40mm)	No	No
BH2072	Sandy GRAVEL with silt: fine to coarse, sub-angular to angular, pale grey to pale red, fine to coarse grained sand, with low plasticity fines	No	No

ID	Soil / Geological Description	FCWS Habitat	FCWS Mitigation Measures to be applied (Yes/No)
BP26			
TP2226	TOPSOIL: Sandy SILT: grey brown, low-plasticity fines, fine to coarse grained sand, with roots and rootlets (<20mm)	No	No
TP2227	TOPSOIL: Silty SAND: grey brown, fine and medium grained sand, low-plasticity silt, with rootlets (<2mm)	No	No
TP2228	TOPSOIL: Silty SAND: grey brown, low-plasticity fines, fine to coarse grained sand, with rootlets (<2mm)	No	No
TP2229	TOPSOIL: Sandy SILT: grey brown, low-plasticity fines, fine to coarse grained sand, with roots and rootlets (<30mm)	No	No
BH2089	SAND with silt; orange brown, fine to medium sand, low plasticity fines	No	No

Appendix F – Consultation record

BCS Comments - dated 2 August 2023 (reference : DOC23/654676)			
Report Reference	BCS Comment	BCS Recommendation	Responses
2.2.1 – Low Impact Works	This section states that “ <i>additional information about the extents of FCWS habitat will be collected during LIW</i> ”. This section should be explicit about what this information is, and this could be addressed by summarising the information provided in section 7.1 (ie. soil investigations undertaken as part of the LIW GI scope will further verify soil types). This section should also confirm when the information will be incorporated into the FCWS MP.	1. Include explicit detail in section 2.2.1 about what additional information will be collected to inform FCWS habitat, and when it will be incorporated into an amended plan.	Detail added to Section 2.2.1, noting updates to the plan are addressed in Section 6.2.8.
Table 2.1 – LIW Management Action Matrix	All LIW in the table will partially implement the “ <i>Survey Prescription – Before & During activities</i> ” control measure. An explanation should be provided describing which part of the measure will be implemented, and how that will be determined (this could include a link to Table B.1 in Appendix B). It is not clear why the “ <i>Habitat Enhancement and Refuge Replacement</i> ” control measure in Table 2.1 is being only partially implemented, or is not applicable, for most of the LIWs. It is not clear why this control measure is not applicable for the utilities investigations and relocation, installation of mitigation measures, and property acquisition work.	2. Explain why all LIW will only be partially implementing the “ <i>Survey Prescription – Before & During activities</i> ” control measure in Table 2.1. 3. Explain why the “ <i>Habitat Enhancement and Refuge Replacement</i> ” control measure is only being partially implemented for the relevant LIW in Table 2.1. 4. Explain why the “ <i>Habitat Enhancement and Refuge Replacement</i> ” control measure is not applicable to utilities investigations and relocation, installation of mitigation measures, and property acquisition work.	2 - Table refined 3 - Table refined 4 - Table refined
2.5 – FCWS at N2NS Separable Portion 1	The following sentence should be reinstated from the North Star to Border FCWS management plan (NS2B FCWS MP) into the first paragraph of this plan: “ <i>248 specimens were recorded in 2021-22 at Bellata and Croppa Creek at the Inland Rail Narrabri to North Star SP1 project</i> ”.	5. Reinstate the requested sentence into the first paragraph of section 2.5 relating to the number of FCWS finds on N2NS SP1.	Sentence added.
Table 3.1 – CoA Compliance Information	Table 3.1 outlines where in the FCWS MP the relevant conditions of approval have been addressed. Recommendations 6-9 list additional references that should be added to Table 3.1 to make it more comprehensive.	6. Add ‘section 5.6.5’ and ‘section 7.1’ to the ‘Where addressed’ column in Table 3.1 for condition E31(a). 7. Review whether the ‘Where addressed’ column in Table 3.1 for condition E31(d) should refer to ‘Appendix E’ or ‘Appendix D’. 8. Add ‘section 6.3’ to the ‘Where addressed’ column in Table 3.1 for condition E31(e). 9. Add ‘section 9’ to the ‘Where addressed’ column in Table 3.1 for condition E31(f).	References added.
