

Chapter 9

Flora

9.0 Flora

9.1 Existing Environment

This chapter provides an assessment of flora values associated with the proposed transmission line and substation sites. References to the Draft Alignment in this Chapter refer to the entire Project (i.e. transmission line, Copperfield River substation and Mount Fox substation). Where the transmission line easement corridor, Mount Fox substation or Copperfield River substation is differentiated in this Chapter, values apply in those areas respectively. Detailed ecology survey reports are provided in Appendix E Ecology (Substation) Technical Report and Appendix F Ecology (Transmission Line) Technical Report, and summarised within this Chapter. Sources of information in relation the project elements are detailed below.

- Mount Fox Substation Ecology Technical Report (Appendix E Ecology (Substation) Technical Report)
- Transmission Line Ecology Technical Report (Appendix F Ecology (Transmission Line) Technical Report)
- Copperfield River substation: Flora Technical Report, Kidston Solar Stage Two (AECOM, 2018).

Detailed ecology information for the proposed Copperfield River substation and surrounding area has been taken from the above report completed for the proposed Kidston Solar Farm Stage Two Project.

The Draft Alignment also includes a short 6 km transmission line connection from the Copperfield River substation to Kidston Solar Farm Stage Two substation and Kidston Pumped Storage Hydro substation. The Draft Alignment in this location traverses the Kidston Mining Lease (ML3347) held by Kidston Gold Mines Limited, a Genex company. The site is heavily disturbed due to previous mining activity, and the flora values are limited. Flora values associated with this short connection are therefore not considered further in this chapter.

9.1.1 Methodology

Flora values associated with the Draft Alignment have been assessed through a range of methodologies.

- Desktop assessment to characterise and identify potential flora species and their habitat that may be present within the Draft Alignment. The desktop assessment included a review of literature, searches of publicly available datasets and online mapping and work previously completed by AECOM.
- Field surveys to classify and map Regional Ecosystems and to identify flora species, including conservation significant and introduced flora. Four separate field surveys targeting flora values were undertaken from November 2017 to August 2018. A Protected Plants survey was undertaken in accordance with the *Nature Conservation Act 1992* (NC Act) requirements where the alignment crosses a high risk area.
- A likelihood of occurrence assessment for conservation significant flora species and communities identified during the desktop review was undertaken. The assessment considered known habitat and ecological requirements of the threatened species against the vegetation communities and habitat values identified in the field surveys.
- Potential habitat maps for the conservation significant flora identified as having a likelihood presence of 'high' or 'known' have been created to identify potential habitat across the Draft Alignment.

9.1.2 Desktop assessment results

The Draft Alignment is primarily located within the Einasleigh Uplands bioregion (majority of the transmission line and the Copperfield River substation). This bioregion largely consists of a series of ranges and plateau surfaces, varying in altitude between 100 m in the west to 1,100 m in the east (Sattler and Williams, 1999).

Approximately 500 m of the eastern end of the Draft Alignment, including the Mount Fox substation site is within the Wet Tropics bioregion. This bioregion is dominated by rugged, rainforest mountains as well as extensive plateau areas and low lying coastal plains (Sattler and Williams, 1999).

9.1.2.1 Mapped Regional Ecosystems

In Queensland, remnant and high value regrowth vegetation is described and mapped by the Queensland Herbarium as Regional Ecosystems (REs). REs are broad plant communities within a bioregion that consistently occur in association with a particular combination of geology, landform and soil (Neldner *et al.*, 2017).

The proposed transmission line crosses 56 mapped REs (some in heterogeneous polygons), which are illustrated in Figure 9-1 and are listed in Table 9-6. Based on classifications provided by the *Vegetation Management Act 1999* (VM Act), 51 REs are listed as 'Least Concern' and 5 REs are 'Of Concern'.

One RE is mapped across the Mount Fox substation site, being RE7.5.4f. This RE is described in Table 9-1 and is illustrated in Figure 9-1 and Figure 9-2.

Table 9-1 Mapped REs – Mount Fox substation

RE ID	Short Description ¹	VM Act Status	Biodiversity Status
7.5.4f	<i>Corymbia intermedia</i> , <i>Allocasuarina torulosa</i> , <i>Lophostemon suaveolens</i> open forest and woodland. Deep weathered soils of basalt origin.	Of Concern	Of Concern

¹ Description of REs as contained in the REDD Version 10.0 (Queensland Herbarium, 2016)

Two REs are mapped across the Copperfield River substation site. These REs are described in Table 9-2 and illustrated in Figure 9-3.

Table 9-2 Mapped Regional Ecosystems – Copperfield River substation

RE ID	Short Description ¹	VM Act Status	Biodiversity Status
9.11.15a	Woodland to low open woodland of <i>Eucalyptus crebra</i> or <i>Eucalyptus cullenii</i> +/- <i>Corymbia erythrophloia</i> or <i>Corymbia pocillum</i> +/- <i>Corymbia dallachiana</i> +/- <i>Erythrophleum chlorostachys</i> +/- <i>Eucalyptus microneura</i> . Occurs on low hills and rises with moderately deep soils derived from metamorphic geologies.	Least Concern	No Concern of Present
9.11.23b	Low open woodland to woodland of <i>Eucalyptus microneura</i> +/- <i>Eucalyptus cullenii</i> or <i>Eucalyptus crebra</i> often with <i>Melaleuca citrolens</i> and <i>Terminalia platyptera</i> in an open sub-canopy. Occurs on metamorphic hills.	Least Concern	No Concern of Present

¹ Description of REs as contained in the REDD Version 10.0 (Queensland Herbarium, 2016)

9.1.2.2 Mapped Category R vegetation

The eastern end of the proposed transmission line intersects with areas mapped as Category R vegetation. Category R vegetation is native woody vegetation, located within 50 m of a watercourse in the Burdekin, Mackay, Whitsunday and Wet Tropics Great Barrier Reef catchments.

No Category R vegetation is mapped in association with the Mount Fox, or Copperfield River substation sites.

9.1.2.3 Threatened Ecological Communities

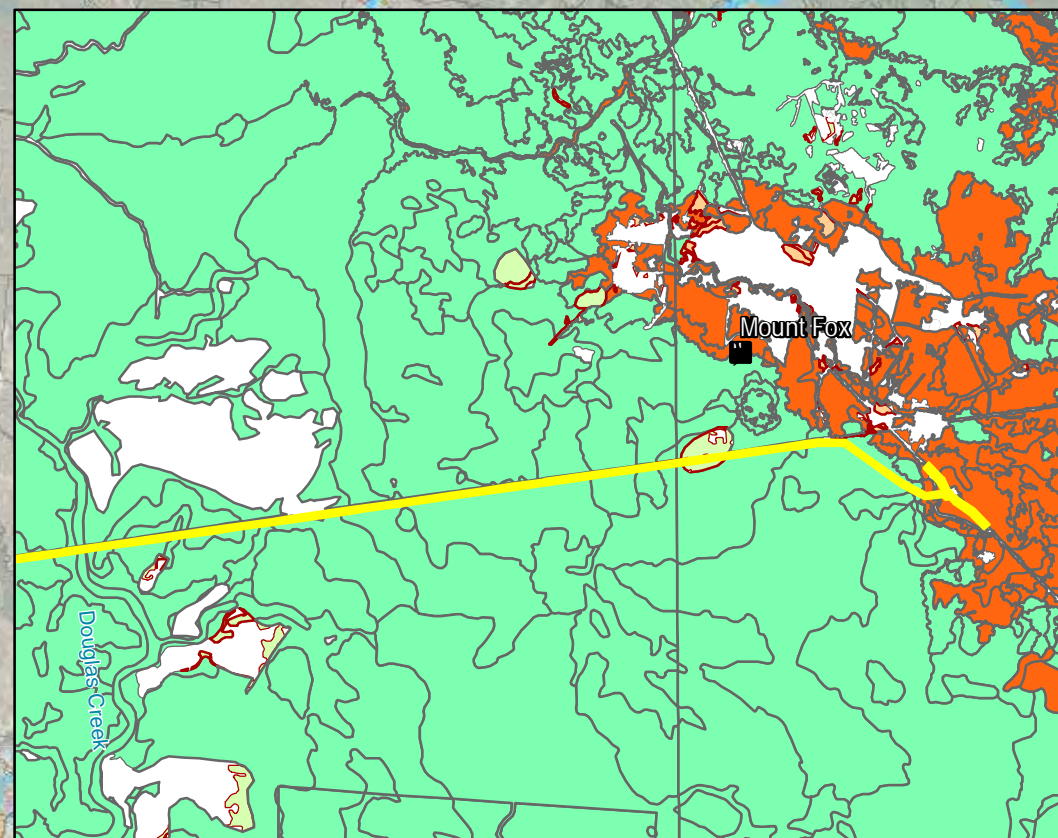
One Threatened Ecological Community (TEC) identified as Endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) was identified as having potential to occur within the transmission line easement corridor, and the Mount Fox substation site. This TEC is: broad leaf tea-tree (*Melaleuca viridiflora*) woodlands in high rainfall coastal north Queensland. In Queensland, this TEC corresponds to the following REs: 7.3.8a, 7.3.8b, 7.3.8c, 7.3.8d, 7.5.4g, 8.3.2a, 8.5.2c and 8.5.6.

No TECs are likely to occur within the Copperfield River substation site.

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
0 7.5 15 22.5 30
Kilometers
1:600,000 (when printed at A3)

Legend

- Places
- Regional Context Area
- Draft Alignment A
- Draft Alignment B
- Draft Alignment B
- Major Watercourses
- Major Roads
- Cadastral Boundaries
- Regional Ecosystems**
- Category A or B area containing of concern regional ecosystems
- Category A or B area that is a least concern regional ecosystem



Data sources:
DCDB, Roads, Watercourses, Regional Ecosystems - DNRM 2017
Site Features and Layout - AECOM 2018
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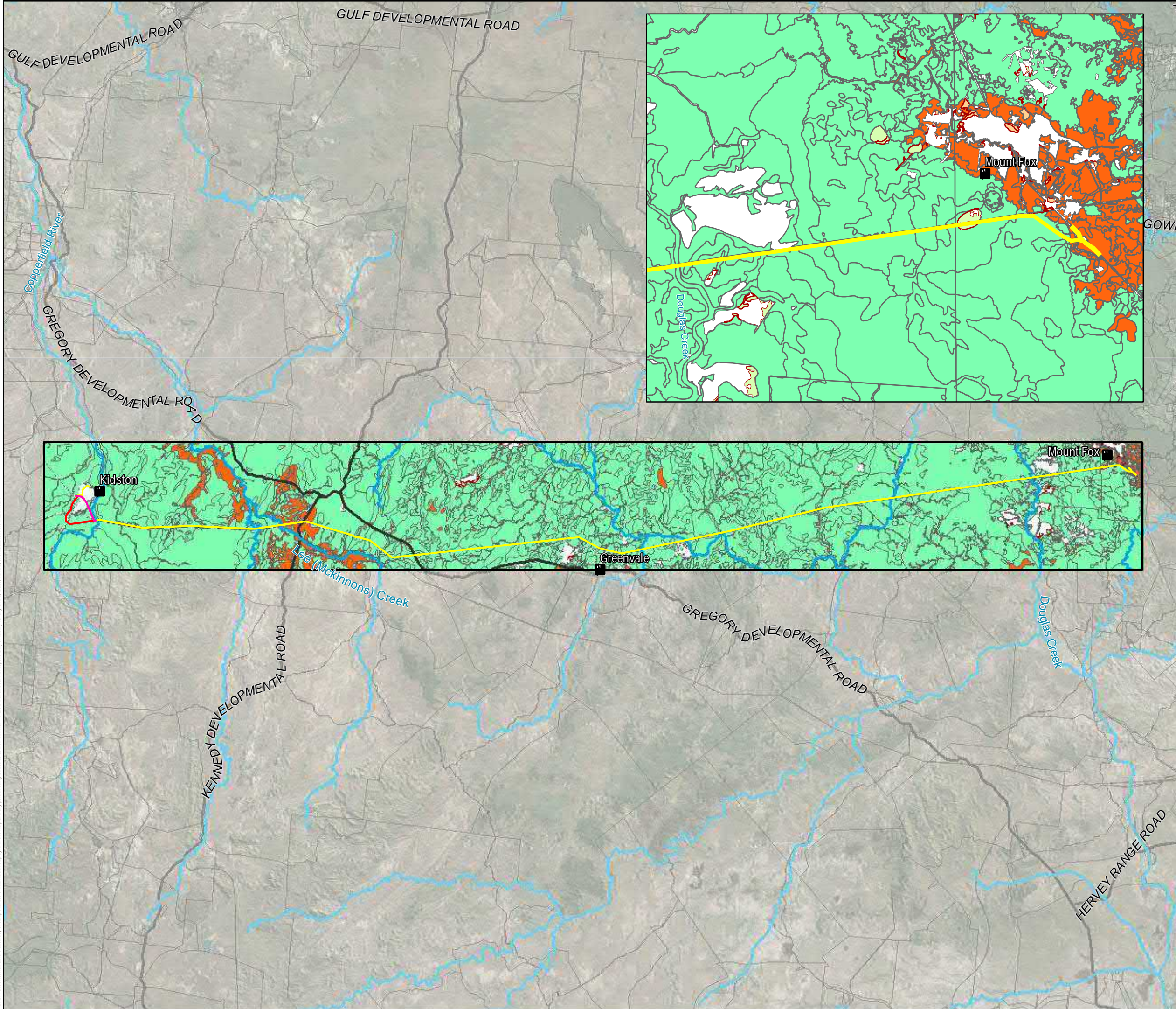
Kidston Connection Project

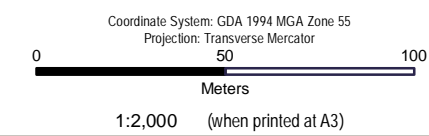
MAPPED REGIONAL ECOSYSTEMS

PROJECT ID: 60554486
CREATED BY: JR
LAST MODIFIED: CFS - 17/09/2018
VERSION: 2

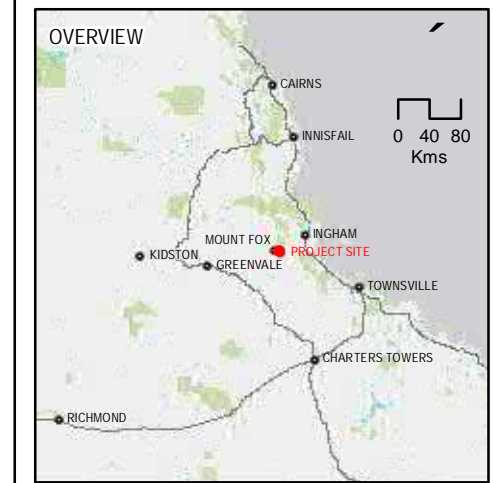
Figure
F9-1

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- Legend**
- Ergon Transmission Lines
 - Roads
 - Cadastral Boundaries
 - Project Site
- Regional Ecosystem**
- Category A or B area containing endangered
 - Category A or B area containing of concern
 - Category A or B area that is least concern



