

Cervantes 1 Conventional Well

Spring Targeted Flora Survey

RCMA AUSTRALIA PTY LTD

FEBRUARY 2021



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ENVIRONMENTAL

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Cervantes 1 Conventional Well Spring Targeted Flora Survey

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EXECUTIVE SUMMARY

RCMA Australia (RCMA) is proposing to undertake conventional drilling operations within the Cervantes oil prospect in the L14 production licence (“L14”) (the Project), located 300 km north-west of Perth, in the northern onshore Perth Basin. Clearing of vegetation is required to widen the existing access track and clear the well pad area. RCMA previously commissioned Woodman Environmental Consulting Pty Ltd (Woodman Environmental) to undertake a flora and fauna Reconnaissance and Targeted survey in Summer 2020 and have now commissioned Woodman Environmental to undertake a targeted flora survey in Spring in order to characterise the annual component of the flora at the Project and confirm the findings of the Reconnaissance and Targeted survey.

Field survey was undertaken over the Development Envelope and Disturbance Area from the 3rd - 4th September 2020. The Disturbance Area was grid searched on foot at a spacing of 10 – 15 m for significant flora taxa and significant vegetation. The vegetation of the proposed disturbance area was previously described by Woodman Environmental (2020b). Therefore, no additional vegetation sampling was undertaken as part of the field survey. However, previous vegetation type (VT) mapping boundaries and polygons were traversed to verify the earlier work.

Two significant flora taxa were recorded within the Development Envelope by this survey, being *Eucalyptus zopherophloia* (P4) and *Thryptomene* sp. Lancelin (M.E. Trudgen 14000) (P3). *Eucalyptus zopherophloia* (P4) was recorded at a one location consisting of one individual within the Development Envelope located within a dense stand of mixed mallees, located immediately south of the proposed access east – west running portion of the access track outside of the Disturbance Area. This taxon is known regionally from 75 location records occurring over a range of approximately 535 km from Shark Bay in the north to Jurien Bay in the south (DBCA 2007-). This location will be physically marked for avoidance by botanists prior to commencement of disturbance activities.

Thryptomene sp. Lancelin (M.E. Trudgen 14000) (P3) was recorded at one location consisting of one individual located within the south-west part of the Development Envelope, immediately west of the proposed access track outside of the area to be impacted by the project. This taxon is known regionally from 28 location records occurring over a range of approximately 194 km from south of Dongara in the north to Ledge Point in the south (DBCA 2007-) with this location on the edge of the known range for this taxon. This location will be physically marked for avoidance by botanists prior to commencement of disturbance activities.

The presence and extent of the four VTs mapped within the Development Envelope previously by Woodman Environmental (2020b) were confirmed during the 2020 field survey, being VT H8, T2, T3 and W1. VT W1 is considered to represent the state listed Priority Ecological Community (PEC) ‘Coastal sands dominated by *Acacia rostellifera*, *Eucalyptus oraria* and *Eucalyptus obtusiflora*’ (P1) (Woodman Environmental 2020b). The presence and extent of this PEC as previously mapped by Woodman Environmental (2020b) was confirmed during the 2020 field survey.

The vegetation condition recorded within the Development Envelope ranged from Excellent to Good with the majority of the vegetation in Excellent condition. VT W1 (considered to represent the state listed 'Coastal sands dominated by *Acacia rostellifera*, *Eucalyptus oraria* and *Eucalyptus obtusiflora*' PEC) was in predominantly in Excellent condition with minimal disturbances recorded and weed cover generally less than 1%. Overall, a total of 0.99 ha of the PEC occurs within the Disturbance Area representing 0.1 % of the locally mapped extent of the PEC mapped.

1. INTRODUCTION

1.1 Project Overview

RCMA Australia (RCMA) is proposing to undertake conventional drilling operations within the Cervantes oil prospect in the L14 production licence (“L14”) (the Project), located in the northern onshore Perth Basin, 3 kilometres (km) south of the Jingemba Production Facility. Clearing of vegetation is required to widen the existing access track and clear the well pad area.

RCMA previously commissioned Woodman Environmental Consulting Pty Ltd (Woodman Environmental) to undertake a flora and fauna Reconnaissance and Targeted survey in Summer 2020 (Woodman Environmental 2020b). Following this, RCMA have commissioned Woodman Environmental to undertake a targeted flora survey in Spring in order to characterise the annual component of the flora at the Project and confirm the findings of the Reconnaissance and Targeted survey.

