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Lot 9231 Bin Rd, Ny
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Authors: [REDACTED]

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Bio Diverse Solutions Australia Pty Ltd

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

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

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

www.biodiversesolutions.com.au

ABN 46 643 954 929

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Executive Summary

Cooperative Bulk Handling (“the client”) commissioned Bio Diverse Solutions as Environmental Consultants to undertake a spring reconnaissance flora and targeted vegetation survey within the 37.06 ha CBH Nyabing Receiving Site (Lot 9231 Bin Road), and later an additional out-of-season flora and targeted vegetation survey of intersections adjacent to the site. Three small areas were not directly surveyed during the reconnaissance or additional survey, but data was extrapolated based on the two site surveys and photos of the extrapolated areas. The extrapolated data was then confirmed through an additional targeted Threatened Ecological Community (TEC) survey in November 2023. The survey area constituted a total of 40.37 ha. The survey area is located within the locality of Nyabing in the Shire of Kent. The surveys were required to provide environmental assessment data to assist with planning and development associated with site upgrades. The data collected guides designs and environmental approvals required for these developments.

Four vegetation units were identified within the survey area. One vegetation unit related to specific hydrological regimes, and therefore consisted of the halophyte-dominated community, namely Vegetation Unit 3: Samphire Shrubland. The condition of the vegetation units ranged from ‘Completely Degraded’ to ‘Very Good’, with degradation largely attributed to significant invasion of agricultural weeds at clearing edges, and disturbance from engineered drainage channels. Approximately 32.08 ha of the 40.37 ha survey area was classified as cleared, consisting of open paddock, bare ground, Cooperative Bulk Handling infrastructure, roads, and a disused railway line. The remaining 8.29 ha existed in a vegetated state. The combined total of flora species identified within the survey area over the spring and out-of-season reconnaissance flora surveys was 103 species. Thirty-seven introduced or non-native species were present, including one species of a ‘Declared Pest – s22(2)’ under the *Biosecurity and Agricultural Management Act 2007 (BAM Act 2007)* and a Weed of National Significance under the *Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act 1999)*, namely *Asparagus asparagoides* (bridal creeper). Of the 53 Priority and Threatened flora identified in the desktop assessment, 31 species were assessed during the pre-survey likelihood of occurrence (LOO) assessment as ‘Likely’ or ‘Possible’ to occur within the survey area. Minor limitations were present for several species that had been assessed as ‘Likely’ or ‘Possible’ to occur within the survey area, relating to insufficient information availability on species and flowering times. They did not significantly affect the validity of the spring reconnaissance survey. One Priority flora taxa was identified within the survey area, namely the P3 *Styphelia* sp. Dumbleyung, which occurred within Vegetation Unit 4: MMMSL. This species was identified post-field and therefore its abundance and distribution within the survey area had to be determined via a targeted flora survey (BDS, 2023a).

Two vegetation units, specifically Vegetation Unit 1: Euclox OW and Vegetation Unit 2: Eucsal OW, displayed similarities to the Threatened (TEC) and Priority (PEC) Ecological Community, ‘Eucalypt Woodlands of the Western Australian Wheatbelt’ (Wheatbelt Woodlands). Wheatbelt Woodland is listed as a Critically Endangered (CR) TEC under the *EPBC Act 1999* and as a Priority 3 PEC under the state *Biodiversity and Conservation Act 2016 (BC Act 2016)*. Analysis of Vegetation Unit 1: Euclox OW and Vegetation Unit 2: Eucsal OW occurred separately to determine whether they met Wheatbelt Woodland TEC / PEC ecological criteria. Vegetation Unit 1: Euclox OW possessed a roadside remnant (0.15 ha) and two small patches totalling approximately 2.93 ha containing mature key canopy species and sufficient condition to be assessed under Category D condition criteria; the remaining area of the vegetation unit was in ‘Completely Degraded’ condition and therefore in an inadequate condition for listing. Vegetation Unit 2: Eucsal OW possessed 0.95 ha of ‘Degraded’ remnant vegetation that was assessed under Category D, and 0.17 ha of ‘Good’ condition vegetation assessed under Category C. Due to the remnant being viewed as a road reserve remnant and spreading approximately 50 m in width, the 5 m minimum patch width criteria was met. Additionally, the minimum density for mature trees of ≥ 5 trees per 0.5 was exceeded, with approximately 6 per 0.5 ha recorded. Therefore, 0.95 ha of roadside patches of Vegetation Unit 2: Eucsal OW was able to meet Category D (“Degraded” condition) criteria for the Wheatbelt Woodlands TEC/PEC, and 0.17 ha of roadside Vegetation Unit 2: Eucsal OW was able to meet Category C (“Good” condition) criteria for the Wheatbelt Woodlands TEC/PEC. The three extrapolated areas were assessed for Wheatbelt Woodland TEC/PEC as part of the November 2023 survey; the small extrapolated patch in the southeast of the survey area meets Wheatbelt Woodland TEC/PEC classification and has been included in the area calculations above.

Historically, the Wheatbelt Woodlands TEC / PEC would have highly likely been prevalent across the survey area. Clearing activities over the past century and invasion by exotic species has degraded the remaining native vegetation remnants to a condition where the majority of eucalypt woodland remnants are no longer able to meet the minimum condition thresholds and thus be listed as part of the Wheatbelt Woodlands TEC/PEC.

1. Introduction, Scope and Background Information

Cooperative Bulk Handling (CBH), here in referred to as “the client” commissioned Bio Diverse Solutions as Environmental Consultants to undertake a spring reconnaissance flora and targeted vegetation (TEC/PEC) survey at the Nyabing CBH Receival Bin, specifically located at Lot 9321 Bin Road, Nyabing WA 6341 and an additional out of season flora and targeted vegetation survey of the adjacent intersections. In addition, three small patches of vegetation were mapped in September 2023 which had not been directly surveyed. The vegetation unit and condition mapping were extrapolated based on observation from the two site surveys and photos of the area that were supplied by CBH for verification of vegetation units and condition. These patches are referred to in the mapping as “Extrapolated Data”. In November 2023 the extrapolated data was verified with a site visit. In addition, during this survey, a targeted vegetation survey was undertaken to determine the presence of TEC/PEC ‘Eucalypt Woodlands of the Western Australian Wheatbelt’ (Wheatbelt Woodlands). The purpose of the survey is to provide environmental assessment data for the planning and development associated with site upgrades.

The scope of works include:

- Complete a desktop assessment of publicly available databases (including DBCA database searches - to be supplied by Cooperative Bulk Handling pertaining to the site for threatened flora and vegetation;
- Undertake a spring and out-of-season flora and vegetation survey across the survey area, including field GPS and mapping of vegetation and flora, boundaries of vegetation units and threatened and priority flora (if present);
 - This shall include a likelihood of occurrence (LOO) assessment for all conservation significant flora species and ecological communities identified in desktop searches;
 - Identification and mapping of the vegetation condition within the survey area using the EPA (2016) condition scale, including the location of any Weeds of National Significance or Declared Weeds;
 - Assessment of vegetation units during the field survey and if bore similarity to any TEC / PEC's identified in the LOO. If required, undertake quadrat sampling in vegetation units where TEC / PEC is potentially present;
- Undertake any identification of flora species, including herbarium identification as required;
- Prepare IBSA data package as per EPA guidelines, and provide to client at completion of survey (as required to be submitted via the IBSA website by the client);
- Preparation of reconnaissance flora and targeted vegetation survey report, which will be aligned with the appropriate government agency legislation and guidelines;
 - TPFL forms for new populations of priority or threatened flora and ecological communities to be submitted to DBCA;
- Preparation of a stand-alone memo providing assessment of environmental approvals required, including of the 10 clearing principals, and any recommendations to mitigate or reduce impacts of the project.

1.1. Location and Development Proposal

The original ‘survey area’ is defined as the approximately 37.06 ha area, comprised of the 28.23 ha CBH Nyabing Receival Site, the adjacent 4.04 ha Shire of Kent reserve, and 4.79 ha railway reserve/infrastructure (refer to Table 1 and Figure 1). An additional survey area, comprised of three sub-sections slightly overlaying the original survey area, added another 2.75 ha to the survey area, creating a combined survey area total of 39.81 ha. The additional survey area covered the intersections of Nyabing-Pingrup Road and Bin Road, Kukerin Road and Bin Road, and Katanning-Nyabing Road and Bin Road. The three extrapolated patches included an additional 0.55 ha of survey area, with the total survey area totalling 40.36 ha. The survey area is situated within the township of Nyabing within the Shire of Kent, approximately 320 km south-east of Perth.

The “study area” consists of the 10 - 30 km radius around the survey area, used for indications of LOO of Threatened or Priority flora and ecological communities. The various search radii used for the desktop assessment were determined by the sources of the databases analysed. It provides a broader local context and assessment of the survey area. This reconnaissance survey provides base-line data for determining what further surveys and environmental approvals are required for the clearing and development of these areas, such as further targeted or detailed surveys.

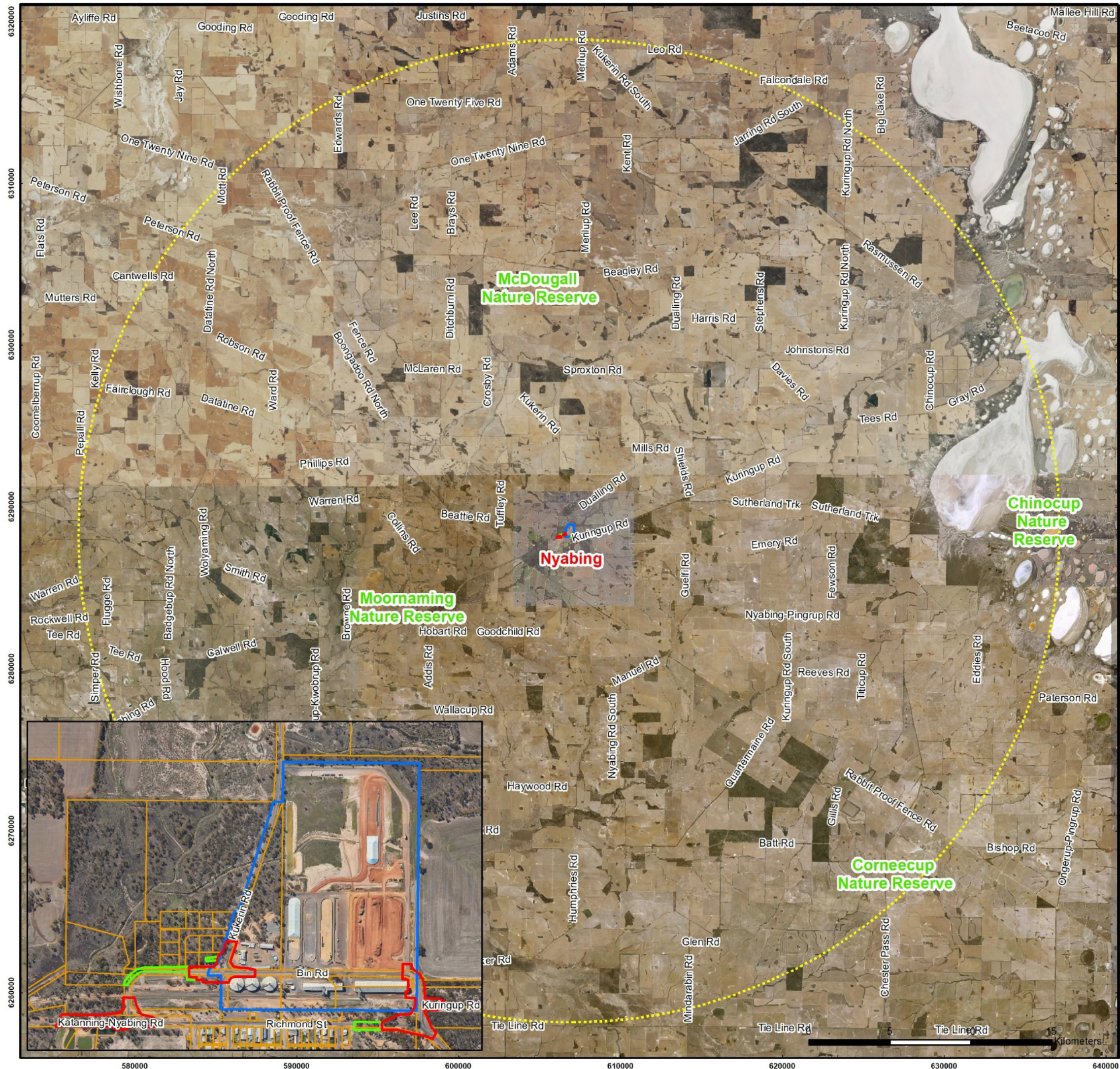
Table 1: Areas included within the 'survey area'.

Area	Survey Area	Location	Area (ha)	Tenure Management	Survey Timing
1	Original	CBH Nyabing Receiving Site	28.23	CBH	12/10/2022
2	Original	Crown Reserve 32930, Lot 158 Bin Road	4.04	Shire of Kent	
3	Original	Railway reserve / infrastructure	4.79	CBH	
4	Additional	Portion of Katanning-Nyabing Road reserve	1.25	Shire of Kent / MRWA	18/04/2023
	Additional	Portion of Richmond Street Road reserve		Shire of Kent	
	Additional	Portion of railway reserve		CBH	
	Additional	Portion of Lot 1 Martin Street		Private / freehold	
5	Additional	Portion of Kukerin Road reserve	1.02	Shire of Kent	
6	Additional	Intersection of Richmond Street and Bin Road	1.53		
7	Extrapolated	Portion of Bin Road reserve	0.32	Shire of Kent	22/11/2023
8	Extrapolated	Portion of drainage line off Kukerin Road	0.04	Shire of Kent	
9	Extrapolated	Portion of Richmond Street reserve	0.19	Shire of Kent	

1.2. Alignment to Legislation, Guidelines and Policies

This survey and subsequent report are aligned to the following legislation, guidelines and policies:

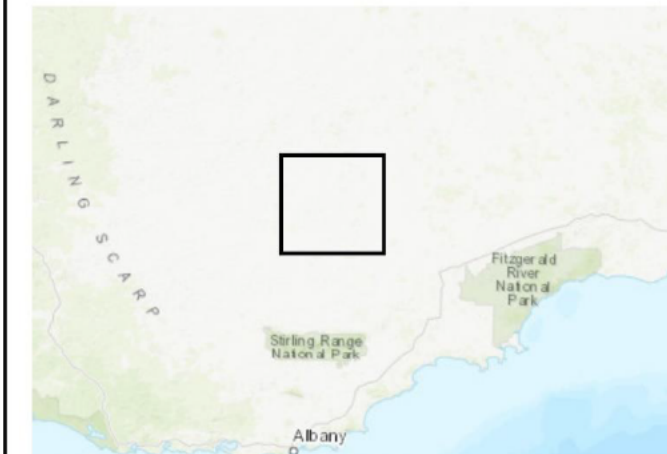
- *Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act 1999)*. Administered by the Australian Government of Department of Agriculture, Water and Environment (DAWE);
- *Biodiversity Conservation Act 2016 (BC Act 2016)*. Administered by the Western Australian Department of Biodiversity, Conservation and Attractions (DBCA);
- *Environmental Protection Act 1986 (EP Act)*. Administered by the Western Australian Department of Water and Environmental Regulation;
- *Biosecurity and Agriculture Management Act 2007 (BAM Act 2007)*;
- EPA (2016) Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment; and
- CoA (2013) Draft Survey guidelines for Australia's Threatened Orchids.



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



Overview Map Scale 1:5,000,000

Legend

Survey Area

- Original Survey Area
- Additional Survey Area
- Extrapolated Data
- 30 km Search Area



Scale
1:230,000 @ A3
GDA2020 MGA 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 Nyabing Reveal Bin,
Lot 9231 Bin Rd
Nyabing, WA 6341

Figure 1: Survey Area Locality.

	QA Check GP	Drawn by CvdM
STATUS FINAL	FILE CBH0026-002	DATE 29/09/2023

1.3. Geology and soils

Database searches show the survey area lies within the Coblinine 2 Subsystem (259Cb_2) within the South-western Zone of Ancient Drainage. The Coblinine 2 Subsystem is described as “Broad valley floors and alluvial plains with significant areas of saline wet soils (30-40%) as well as alkaline grey shallow sandy duplex soils and grey deep sandy duplex soils” (DPIRD, 2022a). The Coblinine System is described as “Broad valley floors, with few lakes, in the South western Zone of Ancient Drainage. Saline wet soils, alkaline grey shallow duplex soils and grey deep sandy duplex soils. Salmon Gum-Wandoo woodland, Mallee scrub and samphire flats” (DPIRD, 2022a).

The South-western Zone of Ancient Drainage is described as “An ancient plain of low relief on weathered granites with sluggish drainage systems and uplands dominated by sands and gravels. Lateritic uplands dominated by grey sandy gravel plain predominately with Proteaceous species” (DPIRD, 2022b).