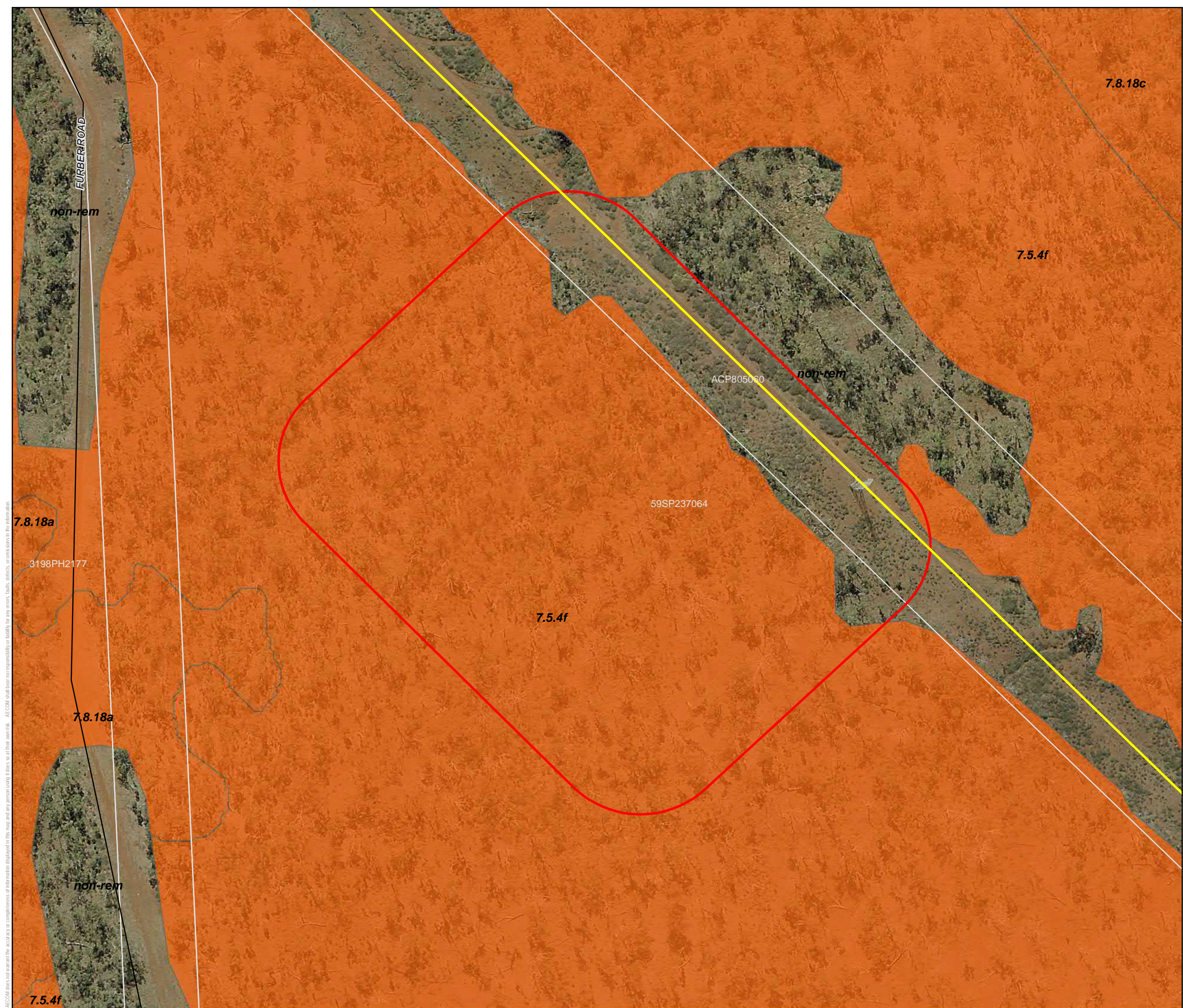
Data sources:
DCDB, Roads, Watercourses, Regional Ecosystems - DNRM 2018
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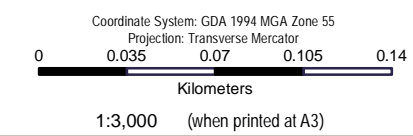
Kidston Connection Project

**MAPPED REGIONAL ECOSYSTEMS
MT FOX SUBSTATION**

PROJECT ID:	60577456	Figure F9-2
CREATED BY:	CFS	
LAST MODIFIED:	CFS - 13/09/2018	
VERSION:	1	

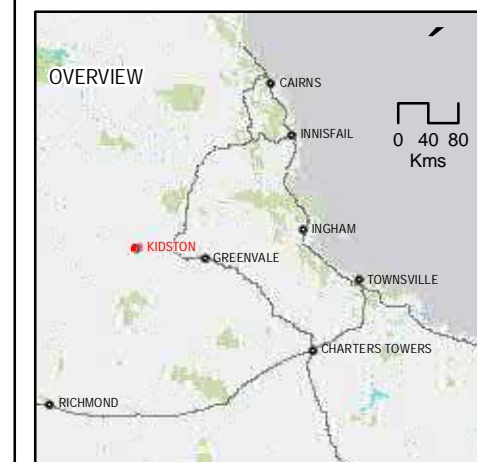


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Legend

- Point Of Interest
 - Major Roads
 - Major Watercourses
 - Regional Context Area
 - Draft Alignment B
 - 33/275kV Solar Farm Substation
- Regional Ecosystem
- Category A or B area containing endangered regional ecosystems
 - Category A or B area containing of concern regional ecosystems
 - Category A or B area that is a least concern regional ecosystem



Data sources:
DCDB, Roads, Watercourses, Regional Ecosystems - DNRM 2017
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**REGIONAL ECOSYSTEMS
COPPERFIELD RIVER**

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VERSION:	2	



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9.1.2.4 Conservation significant flora

The desktop assessment identified 13 conservation significant flora species with the potential to occur within the transmission line corridor. These species and their respective conservation status under the EPBC Act and NC Act are detailed in Table 9-3 below.

Table 9-3 Desktop results for conservation significant flora - transmission line

Common Name	Scientific Name	EPBC Act	NC Act
Cycads			
No common name	<i>Cycas cairnsiana</i>	Vulnerable	Vulnerable
Ferns			
No common name	<i>Lindsaea pulchella var. blanda</i>	Vulnerable	Extinct in the Wild
Higher Dicots			
Pink gidgee	<i>Acacia crombiei</i>	Vulnerable	Vulnerable
Tingoora wattle	<i>Acacia tingoorensis</i>	-	Vulnerable
No common name	<i>Cajanus mareebensis</i>	Endangered	-
No common name	<i>Leptospermum pallidum</i>	-	Near Threatened
No common name	<i>Marsdenia brevifolia</i>	Vulnerable	Vulnerable
No common name	<i>Tephrosia leveillei</i>	Vulnerable	Vulnerable
Monocots			
Miniature moss-orchid	<i>Bulbophyllum globuliforme</i>	Vulnerable	Near Threatened
No common name	<i>Corybas cerasinus</i>	-	Near Threatened
Bluegrass	<i>Dichanthium setosum</i>	Vulnerable	-
Lesser swamp-orchid	<i>Phaius australis</i>	Endangered	Endangered
No common name	<i>Phaius pictus</i>	Vulnerable	Vulnerable

The desktop assessment identified five conservation significant flora species with the potential to occur within the Mount Fox substation site. These species and their respective conservation status under the EPBC Act and NC Act are detailed in Table 9-4 below.

Table 9-4 Desktop results for conservation significant flora – Mount Fox substation

Common Name	Scientific Name	EPBC Act	NC Act
Ferns			
No common name	<i>Lindsaea pulchella var. blanda</i>	Vulnerable	Extinct in the Wild
Higher Dicots			
No common name	<i>Cajanus mareebensis</i>	Endangered	-
No common name	<i>Marsdenia brevifolia</i>	Vulnerable	Vulnerable
Monocots			
Bluegrass	<i>Dichanthium setosum</i>	Vulnerable	-

Common Name	Scientific Name	EPBC Act	NC Act
Lesser swamp-orchid	<i>Phaius australis</i>	Endangered	Endangered

The desktop assessment identified three threatened flora species as potentially present within the area of the Copperfield River substation. These species and their respective conservation status under the EPBC Act and NC Act are detailed in Table 9-5 below.

Table 9-5 Desktop results for conservation significant flora – Copperfield River substation

Common Name	Scientific Name	EPBC Act	NC Act
Cycads			
No common name	<i>Cycas cairnsiana</i>	Vulnerable	Vulnerable
Higher Dicots			
No common name	<i>Cajanus mareebensis</i>	Endangered	-
Monocots			
Bluegrass	<i>Dichanthium setosum</i>	Vulnerable	-

9.1.2.5 Essential habitat

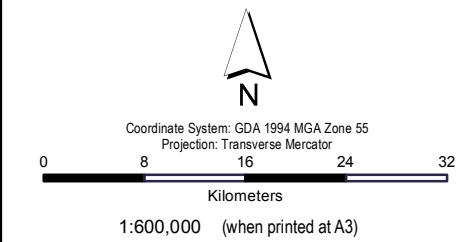
At the eastern end (Mount Fox), the transmission line easement corridor is adjacent to an area mapped as essential habitat for the conservation significant flora species *Acacia tingoorensis* (Tingoorra wattle) Figure 9-4. This species is listed as Vulnerable under the NC Act.

No essential habitat is mapped on the Copperfield River or Mount Fox substation sites.

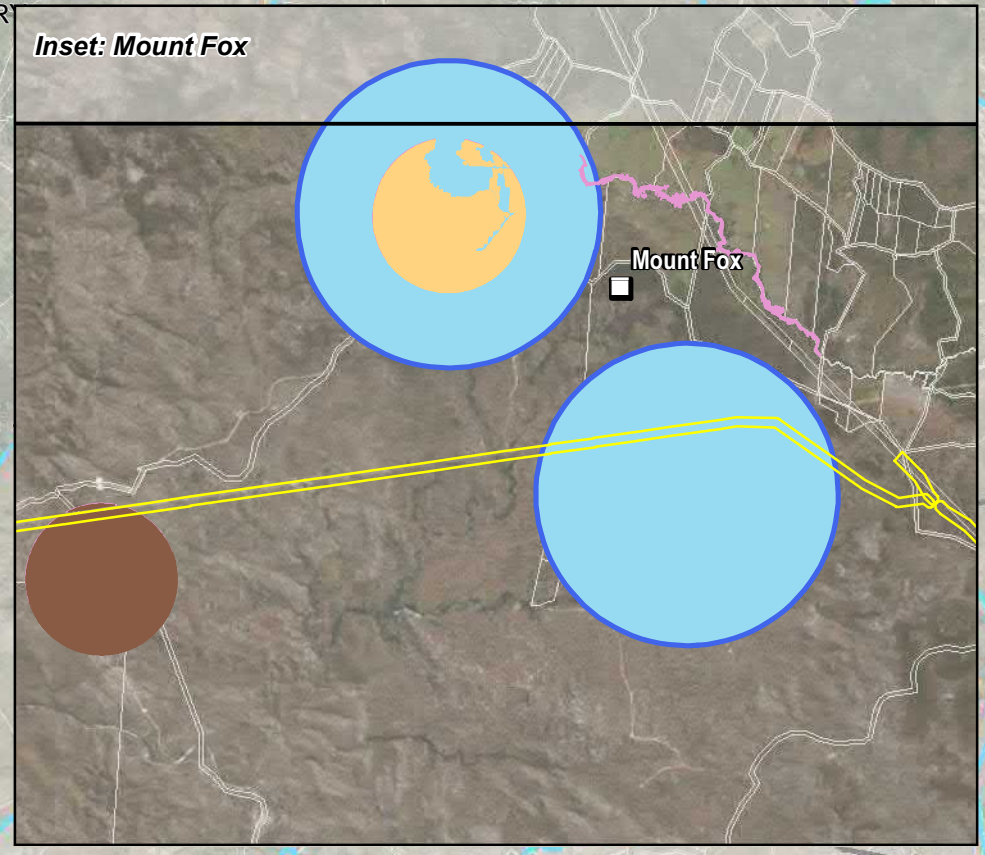
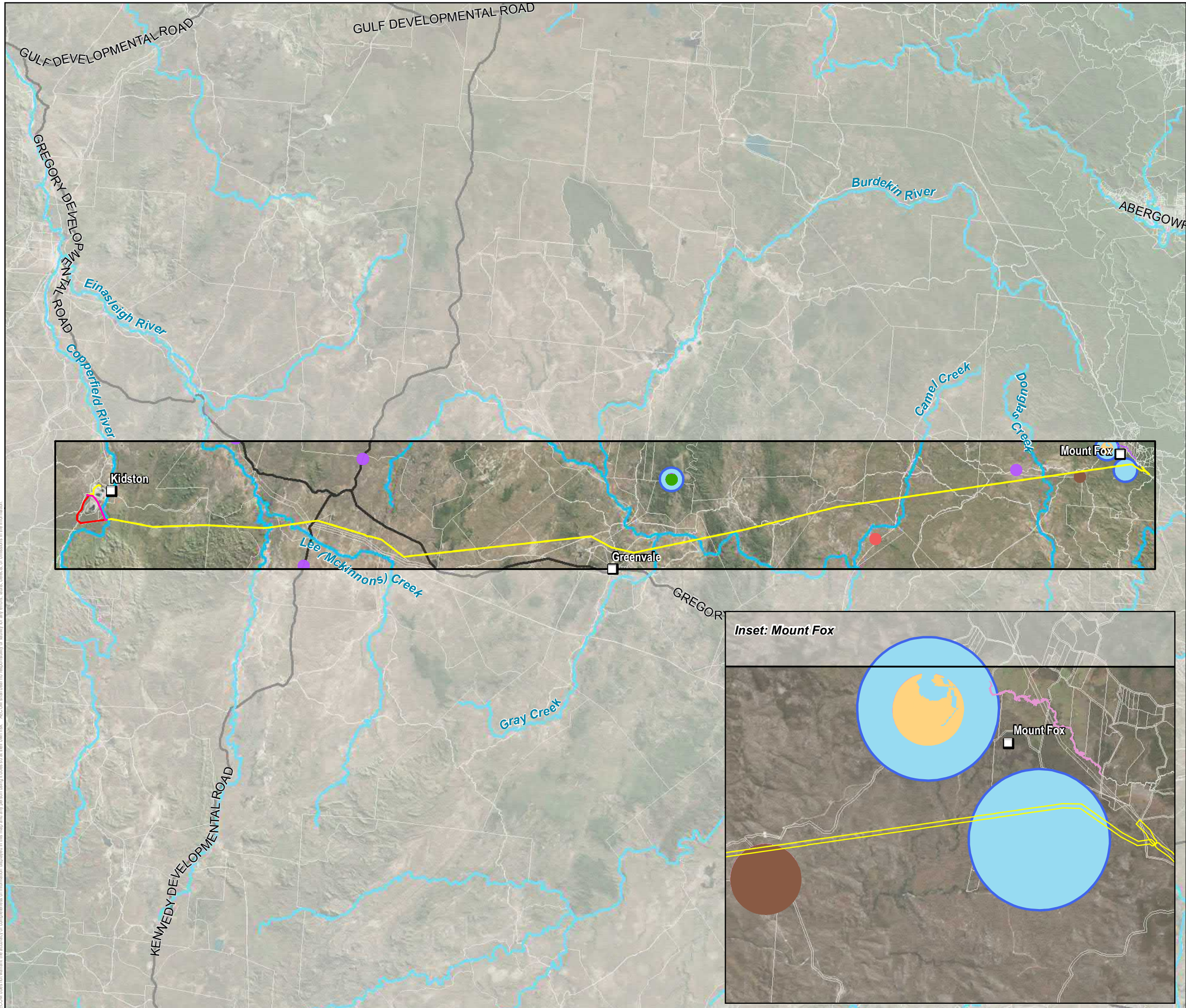
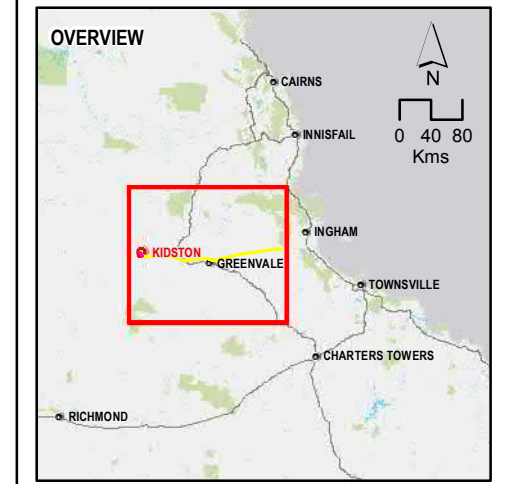
9.1.2.6 Protected plants

Part of the proposed transmission line at the eastern end is mapped as a high risk area on the protected plants flora survey trigger map (Figure 9-4). A protected plants survey was undertaken in this area and a separate Protected Plants Survey Report detailing the results of this survey has been prepared for the Project.

