CBH HYDEN
REVEGETATION PLAN

CBH Hyden Receival Site

Lot 31 Marshall Street, Hyden WA 6359

Final V.1

02/02/2024

BUSHFIRE | ENVIRONMENTAL | WATER | GIS

DOCUMENT CONTROL

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Job No.: CBH006-001
Client: Cooperative Bulk Handling (CBH)

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1. Introduction

Cooperative Bulk Handling (CBH), herein referred to as "the client" commissioned Bio Diverse Solutions as Environmental Consultants to prepare a Revegetation Plan for the revegetation of approximately 2.7 ha area at Lot 31 Marshall Street, Hyden in the Shire of Kondinin.
The Revegetation Plan is a requirement to satisfy the conditions of clearing permit (CPS 8795-1) through the Department of Water and Environmental Regulation (DWER). The aim of this Revegetation Plan is to guide the revegetation activities on site. The proposed revegetation will address the impact of the clearing by returning the subject site to an area of native vegetation that is representative of the area that was cleared, bearing similar ecological and habitat values. This revegetation plan has been developed in line with DWER's *Guide to Preparing Revegetation Plans for Clearing Permits* (DWER, 2018a).

1.1. Key Contacts

The clearing and revegetation activity is occurring at the CBH Hyden Receival Site. the clients key contacts are as follows:

- Senior Specialist – Environment and Sustainability: Trevor Tucker
- Project Manager: Brad Ashworth
- Area Manager: Chris Poot
- Site Contact: Darryl Palmer

The revegetation plan has been developed by Bio Diverse Solutions. The people involved in the creation of this plan are as follows:

- Environmental Consultant and Ecologist: Mikayla Hollyock was involved in writing this plan. She has a BSc in Conservation Biology.
- Environmental Approvals and Compliance Manager: Graham Penter
- Principal Environmental Consultant: Kathryn Kinnear

1.2. Site Details

The clearing site, herein referred to as the "reference site", and revegetation site, herein referred to as the "subject site", are located within Lot 31 Marshall Street, Hyden in the Shire of Kondinin, Figure 2. Approximately 2.67 ha of native vegetation was cleared as detailed by the clearing permit (CPS 8795-1), for the purpose of improving truck marshalling and weighing, access to and additional grain receival and storage facilities at the clients Hyden Receival Site (DWER, 2020). Clearing activity was undertaken in May 2021.
The subject site is comprised of five areas adjacent to and surrounding a drainage basin, an access road and an overhead power line, totalling 2.7 ha, Figure 1(a-d) and Figure 2. Revegetation was attempted at the subject site in August 2023, however was unsuccessful, likely due to planting too late in the season, resulting in seedlings drying out and not establishing root systems prior to summer (T. Tucker, personal communication, 12 December, 2023), see Figure 1(e-f).

Figure 1: a-d) Photos of the subject site. e-f) Photos of dead seedling and rip lines from initial revegetation attempt (August 2023).

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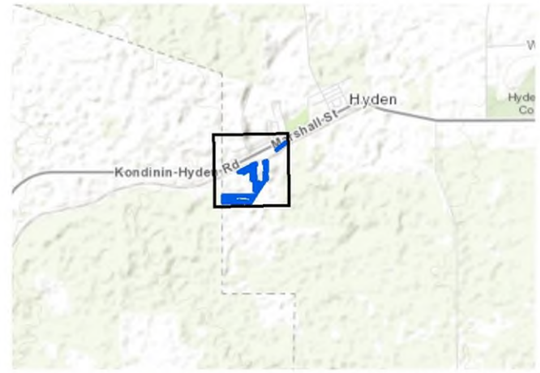


Overview Map Scale 1:100,000

Legend

- Cleared area
- Revegetation area
- Cadastre

Scale
1:3,500 @ A3
GDA MGA 2020 Zone 50

Data Sources
Aerial Imagery: WA Now, Landgate Subscription Imagery
Cadastre, Relief Contours and Roads: Landgate 2017
IRIS Road Network: Main Roads Western Australia 2017
Overview Map: World Topographic map service, ESRI 2012

CLIENT
CBH Group
Lot 31 Marshall Street
Hyden, WA 6359

Figure 2: Revegetation Area

	QA Check	*Drawn by*
	CvdM	**MH**
STATUS **FINAL**	*FILE* **CBH006-001**	*DATE* **12/12/2023**

2. Background Information

2.1. Existing Land Use and Adjacent Tenure

The subject site, of approximately 2.7 ha, is within Lot 31 Marshall Street, Hyden, as part of the client's operational grain receival site, totalling an area of 32.3 ha. The property is under a freehold title, and land usage is described as Transfer of Land Act (Type 1). The property is zoned as "General industry" under the Shire of Kondinin Local Planning Scheme No. 1 (DPLH, 1990). The surrounding properties are predominantly zoned as "Rural" or "Environmental conservation reserve", under the Shire of Kondinin Local Planning Scheme No. 1 (DPLH, 1990).

2.2. Geology and Soils

Database searches shows the subject site lies within the Hyden System (250Hy), described as "Gently undulating mallee, proteaceous and casuarinaceous heaths on pale yellow sandplain, interspersed with substantial areas of granitic country. This system occupies the transitional country between the yellow loamy sandplains of the north." (DPIRD, 2023a).
The South-eastern Zone of Ancient Drainage is described as "A smooth to irregularly undulating plain dominated by salt lake chains in the main valleys with duplex and lateritic soils on the uplands. Mallee vegetation on duplex soils, Proteaceous vegetation on gravels and sands." (DPIRD, 2023b).
The soil type in the subject site is part of the Hyden Sandplain 2 subsystem, described as "Gently undulating mainly grey lateritic sandplain containing iron stone gravelly soils with associated brown yellow sandy and loamy and sandy earths, interspersed with grey alkaline sodic duplexes." (DPIRD, 2023c).

2.3. Climate

The closest open Bureau of Meteorology (BoM) station is Hyden (10568). The average annual temperature in Hyden ranges from 4.6-33.8°C. The average summer temperature ranges between 13.9-33.8°C, whilst average winter temperatures range between 4.6-17.7°C (BoM, 2023a). The annual mean rainfall for Hyden is 341.0 mm (BoM, 2023b). On average the months of May – August are the months with the highest rainfall (Figure 2). There was significantly higher than average rainfall recorded in the months of April and November 2023, and lower than average rainfall recorded in January, February, May, July, October 2023 and December 2022 (Figure 2). The total rainfall in the year previous to the survey (August 2022 to July 2023) was 238.4 mm which is 102.6 mm below average and equates to 30.09% decrease compared to average rainfall (BoM, 2023b).

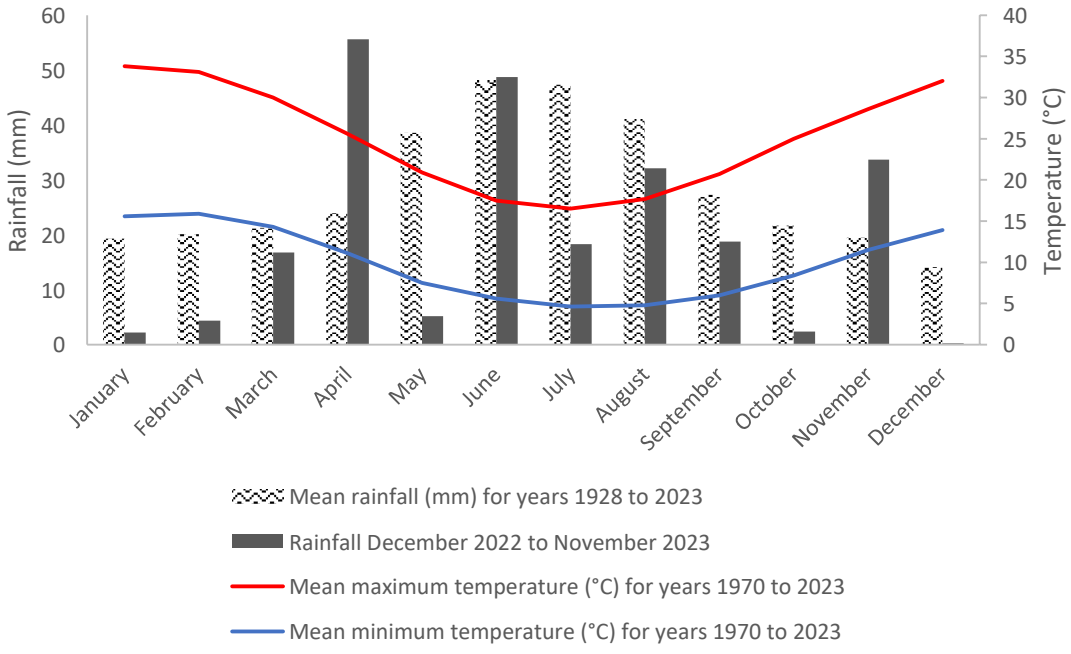


Figure 3: Rainfall and temperature data for Hyden BoM Weather Station (10568).