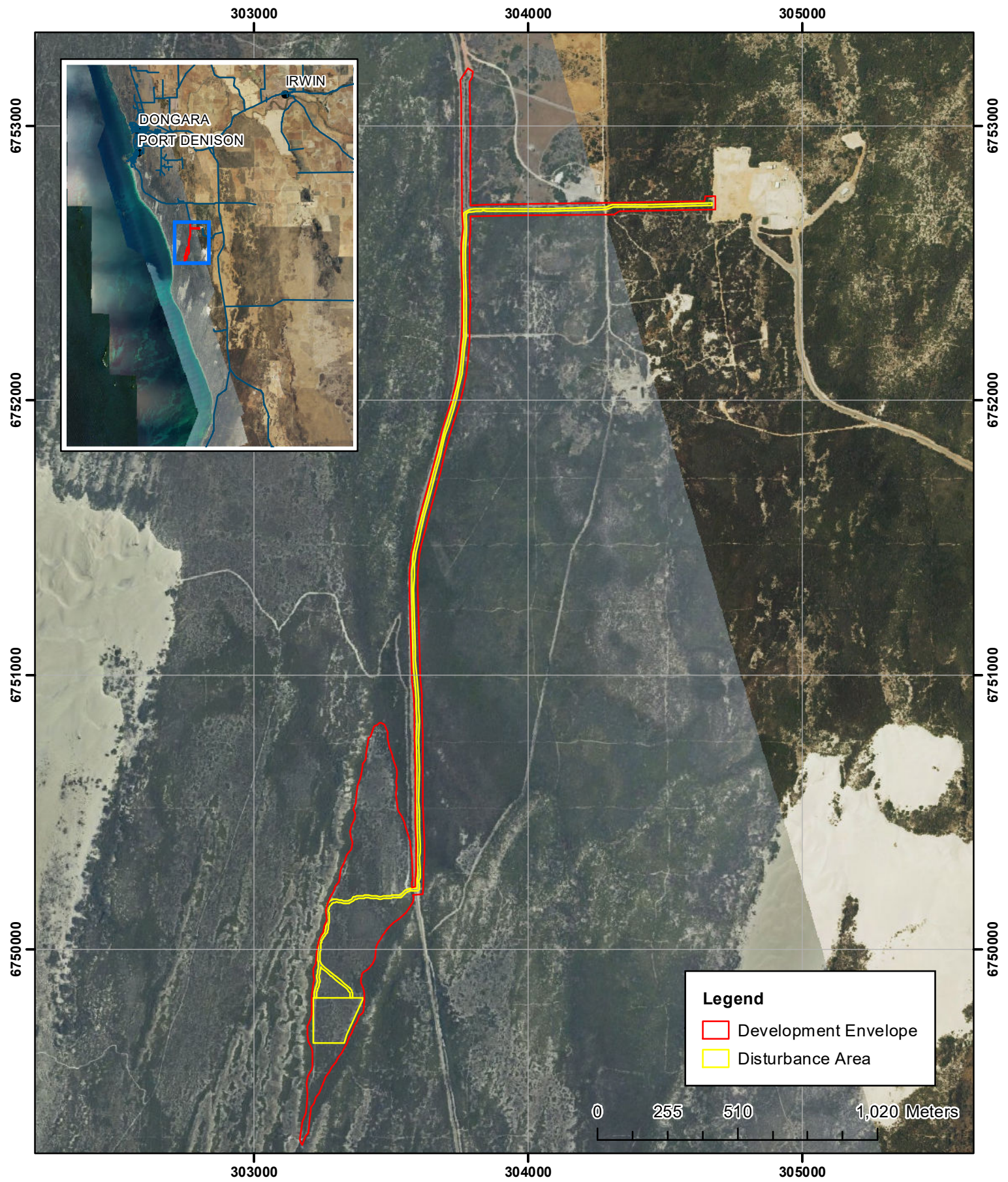
1.2 Project Area Definition



The Project is located within the Shire of Irwin, approximately 300 km north-west of Perth, south-east of Dongara / Port Denison (Figure 1). The Development Envelope is located approximately 13 km south of Dongara, 3 km west of Brand Highway. An existing access track to be used in the project extends north along the Eneabba to Geraldton railway line

The Development Envelope has an area of 36.5 ha and is shown on Figure 1. The Disturbance Area, where direct impacts such as clearing are planned, is shown on Figure 1, and includes a wellpad and access track. The access track mainly follows an existing track of varying widths that will be widened to a full width of 9 m in most areas to allow rig access. The area of direct impact associated with the Project is 6.2 ha as shown in Table 1.