1.4. Climate

The closest open Bureau of Meteorology (BoM) site is Nyabing (010619); which only contains rainfall data dating back to 1913. Thus, temperature data was sourced from the next nearest station, Ongerup (010622), situated approximately 45 km away. The average annual temperature in Ongerup ranges from 9.7–22.0°C (BoM, 2022a). The average summer temperature ranges between 13.5 - 28.1°C, whilst average winter temperatures range between 6.1-15.7°C. The annual mean rainfall for Nyabing is 395.8 mm (BoM, 2022b). On average the months of May – August are the months with the highest rainfall (Figure 2). There was higher than average rainfall recorded in the months of October 2021, and higher than average rain recorded in March, May and August 2022 (Figure 2). The total rainfall in the year previous to the survey (October 2021 – September 2022) was 355.8 mm, which is 40 mm below average and equates to a 10.1% decrease in average rainfall.

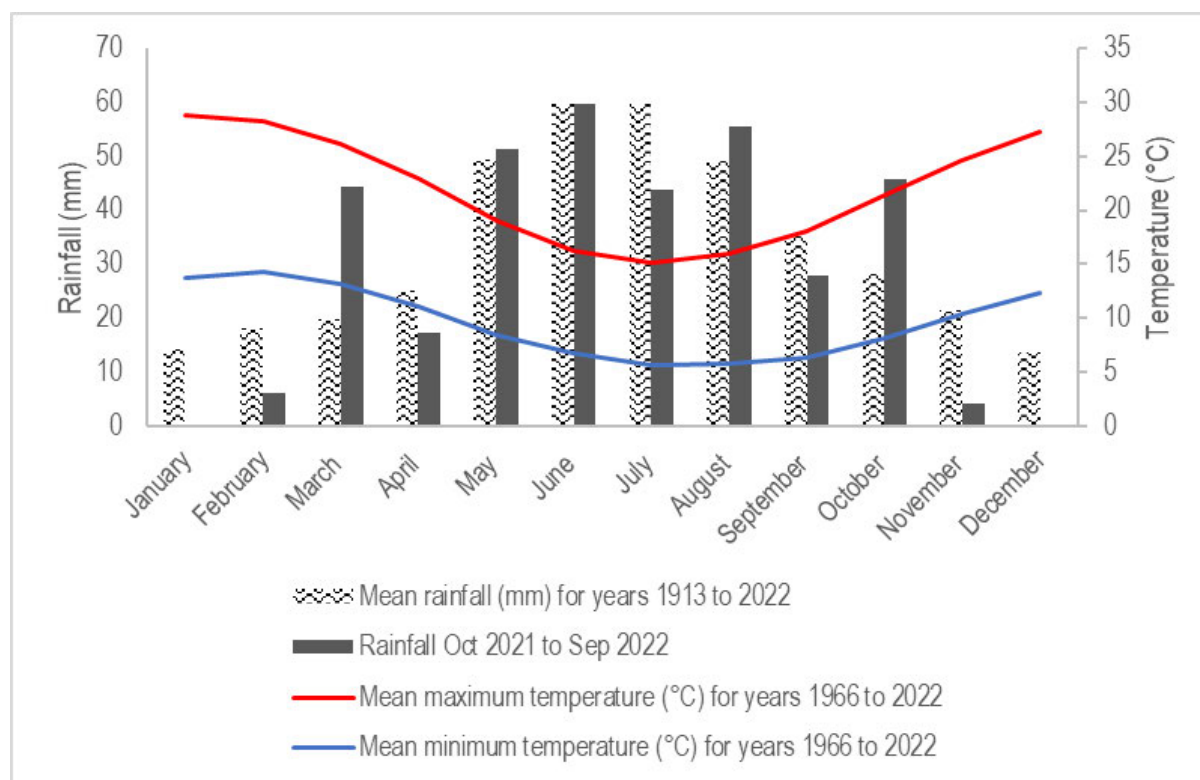


Figure 2: Rainfall Data for Nyabing BoM Weather Station No. 010619 and Temperature Data for Ongerup BoM Weather Station No. 010622.

1.5. 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 survey area lies within a highly modified landscape consisting of agricultural properties, predominantly broadacre dryland cereal cropping. Several elongated, narrow vegetation remnants connect the survey area with Moornaming Nature Reserve, approximately 8 km to the south-west. Several small isolated fragments of remnant native vegetation located on conservation reserves, road reserves and private property to the north, south, east and west of the survey area may act as ecological linkage corridors between the site and McDougall Nature Reserve (approximately 9 km to the north), Corneecup Nature Reserve (approximately 18 km to the south-east), and Chinocup Nature Reserve (approximately 18 km to the east), all managed by Department of Biodiversity, Conservation and Attractions (DBCA).

1.6. Water

The survey area does not lie within any Public Drinking Water Source areas (DWER, 2022). The survey area lies within the South-western Zone of Ancient Drainage (HZ11_SWAD), which is described as “*An ancient plain of low relief on weathered granites with sluggish drainage systems & uplands dominated by sands & gravels. Lateritic uplands dominated by grey sandy gravel plain predominately with Proteaceous species*” (DPIRD, 2022c). The survey area lies within the Hardy Estuary-Coblinine River Hydrographic Catchment of the Blackwood River Basin (DWER, 2018).

No RAMSAR wetlands, or significant wetlands are located within or near the survey area. Several standing water bodies were identified within the survey area, including an artificial drainage channel traversing east-west along the northern section of the survey area, an artificial drainage channel running north-south joining the main channel, and a small dam to the north of the Cooperative Bulk Handling operational zone. The extreme north-eastern corner of the survey area is traversed by a hydrological drainage depression (DPIRD, 2022c).

1.7. Environmentally Sensitive Areas

The survey area does not contain any Environmentally Sensitive Areas (ESA); the nearest ESA is Chinocup Nature Reserve, located approximately 18 km to the east (DWER, 2021).

1.8. Remnant Vegetation

The survey area lies within the Mallee Bioregion and Western Mallee (MAL02) subregion. Beecham and Danks (2001) described 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 wheat fields.*”

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 and 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 survey area within two System and Vegetation Associations (DPIRD, 2019). Refer to Figure 9 in Appendix A:

- **System Association Name:** Hyden
- **Vegetation Association Number:** 967
- **Structure Description:** Medium woodland.
- **Floristic Description:** Wandoo (*Eucalyptus wandoo*) and yate (*E. cornuta*).
- **Remnant Vegetation by Beard Association Rarity in LGA:** 44.29% remaining (GoWA, 2019).
- **Remnant Vegetation by Beard Association Rarity in IBRA Region:** 20.47% remaining (GoWA, 2019).

The eastern portion of the survey area is within the second System and Vegetation Association:

- **System Association Name:** Hyden
- **Vegetation Association Number:** 1094
- **Structure Description:** Mosaic; medium woodland, shrublands, and mallee-scrub.

- **Floristic Description:** York gum (*Eucalyptus loxophleba*) and salmon gum (*E. salmonophloia*), and/or sand mallet (*E. eremophila*) and black marlock (*E. redunca*).
- **Vegetation by Beard Association Rarity in LGA:** 11.82% remaining (GoWA, 2019).
Remnant Vegetation by Beard Association Rarity in IBRA Region: 9.00% remaining (GoWA, 2019).

1.9. Heritage

The survey is located within the Wagyl Kaip & Southern Noongar ILUA (SWALSC, n.d.), and not located within a registered heritage site (DPLH, 2022). 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 DPLH (2022).

2. Methodology – Desktop Assessment

2.1. Threatened and Priority Flora and Ecological Communities

Desktop inventory of potential Threatened and Priority flora and ecological communities known to occur within 10 – 30 km of the survey area was undertaken using the following databases:

- 10 km Nature Map Database Search (combined data from DBCA, WA Museum and WA Herbarium; DBCA, 2022a; WAH 1998 -);
- 20 km Protected matters search tool (DCCEEW, 2022a);
- 30 km Flora DBCA database records (DBCA, 2022b); and
- 20 km TEC / PEC DBCA database records (DBCA, 2022c).

The conservation significance of flora species has been assessed using data from the following sources:

- *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*. Administered by the Australian Government Department of Agriculture, Water and the Environment (DAWE);
- *Biodiversity Conservation Act 2016 (BC Act 2016)*. Administered by the Western Australian Department of Biodiversity Conservation and Attractions (DBCA);
- Minister for the Environment (Hon. Reece Whitby, MLA) Biodiversity Conservation (Threatened Ecological Communities) Order 2023 (Whitby, 2023). A legislative list endorsed by the Western Australian Minister for Environment; and
- DBCA Priority Ecological Community List Version 34 (DBCA, 2022d). A non-legislative list maintained by DBCA for management purposes.

3. Methodology – Field Survey

The purpose of a reconnaissance survey was to provide context and gather knowledge of the survey area. This type of survey aims to verify the desktop information obtained, characterise the flora and vegetation units present and identify if any Priority or Threatened ecological communities are present within the survey area.

A spring-season reconnaissance level flora and targeted vegetation survey was undertaken by Kylie Sadgrove (Botanist) of Natural Area Consulting Management Services, and Kahree Garnaut (Environmental Consultant) of Bio Diverse Solutions on the 12th of October 2022. The survey area was surveyed on foot using traverses and relevés. The intent of the traverses was to identify and map the different vegetation units, their condition category and to undertake more intensive targeted surveys within suitable habitat for conservation significant species. Where Threatened or Priority flora were detected, a higher survey effort to target the area was conducted. Three relevés and six quadrats were systematically surveyed within representative vegetation types to enable analysis and categorisation across the wider area (refer to Appendix D), and used to describe the composition and structure of vegetation units present. Vegetation units were distinguished through changes in structure, dominant taxa and cover characteristics, which is described in both Muir and NVIS Level 5 (sub-association) description methods. An additional targeted flora and vegetation survey was undertaken by Dr Ellen Hickman (Botanist), Charlize van der Mescht (Ecologist) and Mikayla Hollyock (Technical Assistant) on the 18th of April 2023. This survey was conducted on foot using traverses, relevés and quadrats with the purpose of surveying additional sections of vegetation surrounding intersections adjacent to the initial survey area. An additional targeted vegetation survey was conducted by Charlize van der Mescht (Ecologist) and Mikayla Hollyock (Ecologist) on the 22nd November 2023 to verify the extrapolated data mapping and survey a quadrat.

Quadrats were additional and systematically employed to obtain ecological data for analysis of TEC/PEC criteria, where vegetation units were present that bore similarity to TEC/PECs identified in the LOO. Intensive quadrat sampling was undertaken during the spring field survey to ecologically analyse whether two vegetation units (Vegetation Unit 1: Euclox OW, and Vegetation Unit 2: Eucsal OW) met Wheatbelt Woodland TEC/PEC criteria. This methodology is consistent with a Targeted Vegetation Survey. Non-permanent 10x10m quadrats (EPA, 2016) were sampled and analysed for the vegetation units identified as potentially meeting Wheatbelt Woodland TEC/PEC criteria (Table 7 and 8, Section 5.6; DoEE, 2015; Section 5.2). Three quadrats were systematically sampled per vegetation unit. An additional quadrat was placed within the extrapolated area within Vegetation Unit 2: Eucsal OW to confirm the presence Wheatbelt Woodland TEC/PEC.

The flora was systematically recorded within the relevés and collections of photos and/or plant specimens were made where further identification was required, using Kahree Garnaut's Regulation 62 Flora Taking Licence FTB62000454, Ellen Hickman's Regulation 62 Flora Taking Licence FTB62000526 and Charlize van der Mescht's Regulation 62 Flora Taking Licence FTB62000460-2. For species that were not flowering and where foliage or nuts/fruit could not be used for identification, potential habitat was used as an indication of the LOO post-field survey. Where specimens were collected that were similar to Threatened or Priority flora or were considered new populations, verification occurred by the Western Australian Herbarium.

Information collected within each relevé and quadrat included:

- Location: coordinates of the relevé using a handheld GPS unit, recorded in the north-western corner of the quadrat.
- Date and site code.
- Site description: landform, slope, soil colour and type and hydrology.
- Vegetation description: dominant and non-dominant species present within the different growth forms and percentage cover.
- Vegetation condition.
- Photos, collected from the north-west corner of the quadrat.

3.1. Survey Limitations and Constraints

An assessment of potential survey limitations was undertaken as per the EPA (2016) document *Technical Guidance Flora and Vegetation Surveys for Environmental Impact Assessment* (refer to Table 2). Limitations were primarily nil-minor in nature, and did not affect the validity of results presented in the reconnaissance flora and vegetation survey. One species identified on the desktop assessment as 'Possible' to occur, P3 *Leucopogon newbeyi*, had very little taxonomic information available

(Table 9, Appendix B). However, the absence of detected members of the *Leucopogon* genus within the survey area suggests that the species is not present. The three extrapolated areas have not been surveyed. It was however, viewed multiple times while conducting the spring and out-of-season surveys. Photos of the areas were also provided by CBH to confirm the vegetation matched that which is mapped, this therefore, presents a minor limitation.

Table 2: Assessment of potential survey limitations.

Limitation	Significance of limitation	Comment
Experience of personnel	Nil	<p>██████████ has 5 years' experience at conducting targeted, reconnaissance and detailed flora surveys, and is competent in taxonomic identification and assessment of vegetation across Western Australia.</p> <p>██████████ has 2 years' experience conducting flora and vegetation assessments within the south-west region of WA, including mentoring by expert botanists from Bio Diverse Solutions, ██████████ Botanical Consulting, the Geraldton Regional Herbarium and Natural Area Consulting Management Services.</p> <p>██████████ has over 30 years' experience surveying and documenting flora, having previously worked with the DBCA (then CALM) surveying, documenting and managing the threatened flora along the south coast of WA. She completed a PhD on the role of botanical illustration in uncovering new species in contemporary science.</p> <p>██████████ has been employed by Bio Diverse Solutions since 2019, where she has over 4 years' experience with flora and vegetation surveys in the South West, South Coast, Midwest, Esperance-Goldfields and Wheatbelt regions. She has a BSc in Environmental Science and has recently completed her Masters in Environmental Management, and is now Environmental Team Leader.</p> <p>██████████ has been employed by Bio Diverse Solutions as a Technical Assistant since 2023.</p>
Survey timing	Minor	<p>The client requested a spring flora and vegetation survey, consistent with peak flowering times for the majority of species in the area. Timing of survey occurred during the peak flowering period in this locale, and was undertaken on the 12th October 2022.</p> <p>Fifteen species identified as 'Likely' or 'Possible' to occur on the desktop assessment were not described as flowering in October. However, all of these species would have been identifiable without flowering material due to being large shrubs.</p> <p>The additional survey was conducted in April 2023 (autumn), during which period 27 species identified as 'Likely' or 'Possible' to occur on the desktop assessment, were described as not flowering. However, no unidentified species were encountered during the survey, and many of the species described as not flowering in April were identifiable without flowering material.</p>
Access restrictions	Nil	No access restrictions were encountered during the survey.

Table 2 continued

Limitation	Significance of limitation	Comment
Availability of contextual information	Minor	<p>Publicly available desktop and background information was readily available to give a broad contextual understanding of the site. DBCA NatureMap, Threatened and Priority Flora, and Threatened and Priority Ecological Community search information provided ample biological context for the site (DBCA, 2022a, b, c & d); additionally, records from the WA Herbarium (WAH, 1978-) were available.</p> <p>One species assessed in the LOO to be “Likely” to occur within the survey area, namely P3 <i>Leucopogon newbeyi</i>, had very limited contextual information available. No unknown <i>Leucopogon</i> species were detected in the survey area, and therefore this limitation was deemed insignificant.</p>
Survey effort and extent	Minor	<p>103 species were identified during the surveys, and four relevé and seven quadrat data sets were collected to gain as complete a picture as possible of flora species present within each vegetation unit at the site. The area was sufficiently and lengthily searched for Threatened and Priority flora assessed to be possibly occurring in the area and could be detected out-of-season. A random meandering traverse ensured that all areas within 2 m of each other were covered.</p> <p>CR <i>Drakaea isolata</i> was the only orchid identified in the 10 - 30 km desktop analysis, assessed in the LOO to be “Possible” to occur within the survey area. However, the post-survey LOO determined the orchid to be “Unlikely” to occur, due to the lack of suitable habitat observed in the survey area. Following the CoA (2013) <i>Draft Survey guidelines for Australia’s Threatened Orchids</i>, it is recognised that due to the complex nature of orchid phenology and physiology, more intensive survey transects and surveys over multiple time periods may be required for a conclusive finding as to the absence of this species. See Appendix B, Table 9.</p> <p>The three extrapolated areas have not been surveyed. It was however, viewed multiple times while conducting the spring and out-of-season surveys. Photos of the areas were also provided by CBH to confirm the vegetation matched that which is mapped, this therefore, presents a minor limitation.</p>
Identification issues	Nil	<p>The survey was undertaken on the 12th of October 2022, during the peak flowering period for many Wheatbelt flora species to maximise ease of detecting and identifying them. Of the 103 species observed, the vast majority contained sufficient taxonomic information for identification (i.e., nuts, fruit, leaf structure), and it is estimated about 60% of species present were flowering.</p> <p>The Priority species detected, P3 <i>Styphelia</i> sp. Dumbleyung, was not recognised in the field, but was subsequently identified via specimen post-field. Therefore, the density and distribution of these species occurring within the survey area was not recorded outside of the specimen’s known location within Relevé 4. A follow-up targeted survey was conducted in June 2023 to map the population (BDS, 2023).</p>

Table 2 continued.

