Report

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Surat Gas Project – PL194 Wari Djunben - Kogan North Joint Venture (KNJV) and Tong Park

Significant Residual Impacts to Prescribed Environmental Matters
P-EA-100464322

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1. Introduction

Arrow Energy Pty Ltd (Arrow) is planning to construct Wari Djunben – Kogan North Joint Venture (KNJV) and Tong Park, hereafter the Project, as a component of our Surat Gas Project (SGP). The Project comprises a series of well pads, coal seam gas pipelines, water pipelines, and infrastructure required to transfer coal seam gas and produced water. The key details for the current report are outlined in Table 1.

Table 1 Project details

	Key project details
Project Name	Wari Djunben – KNJV and Tong Park (SGP PL194)
Petroleum Lease	PL194
Environmental Authority	P-EA-100464322
Appropriately Qualified Person and Contact	Dr Paul Finn, Principal Ecologist paul.finn@arrowenergy.com.au

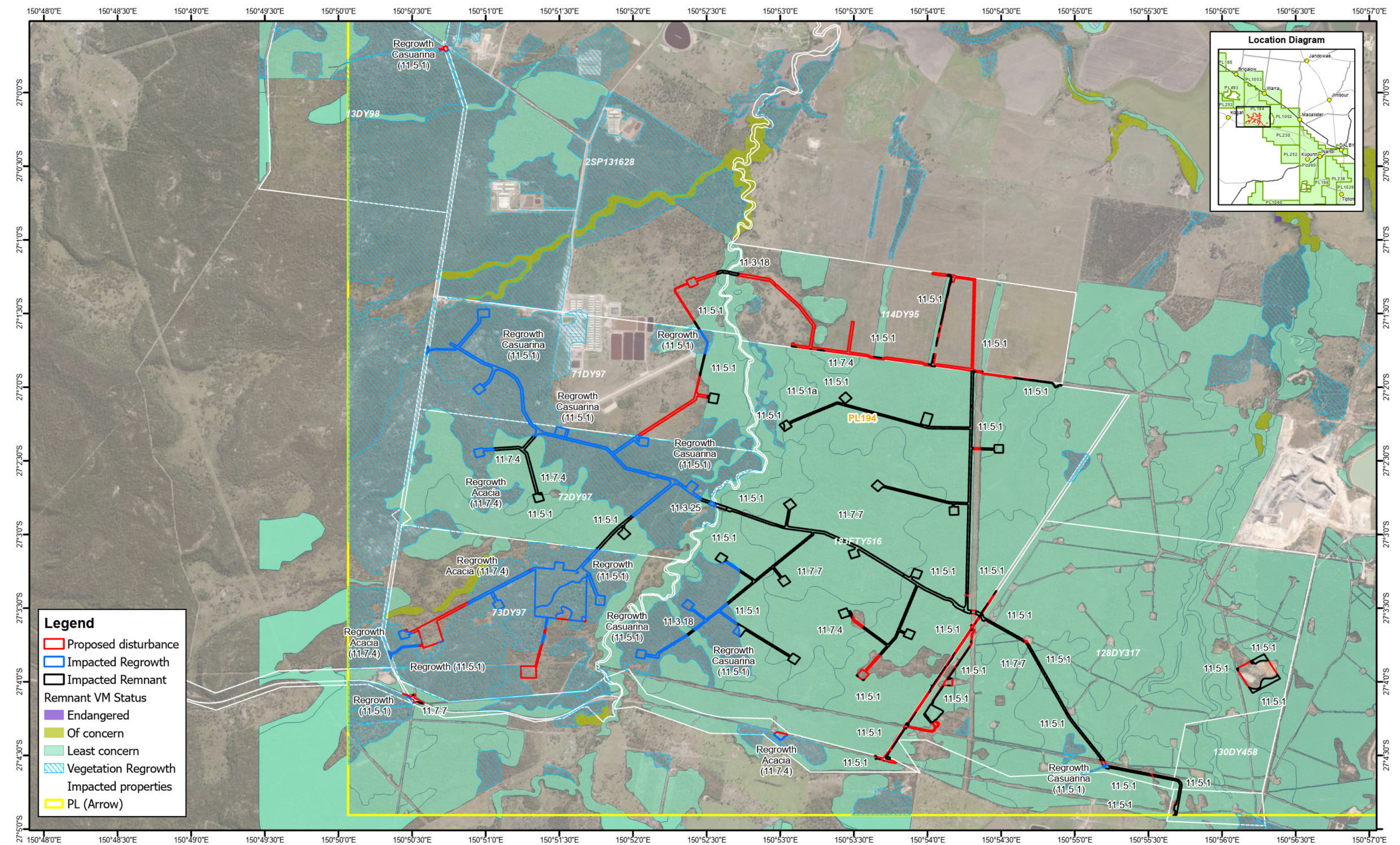
The relevant Environmental Authority (EA) for the Project is the Petroleum Lease (PL) 194 P-EA-100464322 (dated 24 July 2023). This report addresses relevant EA conditions for the above-mentioned project, specifically 'Biodiversity 14, by providing a significant residual impact (SRI) assessment on Prescribed Environmental Matters (PEMs) to determine the Project's environmental offset requirements under the *Environmental Offsets Act 2014* (EO Act).

The Project is located on PL194 in the Surat Basin, approximately 40 km north west of Dalby, in the Southern Brigalow Belt Bioregion. The Project has a total disturbance footprint of approximately 200 ha and is comprised of a mixture of previously cleared land, and remnant and regrowth vegetation. The total footprint located in cleared land (not remnant or regrowth) is 55 ha, and the total area of remnant and regrowth vegetation to be cleared is approximately 145 ha (Table 2).

Table 2 Ground-verified vegetation communities and cleared areas impacted by the Project

Vegetation Community	Area (ha)
11.3.14	0.554
11.3.18	0.408
11.3.25	0.303
11.5.1	51.494
11.7.4	5.971
11.7.7	13.453
Regrowth (11.5.1)	49.609
Regrowth (11.7.4)	23.172
Cleared land (not remnant or regrowth)	54.595
Total	**199.559**

The location of the Project is shown in Figure 1.



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Scale @ A3: 1:42,000

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Coordinate System: GDA2020

Figure 1
KNJV Initial Development / Tong Park location along with that of ground-verified remnant and regrowth vegetation

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1.1 Purpose

There are several requirements of EA P-EA-100464322 relating to managing environmental offsets for the proposed activities to be undertaken. This report has been prepared to address the EA Condition Biodiversity 14:

> Prior to the commencement of each stage, a report completed by an appropriately qualified person, that includes an analysis of the following must be provided to the administering authority:
>
> > (a) for the forthcoming stage—the estimated significant residual impacts to each prescribed environmental matter; and
> >
> > (b) for the previous stage, if applicable—the actual significant residual impacts to each prescribed environmental matter, to date.

1.2 Surat Gas Project development

Stage 1 of the Surat Gas Project (SGP) PL194 development may comprise several sub-stages, the first of these is detailed below:

- PL194 Stage 1a: Wari Djunben - Kogan North Joint Venture (KNJV) and Tong Park – this SRI assessment.

Further scope may be added into this Stage 1 development or may be included in subsequent stages. No impacts beyond those included in the PL194 EA PEMs table will be included in Stage 1 (unless authorised via our existing *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) approval).

The Project scope includes a total of 39 wells with 2 of these being a combination of vertical and deviated wells. Each single well pad will be approximately 1 ha in size and the 2 multi-well pads will be up to 1.5 ha in size. The development also includes gas and water flowlines (gathering), which connect wells and compression facilities and is designed to enable correct operating pressures to be maintained. Proposed activities include the construction and operation of the following:

- Well leases and equipment laydown areas;
- Drilling, completions and workovers;
- Gas and water gathering flowlines/pipelines;
- Access tracks and borrow pits;
- Temporary camps, sewage treatment plants and irrigation;
- Communication systems; and
- Other incidental petroleum activities.

1.3 Surat Gas Project EPBC Act Approval

The areas of the SGP that are located on Arrow PL tenements, of which the Project is a part, is approved under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) approval (EPBC 2010/5343). As an approval condition, the SGP Stage 1 Offset Strategy (EPBC Act Offset Strategy) was prepared by Arrow to address the offset requirements for Stage 1 of the

SGP. The strategy was approved by The Department of Agriculture, Water and the Environment (DAWE) on 7 July 2019. This EPBC Act approval for Stage 1 incorporates impacts from infrastructure located on PL194 and as such addresses the offsets from any impacts to all relevant Matters of National Environmental Significance (MNES) on this tenure.