No protected plants trigger areas were identified in association with the Copperfield River, or Mount Fox substation sites.



- Legend**
- Point Of Interest
 - Major Roads
 - Major Watercourses
 - ▭ Regional Context Area
 - ▭ Draft Alignment
 - ▭ Draft Alignment A
 - ▭ Draft Alignment B
 - ▭ Flora Survey Trigger Area
- Essential Habitat**
- ▭ *Acacia tingoorensis* (Tingoora wattle)
 - ▭ *Lepturus minutus*
 - ▭ Sharman's rock-wallaby (*Petrogale sharmani*)
 - ▭ Black-throated finch (southern) (*Poephila cincta cincta*)
 - ▭ Short-beaked echidna (*Tachyglossus aculeatus*)



Data sources:
DCDB, Watercourses - DNRM 2017
Wildlife Habitat, Essential Habitat - DEHP 2017
Site Features and Layout - AECOM 2018
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**TRANSMISSION LINE
MAPPED ESSENTIAL HABITAT**

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VERSION:	2	

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9.1.3 Field survey results

Due to landholder access restrictions, Lot 5234 SP275834 and Lot 1 OC64 have only been surveyed where public roads cross the Draft Alignment. All other properties traversed by the Draft Alignment have been assessed during at least one of the field surveys. On the basis of the above, this Draft EAR adopts a conservative mitigation and impacts assessment regime for these lots. It has been assumed certain flora species may be present based on habitat modelling, and measures are proposed to mitigate potential impacts.

9.1.3.1 Species diversity

The field surveys identified 281 flora species from 57 families. The dominant plant families recorded were Poaceae (45 species), followed by Fabaceae (32 species), Myrtaceae (32 species) and Mimosaceae (24 species). The full species list is provided in Appendix E Ecology (Substation) Technical Report and Appendix F Ecology (Transmission Line) Technical Report.

9.1.3.2 Regional Ecosystems

Thirty one (31) REs were confirmed during the field surveys for the proposed transmission line. The full list, and status under the VM Act, is provided in Table 9-6 and presented in Figure 9-5. The transmission line corridor was dominated by remnant *Eucalyptus* woodland and open forests with undulating hills and large ephemeral creeks. Dominant canopy species include *Eucalyptus crebra* (narrow-leaved ironbark), *Eucalyptus persistens*, *Eucalyptus brownii* (Brown's box), *Eucalyptus camaldulensis* (river red gum), *Eucalyptus microneura* (Georgetown box), *Corymbia dallachiana* (Dallachy's gum), *Corymbia confertiflora* (rough leaf cabbage gum), and *Corymbia erythrophloia* (variable-barked bloodwood).

The transmission line easement corridor is relatively uniform in vegetation characteristics; however several distinct communities are present. These include the riparian community associated with the major creeks, *Acacia shirleyi* woodland on laterite jump ups, a rocky outcrop on basalt, hills on igneous rocks and non-remnant vegetation in cattle yards, access tracks and the existing powerline easement.

Table 9-6 Field-verified REs within the Draft Alignment – transmission line corridor

RE ID	Short Description ¹	VM Act Status
7.8.18	<i>Corymbia intermedia</i> and/or <i>Lophostemon suaveolens</i> ± <i>Allocasuarina torulosa</i> open forest to woodland on basalt.	Of Concern
7.12.29	<i>Corymbia intermedia</i> and/or <i>Lophostemon suaveolens</i> open forest to woodland ± areas of <i>Allocasuarina littoralis</i> and <i>Allocasuarina torulosa</i> on uplands on granite and rhyolite.	Least Concern
9.3.1	<i>Eucalyptus camaldulensis</i> and/or <i>Eucalyptus tereticornis</i> +/- <i>Melaleuca</i> spp. +/- <i>Casuarina cunninghamiana</i> fringing woodland on channels and levees.	Least Concern
9.3.3	<i>Corymbia</i> spp. and <i>Eucalyptus</i> spp. dominated mixed woodland on alluvial flats, levees and plains.	Least Concern
9.3.3a	Floodplain (other than floodplain wetlands). Woodland to low open woodland of <i>Eucalyptus leptophleba</i> +/- <i>Eucalyptus platyphylla</i> (poplar gum) +/- <i>Corymbia confertiflora</i> +/- <i>Eucalyptus crebra</i> or <i>Eucalyptus cullenii</i> +/- <i>Corymbia clarksoniana</i> .	Least Concern
9.3.5	<i>Eucalyptus brownii</i> +/- <i>Eucalyptus</i> spp. +/- <i>Corymbia</i> spp. open woodland on alluvial plains.	Least Concern
9.3.6a	Woodland to open woodland of <i>Eucalyptus platyphylla</i> +/- <i>Corymbia clarksoniana</i> +/- <i>Corymbia tessellaris</i> +/- <i>Eucalyptus tereticornis</i> .	Least Concern
9.3.13	<i>Melaleuca</i> spp., <i>Eucalyptus camaldulensis</i> and <i>Casuarina cunninghamiana</i> fringing open forest on streams and channels.	Least Concern

RE ID	Short Description ¹	VM Act Status
9.3.16	<i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus platyphylla</i> and/or <i>Corymbia clarksoniana</i> woodland on alluvial flats, levees and plains.	Least Concern
9.3.20	<i>Eucalyptus microneura</i> +/- <i>Corymbia</i> spp. +/- <i>Eucalyptus leptophleba</i> woodland on alluvial plains.	Least Concern
9.3.22a	Open woodland to woodland of <i>Eucalyptus crebra</i> , <i>Corymbia clarksoniana</i> and/or <i>Corymbia dallachiana</i> +/- <i>Eucalyptus platyphylla</i> +/- <i>Eucalyptus brownii</i> +/- <i>Eucalyptus</i> spp. on levees, terraces and banks of larger rivers and on flat to very gentle slopes associated with drainage lines.	Least Concern
9.3.25	<i>Dichanthium</i> spp., and/or <i>Astrebla</i> spp. +/- <i>Iseilema</i> spp. grassland on alluvial deposits derived from basalt soils.	Least Concern
9.5.3	<i>Eucalyptus crebra</i> or <i>Eucalyptus drepanophylla</i> and <i>Corymbia clarksoniana</i> woodland on sand plains.	Least Concern
9.5.11	<i>Eucalyptus persistens</i> +/- <i>Eucalyptus crebra</i> woodland on flats on Tertiary remnant plains.	Least Concern
9.7.1	<i>Eucalyptus persistens</i> woodland on lateritised and deeply weathered surfaces on undulating terrain.	Least Concern
9.7.2	<i>Acacia shirleyi</i> low open forest on mesas and lateritised surfaces.	Least Concern
9.8.1	Open woodland to woodland of <i>Eucalyptus crebra</i> +/- <i>Corymbia erythrophloia</i> +/- <i>Corymbia dallachiana</i> +/- <i>Corymbia</i> spp. +/- <i>Eucalyptus</i> spp. on basalt plains and rocky basalt plains and hills with varying depths of soil.	Least Concern
9.8.4	<i>Eucalyptus crebra</i> and/or <i>Eucalyptus tereticornis</i> open woodland on basalt plains.	Least Concern
9.8.13	<i>Iseilema</i> spp. and/or <i>Dichanthium</i> spp. tussock grassland on basalt plains.	Least Concern
9.11.1a	Low woodland to low open woodland of <i>Eucalyptus melanophloia</i> +/- <i>Eucalyptus persistens</i> +/- <i>Eucalyptus crebra</i> +/- <i>Corymbia dallachiana</i> +/- <i>Corymbia peltata</i> +/- <i>Eucalyptus brownii</i> +/- <i>Acacia julifera</i> on skeletal soils of slopes and crests of undulating rises and low hills of folded metasediments and other metamorphic rocks.	Least Concern
9.11.2a	Woodland to open woodland of <i>Eucalyptus crebra</i> +/- <i>Corymbia dallachiana</i> +/- <i>Corymbia erythrophloia</i> +/- <i>Corymbia clarksoniana</i> +/- <i>Eucalyptus</i> spp. +/- <i>Corymbia</i> spp. on metamorphic hills and rises.	Least Concern
9.11.5	<i>Eucalyptus persistens</i> +/- <i>Eucalyptus crebra</i> woodland on low metamorphic hills.	Least Concern
9.11.15a	Woodland to low open woodland of <i>Eucalyptus crebra</i> or <i>Eucalyptus cullenii</i> +/- <i>Corymbia erythrophloia</i> or <i>Corymbia pocillum</i> +/- <i>Corymbia dallachiana</i> +/- <i>Erythrophleum chlorostachys</i> +/- <i>Eucalyptus microneura</i> on low hills and rises with moderately deep soils derived from metamorphic geologies.	Least Concern
9.11.16	<i>Eucalyptus crebra</i> +/- <i>Corymbia erythrophloia</i> or <i>Corymbia pocillum</i> woodland on steep to rolling hills.	Least Concern

RE ID	Short Description ¹	VM Act Status
9.11.23b	Low open woodland to woodland of <i>Eucalyptus microneura</i> +/- <i>Eucalyptus cullenii</i> or <i>Eucalyptus crebra</i> on metamorphic hills.	Least Concern
9.12.1a	Woodland to low open woodland of <i>Eucalyptus crebra</i> +/- <i>Corymbia dallachiana</i> +/- <i>Corymbia erythrophloia</i> +/- <i>Corymbia clarksoniana</i> +/- <i>Corymbia</i> spp. <i>Eucalyptus exilipes</i> or <i>Eucalyptus granitica</i> can sometimes occur as a dominant.	Least Concern
9.12.10	<i>Corymbia confertiflora</i> and <i>Eucalyptus crebra</i> +/- <i>Corymbia clarksoniana</i> open woodland on rolling igneous hills.	Of Concern
9.12.12	<i>Eucalyptus crebra</i> and <i>Corymbia erythrophloia</i> ± <i>Eucalyptus microneura</i> open woodland on igneous rocks.	Least Concern
9.12.16	<i>Eucalyptus crebra</i> and <i>Corymbia dallachiana</i> +/- <i>Corymbia erythrophloia</i> open woodland on pre-Cainozoic basalt loams and flats to undulating plains.	Of Concern
9.12.26	<i>Eucalyptus moluccana</i> ± <i>Eucalyptus crebra</i> and/or <i>Eucalyptus granitica</i> woodland on igneous rocks.	Of Concern
9.12.32	<i>Eucalyptus persistens</i> woodland on rhyolites and granites.	Least Concern

¹ Description of REs as contained in the REDD Version 10.0 (Queensland Herbarium, 2016)

One RE was identified within the Mount Fox substation site during the field survey (Table 9-7). This RE is listed as Of Concern under the VM Act. This RE was ground truthed to be different to that identified in the desktop assessment (Refer Table 9-1 and Figure 9-6). Non-remnant vegetation occurs underneath the existing Ergon easement.

The vegetation within the Mount Fox substation site was uniform and was dominated by *Corymbia intermedia* (pink bloodwood), with *Lophostemon suaveolens* (swamp mahogany) and occasional *Corymbia tessellaris* (Moreton Bay ash). The shrub layer contained occasional *Corymbia* and *Eucalypt* spp., *Acacia flavescens* (yellow wattle), and majority of the site contained very dense *Lantana camara* (lantana) in both the shrub and ground layers. The non-remnant vegetation also contained dense *Lantana camara* (lantana).

Table 9-7 Ground-truthed REs within the Mount Fox substation site.

RE ID	Short Description ¹	VM Act Status	Biodiversity Status
7.8.18	<i>Corymbia intermedia</i> and/or <i>Lophostemon suaveolens</i> +/- <i>Allocasuarina torulosa</i> open forest to woodland on basalt	Of Concern	Of Concern

¹ Description of REs as contained in the REDD Version 10.0 (Queensland Herbarium, 2016)

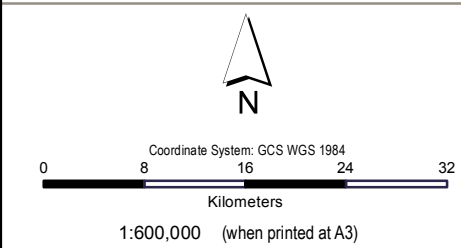
The site has been modified for agricultural purposes. Retained vegetation has been affected by tree thinning, the introduction of cattle for grazing, and the spread of exotic weeds. Evidence of a recent fire was also observed, with a number of large remaining trees containing fire scars, as well as a high number of burnt fallen trees.

One RE was identified across the Copperfield River substation site during the field survey (Table 9-8). This RE is listed as Least Concern under the VM Act. The ground truthed RE results differs to that of the desktop results, by identifying RE 9.12.12 as the only RE being present (refer Table 9-2 and Figure 9-7).