Limitation	Significance of limitation	Comment
Disturbances that may affect results	Minor	<p>The primary form of disturbance was the presence of roads, industrial areas, agricultural fields, and a townsite immediately adjacent to the survey area, which facilitated the invasion of weeds throughout the vegetation. This includes the Declared Pest, <i>Asparagus asparagoides</i> (bridal creeper), and native disturbance-opportunists such as <i>Maireana brevifolia</i> (small leaf bluebush), through the survey area. The dominance of these invasive and native disturbance-opportunistic species has altered the floristic composition of the understorey of at least two of the vegetation units, namely Vegetation Unit 1: Euclox OW, and Vegetation Unit 2: Eucsal OW, by replacement of many native species with exotic weeds, especially grasses.</p> <p>The majority of the northern portion of the site consisted of a paddock which had been historically cleared. Patches of <i>Eucalyptus loxophleba</i> subsp. <i>loxophleba</i> were evidently regenerating within the north-western corner of this area. The regenerating and immature state of the vegetation may limit its representation long-term of the vegetation unit and/or condition assessed to be present during the survey, particularly if it is re-cleared in the future, or allowed to regenerate into woodland.</p> <p>An artificial drainage channel traversing the western section of the survey area posed a significant disturbance that has resulted in an increased abundance of disturbance-opportunistic native and exotic weed species within Vegetation Unit 1: Euclox OW.</p>

4. Results – Desktop Assessment

4.1. Threatened and Priority Flora

The full species list compiled from all available data (Table 9 in Appendix B) is based on observations from a broader area than the survey area and is likely to include species that would not occur in the actual survey area due to a lack of suitable habitat. The data also includes very old records and in some cases the species in question may have become locally or regionally extinct. Conservation categories for Threatened and Priority flora and ecological communities are presented in Tables 12-15 in Appendix C. Protected matters search tool database searches are provided in Appendix F.

As a result of the database searches, a total of 53 Threatened and Priority flora were identified with the study area. Of these, 15 species were assessed as “Likely” to occur, and 16 were assessed as “Possible” to occur within the survey area. Refer to Table 9 in Appendix B for the Likelihood of Occurrence (LOO) analysis. The species that have previously been recorded within a 30 km radius of the survey area are shown in Figure 3.

Significant disturbance across the site resulting in the majority of the remnant vegetation existing in a ‘Degraded’ condition may have contributed to habitat conditions being unsuitable for previously occurring native flora. A soil seed bank may therefore persist within cleared areas. No fire ephemeral species were identified in the pre-survey LOO analysis. However, the survey area appeared long-unburnt, and being situated within a townscape, may impact the germination and succession of fire-sensitive genera present within the remnant vegetation’s soil seed bank.

4.2. Threatened and Priority Ecological Communities

The desktop database search results indicate that one Threatened (TEC) and Priority (PEC) Ecological Community may be present within the survey area (Figure 3; Table 11 Appendix B). Further discussion on the ecological community is provided below. The ‘Eucalypt Woodlands of the Western Australian Wheatbelt (Wheatbelt Woodlands)’ TEC/PEC was assessed as ‘Likely’ to occur within the survey area, due to the distribution and records of the TEC/PEC within the study area.

Eucalypt Woodlands of the Western Australian Wheatbelt (Wheatbelt Woodlands)

Wheatbelt Woodlands is listed as a Priority 3 (P3) Priority ecological community (PEC) under the *BC Act 2016* and a Critically Endangered TEC under the *EPBC Act 1999*. The survey area lies within the Mallee Bioregion and Western Mallee (MAL02) subregion, within the boundaries of the location criteria for Wheatbelt Woodlands. It is therefore a possibility that Wheatbelt Woodland TEC/PEC may be present within the survey area.

Wheatbelt Woodlands is comprised of eucalypt woodlands that formerly were the most common type of vegetation across the wheatbelt landscape of south-western WA, inland between the Darling Range and western edge of the Goldfields. The woodlands are dominated by a complex mosaic of eucalypt species with a tree or mallee form over an understorey that is highly variable in structure and composition. Woodlands dominated by mallee forms or vegetation with a very sparse eucalypt tree canopy are not part of the ecological community (DoEE, 2015).

Wheatbelt Woodland TEC/PEC is recognised by the below key diagnostic features and minimum condition thresholds as outlined in the approved conservation advice guidelines (DoEE, 2015):

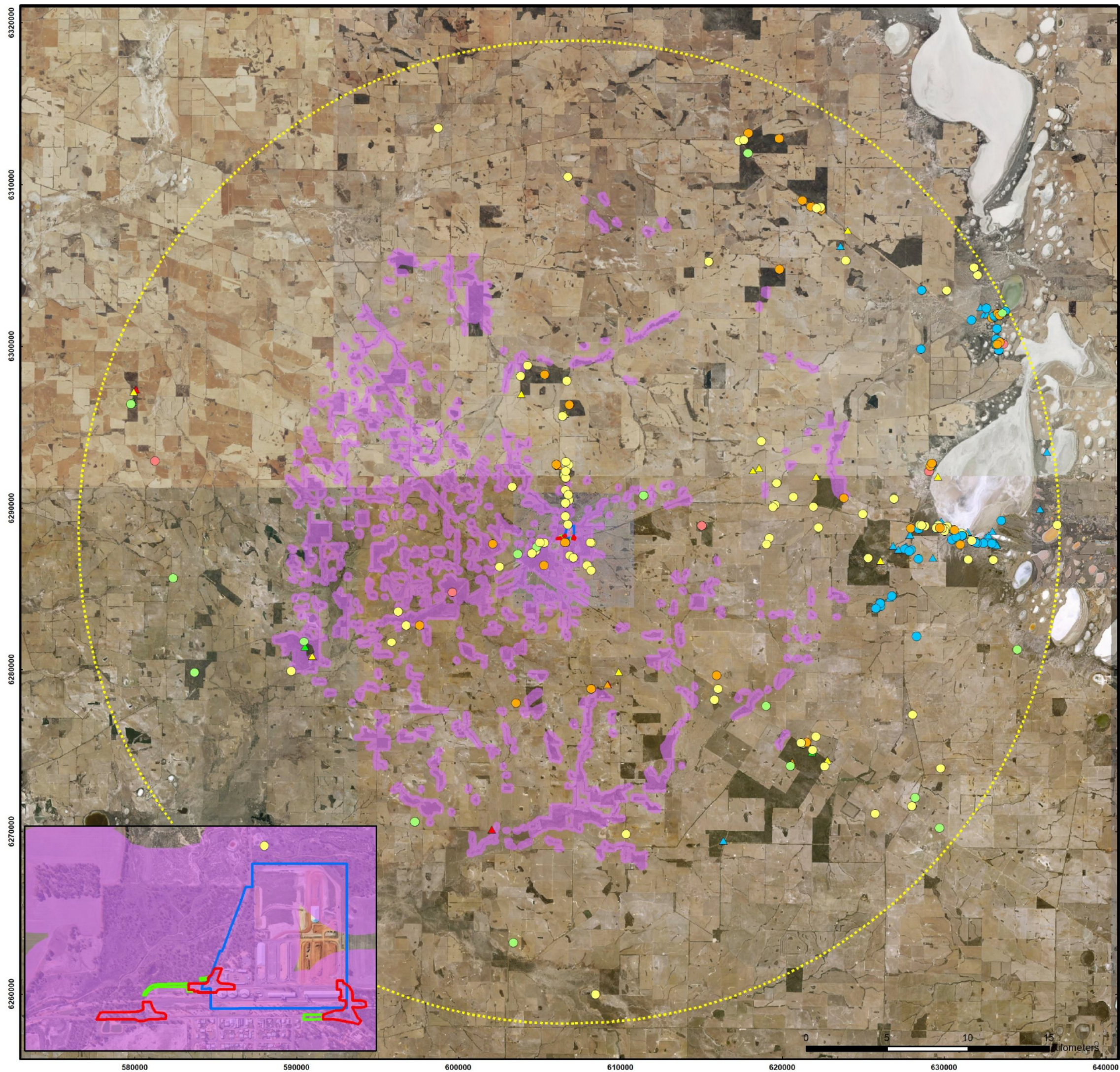
- 1) Occurs within the IBRA Avon Wheatbelt subregions Merredin (AVW01) and Katanning (AVW02), Western Mallee subregion (MAL02) and jarrah forest subregions Northern Jarrah Forest (JAF01) and Jarrah Forest (JAF02) when adjacent to the Avon Wheatbelt.
- 2) Structure of the ecological community is a woodland, with minimum crown cover of tree canopy of mature woodland being 10% (crowns measured as if opaque) and a maximum canopy of 40%.
- 3) Key species of the tree canopy are species of eucalyptus identified in Table 2a of approved conservation guidelines (DoEE, 2015). These are species that typically have a single trunk. One or more tree species are dominant or co-dominant within the patch of the ecological community. If other species are present in the tree canopy, then these do not occur as dominant in the tree canopy.
- 4) Key species of the tree canopy are eucalyptus species with tree or mallee form.
- 5) Native understorey is present but is of variable composition, being a combination of small to medium shrubs graminoids, forbs, scrub/heath, chenopod dominated or saline-tolerant species and shrub thickets, as specified in Table A1 of Appendix (DoEE, 2015).

Condition thresholds for the ecological community are described in Table 3. General notes on the condition thresholds of the ecological community are outlined in the Approved Conservation Guidelines for Wheatbelt Woodlands (DoEE, 2015). Most notably in relation to the survey area, this includes *“It is intended that the condition thresholds will exclude degraded patches from any requirement for protection, for instance: isolated paddock trees on farms, or small or narrow stands of trees that serve as windbreaks or shelterbelts on farms and other properties”*.

Table 3: Condition thresholds for Wheatbelt Woodlands TEC diagnostic criteria.

Note: Condition is referenced to Keighery (1994).

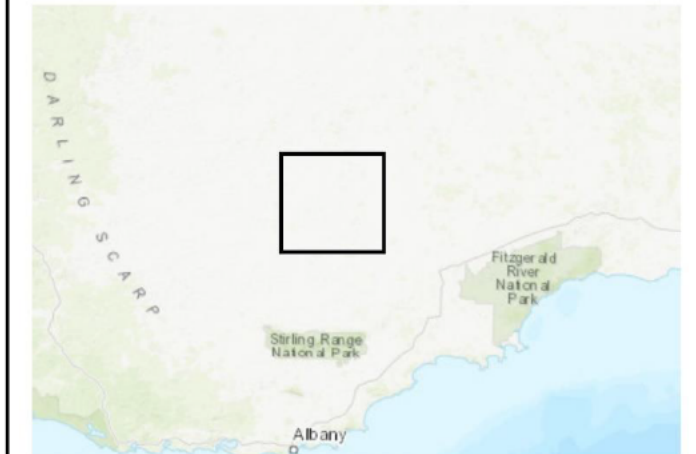
Category and comment	Cover of exotic plants (weeds) AND	Mature trees AND	Minimum patch size (non-roadside patches) OR	Minimum patch width (roadsides only)
A: patches likely to correspond to condition of Pristine / Excellent / Very Good.	Exotic plants account for 0 to 30% of total vegetation cover in the understorey layers i.e., below the tree canopy.	Mature trees may be present or absent.	≥ 2 ha	≥ 5 m
B: Patches likely to correspond to a condition of Good AND retains important habitat features.	Exotic plant species account for 30-50% of total vegetation cover in the understorey layers i.e., below the tree canopy.	Mature trees are present, >5 trees/0.5 ha.	≥ 2 ha	≥ 5 m
C: Patches likely to correspond to a condition of Good.	Exotic plant species account for 30-50% of total vegetation cover in the understorey layers i.e., below the tree canopy.	Mature trees either absent or <5 trees/0.5 ha.	≥ 5 ha	≥ 5 m
D: Patches likely to correspond to a condition of Degraded to Good or medium-low RCV BUT retains important habitat features.	Exotic plant species account for 50-70% of total vegetation cover in the understorey layers i.e., below the tree canopy.	Mature trees present at >5 trees/0.5 ha.	≥ 5 ha	≥ 5 m



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








Overview Map Scale 1:5,000,000

Legend

Survey Area

-  Original Survey Area
-  Additional Survey Area
-  Extrapolated Data
-  30 km Search Area

DBCA Threatened & Priority Flora

- | | |
|---|----|
|  | P1 |
|  | P2 |
|  | P3 |
|  | P4 |
|  | T |

WA Herbarium Threatened & Priority Flor

- P1
- P2
- P3
- P4
- T

Threatened & Priority Ecological Communities

- Wheatbelt Woodlands (P3/CR)



Data Sources

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

Scale
1:230,000 @ A3
GDA2020 MGA Zone 50

CLIENT

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Figure 3: Desktop Flora & TEC/PEC Data (DBCA, 2022c&d).

	QA Check GP	Drawn by CvdM
STATUS FINAL	FILE CBH0026-002	DATE 29/09/2023

5. Results – Field Survey

5.1. Flora Diversity

During the survey, 103 flora species consisting of 30 families and 58 genera, were found. The most commonly occurring families were Asteraceae, Chenopodiaceae, Fabaceae, and Poaceae. The list includes 66 native species (refer to Table 17 Appendix D), and 37 introduced / alien species, of which 34 were considered weeds. It is noted that species richness is the most basic measure of floral diversity, with no further analysis of diversity, such as the Shannon Diversity Index or Simpson Index, conducted.

Plant identification was undertaken through the most relevant, current and available taxonomic literature, keys and herbarium reference specimens available (ALA, n.d.; AVH, n.d.; Euclid, n.d.; French, M., 2012; Hislop, 2012; Hussey *et al.*, 1997; JSTOR, 2000-; Keeble, J., 2021; Lamp and Collett 1976; Maslin, B.R. 2018-; Moore and Wheeler, 2008; WAH 1998 -; Young J.A., n.d.). Nomenclature used through this report follows the most recent scientific names as adopted in the Census of Plants of Western Australia curated by the Western Australian Herbarium (WAH, 1998-).

5.2. Vegetation Units

Four vegetation units were identified during the survey period; vegetation descriptions can be found in the following sections, with relevé data presented in Appendix D. Refer to Figures 4 – 7 for photographs of vegetation units and Figure 8 for extent.

Cleared areas were also present throughout the survey area, occurring as bare ground along access tracks or hardened laydown areas. A total of 31.86 ha of cleared area was present within the survey area. Minor, invasive herbs or agricultural grasses were often present within these bare areas. The vegetation units mapped within the extrapolated areas matched those mapped in the original and additional reconnaissance surveys. To map the extrapolated areas, the adjacent vegetation units and conditions were used as an indication of what vegetation existed within these areas. This was confirmed with photos supplied by CBH. Where TEC/PEC was identified as present, this has not been included in the extrapolated areas as this would have to be confirmed in the field.

1. Vegetation Unit 1: *Eucalyptus loxophleba* subsp. *loxophleba* Open Woodland [Euclox OW]

Vegetation Unit 1: Euclox OW consisted of a eucalypt woodland community characterised by a *Eucalyptus loxophleba* subsp. *loxophleba* overstorey and a mixed understorey of shrubs, herbs and grasses. Common understorey species included *Acacia acuminata*, *Maireana brevifolia*, *Gazania linearis*, and *Ehrharta calycina*. Several *Eucalyptus salmonophloia* feature in the overstorey within the mapped extent of the vegetation unit, although several areas contain no upper-storey structural layer due to previous disturbance of the site. There was a moderate species richness detected within Vegetation Unit 1: Euclox OW, with 62 species recorded. A significant proportion (approximately 48%) of these species are introduced. One Declared Pest under the *BAM Act 2016* was detected in Vegetation Unit 1: Euclox OW, *Asparagus asparagoides* (bridal creeper). No Priority or Threatened flora were detected within Vegetation Unit 1: Euclox OW. It bore similarity to the Wheatbelt Woodland CR TEC/P3 PEC. Quadrat analysis was undertaken to determine whether the vegetation unit met the criteria for this TEC/PEC (refer to Section 5.6). A total of 2.93 ha of Vegetation Unit 1: Euclox OW qualified as Category D Wheatbelt Woodland TEC/PEC.

Vegetation Description (NVIS; DoEE, 2017): U^A *Eucalyptus loxophleba* subsp. *loxophleba* tree\7\; M1[^] *Acacia acuminata*, *Hakea preissii* shrub\4\; M2[^] *Maireana brevifolia*, *Rhagodia baccata* chenopod\2\; G^A *Ehrharta calycina*, *Gazania linearis*, *Romulea rosea* grasses, herbs\1\c.

Vegetation Description (Muir, 1977): *Eucalyptus loxophleba* subsp. *loxophleba* Tree, over *Acacia acuminata*, *Maireana brevifolia*, *Rhagodia baccata* Shrubs, over *Ehrharta calycina*, *Ehrharta longifolia* Grasses, over *Gazania linearis*, *Romulea rosea*, *Thelymitra graminea* Herbs.

Area: 4.40 ha plus additional 0.25 ha in extrapolated areas.

Site description: Well-draining plain within broader gently undulating landscape.

Condition: Completely Degraded - Degraded.

Represented in R1 (refer to Appendix D).



Figure 4: Vegetation Unit 1: *Eucalyptus loxophleba* subsp. *loxophleba* Open Woodland [Euclox OW] vegetation unit present within the survey area.

