



**Western  
Botanical**

Targeted Survey of Proposed Power Line Alignments  
June 2021

Prepared for: Covalent Lithium Pty Ltd

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## 1. Executive Summary

Covalent Lithium Pty Ltd (Covalent) commissioned Western Botanical to undertake a Targeted Survey of a sections of a proposed Powerline Alignment and associated infrastructure supporting a proposed Water Pipeline between Moorine Rock and the Covalent minesite at Mt Holland. These consisted of (i) a 20m wide x 250m long alignment wholly within cleared farmland south of Moorine Rock (the Northern Study Area); and (ii) 20m wide x 10km long sections mostly within cleared farmland adjacent to, and on both eastern and western sides, of the Hyden – Southern Cross Road, some 65 to 75 km north-east of Hyden in the locality of Holleton. The Study Area includes six narrow sections of remnant vegetation on road reserves adjacent to the Hyden-Southern Cross Road and Merenda North Rd through which 14 m wide alignments under proposed power lines would require clearing and remnant trees which overhang agricultural fences, some of which will need to be pruned. Field assessments were undertaken over two days in November 2020 and two days in May 2021 by Geoff & Steven Cockerton, Western Botanical.

The Northern Study Area south of Moorine Rock does not impact native vegetation as the proposed alignment, including placement of three power poles and a Head Pump Station, lies wholly within cleared farmland that is currently under wheat crop. Adjacent vegetation to the north and to the west of the Northern Study Area supports two vegetation associations in Excellent Condition and no Threatened or Priority Flora were confirmed within vegetation immediately adjacent to the proposed alignment.

The Southern Study Area lies mostly within cleared farm land on the eastern and western sides of the Hyden – Southern Cross Road throughout its length, however, crosses Merenda North Road at its southern extent and crosses the Hyden – Southern Cross Road at two points, one approximately centrally within the alignment and one at its northern extent. A Booster Pump Station is located within wholly cleared farmland on the eastern side of the Hyden – Southern Cross Road. All road crossings and the Booster Pump Station site include areas of road reserve supporting native vegetation in Excellent Condition. The Booster Pump Station also lies adjacent to an area of planted farm trees. No Threatened or Priority Flora were confirmed in vegetation either within the proposed alignment.

One roadside population of 34 live plants of *Banksia shanklandiorum* P4, a shrub to 1m in height, was noted on either side of the Hyden – Southern Cross Road at 50J 706856 mE, 6467549 mN, however, this species does not overhang fencelines and is therefore outside but adjacent to the Study Area.

Overall, nineteen species could not be identified fully to species level (three at the Northern Study Area and 16 at the Southern Study Area). Most of these do not match any known species with Conservation Listing in the region and are not of conservation concern and/or lie outside the proposed disturbance footprint. However, it is recommended that two species should not be directly impacted, which can be readily achieved.

## 2. Introduction

Covalent Lithium Pty Ltd (Covalent) commissioned Western Botanical to undertake a Targeted Survey of a sections of a proposed Powerline Alignment and associated infrastructure supporting a proposed Water Pipeline between Moorine Rock and the Covalent minesite at Mt Holland. These consisted of (i) a 20m wide x 250m long alignment wholly within cleared farmland south of Moorine Rock (the Northern Study Area); and (ii) 20m wide x 10km long sections mostly within cleared farmland adjacent to, and on both eastern and western sides, of the Hyden – Southern Cross Road, some 65 to 75 km north-east of Hyden in the locality of Holleton. The Study Area includes six narrow sections of remnant vegetation on road reserves adjacent to the Hyden-Southern Cross Road and Merenda North Rd through which 14 m wide alignments under proposed power lines would require clearing and remnant trees which overhang agricultural fences, some of which will need to be pruned. Field assessments were undertaken over two days in November 2020 and two days in May 2021 by Geoff & Steven Cockerton, Western Botanical.

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### 2.1. Interim Biogeographic Regionalisation of Australia

The Study Areas both occur within the Merredin subregion of the Avon Wheatbelt biogeographic region which supports tall eucalypt woodlands on alluvium, mallee shrublands and *Acacia* – *Allocasuarina* shrublands on sand, gravel and granite.

### 2.2. Site location map

Site maps are presented in Appendix 1.

### **3. Methods**

#### **3.1. Desktop Survey**

A search of the Department of Biodiversity, Conservation and Attractions' (DBCA's) Threatened and Priority Flora (TPFL), WA Herbarium (WAHERB) and Threatened and Priority Ecological Communities (TEC/PEC) databases was previously undertaken by Covalent and the data supplied to Western Botanical through CAD Resources. NatureMap lists of species recorded within a 20 km radius of each site were reviewed prior to field assessment to gauge species previously known in each area.

#### **3.2. Field Survey**

The Study Area was assessed on 25<sup>th</sup> May 2021 using traverses and relevés. The proposed disturbance envelopes through native vegetation were uploaded to hand held GPS units and these areas were assessed in detail while adjacent vegetation was reviewed for contextual information. Specimens of the majority of flora were taken for verification of identification and representative photographs were taken at each site. Specimens were identified using the resources at Western Botanical and the WA Reference Herbarium. Specimens that could not be identified fully can not be taken further as they are sterile and would await collection of flowering material if required. Map production was undertaken by CAD Resources Pty Ltd.

#### **3.3. Landforms**

The Northern Study Area represents a level yellow sandplain with a minor depression which would be subject to broad, non-channelised drainage following rainfall. The Southern Study Areas all represent gently undulating yellow sandplains, overlaying laterite gravel (observed in roadside excavations). These landforms are common and widespread within the Merredin IBRA subregion and are extensively cleared for farming activities in both areas.

#### **3.4. Vegetation Mapping**

Vegetation at each site was mapped at each site allowing for a minimum 50m buffer around the proposed development envelopes impacting native vegetation. Field maps at 1:1,000 scale were utilised in the field for mapping. An area of at least 50 to 70 m was assessed on each of the road within roadside remnants at each site, a minimum of 2,000 sq. m per site.

#### **3.5. Vegetation Condition**

Vegetation Condition was scored using the Scale for the South-West and Interzone Botanical Provinces (EPA, 2016).

## 4. Results and Discussion

### 4.1. Desktop Assessment

The Desktop Survey resulted in a range of Priority Flora being recognised within close proximity to each Study Area. Twenty-three species with conservation significance were recorded within proximity to the Study Areas, including two Threatened Flora, Six Priority 1, Three Priority 2, nine Priority 3 and three Priority 4 species, Table 1. Of these, it was considered that 16 Priority Flora had a possibility of occurring within the Study Areas, given similarity of soils and landscape to their apparent preferred habitats but that the two Threatened Flora (*Eucalyptus crucis* subsp. *crucis* and *Daviesia microcarpa*) were unlikely to occur.

**Table 1. Results of the DBCA Database Searches for Conservation Significant Flora**

Taxon	Cons_Status	Growth Form and Preferred Habitat	Proximity to Northern Study Area	Proximity to Southern Study Area	Likelihood of Occurrence
<i>Acacia crenulata</i>	P3	Yellow sandplains	Yes		Possible
<i>Acacia desertorum</i> var. <i>nudipes</i>	P3	Yellow sandplains	Yes		Possible
<i>Baeckea grandibracteata</i> subsp. Parker Range (K. Newbey 9270)	P3	Laterite gravel, sandplains	Yes		Possible
<i>Banksia shanklandiorum</i>	P4	Yellow sand over laterite gravel		Yes	Possible
<i>Chamelaucium</i> sp. Parker Range (B.H. Smith 1255)	P1	Yellow sand over laterite gravel		Yes	Possible
<i>Daviesia microcarpa</i>	T	Shallow soils over greenstone	Yes	Yes	Unlikely
<i>Eremophila adenotricha</i>	P1	Brown clay-loam, after disturbance		Yes	Unlikely
<i>Eremophila serpens</i>	P4	Yellow sand		Yes	Possible
<i>Eucalyptus crucis</i> subsp. <i>crucis</i>	T	granite rocks	Yes		Unlikely
<i>Eucalyptus exigua</i>	P3	Yellow sandplains	Yes		Possible
<i>Glossostigma trichodes</i>	P1	Aquatic annual, ephemeral pools on , granite rocks	Yes		Unlikely
<i>Lepidosperma</i> sp. Mt Caudan (N. Gibson & M. Lyons 2081)	P1	Breakaways	Yes		Unlikely