4 – Project Roles and Responsibilities	The roles of ‘Environmental Advisor’ and ‘Environmental Representative’ are described in the list of roles associated with the FCWS MP in Table 4.1, but they are not included in the list at the beginning of this section. This requires updating.	10. Include “Environmental Advisor” and “Environmental Representative” in the list at the beginning of section 4.	Roles added to list.
6 – Five-clawed Worm Skink management	The survey methodology referred to in 2(c) has already been described in section 6.2.3, and this methodology is applicable to LIW activities as described in Table B.1 in Appendix B. Therefore, this should be reworded to “ <i>Adequately survey areas prior to and during various LIW and construction activities</i> ”. Similarly, the data collection requirements for any captured FCWS are already described. Therefore 2(d) should be reworded to “ <i>Collect required data for all captured FCWS</i> ”.	11. Reword 2(c) in section 6 to “ <i>Adequately survey areas prior to and during various LIW and construction activities</i> ”. Amend relevant references in the FCWS MP including section 6.2.3. 12. Reword 2(d) in section 6 to “ <i>Collect required data for all captured FCWS</i> ”.	11 - Updates made and amended throughout. 12 - 2(d) reworded as recommended.
6.2.3 – Develop a survey prescription	The last sentence in the first dot point of section 5.2.3 of the NS2B FCWS management plan should be reinstated into section 6.2.3: “ <i>In most cases, this should not last for more than a few hours and accord with the Ecologists Animal Care and Ethics Approval Permit.</i> ” The fifth dot point in section 6.2.3 should be amended to state “ <i>...a minimum waiting period of two days/nights and up to 5 days/nights is proposed before topsoil stripping can commence....</i> ” to be consistent with section 5.2.3 of the NS2B FCWS MP. The purpose of the waiting period is to create a hostile environment for the FCWS, reducing the potential for harm from the LIW. Given that topsoil stripping is listed as an impact in the works to be undertaken in the ‘minor access tracks’ and ‘treatment of contaminated sites’ LIW activities in Table B.1 of Appendix B, the additional measures to be implemented during soil disturbance activities as outlined in the NS2B plan (page 41 and 42 of that plan) should be added to the N2N FCWS plan.	13. Reinstate “ <i>In most cases, this should not last for more than a few hours and accord with the Ecologists Animal Care and Ethics Approval Permit</i> ” into the first dot point of section 6.2.3. 14. Amend the relevant sentence in the fifth dot point of section 6.2.3 to “ <i>...a minimum waiting period of two days/nights and up to 5 days/nights is proposed before topsoil stripping can commence....</i> ”. 15. Add the dot points from pages 41 and 42 in the NS2B FCWS MP describing additional measures to be implemented during soil disturbance activities to section 6.2.3 of the N2N FCWS MP.	13 - Added ‘In most cases, this should not last for more than a few hours’. However, ACA CPB JV do not have a Ecologists Animal Care and Ethics Approval Permit process, nor is it a requirement if CoAs E30+E31 - as such this has not been added. 14 - Sentence amended 15 - Dot points added
6.2.4 – Data collection requirements for captured FCWS	Section 6.2.4 states how FCWS specimens should be stored. The Australian Museum has provided the following preferred storage method: • each specimen placed in an individual ziplocked bag with location (including lat/long) and date of collection written on the bag in permanent marker • stored frozen • provided to the Australian Museum in a maximum of six months	16. Update the FCWS specimen collection and storage method in section 6.2.4 with the preferred method issued by the Australian Museum.	Storage method updated as advised, and rederences to ethanol storage removed as per meeting on 1/8/23.