2. Vegetation Unit 2: *Eucalyptus salmonophloia* Open Woodland [Eucsal OW]

Vegetation Unit 2: Eucsal OW is characterised by salmon gum (*Eucalyptus salmonophloia*) eucalypt woodland over a sparse shrubland and herbland/grassland. Common species present within the shrubland understorey include *Acacia acuminata*, *Templetonia sulcata*, and *Acacia erinacea*. The grassland/herbland component was dominated by *Gazania linearis*, *Austrostipa elegantissima*, and *Austrostipa compressa*. Of the 42 species detected within Vegetation Unit 2: Eucsal OW, 14 are introduced (approximately 33.3%), including *Bromus rubens*, *Ehrharta calycina*, *Ehrharta longifolia*, and *Asparagus asparagoides*, a Declared Pest under the BAM Act 2007. Two of the introduced species are planted/cultivated trees, *Eucalyptus leucoxylon* subsp. *megalocarpa* (large-fruited blue gum) and *Corymbia maculata* (spotted gum). No Priority or Threatened flora were detected within Vegetation Unit 2: Eucsal OW. Quadrat analysis was undertaken to determine whether this vegetation unit met condition requirements for the Wheatbelt Woodland TEC/PEC (refer to Section 5.6). A total of 0.17 ha of Vegetation Unit 2: Eucsal OW qualified as Category C Wheatbelt Woodland TEC/PEC, and an additional 0.95 ha qualified as Category D Wheatbelt Woodland TEC/PEC.

Vegetation Description (NVIS; DoEE, 2017): U^A *Eucalyptus salmonophloia* tree; M1^{AA} *Acacia acuminata* shrubs; M2^{AA} *Templetonia sulcata*, *Acacia erinacea* shrubs; G^A *Gazania linearis*, *Ehrharta calycina* herbs, grasses \1\.

Vegetation Description (Muir, 1977): *Eucalyptus salmonophloia* Tree, over *Acacia acuminata* Tall Shrubs, over *Templetonia sulcata*, *Acacia erinacea*, *Acacia microbotrya* Low Shrubs, over *Gazania linearis*, *Ehrharta calycina*, *Austrostipa compressa*.

Area: 2.89 ha plus additional 0.05 ha in extrapolated areas.

Site description: Flat plain within a gently undulating landscape.

Condition: Completely Degraded – Good.

Represented in R2 (refer to Appendix D).

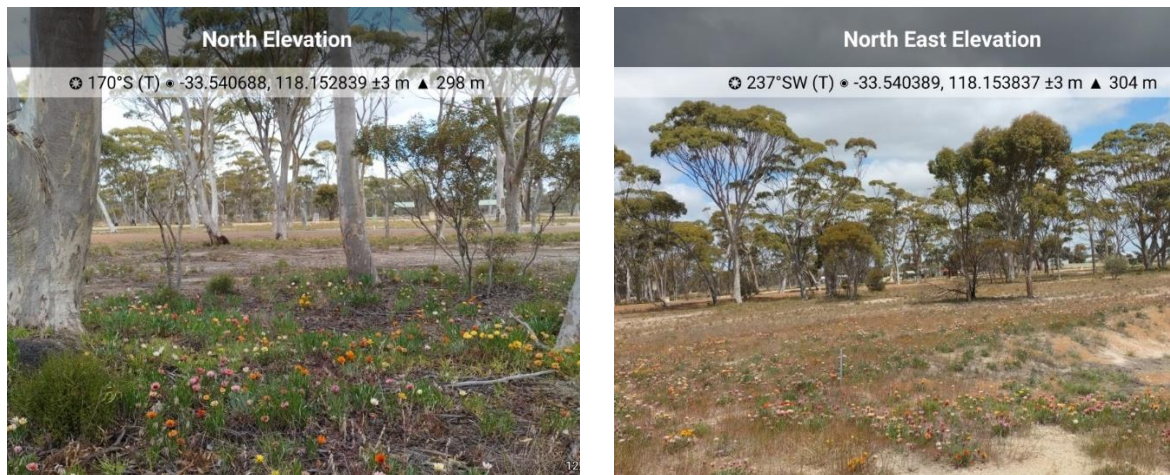


Figure 5: Vegetation Unit 2: *Eucalyptus salmonophloia* Open Woodland [Eucsal OW] vegetation unit present within the survey area.

3. Vegetation Unit 3: Samphire Shrubland [SamShr]

Vegetation Unit 3: SamShr was characterised by a low samphire shrubland dominated by *Tecticornia disarticulata*, with a sparse herb layer of *Cotula australis* (common cotula). Vegetation Unit 3: SamShr occurred in a saline drainage depression, where dead *Eucalyptus loxophleba* subsp. *loxophleba* trunks were indicative of potential occurrence of secondary salinisation. Therefore, the vegetative assemblage was considered environmentally sensitive, with direct linkages to specific hydrological regimes. Several *Eucalyptus occidentalis* (flat-topped yate) and three weed species (*Ehrharta calycina*, *Eragrostis curvula*, and *Lolium rigidum*) were situated along the boundary with Vegetation Unit 3: SamShr. Weed species comprised of approximately 42.8% of the species richness within this vegetation unit.

Vegetation Unit 3 did not bear similarity to any TEC/PECs that were assessed to be “Likely” or “Possible” to occur within the survey area by the LOO.

Vegetation Description (NVIS; DoEE, 2017): M⁺*Tecticornia australis* low scrub; G⁺ *Cotula australis* herb.

Vegetation Description (Muir, 1977): *Tecticornia australis* Low Scrubs, over *Cotula australis* Herbs.

Area: 0.60 ha.

Site description: Saline drainage depression within a broader gently undulating plain.

Condition: Degraded.

Represented in R3 (refer to Appendix D).

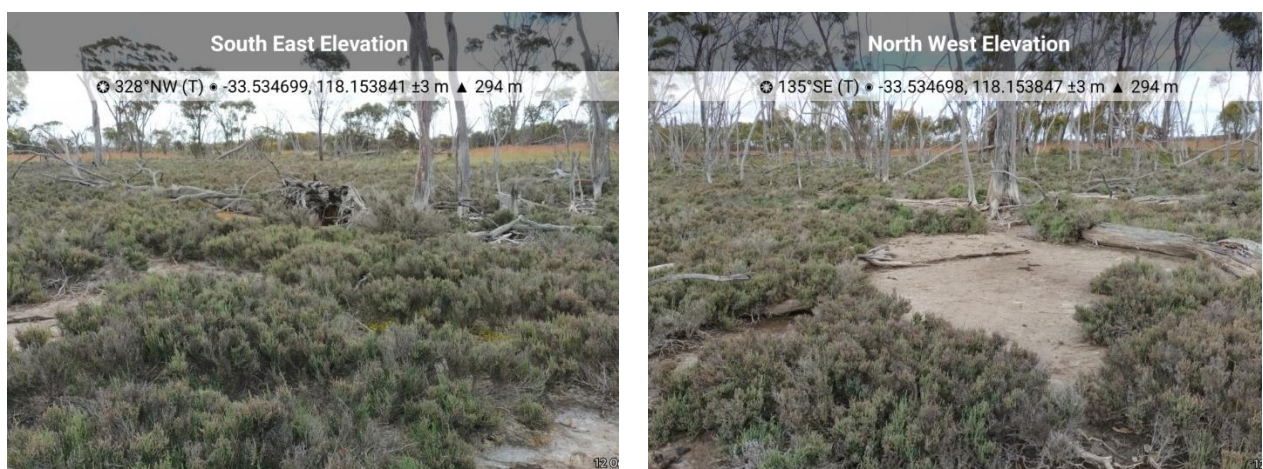


Figure 6: Vegetation Unit 3: Samphire Shrubland (SamShr) present within the survey area.

4. Vegetation Unit 4: Mixed Mallee and Melaleuca Shrubland [MMMSL]

Vegetation Unit 4: MMMSL was characterised by a mallee overstorey dominated by *Eucalyptus orthostemon* and *Eucalyptus phaenophylla*, over a closed shrubland dominated by *Melaleuca acuminata*, *Melaleuca scalena*, and *Daviesia decurrens*, with a sparse herb, sedge and grass layer of *Gahnia ancistrophylla* and *Austrostipa elegantissima*. Vegetation Unit 4: MMMSL occurred in a flat plain of clay-rich soil over underlying lateritic geology. A total of 18 flora species were identified within the vegetation unit, of which one was the weed species *Gazania linearis*. Given the small area of Vegetation Unit 4: MMMSL surveyed, the 17 native species were considered to comprise of a moderate species richness.

Vegetation Unit 4 did not bear similarity to any TEC/PECs that were assessed to be “Likely” or “Possible” to occur within the survey area by the LOO.

(NVIS): U^A *Eucalyptus orthostemon*, *Eucalyptus phaenophylla* tree mallee\6\c; M1^A *Melaleuca acuminata* med shrub\4\i; M2^A *Melaleuca scalena* shrub\3\c; M3^A *Daviesia decurrens*, *Eutaxia empetrifolia*, *Styphelia* sp. Dumblebung low shrub\2\i; G^A *Gahnia ancistrophylla*, *Austrostipa elegantissima*, *Gazania linearis* herbs, sedges, grasses\1\c.

(Muir): *Eucalyptus orthostemon* and *Eucalyptus phaenophylla* Mallee, over a mixed shrubland dominated by *Melaleuca acuminata*, *Melaleuca scalena* and *Daviesia decurrens*, over *Gahnia ancistrophylla*, *Gazania linearis*, and *Austrostipa elegantissima* Sedges, Grasses and Herbs.

Area: 0.12 ha.

Site description: Flat plain amongst a broader gently undulating plain.

Condition: Good - Very Good.

Represented in R4 (refer to Appendix D).

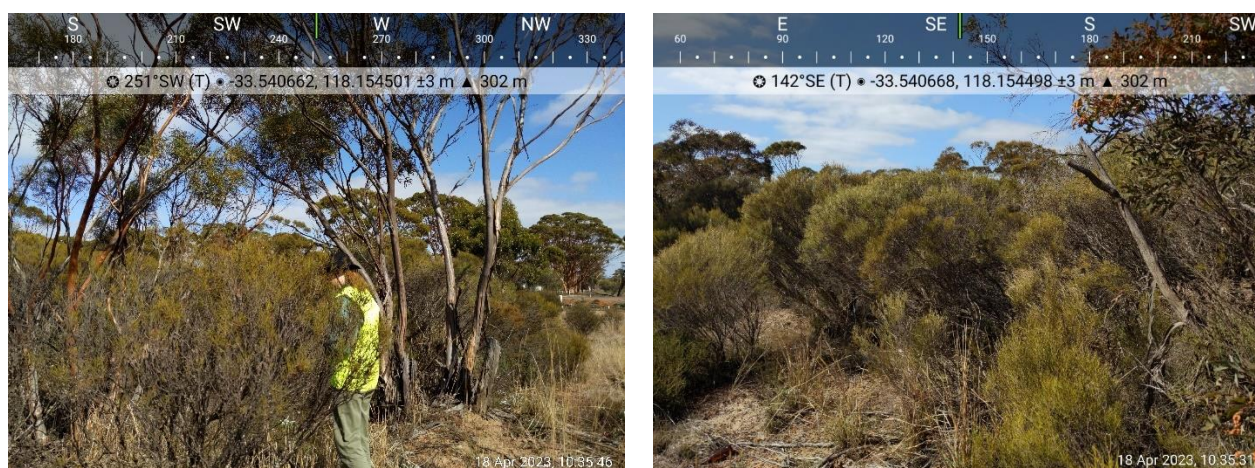


Figure 7: Vegetation Unit 4: Mixed Mallee and Melaleuca Shrubland (MMMSL) present within the survey area.

5.3. Vegetation Condition

The vegetation condition for the survey area (Table 4) has been mapped using the condition rating scale (adapted from Keighery 1994) outlined in *EPA Flora and Vegetation Survey Technical Guidance* (2016).

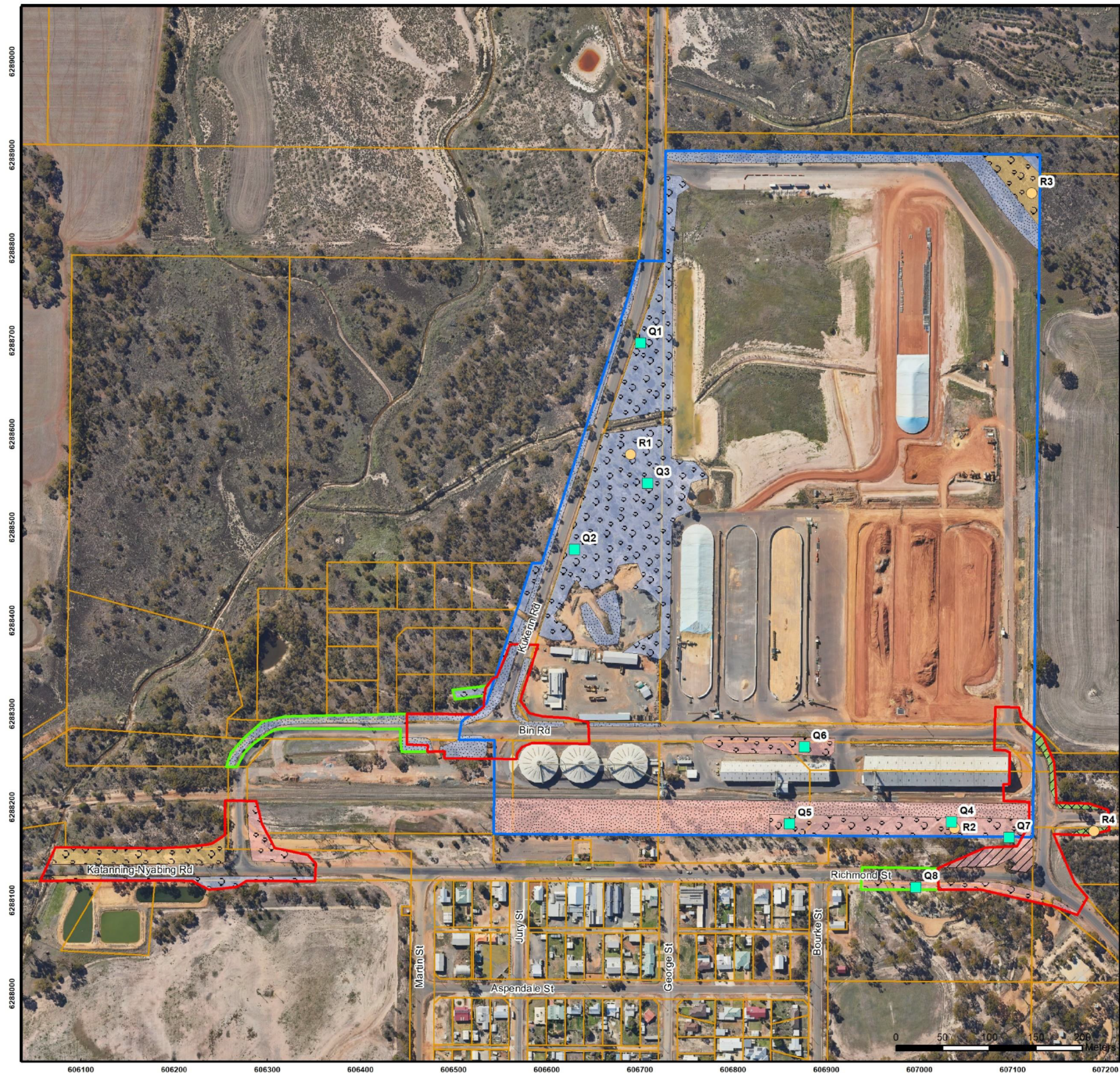
The vegetation condition ranged from ‘Very Good’ to ‘Completely Degraded’ throughout the survey area. These classification levels are related to degradation of structure and vegetation integrity by processes such as clearing, fire, weeds, grazing, and vehicle tracks. Vegetation Unit 1: Euclox OW and Vegetation Unit 2: Eucsal OW are classified as being in ‘Degraded’ to ‘Completely Degraded’ condition; Vegetation Unit 3: SamShr is classified as being in ‘Degraded’ condition; and Vegetation Unit 4: MMMSL is classified as being in ‘Very Good’ to ‘Good’ condition.

There is a deep artificial drainage channel traversing the northern portion of the survey area, an environment observed to favour disturbance-opportunist native species and weeds, thus contributing to it existing in a ‘Degraded’ to ‘Completely Degraded’ condition.

There is indication of potential secondary salinisation occurring within the drainage depression within Vegetation Unit 3: SamShr, as evidenced by mass tree death. This ecosystem has likely experienced an increase in salinity over the past several decades as a result of broadacre agricultural clearing across the landscape, altering hydrological regimes.

Table 4: Vegetation condition rating.