Taxon	Cons_Status	Growth Form and Preferred Habitat	Proximity to Northern Study Area	Proximity to Southern Study Area	Likelihood of Occurrence
Lepidosperma sp. Pigeon Rocks (H. Pringle 30237)	P3	Rush, granite rocks	Yes		Unlikely
Leucopogon sp. Ironcaps (N. Gibson & K. Brown 3070)	P3	Yellow sand over laterite gravel, ridges		Yes	Possible
Leucopogon sp. Yellowdine (M. Hislop & F. Hort MH 3194)	P1	Yellow sand		Yes	Possible
Myriophyllum petraeum	P4	Aquatic annual, ephemeral pools on granite rocks	Yes		Unlikely
Rinzia fimbriolata	P1	Yellow sandplains	Yes		Possible
Rinzia triplex	P3	Yellow sandplains	Yes		Possible
Stylidium choreanthum	P2	Yellow sandplains	Yes		Possible
Verticordia mitodes	P3	Yellow sandplains	Yes	Yes	Possible
Verticordia multiflora subsp. solox	P2	Yellow sand over laterite gravel		Yes	Possible
Verticordia pulchella	P2	Yellow sandplains	Yes	Yes	Possible
Verticordia stenopetala	P3	Yellow sandplains	Yes		Possible

## 4.2. Field Survey

### 4.2.1. Northern Study Area

The Northern Study Area impacts no native vegetation. The plants observed along the fence line within the agricultural land under crop were weeds of *Hordeum vulgare* (Barley Grass), *Lolium rigidum* (Annual Rye Grass), *Bromus madritensis* (Brome Grass), *Ehrharta calycina* (Veldt Grass) and *Emex Australis* (Doublegee).

Vegetation outside the alignment consists of two associations, Table 2. These are described below.



**Table 2. Vegetation Associations, Northern Study Area**

Veg Code	Veg Name
E1	<i>Eucalyptus subangusta</i> subsp. <i>subangusta</i> mallee shrubland over <i>Lepidosperma sanguinolentum</i> on yellow silty sand.
M1	<i>Melaleuca eleuterostachya</i> and <i>M. zeteticorum</i> Thicket with emergent <i>Acacia resinimarginea</i> on yellow clayey sand.

**E1 *Eucalyptus subangusta* subsp. *subangusta* mallee shrubland over *Lepidosperma sanguinolentum* on yellow silty sand.**

*Eucalyptus subangusta* subsp. *subangusta* Mallee Shrubland to 6m, PFC 25% with scattered *Acacia* aff. *coolgardiensis* 1m, *Acacia hemiteles* 1.2 to 2m, *Olearia eremicola* 1m, PFC 2 to 3% over *Lepidosperma sanguinolentum* 0.5m, PFC 10% to 12% over *Borya constricta* 0.1m, PFC to 10%. Soil is pale yellow silty sand on a near-level plain. Twenty nine species were recorded in this community. See Table 3.

No species with conservation significance were confirmed within this vegetation.

**Plate 1. E1: *Eucalyptus subangusta* subsp. *subangusta* mallee shrubland over *Lepidosperma sanguinolentum***



Two specimens remain not fully identified within this community:



One sample which has affinities to *Acacia coolgardiensis* was collected adjacent to the road side, within soil disturbed in a roadside drain, and observed as scattered plants within the community. However, the material was sterile and full identification of this specimen is not possible without flowers and/or fruits. This lies outside the proposed alignment of the powerline.

One specimen of Myrtaceae sp. (G. & S. Cockerton WB40491), a blue dense shrub to 1m, was also recorded. This has affinities to *Pericalymma ellipticum* subsp. *ellipticum*, which has a Swan Coastal Plain and western Jarrah Forest distribution and its occurrence at the Study Area is unexpected. However, the material is sterile and unable to be identified further. It lies outside the proposed alignment of the powerline.

**M1 *Melaleuca eleuterostachya* and *M. zeteticorum* Thicket with emergent *Acacia resinimarginea* on yellow clayey sand**

Thicket of *Melaleuca eleuterostachya* 2.5 to 3m, *M. zeteticorum* 2m, PFC 60% with occasional emergent *Acacia resinimarginea* 4m, PFC 5%. Occasional lower shrubs of *Enchylaena lanata* 0.3m, *Olearia pimelioides* 1m, and grasses *Amphipogon caricinus* var. *caricinus* 0.3m, *Austrostipa elegantissima* 1m, PFC 2 to 3%. As one moves southwards, occasional *Phebalium tuberosum* (tightly rolled leaf form) 1.2m, are present in the understorey. One small patch of *Mesembryanthemum nodiflorum* \* (Slender Iceplant) is present. Soil is a yellow clayey sand, community lies slightly lower in the landscape than the adjacent vegetation. Twenty species including one weed were recorded in this community. See Table 3.

No species with conservation significance were confirmed within this vegetation.

**Plate 2. M1: *Melaleuca eleuterostachya* and *M. zeteticorum* Thicket with emergent *Acacia resinimarginea***



A species vs sites correlation is presented in Table 3.

**Table 3. Species vs Sites Correlation, Northern Study Area**

	Veg Code	E1	M1	Crop and fence line
	<b>Species Richness</b>	<b>28</b>	<b>20</b>	<b>6</b>
Family	Taxon	Projected Foliar Cover		
Aizoaceae	<i>Disphyma crassifolium</i>	0.1%		
Aizoaceae	<i>Mesembryanthemum nodiflorum</i> * (Slender Iceplant)		0.1%	
Amaranthaceae	<i>Ptilotus polystachyus</i>	0.1%		
Apiaceae	<i>Trachymene cyanopetala</i>	0.1%		
Asparagaceae	<i>Lomandra effusa</i>	0.1%		
Asparagaceae	<i>Thysanotus manglesii</i>	0.1%	0.1%	
Asteraceae	<i>Olearia pimeleoides</i>		1%	
Asteraceae	<i>Olearia</i> sp. <i>Eremicola</i> (Diels & Pritzel s.n. PERTH 00449628)	1%		

	Veg Code	E1	M1	Crop and fence line
	<b>Species Richness</b>	<b>28</b>	<b>20</b>	<b>6</b>
Asteraceae	Schoenia cassiniana	1.0%		
Asteraceae	Waitzia acuminata var. acuminata	1.0%	0.1%	
Boryaceae	Borya constricta	10%		
Brassicaceae	Stenopetalum lineare var. lineare	0.1%		
Chenopodiaceae	Enchylaena lanata	0.1%	1%	
Chenopodiaceae	Rhagodia drummondii	0.1%	2%	
Cyperaceae	Lepidosperma sanguinolentum	15.0%		
Fabaceae	Acacia hemiteles	1.0%		
Fabaceae	Acacia resinimarginea		5%	
Fabaceae	Acacia sp. Indet	10.0%		
Fabaceae	Austrostipa elegantissima	10.0%	1%	
Fabaceae	Austrostipa puberula	1%	1%	
Goodeniaceae	Brunonia australis	0.1%	0.1%	
Goodeniaceae	Dampiera lavandulacea	0.1%		
Myrtaceae	Chamelaucium ciliatum (Wagin – Lake Grace form)		0.1%	
Myrtaceae	Eucalyptus subangusta subsp. subangusta	25.0%	1.0%	
Myrtaceae	Melaleuca eleuterostachya		30%	
Myrtaceae	Melaleuca laxiflora	50.0%	2%	
Myrtaceae	Melaleuca zeteticorum		30%	
Myrtaceae	Myrtaceae sp. Indet (G. & S. Cockerton WB40491)	5.0%		
Orchidaceae	Thelymitra petrophila	0.1%		
Poaceae	Amphipogon caricinus var. caricinus	0.1%	3%	
Poaceae	Aristida contorta	0.1%		
Poaceae	Bromus madritensis * (Brome Grass)			present
Poaceae	Ehrharta calycina * (Veldt Grass)			present
Poaceae	Hordeum vulgare * (Barley Grass)			present
Poaceae	Lolium rigidum * (Annual Rye Grass)			present
Poaceae	Monachather paradoxus	10%		
Poaceae	Rytidosperma caespitosum	0.5%	1%	
Poaceae	Triodia sp. Indet	0.1%		
Poaceae	Vulpia myuros* (Rats Tail Fescue)		1%	
Poaceae	Wheat crop *			present
Polygoniaceae	Emex australis * (Doublegee)			present
Rutaceae	Phebalium tuberculosum sens. lat.		1%	
Santalaceae	Santalum acuminatum		0.1%	

#### 4.2.1.1. Shrubs Overhanging Fencelines

Shrubs overhanging fencelines, which may require pruning include the following:

*Acacia hemiteles*

*Acacia resinimarginea*

*Eucalyptus subangusta* subsp. *subangusta*

*Melaleuca eleuterostachya*

*Melaleuca laxiflora*

*Melaleuca zeteticorum*

None of these species have conservation significance and all are common in the respective vegetation associations noted.