2.4. Habitat Connectivity

Habitat connectivity assessments rely on a bioregional and landscape-scale approach to evaluate habitat for fauna movement and ecological linkage across a region. Habitat connectivity is largely reliant on remnant vegetation, recognising it plays a very important role in developing corridors between protected areas to assist in achieving long-term biodiversity management outcomes (Wilkins et al. 2006).

The subject site lies within a highly modified landscape consisting of agricultural properties. The Lake Gounter Nature Reserve is located approximately 5 km north west of the survey area. There are other small to large areas of remnant vegetation located to the north, south, east and west of the subject site. The subject site is ultimately linked to these surrounding areas of vegetation through the existing road reserves, and vegetation within private property.

2.5. Water and Wetlands

The subject site does not lie within any Public Drinking Water Source areas (DWER, 2023). The subject site lies within the South East Zone of Ancient Drainage (HZ10_SEAD) Hydrological Zone (DPIRD, 2023d), described as "*A smooth to irregularly undulating plain dominated by salt lake chains in the main valleys with duplex & lateritic soils on the uplands. Mallee vegetation on duplex soils, Proteaceous vegetation on gravels & sands.*" (DPIRD, 2023d). The subject site lies within the Swan Avon Lockhart Hydrographic Catchment (DWER, 2018b) and within the Outer Avon Hydrographic Subcatchment (DWER, 2018c).

No RAMSAR wetlands, or significant wetlands are located within the subject site (DBCA, 2017a; DBCA, 2017b). Approximately 5 km to the north and north west of the subject site there is the Lake Camm mainstream, associated with the Lake Gounter Nature Reserve, identified in Section 2.4 (DWER, 2018d).

2.6. Environmentally Sensitive Areas

The subject site does not contain any Environmentally Sensitive Areas (ESAs). The nearest ESA lies approximately 5 km to the north, associated with the Lake Gounter Nature Reserve, identified in Section 2.4 (DWER, 2021).

2.7. Remnant Vegetation

The subject site lies within the Mallee IBRA bioregion and Western Mallee (MAL02) subregion (DPIRD, 2020). Beecham et al., (2001) describes the Mallee bioregion as "*the south-eastern part of Yilgarn Craton. Its landscape is gently undulating, with partially occluded drainage. Mallee over myrtaceous-proteaceous heaths on duplex (sand over clay) soils are common. Melaleuca shrublands characterise alluvia, and Halosarcia low shrublands occur on saline alluvium. A mosaic of mixed eucalypt woodlands and mallee occur on calcareous earth plains and sandplains overlying Eocene limestone strata in the east. Landscape is fragmented with particular surface-types almost completely cleared as wheatfields. Western Mallee (MAL2) subregion has more relief than its eastern counterpart: main surface-types comprise clays and silts underlain by Kankar, exposed granite, sandplains and laterite pavements. Salt lake systems on a granite basement. Occluded drainage system. Mallee communities occur on a variety of surfaces; Eucalyptus woodlands occur mainly on fine textured soils, with scrub-heath on sands and laterite. The climate is warm Mediterranean and annual rainfall is 250-500mm. Total area of the subregion is 4,763,963 ha.*"

The vegetation has been mapped on a broad scale by J.S. Beard (Shepherd et al., 2002) in the 1970's, where a system was devised for state-wide mapping and vegetation classification based on geographic, geological, soil, climate structure, life form and vegetation characteristics (Sandiford & Barrett, 2010). Vegetation units were regarded as associations and were grouped into Vegetation Systems representing a particular pattern of association distribution within a given area. A GIS search of J.S. Beards (Beard et al., 2013) vegetation classification places the subject site within two Vegetation Associations (DPIRD, 2019) Refer to Table 1 and Figure 9.

Table 1: Vegetation Associations mapped within the survey area (Beard et al., 2013).

Details	Vegetation Association	
System Association Name	Hyden	Hyden
Vegetation Association Number	519	945
Structure Description	Mallee	Woodland/Mallee
Floristic Description	Eucalypt shrubland Eucalyptus eremophila, E. redunca, E. spp.	-
Remnant Vegetation by Beard Association Rarity in LGA	54.33% remaining (GoWA, 2019).	17.44% remaining (GoWA, 2019).

Table 1 continued.

Remnant Vegetation by Beard Association Rarity in IBRA Region	59.45% remaining (GoWA, 2019).	19.63% remaining (GoWA, 2019).

2.8. Heritage

The subject site is located within the Nyaki-Nyaki Nyungar nation (Horton, 1996). The subject site is not located within a registered heritage site, however there are multiple registered sites approximately 3-4 km to the east associated with Katter Kich (Wave Rock) (DPLH, 2023).
It is recognised that there has been a large scale of loss of cultural knowledge and information, and the survey area may contain additional heritage values that are not recognised through Department of Planning, Lands and Heritage (DPLH, 2023). Further due diligence may be required in accordance with the Aboriginal Cultural Heritage Act 2021 (ACH Act) and Aboriginal Cultural Heritage Guidelines.

2.9. Dieback

The Dieback Information Delivery and Management System (DIDMS; SCNRM, 2023) disease confidence mapping of *Phytophthora cinnamomi* of the subject site has not been completed. It is important to note that the publicly available data provided in DIDMS is indicative only and it is stated by SCNRM that "*the extent of infestations are underestimated, as not all areas have been surveyed and disease boundaries are likely to extend into mapped disease-free areas since surveys were conducted*" (SCNRM, 2020).

3. Revegetation Commitments

The intent of this plan is to return the subject site to an area of native vegetation that bears ecological and habitat values, that will ultimately play a role in conserving biodiversity and ecological health at a site scale, as well as at a landscape scale.
The objectives of this plan are to:

1. Reestablish a functional landscape, representing pre-clearing vegetation units through similar composition, structure and density;
2. Reinstate the high condition value of the area, with revegetated areas to be at a minimum of good condition (Keighery, 1994), as per the minimum condition of the reference vegetation unit, with hygiene management strategies to prevent the introduction of weeds or disease to the subject site and maintain a limited presence of non-native species;
3. Reinstatement of the biodiversity of the area with use of a variety of species of local provenance seeds and propagating material; and
4. Reestablish an ecosystem that has the capacity to become self-sustaining with minimal to no management into the future.

Reference vegetation units are described in Section 4, with Section 4.1 describing vegetation composition, structure and density, and Section 4.2 detailing vegetation condition. Specific and measurable targets and completion criteria, will be detailed in Section 5 as per the DWER (2018a) document "*A Guide to Preparing Revegetation Plans for Clearing Permits*". The subject site is proposed to be revegetated by means of direct seeding and planting with use of local provenance seeds and propagating material, see Section 8 for details pertaining to revegetation methods to be employed.

4. Reference Site Assessment

Site assessment of the reference site, prior to clearing, was completed in 2019 by Ecoscape (Australia) (2020). The findings of the site assessment will be used as a basis for revegetation works as a representation of pre-clearing vegetation units (including composition, structure and density). See below a summary of vegetation units, condition and weeds and disturbance as per the Ecoscape report (2020).

4.1. Vegetation Units

Three vegetation units were identified during the survey period, NVIS level 5 (DoEE, 2017) and Muir's (1977) vegetation descriptions can be found in the following sections. NVIS level 5 descriptions are a method of describing vegetation with floristic (species, dominance) information and structural (height, cover, growth form) information summarised for each vegetation strata layer present (upperstorey, midstorey, ground storey). Muir's definitions present similar floristic information within the framework of definitions derived from Muirs definitions of life form/height class (Muirs, 1977). For further information, see Hyden Flora, Vegetation and Fauna Surveys CBH Group (Ecoscape, 2020). Refer to Figures 4–6 for photographs of vegetation units and Figure 7 for mapped vegetation condition.

Vegetation Unit A: *Melaleuca hamata, Allocasuarina* spp. tall open shrubland (MhAaAcTOS)

Vegetation Description (NVIS): M+ ^*Melaleuca hamata*,^*Allocasuarina acutivalvis*,^*Allocasuarina campestris*\^shrub\4\i;G ^^*Borya constricta,Amphipogon caricinus,Lepidobolus preissianus*\^forb,tussock grass,sedge\1\c

Vegetation Description (Muirs): *Melaleuca hamata*, *Allocasuarina acutivalvis* and *Allocasuarina campestris* tall open shrubland over *Borya constricta, Amphipogon caricinus* and *Lepidobolus preissianus* low forbland/tussock grassland/sedgeland.

Area: 1.83ha

Condition: Completely degraded, degraded, good, very good to excellent.