Vegetation type	Condition rating	Area (ha)
1: <i>Eucalyptus loxophleba</i> subsp. <i>loxophleba</i> Open Woodland [Euclox OW]	Degraded	3.10
	Completely Degraded	1.56
2: <i>Eucalyptus salmonophloia</i> Open Woodland [Eucsal OW]	Good	0.17
	Degraded	1.18
	Completely Degraded	1.58
3: Samphire Shrubland [SamShr]	Degraded	0.60
4: Mixed Mallee and Melaleuca Shrubland [MMMSL]	Very Good	0.05
	Good	0.05
Total		8.29 ha



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



Overview Map Scale 1:100,000

Legend

Survey Area

- Original Survey
- Additional Survey
- Extrapolated Data
- Cadastre

Sample Sites

- Quadrat
- Releve

Vegetation Units

- 1: Eucalyptus loxophleba subsp. loxophleba Open Woodland [Euclox OW]
- 2: Eucalyptus salmonophloia Open Woodland [Eucsal OW]
- 3: Samphire Shrubland [SamShr]
- 4: Mixed Mallee and Melaleuca Shrubland [MMMSL]

Vegetation Condition

- Completely degraded
- Degraded
- Good
- Very good

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

Scale
1:4,000 @ A3
GDA MGA 2020 Zone 50

CLIENT
CBH Nyabing Reveal Bin
Lot 9231 Bin Rd
Nyabing, WA 6341

Figure 8: Vegetation Units & Condition

	QA Check GP	Drawn by CvdM, MH
STATUS FINAL	FILE CBH0026-004	DATE 28/11/2023

5.4. Weeds and disturbance

Of the 103 flora species recorded within the survey area, 37 species were introduced. Of these introduced species, three eucalypt species (*Eucalyptus camaldulensis* subsp. *camaldulensis*, *E. cladocalyx*, and *E. leucoxydon* subsp. *megalocarpa*) were observed to have been planted, and therefore were not considered weeds. The full suite of the 34 weed species recorded is listed below in Table 5, with their corresponding ratings under the Australian Weed Strategy (IPAC, 2017), Environmental Weeds Strategy for Western Australia (EWSWA; CALM, 1999) and the *BAM Act 2007*. The ratings given under the EWSWA relate to determining the significance of a weed, based on the criteria of invasiveness, impacts, potential for spread and socioeconomic and environmental values, and can be either 'High', 'Moderate', 'Mild', or 'Low' (CALM, 1999).

All species except bridal creeper (*Asparagus asparagoides*) are classed as 'Permitted – s11', while bridal creeper is rated as a higher risk and is therefore classed as a 'Weed of National Significance (WoNS)' under the *EPBC Act 1999*, and is listed as a 'Declared Pest – s22(2)' under the *BAM Act 2007*. This Declared Pest species was GPS recorded and mapping can be found in Figure 11. Under the EWSWA, bridal creeper, Mediterranean turnip, Guildford grass, great brome, perennial veldt, and African lovegrass are listed as 'High,' while common iceplant, cape weed, smooth cat's ear, common sowthistle, Ursinia, hare's foot clover, hop clover, bearded oat, wild oat, red brome, annual veldt grass, northern barley grass, barley grass, annual ryegrass, and rat's tail fescue are rated as 'Moderate' (Table 5). The remaining species are rated 'Mild', 'Low', or are not listed.

Table 5: Weed species recorded from the survey area.

Family	Species	Vernacular	WA Weed Strategy rating (CALM 1999)	BAM Act (2007)	Weed of National Significance (IPAC, 2017)
Aizoaceae	<i>Mesembryanthemum crystallinum</i>	Common iceplant	Moderate	Permitted – s11	
Aizoaceae	<i>Mesembryanthemum nodiflorum</i>	Slender iceplant	Mild	Permitted – s11	
Anacardiaceae	<i>Schinus molle</i>	Peppercorn tree	TBA	Permitted – s11	
Asparagaceae	<i>Asparagus asparagoides</i>	Bridal creeper	High	Declared Pest – s22(2)	WoNS
Asteraceae	<i>Arctotheca calendula</i>	Cape weed	Moderate	Permitted – s11	
Asteraceae	<i>Dittrichia graveolens</i>	Stinking fleabane	Mild	Permitted – s11	
Asteraceae	<i>Gazania linearis</i>	Treasure flower	Low	Permitted – s11	
Asteraceae	<i>Gnaphalium</i> sp.	Cudweed	Low	Permitted – s11	
Asteraceae	<i>Hypochaeris glabra</i>	Smooth cat's ear	Moderate	Permitted – s11	
Asteraceae	<i>Sonchus oleraceus</i>	Common sowthistle	Moderate	Permitted – s11	
Asteraceae	<i>Taraxacum</i> sp.	Dandelion	Low	Permitted – s11	
Asteraceae	<i>Ursinia anthemoides</i>	Ursinia	Moderate	Permitted – s11	
Brassicaceae	<i>Brassica tournefortii</i>	Mediterranean turnip	High	Permitted – s11	
Crassulaceae	<i>Crassula alata</i>		Low	Permitted – s11	

Table 5 continued

Family	Species	Vernacular	WA Weed Strategy rating (CALM 1999)	BAM Act (2007)	Weed of National Significance (IPAC, 2017)
Fabaceae	<i>Trifolium arvense</i>	Hare's foot clover	Moderate	Permitted – s11	
Fabaceae	<i>Trifolium campestre</i>	Hop clover	Moderate	Permitted – s11	
Fabaceae	<i>Vicia benghalensis</i>	Purple vetch	Low	Permitted – s11	
Iridaceae	<i>Freesia alba x liechtlinii</i>	Freesia	TBA	Permitted – s11	
Iridaceae	<i>Romulea rosea</i>	Guildford grass	High	Permitted – s11	
Plumbaginaceae	<i>Limonium sinuatum</i>	Perennial sea lavender	Low	Permitted – s11	
Poaceae	<i>Avena barbata</i>	Bearded oat	Moderate	Permitted – s11	
Poaceae	<i>Avena fatua</i>	Wild oat	Moderate	Permitted – s11	
Poaceae	<i>Bromus catharticus</i>	Prairie grass	Low	Permitted – s11	
Poaceae	<i>Bromus diandrus</i>	Great brome	High	Permitted – s11	
Poaceae	<i>Bromus rubens</i>	Red brome	Moderate	Permitted – s11	
Poaceae	<i>Ehrharta calycina</i>	Perennial veldt	High	Permitted – s11	
Poaceae	<i>Ehrharta longiflora</i>	Annual veldt	Moderate	Permitted – s11	
Poaceae	<i>Eragrostis curvula</i>	African lovegrass	High	Permitted – s11	
Poaceae	<i>Hordeum glaucum</i>	Northern barley grass	Moderate	Permitted – s11	
Poaceae	<i>Hordeum leporinum</i>	Barley grass	Moderate	Permitted – s11	
Poaceae	<i>Lolium rigidum</i>	Annual ryegrass	Moderate	Permitted – s11	
Poaceae	<i>Vulpia myuros</i>	Rat's tail fescue	Moderate	Permitted – s11	
Primulaceae	<i>Lysimachia arvensis</i>	Pimpernel	Not listed	Permitted – s11	

5.5. Presence of Threatened & Priority Flora

One species of Priority flora, the P3 *Styphelia* sp. Dumbleyung, was identified during the April 2023 survey. This species was detected during the relevé of Vegetation Unit 4: MMMSL (refer to Figure 11). This specimen was considered to be part of a new population, as it has not been previously recorded in the area. Due to the post-field identification of the species, its abundance and distribution was not recorded.

Numerous species were observed to bear similarities with Priority and/or Threatened flora on the LOO assessment, but were found to be common, non-threatened species. The species are listed and discussed below.

- *Acacia erinacea* (hedgehog wattle) – all unknown acacias were precautiously tagged due to the numerous acacias listed on the LOO. *Acacia erinacea* bears similarity to P3 *A. brachyphylla*, which shares the upright, rounded shrub growth form, height and flowering time. However, the red sprouting foliage and thorn structure of the observed specimen, and the presence of its preferable clay-rich soil type, assisted the identification of the species as *A. erinacea*.
- *Acacia bidentata* – all unknown acacias were precautiously tagged due to the numerous acacias listed on the LOO. P4 *Acacia bidentata* bears similarities to *A. declinata*, due to the prostrate, dense growth form, and its clay-rich habitat preference. However, the observed species was determined to be *A. bidentata*, by the October flowering time and leaf shape.
- *Eremophila subfloccosa* (dense-felted eremophila) – although it did not bear similarities to any flora in the LOO, this species was unknown and thought to be a possible Threatened or Priority flora due to its pubescent foliage and lack of abundance in the survey area. It was later identified to be the common dense-felted eremophila (*Eremophila subfloccosa*).
- *Grevillea huegelii* – bears similarity to the P3 *Grevillea newbeyi*, through the pink/pink-red-cream flower colouration. However, *G. huegelii* has a darker red flower (lacking the cream/pink) and a prostrate growth form, contrasting with the bushy, densely-branched *G. newbeyi*.

Styphelia sp. Dumbleyung – P3

A specimen of *Styphelia* sp. Dumbleyung was submitted to the Michael Hislop of the WA Herbarium for verification. The pressed specimen remains retained by Dr. Ellen Hickman. A Threatened and Priority report form was submitted to the DBCA Species district Flora Conservation Office, and Species and Communities Branch on the 31/05/2023 (Appendix E).

The plant of *Styphelia* sp. Dumbleyung likely represents a partial or edge survey, with only the vegetation within the survey area being surveyed. It is likely that more individuals of the species occur in the vegetation of the same type (Vegetation Unit 4: MMMSL) extending beyond the survey area. Further surveys will be required to ascertain the population of *Styphelia* sp. Dumbleyung occurring within the survey area, and potentially within a 10 ha area surrounding the known location of the single plant identified.

The known distribution and records of *Styphelia* sp. Dumbleyung within the Florabase (WAH, 1998 -) indicate that the species has a total of 13 records, located within a range stretching 250 km east-west, and 70 km north-south. It has been recorded in the Local Government Areas of Dumbleyung, Kent, Lake Grace, and Wagin. It has been recorded within the IBRA subregions of Merredin (AVW02) and Western Mallee (MAL02; Figures 9 & 10).



Figure 9: Photo of specimen of P3 *Styphelia* sp. Dumbleyung within the survey area.

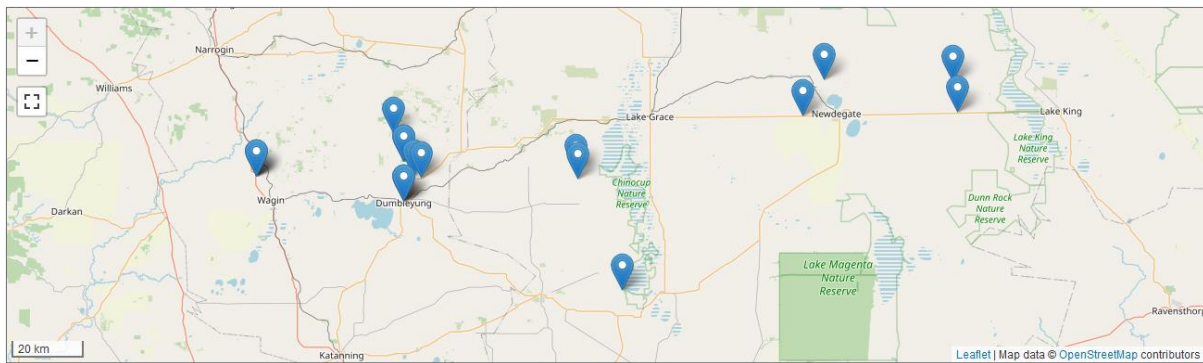
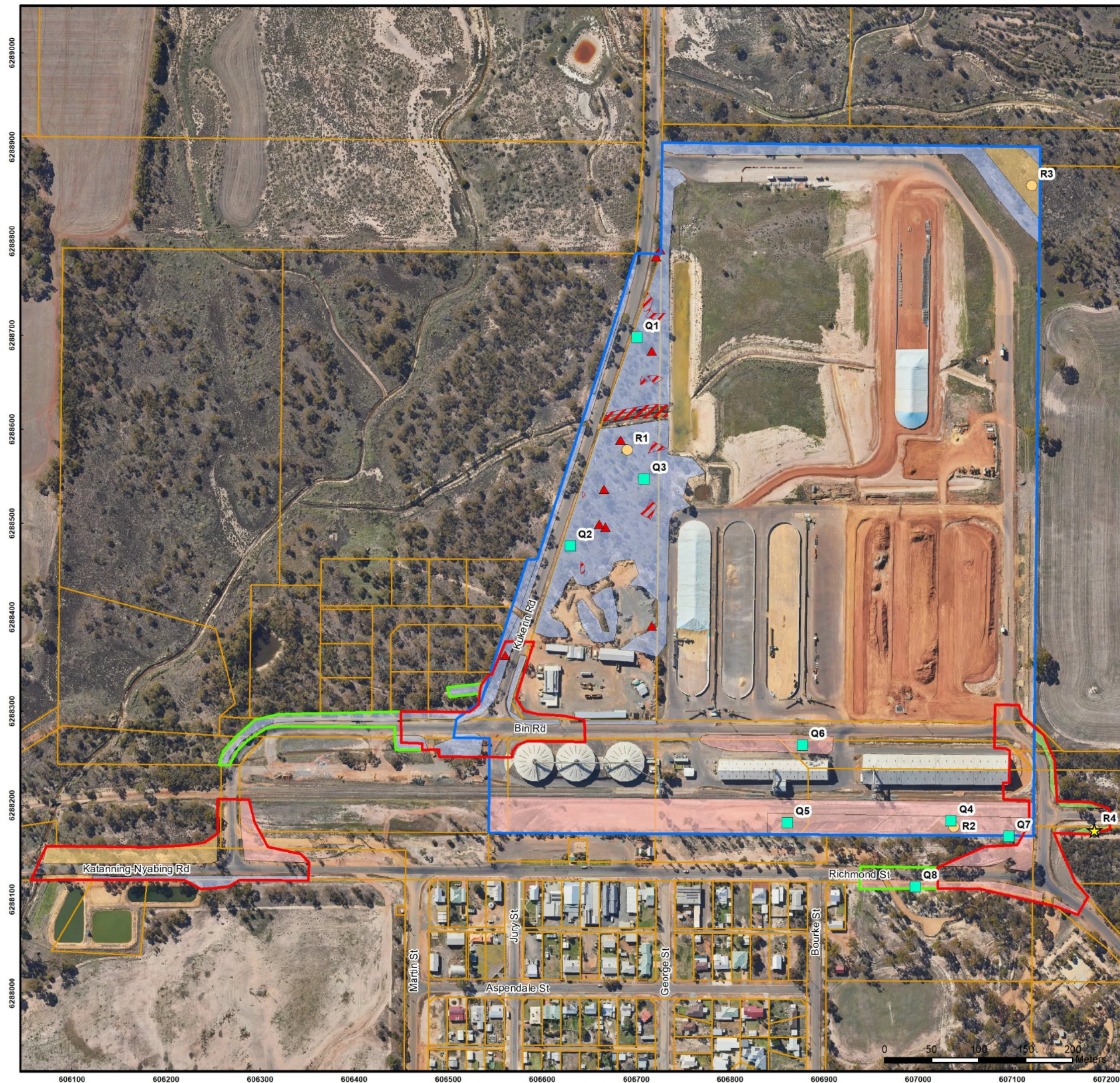


Figure 10: Regional distribution of P3 *Styphelia* sp. Dumbleyung (WAH, 1998 -).



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



Legend Overview Map Scale 1:100,000

Survey Area

- Original Survey Area
- Additional Survey Area
- Extrapolated Data
- Cadastre

Sample Sites

- Quadrat
- Releve

Vegetation Units

- 1: Eucalyptus loxophleba subsp. loxophleba Open Woodland [Euclox OW]
- 2: Eucalyptus salmonophloia Open Woodland [Eucsal OW]
- 3: Samphire Shrubland [SamShr]
- 4: Mixed Mallee and Melaleuca Shrubland [MMMSL]

Declared Pests/WoNS

- Asparagus asparagoides

Declared Pests/WoNS

- Asparagus asparagoides

Threatened & Priority Flora

- Styphelia sp. Dumbleyung (P3)

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

Scale
1:4,000 @ A3
GDA MGA 2020 Zone 50

CLIENT
CBH Nyabing Reveal Bin
Lot 9231 Bin Rd
Nyabing, WA 6341

Figure 11: Flora findings.

	QA Check GP	Drawn by CvdM, MH
STATUS FINAL	FILE CBH0026-004	DATE 28/11/2023

5.6. Threatened and Priority Ecological Communities

One Threatened (TEC) and Priority (PEC) Ecological Community was identified in the 10-30 km desktop analysis as 'Likely' to occur within the survey area. Specifically, this was the 'Eucalyptus Woodlands of the Western Australian Wheatbelt (Wheatbelt Woodlands)' CR/P3 TEC/PEC. See Section 4.2 and Table 11, Appendix B for further detail. The targeted ecological community component of the survey was primarily centred on determining the presence or absence of TEC/PEC within the survey area, via quadrat analysis (Section 4.2; Table 11 Appendix B).

Two vegetation units within the survey area, namely Vegetation Unit 1: Euclox OW and Vegetation Unit 2: Eucsal OW, were deemed likely to meet Wheatbelt Woodland TEC/PEC criteria (Table 6). Specific analysis of quadrats is presented in Table 7 and 8, with comparison to criteria outlined in Section 4.2. The survey area is located within the defined Western Mallee Floristic Bioregion as outlined in Criteria 1, and therefore meets geographic boundary criteria. Both vegetation units met Criteria 2, having a eucalypt canopy cover of >10% and therefore being defined as Woodlands. Additionally, Criteria 3 and 4 were met by both *Eucalyptus loxophleba* subsp. *loxophleba* and *Eucalyptus salmonophloia* being key dominant tree species, as listed in Table 2a of the conservation guidelines (DoEE, 2015), and possessing a variable understorey of grasses, herbs and shrubs. The remainder of criteria differed between vegetation units and is discussed in further detail in Table 6.