#### 4.2.1.2. Weeds of the Northern Study Area

Seven weed species were recorded within and adjacent to pasture in the Northern Study Area near Moorine Rock. *Mesembryanthemum nodiflorum* (Slender Iceplant) was observed in remnant vegetation in this area but is a minor, ubiquitous weed species and is not considered an issue for development of the project. None of these are considered significant weeds.

#### 4.2.2. Southern Study Area

The Southern Study Area traverses native vegetation in three locations. These sites supported 110 native species and two minor weeds in four Vegetation Associations denoted as S1, S2, S3 and H1 communities, Table 4.

**Table 4. Vegetation associations of the Southern Study Area**

Veg Code	Veg Name
<b>S1</b>	<i>Allocasuarina spinosissima</i> Shrubland with emergent <i>Eucalyptus burracoppinensis</i> and <i>E. leptopoda</i> subsp. <i>leptopoda</i> mallee and occasional <i>Allocasuarina acutivalvis</i> subsp. <i>acutivalvis</i> on pale yellow clayey sand over laterite
<b>S2</b>	Mature <i>Allocasuarina acutivalvis</i> Shrubland with emergent <i>Eucalyptus burracoppinensis</i> and <i>E. leptopoda</i> subsp. <i>leptopoda</i> mallee on shallow pale yellow clayey sand over laterite
<b>S3</b>	Long unburnt mature / moribund <i>Allocasuarina acutivalvis</i> Shrubland with emergent <i>Eucalyptus burracoppinensis</i> and <i>E. leptopoda</i> subsp. <i>leptopoda</i> mallee on pale yellow clayey sand.
<b>H1</b>	Open <i>Hakea invaginata</i> , <i>H. meisneriana</i> Heath over <i>Ecdiocola monostachya</i> , <i>Lepidosperma diurnum</i> , <i>Lepidosperma</i> aff. sp. Ravensthorpe (G.F. Craig 5188), (G & S Cockerton WB40553), and <i>Lepidobolus preissianus</i> subsp. <i>volubilis</i> Sedgeland.

These are described below.

#### **S1 *Allocasuarina spinosissima* Shrubland with emergent *Eucalyptus burracoppinensis* and *E. leptopoda* subsp. *leptopoda* mallee on pale yellow clayey sand over laterite.**

*Allocasuarina spinosissima* 2.5m PFC 5 to 15% with emergent *Eucalyptus leptopoda* subsp. *leptopoda*, *E. burracoppinensis* 4m, and occasional *Allocasuarina acutivalvis* subsp. *acutivalvis* 3m PFC 5% over *Hakea* sp. *Petrophile* sp. *Melaleuca* spp., 1 to 2m, PFC 5% over *Beaufortia puberula*, *Drummondita hassellii*, *Melaleuca cordata* low shrubs to 1m, PFC 5% over *Lepidosperma* spp. (4 species), 0.3 to 0.8m, *Lepidobolus preissianus* subsp. *volubilis*, *Lomandra marginata*, *Schoenus* sp. S3-9 (pale bases) 0.25m, PFC 3% over *Schoenus calcatus* 0.03m, PFC < 1%, Plate 3. A long unburnt site but with historical disturbance on its southern fringe adjacent to the fence line. See Table 5.

Soil is a firm pale yellow silty clayey sand with laterite at approximately 0.7 to 0.9m (evidence in adjacent clearing).



**Plate 3. S1 *Allocasuarina spinosissima* Shrubland with emergent *Eucalyptus burracoppinensis* and *E. leptopoda* subsp. *leptopoda* mallee**



**S2 *Allocasuarina acutivalvis* Shrubland with emergent *Eucalyptus burracoppinensis* and *E. leptopoda* subsp. *leptopoda* mallee on shallow pale yellow clayey sand over laterite.**

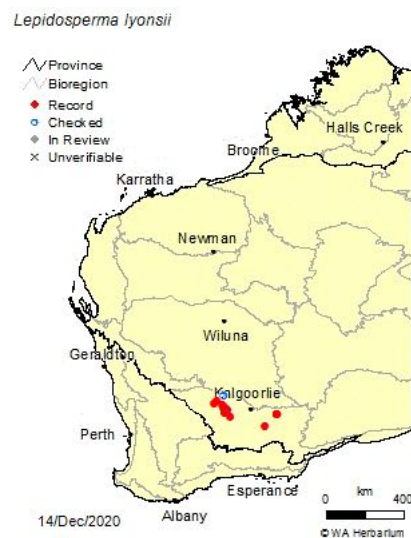
East side of Road: emergent *Eucalyptus burracoppinensis* 4m over *Allocasuarina acutivalvis* 2 to 3.5m, Ticket, PFC 100% with occasional scattered plants of *Lepidosperma diurnum*, *L. aff. lyonsii* (G. & S. Cockerton WB40492), *Patersonia rudis* subsp. *velutina*, *Gahnia* spp. and *Schoenus* spp. 0.25m, *Melaleuca cordata*, Myrtaceae and Proteaceae spp. to 1m, PFC 1 to 2%. Soil is a firm pale yellow clayey sand with laterite gravel at surface. Long unburnt site, though density of *Allocasuarina* indicates last burnt around 20 to 30 yrs. ago. See Figure 7 and Plate 4.

One of the *Lepidosperma* species is a widespread but poorly known and undescribed species, *Lepidosperma* aff. *lyonsii* (G. & S. Cockerton WB40492). It is part of a group of *Lepidosperma* species growing from 0.2 to 0.4m high with narrow (3mm wide) leaves and resinous hairy margins grows on yellow sandplains in the region between Southern Cross, and east of Kalgoorlie, both north and south of the Gt. Eastern Hwy. The *Lepidosperma* aff. *lyonsii* group is widespread and does not require conservation focus.

On the other hand, the morphologically similar *Lepidosperma lyonsii* is a Priority 1 species, it is restricted to stony banded ironstone and chert hills in the region north of Southern Cross and is not found within this Study Area. This species complex requires specialist taxonomic review.

The distribution of both species is presented in Figure 1.

**Figure 1. Distribution of *Lepidosperma lyonsii* and *Lepidosperma* aff. *lyonsii* combined (Florabase)**





**Plate 4. S2 *Allocasuarina acutivalvis* Shrubland with emergent *Eucalyptus burracoppinensis* and *E. leptopoda* subsp. *leptopoda* mallee from the road surface**



**Plate 5. S2 *Allocasuarina acutivalvis* Shrubland with emergent *Eucalyptus burracoppinensis* and *E. leptopoda* subsp. *leptopoda* mallee**





**S3 *Allocasuarina acutivalvis* Shrubland with emergent *Eucalyptus burracoppinensis* and *E. leptopoda* subsp. *leptopoda* mallee over Myrtaceae, Proteaceae mid-shrubs and *Lepidosperma* species on pale yellow clayey sand over laterite– Long Unburnt**

East side of road, much longer unburnt, suggest > 50 years. More species rich and more open. *Allocasuarina acutivalvis* subsp. *acutivalvis* 3m, *Acacia*, *Hakea* spp. shrubland to 2.5m, PFC 15 to 20% with low shrubs of Myrtaceae spp. to 1m, PFC 5% over *Lepidosperma diurnum*, *L. aff. lyonsii* (G. & S. Cockerton WB40492), *Gahnia* spp. and *Schoenus* spp. 0.2 to 0.5m, PFC 3 to 5%. See Table 5, Plate 6, Plate 7.

This site has not been burnt for many years and much of the vegetation is moribund, dying and leaving a very open upper and mid storey canopy.