Table 1: Project Disturbance Area

Aspect	Project Area (Disturbance Area)	Previously Disturbed / Cleared	Vegetation Clearing Required
Wellpad	2.4	0.05	2.36
Access Track	3.84	2.05	1.79
TOTAL	6.24	2.09	4.15



Development Envelope and Disturbance Area Location	Author: Alison Saligari	 Figure 1
	WEC Ref: RCMA20-54-01	
Filename: RCMA20-54-01-f01		
Scale: 1:18,000 (A4)		
Projection: GDA 1994 MGA Zone 50		
 WOODMAN ENVIRONMENTAL	Revision: A - 22 Oct 2020	
	<small>This map should only be used in conjunction with WEC report RCMA20-54-01.</small>	

1.3 Aim and Objectives

The primary aims of this assessment were to conduct a spring targeted flora and vegetation survey in order to characterise the annual component of the flora within the Development Envelope and confirm the findings of the previous Reconnaissance and Targeted survey undertaken by Woodman Environmental in February 2020 (Woodman Environmental 2020b).

The overall objectives of the assessment were to:

- Identify significant flora taxa within the Development Envelope, with such taxa defined as one of the following (hereafter referred to as significant flora taxa):
 - Listed Threatened Species (T) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (Commonwealth);
 - Threatened Flora (T) under the *Biodiversity Conservation Act 2016* (BC Act) (WA);
 - Priority Flora taxa (P) as classified by the Western Australian Department of Biodiversity, Conservation and Attractions (DBCA); and
 - Other significant flora taxa as defined by the Environmental Protection Authority (EPA) (2016a; b).
- Identify vegetation / verify previous mapping of vegetation that occurs within the Development Envelope that is one of the following (hereafter referred to as significant vegetation):
 - Listed Threatened Ecological Communities (TEC) under the EPBC Act;
 - TEC as classified by DBCA and endorsed by the Western Australian (WA) Minister for the Environment;
 - Priority Ecological Communities (PEC) as classified by DBCA; and
 - Other significant vegetation as defined by EPA (2016a; b).
- Verify / update previous Vegetation Type (VT) mapping within the Development Envelope.
- Verify / update previous vegetation condition mapping within the Development Envelope and provide a table of the vegetation condition rating and area for each.
- Characterise the annual component of the flora within the Development Envelope including a list of introduced taxa.

The survey and reporting works comply with the following guidance documents:

- Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016a); and
- Environmental Factor Guideline – Flora and Vegetation (EPA 2016b).

1.4 Level of Survey

This assessment included a Targeted Survey as defined in Section 4.2 of the 'Technical Guidance for Flora and Vegetation Surveys for Environmental Impact Assessment' (EPA 2016a). This level of survey was requested by the Environmental Protection Authority (EPA) Service Unit and is considered appropriate given the level of disturbance proposed and the amount of existing previous data available for the proposed disturbance area.

2. BACKGROUND

2.1 Climate

The Development Envelope is located within Irwin Botanical District (Northern Sandplains Region), within the Southwest Botanical Province as classified by Beard (1990). The climate is classified as dry, warm Mediterranean, with predominantly winter precipitation (300 – 500 mm) and seven to eight dry months per year (Beard 1990).

Figure 2 presents the long term average monthly maximum temperatures for Geraldton Airport (2011-2020) and average monthly precipitation data for Port Denison (2000 - 2020), the most relevant meteorological stations to the Development Envelope with adequate data recorded for 2020 (Bureau of Meteorology 2020).

Long term monthly maximum temperatures at Geraldton peak in February (32.7°C). Long-term average monthly rainfall at Port Denison peaks from late autumn to early spring (May-August), with the highest rainfall on average received in July (83.6 mm). Rainfall received at Port Denison in the months prior to the survey in 2020, was below the long-term annual average for May – August (270.1 mm), with only 218.4 mm received.