Figure 4: Vegetation Unit A: *Melaleuca hamata, Allocasuarina* spp. tall open shrubland (MhAaAcTOS) (Ecoscape, 2020).

Vegetation Unit B: *Eucalyptus loxophleba* subsp. *gratiae* low mallee woodland (ElLMW)

Vegetation Description (NVIS): U+ ^*Eucalyptus loxophleba* subsp. *gratiae*\^tree mallee\6\i;M ^^*Melaleuca hamata,Santalum acuminatum,Alyxia buxifolia*\^shrub\4\i;G ^*Rytidosperma setaceum.*^*Borya constricta,Neurachne alopecuroidea*\^tussock grass,forb\1\i

Vegetation Description (Muirs): *Eucalyptus loxophleba* subsp. *gratiae* low mallee woodland over *Melaleuca hamata*, *Santalum acuminatum* and *Alyxia buxifolia* tall open shrubland over *Rytidosperma setaceum, Borya constricta* and *Neurachne alopecuroidea* low open tussock grassland/forbland

Area: 0.21 ha

Condition: Good to excellent.

Figure 5: Vegetation Unit B: *Eucalyptus loxophleba* subsp. *gratiae* low mallee woodland (EILMW) (Ecoscape, 2020)

Vegetation Unit C: *Maireana brevifolia* and *Acacia multispicata* mid sparse chenopod shrubland/shrubland (MbAcMSCSS)

Vegetation Description (NVIS): M+ ^*Maireana brevifolia*,^*Acacia multispicata*\^chenopod shrub,shrub\3\r;G ^^*Avena barbata,Arctotheca calendula,Hordeum leporinum*\^other grass,forb\1\c

Vegetation Description (Muirs): *Maireana brevifolia* and *Acacia multispicata* mid sparse chenopod shrubland/shrubland over **Avena barbata,* **Arctotheca calendula* and **Hordeum leporinum* low grassland/forbland

Area: 1.17 ha

Condition: Completely degraded to degraded.

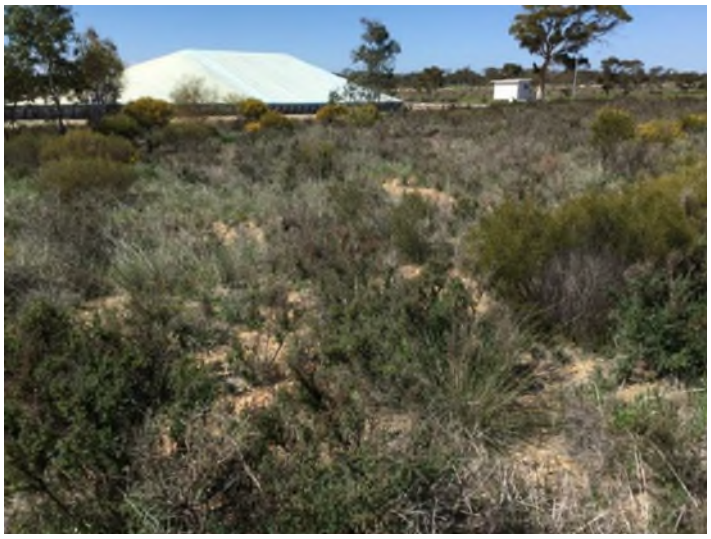


Figure 6: Vegetation Unit C: *Maireana brevifolia* and *Acacia multispicata* mid sparse chenopod shrubland/shrubland (MbAcMSCSS) (Ecoscape, 2020)

4.2. Vegetation Condition

The vegetation ranged from completely degraded to excellent condition throughout the survey area, using the condition rating scale (adapted from Keighery, 1994) outlined in *EPA Technical Guidance Flora and Vegetation Surveys for Environmental Impact Assessment* (2016). These classification levels are related to degradation of structure and vegetation integrity by processes such as clearing, fire, weeds, grazing, Phytophthora Dieback and vehicle tracks. In the survey area the main factors

influencing condition were previous clearing and localised weed invasion. See Table 2 for vegetation condition extent and Figure 7 for mapped vegetation condition.

Table 2: Vegetation condition extent (Ecoscape, 2020)

Vegetation condition	Extent (ha)	Extent (%)
Excellent	1.55	28.84
Very Good	0.09	1.61
Good	0.33	6.14
Degraded	0.92	17.17
Completely Degraded	0.31	5.73
Cleared	2.18	40.51

4.3. Weeds and Disturbance

Twenty-six non-native species were identified in the survey area. **Ehrharta longiflora* (Annual Veldt Grass) and **Arctotheca calendula* (Cape Weed) were the most commonly recorded introduced species. Within largely intact vegetation they occurred in localised patches associated with rabbit dung mounds or under *Santalum acuminatum* (Quandong) trees; in disturbed areas they were a significant contributor to lowering vegetation condition ratings. **Moraea miniata* (Two-leaf Cape Tulip) was recorded opportunistically and is a "Declared Pest - s22(2)" under the *Biosecurity and Agriculture Management Act 2007* (BAM Act). *M. miniata* is in the exempt category and has no management requirements. No Weeds of National Significance (WoNS; IPAC, 2017) were recorded within the survey area (Ecoscape, 2020).

4.4. Reference Site Implications for Revegetation

Based off the gathered data; subject site background information (Section 2); reference site assessment (Section 4); and observations made during a site visit, the revegetation plan and species list, is modelled off Vegetation Unit A (MhAaAcTOS). The rationale being that in the reference site, this vegetation unit primarily represented remnant vegetation in good, very good and excellent condition (it was recorded in completely degraded and degraded condition in disturbed edge zones and isolated patches only). In addition, the geology of Vegetation Unit A in the reference site; yellow, brown, clayey sand (Ecoscape, 2020), most closely resembles the geology of the subject site. A complete species list and quadrat data for Vegetation Unit A can be found in Appendix B.

Justification for excluding Vegetation Unit B, is that it represented only a small percentage of the reference site (3.84%) and was characterised by a geology that differed to the subject site (Orange loamy sand; Ecoscape, 2020). Vegetation Unit C was excluded as it was only recorded in completely degraded to degraded condition, it is likely that this vegetation unit represents an area that was previously cleared, and thus is not a suitable model for revegetation works.

673800 673900 674000 674100 674200 674300 674400 674500

6407900 6407800 6407700 6407600 6407500 6407400 6407300 6407200

KONDININ HYDEN RD

BROOKTON HWY

DAM

VG CD E G D

LEGEND

Survey_Area

Flora Quadrats (Ecoscape, 2018)

- Quadrat
- Relevé

Vegetation Condition (Ecoscape, 2018)

- Excellent (E)
- Very Good (VG)
- Good (G)
- Degraded (D)
- Completely Degraded (CD)

Vegetation Type (Ecoscape, 2018)

- *Eucalyptus loxophleba* subsp. *gratiae* low mallee woodland (EILMW)
- *Maireana brevifolia* and *Acacia multispicata* mid sparse chenopod shrubland/shrubland (MbAcMSCSS)
- *Melaleuca hamata, Allocasuarina acutivalvis* and *Allocasuarina campestris* tall open shrubland (MhAaAcTOS)

Fauna Habitat

MbAcMSCSS = Chenopod Shrubland

MhAaAcTOS and EILMW = Shrubland

ecoscape

Figure 7: Vegetation units and condition of reference site (Ecoscape, 2020)

HYDEN FLORA, VEGETATION AND FAUNA SURVEYS

DATA SOURCES:
SOURCE DATA:
AERIAL: LANDGATE LOCATE MOSAIC
BASEMAP: GEOSCIENCE AUSTRALIA
SERVICE LAYERS:

CBH GROUP

COORDINATE SYSTEM: GDA 1994 MGA ZONE 50
PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA 1994
UNITS: METER

N

SCALE: 13,000 @ A3

0 25 50 75 100 m

PROJECT NO: 4464-19

REV	AUTHOR	APPROVED	DATE
00	SB	LA	22/10/2019
01	SB	LA	02/12/2019

MAP 02

5. Targets and Completion Criteria

Completion targets and criteria for consideration of successful revegetation of the area are displayed in Table 3. Baseline floristic data has been based off Vegetation Unit A in the reference site, see Section 4.4 for justification.

Table 3: Completion targets and criteria for the subject site.