**Plate 6. S3 *Allocasuarina acutivalvis* Shrubland with emergent *Eucalyptus burracoppinensis* and *E. leptopoda* subsp. *leptopoda***





**Plate 7. S3 *Allocasuarina acutivalvis* Shrubland with emergent *Eucalyptus burracoppinensis* and *E. leptopoda* subsp. *leptopoda***





## H1 Heath Community

The H1 Heath community is described as Tall Heath of *Melaleuca cordata* 1m, *Hakea erecta* 1.2m, *Hakea invaginata* 1.5m *H. cygnus* subsp. *cygnus* 1.5m. and a range of Myrtaceae spp., PFC 10% over a sedgeland of *Ecdiocola monostachya*, *Lepidobolus preissianus* subsp. *volubilis* and *Lepidosperma* spp., PFC 30%, Plate 8. Soil is a yellow clayey sand with laterite gravel at shallow depth.

### Plate 8. H1 Heath community looking eastwards



A species – sites matrix for the Southern Study Area is presented in Table 5.

**Table 5. Species vs. Sites Matrix for the Southern Study Area Crossovers**

Family	Taxon	ID Comment	Significant?	S1	S2	H1	S3	S3
				Southern Crossover	Southern Crossover	Southern Crossover	Central Crossover	Northern Crossover
Apiaceae	Platysace trachymenioides					1	1	
Asparagaceae	Chamaexeros fimbriata			1				
Asparagaceae	Lomandra marginata							1
Asparagaceae	Thysanotus manglesianus							1
Asteraceae	Arctotheca calendula * (Cape Weed)		Weed		1	1		
Asteraceae	Waitzia aurea					1	1	
Boryaceae	Borya constricta					1	1	
Casuarinaceae	Allocasuarina acutivalvis subsp. acutivalvis				1 <sup>1</sup>		1	1
Casuarinaceae	Allocasuarina aff. campestris (G & S Cockerton WB40550)	Potentially a clonal mutant of A. campestris				1		
Casuarinaceae	Allocasuarina spinosissima			1	1		1	
Colchicaceae	Wurmbea tenella					1	1	
Cupressaceae	Callitris preissii			1		1	1	1
Cyperaceae	Lepidosperma aff. diurnum (G & S Cockerton WB40556)	Unable to be taken further	Range Infill		1	1	1	
Cyperaceae	Lepidosperma aff. lyonsii (G. & S. Cockerton WB40492)	Unable to be taken further			1		1	1
Cyperaceae	Lepidosperma aff. sp. Ravensthorpe (G.F. Craig 5188), (G & S Cockerton WB40553)	Unable to be taken further	~100 km northwards Range Extension			1	1	
Cyperaceae	Lepidosperma diurnum (G. & S. Cockerton WB40493)					1		1
Cyperaceae	Lepidosperma ghanoides			1				
Cyperaceae	Lepidosperma sanguinolentum							1
Cyperaceae	Lepidosperma sp. (G & S Cockerton WB40554)	Unable to be taken further			1	1	1	
Cyperaceae	Schoenus calcatus			1	1	1	1	1
Cyperaceae	Schoenus hexandrus				1		1	1

<sup>1</sup> Grey shading indicates dominance within each vegetation association.

Family	Taxon	ID Comment	Significant?	S1 Southern Crossover	S2 Southern Crossover	H1 Southern Crossover	S3 Central Crossover	S3 Northern Crossover
Cyperaceae	Schoenus sp. (G & S Cockerton WB40561)	need flowers						
Cyperaceae	Schoenus sp. pale brown bases (G & S Cockerton WB405)	need flowers			1			
Cyperaceae	Schoenus sp. red bases (G & S Cockerton WB40562)	need flowers						
Dasypogonaceae	Lomandra sp. terete (G & S Cockerton WB40560)	need flowers			1			
Dilleniaceae	Hibbertia aff. eatoniae	need flowers					1	
Dilleniaceae	Hibbertia stenophylla			1		1		1
Droseraceae	Drosera subhirtella				1	1	1	
Ecdiocolaceae	Ecdeiocolea monostachya			1	1	1	1	
Ericaceae	Astroloma serratifolium					1	1	
Ericaceae	Styphelia dielsii					1		
Ericaceae	Styphelia hamulosa				1	1	1	
Euphorbiaceae	Beyeria sulcata subsp. sulcata				1		1	
Fabaceae	Acacia beauverdiana						1	
Fabaceae	Acacia dielsii			1		1		
Fabaceae	Acacia heteroneura subsp. jutsonii			1	1			
Fabaceae	Acacia multispicata					1		
Fabaceae	Acacia resinimarginea						1	
Fabaceae	Acacia sphacelata subsp. recurva			1	1			
Fabaceae	Daviesia croniniana			1				
Fabaceae	Daviesia nudiflora subsp. nudiflora				1			
Fabaceae	Gastrolobium ?floribundum	need flowers					1	
Fabaceae	Jacksonia nematoclada			1				
Goodeniaceae	Dampiera lavandulacea					1		
Iridaceae	Patersonia rudis subsp. velutina							1
Lauraceae	Cassytha glabella forma dispar			1	1	1	1	
Lauraceae	Cassytha pomiformis				1			
Myrtaceae	Aluta appressa			1	1		1	1
Myrtaceae	Baeckea muricata			1	1	1		

Family	Taxon	ID Comment	Significant?	S1	S2	H1	S3	S3
				Southern Crossover	Southern Crossover	Southern Crossover	Central Crossover	Northern Crossover
Myrtaceae	Baeckea sp. Koonadgin (B.L. Rye & M.E. Trudgen BLR 241137)				1	1		
Myrtaceae	Balaustion pulcherrimum						1	
Myrtaceae	Beaufortia orbifolia							
Myrtaceae	Beaufortia puberula			1	1	1	1	
Myrtaceae	Chamelaucium ciliatum Wubin – Lake Grace form (G. & S. Cockerton WB40493)			1				
Myrtaceae	Cyathostemon heterantherus				1			
Myrtaceae	Ericomyrtus serpyllifolia					1	1	
Myrtaceae	Eucalyptus burracoppinensis			1	1		1	1
Myrtaceae	Eucalyptus gomphocephala (planted)				1	1		
Myrtaceae	Eucalyptus leptopoda subsp. leptopoda			1			1	1
Myrtaceae	Euryomyrtus leptospermoides			1				1
Myrtaceae	Euryomyrtus maidenii			1	1	1	1	1
Myrtaceae	Euryomyrtus leptospermoides				1	1	1	
Myrtaceae	Homalocalyx thryptomenoides					1	1	
Myrtaceae	Leptospermum nitens			1		1		
Myrtaceae	Melaleuca aff. subtrigona	need flowers			1	1	1	
Myrtaceae	Melaleuca cordata			1	1	1	1	1
Myrtaceae	Melaleuca pungens			1			1	
Myrtaceae	Melaleuca aff. calyptroides	need flowers		1				1
Myrtaceae	Micromyrtus erichsenii			1	1	1	1	
Myrtaceae	Micromyrtus obovata					1	1	
Myrtaceae	Myrtaceae sp. Indet.	need flowers				1	1	
Myrtaceae	Baeckea grandibracteata							
Myrtaceae	Myrtaceae sp. #57 ?Verticordia	need flowers				1		
Myrtaceae	Verticordia inclusa			1	1			
Myrtaceae	Verticordia chrysantha					1	1	
Myrtaceae	Verticordia chrysanthella							1
Myrtaceae	Verticordia roei				1	1		
Orchidaceae	Pterostylis sp. Indet.	need flowers			1			