1.3.1 MNES and MSES where they are substantially the same matter

On many occasions, remnant and high-value regrowth vegetation listed as PEMs or Matters of State Environmental Significance (MSES) also provide habitat for species listed as MNES. In these situations, the Commonwealth approval takes precedence and therefore offsets provided for MNES also satisfy the requirement for State offsets.

All MNES species identified in the Project (Table 3), are the same matters as those assessed and approved under the EPBC Act SGP Stage 1 Offset Strategy.

While the EPBC Act Offset Strategy area shown in the figures (5.4a and 5.5a) does not cover the entire area of the SGP Stage 1 project footprint, the offset strategy foresees that infrastructure location changes would occur and addresses this with the inclusion of the following statement in section 1:

> '*Figure 1.1 shows an indicative location of the Stage 1 activities in relation to the project. The locations shown are subject to change as the project progresses through the detailed design phase and Arrow shareholder and joint venture partner approval processes*.'

The offset strategy also notes that whilst specific locations may change, the principles and strategies for securing offsets that are presented in the EPBC Act Stage 1 Offset Strategy will be implemented.

2. Methods

2.1 Identifying Prescribed Environmental Matters (PEMs)

The Project's disturbance footprint (Figure 1) has been used to identify areas that may have a SRI on PEMs as defined in the EO Act. The presence/absence of each matter was determined in accordance with the 'Method for mapping Matters of State environmental significance For the State Planning Policy 2017' (DES, 2020).

Detailed and seasonal ecological assessments (Ecosmart Ecology and 3D Environmental, 2017, 2018, 2019 and 2021) were undertaken for the SGP area (covering on-tenure PLs and off-tenure PPLs) which provided ground-verified data on PEMs that are regulated vegetation, protected wildlife habitat, connectivity areas, wetlands and watercourses. These assessments included:

- detailed, seasonal terrestrial ecological surveys across the full range of habitats occurring within the SGP on- and off-tenure areas.
- validating and refining regional ecosystem (RE) mapping for the project, including wetlands of high ecological significance.
- refining mapping for 'core habitat known' and 'core habitat possible' for all relevant species identified under the EPBC Act and *Nature Conservation Act 1992* (NC Act).

This ground-verified data was used to cross-check Queensland Government supplied mapping data on PEMs that are regulated vegetation, protected wildlife habitat, connectivity areas, wetlands and watercourses. Government supplied mapping data was relied upon to identify the following PEMs:

- Wetlands and watercourses.
- Designated precincts in strategic environmental areas.
- Protected areas.
- Highly protected zones of State marine parks.
- Fish habitat areas.
- Waterway providing for fish passage.
- Marine plants.
- Legally secured offset areas.

Additionally, the Queensland Government's Landscape Fragmentation and Connectivity (LFC) Tool was used to assess potential impacts on connectivity areas using ground-verified data.

Conclusions drawn on the presence/absence of PEMs are provided in Section 3.1 (Table 3), which covers all PEMs listed in the PL194 EA and whether or not they were identified within impact areas. Further detailed assessment is provided in Sections 3.2.1 to 3.2.5 for those PEMs that were identified from mapping sources and potentially impacted by the Project.

2.2 Significant residual impact (SRI) assessment

The following documents have been used to assess whether the Project will have a SRI on PEMs:

- *Environmental Offset Act 2014* (EO Act).
- *Environmental Offset Regulation 2014* (EO Regulation).
- Queensland Environmental Offsets Policy (Version 1.13) (DES, 2022).
- Queensland Environmental Offsets Policy Significant Residual Impact Guideline (DEHP, 2014).
- Method for mapping Matters of state environmental significance (DES, 2020).
- Surat Gas Project Threatened Species Mapping Rules Review (Ecosmart Ecology and 3D Environmental, 2023).

3. Results

3.1 Assessment of PEMs for Potential SRI

As per Biodiversity 14 (a), Table 3 includes an analysis and estimated significant residual impact against all of the PEMs listed in the PL194 EA. It identifies five (5) PEMs that warrant further assessment to establish the presence or absence of a significant residual impact. These being:

1) Regulated vegetation – Regional ecosystems (not within an urban area) within the defined distance from the defining banks of a relevant watercourse.
2) Regulated vegetation – Essential habitat (not in an urban area) for critically endangered, endangered or vulnerable wildlife.
3) Protected wildlife habitat – Habitat for animals that are critically endangered, endangered or vulnerable wildlife.

4) Protected wildlife habitat – Habitat for an animal that is special least concern.
5) Waterway providing for fish passage – Fish passage (not in an urban area).

Table 3 Analysis of all Prescribed Environmental Matters (PEMs) and whether or not they have the potential for a Significant Residual Impact (SRI)

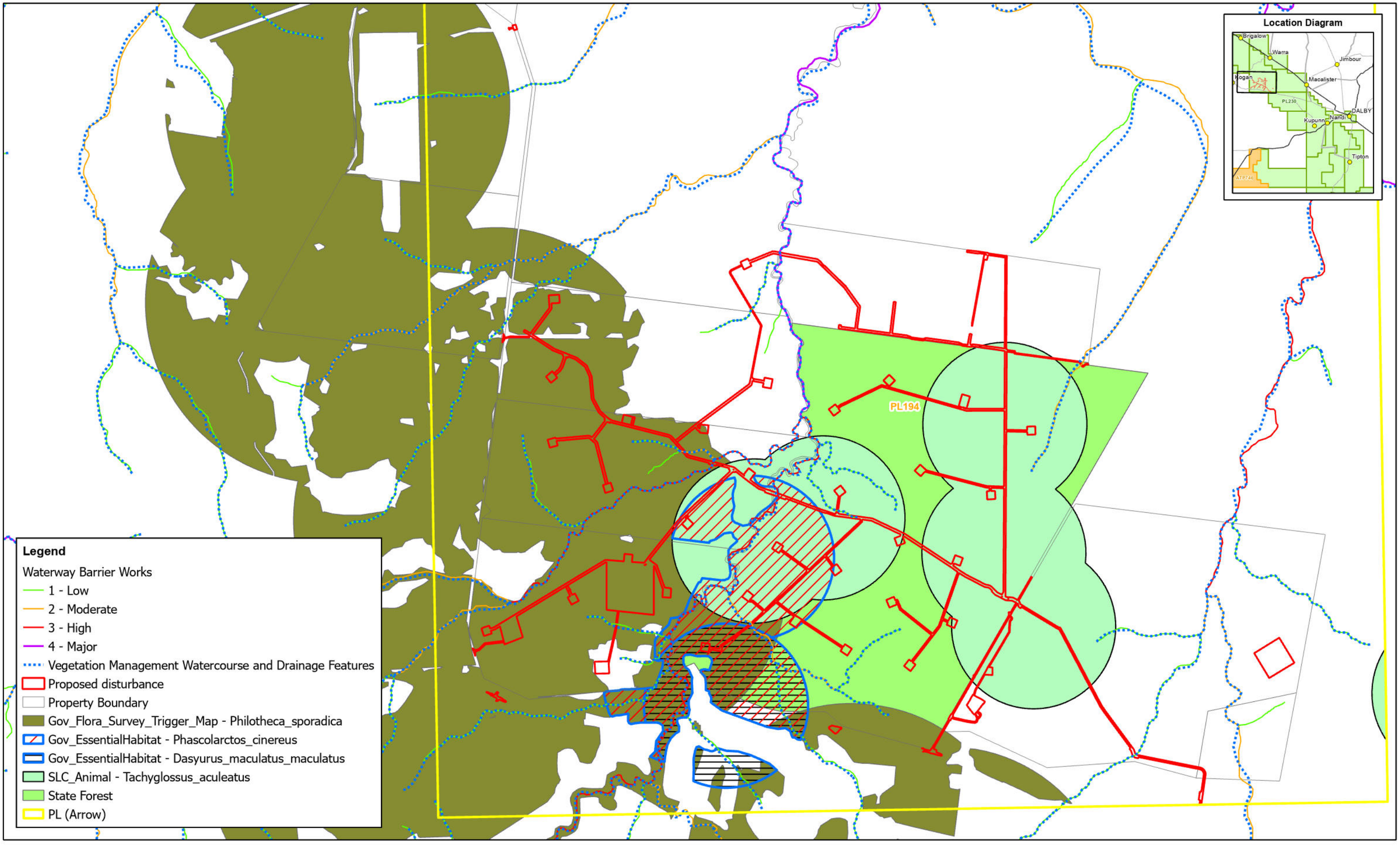
Item	PEM	Potential for SRI	Comments
1	Regulated vegetation – Endangered regional ecosystems.	No	Not located within the disturbance footprint of the current project.
2	Regulated vegetation – Of concern regional ecosystems.	No	Not located within the disturbance footprint of the current project.
3	Regulated vegetation – Regional ecosystems (not within an urban area) that intersect a wetland on the vegetation management wetlands map.	No	Not located within the disturbance footprint of the current project.
4	Regulated vegetation – Regional ecosystems (not within an urban area) within the defined distance from the defining banks of a relevant watercourse on the vegetation management watercourse map.	Yes	Includes a total of 1.739 ha of ground-verified remnant vegetation across the following REs: • 0.501 ha of RE 11.3.14. • 0.256 ha of RE 11.3.18. • 0.408 ha of RE 11.5.1. • 0.574 ha of RE 11.7.7. This vegetation is associated with Braemar Creek and several other unnamed tributaries with stream orders of 1, 2, 3 and 4 (Figure 2). Refer to Section 3.2.1 for the SRI assessment of this PEM. All vegetation polygons are co-located with protected wildlife habitat (Table 4, Figure 2).
5	Regulated vegetation – Essential habitat (not in an urban area) for critically endangered, endangered or vulnerable wildlife.	Yes	A total of 17.981 ha of Queensland Government mapped essential habitat will be impacted for the project (Table 4, Figure 2): • 15.309 ha for the Koala (*Phascolarctos cinereus*), listed as Endangered under both the NC Act and EPBC Act. • 2.312 ha for the Spotted-tailed Quoll (southern subspecies) (*Dasyurus maculatus maculatus*), listed as Endangered under both the NC Act and EPBC Act (overlaps entirely with the Koala essential habitat listed above). • 2.672 ha for the Kogan waxflower (*Philotheca sporadica*), listed as Near Threatened under the NC Act and not listed under the EPBC Act. As a Near