Criterion		Baseline Floristic data	Completion targets	Completion criteria
Species richness	A(i)	Vegetation Unit A site species richness is 53 species (native species only).	Minimum of 60% of native species returned, based on reference site.	The revegetation site contains a minimum of 32 native species, as recorded at the reference site.
	A(ii)	Species richness of the quadrats (20mx20m) in the reference site was 31, 31 and 30 species. Therefore, the average number of species per quadrat is 31.	Minimum of 60% of native species returned, based on reference site.	The revegetation site has a minimum of 19 native species per quadrat, as recorded at the reference sites.
	A(iii)	There are three dominant tree/shrub species in the midstorey strata layer of the reference site.	Return of dominant species in the midstorey, based on reference site.	The three dominant midstorey species (*Melaleuca hamata*, *Allocasuarina acutivalvis*, *Allocasuarina campestris)* to be found in the revegetation area.
	A(iv)	There is one dominant shrub species and a total species richness of 47 in the understorey/ ground strata layer of the reference site.	Return of dominant species and minimum of 60% of understorey /ground species richness return, based on reference site.	The dominant understorey species (*Borya constricta*) and a minimum of 28 understorey/ground species to be found in the revegetation area.
Species density	B	NVIS Level 5 Description of Vegetation Unit A (see section 4.1) described midstorey density of the reference site as a tall open shrubland indicating 10-30% shrub cover.	Minimum of 60% return of shrub density in the midstorey, based on reference site.	The revegetation site has a minimum of 6-18% shrub cover in the midstorey.
Herbs, sedges, grasses	C	NVIS Level 5 Description of Vegetation Unit A (see section 4.1) described understorey density of the reference site as a low forbland/tussock grassland/sedgeland indicating 30-70% herb/sedge/grass/small shrub cover.	Minimum of 60% return of herb/ sedge/grass/small shrub density in the understorey/ ground, based on reference site.	The revegetation site has a minimum of 18-42% herb/sedge/grass/small shrub density in the understorey/ ground.
Weed cover	D(i)	Weed cover in the quadrats in the reference site was <1%, <1% and 2%. Therefore, the average weed cover is ~1% (major competitive species).	No more than 10% greater than in the reference sites.	The revegetation site has no more than 1.1% weed cover (major competitive species).
	D(ii)	No declared weeds are present.	Managed as required by the *Biosecurity and Agriculture Management Regulations 2013.*	Absent from the revegetated area.

Table 3 continued.

Bare ground	E	Bare ground in the quadrats in the reference site was 55%, 60% and 65%. Therefore, the average bare ground cover is 60%.	No more than 10% greater than in the reference sites.	The revegetation site average for bare ground is to be no more than 66%.
Survival rate	F	Survival rate to be achieved.	If after 5 years of planting a survival rate of at least 80% is not achieved, all planted trees that have not survived must be replanted within 12 months and monitored for a further 2 years. See Section 8 for more guidance on maintenance and contingency actions.	The revegetation site needs to ensure a survival rate for trees of at least 80% is achieved after five years, and replant any trees within 12 months of dying.

The criteria framework presented in Table 3 is guided by the template in the DWER (2018a) document "*A Guide to Preparing Revegetation Plans for Clearing Permits*". All criteria address various measurable vegetation characteristics, using the baseline floristic data and revegetation objectives, outlined in Section 3, to inform completion targets. See Table 4 for a summary of which criterion addresses the objectives in Section 3. The percentage thresholds outlined in the completion targets were chosen as limits that could be realistically achieved, were representative of the baseline floristic data and aligned with the revegetation commitments.

Table 4: Summary of which criterion address the revegetation objectives.

Criterion	Objective			
	1	2	3	4
A	X	X	X	
B	X	X	X	
C	X	X	X	
D		X	X	
E	X		X	
F				X

6. Site Preparation

This section details actions required to prepare the site for revegetation activities.

6.1. Fire management

A bushfire assessment was not undertaken for the subject site. A 5m wide fire break exists along the fenced boundaries of the CBH site, adjacent to the west, south and eastern boundaries of the subject site. Maintenance and slashing of vegetation encroaching into the fire break should occur annually. This maintenance should be undertaken in September to November, prior to the bushfire risk season. Care should be taken to prevent excessive disturbance to the subject site so as not to negatively affect revegetation efforts.

6.2. Weed management plan

The subject site has a significant infestation of common agricultural and cropping weed species. Eliminating weeds from the subject site will be essential for revegetation success; to reduce competition for moisture, light and nutrients; and to satisfy the targets and completion criteria for this revegetation plan.
The aims of the weed management plan are to:

- Significantly reduce extent of current weed invasions within areas intended for revegetation;
- Increase available area suitable for revegetation activities;
- Attempt to eradicate smaller infestations or small populations;
- Prevent the introduction of new weed species, particularly declared pests (BAM act) and WoNS (IPAC, 2017); and
- Regularly monitor the site for invasive species.

Weed treatment will be conducted using the following methodology:

- Ensure no weed-affected soil is brought into the subject site by vehicles, machinery or equipment;
- Large woody weeds will be grubbed (hand removal), poisoned or removed from site and disposed to approved green waste receival facilities;
- Small weeds will be sprayed by a licensed contractor but only if the weeds are out-competing the native vegetation establishment areas;
- Scalping to be conducted in the south western area of the subject site where weed burden is particularly high (note that scalping is to be conducted in conjunction with ripping); and
- Initial follow up spraying may be undertaken annually as required. This will be dependent on what species are present and in what volumes.

Generally, herbicide spraying is most successful when the weeds are actively growing and before they produce seed heads, in late winter to early spring (GoSA, 2019). Avoid herbicide drift or overspray as this will impact the health, vigour and fecundity of the native vegetation and potentially impact the revegetation success. Spraying should be conducted by a licensed and qualified weed management contractor, using suitable weed treatments that will not persist in the soil or negatively impact native vegetation success (eg. residual herbicides). In addition, it is recommended that weed management strategies be extended to areas beyond the subject site (subject to those areas respective land tenure), to prevent weed invasion from external sources. See Table 5 for a suggested timeline for weed management prior to planting.
Due to the high weed infestation at the subject site, particularly in the southern sections of the subject site, scalping is recommended. Scalping involves removing the top few centimetres of weed burden, including the weeds and the seed in the soil (Sheehan et al., 2018).
It is recommended that any vehicles or machinery are treated and clean prior to entering the subject site. This is to ensure that weeds are not further dispersed by the machinery and activity on site.

6.3. Dieback and hygiene management plan

There is no evidence of dieback (*phytophora* sp.) infestations at the subject site or in adjacent vegetation. Dieback generally occurs in areas that receive a minimum of 400mm of rainfall a year (DWER, 2018a), as such it is not currently widespread in the wheatbelt, where rainfall is typically below this (mean annual rainfall in Hyden is 341.0mm) and soil conditions are dry for majority of the year. However, indications of dieback or other plant diseases will be monitored annually as a part of the annual reporting required by the clearing permit.
The aims of the dieback and hygiene management plan are to:

- Mitigate the risk of introducing or spreading disease through the subject site, seed/vegetative material collection sites, or to adjacent vegetation, including the nearby Lake Gounter Nature Reserve;
- Regularly monitor the subject site and seed/vegetative material collection sites for indications of dieback or any other plant diseases; and
- Manage and treat dieback should it occur at the subject site.

The hygiene and dieback management will be conducted using the following methodology:

- Clean earth-moving machinery, vehicles or any other equipment of soil or vegetative material prior to entry or departure from the subject site;

- Erect clean down signs at entry and departure points from the site;
- Ensure that no dieback infected soil, mulch, fill, matting or any other vegetative material enters the subject site;
- Limit earth-moving activity in wet conditions; and
- Employ a registered dieback interpreter to assess the presence of dieback at the site and guide subsequent management tactics, if indications of dieback are detected at the subject site.

6.4. Ripping and ground preparation

Subject site ground conditions are hard and compacted. Deep ripping of the subject site (up to 0.5m, as recommended in the Wheatbelt; WNRM, 2023) will be required to break up soil compaction, to allow root and water penetration. Rip lines should be approximately 2-3m apart and run along contour lines, to aid in harvesting water as it flows down slope (WNRM, 2023).
The soil should be prepared by scalping (in required areas), ripping then mounding. Alternatively, the use of a 'one-pass tree planter' is recommended as it scalps, rips and mounds in one operation, it is commonly used in wheatbelt revegetation works (WNRM, 2023). To mitigate wind erosion following ripping, it is recommended to lay down mulched material and brush matting and conduct the ripping prior to planting.

6.5. Mulch spreading and brush matting

Spreading mulch and brush matting are to be used in the subject site to mitigate wind erosion following ripping. These methods also aid in retaining soil moisture by reducing evaporation, insulating from temperature extremes and supressing weeds, thus improving seedling success. This introduction of organic material into the subject site also provides micro-habitats and niches for invertebrates and microorganisms.
Mulching of local vegetative material (already present at the subject site) should be conducted prior to ripping and ground preparation, stored, then spread over and around the mounds before planting. It is recommended that mulching is applied to 60-100cm radius, approximately 10cm deep around the seedlings (LFW, n.d.). It is also good practice to leave 10cm space around the stem to avoid fungal infections or rot (LFW, n.d.).
Brush matting involves laying down branches or "brush" as a protective ground layer and a cost-effective revegetation technique. Branches bearing fertile materials (seeds) should be used, when weather conditions are conducive the seeds will drop, germinate and grow. The rate of success and speed of this method is not as high as for other revegetation techniques, such as direct seeding or planting, however it is cost-effective and provides other benefits, as above. Among others, species of the families myrtaceae and fabaceae are generally suitable for this method. See species denoted by ^ in Table 5, for species suitable for brush matting.