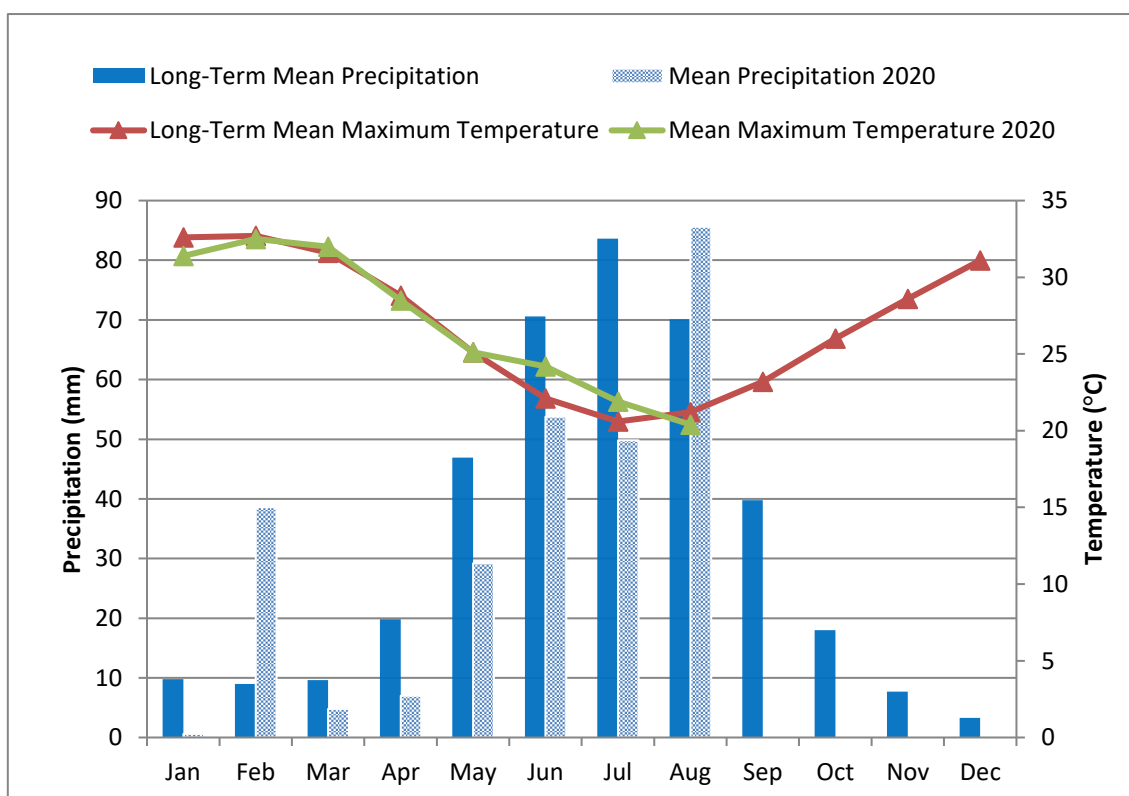


Figure 2: Average Maximum Temperature and Precipitation Geraldton Airport (Temperature) and Port Denison (Rainfall) (Bureau of Meteorology 2020)

2.2 Land Tenure

The majority of the Development Envelope is situated within Beekeepers Nature Reserve as shown on Figure 1. There is also a smaller area of crown land within the Development Envelope.

3. METHODS

3.1 Desktop Review

A review of all publicly available flora and vegetation data relevant to the Development Envelope and surrounds was undertaken as part of the desktop review and risk assessment for the Project (Woodman Environmental 2020a) and the Reconnaissance and Targeted Flora and Vegetation Survey (Woodman Environmental 2020b). This included obtaining and reviewing copies of reports of previous biological surveys carried out within the vicinity of the area (where available) and interrogation of all relevant databases and other sources. For a full account of the methods and results of the desktop review refer to section 5.1 of the Reconnaissance and Targeted Flora and Vegetation Survey report (Woodman Environmental 2020b).

3.2 Personnel and Licensing

Table 2 lists the personnel involved in both fieldwork and plant identifications for the targeted survey. The Project Manager (Greg Woodman) has extensive previous experience (> 10 years) in conducting similar flora surveys in the Geraldton Sandplains IBRA region. Plant identifications were undertaken by personnel with extensive previous experience in undertaking plant identifications of flora of the Northern Sandplains. All plant material was collected under the *Flora Taking (Biological Assessment) licences* and *Authorisation to Take or Disturb Threatened Species* pursuant to the *Biodiversity Conservation Act 2016*, sections 40, 274 and 275, as listed in Table 2.

Table 2: Personnel and Licensing Information

Personnel	Flora Collecting Permit (BC Act/WC Act)	Role
Greg Woodman BSc (Environmental Science) (Hons)	FB62000053 TFL19-1819	Project Manager/ Field manager
Diana Barrie BSc (Agricultural Science / Conservation Biology)	-	Field survey
David Coultas BSc (Environmental Biology) (Hons)	NA	Plant identifications
Margaret Collins PhD (Ecology and Soil Microbiology)	NA	Plant identifications

3.3 Field Survey Methods

Field survey was undertaken from the 3rd - 4th September 2020. The timing of the survey is considered to be optimal for the South-West and Interzone province as per the EPA Technical Guidance (EPA 2016a) and coincides with the flowering period of the majority of the target taxa (September – November).