Item	PEM	Potential for SRI	Comments
			Threatened species, it is not relevant to this PEM. Refer to Section 3.2.2 for the SRI assessment of this PEM. All vegetation polygons are co-located with protected wildlife habitat (Table 4, Figure 2).
6	Connectivity Areas – Connectivity area that is a regional ecosystem (not in urban area)	No	Not located within the disturbance footprint of the current project.
7	Wetlands and watercourses – A wetland in a wetland protection area	No	Not located within the disturbance footprint of the current project.
8	Wetlands and watercourses – A wetland of high ecological significance shown on the map of Queensland wetland environmental values	No	Not located within the disturbance footprint of the current project.
9	Wetlands and watercourses – A wetland or watercourse in high ecological value waters	No	Not located within the disturbance footprint of the current project.
10	Designated precinct in a strategic environmental area	No	Not located within the disturbance footprint of the current project.
11	Protected wildlife habitat – An area that is shown as a high risk area on the flora survey trigger map and that contains plants that are critically endangered, endangered or vulnerable.	No	Not located within the disturbance footprint of the current project. A total of 89.383 ha of the project footprint is within an area shown as a high risk area on the flora survey trigger map (Table 4, Figure 2). However, the focal species is Kogan waxflower (*Philotheca sporadica*), listed as Near Threatened under the NC Act and therefore not a PEM under the EO Act. A protected plants flora survey, report and clearing permit or exemption application will be undertaken prior to clearing. However, as it has been determined that the high risk trigger area does not contain plants that are critically endangered, endangered or vulnerable, a SRI assessment of this PEM is not required. This matter will not be assessed any further in this SRI assessment report. All vegetation polygons are co-located with protected wildlife habitat (Table 4, Figure 2).

Item	PEM	Potential for SRI	Comments
12	Protected wildlife habitat – An area that is not shown as a high risk area on the flora survey trigger map, to the extent the area contains plants that are critically endangered, endangered or vulnerable.	No	Not located within the disturbance footprint of the current project.
13	Protected wildlife habitat – A koala habitat area as determined by the chief executive on the koala conservation plan map.	No	Not located within the disturbance footprint of the current project.
14	Protected wildlife habitat – Habitat for an animal that is critically endangered, endangered or vulnerable.	Yes	A total of 199.559 ha will be disturbed with 144.965 ha of ground-verified remnant and regrowth vegetation to be cleared representing core habitat for one or more of the 10 species listed below: • 144.965 ha for the Koala, *Phascolarctos cinereus* (Endangered under both the NC Act and EPBC Act). • 71.776 ha for the Greater Glider, *Petauroides volans* (Endangered under both the NC Act and EPBC Act). • 71.221 ha for the Yellow-bellied Glider, *Petaurus australis* (Vulnerable under both the NC Act and EPBC Act). • 71.880 ha for the South-eastern Long-eared Bat[1], *Nyctophilus corbeni* (Vulnerable under both the NC Act and EPBC Act). • 72.184 for the Diamond Firetail, *Stagonopleura guttata* (Vulnerable under both the NC Act and EPBC Act). • 29.143 ha for the South-eastern Glossy Black-cockatoo, *Calyptorhynchus lathami* (Vulnerable under both the NC Act and EPBC Act). • 72.184 ha for the Common Death Adder, *Acanthophis antarcticus* (Vulnerable under the NC Act). • 71.326 ha for the Dunmall's Snake[1], *Glyphodon (Furina) dunmalli* (Vulnerable under both the NC Act and EPBC Act). • 1.265 ha for the Grey Snake, *Hemiaspis damelii* (Endangered under both the NC Act and EPBC Act).

Item	PEM	Potential for SRI	Comments
			• 0.303 ha for the Brigalow Woodland Snail, *Adclarkia cameroni* (Vulnerable under the NC Act and Endangered EPBC Act). All remnant and regrowth vegetation is mapped as protected wildlife habitat for one or more threatened species, with all vegetation polygons co-located to varying degrees with all other matters, and all the vegetation to be cleared is considered Koala habitat (Table 4, Figure 2). Refer to Section 3.2.3 for the SRI assessment of this PEM.
15	Protected wildlife habitat – Habitat for an animal that is special least concern (i.e. echidna or platypus).	Yes	A total of 53.720 ha of protected wildlife habitat for the Short-beaked Echidna (*Tachyglossus aculeatus*), listed as Special Least Concern under the NC Act, will be impacted for the project (Table 4, Figure 2). Refer to Section 3.2.4 for the SRI assessment of this PEM. All vegetation polygons are co-located with protected wildlife habitat for the Koala and other threatened species (Table 4, Figure 2).
16	Protected areas	No	Not located within the disturbance footprint of the current project.
17	Highly protected zones of State marine parks	No	Not located within the disturbance footprint of the current project.
18	Fish habitat area	No	Not located within the disturbance footprint of the current project.
19	Waterway providing for fish passage – Fish passage (not in an urban area)	Yes	A total of 0.245 ha within in-stream components of watercourses will be impacted. These are associated with Braemar Creek and several other unnamed tributaries with Waterway Barrier Works (fish passage) impact categories of 1, 2, 3 and 4 (Table 4, Figure 2). Refer to Section 3.2.5 for the SRI assessment of this PEM. Most are remnant or regrowth vegetation polygons and are therefore co-located with protected wildlife habitat (Table 4, Figure 2).
20	Marine plants	No	Not located within the disturbance footprint of the current project.
21	Legally secured offset area	No	Not located within the disturbance footprint of the current project.

([1]) Instances where the PEM corresponds to a MNES assessed under EPBC Act Approval (EPBC 2010/5344).



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Author: tstringer

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Coordinate System: GDA2020 MGA Zone 56

Figure 2a
Prescribed Environmental Matters (PEMs) occurring within the project footprint