6.6. Topsoil

Stockpiled topsoil reserved from the reference site was spread over the subject site in September 2021 and unsuccessful revegetation activities conducted in August 2023 (T. Tucker, personal communication, 12 December, 2023). Care should be exercised whilst conducting site preparation activities to not disturb native species regenerating from the topsoil seedbank, or alternatively vegetative material should be harvested/reserved for brush matting or other revegetation activities.

7. Revegetation Methodology

The following section outlines the detailed steps for successful revegetation of the subject site, including species list, revegetation actions and management.

7.1. Species List

The following species list, Table 5, is modelled off Vegetation Unit A (MhAaAcTOS). The recommended revegetation species list is composed of species recorded within the reference site and excluding species such as orchids and climbers that are not practical revegetation species.

Table 5: Revegetation species list (species listed by strata layer, form then in alphabetical order based on family, *denotes species dominance within respective strata layer, ^denotes species suitable for brush matting).

Strata Layer	Form	Family	Species
Midstorey	Trees, shrubs	Casuarinaceae	*^*Allocasuarina acutivalvis*
		Casuarinaceae	*^*Allocasuarina campestris*
		Myrtaceae	*^*Melaleuca hamata*
		Santalaceae	*Exocarpos aphyllus*
		Santalaceae	^*Santalum acuminatum*
Understorey/ ground	Shrubs	Chenopodiaceae	*Enchylaena tomentosa*
		Cyperaceae	*Schoenus hexandrus*
		Dilleniaceae	*Hibbertia eatoniae*
		Ericaceae	*Styphelia dielsiana (prev. Leucopogon dielsianus)*
		Ericaceae	*Styphelia hamulosa (prev. Leucopogon hamulosus)*
		Ericaceae	*Styphelia serratifolia (prev. Astroloma serratifolium)*
		Fabaceae	^*Acacia multispicata*
		Fabaceae	^*Mirbelia microphylla*
		Fabaceae	*Leptosema daviesioides*
		Goodeniaceae	*Dampiera juncea*
		Myrtaceae	^*Cyathostemon heterantherus*
		Myrtaceae	*Ericomyrtus serpyllifolia*
		Myrtaceae	^*Leptospermopsis erubescens (prev. Leptospermum erubescens)*
		Myrtaceae	^*Melaleuca depauperata*
		Myrtaceae	^*Melaleuca laxiflora*
		Myrtaceae	^*Melaleuca platycalyx*
		Pittosporaceae	*Cheiranthera filifolia*
		Proteaceae	*Grevillea yorkrakinensis*
		Proteaceae	*Persoonia trinervis*
		Rhamnaceae	*Cryptandra apetala var. anomala*
	Herbs, sedges, grasses	Rhamnaceae	*Cryptandra myriantha*
		Apiaceae	*Platysace effusa*
		Asparagaceae	*Lomandra effusa*
		Boryaceae	**Borya constricta*
		Cyperaceae	*Lepidosperma drummondii*
		Cyperaceae	*Schoenus calcatus*
		Haemodoraceae	*Haemodorum discolor*
		Poaceae	*Amphipogon caricinus*
		Poaceae	*Austrostipa elegantissima*
		Poaceae	*Neurachne alopecuroidea*
		Poaceae	*Spartochloa scirpoidea*
		Polygalaceae	*Comesperma volubile*
		Restionaceae	*Lepidobolus preissianus*

7.2. Revegetation activities

Local provenance seeds and propagating material, will exclusively be used for this revegetation. In the first year the availability of local provenance seeds and tubestock for the required species, could be a limitation. As such it is recommended that an

initial planting be conducted, with some of the recommended species more commonly found in nurseries. Subsequent planting can be conducted in the second year, using collected seed and propagated material, to infill and increase species diversity as per the targets and completion criteria (Section 5). The minimum seeding/planting rate proposed is 1080 stems per ha, this will be completed with a combination of tubestock planting and direct seeding. See Table 6 for a suggested timeline for the first year of site preparation and revegetation activities.

7.3. Initial planting

An initial planting should occur in the first year with tubestock of some more commonly cultivated nursery species, sourced from nurseries based in the Wheatbelt. The optimal time to conduct tubestock planting in the Wheatbelt is May to June (DWER, 2018a), once the rain has arrived for the winter. Ideally planting should be conducted after good rains with rain forecasted following the planting. Planting at this time of year gives seedlings a chance to establish roots so they can persist through the dry summer months. In addition, direct seeding can also occur in conjunction with this initial planting provided local provenance seeds of appropriate species can be sourced. The spacing of seedlings and seeding should take into account a subsequent planting event in the following year.
The following species are some species generally available and should be utilised in the initial planting:

- Melaleuca hamata
- Allocasuarina campestris
- Leptospirosis erubescens
- Santalum acuminatum
- Acacia multispicata
- Austrostipa elegantissima

7.4. Seed collection and propagation

Seed collection is to be conducted in spring to gather local provenance seeds and propagating material, to contribute and increase species diversity and reintroduce the species recorded in the reference site. Seeds should be collected from local sites with similar geology and species composition to the reference site by an appropriately licensed seed collector. As per the dieback and hygiene management plan it is essential to ensure seeds are collected from dieback free areas.
Following seed collection appropriate actions should be taken to store seeds (and treat if required) and propagate seedlings in preparation for planting activities in the second year.

7.5. Direct seeding

Direct seeding should occur in conjunction with tubestock planting. Seeding of herb, sedge and grass species will be helpful to restore the forbland/tussock grassland/sedgeland described in the reference site. The optimal time for direct seeding in the Wheatbelt is April to June, after good rains and before forecasted follow-up rain (GAV, 2003).

7.6. Tube stock planting

A secondary tubestock planting will occur in the second year with the material collected and propagated the preceding spring. These seedlings should be planted among the plants and seedlings from the initial planting. This planting should be conducted in May to June, after the rain for the season has commenced.

7.7. Timeline of activities

See Table 6 for a proposed timeline of activities for the first year.

Table 6: Timeline of site preparation and revegetation activities in the first year.

<table>
<tr><th>Jan</th><th colspan="2">Feb</th><th>Mar</th><th>Apr</th><th>May</th><th>Jun</th><th>Jul</th><th>Aug</th><th>Sep</th><th>Oct</th><th>Nov</th><th>Dec</th></tr>
<tr><td rowspan="3">Order available species from nursery for the initial planting.</td><td colspan="3" rowspan="3">Initial weed control- manual removal and spraying within subject site and adjacent weed infested areas.
Allow minimum 25 days between herbicide application and planting (WNRM, 2023).</td><td>Scalp/rip/mound the subject site in preparation of planting.</td><td colspan="2" rowspan="3">Initial planting- conducted after first rains. Tubestock and direct seeding, if available.</td><td rowspan="3"></td><td rowspan="3"></td><td colspan="4">Seed collection, then subsequent seed treatment and propagation.</td></tr>
<tr><td>Mulching and brush matting (after ripping activity is completed).</td><td colspan="3">Post planting/ annual weed control as required.</td><td rowspan="2"></td></tr>
<tr><td colspan="3">Fire management.</td></tr>
<tr><td colspan="9"></td><td colspan="2">Water planted vegetation as required (see Section 8.1).</td></tr>
<tr><td colspan="12">Weed management plan – Ongoing</td></tr>
<tr><td colspan="12">Dieback and hygiene management plan - Ongoing</td></tr>
</table>

8. Maintenance and Contingency Measures

The contingency measures will only be enacted if monitoring outcomes suggest that the completion targets listed in Table 3 were not tracking to be met after year two of the revegetation plan. Contingency measures are included within this management plan. These protocols are designed to reduce adverse environmental impacts and provide an early detection of non-conformance and subsequent corrective action. Any modifications to the outlined strategies and methodologies to meet unexpected conditions shall be agreed to by the CBH Site Manager. Monitoring shall be used to confirm the effectiveness of any changes.

8.1. Additional watering

If rain during the winter/planting period has been insufficient or lower than average (approx. 340mm) and there is evidence of plant stress (stunted growth of seedlings, signs of desiccation), additional watering may be required. If watering is required it should be undertaken between the months of November and March (DWER, 2020). Broadcast watering is recommended as a cost-effective, low labour method of watering, and the planted rip lines should divert water to seedlings. An additional contingency action during particularly dry periods/years is the addition of a wetting agent to further support seedling success.