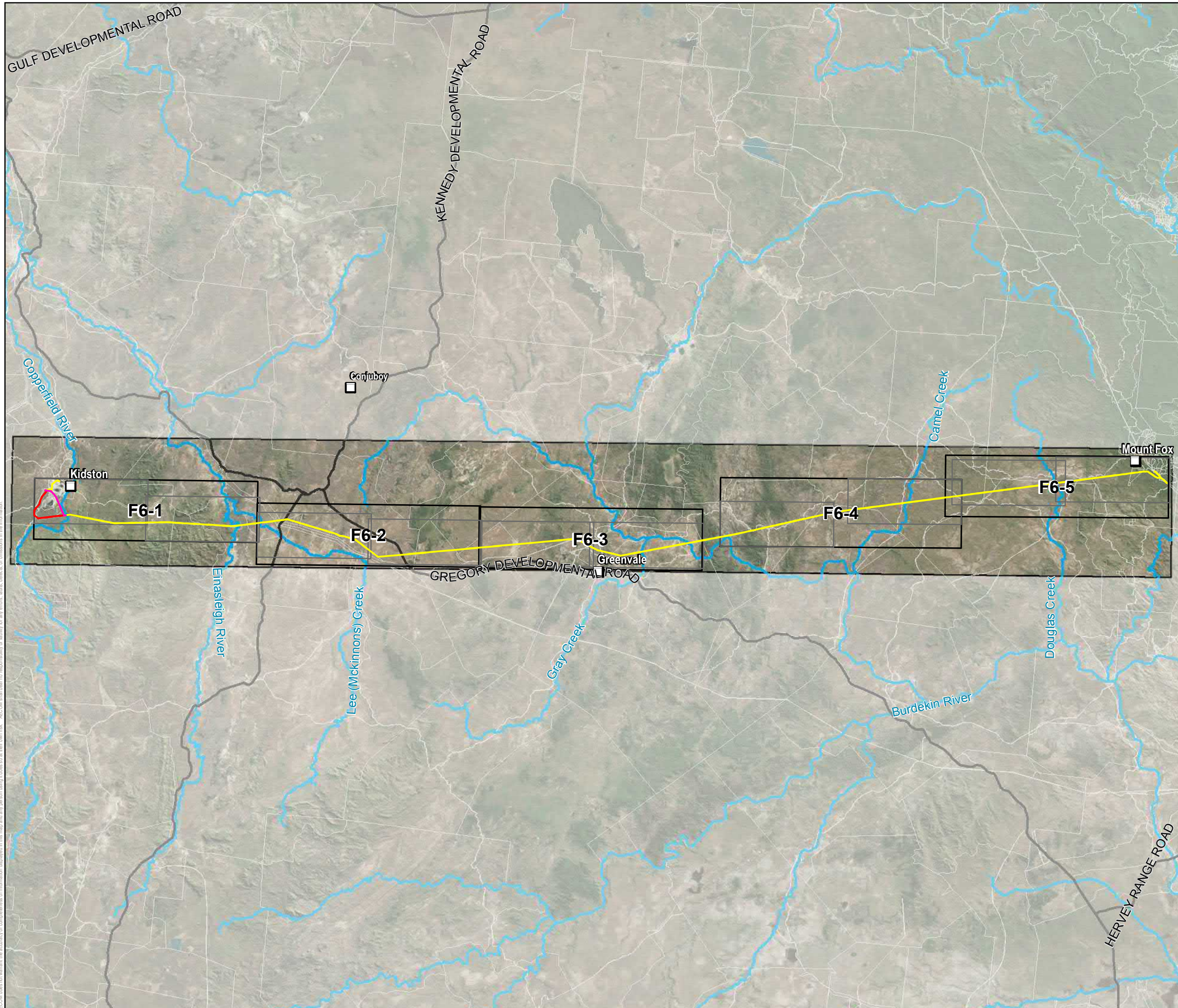
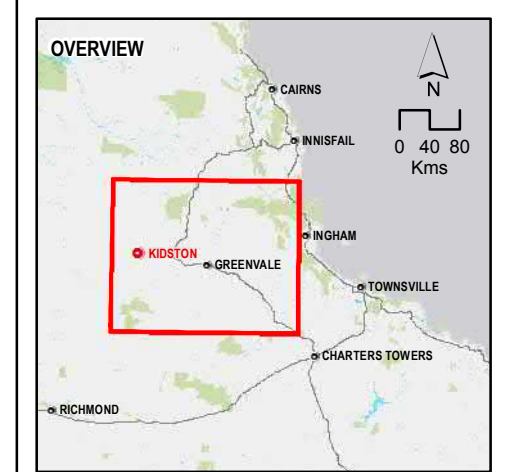
Table 9-8 Ground-truthed REs within the Copperfield River substation site

RE ID	Short Description ¹	VM Act Status	Biodiversity Status
9.12.12	<i>Eucalyptus crebra</i> and <i>Corymbia erythrophloia</i> +/- <i>E. microneura</i> open woodland on igneous rocks	Least Concern	Not of Concern at Present

¹ Description of REs as contained in the REDD Version 10.0 (Queensland Herbarium, 2016)



- Legend**
- Point Of Interest
 - Major Roads
 - Major Watercourses
 - Cadastral Boundaries
 - Regional Context Area
 - Draft Alignment
 - Draft Alignment A
 - Draft Alignment B
- Field Verified Regional Ecosystems**
- Of Concern RE
 - Least Concern RE
 - Non Remnant



Data sources:
DCDB, Roads, Watercourses - DNRM 2017
Site Features and Layout - AECOM 2018
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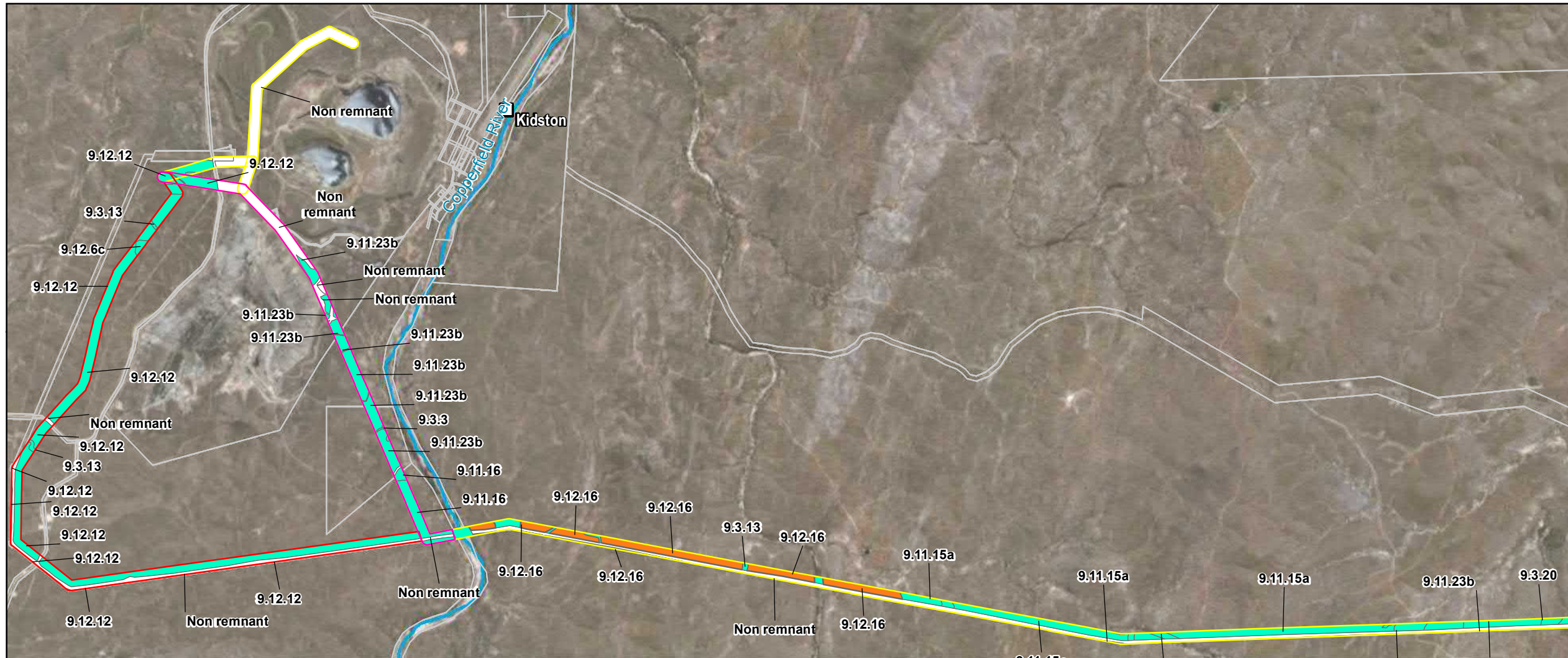
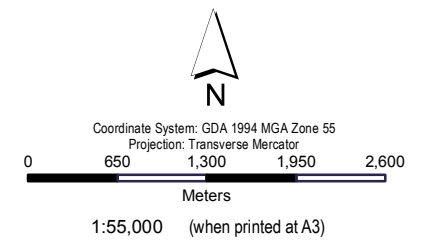
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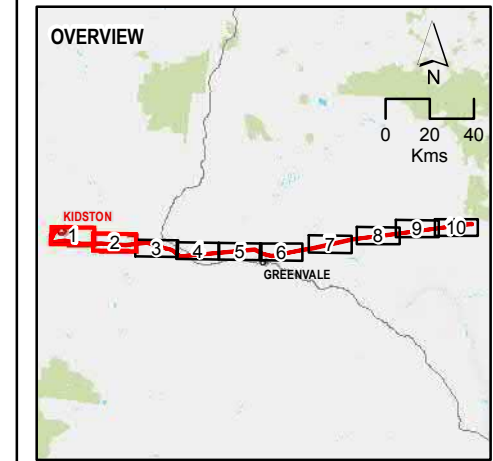
**TRANSMISSION LINE
GROUND TRUTHED
REGIONAL ECOSYSTEMS**

PROJECT ID: 60577456	Figure F9-5
CREATED BY: JB	
LAST MODIFIED: CFS - 18/09/2018	
VERSION: 1	

Filename: Document Path: \austv1\p001\projects\605X\60577456\4_Tech Work Area\4.99 GIS\02_MXD\Electrical Transmission Line Report\USE60577456_006_FieldVerifiedEcosystems_A3L_Fig6_v4_Overview.mxd



- Legend**
- Point Of Interest
 - Major Roads
 - Major Watercourses
 - Cadastral Boundaries
 - ▭ Regional Context Area
 - ▭ Draft Alignment
 - ▭ Draft Alignment A
 - ▭ Draft Alignment B
- Field Verified Regional Ecosystems**
- ▭ Of Concern RE
 - ▭ Least Concern RE
 - ▭ Non Remnant



Data sources:
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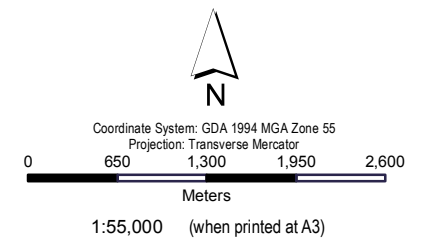
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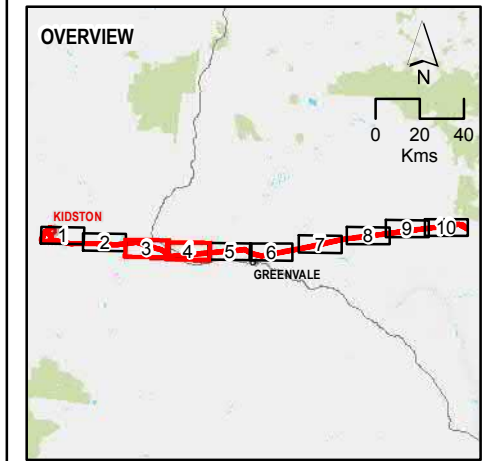
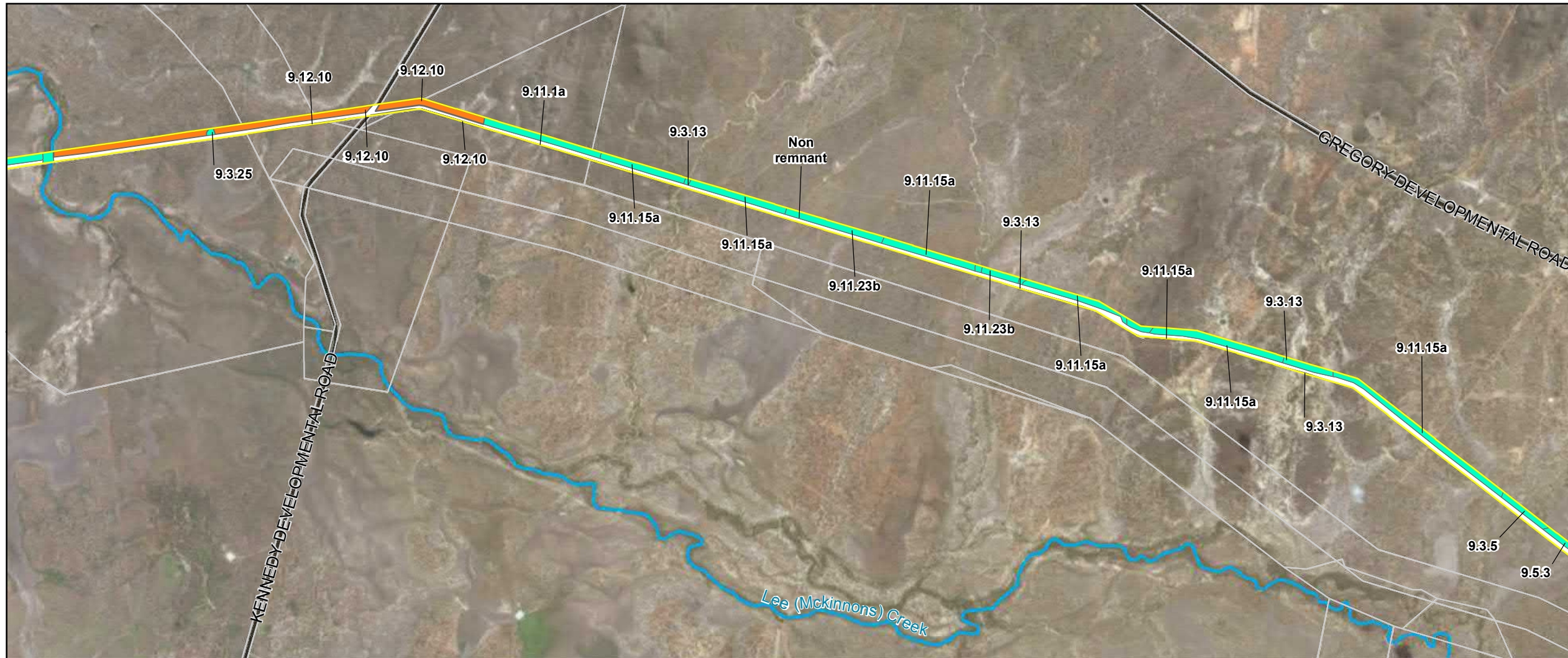
**TRANSMISSION LINE
GROUND TRUTHED
REGIONAL ECOSYSTEMS**

PROJECT ID:	60554486	Figure F9-5A
CREATED BY:	JR	
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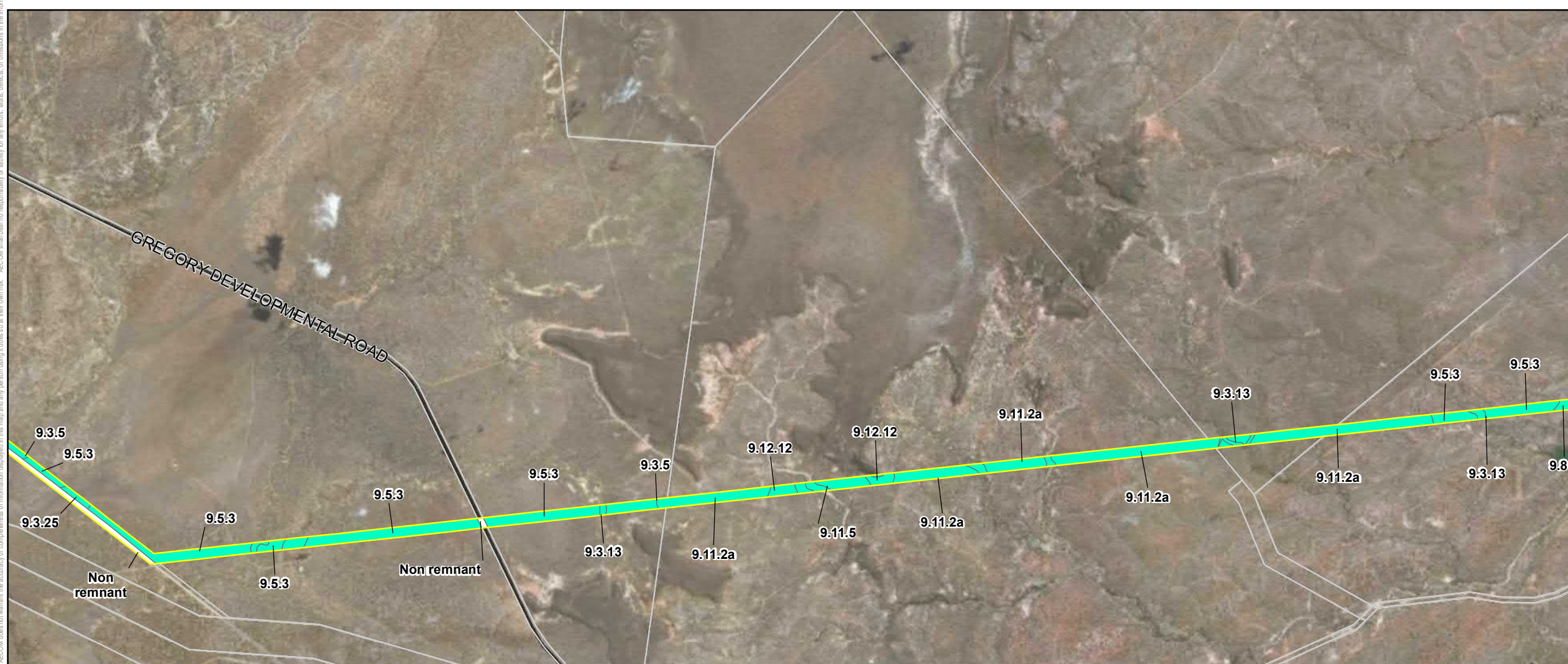