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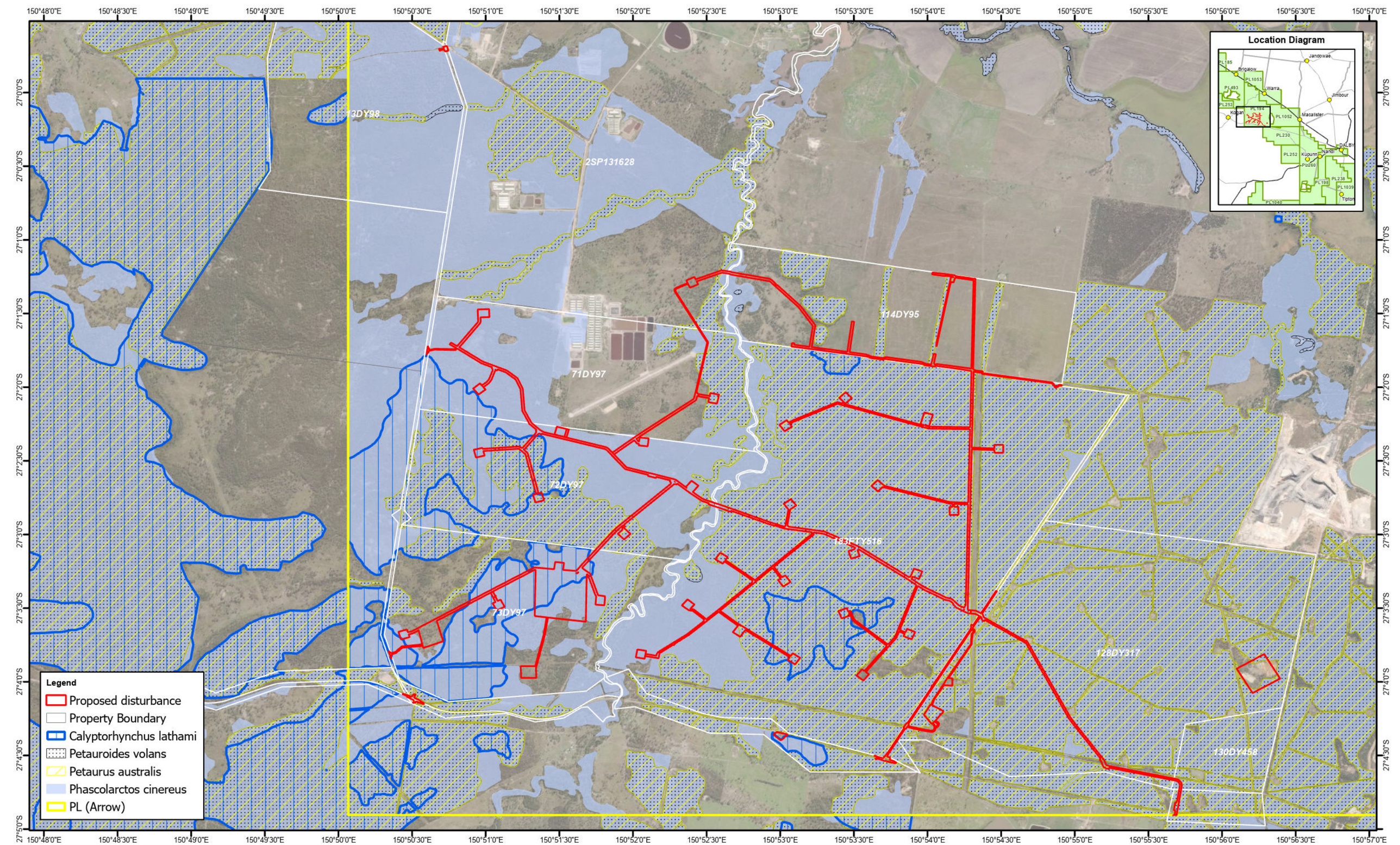

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Figure 2b
Prescribed Environmental Matters (PEMs) occurring within the project footprint

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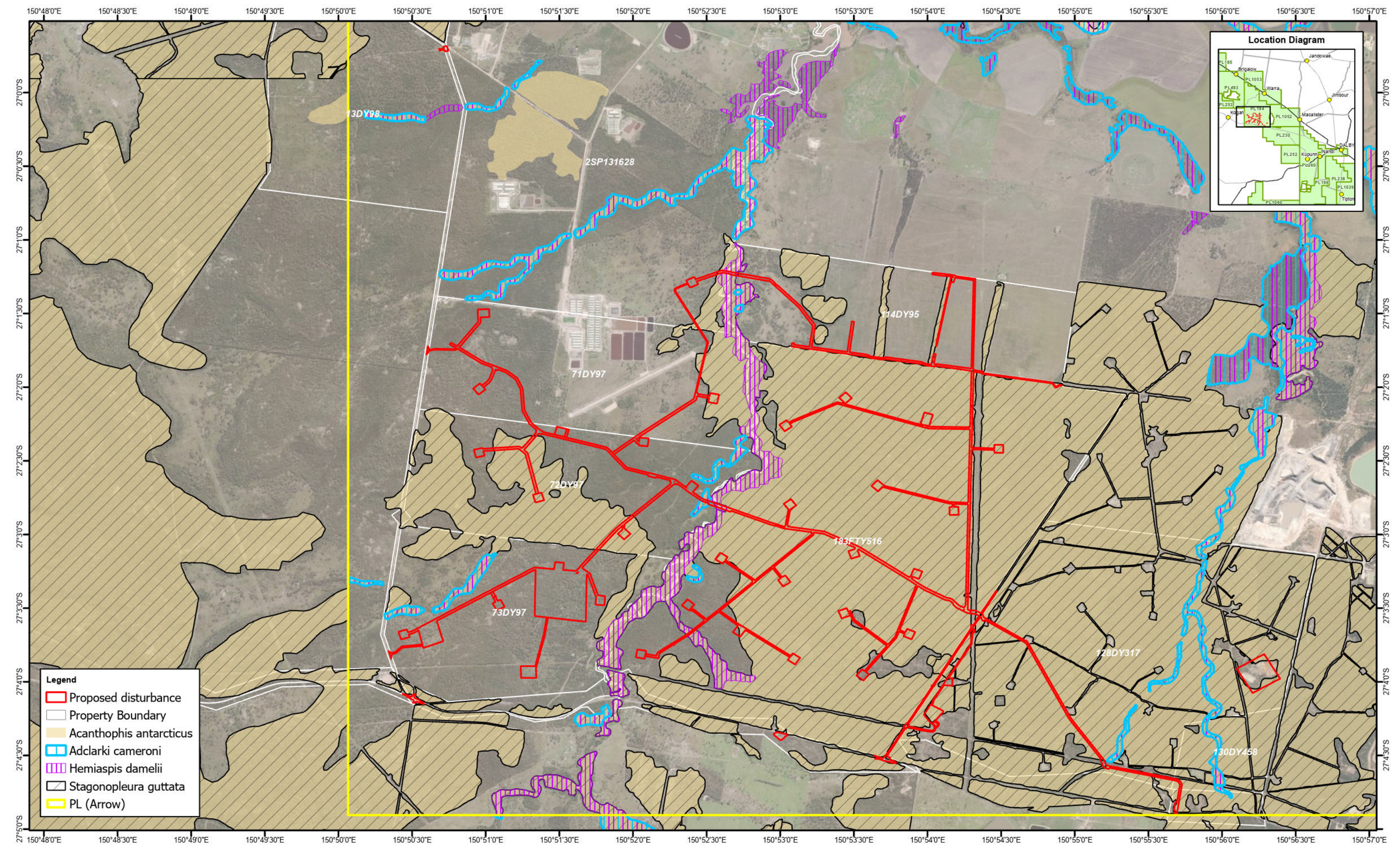

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Figure 2c
Prescribed Environmental Matters (PEMs) occurring within the project footprint

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3.2 Assessment of PEMs for Actual SRI

Review of Table 3 shows five PEMs with a potential for SRI (see Figures 1 and 2 for locations). Sections 3.2.1 to 3.2.5 provide a further assessment of these five matters. Table 4 provides a breakdown of each vegetation community that is impacted by the Project and the relevant PEM that is associated with each one.

Table 4 Summary of Impacted Prescribed Environmental Matters (PEMs) including areas (ha), vegetation communities and co-locations

Vegetation Community	Area (ha)	Regulated Vegetation			Protected Wildlife Habitat (ha) – endangered or vulnerable wildlife										Protected Wildlife Habitat (ha) – special least concern wildlife	Waterway providing for fish passage (ha)
		RE within the defined distance of defining banks of a watercourse	Essential habitat for endangered wildlife		Koala	Greater Glider	Yellow-bellied Glider	South-eastern Long-eared Bat[1]	Diamond Firetail	South-eastern Glossy Black-cockatoo	Common Death Adder	Dunmall's Snake[1]	Grey Snake	Brigalow Woodland Snail	Short-beaked Echidna	Fish passage (not in an urban area)
			Spotted-tailed Quoll*	Koala												
11.3.14	0.554	0.501		0.167	0.554	0.554		0.554	0.554		0.554		0.554		0.554	0.043
11.3.18	0.408	0.256	0.023	0.216	0.408			0.408	0.408		0.408	0.408	0.408		0.064	0.008
11.3.25	0.303				0.303	0.303	0.303		0.303		0.303		0.303	0.303	0.303	
11.5.1	51.494	0.408		6.352	51.494	51.494	51.494	51.494	51.494		51.494	51.494			28.072	0.070
11.7.4	5.971				5.971	5.971	5.971	5.971	5.971	5.971	5.971	5.971				
11.7.7	13.453	0.574		1.369	13.453	13.453	13.453	13.453	13.453		13.453	13.453			10.994	0.048
Regrowth (11.5.1)	49.609		2.289	7.205	49.609										7.797	0.071
Regrowth (11.7.4)	23.172				23.172					23.172						
Cleared land	54.595														5.935	0.006
Total	**199.559**	**1.739**	**2.312**	**15.309**	**144.965**	**71.776**	**71.221**	**71.880**	**72.184**	**29.143**	**72.184**	**71.326**	**1.265**	**0.303**	**53.720**	**0.245**

([1]) Instances where the PEM corresponds to a MNES assessed under EPBC Act Approval (EPBC 2010/5344).