6.2.5 – Identifying and establishing FCWS relocation sites	Section 6.2.5 should clarify how many relocation sites will be established for LIW. An explanation should be provided that additional sites will be established if more than 10 adults and 5 sub-adult skinks per 100m ² are relocated. Given the large distances between individual FCWS habitat areas, consideration should be given to where relocation sites will be established (eg. north and south of the Pilliga forest). The last dot point should be amended as the example provided is not appropriate; the Pilliga Forest is not FCWS habitat according to Appendix A.	17. Clarify in section 6.2.5 how many relocation sites will be established for LIWs. 18. Include an explanation in section 6.2.5 that additional sites will be established if more than 10 adults and 5 sub-adult skinks per 100m ² are relocated. 19. Provide more relevant sites as potential FCWS relocation areas, given the Pilliga Forest is not FCWS habitat.	17 - It is intended to establish one relocation site per LIW location (where FCWS are identified). Where LIW sites are in close proximity to one another relocation sites may be combined, however they would still comply with the density limit referred to in comment 18. 18 - Additional bullet point added. 19 - Bullet point amended.
6.2.6 – Habitat enhancement and refuge replacement	The reference in section 6.2.6 to Figure 5.6 should probably be Figure 6.3. It is not clear when the Phase 1 habitat enhancement will occur, but the text in section 6.2.6 implies it could be during construction works. The text should clarify that these works will occur during the LIW phase if any FCWS are relocated.	20. Review the reference to Figure 5.6 in section 6.2.6 to ensure it is correct. 21. Clarify in section 6.2.6 that habitat enhancement will occur during the LIW phase if any FCWS are relocated.	20 - Reference amended, this has now become Figure 6-4. 21 - Wording changed from ‘Construction’ to ‘Works’.

6.2.7 – FCWS Encounter Procedure	The FCWS MP identifies and refers to FCWS habitat and potential FCWS habitat (particularly in Appendix A). To remove confusion, an explicit statement should be included in section 6.2.7 stating that for the purposes of the plan, both FCWS habitat and potential FCWS habitat are collectively considered to be 'FCWS Habitat Areas'. The second paragraph states that FCWS identified outside of a FCWS Habitat Area will have management strategies applied for 500 metres either side of the capture. It is noted that the agreed distance for the NS2B MP was 200 metres, and 200 metres is stated elsewhere in section 6.2.7. Confirmation should be provided on which distance is being utilised for this plan.	22. Confirm in section 6.2.7 that both 'FCWS habitat' and 'potential FCWS habitat' are considered to be FCWS Habitat Areas for the purposes of the plan. 23. Confirm whether management strategies will be adopted for 200 metres or 500 metres either side of a FCWS find outside of a FCWS Habitat Area.	22 - Sentence clarifying potential FCWS habitat to be treated as per 'FCWS habitat' has been added. 23 - Management strategies to be adopted for 200m either side of FCWS find, consistent with NS2B plan.
Table 6.1 – FCWS Management SMART Performance Indicators	Administrative updates should be made to Table 6.1 as per Recommendations 24-25.	24. Change 'NS2B' to 'N2N' in the 'Achievable' column for item 3 in Table 6.1. 25. Change 'Construction activity' to 'LIW' in the 'Time-bound' column for item 6 in Table 6.1.	Both recommendations adopted.
9.1.3 – Quarterly updates	Section 9.1.3 states reports on FCWS encounters will be provided to BCS quarterly. This contrasts with the monthly requirement in the NS2B FCWS MP. BCS suggests that quarterly reporting is acceptable, however if FCWS are encountered, the reporting should default to a monthly frequency.	26. Update section 9.1.3 to confirm that FCWS encounters can be reported to BCS and DCCCEW quarterly, however the frequency should change to monthly if a FCWS is encountered. Update wording in Step 4 of the FCWS Encounter Procedure (Appendix D) also.	To avoid any confusion between monthly or quarterly, changed reporting to monthly from the first encounter. Appendix D also updated.