Family	Taxon	ID Comment	Significant?	S1 Southern Crossover	S2 Southern Crossover	H1 Southern Crossover	S3 Central Crossover	S3 Northern Crossover
Poaceae	<i>Amphipogon caricinus</i> subsp. <i>caricinus</i>					1	1	
Poaceae	<i>Austrostipa elegantissima</i>				1		1	1
Poaceae	<i>Austrostipa hemipogon</i>				1			
Poaceae	<i>Ehrharta longiflora</i> * (Annual Veldt Grass)		Weed			1	1	
Polygalaceae	<i>Comesperma spinosum</i>			1	1	1	1	1
Proteaceae	<i>Banksia cirsioides</i>						1	1
Proteaceae	<i>Banksia elderiana</i>					1	1	
Proteaceae	<i>Grevillea acacioides</i>			1	1	1	1	
Proteaceae	<i>Grevillea cagiana</i>			1				
Proteaceae	<i>Grevillea coccinea</i> subsp. <i>coccinea</i>		~100 km northerly range extension		1			
Proteaceae	<i>Grevillea eriobotrya</i>		Minor southerly Range Extension		1		1	
Proteaceae	<i>Grevillea excelsior</i>							1
Proteaceae	<i>Grevillea paradoxa</i>					1	1	
Proteaceae	<i>Hakea cygna</i> subsp. <i>cygna</i>					1		
Proteaceae	<i>Hakea erecta</i>			1	1	1	1	
Proteaceae	<i>Hakea francissiana</i>						1	
Proteaceae	<i>Hakea invaginata</i>			1		1	1	
Proteaceae	<i>Hakea meisneriana</i>							1
Proteaceae	<i>Hakea platysperma</i>			1	1			
Proteaceae	<i>Persoonia coriacea</i>			1	1	1		1
Proteaceae	<i>Petrophile merrallii</i>			1	1	1	1	
Proteaceae	<i>Petrophile stricta</i>			1	1		1	
Proteaceae	<i>Synaphea interioris</i>					1		
Pteridaceae	<i>Cheilanthes sieberi</i> subsp. <i>sieberi</i>			1	1	1	1	
Restionaceae	<i>Lepidobolus preissianus</i> subsp. <i>volubilis</i>				1	1	1	
Rhamnaceae	<i>Cryptandra apetala</i> var. <i>anomala</i>						1	
Rutaceae	<i>Drummondita hassellii</i>			1	1	1	1	1
Rutaceae	<i>Phebalium filifolium</i>				1	1	1	

Family	Taxon	ID Comment	Significant?	S1 Southern Crossover	S2 Southern Crossover	H1 Southern Crossover	S3 Central Crossover	S3 Northern Crossover
Rutaceae	<i>Phebalium laevigatum</i>				1	1		
Rutaceae	<i>Phebalium lepidotum</i>						1	
Santalaceae	<i>Choretrum glomeratum</i>					1		1
Santalaceae	<i>Exocarpos sparteus</i>					1	1	
Santalaceae	<i>Santalum acuminatum</i>			1		1	1	
Xanthorrhoeaceae	<i>Xanthorrhoea nana</i>					1	1	



#### 4.2.2.1. Species Not Fully Identified

Eighteen species collected within the vegetation of the Southern Study Area remain not fully identified to species (in one case to genus level), Table 6. These include:

- (i) Twelve species: one *Hibbertia* sp., an *Allocasuarina* sp., three *Schoenus* species, one *Lomandra* sp., a *Gastrolobium* sp., two *Melaleuca* and two Myrtaceae spp. and a *Pterostylis* sp. These require flowering and/or fruiting material to further the ID process;
- (ii) Four *Lepidosperma* species are not fully identified. The taxonomy of *Lepidosperma* requires taxonomic review. The identifications of these can not be taken further without flowering and/or fruiting material and review by a specialist taxonomist.

None of the species not yet fully identified resemble any of the known Priority or Threatened Flora in the region.

**Table 6. Species Not Fully Identified**

Taxon	Reason for incomplete ID	Potentially within Disturbance Footprint?
<i>Allocasuarina</i> aff. <i>campestris</i> (G & S Cockerton WB40550)	Potentially a clonal mutant of <i>A. campestris</i>	No
<i>Gastrolobium</i> aff. <i>floribundum</i>	Flowers / fruits required to be certain, most likely is this species.	No
<i>Hibbertia</i> aff. <i>eatoniae</i>	Flowers / fruits required	Yes
<i>Lepidosperma</i> aff. <i>diurnum</i> (G & S Cockerton WB40556)	Specialist taxonomic review required	Yes
<i>Lepidosperma</i> aff. <i>lyonsii</i> (G & S Cockerton WB40492)	Specialist taxonomic review required to clarify the <i>L. aff. lyonsii</i> complex.	Yes
<i>Lepidosperma</i> aff. sp. Ravensthorpe (G.F. Craig 5188), (G & S Cockerton WB40553)	Specialist taxonomic review required. ~100 km northwards Range Extension	No
<i>Lepidosperma</i> sp. (G & S Cockerton WB40554)	Specialist taxonomic review required	Yes
<i>Lomandra</i> sp. <i>terete</i> (G & S Cockerton WB40560)	Specialist taxonomic review required	Yes
<i>Melaleuca</i> aff. <i>calyptroides</i>	Flowers / fruits required	No
<i>Melaleuca</i> aff. <i>subtrigona</i>	Flowers / fruits required	Yes
Myrtaceae Genus sp. (G. & S. Cockerton WB40494)	Requires collection of flowering material in Spring and specialist taxonomic review.	Yes
Myrtaceae sp. (G. & S. Cockerton WB40491)	Flowers / fruits required to further identification	No

Taxon	Reason for incomplete ID	Potentially within Disturbance Footprint?
Myrtaceae sp. #57 ?Verticordia	Flowers / fruits required to further identification	Yes
Pterostylis sp. Indet.	Flowers / fruits required to further identification	No
Schoenus sp. (G & S Cockerton WB40561)	Flowers / fruits required to further identification	Yes
Schoenus sp. pale brown bases (G & S Cockerton WB405)	Flowers / fruits required to further identification	Yes
Schoenus sp. red bases (G & S Cockerton WB40562)	Flowers / fruits required to further identification	Yes
Triodia sp.	Flowers / fruits required to be certain	No

#### 4.2.2.2. Range Extensions

Three of the native taxa, *Grevillea excelsior* represents a minor southerly range extension while, *Grevillea coccinea* subsp. *coccinea*, *Lepidosperma* aff. sp. Ravensthorpe (G.F. Craig 5188), (G & S Cockerton WB40553), represent moderate northerly range extensions of around 100 km.

### 4.2.2.3. Trees Overhanging Farmland Fences

Numerous trees and large shrubs were observed overhanging farmland fences and may require pruning, Plate 9. These included the larger plants, shrubs and mallees, that are common within vegetation of the Study Area. They include the following species:

*Acacia beauverdiana*

*Acacia resinimarginea*

*Allocasuarina acutivalvis*

*Banksia cirsioides*

*Eucalyptus aff. cylindrocarpa*

*Eucalyptus burracoppinensis*

*Eucalyptus leptopoda subsp. leptopoda*

*Grevillea eriobotrya*

*Grevillea paradoxa*

*Hakea erecta*

*Hakea francissiana*

*Leptospermum roei*

None of the trees and shrubs overhanging farmland fences represent species with Conservation Listing and none should be significantly adversely affected by pruning of overhanging branches.

#### Plate 9. Typical view of trees overhanging farm fences which may require pruning





#### 4.2.2.4. Trees and Shrubs on Farmland Remnants

Trees and shrubs in farmland remnants were investigated where the proposed powerline may traverse remnant farmland vegetation. In all cases, farmland remnants had been grazed and the understorey component was depauperate, with only the toughest species persisting, Plate 10. These remnants would be considered to be in a Degraded Condition utilising the Vegetation Condition Scale presented in EPA (2016).

**Plate 10. Typical farm remnant with depauperate understorey due to grazing.**



Species present at each of these farmland remnants are listed in Table 7.

**Table 7. Species within Farmland Remnants**

	Farmland Remnant 1	Farmland Remnant 2	Farmland Remnant 3	Farmland Remnant 4	Farmland Remnant 5	
					north	south
Easting	708172	708850	709944	710759	710951	710754
Northing	6470384	6471766	6473880	6475519	6475651	6475264
<i>Acacia beauverdiana</i>	1		1			
<i>Austrostipa elegantissima</i>	1				1	1
<i>Eucalyptus burracoppinensis</i>	1	1	1			

	Farmland Remnant 1	Farmland Remnant 2	Farmland Remnant 3	Farmland Remnant 4	Farmland Remnant 5	
					north	south
Melaleuca cordata	1					
Allocasuarina acutivalvis		1	1		1	11
Allocasuarina spinosissima		1			1	1
Beaufortia orbifolia		1				
Hakea invaginata		1				
Hakea subsulcata		1				
Leptospermum roei		1				
Santalum acuminatum			1			
Eucalyptus camaldulensis (planted)				1		
Eucalyptus sp. (planted)				1		
Banksia elderiana						1
Comesperma spinosum					1	1
Drosera subhirtella					1	1
Eucalyptus leptopoda subsp. leptopoda					1	1
Schoenus sp. tiny red bases (G & S Cockerton WB40562)					1	1

#### 4.2.2.5. Species to be Avoided

Of the species not fully identified lying within or adjacent to potential disturbance footprints, direct impacts to the following two should be avoided:

Myrtaceae Genus sp. (G. & S. Cockerton WB40494) should be avoided in development of the powerline. It was recorded at 50 J 706264 mE, 6466556 mN, on the north-western corner of Merenda North Road, adjacent to the fenceline. This may represent a species with both taxonomic and conservation significance. A specimen has been initially reviewed by Dr. Barbara Rye, WA Herbarium and has now been vouchered at the WA Herbarium for a more detailed taxonomic review.