3.2.1 Regulated vegetation – Regional ecosystems (not within an urban area) within the defined distance from the defining banks of a relevant watercourse.

Table 4 shows that eight (8) vegetation communities will be impacted by the Project, Regrowth REs 11.5.1 and 11.7.4, and Remnant REs 11.3.14, 11.3.18, 11.3.25, 11.5.1, 11.7.4, and 11.7.7. Of the remnant communities 0.501 ha of RE 11.3.14, 0.256 ha of RE 11.3.18, 0.408 ha of RE 11.5.1 and 0.574 ha of RE 11.7.7 occur within the defined distance from the defining banks of a relevant watercourse. These four REs are listed as 'Regional ecosystems (not within an urban area) within the defined distance from the defining banks of a relevant watercourse on the vegetation management watercourse map' within the PL 194 EA with sufficient allowable impact areas.

As shown in Table 4 these RE polygons also provide habitat for protected wildlife, most of which are also listed protected species under the EPBC Act. It is Arrow's consideration that under such circumstances the biodiversity offset associated with this PEM would therefore be managed under the EPBC Act approval (EPBC 2010/5344) and associated Offset Strategy for the SGP Stage 1. However, The Department of Environment and Science (DES) considers regulated vegetation within the defined distance from a watercourse as a substantially different matter to habitat for protected species. Given the time-critical nature of the approval for this SRI report, Arrow will include a total area of 1.739 ha within the Notice of Election for biodiversity offset (both under this PEM and for the overlapping protected wildlife habitat as shown in Table 4, see also Section 3.2.3). It is noted that Arrow will further investigate options to avoid this sort of duplication of offset requirements in the future.

3.2.2 Regulated vegetation – Essential habitat (not in an urban area) for endangered or vulnerable wildlife.

As shown in Tables 3 and 4 there is 15.309 ha of Queensland Government mapped essential habitat for the Koala (*Phascolarctos cinereus*) and an overlapping 2.312 ha for the Spotted-tailed Quoll (*Dasyurus maculatus maculatus*), both listed as endangered under the EPBC Act and the NC Act, to be impacted by the Project. In all situations, the specific area of habitat to be impacted for a listed species protected under the NC Act is also habitat to be impacted for a species protected under the EPBC Act, including habitat for the South-eastern Long-eared Bat and Dunmall's Snake. As noted in Section 3.2.1, Arrow will further investigate options to avoid this sort of duplication of offset requirements when State matters overlap with Federal matters for the same impact area.

Essential habitat for the Koala

Of the 15.309 ha of mapped essential habitat for the Koala, 7.205 ha is located within regrowth vegetation, and 8.104 ha is located within remnant vegetation. The entire 15.309 ha overlaps with protected wildlife habitat for the Koala (Table 4, Section 3.2.3). This PEM also overlaps with 1.365 ha of the REs within the defined distance from the defining banks of a relevant watercourse PEM (Table 4, Section 3.2.1).

Regulated vegetation is a prescribed regional ecosystem as defined in the EO Act and does not include regrowth vegetation. As such Arrow will include a total area of 8.104 ha within the Notice of Election for biodiversity offset for essential habitat for the endangered Koala, including:

- 0.167 ha within remnant RE 11.3.14
- 0.216 ha within remnant RE 11.3.18
- 6.352 ha within remnant RE 11.5.1
- 1.369 ha within remnant RE 11.7.7

Essential habitat for the Spotted-tailed Quoll

The purpose of this SRI assessment is to decide whether or not the Project will or is likely to have a significant residual impact on the MSES, Queensland Government mapped essential habitat for the Spotted-tailed Quoll. This SRI assessment was completed in accordance with the Queensland Environmental Offsets Policy Significant Residual Impact guideline (DEHP 2014). Of the 15.309 ha of essential habitat impacted by the Project, 2.312 ha is mapped as essential habitat for the Spotted-tailed Quoll. The majority (2.289 ha) is located within regrowth vegetation (RE 11.5.1) and the remaining 0.023 ha is within remnant RE 11.3.18. This area completely overlaps with protected wildlife habitat for the Koala and several other threatened species (Table 4). Koala and Spotted-tailed Quoll are in the same species functional group under the EO Act and as such offsets could be co-located for the two species (DES, 2022).

Species overview:

Dasyurus maculatus maculatus is the southern subspecies of Spotted-tailed Quoll, occurring on the eastern Australian coastline from southeast Queensland through to eastern NSW, Victoria and Tasmania (DAWE, 2022). The subspecies is broken up into two populations, one on the mainland and one in Tasmania.

D. m. maculatus is a nocturnal carnivorous marsupial which can be distinguished by its reddish-brown fur with white spots on both its body and tail (DAWE, 2022). The species is the approximate size of the domestic cat, weighing about 5 kg, with a body and tail length of approximately 500 mm and 450 mm respectively (Queensland Museum, 1995). The species feeds primarily on medium-sized mammals (500–5000 g), however it is opportunistic and known to feed on anything from insects to small wallabies (Dawson, 2007).

D. m. maculatus breeds in winter, usually giving birth between late July and mid-August (Meyer-Gleaves, 2010). The young are inside the mother's pouch for approximately seven weeks, and do not reach independence until they are 17 to 19 weeks of age, spending the majority of lives up until this point inside a den relying on their mothers for food (Meyer-Gleaves, 2010). The species have a rather low reproductive output, with some females breeding only once or twice in their lifetimes (DotE, 2016). Female members of this species tend to have a home range of 200-1000 ha, and males have a much larger range of up to 500-2500 ha (Fitzgibbon, 2020). Female home ranges tend to overlap more frequently than those of males, however both sexes are highly solitary, and distributions are usually sparse (Meyer-Gleaves, 2010; Fitzgibbon, 2020). The species travel on average 3-5 km in 24 hours, however distances of over 7 km per night have been recorded (Fitzgibbon, 2020).

In southern Queensland, *D. m. maculatus* can be found on both sides of the Great Dividing Range in a range of habitats including rainforest, wet and dry sclerophyll forest, coastal heathland, scrub and dunes, woodland, heathy woodland, swamp forest, mangroves, on beaches and sometimes in grassland or pastoral areas adjacent to forested areas (DotE, 2016). The species is however

forest dependent, and its western distribution is limited by rainfall requirements, preferring to live in areas of consistent rainfall of over 600 mm per year (DotE, 2016; Belcher, 2004). The species relies on den sites for habitat, such as rock crevices, caves, hollow logs, burrows and tree hollows (DAWE, 2022).

The *D. m. maculatus* population is thought to have reduced by 50-90% since European settlement, and it now exists in fragmented populations (Meyer-Gleaves, 2010). The most significant threat to the species is habitat loss and fragmentation of forests that the species depends on for survival (Meyer-Gleaves, 2010). This has been caused by large-scale clearing and wildfires. Secondary to this are impacts from introduced species, both predators and prey. Introduced species such as cats (*Felis catus*), domestic dogs (*Canis familiaris*) and foxes (*Vulpes vulpes*) impact on *D. m. maculatus* through direct predation and competition for food (Meyer-Gleaves, 2010). The species may also be susceptible to baiting which is used to control these introduced predators (DotE, 2016). Though no studies have conclusively linked cane toad (*Rhinella marina*) poisoning to declines in Spotted-tail Quoll populations, modelling studies have predicted that this poisoning could put the southern subspecies at a moderate risk of population decline (DotE, 2016). Research into population decline due to cane toad poisoning is an action proposed in Australian Government Department of the Environment's National Recovery Plan for the Spotted-tailed Quoll *Dasyurus maculatus* (DotE, 2016).

Assessment of significance of impacts:

The Project will involve the drilling and completion of coal seam gas wells, along with the construction of supporting wellsite and gathering infrastructure. This infrastructure will deliver gas to the Kogan and Daandine gas processing facilities. Arrow's first priority during planning for this Project was to avoid the clearing of native vegetation, however because of the location of the proposed Project within Dalby State Forest and surrounding freehold properties, some of which have retained significant areas of vegetation, some clearing of vegetation is necessary. The impact of this clearing will be minimised by clearing the narrowest corridors possible within forested areas, co-locating tracks and pipelines as far as practicable, and ensuring that rehabilitation of Right of Ways (ROWs) is conducted as soon as possible after construction.