Table B.1 – LIW Activity Risk Matrix, Appendix B	Impact 2 and 7 (ground penetration in geotechnical investigations; ground penetration in installation of mitigation measures) can have mitigation measures 2.7 and 2.8 deleted as these are duplications of mitigation measures 2.4 and 2.5. It is not clear why the slashing mitigation measures for geotechnical investigations (item 1) are slightly different to those for slashing in installation of mitigation measures (item 6). To avoid confusion and duplication, it is recommended listing the more comprehensive set of mitigation measures for slashing impacts. The ground penetration (fence posts) impact for item 12 appears to have mitigation measures related to slashing. The mitigation measures should be reviewed to ensure they are appropriate for this impact.	27. Delete mitigation measures 2.7 and 2.8 in items 2 and 7 (ground penetration in geotechnical investigations; ground penetration in installation of mitigation measures) in Table B.1. 28. Ensure the mitigation measures for slashing impacts are consistent for items 1 and 6 in Table B.1. List the more comprehensive set of mitigation measures for both items.	Measures deleted. Measures made consistent (with item 6).
Table C.1 – FCWS Register, Appendix C	Insert 'SVL (mm)' and 'chainage' as additional items to be recorded, for consistency with the NS2B FCWS register.	29. Review the mitigation measures for item 12 (ground penetration, fence posts) in Table B.1.	Item 12 measures amended.
Appendix D – FCWS Encounter Procedure	As per the comments relating to Recommendation 22, it is recommended that for clarity a statement is made under 'Scope' that for the purposes of the encounter procedure, 'FCWS Habitat Areas' includes both FCWS habitat and potential FCWS habitat delineated by the red and orange polygons in Appendix A. Several administrative edits to the encounter procedure are required, as described in Recommendations 32-40.	30. Include 'SVL (mm)' and 'chainage' as additional items in the FCWS Register in Table C.1. 31. Include clarification under 'Scope' in the FCWS Encounter Procedure that 'FCWS Habitat Areas' includes both FCWS habitat and potential FCWS habitat delineated by the red and orange polygons in Appendix A. 32. Delete the duplication of "Series of measurements including" in Step 1 under the 'Procedure' heading. 33. Under Step 2 for FCWS encounters outside of FCWS Habitat Areas, relocation of individuals is in accordance with section 6.2.5, not section 5.2.5. 34. Under Step 2 for FCWS encounters outside of FCWS Habitat Areas, amend the relevant dot point to "Data capture of the individual and habitat data outlined in Appendix C of the FCWS MP and as outlined in Step 1 for encounters inside of identified FCWS Habitat Areas". 35. Include the following dot point from the NS2B MP in the relevant list in Step 2: "Any refinements to FCWS Habitat Area would be addressed as per Section 7.1 of the FCWS MP; with the Environmental Representative considering the Project Ecologist advice. Where the Environmental Representative endorses the Project Ecologist advice the FCWS Habitat Area shall be updated, and the Environmental Representative will include any endorsements of refined FCWS Habitat Areas in monthly reports to DPE." 36. Delete the Step 1 heading from the top of page 59 of 110. 37. Include the following information from the NS2B MP in Step 4: "IR will endeavour, notwithstanding practical and safety considerations, to collect all samples and send to the relevant independent, publicly owned museum (Australian Museum as a priority). IR will fund further analysis by the museum where the Australian Museum is willing and able to accept the specimens". 38. Delete the Step 1 heading from the top of Page 60 of 110. 39. Delete 'potential' from the first line in the Figure 1 flow chart so that it reads "FCWS encountered within FCWS Habitat Area". 40. Insert the Figure 2 flow chart from the approved NS2B MP into the FCWS Encounter Protocol for encounters outside of FCWS Habitat Areas.	Items added. Recommendation addressed. All recommendations addressed.