8.2. Weed control

If weeds are suppressing native plant growth and/or declared weeds are present in the subject site, control methods for environmental weed species will be intensified, with an increase of rounds of herbicide spraying each winter/spring and potential adjustment of herbicide dosage, where appropriate. Determine if there are any significant 'source' sites of the weed species located outside the subject site that may need to be addressed, if so apply weed control methods to these areas as required. If new aggressive weeds are introduced to the site (eg. Declared Pest/WoNS or environmental weed), introduction vectors should be investigated and managed as required (eg heightened hygiene protocol measures for machinery entering the site). Appropriate weed control may need to be extended into adjacent areas of early infestation to suppress invasion and preferably eradicate the species.
If weed management, detailed in Section 6.2, is deemed insufficient for emerging site conditions and weed infestation, reassessment of control techniques will be undertaken. If deemed appropriate an updated and comprehensive weed management plan should be developed to manage the weed issue at the subject site.

8.3. Remedial planting

Should annual monitoring suggest that targets and completion criteria are not on track after year two revegetation activities remedial planting will occur. Site conditions and reasons for lack of plant success will be considered and addressed if additional planting is to occur. This may include, but is not limited to, an increase in watering rates, fertiliser application when planting, or use of a more suitable species for the observed conditions or erecting fences to reduce grazing pressure. Infill plantings are to be undertaken as required in consultation with the Environmental team and CBH Site Managers.

8.4. Dieback treatment

Monitoring for signs of dieback is ongoing as per the dieback and hygiene management plan. If indications of dieback are detected, a registered dieback interpreter will be employed to assess the presence of dieback at the site and guide subsequent management tactics. If dieback is present dieback mapping, monitoring, management and reporting to DWER will occur. If necessary, hygiene management protocols will be intensified.

8.5. Erosion control

Annual monitoring of the subject site will detect erosion should it emerge as a problem at the site. While planted vegetation should stabilise soil and prevent erosion, if necessary additional methods may be introduced until vegetation is fully established.
Additional erosion control methods:

- Additional spreading of mulch and brush matting (past year one);
- Erosion control mats and blankets; and
- Temporary ground cover vegetation, such as annual grasses or herbs (native).

9. Monitoring and Analysis

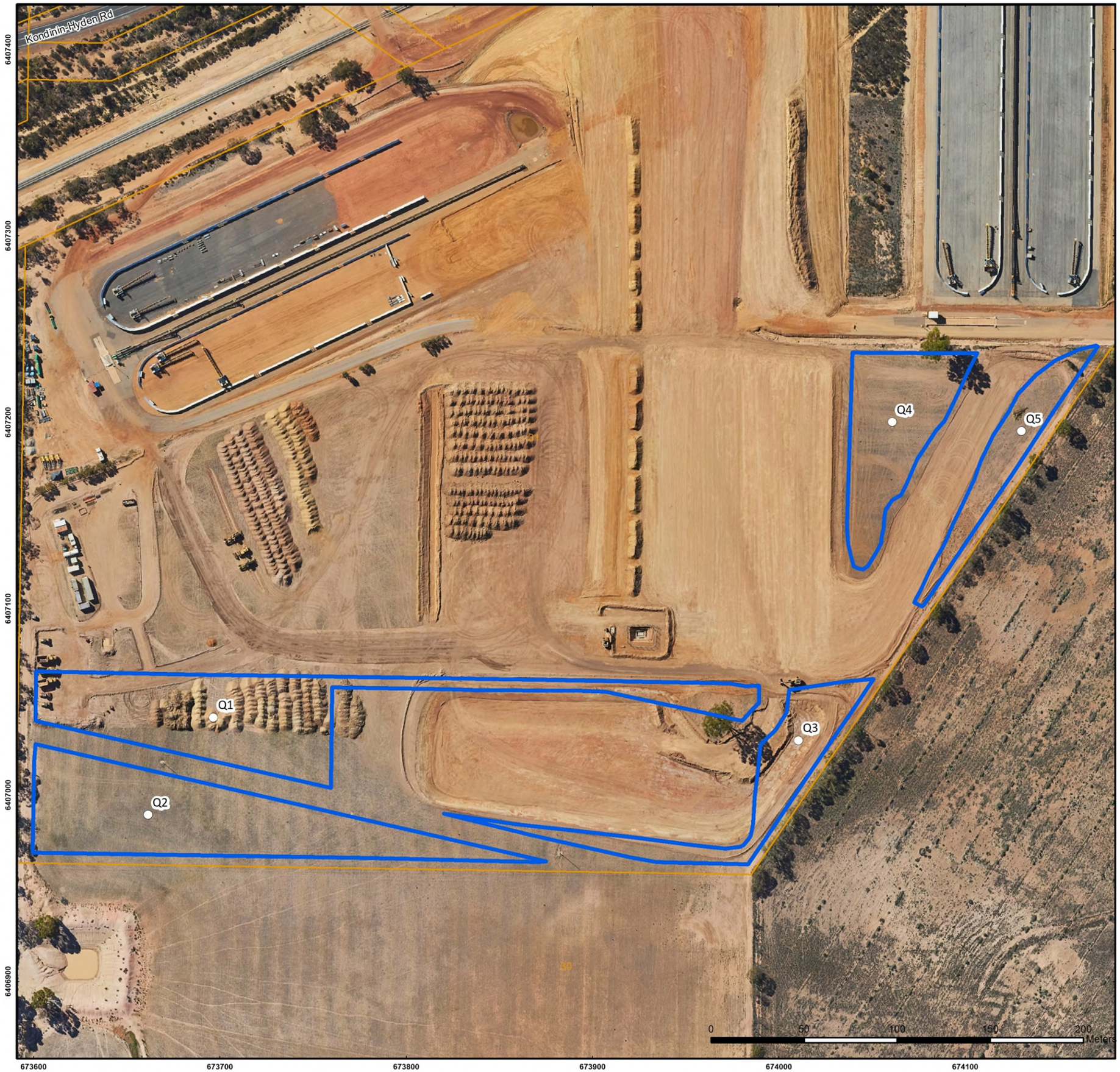
It is expected that a minimum of 3 years will be required to meet a successful revegetation program of this scale. However, determination of the area to be 'on track' to meet measurables can be recorded as indicative of success in future years. Annual monitoring is to be undertaken in December/January (Summer periods) each year to assess the success of the revegetation plan. The timing is appropriate for all weed grass species to be absent from growth period, post spring growth of native species and assessment of the revegetation plants to be clearly identifiable. Assessment for weeds may be required during winter/spring months if weeds are encroaching and/or suppressing plant growth.

A minimum of five permanent quadrat monitoring points will be installed to ensure consistent ongoing monitoring. Quadrats will be marked with a permanent post at the north-west corner of the quadrat. Quadrats should be positioned with one in the middle of each revegetated patch, see Figure 8. Installation of quadrats in the middle of patches will accurately capture revegetation progress, with less influence from edge effects. These quadrats will also provide points for photo monitoring, see Table 7.

An annual report containing records relating to condition 4(a) and 4(b), and records of activities undertaken in the preceding calendar year (1 January to 30 December), as per the clearing permit is to be completed. See Table 7 for details of what monitoring data will be collected, incidental records and data that will be collected if relevant.

Table 7: Monitoring details.

Data collection type	Aim of monitoring	Output	Frequency	Duration
Site-level	Vegetation condition	Data and map.	Annual	Ongoing annually until completion criteria met and maintained for two years.
	Weed monitoring and mapping	Data and map.		
	Disease monitoring, as required.	Data, map, name and qualifications of dieback interpreter.		
Quadrat-level	Quadrat floristics	Floristic survey data, analysis (ordinations), discussion, list of coordinates and site map with quadrats.	Annual	Ongoing annually until completion criteria met and maintained for two years.
	Vegetation structure	Data, analysis and discussion.		
	Photopoint monitoring	Images, list of coordinates, map of photopoints from quadrat location.		



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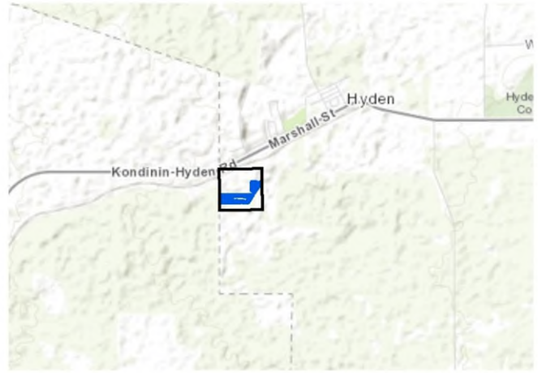


Overview Map Scale 1:100,000

Legend

- Revegetation area
- Cadastre
- Quadrat points

Scale
1:2,000 @ A3
GDA MGA 2020 Zone 50

Data Sources
Aerial Imagery: WA Now, Landgate Subscription Imagery
Cadastre, Relief Contours and Roads: Landgate 2017
IRIS Road Network: Main Roads Western Australia 2017
Overview Map: World Topographic map service, ESRI 2012

CLIENT
CBH Group
Lot 31 Marshall Street
Hyden, WA 6359

Figure 8: Quadrat Points.