*Allocasuarina* aff. *campestris* (G & S Cockerton WB40550) seems to represent a clonal mutant of *Allocasuarina campestris*, a widespread species known for occasional clonality near the south coast of W.A. (K.L. Wilson, L.A.S. Johnson (2020). While uncertainty of its taxonomic status remains, direct impacts to the population, which lies on the eastern side of the proposed eastern crossover at Merenda North Road (extending south-eastwards for 50m from 50J 706427 mE, 6466449 mN), should be avoided.

#### 4.2.2.6. Weeds of the southern Study Area

Two weeds were recorded at the Southern Study Area: *Arctotheca calendula* (Cape Weed) and *Ehrharta longiflora* (Annual Veldt Grass). These were observed on the active road verge against the trafficked gravel roads and on fencelines bordering farm land. Neither are considered significant weeds. Vegetation Condition

Vegetation within the Study Area (remnants on road verges) were considered in Excellent condition using the scale presented in EPA 2016. Excellent represents vegetation with the following attributes: “Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species. Damage to trees caused by fire, the presence of non-aggressive weeds and occasional vehicle tracks.”

### 4.3. Vegetation Maps

Field maps showing the Study Areas are presented in Appendix 1 and Vegetation maps are presented in Appendix 2.

## 5. Assessment Against the 10 Clearing Principles

**Principle (a) – Native vegetation should not be cleared if it comprises a high level of biological diversity.**

The Northern Study Area impacts no native vegetation.

Flora and Vegetation observed within the roadside remnants in the Southern Study Area is very characteristic of the vegetation adjacent to the proposed small development corridors. Vegetation on the yellow clayey sands that have been widely developed for Agriculture in the areas adjacent to the Study Areas are not considered having particularly high species richness with between 7 and 30 native taxa observed in Relevés and traverses, over areas of at least 2,000 sq. m at each site.

The Project is not at variance with this principle.

**Principle (b) – Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.**

The Northern Study Area impacts no native vegetation.

The areas of native vegetation to be disturbed in the Southern Study Area are small and contiguous with extensive roadside remnants. Small areas of development planned should not significantly affect fauna habitat of the local area.

The Project is not at variance with this principle.

**Principle (c) – Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.**

No Priority or Threatened Flora were observed at either of the Study Areas. None of the species not yet fully identified resemble any Threatened or Priority flora species known in within a 10m radius of each part of the Study Area.

The Project is not at variance with this principle.

**Principle (d) – Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a threatened ecological community.**

No Threatened Ecological Communities or Priority Ecological Communities are known within or adjacent to either part of the Study Areas.

The Project is not at variance with this principle.

**Principle (e) – Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.**

The Northern Study Area impacts no native vegetation.

The areas of native vegetation to be disturbed in the Southern Study Area are small (20m wide alignments across roadside remnant vegetation) and contiguous with extensive roadside remnants of similar vegetation composition structure and ages since fire.

While the eastern Wheatbelt and the Merredin IBRA subregion has been extensively cleared, the proposed development for powerline crossovers are small and likely insignificant in area, within a local-ecological sense.

The Project is not at variance with this principle.

**Principle (f) – Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.**

No wetlands or watercourses are associated with either Study Area.

The Project is not at variance with this principle.

**Principle (g) – Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.**

The areas to be cleared are small and abut extensive roadside remnants and are unlikely to cause or exacerbate land degradation.

The Project is not at variance with this principle.

**Principle (h) – Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.**

No Conservation Reserves are located immediately adjacent to either Study Area.

The Project is not at variance with this principle.

**Principle (i) – Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.**

The areas to be cleared are small and abut extensive roadside remnants. Soils of the sites are likely to demonstrate moderate permeability. The proposed developments are unlikely to have any impacts on surface water quality.

The Project is not at variance with this principle.



**Principle (j) – Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding.**

The areas to be cleared are small and abut extensive roadside remnants. Soils of the sites are likely to demonstrate moderate permeability. The proposed developments are unlikely to have any impacts on surface water quality or local drainage patterns.

The Project is not at variance with this principle.

## 6. Limitations

Limitation	Discussion
Available sources of contextual information	Contextual information on flora of the Study Areas was available from publicly available databases. This is not considered a limitation.
The Scope of the survey	The scope of the project was defined and the development envelopes are small, with minimal impact on native vegetation. This is not considered a limitation.
Proportion of flora collected and identified	Of the 29 flora recorded in the Northern Study Area, three were not fully identified due to lack of suitable flowering / fruiting material. One of the species has affinities to <i>Acacia cylindrica</i> P3, but is likely not this species. The Southern Study Area had 110 endemic flora species with 16 of these not fully identified: including four of <i>Lepidosperma</i> which require specialist review. This may be considered a limitation to the project, however, areas assessed are small and similar vegetation extends either side of each site to be developed. The likelihood of species not fully identified being restricted to within the proposed development envelopes is considered highly unlikely. This is considered a minor but immaterial limitation.
Completeness and further work which may be needed	Other than completing the identifications of flora through recollections of species not fully identified in a favourable Spring period, no further work is required. This is considered a minor limitation.
Mapping reliability	Mapping reliability is adequate, maps at 1:1000 scale were used in the field. This is not considered a limitation.
Timing: weather, season	Seasonal conditions were dry during the November 2020 field assessment and few species were in flower. This was addressed by the May 2021 survey. However, some Myrtaceae species were not collected with identifying flowers or fruits and identification using vegetative parts was necessary. Some could not be verified to species level in this manner. Timing of the surveys is considered a limitation.
Disturbances	Vegetation was in excellent condition and undisturbed. This is not considered a limitation.
Intensity	Survey areas were small and adequate time was spent in assessing each site to be disturbed. This is not considered a limitation.
Resources	Adequate resources were available for the survey. This is not considered a limitation.
Access	Site access was excellent and readily achieved. This is not considered a limitation.
Experience levels	Senior Botanist Geoff Cockerton has 35 years in assessing flora and vegetation in Western Australia including over 20 years assessing flora and vegetation of the Coolgardie bioregion. This is not considered a limitation.

## 7. List of Participants

Staff Member	Field Surveys	Specimen Identification	Data Analysis	Report Preparation
Geoff Cockerton B.Sc. (Biology) Senior Botanist <i>License No. – FB62000046</i>	1	1	1	1
Steven Cockerton Field Assistant	1			
Jason Paterson B.Sc. (Hons.) Graduate Botanist		1		

## 8. Acknowledgements

Mr. Mike Hislop, botanist, WA Herbarium, for review of some Myrtaceae specimens and for opinion on *Allocasuarina campestris* specimens.

Dr. Kevin Thiele, WA Herbarium, for review of *Hibbertia* specimens and opinion on *Allocasuarina campestris* specimens.

Mr. Malcolm Trudgen, Consulting Botanist, for review of Myrtaceae specimens.



## 9. Bibliography

AVH (2017-) *The Australasian Virtual Herbarium*. Council of Heads of Australasian Herbaria, retrieved from <http://avh.chah.org.au/> (accessed 2017).

Bureau of Meteorology (2017) *Australian Government, Bureau of Meteorology*. Retrieved from <http://www.bom.gov.au/>.

Department of Biodiversity, Conservation and Attractions. Threatened and Priority Flora Database, WA Herbarium Database, Threatened and Priority Ecological Communities Databases, accessed 2019.