- Legend**
- Point Of Interest
 - Major Roads
 - Major Watercourses
 - Cadastral Boundaries
 - ▭ Regional Context Area
 - ▭ Draft Alignment
 - ▭ Draft Alignment A
 - ▭ Draft Alignment B
- Field Verified Regional Ecosystems**
- ▭ Of Concern RE
 - ▭ Least Concern RE
 - Non Remnant



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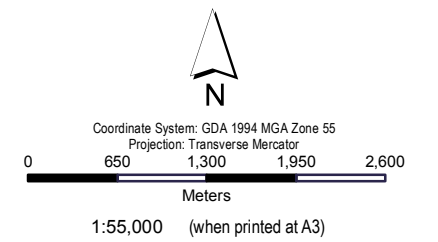


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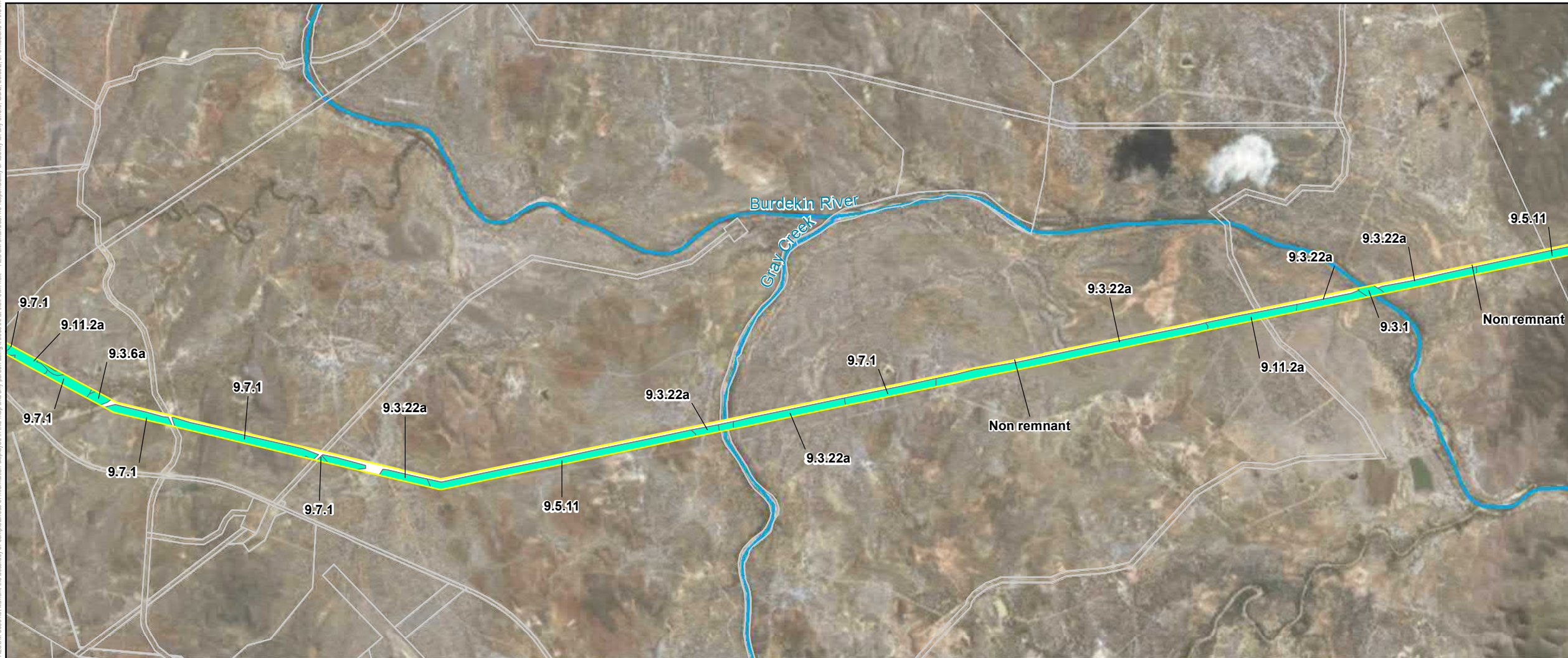
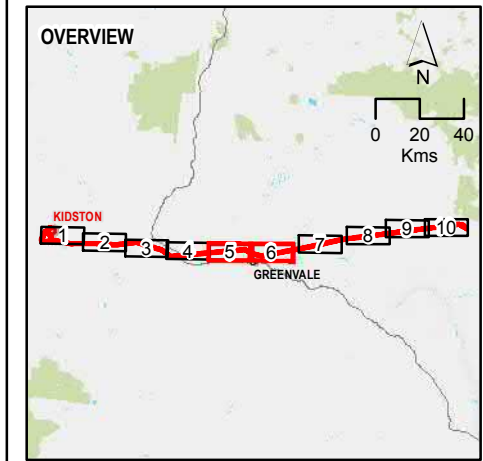
**TRANSMISSION LINE
GROUND TRUTHED
REGIONAL ECOSYSTEMS**

PROJECT ID:	60554486	Figure F9-5B
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- Legend**
- Point Of Interest
 - Major Roads
 - Major Watercourses
 - Cadastral Boundaries
 - ▭ Regional Context Area
 - ▭ Draft Alignment
 - ▭ Draft Alignment A
 - ▭ Draft Alignment B
 - Field Verified Regional Ecosystems**
 - ▭ Of Concern RE
 - ▭ Least Concern RE
 - ▭ Non Remnant



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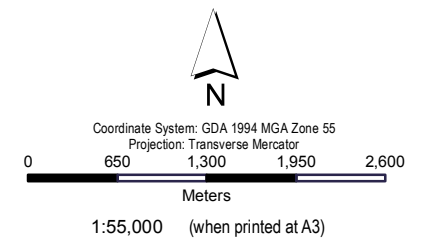
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**TRANSMISSION LINE
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REGIONAL ECOSYSTEMS**

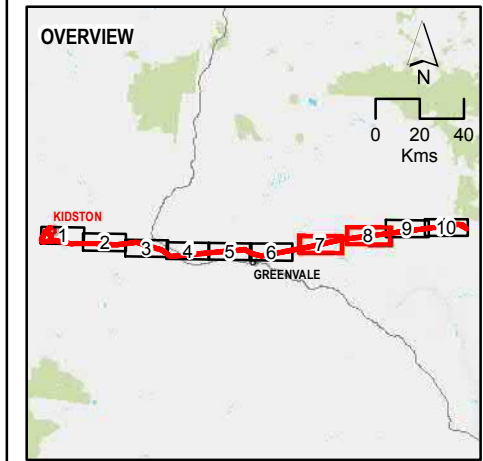
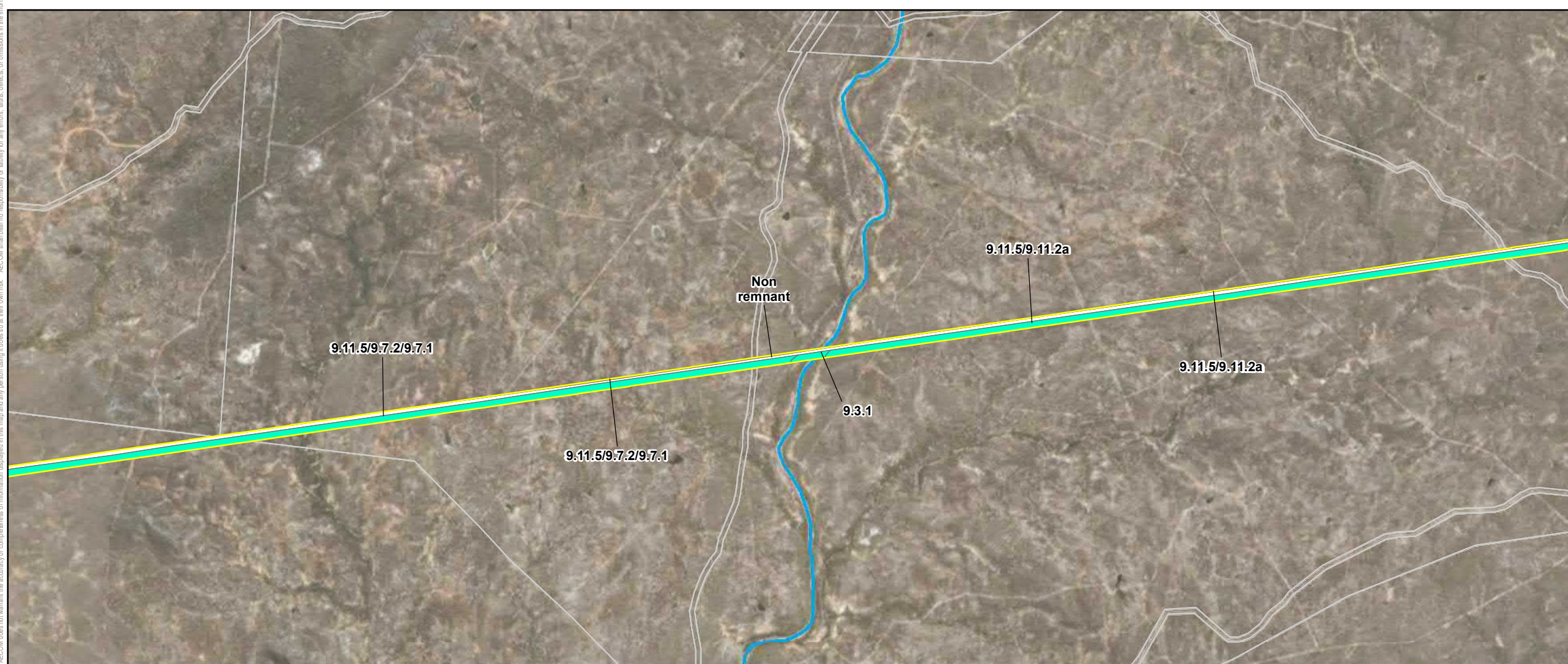
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Legend

- Point Of Interest
- Major Roads
- Major Watercourses
- Cadastral Boundaries
- Regional Context Area
- Draft Alignment
- Draft Alignment A
- Draft Alignment B
- Field Verified Regional Ecosystems**
- Of Concern RE
- Least Concern RE
- Non Remnant