	QA Check	*Drawn by*
	GP	**MH**
STATUS	*FILE*	*DATE*
FINAL	**CBH006-001**	**01/02/2024**

10. Schedule and Budget

See Table 8 for a schedule of actions for the revegetation project.

Table 8: Schedule of actions.

Stage	Action	Responsibility	Timing	Year 1 - 2024	Year 2 – 2025	Year 3 - 2026	Year 4 - 2027	Year 5 and beyond	Cost Estimates
Site Preparation	Contractor/s onboarding and briefing	BDS Environmental team – TBC	Prior to contractor works, ongoing as required.	X	Ongoing as required.				TBC
	Fire management	Contractors -TBC	September to November.	X	X	X	X	X	TBC
	Weed management	Contractors -TBC	February to March.	X					TBC
	Weed management plan		Ongoing.	X	X	X	X	X	
	Dieback and hygiene management plan		Ongoing.	X	X	X	X	X	TBC
	Ripping and ground preparation	Contractors -TBC	April, prior to mulch spreading and brush matting.	X					TBC
	Mulch spreading and brush matting	Contractors - TBC	April.	X					TBC
Revegetation activities	Place tube stock orders with nursery	BDS Environmental team ordering from nursery -TBC	January.	X					TBC
	Direct seeding	Contractors - TBC	April to June. Initial seeding year 1, infill and increase species diversity year 2.	X	X				TBC
	Tube stock planting	Contractors - TBC	May to June. Initial planting year 1, infill and increase species diversity year 2.	X	X				TBC
	Seed collection	Contractors - TBC	September to November.	X					TBC
	Plant propagation	Contractors - TBC	December to February.	X	X				TBC
Maintenance and Contingency	Weed control	Contractors - TBC	September to November, annually as required as per contingency actions.	X	X	Ongoing annually as required.			TBC
	Remedial planting	Contractors - TBC	If required as per contingency actions.			If required following scheduled revegetation activities.			TBC
	Dieback treatment	Contractors - TBC	If required as per contingency actions.						TBC
	Erosion control	Contractors - TBC	If required as per contingency actions.						TBC

Table 8 continued.

Stage	Action	Responsibility	Timing	Year 1 - 2024	Year 2 – 2025	Year 3 - 2026	Year 4 - 2027	Year 5 and beyond	Cost Estimates
Monitoring	Vegetation monitoring against targets and completion criteria	BDS Environmental team – TBC	At commencement of revegetation activities. Annual following revegetation completion.		X	Ongoing annually until completion criteria met and maintained for two years.			TBC
	Weed monitoring	BDS Environmental team – TBC	At commencement of revegetation activities. Annual following revegetation completion.		X	Ongoing annually until completion criteria met and maintained for two years.			TBC
	Dieback monitoring	Contractors - TBC	Ongoing		X	X	X	X	TBC
Reporting	Revegetation plan	BDS Environmental team		X					TBC
	Annual progress report	BDS Environmental team – TBC	June 30 each year		X	Ongoing annually until completion criteria met and maintained for two years.			TBC

11. References

Beard, J., Beeston, G., Harvey, J., Hopkins, A., & Shepherd, D. (2013). The vegetation of Western Australia at the 1:3,000,000 scale. Explanatory memoir. Second Edition. *Conservation Science Western Australia,* 9, 1-152.

Beecham, B., & Danks, A. (2001). Mallee 2 (MAL2 - Western Mallee subregion). A Biodiversity Audit of Western Australia's 53 Biogeographical Subregions in 2002. Department of Conservation and Land Management.

BoM, Bureau of Meteorology Australia. (2023a). Climate Statistics for Australian Locations – Hyden (Station No. 10568) Accessed: December 2023. www.bom.gov.au.

BoM, Bureau of Meteorology Australia. (2023b). Monthly Rainfall– Hyden (Station No. 10568) Accessed: December 2023. www.bom.gov.au.

DBCA, Department of Biodiversity, Conservation and Attractions. (2017a). *Ramsar Sites (DBCA-010).* [Data set]. DataWA. https://catalogue.data.wa.gov.au/dataset/ramsar-sites

DBCA, Department of Biodiversity, Conservation and Attractions. (2017b). *South Coast Significant Wetlands (DBCA-018).* [Data set]. DataWA. https://catalogue.data.wa.gov.au/dataset/south-coast-significant-wetlands

DoEE, Department of the Environment and Energy. (2017). Australian Vegetation Attribute Manual Version 7.0. NVIS Technical Working Group.

DPIRD, Department of Primary Industries and Regional Development. (2023a). Soil Landscape Mapping - Systems (DPIRD-064) [Data set]. https://catalogue.data.wa.gov.au/dataset/soil-landscape-mapping-systems

DPIRD, Department of Primary Industries and Regional Development. (2023b). Soil landscape land quality - Zones (DPIRD-017) [Data set]. https://catalogue.data.wa.gov.au/dataset/soil-landscape-land-quality-zones

DPIRD, Department of Primary Industries and Regional Development. (2023c). Soil Landscape Mapping - Best Available (DPIRD-027) [Data set]. https://catalogue.data.wa.gov.au/dataset/soil-landscape-mapping-best-available

DPIRD, Department of Primary Industries and Regional Development. (2019). *Pre-European Vegetation* (DPIRD-006). [Data set]. https://catalogue.data.wa.gov.au/dataset/pre-european-dpird-006

DPIRD, Department of Primary Industries and Regional Development. (2020). *Interim Biogeographic Regionalisation for Australia (IBRA), Version 7 (Subregions).* [Data set]. https://www.environment.gov.au/fed/catalog/search/resource/details.page?uuid=%7B1273FBE2-F266-4F3F-895D-C1E45D77CAF5%7D

DPIRD, Department of Primary Industries and Regional Development. (2023d). *Hydrological Zones of Western Australia (DPIRD-069*). [Data set]. https://catalogue.data.wa.gov.au/dataset/hydrological-zones-of-western-australia

DPLH, Department of Planning, Lands and Heritage. (1990). *PlanWA*. Viewed December 2023. https://espatial.dplh.wa.gov.au/planwa/Index.html?viewer=planwa

DPLH, Department of Planning, Lands and Heritage. (2023). *Aboriginal Cultural Heritage Inquiry System (ACHIS*). Viewed October 2023.

DWER, Department of Water and Environmental Regulation. (2018a). *A Guide to Preparing Revegetation Plans for Clearing Permits*. Government of Western Australia. https://www.der.wa.gov.au/images/documents/our-work/consultation/Revegetation-plan/A_Guide_to_Preparing_Revegetation_Plans_for_Clearing_Permits.pdf

DWER, Department of Water and Environmental Regulation. (2018b). *Hydrographic Catchments - Catchments (DWER-028).* [Data set]. https://catalogue.data.wa.gov.au/dataset/hydrographic-catchments-catchments

DWER, Department of Water and Environmental Regulation. (2018c). *Hydrographic Catchments - Subcatchments (DWER-030*). [Data set]. https://catalogue.data.wa.gov.au/dataset/hydrographic-catchments-subcatchments

DWER, Department of Water and Environmental Regulation. (2018d). *Hydrography, Linear (Hierarchy) (DWER-031)*. [Data set]. https://catalogue.data.wa.gov.au/dataset/hydrography-linear-hierarchy

DWER, Department of Water and Environmental Regulation. (2020). *CPS 8795-1 Area Permit Plans and Decision Report.* Government of Western Australia.

DWER, Department of Water and Environmental Regulation. (2021). *Clearing Regulations - Environmentally Sensitive Areas* (DWER-046). [Data set]. https://catalogue.data.wa.gov.au/dataset/clearing-regulations-environmentally-sensitive-areas-dwer-046

DWER, Department of Water and Environmental Regulation. (2023). *Public Drinking Water Source Areas (DWER-033)* [Data set]. DataWA. https://catalogue.data.wa.gov.au/dataset/public-drinking-water-source-areas

Ecoscape (Australia) Pty Ltd (2020) Hyden Flora, Vegetation and Fauna Surveys, report prepared for CBH Group.