Department of the Environment, Water, Heritage and the Arts (2009). *Interim Biogeographic Regionalisation for Australia (IBRA), version 6.1*. Retrieved from <http://www.environment.gov.au/parks/nrs/science/bioregion-framework/ibra/index.html>.

Environmental Protection Authority (EPA) (2016) *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment*, EPA , Western Australia

K.L. Wilson, L.A.S. Johnson (2020) *Allocasuarina campestris*, in (ed.), *Flora of Australia*. Australian Biological Resources Study, Department of Agriculture, Water and the Environment: Canberra. <https://profiles.ala.org.au/opus/foa/profile/Allocasuarina%20campestris> [Date Accessed: 05 June 2021]

## **Appendix 1. Site Maps**

Figure 2. Northern Study Area





Figure 3. Southern Study Area – Overview (1 of 3)

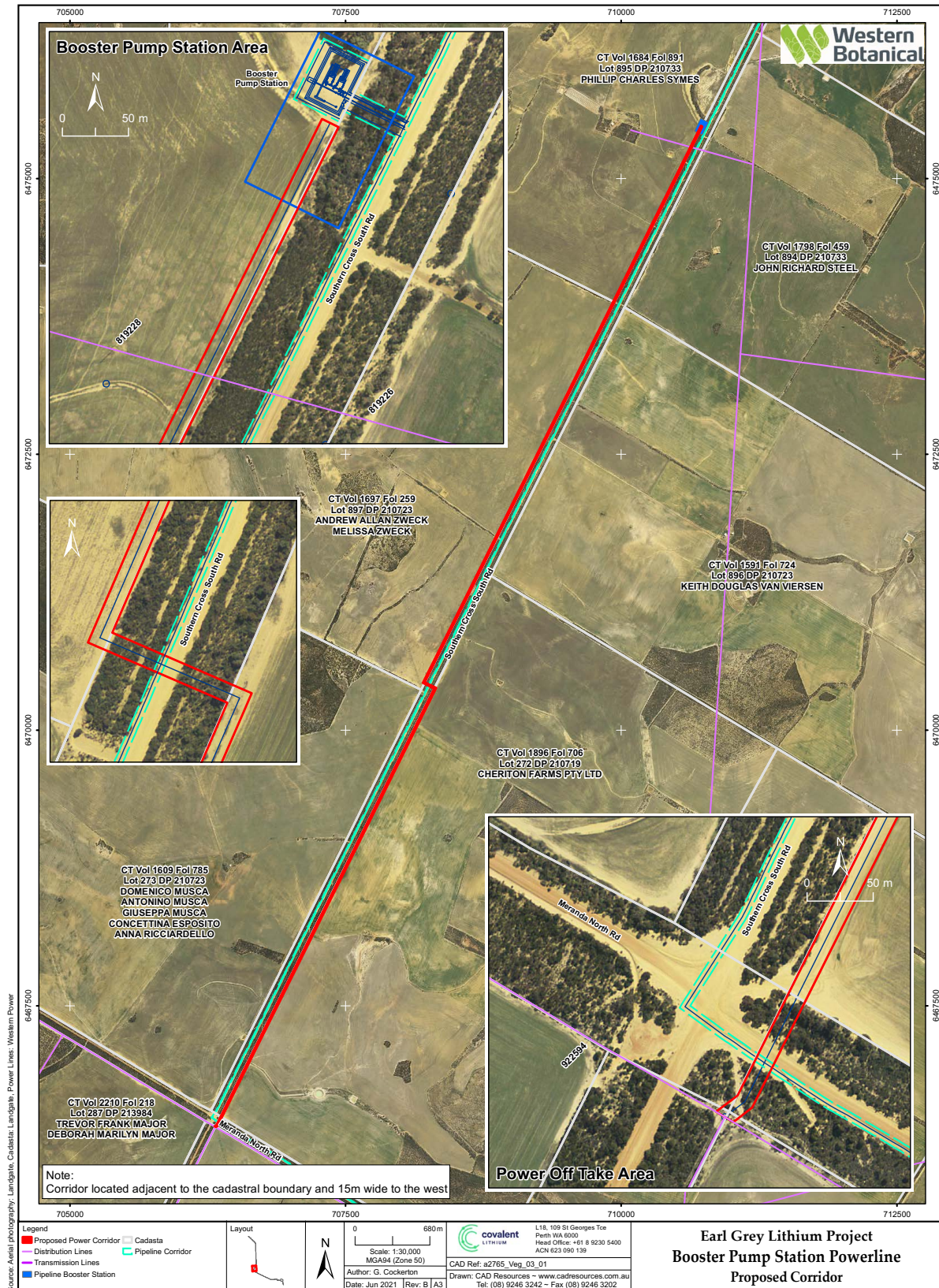
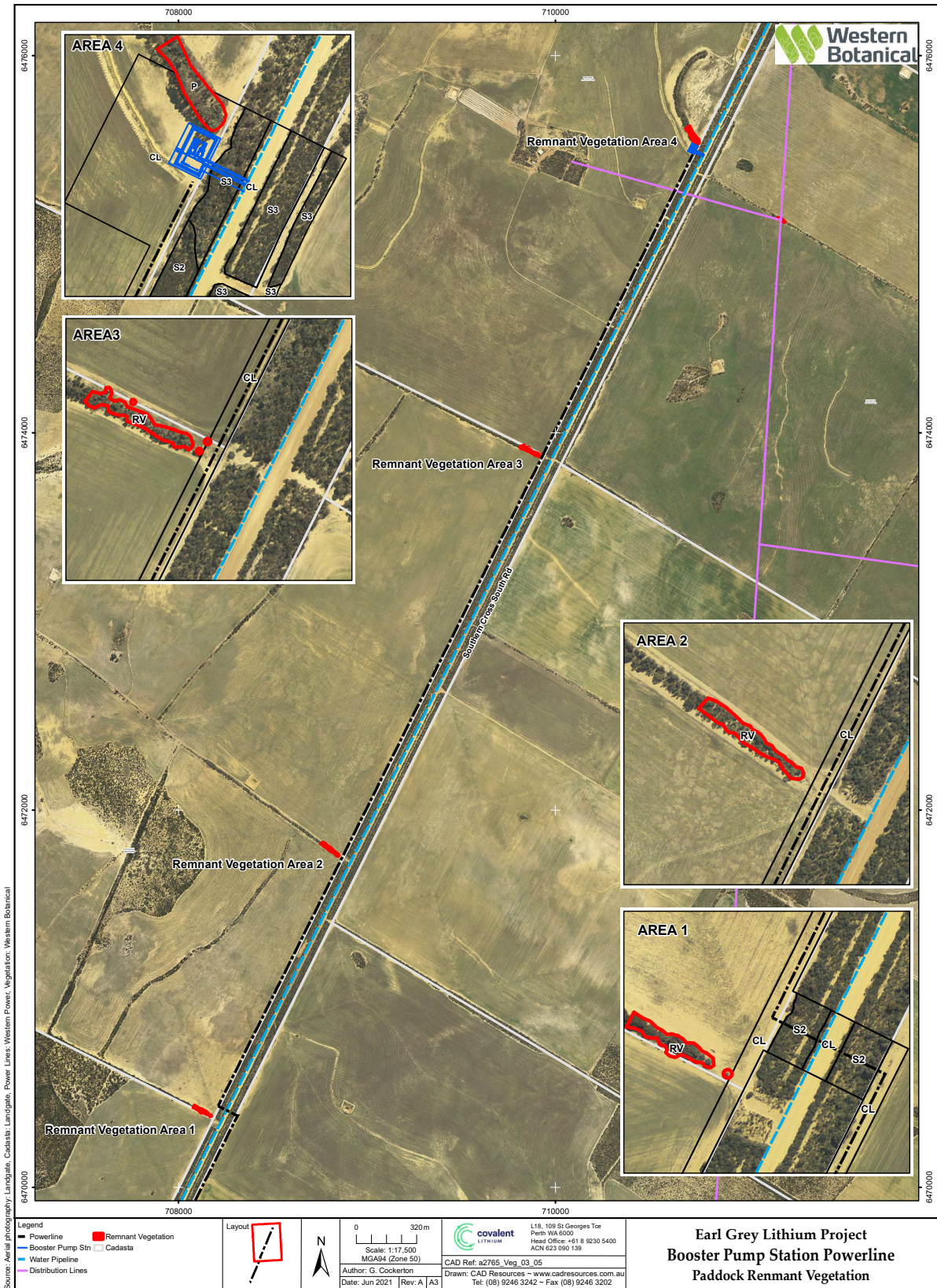