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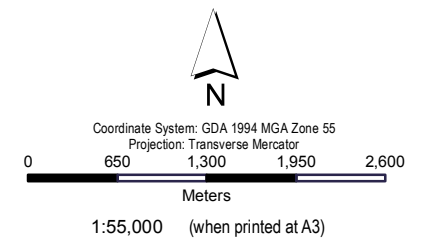
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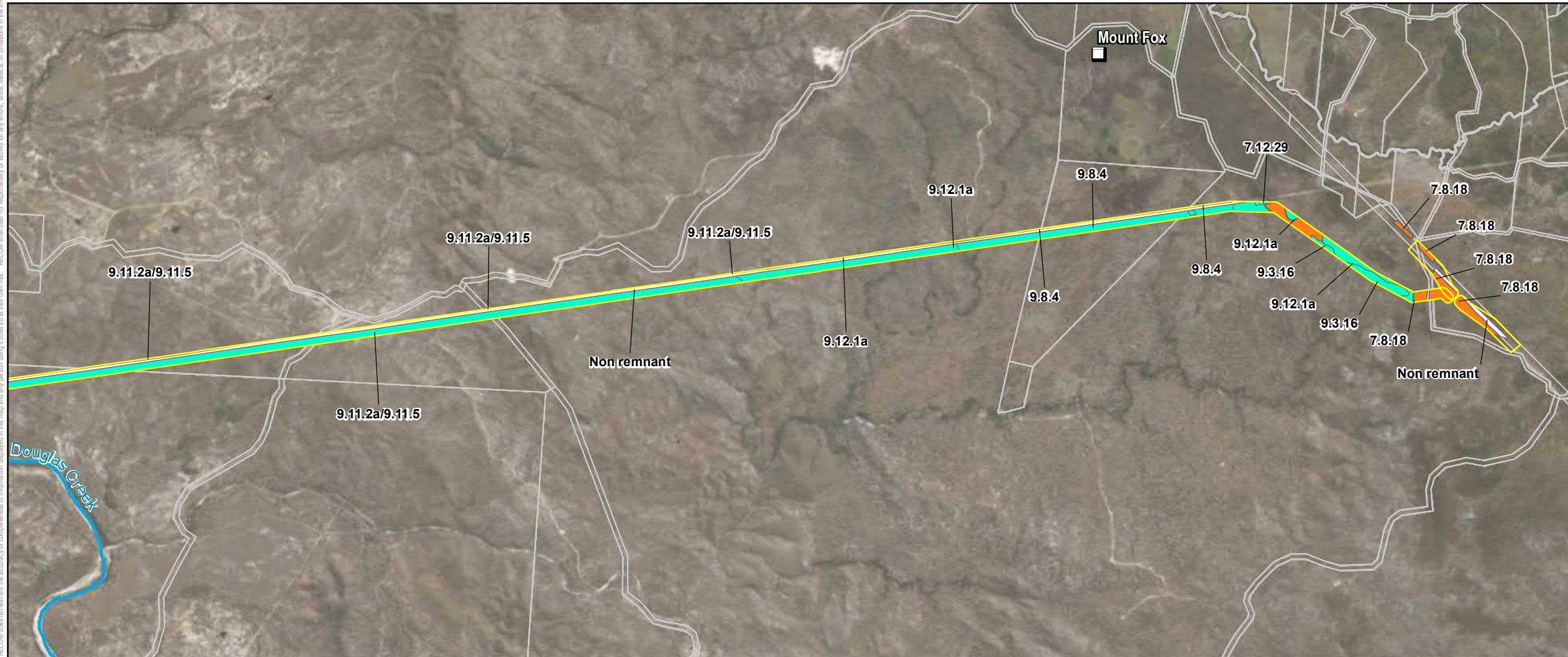
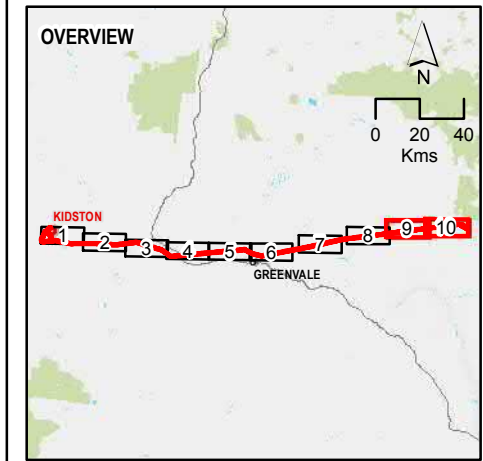
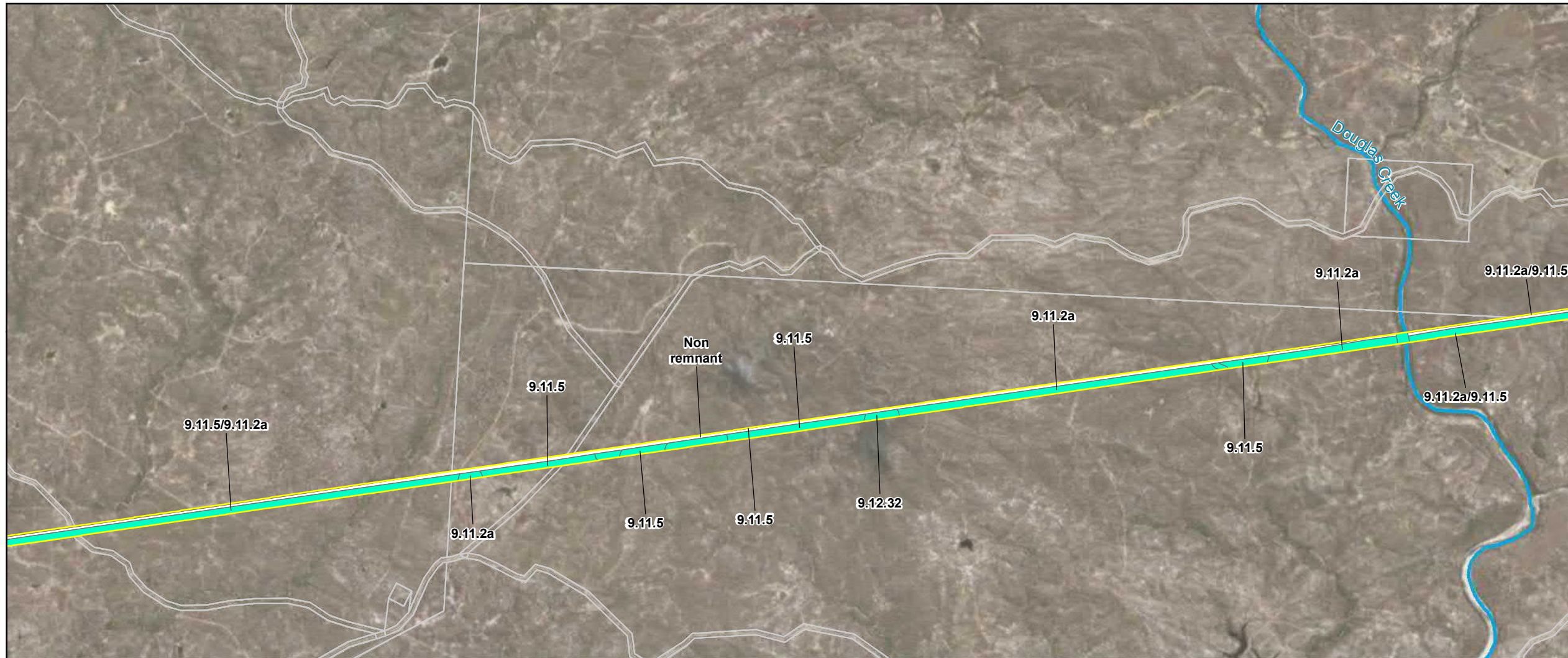
**TRANSMISSION LINE
GROUND TRUTHED
REGIONAL ECOSYSTEMS**

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- Legend**
- Point Of Interest
 - Major Roads
 - Major Watercourses
 - Cadastral Boundaries
 - ▭ Regional Context Area
 - ▭ Draft Alignment
 - ▭ Draft Alignment A
 - ▭ Draft Alignment B
- Field Verified Regional Ecosystems**
- ▭ Of Concern RE
 - ▭ Least Concern RE
 - ▭ Non Remnant



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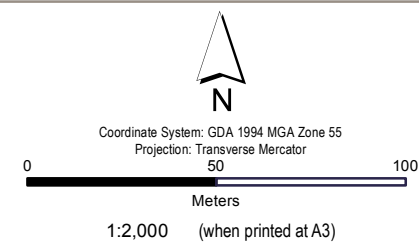
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**TRANSMISSION LINE
GROUND TRUTHED
REGIONAL ECOSYSTEMS**

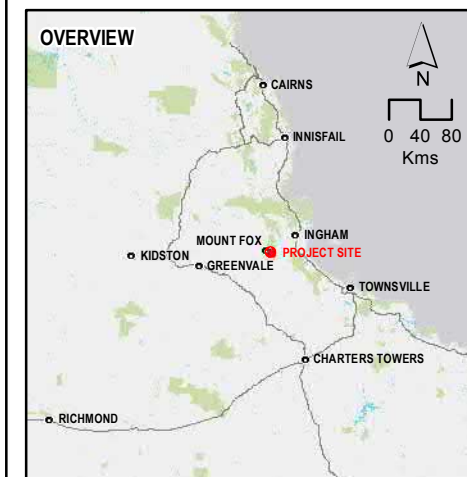
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CREATED BY:	JR	
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VERSION:	2	

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Legend

- Ergon Transmission Lines
- Roads
- Cadastral Boundaries
- Project Site
- Ground-Truthed Regional Ecosystems**
- Category A or B Area Containing of Concern
- Non-remnant
- Habitat Type**
- Open forest of *Corymbia intermedia*,
- Lophostemon suaveolens* and *Corymbia tessellaris* on basalt



Data sources:
DCDB, Roads, Watercourses - DNRM 2018
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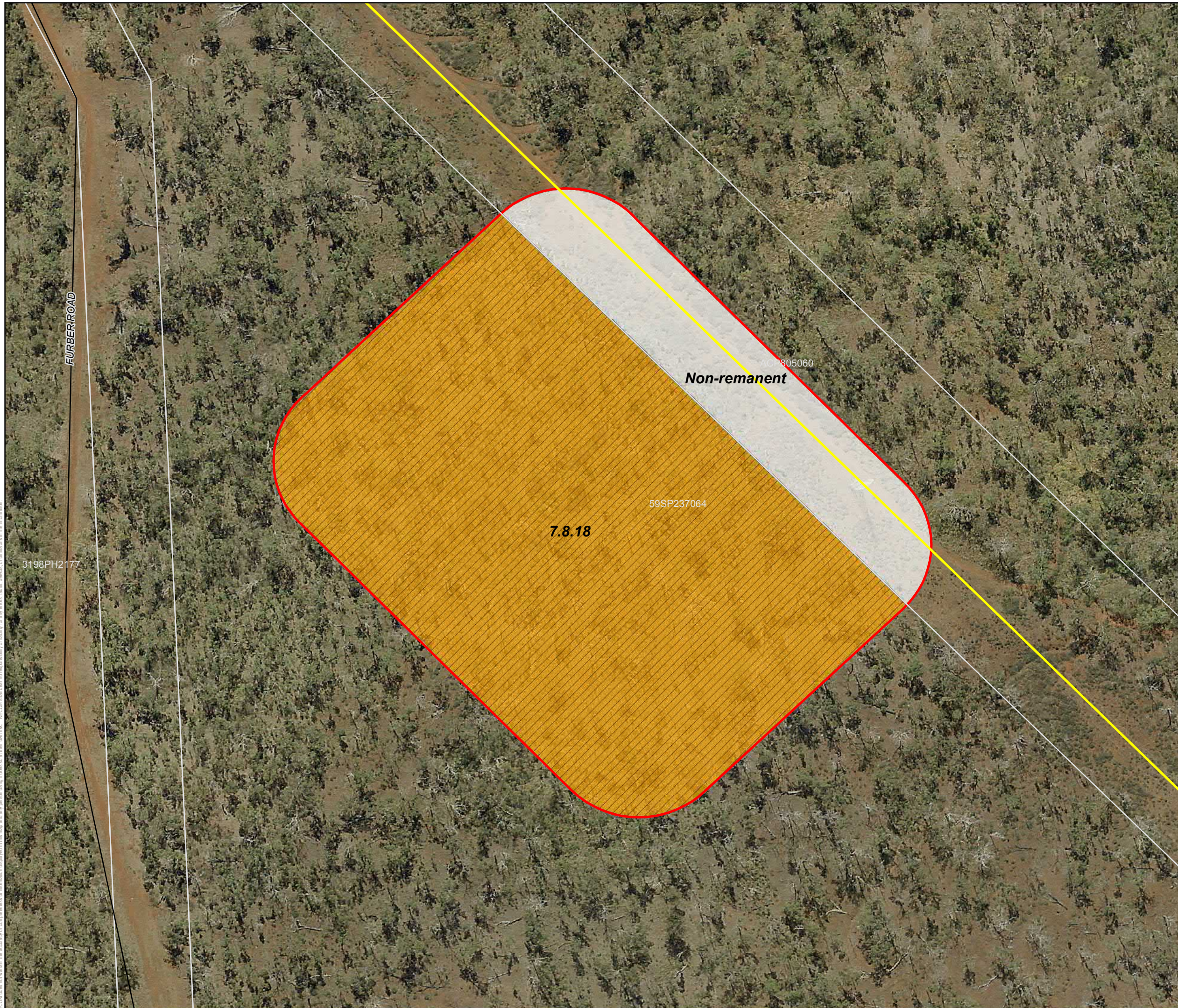
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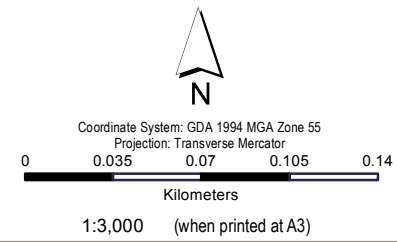
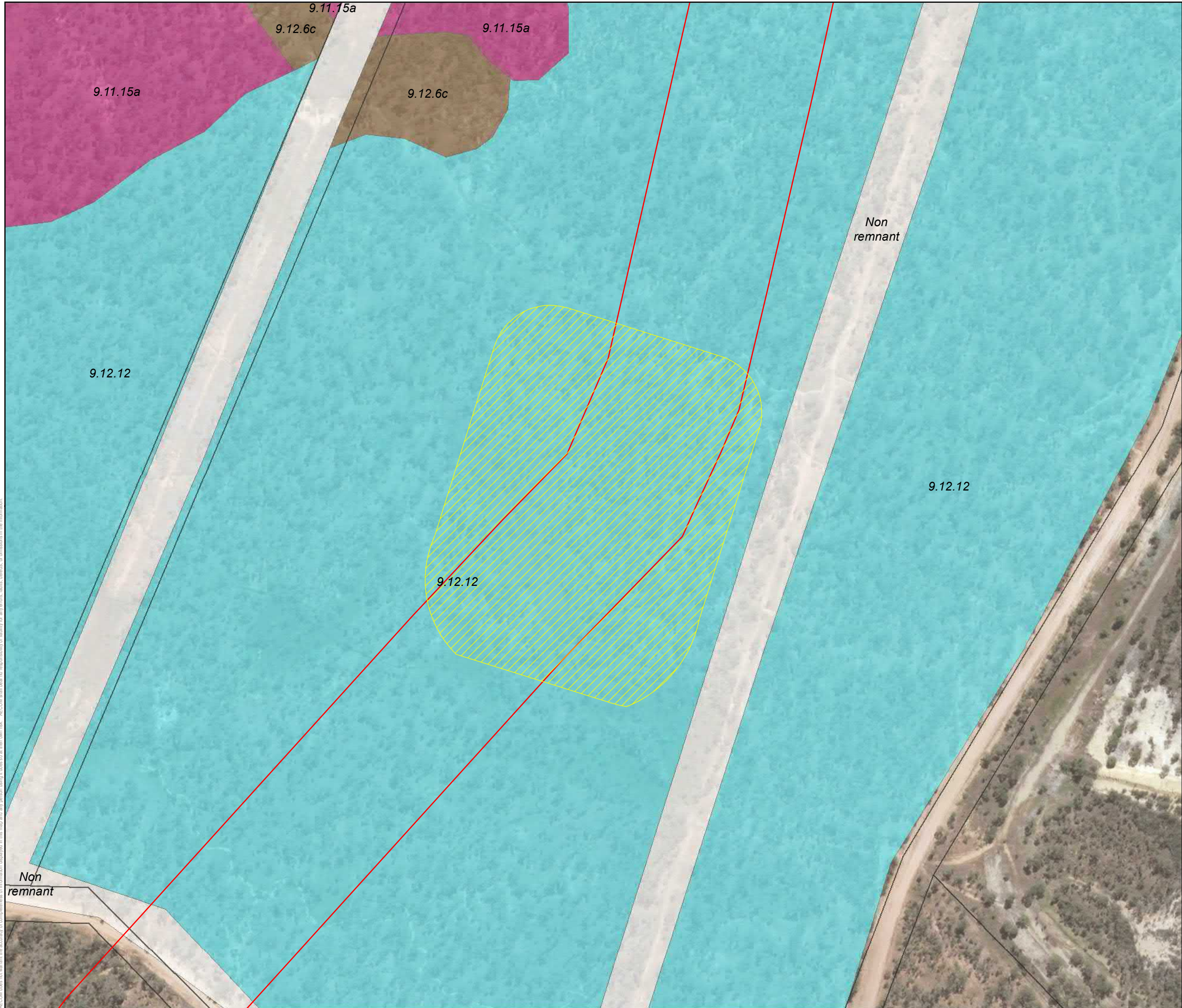
**Ground-Truthed
Regional Ecosystems
Mount Fox Sub GT**

PROJECT ID: 60577456
CREATED BY: CFS
LAST MODIFIED: CFS - 13/09/2018
VERSION: 1

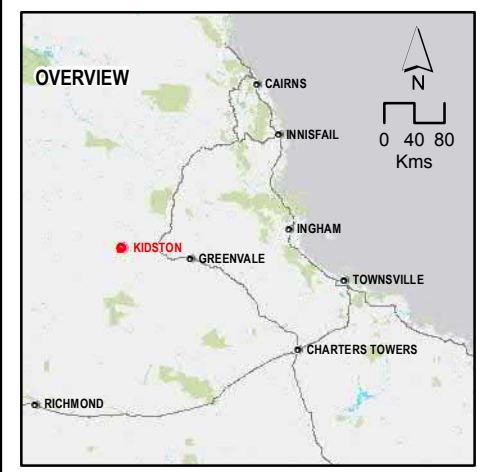
**Figure
F9.6**



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- Legend**
- Point Of Interest
 - Major Roads
 - Major Watercourses
 - Regional Context Area
 - Draft Alignment B
 - 33/275kV Solar Farm Substation
- Ground-truthed RE**
- 9.11.15a
 - 9.12.12
 - 9.12.6b
 - 9.12.6c
 - 9.3.13
 - 9.3.20
 - Non remnant



Data sources:
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**GROUND TRUTHED
REGIONAL ECOSYSTEMS
COPPERFIELD RIVER**

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VERSION:	2	

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9.1.3.3 Threatened Ecological Communities

No TECs were encountered during the field surveys. None of the REs confirmed during the field surveys, or identified in the Queensland Herbarium RE mapping, correspond to the Endangered TEC identified in the desktop assessment: broad leaf tea-tree (*Melaleuca viridiflora*) woodlands in high rainfall coastal north Queensland.