	As per Recommendation 23, for FCWS encounters outside of identified FCWS Habitat Areas, confirm whether stop work applies to 500 metres either side of the find, or 200 metres either side of the find. BCS supports the simplification of the details in the encounter procedure where appropriate, but details regarding the specific photographs should be included. The following information should be included in Step 2, as per the NS2B FCWS MP: "Where practicable, validation photos from on top, side, below and close-up photos of forelimbs and hindlimbs", and "Photographs of the site (general location, vegetation, habitat features where the individual/s was discovered) shall be captured for each individual discovered. Photographs to be taken by the Project Ecologist or Fauna Spotter as part of the recording the data of the find."	41. Under Step 2 for FCWS encounters outside of FCWS Habitat Areas, confirm the distance either side of the FCWS encounter that the stop work requirement applies to. 42. Include the two requirements of photos (of the FCWS, and the encounter site) in Step 2 as described in the NS2B FCWS MP.	Confirmed at 200m. Both requirements added.

	Step 2 has omitted information on the health/condition assessment that must occur on any encountered FCWS. The following information should be inserted in Step 2, as per the NS2B FCWS MP: <i>"The Project Ecologist or Fauna Spotter Catcher will assess the condition of the Five-clawed Worm skink and determine whether it can be relocated.</i> <i>• If relocated, the details of the relocation site and condition will be recorded</i> <i>• If injured and unable to be relocated, the Project Ecologist or Fauna Spotter Catcher would determine requirement for euthanasia, rest period or veterinary treatment</i> <i>• If deceased, specimens shall be preserved and sent to the Australian Museum at regular intervals where reasonable and practical (as outlined in section 6.2.4 of the approved FCWS Management Plan).</i> <i>Report on the finding; alive and relocated or deceased must be in accordance with Section 4 of this procedure (Section 9.1 of the FCWS Management Plan).</i> <i>NOTE: Five-clawed Worm skink finds will be immediately notified to ARTC and ARTC will notify the relevant regulatory agencies as per Section 9.1 of the FCWS Management Plan, and Section 4 below."</i>	43. Include a description of the health/condition assessment that must occur on any encountered FCWS in Step 2, as described in the NS2B FCWS MP.	Recommendation addressed - noting text on reporting and notifying is already within the last bullet of Section 2.
	Step 3 states that works can recommence in areas outside of FCWS Habitat Areas following written advice for FCWS determined to be transiting. FCWS are unlikely to be 'transiting', and any encounters should have the location deemed to be habitat. The dot point and sub points relating to encounters outside of FCWS Habitat Areas should be deleted from Step 3 and replaced with the wording from the NS2B FCWS MP: <i>"Where a Five-clawed Worm Skink is encountered prior to or during all project activities, outside identified FCWS Habitat Areas – works may recommence following advice from the ACA CPB JV Environmental Team that all information and processes required in Step 2 has been completed."</i>	44. Delete the dot point in Step 3 relating to FCWS encounters outside of FCWS Habitat Areas and replace with the relevant information from the NS2B FCWS MP.	Recommendation addressed.
	The Figure 1 flow chart should replicate the approved procedure in the NS2B MP. As a result, the following step should be inserted immediately under the 'stop all works' step: <i>"Notify ACA CPB JV Supervisor and ACA CPB JV Environmental Team. ACA CPB JV Environmental Team to notify ARTC and contact Ecologist and/or Fauna Spotter Catcher".</i> Also insert the following step: <i>"The Ecologist or Fauna Spotter Catcher will confirm the species, and record details and photos of the find and capture location as per the FCWS MP (Appendix C). NOTE: Where a FCWS is found in identified FCWS Habitat Areas during relevant Low Impact Works activities listed in Appendix B, the ACA CPB JV Supervisor/Environmental Team can record and relocate the find".</i> Note – the reference to 'Supervisor' in the steps above should be replaced with the appropriate ACA CPB JV position.	45. Insert additional steps into the Figure 1 flow chart that have been omitted compared to the approved NS2B FCWS MP flow chart for encounters inside FCWS Habitat Areas.	Additional steps added.