Vegetation Unit 3: SamShr and Vegetation Unit 4: MMMSL did not bear any similarities to the Wheatbelt Woodlands TEC/PEC due to the lack of the canopy being dominated by key canopy species listed for the TEC/PEC listed in the conservation guidelines (DoEE, 2015), and the lack of similarity to other known TEC/PECs that could possibly occur within the region. Therefore, Vegetation Units 3: SamShr and 4: MMMSL were not subject to quadrat analyses.

TEC/PECs were originally not mapped within the extrapolated areas as this requires field verification. Upon field verification in November the extrapolated areas were confirmed as Wheatbelt Woodland TEC/PEC. These areas totalling 0.07 ha, aligned to Category D of the Wheatbelt Woodland criteria.

Table 6: Vegetation units identified within the survey area that may meet the Threatened/Priority ecological community Wheatbelt Woodland criteria.

Vegetation unit	Code	Condition	Area (ha)	Meet Patch Size/width Criteria?	>5 mature trees per 0.5 ha?	Meet criteria for Wheatbelt Woodland TEC/PEC
1: <i>Eucalyptus loxophleba</i> subsp. <i>loxophleba</i> Open Woodland	Euclox OW	Degraded	0.15	Yes (roadside)	Yes	Yes
			2.02	Yes (roadside)	Yes	Yes
			0.75	Yes (roadside)	Yes	Yes
		Completely Degraded	1.33	No	No	No
2: <i>Eucalyptus salmonophloia</i> Open Woodland	Eucsal OW	Good	0.17	Yes (roadside, is over 5 m wide)	Yes	Yes – Category C
		Degraded	0.59	Yes (roadside)	Yes	Yes – Category D
			0.24	No	No	No
			0.17	Yes (roadside)	Yes	Yes – Category D
			0.17			
			0.03			
		Completely Degraded	1.59	No	No	No

Vegetation Unit 1: Euclox OW consisted of a predominantly *Eucalyptus loxophleba* subsp. *loxophleba* (York gum) overstorey, featuring several significant *Eucalyptus salmonophloia* (salmon gum). The understorey composition and structure had been significantly altered by invasive agricultural and garden weed species (comprising 63-66% of species richness), which resulted in much of the vegetation unit being assessed to be in 'Degraded' condition. The 'Completely Degraded' remnants were not able to meet Condition D threshold criteria for assessment (refer to Table 3, Section 4.2), and subsequently were not included in the TEC/PEC analysis. Within the Shire of Kent Crown Reserve 32930, the two patches of Vegetation Unit 1: Euclox OW (totalling 2.77 ha, split by an artificial drainage channel) existed in a 'Degraded' condition, and contained areas of understorey possessing a diversity of native flora reflective of the original, undisturbed ecological community composition. This 'Degraded' area of Vegetation Unit 1 assessed under Category D condition thresholds to meet the criteria for roadside vegetation (refer to Table 7). The 0.14 ha of roadside remnant of Vegetation Unit 1: Euclox OW met Category D condition criteria, as it has sufficient native species composition, met the minimum roadside width of at least 5 m, and exceeded the minimum mature tree density of 5 per 0.5 ha. Therefore, a total of 2.91 ha of Vegetation Unit 1: Euclox OW qualifies as a Category D roadside remnant of the Wheatbelt Woodlands TEC/PEC. Refer to Table 7 for further detail.

Vegetation Unit 2: Eucsal OW consisted of an entirely *Eucalyptus salmonophloia* (salmon gum) overstorey, and an understorey that had been altered in composition and structure by historical clearing and weed invasion. The vegetation unit was occurring on a railway reserve acting effectively as a road reserve, located directly north of Richmond Street in the township of Nyabing. Vegetation Unit 2: Eucsal OW, present within the roadside remnant of the survey area, extended well beyond the survey area boundaries, and the condition ranged from 'Degraded' to 'Good' resulting in the patch meeting Wheatbelt Woodland TEC/PEC criteria in Category D condition. This was justified on the grounds of the precautionary principle, as developments that could potentially diminish or infringe on the ecological and habitat values of the mature *Eucalyptus salmonophloia* by impacting the roots. Therefore, the classing of the eligible roadside patch of Wheatbelt Woodland TEC/PEC in Category D condition allows for future developments to be tailored around protecting this TEC/PEC, allowing the long-term viability of the vegetation. The proposed Cooperative Bulk Handling developments may impact the health of these mature trees, and thus the viability of the TEC/PEC. Quadrat analyses determined that a 0.17 ha roadside remnant of Vegetation Unit 2: Eucsal OW in 'Good' condition met the Category C criteria for Wheatbelt Woodland TEC/PEC, and 0.95 ha of roadside Vegetation Unit 2: Eucsal OW in 'Degraded' condition in the southern portion of the survey area was deemed to meet the Category D criteria. The remaining 1.59 ha of Vegetation Unit 2: Eucsal OW was in a 'Completely Degraded' condition, and did not meet patch size or condition criteria for Wheatbelt Woodland TEC/PEC listing. As the vegetation unit extended beyond the survey area along the road reserve, it is highly likely that the actual patch size of the Wheatbelt Woodland TEC/PEC remnant exceeds 2 ha.

Historically, the Wheatbelt Woodlands TEC/PEC was highly likely to have occurred in an intact condition throughout the survey area. However, clearing activities and effects of threatening processes such as weed invasion has altered the condition, floristic composition, and patch sizes of the woodland remnants. In summary, a total of 2.96 ha of Vegetation Unit 1: Euclox OW and 1.12 ha of Vegetation Unit 2: Eucsal OW within the survey area are eligible for listing as Wheatbelt Woodland TEC/PEC. Refer to Tables 7 and 8 for further detail, and Figure 12 for occurrence.

A threatened and priority report form (TPFL form) was submitted to communities' branch of Department of Biodiversity, Conservation and Attractions on the 26/05/2023.

Table 7: Quadrat analysis of Vegetation Unit 1: Euclox OW during the targeted survey, determining the presence of 'Eucalyptus Woodlands of the Western Australian Wheatbelt (Wheatbelt Woodlands)' Threatened (TEC) and Priority (PEC) Ecological Community.

Criteria	Description	Discussion	Meet Criteria
1)	Occurs within the IBRA Avon Wheatbelt subregions Merredin (AVW01) and Katanning (AVW02), Western Mallee subregion (MAL02) and jarrah forest subregions Northern Jarrah Forest (JAF01) and Jarrah Forest (JAF02) when adjacent to the Avon Wheatbelt.	Confirmed that the survey area is located within the Mallee Bioregion and Western Mallee (MAL02) subregion.	Yes
2)	Structure of the ecological community is a woodland, with minimum crown cover of tree canopy of mature woodland being 10% (crowns measured as if opaque).	Q1, 2 & 3 all achieved a minimum crown cover of tree canopy of >10% of mature woodland. Specifically, <i>Eucalyptus loxophleba</i> subsp. <i>loxophleba</i> had a cover of 10% for Q1 & Q2, and 10-30% for Q3; <i>Eucalyptus salmonophloia</i> also had a cover of 10-30% for Q3. This exceeds the minimum of 10% required to meet the criteria and the vegetation unit is consistent with a woodland structure.	Yes – Q1, Q2 & Q3
3)	Key species of the tree canopy are species of Eucalyptus identified in Table 2a of approved conservation guidelines (DoEE, 2015). These are species that typically have a single trunk. One or more tree species are dominant or co-dominant within the patch of the ecological community. If other species are present in the tree canopy, then these do not occur as dominant in the tree canopy.	Both eucalypt species, <i>Eucalyptus loxophleba</i> subsp. <i>loxophleba</i> and <i>Eucalyptus salmonophloia</i> , are listed as key species of the tree canopy in Table 2a of the Approved Conservation Advice.	Yes – Q1, Q2 & Q3
4)	Native understorey is present but is of variable composition, being a combination of grasses, other herbs and shrubs, as specified in Table 2 of Section 4.2.	Native understorey is present in all three quadrats, with a mixture of grasses (i.e. <i>Austrostipa compressa</i>), herbs (i.e. <i>Lomandra mucronata</i> , <i>Dianella revoluta</i>), and shrubs (i.e. <i>Acacia acuminata</i> , <i>Rhagodia preissii</i>). Introduced species comprised of approximately 53-67% of the understorey species richness, therefore grading all quadrats into Condition Category D.	Yes - Q1, Q2 & Q3.
5)	Patch Size and Condition Criteria (Table 3 Section 4.2).	Table 3 (Section 4.2) identifies the specific condition and patch thresholds of Wheatbelt Woodlands TEC/PEC, with specific focus applied to the roadside minimum patch width required. Although located on Crown Reserve 32930, the patch of Vegetation Unit 1: Euclox OW is acting as roadside vegetation buffering the CBH operational site from Kukerin Road. As this patch exceeds 5 m in width, it is considered to qualify as a roadside, Category D component of the Wheatbelt Woodlands TEC/PEC.	Yes – Q1, Q2, & Q3 Yes – 0.14 ha roadside patch

Table 8: Quadrat analysis of Vegetation Unit 2: Eucsal OW during the targeted survey, determining the presence of 'Eucalyptus Woodlands of the Western Australian Wheatbelt (Wheatbelt Woodlands)' Threatened (TEC) and Priority (PEC) Ecological Community.

Criteria	Description	Discussion	Meet Criteria
1)	Occurs within the IBRA Avon Wheatbelt subregions Merredin (AVW01) and Katanning (AVW02), Western Mallee subregion (MAL02) and jarrah forest subregions Northern Jarrah Forest (JAF01) and Jarrah Forest (JAF02) when adjacent to the Avon Wheatbelt.	Confirmed that the survey area is located within Mallee Bioregion and Western Mallee (MAL02) subregion.	Yes – all sites
2)	Structure of the ecological community is a woodland, with minimum crown cover of tree canopy of mature woodland being 10% (crowns measured as if opaque).	Q4, 5 & 6 all achieved a minimum crown cover of tree canopy of >10% of mature woodland. Specifically, <i>Eucalyptus salmonophloia</i> had a cover of 10-30% for Q4, Q6, Q7 & Q8, and 10% for Q5. This exceeds the minimum of 10% required to meet the criteria and the vegetation unit is consistent with a woodland structure.	Yes – Q4, Q5, Q6 & Q7, Q8
3)	Key species of the tree canopy are species of Eucalyptus identified in Table 2a of approved conservation guidelines (DoEE, 2015). These are species that typically have a single trunk. One or more tree species are dominant or co-dominant within the patch of the ecological community. If other species are present in the tree canopy, then these do not occur as dominant in the tree canopy.	<i>Eucalyptus salmonophloia</i> is listed as key species of the tree canopy in Table 2a of the Approved Conservation Advice (DoEE, 2015).	Yes – Q4, Q5, Q6 & Q7, Q8
4)	Native understorey is present but is of variable composition, being a combination of grasses, other herbs and shrubs, as specified in Table 2 of Section 4.2.	Native understorey is present in all three quadrats, with a mixture of grasses (i.e. <i>Austrostipa compressa</i> , <i>Rytidosperma setaceum</i> , <i>Austrostipa elegantissima</i>), herbs (i.e. <i>Carpobrotus modestus</i>), and shrubs (i.e. <i>Acacia bidentata</i> , <i>Acacia erinacea</i>). Introduced species comprised of approximately 58-89% of the understorey species richness, therefore grading Q4 & Q5 into Condition Category D, whilst Q7 had 27% introduced species composition, therefore grading it into Condition Category A (Table 2, Section 4.2). Both Q4, Q5 & Q8, positioned within 'Degraded' vegetation, and Q7 ('Good' condition) were able to meet this condition. Quadrat 6 does not meet this condition, as it was within 'Completely Degraded' vegetation.	Yes – Q4, Q5, Q7, Q8 No – Q6
5)	Patch Size and Condition Criteria (Table 2 Section 4.2).	Table 3 (Section 4.2) identifies the specific condition and patch thresholds of Wheatbelt Woodlands TEC/PEC, with specific focus applied to the roadside minimum patch width required. A 0.75 ha component of Vegetation Unit 2: Eucsal OW in 'Degraded' condition met Category D condition criteria, and is considered a roadside patch due to the position as a buffer between a main road and infrastructure, and it is > 5m in width. It also contains mature trees at a density of >5 per 0.5 ha.	Yes – Q4, Q5, Q7 & Q8 No – Q6

6. Discussion

The scope for this survey was to provide the client with information on any threatened or priority flora species that are potentially present within the subject site, as well as threatened/priority ecological communities, and to provide an assessment on vegetation types and their general condition. Four vegetation units were recorded during the survey, namely Vegetation Unit 1: *Eucalyptus loxophleba* subsp. *loxophleba* Open Woodland [Euclox OW], Vegetation Unit 2: *Eucalyptus salmonophloia* Open Woodland [Eucsal OW], Vegetation Unit 3: Samphire Shrubland [SamShr], and Vegetation Unit 4: Mixed Mallee and Melaleuca Shrubland [MMMSL]. The vegetation units broadly align with different habitat types, such as the association of the Samphire Shrubland vegetation unit with saline drainage depressions within the landscape. The condition of the vegetation units ranged from 'Completely Degraded' to 'Good' with the majority of the vegetation units existing in a 'Degraded' condition.

A total of 103 flora species were recorded, comprising 66 native species and 37 introduced species. One Priority flora species was detected during the survey period, namely the P3 *Styphelia* sp. Dumblebung. This Priority species was located within Vegetation Unit 4: MMMSL. Due to the species being identified post-survey as a Priority flora, a targeted flora survey was conducted (BDS, 2023).

Vegetation Units 1 and 2 were detected as meeting criteria for the 'Eucalypt Woodlands of the Western Australian Wheatbelt (Wheatbelt Woodlands)' Threatened (TEC) and Priority (PEC) Ecological Community. Three roadside remnants (totalling approximately 2.93 ha) of Vegetation Unit 1: Euclox OW existing in a 'Degraded' condition met Category D criteria for the Wheatbelt Woodland TEC/PEC. The combined total of 1.12 ha of roadside 'Good' and 'Degraded' Vegetation 2: Eucsal OW qualified as Wheatbelt Woodland TEC/PEC due to meeting condition and patch size requirements for Category C and Category D listing. The TEC/PEC extends beyond the survey area into the road reserve immediately south of the railway reserve on which the survey area is situated, however the vegetation was considered to effectively be a roadside remnant due to its position between a main road and infrastructure, and substantial width of approximately 50 m granting it ecological value. The total area of Wheatbelt Woodland TEC/PEC identified within the survey area was 4.04 ha. The record of the detected TEC/PEC was reported to the DBCA.

During the survey, several environmental weeds were recorded, however only one species is of concern; *Asparagus asparagoides* (bridal creeper), which is a Declared Pest under the BAM Act and a Weed of National Significance (WoNS) under the EPBC Act 1999. This environmental weed, most prevalent within Vegetation Unit 1: Euclox OW, as well as other weed species rated as 'High' under the WA Weed Strategy, should be controlled to prevent further invasion and establishment in the area, and subsequent further degradation of remnant vegetation.