9.1.3.4 Conservation significant flora

One conservation significant flora species was identified during the field surveys for the proposed transmission line. *Leptospermum pallidum*, listed as Near Threatened under the NC Act was found outside of the Draft Alignment.

A protected plants survey was undertaken in the most eastern extent of the Draft Alignment due to a high risk area shown on the protected plants flora survey trigger map. The protected plants survey was completed in accordance with the *Flora Survey Guidelines – Protected Plants*. The threatened species triggering the high risk area was not able to be confirmed by the Queensland Herbarium due to insufficient data. Therefore, a targeted search for *Acacia tingoorensis* (Tingoora wattle) was undertaken as an area of essential habitat is mapped by DES nearby. No conservation significant flora species were identified within the high risk trigger area.

No conservation significant flora species were identified within the Mount Fox or Copperfield River substation sites during the field surveys.

9.1.3.5 Likelihood of occurrence

The likelihood of occurrence assessment identified four flora species with a moderate or high likelihood of occurring within the transmission line corridor based on the habitat encountered during the field surveys (Table 9-9). The likelihood of occurrence assessments for all conservation significant flora species is presented in Appendix F Ecology (Transmission Line) Technical Report, and summarised in Table 9-9.

Table 9-9 Flora likelihood of occurrence assessment results – transmission line

Value	Likelihood of Occurrence	
	Moderate	High
Conservation Significant Flora	<ul style="list-style-type: none"> • <i>Marsdenia brevifolia</i> • <i>Tephrosia leveillei</i> • <i>Acacia tingoorensis</i> (Tingoora wattle) 	<ul style="list-style-type: none"> • <i>Leptospermum pallidum</i>

No conservation significant flora species are considered likely to occur within the Mount Fox or Copperfield River substation sites.

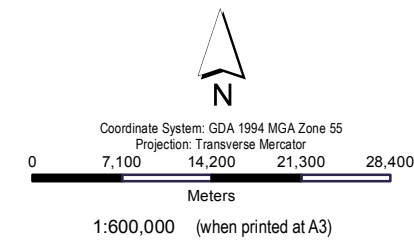
9.1.4 Habitat modelling

The likelihood of occurrence assessments identified one conservation significant species as either highly likely or known to occur within the Draft Alignment.

Potential habitat for this species has been modelled within the Draft Alignment, using the modelling rules detailed in Appendix F Ecology (Transmission Line) Technical Report. The results of the habitat modelling are outlined in Table 9-10 and the mapping is presented in Figure 9-8. The modelled habitat is the same for both alignment options.

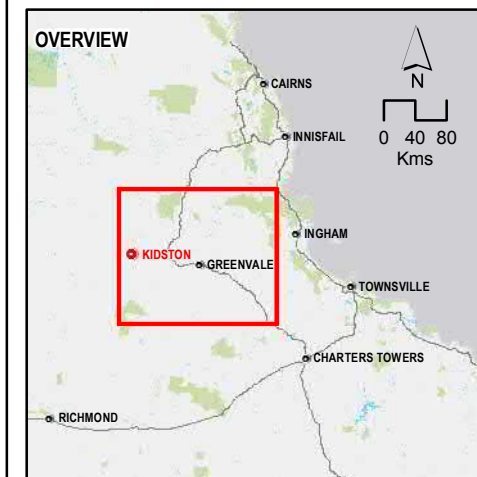
Table 9-10 Habitat modelling areas within the Draft Alignment

Species	Primary Habitat (Known) (ha)	Primary Habitat Possible (ha)	General Habitat (ha)
Flora			
<i>Leptospermum pallidum</i>	0.3	-	302.3



Legend

- Leptospermum Pallidum Sighting Locations
- Point Of Interest
- Major Roads
- Major Watercourses
- Regional Context Area
- Draft Alignment
- Draft Alignment A
- Draft Alignment B
- Primary Habitat Known
- Primary Habitat Possible
- General Habitat



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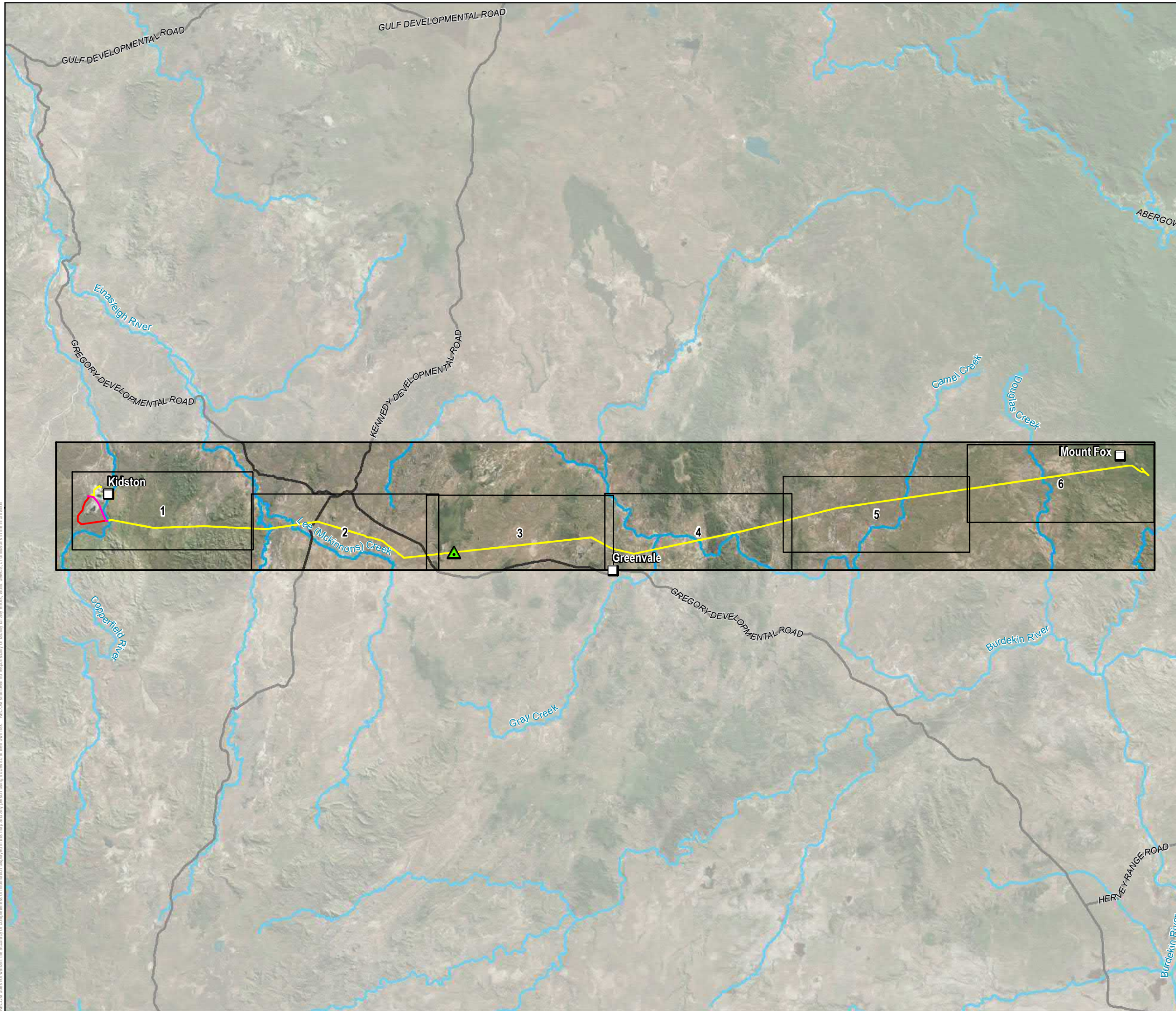
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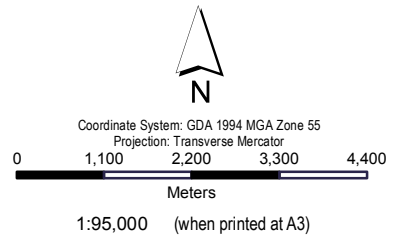
Leptospermum Pallidum Habitat

PROJECT ID: 60554486
CREATED BY: JR
LAST MODIFIED: CFS - 18/09/2018
VERSION: 2

Figure
F9-8A
(1 of 4)

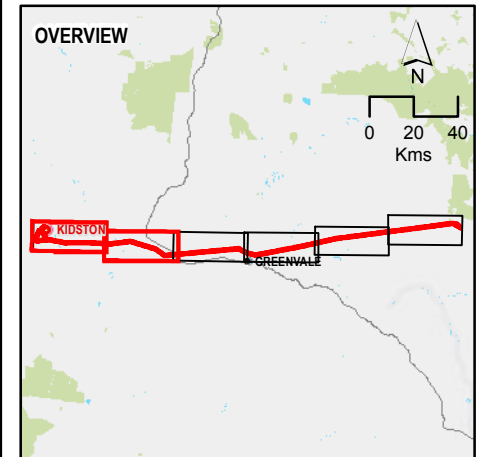


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Legend

- Leptospermum Pallidum Sighting Locations
- Point Of Interest
- Major Roads
- Major Watercourses
- Regional Context Area
- Cadastral Boundaries
- Draft Alignment
- Draft Alignment A
- Draft Alignment B
- Primary Habitat Known
- Primary Habitat Possible
- General Habitat



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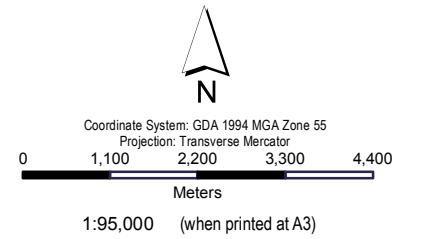
Genex Kidston Connection Project

Leptospermum Pallidum Habitat

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LAST MODIFIED: CFS - 05/09/2018
VERSION: 2

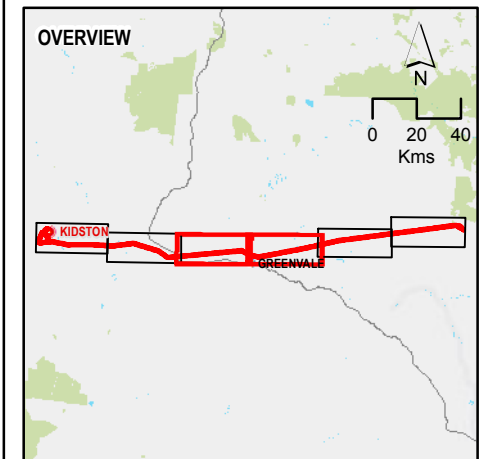
Figure
F9-8B
(2 of 4)

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Legend

- Leptospermum Pallidum Sighting Locations
- Point Of Interest
- Major Roads
- Major Watercourses
- Regional Context Area
- Cadastral Boundaries
- Draft Alignment
- Draft Alignment A
- Draft Alignment B
- Primary Habitat Known
- Primary Habitat Possible
- General Habitat



Data sources:
DCDB, Roads, Watercourses - DNRM 2018
Site Features and Layout - AECOM 2018
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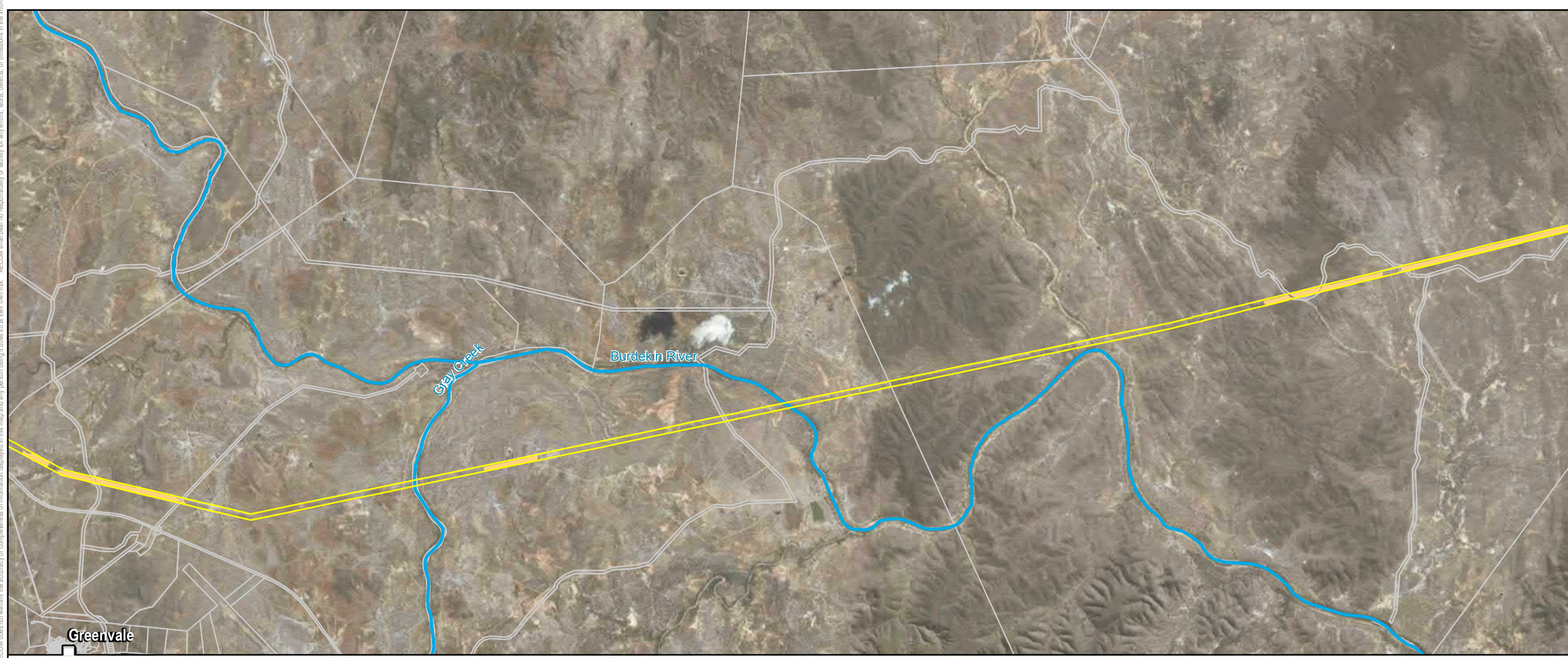
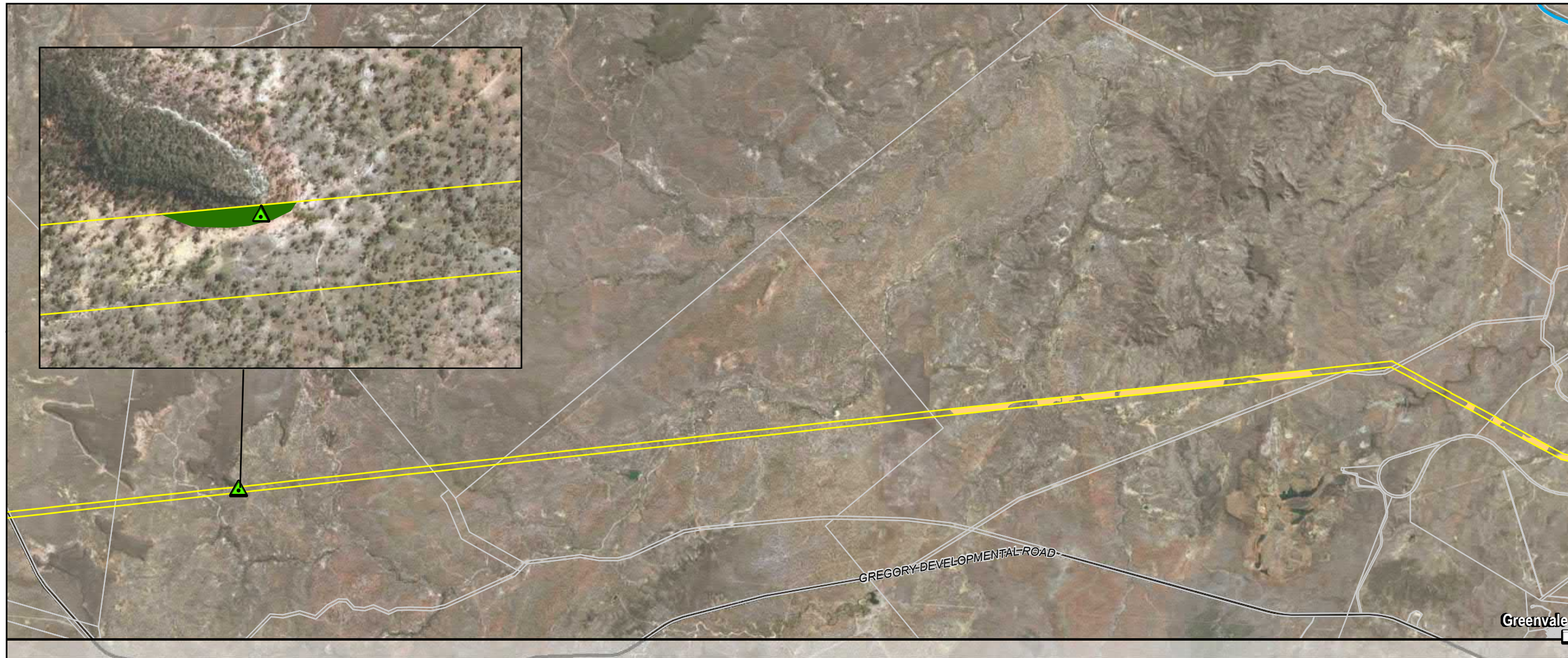
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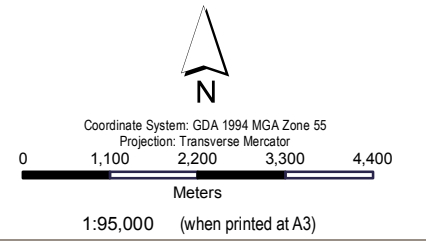
Leptospermum Pallidum Habitat