This stage of the Project development will involve the clearing of one, 1 ha well pad along with an associated access track and gathering within an area mapped as essential habitat for Spotted-tailed Quoll (*D. m. maculatus*). This clearing will occur entirely within Dalby State Forest. Wildlife online database searches were undertaken on 10 February 2022, showing all protected species recorded since 1980 within 50 km of the proposed infrastructure. The essential habitat mapping is based on one record from May 1980, which is the only individual recorded within 50 km of the proposed infrastructure. The record is unconfirmed and located immediately south of Dalby Kogan Road on the edge of a fragmented patch of ground-verified RE 11.5.1 surrounded by intensively farmed cropping land. Dalby State Forest to the north of the record is completely lacking in rock crevices and caves, a necessary requirement for quoll den sites. The species, if it existed on this property, would therefore rely heavily on hollow logs for den sites. These nesting sites were found to be quite sparse during field assessments because of historic clearing of large eucalypts in the state forest. The average yearly rainfall in the Dalby region is 676 mm, which exceeds the 600 mm minimum rainfall requirements of *D. m. maculatus* (BoM 2021a). This is however highly inconsistent between years, with 14 of the last 29 years having a yearly rainfall of under 600 mm (BoM 2021b).

It is extremely unlikely that any *D. m. maculatus* individuals could currently be found in this vicinity. In a recent likelihood of occurrence assessment, Mark Sanders who is a highly regarded fauna expert concluded that the species "will not occur" in the area (Ecosmart Ecology and 3D

Environmental, 2023). As per the assessment of significance in the table below, Arrow conclude that the Project activities are considered very unlikely to cause a significant residual impact to the species. As such Arrow will not be including any area (ha) within the Notice of Election for biodiversity offset for essential habitat for the endangered Spotted-tailed Quoll.

Significance criteria	**Assessment of significance**
An action is likely to have a significant impact on endangered and vulnerable wildlife if the impact on the habitat is likely to:	
Lead to a long-term decrease in the size of a local population	No populations of *D. m. maculatus* are known to exist in the area. The only record of the species within 50 km of the proposed activities was recorded over 40 years ago and is unconfirmed so it is unlikely to be accurate. It is therefore extremely unlikely that the proposed activities will lead to a long-term decrease in the size of a local population.
Reduce the extent of occurrence of the species	As stated above, *D. m. maculatus* is extremely unlikely to occur in this location because no reliable sightings have occurred within 50 km of the site in the last 40 years. The species is also unlikely to occur in this location because the annual rainfall does not consistently exceed 600 mm in the region, and the required den sites are not readily available. The proposed activities will therefore be located outside of the species' realistic extent of occurrence.
Fragment an existing population	As stated above, no existing populations are known or likely to occur in the area. After construction, the widest area that a *D. m. maculatus* individual would need to traverse would be approximately 70 m, and these areas will be rehabilitated swiftly after construction. The smallest average home ranges of *D. m. maculatus* are 200 ha, and the shortest average distance travelled by the species in 24 hours is 3 km. It is therefore extremely unlikely that clearing of the scale proposed would fragment populations of this species.
Result in genetically distinct populations forming as a result of habitat isolation	As stated above, no existing populations are known or likely to occur in the area. After construction, the widest area that a *D. m. maculatus* individual would need to traverse would be approximately 70 m, and these areas will be rehabilitated swiftly after construction. The smallest average home ranges of *D. m. maculatus* are 200 ha, and the shortest average distance travelled by the species in 24 hours is 3 km. It is therefore extremely unlikely that this activity will prevent the transfer of genetic material within a population.
Result in invasive species that are harmful to an endangered or vulnerable species becoming established in the endangered or vulnerable species' habitat	The invasive species that have the greatest effect on quoll populations are cats and foxes, which prey on and compete with the species. Cane toads also kill the species through poisoning when preyed upon. All three of these pest species are already established in the broader area. Arrow monitor for pest animals and plants under their Pest Management Procedure. Arrow has committed to ensuring that activities do not encourage or draw pest animals into areas with infrastructure (e.g. cats, foxes and wild dogs scavenging around camps or manned facilities). Where pest species are identified onsite, management techniques including euthanasia will be considered on a case-by-case basis. With these control measures, there will be no additional risk of invasive species that are harmful to *D. m. maculatus* becoming established in the area due to Arrow's activities.
Introduce disease that may cause the population to decline	Diseases in populations of threatened species including *D. m. maculatus* are often exacerbated by habitat fragmentation and increased population density. Arrow's activities will not fragment or isolate any known populations of the species, nor will it reduce the overall extent of occurrence of the species. There is no risk of disease becoming more prevalent or having a more significant impact on a population because of the clearing activities proposed for this project.
Interfere with the recovery of the species	As stated above, *D. m. maculatus* is extremely unlikely to occur in this location because no reliable sightings have occurred within 50 km of the site in the last 40 years. The activities will not fragment or reduce the extent of known habitat, nor will it increase the risk of pests or diseases that may impact the species. It is therefore extremely unlikely that the recovery of the species will be impacted.
Cause disruption to ecologically	Though the species may be found in areas outside of their ideal habitat, due to their relatively large home range, they are reliant on forested areas with den sites

Significance criteria	Assessment of significance
significant locations (breeding, feeding, nesting, migration or resting sites) of a species	and consistent rainfall of over 600 mm per year. Dalby State Forest does not meet this species requirements and is therefore not considered important habitat for the species. The proposed activities will be carried out in open woodland lacking in rock crevices and caves, with only sparse hollow logs and trees for den sites. Arrow records the locations of habitat trees and retains hollow-bearing trees and logs where possible during clearing activities. It is therefore unlikely that these activities will cause disruption to ecologically significant locations for the species.
Conclusion	Given that no *D. m. maculatus* populations are known to occur in the region, no important habitat is proposed to be cleared, and a large amount of remnant vegetation will remain in the area after construction activities occur, the proposed gas production infrastructure is considered very unlikely to cause a significant residual impact to the species.

3.2.3 Protected wildlife habitat – habitat for an animal that is critically endangered, endangered or vulnerable.

As shown in Tables 3 and 4 there is habitat for ten (10) vulnerable and/or endangered species to be impacted by the Project. In all situations, the specific area of habitat to be impacted for a listed species protected under the NC Act is also habitat to be impacted for a species protected under the EPBC Act.

As noted in Section 3.2.1, Arrow will further investigate options to avoid this sort of duplication of offset requirements when State matters overlap with Federal matters for the same impact area. However, given the time-critical nature of the approval for this SRI report, Arrow will include the areas of impacted PEMs for protected wildlife habitat. This totals an area of 144.965 ha to be included in the Notice of Election for this Project. This offset area includes a combination of regulated vegetation and protected wildlife habitat for the Koala, Greater Glider, Yellow-bellied Glider, Diamond Firetail, Glossy Black-cockatoo, Common Death Adder, Grey Snake, and Brigalow Woodland Snail (refer to Table 4 for breakdown), including:

- 0.554 ha Remnant 11.3.14
- 0.408 ha Remnant 11.3.18
- 0.303 ha Remnant 11.3.25
- 51.494 ha Remnant 11.5.1
- 5.971 ha Remnant 11.7.4
- 13.453 ha Remnant 11.7.7
- 49.609 ha Regrowth 11.5.1
- 23.172 ha Regrowth 11.7.4

This PEM also overlaps completely with all other PEMs described in this SRI assessment report (Table 4).

3.2.4 Protected wildlife habitat – habitat for an animal that is special least concern.

As shown in Tables 3 and 4 there is 53.720 ha of protected wildlife habitat for the Short-beaked Echidna, listed as a special least concern species, to be impacted by the Project. Of the 53.720 ha, 5.935 ha has been ground verified as cleared land, leaving 47.785 ha of remnant and regrowth vegetation (REs 11.3.14, 11.3.18, 11.3.25, 11.5.1 and 11.7.7) (Tabel 4). This area completely

overlaps with protected wildlife habitat for the Koala and several other threatened species (Table 4). Koala and Short-beaked Echidna are in the same species functional group under the EO Act and as such offsets could be co-located for the two species (DES, 2022).

Under the SRI Assessment Guideline (DEHP, 2014), an action is likely to have a significant impact on special least concern (non-migratory) wildlife habitat if it is likely that it will result in:

- a long-term decrease in the size of a local population; or
- a reduced extent of occurrence of the species; or
- fragmentation of an existing population; or
- result in genetically distinct populations forming as a result of habitat isolation; or
- disruption to ecologically significant locations (breeding, feeding or nesting sites) of a species.

The Short-beaked Echidna is a widespread and common mammal, occurring throughout all of mainland Australia. They are generalist in their habitat preference, occurring within alpine and cold-temperate areas to deserts and tropical regions. The Short-beaked Echidna appears to have no specific habitat requirements beyond a food supply of ants and termites.

As this species is widespread, highly mobile, non-territorial, and a generalist in habitat preference, the removal of 48 ha of potential habitat for the Short-beaked Echidna is not likely to lead to a long-term decrease in the size of a local population, or a reduced extent of occurrence of the species.