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8. Appendices

Appendix A – Maps

Appendix B – Conservation Significant Values Likelihood of Occurrence Analysis

Appendix C – Conservation Status Definitions and Condition Scale

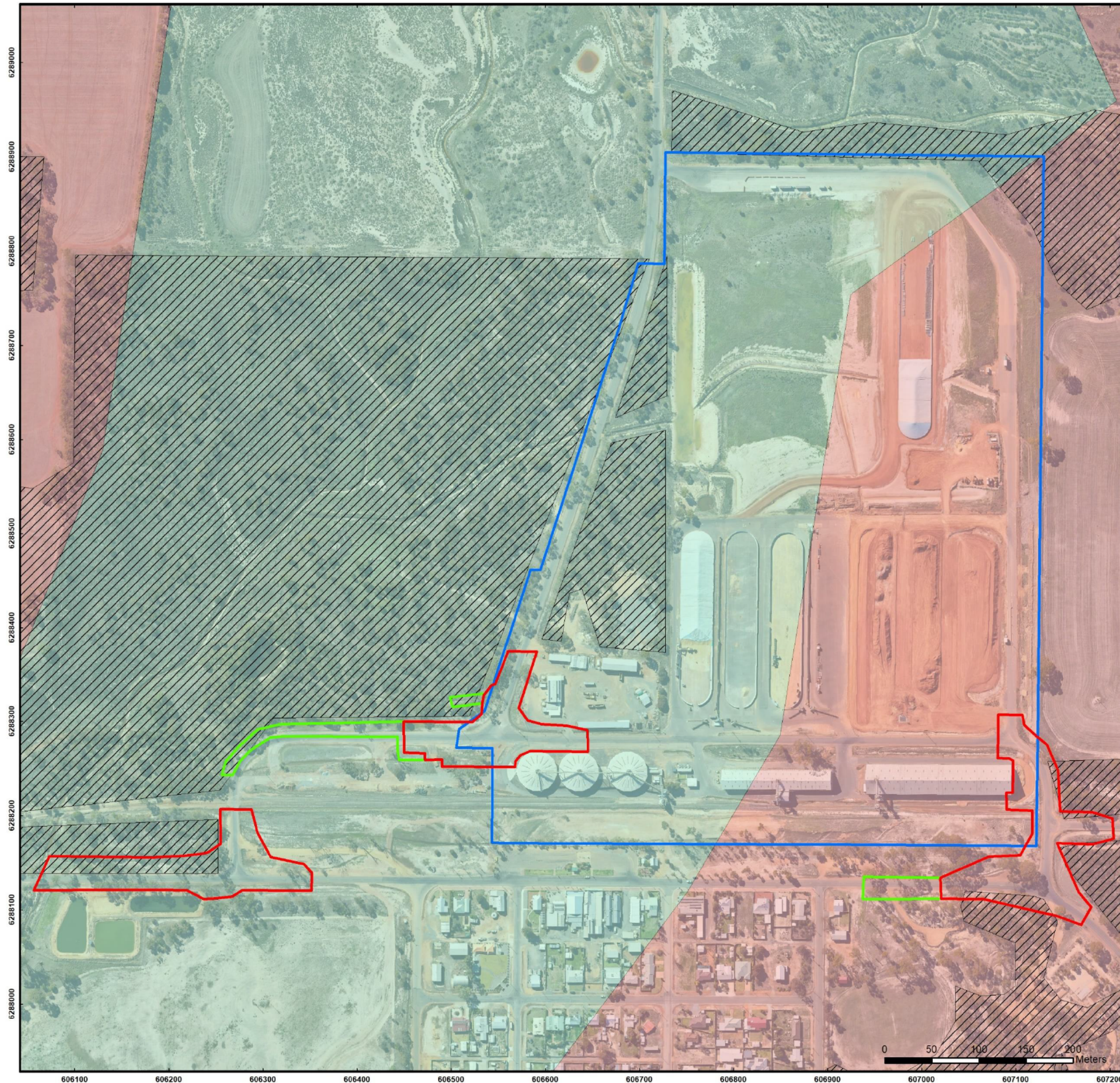
Appendix D – Species Lists, Relevé and Quadrat Data

Appendix E – Threatened and Priority reporting forms

Appendix F – DCCEEW PMST report

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



Overview Map Scale 1:100,000

Legend

Survey Area

- Original Survey Area
- Additional Survey Area
- Extrapolated Data
- Cadastre
- Native Vegetation Extent

Pre-European Vegetation

- Hyden, 1094
- Hyden, 967

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

Scale
1:4,000 @ A3
GDA MGA 2020 Zone 50

CLIENT
CBH Nyabing Reveal Bin
Lot 9231 Bin Rd
Nyabing, WA 6341

Figure 13: Pre-European Vegetation

	QA Check GP	Drawn by CvdM
STATUS FINAL	FILE CBH0026-002	DATE 29/09/2023



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



Overview Map Scale 1:100,000

Legend

Survey Area

- Original Survey Area
- Additional Survey Area
- Extrapolated Data
- Cadastre
- Survey Effort

Sample Sites

- Quadrat
- Releve

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

Scale
1:4,000 @ A3
GDA MGA 2020 Zone 50

CLIENT
CBH Nyabing Receiving Bin
Lot 9231 Bin Rd
Nyabing, WA 6341

Figure 14: Survey Effort

	QA Check GP	Drawn by CvdM, MH
STATUS FINAL	FILE CBH0026-004	DATE 28/11/2023

Appendix B

Conservation Significant Values Likelihood of Occurrence Analysis

Table 9: Criteria for assessing the likelihood of occurrence of conservation significant flora within a 30km radius of the survey area.

Likelihood	Criteria
Present	Species is recorded within the survey area.
Likely	Species has been previously recorded in close proximity and suitable habitat occurs within the survey area.
Possible	Species previously recorded within 10 km and suitable habitat occurs in the survey area.
Unlikely	<p>The species has been recorded locally through database searches. However, suitable habitat for the species does not occur at the survey area or suitable habitat may occur but the species has a highly restricted distribution, is very rare and only known from a limited number of populations.</p> <p>Species is unlikely to occur due to the site lacking critical habitat, only containing marginally suitable habitat, and/or the survey area is considerably degraded.</p> <p>The species has not been recorded in the survey area despite adequate survey effort.</p>
Highly Unlikely	No suitable habitat within the survey area or the survey area is outside the species' natural distribution.

Table 10: Potential conservation significant flora located within 30 km of the survey area and likelihood of occurrence analysis (post survey).

NB - Species are sorted by likelihood of presence. Numerous resources specific to Threatened and Priority flora listed below were used in the likelihood assessment (DBCA, 2022c; DCCEEW, 2022b; Hislop, M., 2012; WAH, 1998).

Family	Species	Vernacular	Status (WA)	NatureMap	PMST	DBCA	Description- Species	Description - Habitat	Peak Flowering period	Pre-Survey Likelihood of Occurrence Analysis	Post Survey Likelihood of Occurrence and Flora Survey Outcome	Limitations
Fabaceae	<i>Acacia leptalea</i>	Chinocup Wattle	VU		X		A dense rounded shrub 0.5-2 m high and 2 m wide with globular golden flower heads.	White-grey or red sand or sandy loam slopes, in open mallee with a dense understorey of Melaleuca, in undulating plains and drainage lines.	Jun-Oct	Likely	Unlikely – not detected. Unsuitable habitat.	
Fabaceae	<i>Acacia mutabilis subsp. rhynchophylla</i>		P3	X			Shrub, 0.5-1 m high. Fl. yellow.	Gravelly sand, sandy loam or loam.		Likely	Unlikely - Not detected. Unsuitable soil.	
Proteaceae	<i>Banksia drummondii subsp. macrorufa</i>		P2			X	Non-lignotuberos shrub, to 1.5 m high, to 2 m wide. Fl. yellow & red.	Sand & gravel.	Jan	Likely	Unlikely – no Banksia detected.	
Proteaceae	<i>Banksia meganotia</i>		P3			X	Straggly or erect, prickly, lignotuberos shrub, 0.3-1 m high. Fl. Yellow.	Sand, sandy loam or clay loam over laterite.	Oct	Likely	Unlikely – Not detected.	
Proteaceae	<i>Banksia rufistylis</i>		P2			X	Columnar, non-lignotuberos shrub, to 1.5 m high. Fl. cream & red.	Gravelly loam or sand.	Jul-Aug	Likely	Unlikely – no Banksia detected.	
Fabaceae	<i>Bossiaea divaricata</i>		P4	X			Shrub, to 0.6 m high.	Sandy lateritic soils.		Likely	Unlikely – Not detected. Unsuitable soil.	
Ericaceae	<i>Brachyloma mogin</i>		P3	X			Compact shrub, 0.4 m high. Fl. red/pink/white.	Grey clayey sand. Swamp flat.	Jun	Likely	Unlikely – No Ericaceae species detected.	Insignificant -Flowering time
Orchidaceae	<i>Caladenia integra</i>	Smooth-lipped spider orchid	P4			X	Tuberous, perennial, herb, 0.2-0.5 m high. Fl. green & red.	Clayey loam. Granite outcrops, rocky slopes.	Sep-Oct	Likely	Unlikely – unsuitable habitat.	
Cyperaceae	<i>Conostylis seorsiflora subsp. Nyabing</i> (A. Coates s.n. 2/10/1988)		P2			X	Rhizomatous, perennial, grass-like or herb.	Gravel soils.		Likely	Unlikely – not detected, potentially unsuitable habitat.	
Malvaceae	<i>Lasiopetalum fitzgibbonii</i>		P3			X	Erect, spreading shrub, 0.3-1.5 m high. Fl. blue-purple-pink.	Sand, clay loam, lateritic soils. Undulating plains, hills.	Sep-Nov	Likely	Unlikely – not detected.	
Ericaceae	<i>Leucopogon florulentus</i>		P3	X			Erect slender shrub, 0.3-0.8 m high. Fl. White.	White/grey or yellow sand, sandy clay, gravelly lateritic soils. Sandplains, gentle slopes.	Jun-Nov	Likely	Unlikely - No Ericaceae species detected.	
Ericaceae	<i>Leucopogon newbeyi</i>		P3	X						Likely	Unlikely – no species of Ericaceae detected.	Limited taxonomic information
Myrtaceae	<i>Melaleuca polycephala</i>		P3	X			Spreading shrub, 0.6-0.9 m high. Fl. pink-purple.	Sandy clay, clay.	Sep-Nov	Likely	Unlikely – not detected.	
Myrtaceae	<i>Verticordia brevifolia subsp. brevifolia</i>		P3			X	Shrub, 0.2-0.4 m high. Fl. yellow/orange-red.	Gravelly loam & clay. Road verges.	Oct-Nov	Likely	Unlikely – no Verticordia detected.	
Myrtaceae	<i>Verticordia coronata</i>		P3	X			Erect or spreading shrub, 0.15-0.5 m high. Fl. Yellow.	Clay loam, clay & sandy loam, sometimes gravelly.	Sep-Dec	Likely	Unlikely – no Verticordia detected.	
Fabaceae	<i>Acacia brachyphylla</i>		P3			X	Spreading to upright rounded shrub, 0.2-0.6(-0.9) m high. Fl. Yellow.	Sand, loam, gravelly soils.	Jun-Oct	Possible	Unlikely -Not detected.	
Fabaceae	<i>Acacia declinata</i>		P4	X			Dense, intricately branched, prostrate, pungent shrub, 0.2-0.4 m high. Fl. Yellow.	Loamy or sandy clay.	Aug-Sep	Possible	Unlikely -Not detected.	
	<i>Banksia erythrocephala subsp. inopinata</i>		P3			X	Prickly, erect, lignotuberos shrub, 0.6-1 m high. Fl. Yellow..	White sand over laterite, gravelly clay.	Apr	Possible	Unlikely – No Banksia detected.	

Table 10 continued

Family	Species	Vernacular	Status (WA)	NatureMap	PMST	DBCA	Description- Species	Description - Habitat	Peak Flowering period	Pre-Survey Likelihood of Occurrence Analysis	Post Survey Likelihood of Occurrence and Flora Survey Outcome	Limitations
Fabaceae	<i>Chorizema ulotropis</i>		P4	X			Sprawling, open, semi-prostrate shrub, to 0.45 m high. Fl. orange-yellow.	Moist to dry soils, white sand with gravel, laterite, granite. Outcrops, winter damp to dry areas, flats.	Jul-Sep	Possible	Unlikely – Not detected, unsuitable habitat.	
Asparagaceae	<i>Thysanotus gageoides</i>		P3	X			Perennial, herb (with tuberous roots), to 0.2 m high. Fl. Purple.	Sand, clay, granite, sandstone, laterite.	Oct-Nov	Possible	Unlikely – Not detected, no Thysanotus detected.	
Proteaceae	<i>Adenanthos pungens</i> subsp. <i>pungens</i>	Spiky Adenanthos	EN		X		Erect shrub, 0.5-3 m high. Fl. pink/red.	White/grey or pink sand, rocky soils, gypsum. Sand dunes, hillsides.	Aug-Nov	Possible	Unlikely – No Adenanthos detected.	
Proteaceae	<i>Banksia fasciculata</i>		P3			X	Columnar, non-lignotuberous shrub, 1-2.5 m high. Fl. cream-yellow.	Lateritic clay, sand over laterite.	May-Aug	Possible	Unlikely – Not detected. Unsuitable soil.	
Orchidaceae	<i>Drakea isolata</i>	Hammer Orchid	CR			X	Tuberous, perennial, herb, 0.1-0.3 m high. Fl. Red.	Sand.	Sep-Oct	Possible	Unlikely – not detected.	Cryptic.
Myrtaceae	<i>Eucalyptus dissimulata</i> subsp. <i>dissimulata</i>		P4	X			(Mallee), 1.7-4 m high, bark smooth, grey. Fl. Cream.	White or yellow sand. Sandplains.	Dec	Possible	Unlikely – no mallees present.	
Myrtaceae	<i>Eucalyptus vesiculosa</i>	Corackerup Mallee	P4	X			(Mallee), to 3 m high, bark smooth, grey over rich coppery red. Fl. Pink.	Flat sites, slight rises.	May	Possible	Unlikely – no unidentified Eucalypts.	
Fabaceae	<i>Eutaxia nanophylla</i>		P3	X			Straggly, rounded shrub, to 0.35 m high. Flowers yellow, orange & red.	Clayey sand, red clay, stoney clayey loam. Low-lying areas, damp flats, slopes, undulating plains, low stony ridges.	Oct-Nov	Possible	Unlikely – no Eutaxia detected.	
Proteaceae	<i>Hakea oldfieldii</i>		P3	X			Open, straggling shrub, up to 2.5 m high. Fl. white-cream/yellow.	Red clay or sand over laterite. Seasonally wet flats.	Aug-Oct	Possible	Unlikely – Not detected, unsuitable habitat.	
Dilleniaceae	<i>Hibbertia priceana</i>		EN	X			Usually compact but sometimes sprawling, dwarf shrub, to 0.15 m high. Fl. Yellow.	Gret sandy clay with laterite gravel. Ridges.	Jun-Aug	Possible	Unlikely – no Hibbertia detected.	
Myrtaceae	<i>Melaleuca fissurata</i>		P4	X			Shrub, 0.5-2(-4) m high. Fl. white/yellow.	White/grey sand, sandy loam. Samphire flats, salt pans.	Jul-Aug	Possible	Unlikely – Not detected.	
Chenopodiaceae	<i>Roycea pycnophylloides</i>	Saltmat	VU		X		Perennial, herb, forming densely branched, silvery mats to 1 m wide.	Sandy soils, clay. Saline flats.	Sep	Possible	Unlikely – Not detected.	
Rhamnaceae	<i>Spyridium mucronatum</i> subsp. <i>recurvum</i>		P3	X			Erect or spreading shrub, 0.15-0.6 m high. Fl. white-cream-yellow.	Sandy & clayey soils. Plains.	Oct-Nov	Possible	Unlikely – no Rhamnaceae species detected.	
Fabaceae	<i>Acacia brachyphylla</i>		P3			X	Spreading to upright rounded shrub, 0.2-0.6(-0.9) m high. Fl. Yellow.	Sand, loam, gravelly soils.	Jun-Oct	Unlikely	Unlikely -Not detected.	
Fabaceae	<i>Acacia declinata</i>		P4	X			Dense, intricately branched, prostrate, pungent shrub, 0.2-0.4 m high. Fl. Yellow.	Loamy or sandy clay.	Aug-Sep	Unlikely	Unlikely -Not detected.	
Proteaceae	<i>Adenanthos pungens</i> subsp. <i>pungens</i>	Spiky Adenanthos	EN		X		Erect shrub, 0.5-3 m high. Fl. pink/red.	White/grey or pink sand, rocky soils, gypsum. Sand dunes, hillsides.	Aug-Nov	Unlikely	Unlikely – No Adenanthos detected.	
Ericaceae	<i>Andersonia setifolia</i>		P3	X			Decumbent to erect, cushion-forming shrub, 0.05-0.15 m high. Fl. red/white.	Sandy & gravelly soils. Hillslopes & breakaways.	Jun-Oct	Unlikely	Unlikely – no Ericaceae species detected.	
Proteaceae	<i>Banksia erythrocephala</i> subsp. <i>inopinata</i>		P3			X	Prickly, erect, lignotuberous shrub, 0.6-1 m high. Fl. Yellow.	White sand over laterite, gravelly clay.	Apr	Unlikely	Unlikely – No Banksia detected.	
Proteaceae	<i>Banksia fasciculata</i>		P3			X	Columnar, non-lignotuberous shrub, 1-2.5 m high. Fl. cream-yellow.	Lateritic clay, sand over laterite.	May-Aug	Unlikely	Unlikely – Not detected. Unsuitable soil.	
Fabaceae	<i>Chorizema ulotropis</i>		P4	X			Sprawling, open, semi-prostrate shrub, to 0.45 m high. Fl. orange-yellow.	Moist to dry soils, white sand with gravel, laterite, granite. Outcrops, winter damp to dry areas, flats.	Jul-Sep	Unlikely	Unlikely – Not detected, unsuitable habitat.	
Orchidaceae	<i>Drakea isolata</i>	Hammer Orchid	CR			X	Tuberous, perennial, herb, 0.1-0.3 m high. Fl. Red.	Sand.	Sep-Oct	Unlikely	Unlikely – not detected.	
Myrtaceae	<i>Eucalyptus brandiana</i>	Four-winged Mallet	P2	X						Unlikely	Unlikely – no detected Eucalypts remain unidentified.	