PROJECT ID: 60554486
CREATED BY: JR
LAST MODIFIED: CFS - 05/09/2018
VERSION: 2

Figure
F9-8C
(3 of 4)

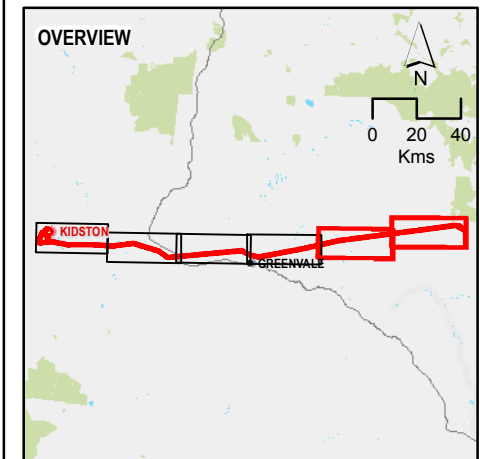


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Legend

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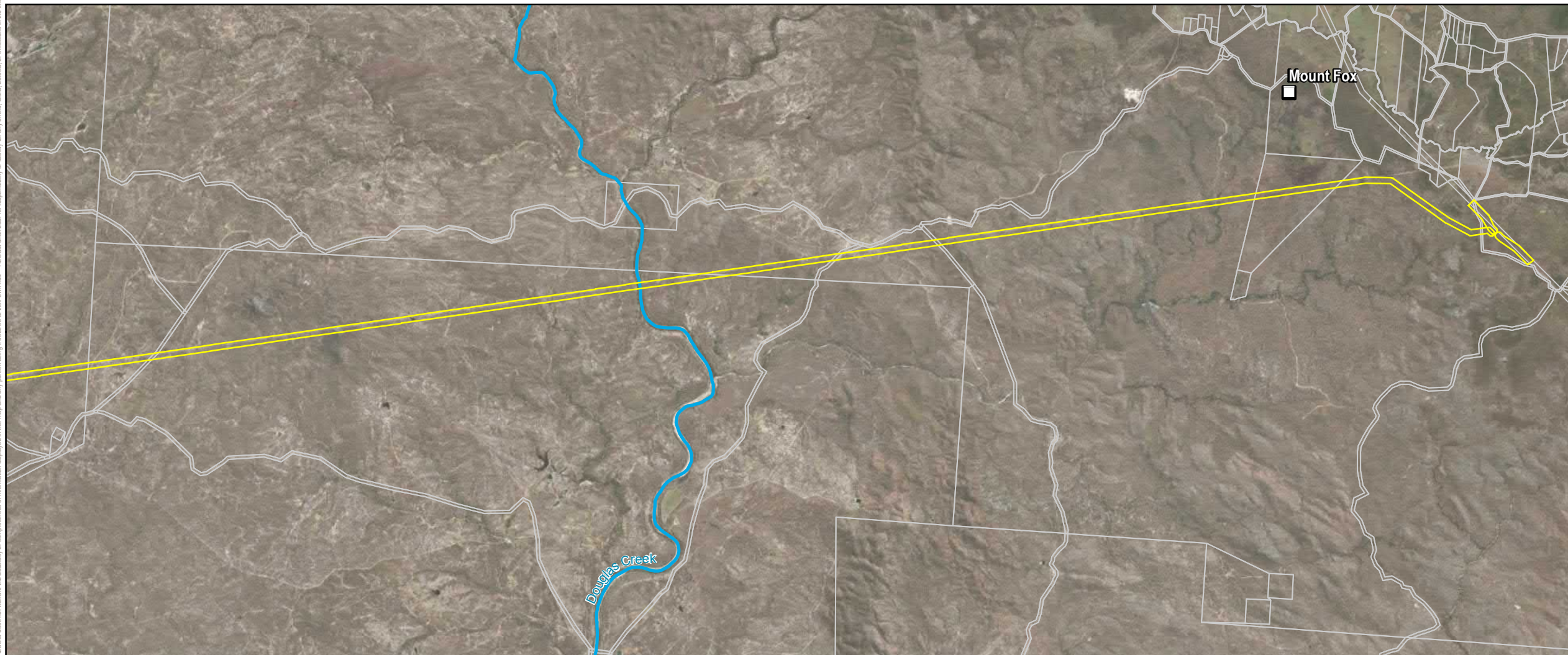
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Leptospermum Pallidum Habitat

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Figure
F9-8D
(4 of 4)



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9.2 Potential Impacts

The following section details the potential impacts to flora values within the Draft Alignment. The potential impacts have been considered in the following ways:

- construction phase impacts
- operation and maintenance phase impacts
- potential impacts to conservation significant species.

With the exception of the conservation significant species impacts, the impacts are considered applicable across the transmission line and substation sites.

9.2.1 Construction phase impacts

The most significant impacts on ecological values will occur during the Project's construction phase, when vegetation and habitat removal will occur.

9.2.1.1 Vegetation clearance

The transmission line corridor contains large tracts of remnant vegetation, with 75% containing Least Concern and Of Concern REs. Based on a maximum clearing width of 60 m, between 1,704 ha (Option A) and 1,756 ha (Option B) of remnant vegetation may be cleared by the Project. However, following the incorporation of mitigation measures into the design process, such as scalloping or spanning over sensitive environments, the final amount of vegetation clearing will be less than this amount.

The Mount Fox substation site is a 7.5 ha plot containing the Of Concern RE 7.8.18 across 6.1 ha. Removal of Of Concern RE can pose a risk to bioregional species diversity and long term resilience of the RE in question. However, considering the degraded nature of this RE within the site, the low species diversity recorded, and the relatively small area to be cleared (6.1 ha), it is unlikely that the vegetation clearing will pose a significant risk to bioregional species diversity and long term resilience of this RE.

The Copperfield River substation site is 7.5 ha containing the Least Concern RE 9.12.12. The site has intact groundcover, low weed invasion, developed canopy cover and minimal grazing impacts. The status of Least Concern means the vegetation community is well represented within the Bioregion, and clearing this vegetation does not pose a significant risk to bioregional diversity, or the long term resilience of this RE. Clearing of good quality remnant vegetation however should always be kept to a minimum where possible.

9.2.1.2 Increased dust

Deposition of dust, sand and soil resulting from construction may have potential impacts on vegetation if excessive levels are sustained over extended periods. When dust settles on plant foliage it can reduce the amount of light penetration on the leaf surface, block and damage stomata, and slow rates of gas exchange and water loss. Reduction in the ability to photosynthesise due to physical effects may result in reduced growth rates of vegetation and decreases in floral vigour and overall community health.

The dominant flora species of the vegetation communities in the Draft Alignment generally exhibit physiological qualities that are not sensitive to dust deposition. The sclerophyllous foliage of *Eucalyptus* and *Corymbia* species is generally pendulous (i.e. points down), with a thick smooth cuticle that does not encourage particulate matter to remain on the surface. The dominant woodland species are also generally hardy and well adapted to adverse conditions (e.g. extended dry conditions and low nutrient soils).

9.2.1.3 Edge effects

Edge effects are zones of changed environmental conditions (e.g. altered light levels, wind speed, temperature) occurring along the edges of habitat fragments. Examples of edge effects include weed invasion and altered community assemblage. Clearing in remnant, high ecological value areas can promote the growth of different vegetation types (Moenting and Morris, 2006) and allow invasion by introduced species specialising in edge habitats. In the proposed co-located areas, vegetation has been cleared for the Ergon powerlines, and therefore significant increases in edge effects are not anticipated.

9.2.2 Operation

As a distribution entity, Powerlink Queensland is obligated to manage electricity infrastructure to ensure the safe and reliable provision of electricity. To satisfy safety requirements, periodic vegetation management works will be undertaken within the Draft Alignment.

Impacts associated with the maintenance and access during the operational phase of the Project is similar to those identified for the construction phase, and will be routine and temporary in nature.

9.2.3 Conservation significant species

One conservation significant flora species was identified adjacent to the transmission line site. *Leptospermum pallidum* (Plate 9-1) was located approximately 22 m north of the Draft Alignment (-18.971496, 144.723464) on Lot 547 SP242570. The location of the record is shown on Figure 9-8. The population was identified on the slopes of a 0.335 ha lateritic jump-up (RE 9.7.2) and comprised more than 50 individuals. The species identification was confirmed by the Queensland Herbarium. As the nearest individual was 52 m from the centre of the alignment, the entire population fell outside of the Draft Alignment easement corridor.

Habitat modelling (refer Section 9.1.4) identified the following that may be impacted by the Draft Alignment.

- 0.3 ha of Primary Habitat (known). *Leptospermum pallidum* was confirmed within the Primary Habitat (known) area. Primary Habitat is defined by the habitat model as recent records (since 1980) or confirmed sightings, including remnant and regrowth vegetation within 1 km of the record.
- 302.3 ha of General Habitat. General Habitat is defined as areas of potential habitat with some features or values known to contribute to, or be important for the occupation of the species.

Further information of habitat model definitions can be found in Appendix F Ecology (Transmission Line) Technical Report.

The clearance of vegetation associated with lateritic geology zones (land zone 7) may result in the inadvertent loss of individuals or small populations of this species. While the current extent of *Leptospermum pallidum* within the Primary Habitat (known) area is found outside the Draft Alignment, suitable habitat for this species does occur within the Draft Alignment.

No other conservation significant species were recorded within the Draft Alignment. Habitat modelling identified the following as a moderate likelihood of occurrence, within the Draft Alignment, however were not confirmed during field survey efforts.

- *Marsdenia brevifolia*
- *Tephrosia levelleii*
- *Acacia tingoorensis* (Tingoora wattle).

Further information on these species can be found within Appendix F Ecology (Transmission Line) Technical Report.



Plate 9-1 *Leptospermum pallidum*

9.3 Mitigation and Management Measures

9.3.1 Vegetation clearance

Vegetation clearing for the Project will be limited to only where there is a statutory requirement under the *Electricity Act 1994* and *Electrical Safety Regulation 2013* to maintain safe clearances between conductors and the vegetation, and to enable safe working conditions for construction (particularly heli-stringing) and maintenance crews.

A key benefit of co-locating the proposed transmission line with the existing Ergon lines will be the reduced amount of additional clearing required when compared to a standalone transmission line. The centreline of the proposed line will be located 40 m from the centreline of the Ergon lines to provide sufficient room for ground and aerial based maintenance activities and ensure all lines can be operated safely and reliably.

While the extent of the transmission line will mean that impacts on remnant vegetation communities are unavoidable, there are a range of measures that will be implemented in addition to the Environmental Management Plans (Appendix I) to minimise the level of impact from clearing vegetation. These include the following measures.

- Vegetation clearing will be avoided or minimised in sensitive environments, specifically riparian areas around creek lines and mapped potential habitat for conservation significant flora species.
- The Project Environmental Management Plans and EWPs will include vegetation management and mapping to provide clear guidance on areas to be cleared and retained, methods for clearing and other relevant environmental protection measures.
- During detailed design, scalloping or spanning over sensitive environments to be applied where practicable.
- Workers will be made aware of management requirements in induction training and through work instructions.

9.3.2 Increased dust

To minimise the deposition of dust on adjacent vegetation, dust generation from Project activities will be minimised by engineering controls and dust suppression measures will be used, such as water trucks and sprinklers. Vehicle speeds will also be restricted on cleared tracks to minimise the generation of dust.

9.3.3 Edge effects

To minimise edge effects within the Draft Alignment, the following measures will be implemented.

- Clear demarcation of remnant vegetation at the boundary of the clearing footprint that must not be disturbed, to avoid inadvertent clearing and disturbance.
- Implementation of a Biosecurity Management Plan which incorporates monitoring of the project area for incursion of weed species and application of weed management, as required.

Impacts will be temporary, and mitigation measures outlined above will apply.

9.3.4 Conservation significant species

Any vegetation clearing in the areas adjacent to known *Leptospermum pallidum*, and areas where the habitat model has identified conservation significant species as possibly being present, must be undertaken carefully so as not to inadvertently disturb any individuals of this species. The following mitigations are proposed.

- Prior to construction, individuals of this species will be identified and flagged to ensure all construction personnel are aware of its location. A picture of the species and its location will be included in the EMP and EWP maps.
- Maintain a maximum distance as possible from all individuals.
- Maintain standard weed management practices as per Biosecurity Management Plan.