The nature of the clearing works for the Project does not involve broadscale clearing, with vegetation clearing comprising of narrow (< 40 meters wide) linear strips and well pads approximately 1 ha in size. This type of clearing footprint is not likely to result in fragmentation of an existing population as the nature of the clearing does not create a 'hard' barrier to dispersal (such as a permanent road or large building) and the species will move through disturbed and cleared areas such as access tracks. Therefore, the proposed action is unlikely to result in fragmentation of populations or result in genetically distinct populations forming as a result of habitat isolation.

Although no burrows or potential den sites have been specifically recorded within the Project area, Arrow's *Species management program for Tampering with Animal Breeding Places* (2023) (SMP) will be implemented prior to and during habitat disturbance. The SMP outlines specific controls and mitigation measures to be implemented if individual Echidnas, as well as potential or active burrows are found within the clearing area during pre-clearance surveys or clearing works. The Impact Minimisation Hierarchy ensures that avoiding disturbance during breeding season (July – November) is the highest priority in the hierarchy of controls, as well as additional measures including exclusion zones around individuals or burrows, and specific management by an experienced fauna spotter catcher. Therefore, the proposed action is unlikely to result in disruption to ecologically significant locations for the Short-beaked Echidna.

It is unlikely that the construction of the Project will result in a long-term decrease in the size of a local population or reduce the extent of occurrence of the Short-beaked Echidna, and is unlikely to result in population fragmentation or genetically distinct populations of Echidnas. Furthermore, it is unlikely that the construction works will result in a disruption to ecologically significant locations (breeding, feeding or nesting sites).

The results of this SRI assessment conclude that the construction and operation for the Project is unlikely to have a significant impact to the Short-beaked Echidna. A SRI for this PEM is not

considered likely and therefore this PEM will not be included in the Notice of Election for biodiversity offset for this Project.

3.2.5 Waterway providing for fish passage – Fish passage (not in an urban area).

There are mapped watercourses intersecting the Project footprint associated with Braemar Creek and several other unnamed tributaries (Table 4, Figure 2). These waterways are categorised by DAF as having a mix of 'low', 'moderate', 'high', and 'major' risk of impact for fish passage. Waterway barrier works in a fish passage waterway will be undertaken in accordance with the DAF guideline "*Accepted development requirements for operational work that is constructing or raising waterway barrier works*" (DAF, 2018). The purpose of this section is to assess if the proposed pipeline crossing construction will have a SRI relating to the MSES 'Waterway providing for Fish Passage'.

Under the SRI Assessment Guideline (DEHP, 2014), an environmental offset may be required '*for any part of a waterway that provides for passage of fish (other than that part of a waterway within an urban area) if the construction, installation or modification of waterway barrier works carried out under an authority will limit the passage of fish along the waterway*'.

In accordance with DEHP (2014), the construction and operation of the pipeline for the Project is not likely to:

- result in the mortality or injury of fish; or
- result in conditions that substantially increase risks to the health, wellbeing and productivity of fish seeking passage such as through the depletion of fishes energy reserves, stranding, increased predation risks, entrapment or confined schooling behaviour in fish; or
- reduce the extent, frequency or duration of fish passage previously found at a site; or
- substantially modify, destroy or fragment areas of fish habitat (including, but not limited to in-stream vegetation, snags and woody debris, substrate, bank or riffle formations) necessary for the breeding and/or survival of fish; or
- result in a substantial and measurable change in the hydrological regime of the waterway, for example, a substantial change to the volume, depth, timing, duration and frequency of flows; or
- lead to significant changes in water quality parameters such as temperature, dissolved oxygen, pH and conductivity that provide cues for movement in local fish species.

The focal watercourses are ephemeral in nature. Construction of the pipelines are proposed to be a standard open-cut (trenching) method. This technique is most suited to dry or low flow conditions and involves establishing a stable working platform either side of the watercourse and creating a trench using excavators, or similar. Tie-in points will be located on high ground, away from any water flow. Trench spoil removed from the watercourse will be positioned above the high bank. Welded pipe will be laid in the trench and spoil material returned to the trench. Trench and backfill activities will be undertaken to ensure that the bed and bank materials are stockpiled separately and returned to the trench to match original conditions to the greatest extent possible. Rock protection may be placed over the trench if required, to prevent potential scouring during high water flow conditions.

Pipeline construction will be undertaken outside of the wet season when the watercourses are not expected to be flowing. As such it is very unlikely that fish species will be present during

construction. Construction time for watercourse crossing is expected to be approximately 10 days. Construction methodology will not introduce any chemicals or solvents, alter water chemistry, or change flow regimes. All construction works will be undertaken and completed in accordance with IECA Best Practice Erosion & Sediment Control Guidelines (IECA, 2008). If water is present in the watercourse, erosion and sediment control (ESC) measures such as temporary coffer dams and silt curtains, as determined by a suitably qualified person, will be installed for the duration of instream works. These measures may temporarily restrict passage whilst in place. If required, water quality monitoring (such as, total dissolved solids (TDS), dissolved oxygen, pH, etc.) will be undertaken during instream construction works to ensure ESC measures and construction methodology is effective. Fauna spotter-catchers will regularly monitor the crossing for possible presence of aquatic species including fish. In the event that monitoring has indicated an impact then works will cease until such time as the issue is resolved in consultation with a suitably qualified person. The ESC measures will be removed once in-stream construction works are completed.

Following construction, the construction trench will be backfilled using spoil to match original conditions. All temporary construction materials and equipment will be removed from the crossing location prior to the onset of the following wet season. No permanent structure or water barrier will be left in-situ that will meaningfully change local hydrology. Following completion of construction activities, the disturbed area will be rehabilitated to reflect the pre-disturbance state and surrounding area.

Therefore, it is very unlikely that the construction of the pipeline will result in the direct mortality or injury of fish, or substantially increase risks to fish health and wellbeing through stranding, entrapment, or confined schooling behaviour. The extent, frequency or duration of fish passage is unlikely to be reduced. The construction and operation of the pipeline is unlikely to substantially modify, destroy or fragment areas of fish habitat necessary for the breeding and/or survival of fish. It is also very unlikely to result in a substantial and measurable change in the hydrological regime of the waterway or lead to significant changes in water quality.

The results of this SRI assessment conclude that the construction and operation of the pipeline for the Project is very unlikely to have a significant impact to a waterway providing for fish passage and will not limit the passage of fish along the waterway. A SRI for this PEM is not considered likely and therefore this PEM will not be included in the Notice of Election for biodiversity offset for this Project.

4. Conclusion

Arrow is yet to investigate options to avoid duplication in regard to biodiversity offsets for overlapping State and Federal matters for the same impact area. This, in combination with the time critical nature of the Project (Wari Djunben, SGP PL194) and this SRI assessment report approval, has led Arrow to identify a total of 144.965 ha of vegetation clearing to require an offset under the State process for three overlapping PEMs, including:

- Regulated vegetation (REs within the defined distance from the defining banks of a relevant watercourse),
- Regulated vegetation (essential habitat for endangered wildlife – Koala), and
- Protected wildlife habitat (habitat for Koala, Greater Glider, Yellow-bellied Glider, Diamond Firetail, Glossy Black-cockatoo, Common Death Adder, Grey Snake, and Brigalow Woodland Snail).

This includes:

- 0.554 ha Remnant 11.3.14
- 0.408 ha Remnant 11.3.18
- 0.303 ha Remnant 11.3.25
- 51.494 ha Remnant 11.5.1
- 5.971 ha Remnant 11.7.4
- 13.453 ha Remnant 11.7.7
- 49.609 ha Regrowth 11.5.1
- 23.172 ha Regrowth 11.7.4

As noted above, Arrow will further investigate options to avoid this sort of duplication of offset requirements when State matters overlap with Federal matters for the same impact area.

Table 5 shows the SRIs for PEMs impacted by the current Project (Wari Djunben, SGP PL194) reconciled with the PL 194 EA Table 3 (Biodiversity 11). All matters, both MSES and MNES, identified as present and to be disturbed trigger a SRI. For the current Project this includes Dunmall's Snake and South-eastern Long-eared Bat for which offsets will be managed under the EPBC Act Stage 1 Offset Strategy for the SGP.