EPA, Environmental Protection Authority. (2016). *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment*. Government of Western Australia. https://www.epa.wa.gov.au/sites/default/files/Policies_and_Guidance/EPA%20Technical%20Guidance%20-%20Flora%20and%20Vegetation%20survey_Dec13.pdf

GAV. Greening Australia Victoria. (2003). *Revegetation Techniques*. https://www.greeningaustralia.org.au/wp-content/uploads/2017/11/GUIDE_A-guide-for-establishing-native-vegetation-in-Victoria.pdf

GoSA, Government of South Australia. (2019). *Weed management techniques.* Factsheet. https://cdn.environment.sa.gov.au/landscape/docs/hf/weed-management-techniques.pdf

GoWA, Government of Western Australia. (2016). *Biosecurity and Agriculture Management Act 2007.* State legislation.

GoWA, Government of Western Australia. (2019). *2018 Statewide Vegetation Statistics (formerly the CAR Reserve Analysis).* [Data set]. DBCA. https://library.dbca.wa.gov.au/static/FullTextFiles/072362/072362.pdf
GoWA, Government of Western Australia. (2021). *Aboriginal Cultural Heritage Act 2021.* State legislation.
Horton, D. R. (1996). *The AIATSIS Map of Indigenous Australia*. Australian Institute of Aboriginal and Torres Strait Islander Studies. https://aiatsis.gov.au/explore/map-indigenous-australia
IPAC, Invasive Plants and Animals Committee (2017). *Australian Weeds Strategy 2017-2027*. Commonwealth of Australia.
Keighery, B.J. (1994). *Bushland Plant Survey: a Guide to Plant Community Survey for the Community*. Wildflower Society of WA (Inc.), Nedlands, Western Australia
LFW, Land for Wildlife. (n.d.). *Revegetation Practicalities.* https://www.lfwseq.org.au/wp-content/uploads/2016/11/Revegetation-Practicalities.pdf
Sandiford, E.M., & Barrett, S. (2010) *Albany Regional Vegetation Survey, Extent, Type and Status.* [Unpublished report]. Department of Environment and Conservation.
SCNRM, South Coast Natural Resource Management. (2020). *Plant Disease Data Help Document.* https://didms.gaiaresources.com.au/static/doc/DIDMS%20Help%20content%20PI_dis%2020210311.pdf
SCNRM, South Coast Natural Resource Management. (2023). *The Dieback Information Delivery and Management System.* https://dieback.net.au/dieback-public-map/
Sheehan, M., James, R., & Blood, K. (2018). Looking for weeds: search and detect guide (2nd Edition). A guide for searching and detecting weeds at the early stage of invasion on public land in Victoria. Department of Environment, Land, Water and Planning, Victoria. https://www.environment.vic.gov.au/__data/assets/pdf_file/0024/49173/WESI-Guide-2ndEd-01_search-and-detect_PRINT.pdf
Shepherd, D.P., Beeston, G.R., & Hopkins, A.J.M. (2002). Native Vegetation in Western Australia, extent, type and status. Resource Management Technical Report 249. Department of Agriculture.
Wilkins, P., Gilfillan, S., Watson, J., & Sanders, A. (2006) *The Western Australian South Coast Macro Corridor Network – a bioregional strategy for nature conservation.* Department of Conservation and Land Management (CALM) & South Coast Regional Initiative Planning Team (SCRIPT). https://southcoastnrm.com.au/wp-content/uploads/2022/05/WA-MacroCorridorReport-Full-WEB.pdf
WNRM, Wheatbelt Natural Resource Management. (2023). *Revegetation: It's Time to Get Your Trees in the Ground.* https://www.wheatbeltnrm.org.au/whats-happening/news/healthy-environments/revegetation-it%E2%80%99s-time-get-your-trees-ground

12. Appendices

Appendix A: Maps

Appendix B: Species List and Quadrat Data (Ecoscape, 2020)

Appendix C: Checklist on Recommended Content for a Revegetation Plan

Appendix A

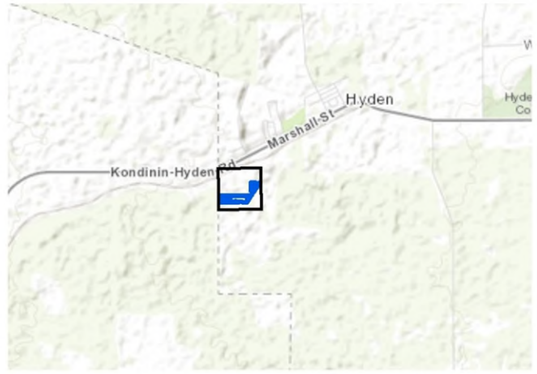
Maps

Albany Office:
29 Hercules Crescent
Albany, WA 6330
(08) 9842 1575

Denmark Office:
7/40 South Coast Highway
Denmark, WA 6333
(08) 9848 1309

Esperance Office:
2A/113 Dempster Street
Esperance, WA 6450
(08) 9072 1382

BIO DIVERSE SOLUTIONS



Overview Map Scale 1:100,000

Legend

- Revegetation Area
- Cadastre

Pre European Vegetation (DPIRD_006)

Vegetation Association

- Hyden, 519
- Hyden, 945

Scale
1:2,000 @ A3
GDA MGA 2020 Zone 50

Data Sources
Aerial Imagery: WA Now, Landgate Subscription Imagery
Cadastre, Relief Contours and Roads: Landgate 2017
IRIS Road Network: Main Roads Western Australia 2017
Overview Map: World Topographic map service, ESRI 2012

CLIENT
CBH Group
Lot 88 Marshall Street
Hyden, WA 6359

Figure 9: Pre European Vegetation

	QA Check	*Drawn by*
	CvdM	**MH**
STATUS	*FILE*	*DATE*
FINAL	**CBH006-001**	**08/12/2023**

Appendix B

Species Lists and Quadrat Data (Ecoscape, 2020)

Table 9: Complete species list of Vegetation Unit A (Ecoscape, 2020)

Family	Species
Apiaceae	*Platysace effusa*
Asparagaceae	*Chamaexeros fimbriata*
Asparagaceae	*Lomandra effusa*
Asparagaceae	*Thysanotus patersonii*
Asteraceae	**Arctotheca calendula*
Boryaceae	*Borya constricta*
Casuarinaceae	*Allocasuarina acutivalvis*
Casuarinaceae	*Allocasuarina campestris*
Chenopodiaceae	*Enchylaena tomentosa*
Cyperaceae	*Lepidosperma ?sp.*
Cyperaceae	*Lepidosperma drummondii*
Cyperaceae	*Lepidosperma pruinosum*
Cyperaceae	*Schoenus ?subflavus*
Cyperaceae	*Schoenus calcatus*
Cyperaceae	*Schoenus hexandrus*
Dilleniaceae	*Hibbertia eatoniae*
Droseraceae	*Drosera andersoniana*
Droseraceae	*Drosera macrantha*
Droseraceae	*Drosera moorei*
Ericaceae	*Styphelia dielsiana (prev. Leucopogon dielsianus)*
Ericaceae	*Styphelia hamulosa (prev. Leucopogon hamulosus)*
Ericaceae	*Styphelia serratifolia (prev. Astroloma serratifolium)*
Fabaceae	*Acacia multispicata*
Fabaceae	*Leptosema daviesioides*
Fabaceae	*Mirbelia microphylla*
Goodeniaceae	*Dampiera juncea*
Haemodoraceae	*Haemodorum discolor*
Hemerocallidaceae	*Chamaescilla corymbosa*
Lauraceae	*Cassytha glabella*
Myrtaceae	*Cyathostemon heterantherus*
Myrtaceae	*Ericomyrtus serpyllifolia*
Myrtaceae	*Leptospermopsis erubescens (prev. Leptospermum erubescens)*
Myrtaceae	*Melaleuca depauperata*
Myrtaceae	*Melaleuca hamata*
Myrtaceae	*Melaleuca laxiflora*
Myrtaceae	*Melaleuca platycalyx*
Orchidaceae	*Caladenia dimidia*
Orchidaceae	*Caladenia hirta*
Orchidaceae	*Diuris brachyscapa*
Peronosporaceae	*Persoonia trinervis*
Pittosporaceae	*Cheiranthera filifolia*
Poaceae	**Ehrharta longiflora*
Poaceae	*Amphipogon caricinus*
Poaceae	*Austrostipa elegantissima*
Poaceae	*Neurachne alopecuroidea*
Poaceae	*Spartochloa scirpoidea*
Polygalaceae	*Comesperma integerrimum*
Polygalaceae	*Comesperma volubile*
Proteaceae	*Grevillea yorkrakinensis*
Restionaceae	*Lepidobolus preissianus*
Rhamnaceae	*Cryptandra apetala var. anomala*
Rhamnaceae	*Cryptandra myriantha*

Table 9 continued.

Family	Species
Santalaceae	*Exocarpos aphyllus*
Santalaceae	*Santalum acuminatum*

Appendix C

Checklist on Recommended Content for Revegetation Plan