Table 10 continued

Family	Species	Vernacular	Status (WA)	NatureMap	PMST	DBCA	Description- Species	Description - Habitat	Peak Flowering period	Pre-Survey Likelihood of Occurrence Analysis	Post Survey Likelihood of Occurrence and Flora Survey Outcome	Limitations
Fabaceae	<i>Chorizema ulotropis</i>		P4	X			Sprawling, open, semi-prostrate shrub, to 0.45 m high. Fl. orange-yellow.	Moist to dry soils, white sand with gravel, laterite, granite. Outcrops, winter damp to dry areas, flats.	Jul-Sep	Unlikely	Unlikely – Not detected, unsuitable habitat.	
Orchidaceae	<i>Drakea isolata</i>	Hammer Orchid	CR			X	Tuberous, perennial, herb, 0.1-0.3 m high. Flowers red.	Sand.	Sep-Oct	Unlikely	Unlikely – not detected.	
Myrtaceae	<i>Eucalyptus brandiana</i>	Four-winged Mallet	P2	X						Unlikely	Unlikely – no detected Eucalypts remain unidentified.	
Myrtaceae	<i>Eucalyptus dissimulata</i> subsp. <i>dissimulata</i>		P4	X			(Mallee), 1.7-4 m high, bark smooth, grey. Fl. Cream.	White or yellow sand. Sandplains.	Dec	Unlikely	Unlikely – no mallees present.	
Myrtaceae	<i>Eucalyptus vesiculosa</i>	Corackerup Mallee	P4	X			(Mallee), to 3 m high, bark smooth, grey over rich coppery red. Fl. Pink.	Flat sites, slight rises.	May	Unlikely	Unlikely – no unidentified Eucalypts.	
Fabaceae	<i>Eutaxia nanophylla</i>		P3	X			Straggly, rounded shrub, to 0.35 m high. Fl. yellow&orange&red.	Clayey sand, red clay, stoney clayey loam. Low-lying areas, damp flats, slopes, undulating plains, low stony ridges.	Oct-Nov	Unlikely	Unlikely – no Eutaxia detected.	
Proteaceae	<i>Grevillea newbeyi</i>		P3	X			Bushy, intricately branched, spreading shrub, 0.6-1.5 m high. Fl. pink/pink-red-cream.	Clay loam, sandy gravelly soils.	Jan, Jun or Sep-Nov	Unlikely	Unlikely – No unidentified Grevilleas.	
Proteaceae	<i>Hakea oldfieldii</i>		P3	X			Open, straggling shrub, up to 2.5 m high. Fl. white-cream/yellow.	Red clay or sand over laterite. Seasonally wet flats.	Aug-Oct	Unlikely	Unlikely – Not detected, unsuitable habitat.	
Myrtaceae	<i>Melaleuca fissurata</i>		P4	X			Shrub, 0.5-2(-4) m high. Fl. white/yellow.	White/grey sand, sandy loam. Samphire flats, salt pans.	Jul-Aug	Unlikely	Unlikely – Not detected.	
Ericaceae	<i>Stenanthra pungens</i>		CR			X				Unlikely	Unlikely – no Ericaceae species detected.	Limited taxonomic information
Ericaceae	<i>Styphelia disjuncta</i>			X						Unlikely	Unlikely – no Ericaceae detected.	
Dilleniaceae	<i>Hibbertia priceana</i>		EN	X			Usually compact but sometimes sprawling, dwarf shrub, to 0.15 m high. Fl. Yellow.	Grey sandy clay with laterite gravel. Ridges.	Jun-Aug	Unlikely	Unlikely – no Hibbertia detected.	
Chenopodiaceae	<i>Roycea pycnophylloides</i>	Saltmat	VU		X		Perennial, herb, forming densely branched, silvery mats to 1 m wide.	Sandy soils, clay. Saline flats.	Sep	Unlikely	Unlikely – Not detected.	
Rhamnaceae	<i>Spyridium mucronatum</i> subsp. <i>recurvum</i>		P3	X			Erect or spreading shrub, 0.15-0.6 m high. Fl. white-cream-yellow.	Sandy & clayey soils. Plains.	Oct-Nov	Unlikely	Unlikely – no Rhamnaceae species detected.	
Ericaceae	<i>Styphelia disjuncta</i>			X						Unlikely	Unlikely – no Ericaceae detected.	
Asparagaceae	<i>Thysanotus gageoides</i>		P3	X			Perennial, herb (with tuberous roots), to 0.2 m high. Fl. Purple.	Sand, clay, granite, sandstone, laterite.	Oct-Nov	Unlikely	Unlikely – Not detected, no Thysanotus detected.	

Table 11: Potential Threatened or Priority ecological communities located within 30 km of the survey area and likelihood of occurrence analysis (post survey).

Community Name	Status		Description	Pre-Survey Likelihood of Occurrence	Post-Survey Likelihood of Occurrence and Survey Outcome
	EPBC Act 1999	BC Act 2016			
Eucalyptus Woodlands of the Western Australian Wheatbelt	CR EN - TEC	P3 - PEC	The ecological community defined and assessed as TEC/PEC 'Eucalyptus Woodland of the Western Australian Wheatbelt' is comprised of eucalypt woodlands that formerly were the most common type of vegetation across the wheatbelt landscape of south-western WA, inland between the Darling Range and western edge of the goldfields. The woodlands are dominated by a complex mosaic of eucalypt species with a tree or mallee form over an understorey that is highly variable in structure and composition. Woodlands dominated by mallee forms or vegetation with a very sparse Eucalypt tree canopy are not part of the ecological community (DoE 2015).	Likely	Present – specifically within Vegetation Unit 2: Eucsal OW.

Appendix C

Conservation Status Definitions and Condition Scale

Table 12: Conservation code definitions for flora and fauna as listed as threatened or specially protected.

Threatened, Extinct and Specially Protected fauna or flora are species which have been adequately searched for and are deemed to be, in the wild, threatened, extinct or in need of special protection, and have been gazetted as such.

Threat Category	Definition
Threatened - Critically endangered species (CR)	Facing an extremely high risk of extinction in the wild in the immediate future.
Threatened - Endangered species (EN)	Facing a very high risk of extinction in the wild in the near future.
Threatened - Vulnerable species (VU)	Facing a high risk of extinction in the wild in the medium-term future.
Threatened - Extinct (EX)	There is no reasonable doubt that the last member of the species has died.
Threatened – Extinct in the wild (EW)	Species is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form.
Specially protected species - Migratory species (MI)	Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth. Includes birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and fauna subject to the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the <i>BC Act 2016</i> are a subset of the migratory animals that are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species.
Specially protected species – Conservation Dependent (CD)	Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened.
Specially protected species – Other specially protected species (OS)	Fauna otherwise in need of special protection to ensure their conservation.

Table 13: Conservation code definitions for flora and fauna as listed as Priority.

Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3.

Threat Category	Definition
Priority 1: Poorly-known species	Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation.
Priority 2: Poorly-known species	Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation.
Priority 3: Poorly-known species	Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat.
Priority 4: Rare, Near Threatened and other species in need of monitoring	(a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands. (b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent. (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

Table 14: Conservation code definitions for ecological communities listed as threatened (TEC).

Threat Category	Definition
Presumed Totally Destroyed (PD)	An ecological community that has been adequately searched for but for which no representative occurrences have been located. The community has been found to be totally destroyed or so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure in the foreseeable future.
Critically Endangered (CR)	An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated.
Endangered (EN)	An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future.
Vulnerable (VU)	An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range.

Table 15: Conservation code definitions for ecological communities listed as priority (PEC).

Possible threatened ecological communities that do not meet survey criteria or that are not adequately defined are added to the Priority Ecological Community List under priorities 1, 2 and 3.

Threat Category	Definition
Priority One (P1)	Ecological communities that are known from very few occurrences with a very restricted distribution (generally ≤ 5 occurrences or a total area of ≤ 100 ha), and appear to be under immediate threat.
Priority Two (P2)	Communities that are known from few occurrences with a restricted distribution (generally ≤ 10 occurrences or a total area of ≤ 200 ha). At least some occurrences are not believed to be under immediate threat (within approximately 10 years) of destruction or degradation.
Priority Three (P3)	(i)Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or: (ii)communities known from a few widespread occurrences, which are either large or with significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat (within approximately 10 years), or; (iii)communities made up of large, and/or widespread occurrences, that may or may not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, inappropriate fire regimes, clearing, hydrological change etc.
Priority Four (P4)	Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring.
Priority Five (P5)	Conservation Dependent ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

Table 16: Condition Rating Scale (adapted from Keighery 1994) outlined in EPA (2016a).

Vegetation Condition Rating	Description
Pristine	Pristine or nearly so, no obvious signs of disturbance or damage caused by human activities since European settlement.
Excellent	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.
Very good	Vegetation structure altered, obvious signs of disturbance. Disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds at high density, partial clearing, dieback and grazing.
Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees and shrubs.

Appendix D

Species Lists, Relevé and Quadrat Data

Table 17: Flora Species List recorded within survey area.

Family	Species	Vernacular	Cons code	Invasive	Veg Unit 1	Veg Unit 2	Veg Unit 3	Veg Unit 4
Aizoaceae	<i>Carpobrotus modestus</i>	Inland pigface			X	X		X
Aizoaceae	<i>Mesembryanthemum crystallinum</i>	Common iceplant		X	X	X		
Aizoaceae	<i>Mesembryanthemum nodiflorum</i>	Slender iceplant		X	X	X		
Amaranthaceae	<i>Ptilotus manglesii</i>	Pom poms				X		
Amaranthaceae	<i>Ptilotus polystachyus</i>	Prince of Wales feather			X			
Amaranthaceae	<i>Ptilotus spathulatus</i>	Pussy tails				X		
Anacardiaceae	<i>Schinus molle</i>	Peppercorn tree		X	X			
Asparagaceae	<i>Asparagus asparagoides</i>	Bridal creeper		X – Declared Pest / WoNS	X			
Asparagaceae	<i>Lomandra mucronata</i>	Mat rush			X	X		
Asparagaceae	<i>Lomandra sericea</i>	Silky mat rush			X			
Asphodelaceae	<i>Dianella revoluta</i>	Blueberry flax lily						X
Asteraceae	<i>Arctotheca calendula</i>	Cape weed		X	X	X		
Asteraceae	<i>Cotula australis</i>	Common cotula			X		X	
Asteraceae	<i>Dittrichia graveolens</i>	Stinking fleabane		X		X		
Asteraceae	<i>Erigeron bonariensis</i>	Fleabane			X			
Asteraceae	<i>Gazania linearis</i>	Treasure flower		X	X	X		X
Asteraceae	<i>Gnaphalium sp.</i>	Cudweed		X	X			
Asteraceae	<i>Hypochaeris glabra</i>	Smooth cats-ear		X	X			
Asteraceae	<i>Olearia imbricata</i>	Imbricate daisy-bush			X			
Asteraceae	<i>Olearia ramosissima</i>	Much-branched daisy-bush				X		
Asteraceae	<i>Podolepis rugata</i>	Pleated podolepis			X	X		
Asteraceae	<i>Sonchus oleraceus</i>	Common sowthistle		X	X			
Asteraceae	<i>Taraxacum sp.</i>	Dandelion		X	X			
Asteraceae	<i>Ursinia anthemoides</i>	Ursinia		x	X			

Table 17 continued.

Family	Species	Vernacular	Cons code	Invasive	Veg Unit 1	Veg Unit 2	Veg Unit 3	Veg Unit 4
Brassicaceae	<i>Brassica tournefortii</i>	Mediterranean turnip		X	X	X		
Casuarinaceae	<i>Allocasuarina huegeliana</i>	Rock sheoak			X			
Chenopodiaceae	<i>Atriplex lindleyi</i>	Flat-top saltbush			X	X		
Chenopodiaceae	<i>Enchylaena tomentosa</i>	Barrier saltbush			X			
Chenopodiaceae	<i>Maireana brevifolia</i>	Small leaf bluebush			X	X		
Chenopodiaceae	<i>Rhagodia preissii</i>	Mallee saltbush			X			
Chenopodiaceae	<i>Sclerolaena eurotioides</i>	Fluffy bindii			X			
Chenopodiaceae	<i>Tecticornia indica</i>	Samphire					X	
Chenopodiaceae	<i>Tecticornia lepidosperma</i>				X			
Convolvulaceae	<i>Wilsonia humilis</i>	Silky wilsonia						
Crassulaceae	<i>Crassula alata</i>			X	X			
Cyperaceae	<i>Gahnia ancistrophylla</i>	Hooked-leaf saw sedge			X			X
Cyperaceae	<i>Lepidosperma asperatum</i>					X		
Cyperaceae	<i>Lepidosperma costale</i>				X			
Cyperaceae	<i>Lepidosperma tenue</i>				X	X		
Ericaceae	<i>Styphelia</i> sp. Dumblebung		P3					X
Fabaceae	<i>Acacia acuminata</i>	Jam			X	X		
Fabaceae	<i>Acacia bidentata</i>				X	X		
Fabaceae	<i>Acacia erinacea</i>	Hedgehog wattle				X		
Fabaceae	<i>Acacia microbotrya</i>	Manna wattle			X	X		
Fabaceae	<i>Acacia pulchella</i>							X
Fabaceae	<i>Daviesia decurrens</i>					X		X
Fabaceae	<i>Daviesia nematophylla</i>					X		
Fabaceae	<i>Eutaxia empetrifolia</i>				X			X
Fabaceae	<i>Pultenaea empetrifolia</i>					X		
Fabaceae	<i>Templetonia sulcata</i>	Centipede bush				X		
Fabaceae	<i>Trifolium arvense</i>	Hare's foot clover		X	X			

Table 17 continued.

Family	Species	Vernacular	Cons code	Invasive	Veg Unit 1	Veg Unit 2	Veg Unit 3	Veg Unit 4
Fabaceae	<i>Trifolium campestre</i>	Hop clover		X	X	X		
Fabaceae	<i>Vicia benghalensis</i>	Purple vetch		X	X			
Hemerocallidaceae	<i>Dianella revoluta</i>	Blueberry lily			X			
Iridaceae	<i>Freesia alba x liechtlinii</i>	Freesia		X	X	X		
Iridaceae	<i>Romulea rosea</i>	Guildford grass		X	X	X		
Juncaceae	<i>Juncus radula</i>	Hoary rush				X		
Myrtaceae	<i>Eucalyptus cladocalyx</i>	Sugar gum		Cultivated / Planted		X		
Myrtaceae	<i>Eucalyptus camaldulensis</i> subsp. <i>camaldulensis</i>	River red gum		Cultivated / Planted		X		
Myrtaceae	<i>Eucalyptus leucoxylon</i> subsp. <i>megalocarpa</i>	Large-fruited blue gum		Cultivated / Planted		X		
Myrtaceae	<i>Eucalyptus loxophleba</i> subsp. <i>loxophleba</i>	York gum			X		X	
Myrtaceae	<i>Eucalyptus occidentalis</i>	Flat-topped yate			X		X	
Myrtaceae	<i>Eucalyptus orthostemon</i>	Diverse mallee						X
Myrtaceae	<i>Eucalyptus phaenophylla</i>	Common southern mallee						X
Myrtaceae	<i>Eucalyptus salmonophloia</i>	Salmon gum			X	X		
Myrtaceae	<i>Melaleuca acuminata</i>	Mallee honeymyrtle				X		X
Myrtaceae	<i>Melaleuca bracteosa</i>							
Myrtaceae	<i>Melaleuca brophyi</i>				X			
Myrtaceae	<i>Melaleuca lateriflora</i>	Oblong leaf honeymyrtle/ gorada						X
Myrtaceae	<i>Melaleuca scalena</i>					X		X
Orchidaceae	<i>Thelymitra graminea</i>	Shy sun orchid			X	X		
Pittosporaceae	<i>Billardiera fusiformis</i>	Australian bluebell						X

Table 17 continued.

Family	Species	Vernacular	Cons code	Invasive	Veg Unit 1	Veg Unit 2	Veg Unit 3	Veg Unit 4
Plumbaginaceae	<i>Limonium sinuatum</i>	Perennial sea lavender/ statice		X	X	X		
Poaceae	<i>Austrostipa compressa</i>	Compact needlegrass			X	X		
Poaceae	<i>Austrostipa elegantissima</i>	Tall feathergrass			X	X		X
Poaceae	<i>Amphipogon caricinus</i>	Long greybeard grass						X
Poaceae	<i>Amphipogon strictus</i>	Greybeard grass				X		
Poaceae	<i>Avena barbata</i>	Bearded oat		X	X	X		
Poaceae	<i>Avena fatua</i>	Wild oat		X	X	X		
Poaceae	<i>Briza maxima</i>	Blowfly grass				X		
Poaceae	<i>Bromus catharticus</i>	Prairie grass		X	X	X		
Poaceae	<i>Bromus diandrus</i>	Great brome		X	X			
Poaceae	<i>Bromus rubens</i>	Red brome		X	X	X		
Poaceae	<i>Digitaria sanguinalis</i>				X			
Poaceae	<i>Ehrharta calycina</i>	Perennial veldt		X	X		X	
Poaceae	<i>Ehrharta longifolia</i>	Annual veldt grass		X	X			X
Poaceae	<i>Eragrostis curvula</i>	African lovegrass		X	X		X	
Poaceae	<i>Hordeum glaucum</i>	Northern barley grass		X		X		
Poaceae	<i>Hordeum leporinum</i>	Barley grass		X	X			
Poaceae	<i>Lolium rigidum</i>	Annual ryegrass		X	X	X	X	
Poaceae	<i>Rytidosperma setaceum</i>	Small-flowered wallaby grass			X	X		
Poaceae	<i>Vulpia myuros</i>	Rat's tail fescue		X	X			
Polygonaceae	<i>Polygonum aviculare</i>	Wireweed		X	X			
Primulaceae	<i>Lysimachia arvensis</i>	Pimpernel		X	X			

Table 17 continued.

Family	Species	Vernacular	Cons code	Invasive	Veg Unit 1	Veg Unit 2	Veg Unit 3	Veg Unit 4
Proteaceae	<i>Grevillea huegelii</i>	Comb spider-flower				X		
Proteaceae	<i>Grevillea oligantha</i>	Few-flowered grevillea						X
Proteaceae	<i>Hakea preissii</i>	Needle tree			X	X		
Rhamnaceae	<i>Stenanthemum notiale</i>							X
Rubiaceae	<i>Opercularia hispidula</i>	Hispid stinkweed						X
Santalaceae	<i>Santalum acuminatum</i>	Quandong			X			
Scrophulariaceae	<i>Eremophila subfloccosa</i>	Dense-felted eremophila			X	X		