Table 5 Significant Residual Impacts (SRIs) to Prescribed Environmental Matters (PEMs) reconciled with the Environmental Authority (EA) Table 3 (Biodiversity 11) for SGP PL194 Wari Djunben

PEM	Total area (ha) authorised in EA	Total area (ha) from SGP PL194 Wari Djunben	Estimated area (ha) remaining
REGULATED VEGETATION			
Regional ecosystems (not within an urban area) within the defined distance from the defining banks of a relevant watercourse on the vegetation management watercourse map			
RE 11.3.14	0.6	0.6	0
RE 11.3.18	0.3	0.3	0
RE 11.5.1	0.5	0.5	0
RE 11.7.7	0.6	0.6	0
Essential habitat (not in an urban area) on the essential habitat map for endangered wildlife			
Phascolarctos cinereus (Koala)	8.7	8.7	0
Dasyurus maculatus (Spotted-tailed Quoll)	2.4 (no SRI)	2.4	0
PROTECTED WILDLIFE HABITAT			
Habitat for an animal that is endangered wildlife			
Hemiaspis damelii (Grey Snake)	1.3	1.3	0
Phascolarctos cinereus (Koala)	145.7	145.7	0
Petauroides volans (Greater Glider)	71.8	71.8	0
Habitat for an animal that is vulnerable wildlife			
Acanthophis antarcticus (Common Death Adder)	72.2	72.2	0
Adclarkia cameroni (Brigalow Woodland Snail)	0.4	0.4	0
Petaurus australis (Yellow-bellied Glider)	71.3	71.3	0
Nyctophilus corbeni (South-eastern Long-eared Bat)[1]	71.9 (MNES)	71.9	0
Glyphodon (Furina) dunmalli (Dunmall's Snake)[1]	71.4 (MNES)	71.4	0

PEM	Total area (ha) authorised in EA	Total area (ha) from SGP PL194 Wari Djunben	Estimated area (ha) remaining
Stagonopleura guttata (Diamond Firetail)	72.2	72.2	0
Calyptorhynchus lathami (Glossy Black Cockatoo)	29.2	29.2	0
Habitat for an animal that is special least concern wildlife			
Tachyglossus aculeatus (Echidna)	53.8 (no SRI)	53.8	0
WATERWAY PROVIDING FOR FISH PASSAGE			
Fish passage (not in an urban area)	0.3 (no SRI)	0.3	0

([1]) = Instances where the PEM corresponds to a MNES assessed under EPBC Act Approval (EPBC 2010/5344).

4.1 Distinct Matter Area (DMA) Grouping Justification for Financial Offsets

If this SRI assessment is approved by DES a corresponding Notice of Election (NoE) submission will be made as a Financial Offsets Calculation. Several matters have been grouped together in the same Distinct Matter Area (DMA) (Table 6), due to colocation of habitat.

The purpose of this Section is to provide supporting justification that demonstrates why it is appropriate to group these matters in the same DMA, in relation to their required habitat requirements and rehabilitation management actions.

Table 6 Distinct Matter Area (DMA) Groupings for Financial Offsets Calculation

DMA	Matter Groups	Impact Area (ha)
1.1	1.1.1: Regional ecosystem—11.3.14 (*Eucalyptus spp*., *Angophora spp*., *Callitris spp*. woodland on alluvial plains) [including 0.167 ha remnant essential habitat for the Koala, and 0.501 ha RE within the defined distance of defining banks of a watercourse] 1.1.2: Threatened animals— *Phascolarctos cinereus* (Koala)	0.6
1.2	1.2.1: Regional ecosystem—11.3.18 (*Eucalyptus populnea, Callitris glaucophylla, Allocasuarina luehmannii* shrubby woodland on alluvium) [including 0.216 ha remnant essential habitat for the Koala, and 0.256 ha RE within the defined distance of defining banks of a watercourse] 1.2.2: Threatened animals— *Phascolarctos cinereus* (Koala)	0. 3
1.3	1.3.1: Regional ecosystem—11.5.1 (*Eucalyptus crebra* and/or *E. populnea, Callitris glaucophylla, Angophora leiocarpa, Allocasuarina luehmannii* woodland on Cainozoic sand plains and/or remnant surfaces) [including 6.352 ha remnant essential habitat for the Koala, and 0.408 ha RE within the defined distance of defining banks of a watercourse] 1.3.2: Threatened animals— *Phascolarctos cinereus* (Koala)	6.4
1.4	1.4.1: Regional ecosystem—11.7.7 (*Eucalyptus fibrosa* subsp. *nubilis* +/- *Corymbia* spp. +/- *Eucalyptus* spp. woodland on Cainozoic lateritic duricrust) [including 1.369 ha remnant essential habitat for the Koala, and 0.574 ha RE within the defined distance of defining banks of a watercourse] 1.4.2: Threatened animals— *Phascolarctos cinereus* (Koala)	1.4
1.5	1.5.1: Threatened animals— *Phascolarctos cinereus* (Koala) [habitat is within remnant REs 11.3.14, 11.3.18, 11.3.25, 11.5.1, 11.7.4 and 11.7.7, and regrowth REs 11.5.1 and 11.7.4]	137.0
1.6	1.6.1: Threatened animals— *Petauroides volans* (Greater Glider) [habitat is within remnant REs 11.3.14, 11.3.25, 11.5.1, 11.7.4 and 11.7.7]	71.8
1.7	1.7.1: Threatened animals— *Petaurus australis* (Yellow-bellied Glider) [habitat is within remnant REs 11.3.25, 11.5.1, 11.7.4 and 11.7.7]	71.3

DMA	Matter Groups	Impact Area (ha)
1.8	1.8.1: Threatened animals— *Stagonopleura guttata* (Diamond Firetail) [habitat is within remnant REs 11.3.14, 11.3.18, 11.3.25, 11.5.1, 11.7.4 and 11.7.7]	72.2
1.9	1.9.1: Threatened animals— *Calyptorhynchus lathami* (South-eastern Glossy Black-cockatoo) [habitat is within remnant and regrowth RE 11.7.4]	29.2
1.10	1.10.1: Threatened animals— *Acanthophis antarcticus* (Common Death Adder) [habitat is within remnant REs 11.3.14, 11.3.18, 11.3.25, 11.5.1, 11.7.4 and 11.7.7]	72.2
1.11	1.11.1: Threatened animals— *Hemiaspis damelii* (Grey Snake) [habitat is within remnant REs 11.3.14,11.3.18 and11.3.25]	1.3
1.12	1.12.1: Threatened animals— *Adclarkia cameroni* (Brigalow Woodland Snail) [habitat is within remnant RE 11.3.25]	0.4

Koalas occur in a diversity of habitats including temperate, sub-tropical and tropical forest, woodland and semi-arid communities, and sclerophyll forest, on foothills, plains and in coastal areas. Koalas near the western edge of their range are often associated with watercourses though are not restricted to them. Koalas feed on eucalyptus trees but show dietary preference based on geographical region and the types of tree species present. In the Brigalow Belt Koalas have at least 24 species of Eucalyptus upon which they preferentially forage, of these the following have been recorded within the SGP: *Corymbia tessellaris*, *C. citriodora*, *Eucalyptus camaldulensis*, *E. chloroclada*, *E. coolabah*, *E. crebra*, *E. exserta*, *E. fibrosa*, *E. melanophloia*, *E. moluccana*, *E. ochrophloia*, *E. populnea*, and *E. tereticornis* (Ecosmart Ecology and 3D Environmental, 2023). Given this description, the habitat mapping rules provided in the SGP ecology report identifies all remnant and regrowth REs except 11.9.5 as 'Core Habitat Possible' with respect to Koala habitat (Ecosmart Ecology and 3D Environmental, 2023).

Therefore, the patches of REs 11.3.14, 11.3.18, 11.5.1 and 11.7.7 within the SGP PL194 Project (Wari Djunben) area constitute 'Core Habitat Possible' for the Koala and as such, the implementation of management actions relating to the rehabilitation of these REs will apply to the rehabilitation of habitat for the Koala.

Appendix 6 of the Queensland Environmental Offsets (EO) Policy (v1.13) (DES, 2022) outlines several examples of direct management actions that can achieve a conservation outcome. The implementation of such management actions when applied to rehabilitated areas of REs 11.3.14, 11.3.18, 11.5.1 and 11.7.7 can lead to an improvement in the extent and quality of available habitat for the Koala.

Based on the habitat mapping rules for Koala (Ecosmart Ecology and 3D Environmental, 2023), management actions intended to restore disturbed and/or degraded areas of REs 11.3.14, 11.3.18, 11.5.1 and 11.7.7 will simultaneously result in an improvement in the shelter and foraging habitat for this species. Therefore, grouping REs 11.3.14, 11.3.18, 11.5.1 and 11.7.7 and Koala habitat in

the same DMA for the purposes of calculating the financial offset liability for SGP PL194 Project (Wari Djunben) is appropriate.

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6 Document Administration

Revision history

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Acceptance and release

Author

Position	Incumbent	Release Date
Principal Ecologist	*Paul Finn*	*21/09/2023*
Principal Ecologist	*Paul Finn*	*02/11/2023*

Stakeholders and reviewers

Position	Incumbent	Review Date
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