Figure 4. Southern Study Area – Farmland Remnants Locations



## **Appendix 2. Vegetation Maps**





Figure 5. Southern Study Area – Booster Station

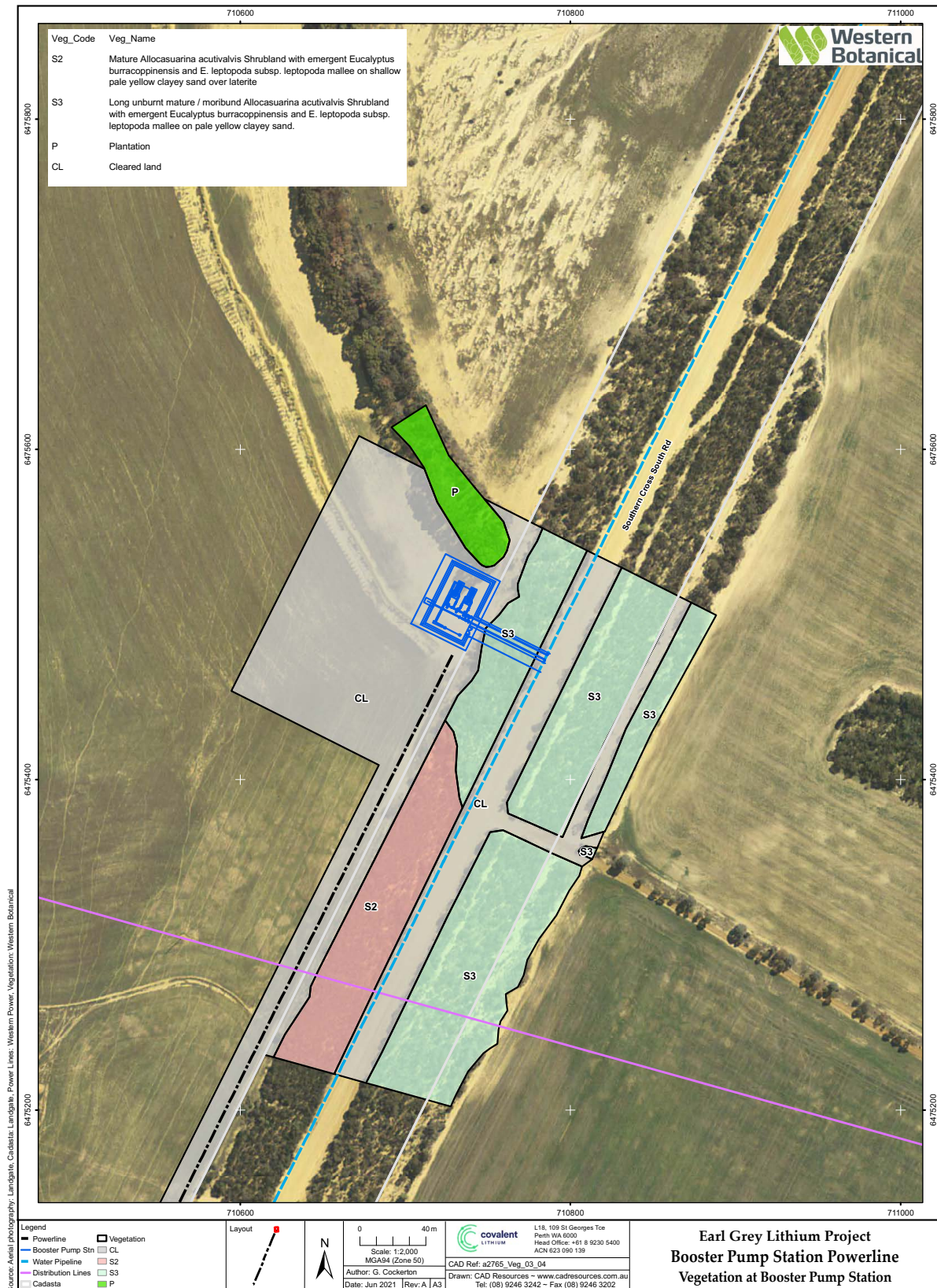


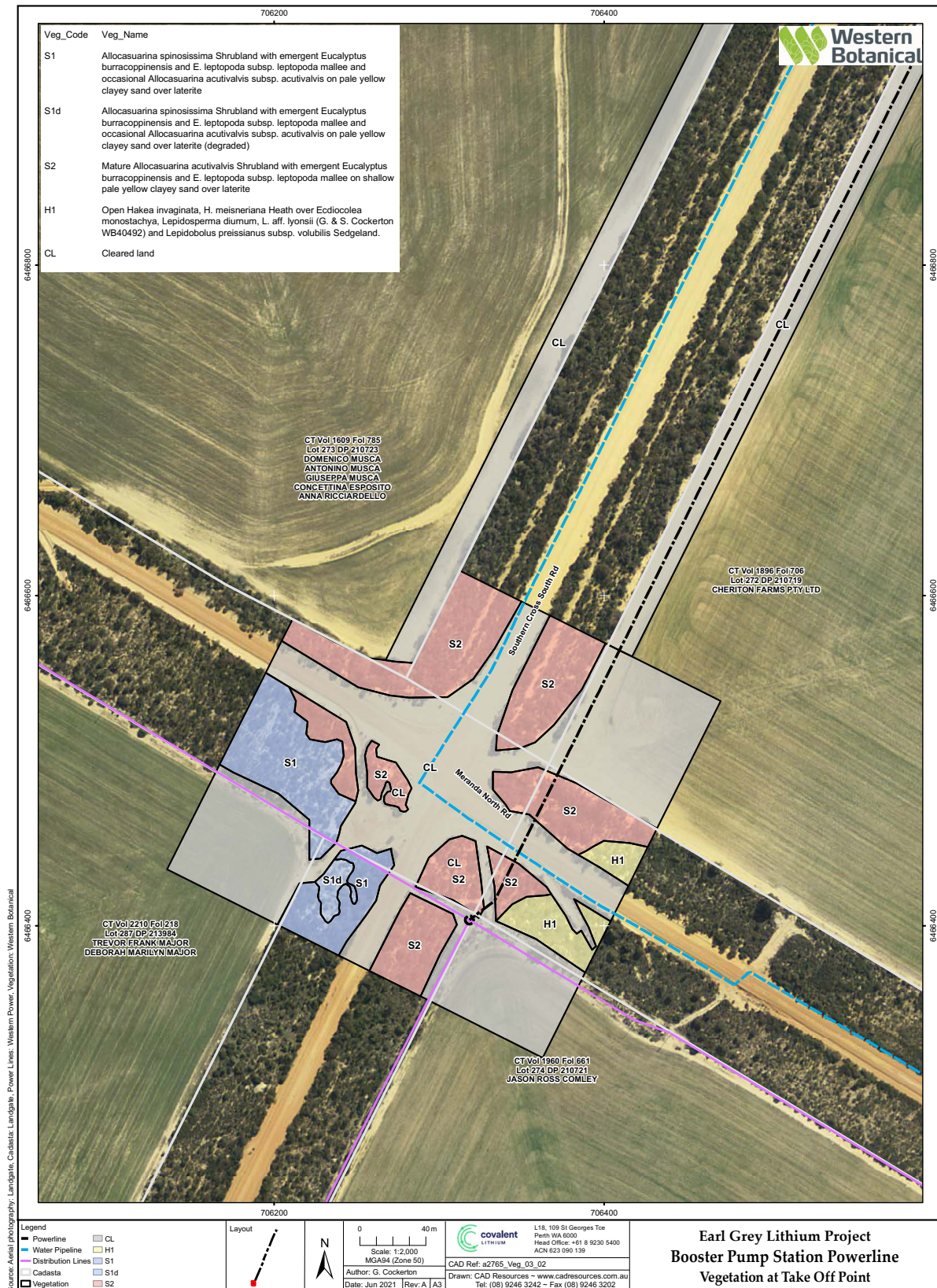


Figure 6. Vegetation Map – Crossing over the Hyden – Southern Cross Road





Figure 7. Vegetation Map – Take-off Point







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