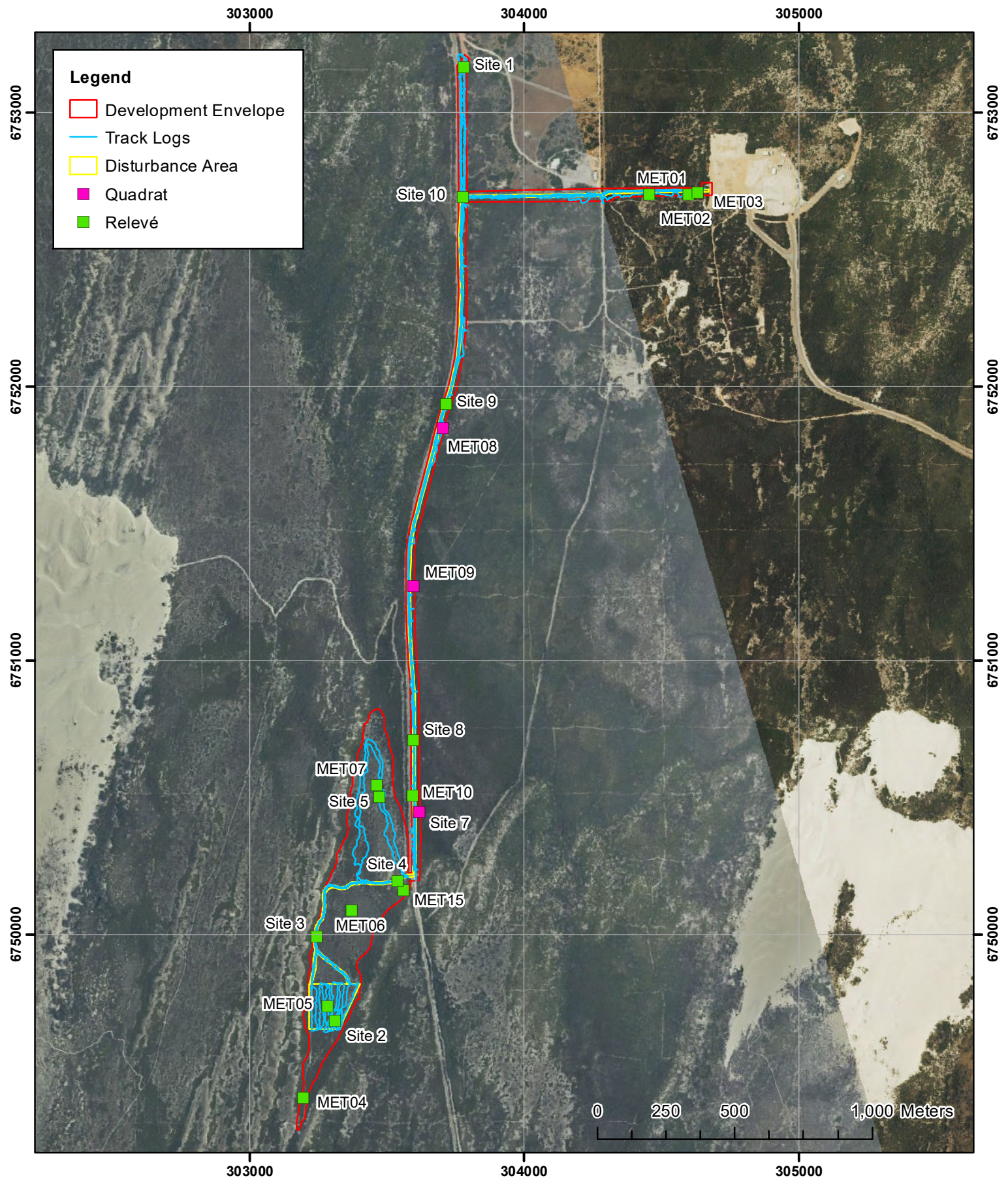
The Development Envelope was grid searched on foot at a spacing of 10 – 15 m for significant vegetation and significant flora taxa (see Table 14 of Woodman Environmental (2020b) for a



list of target significant flora). If populations of any significant flora taxa were identified, a representative collection of material was made, and the abundance and spatial distribution of individuals was recorded using a hand held Garmin Global Positioning System (GPS).

The vegetation of the Development Envelope was previously described as part of the Denison 3D Seismic Survey Project (Woodman Environmental 2005) and was subsequently updated during the previous 2020 survey with additional quadrats, relevés and transects undertaken within the Development Envelope (Woodman Environmental 2020b). The locations of quadrats and/or relevés within each vegetation type (VT) were used in conjunction with aerial photograph interpretation and field notes taken during survey to confirm the presence and extent of these VT mapping polygon boundaries. The original VT mapping polygon boundaries were then updated where necessary using Geographic Information System (GIS) software. No additional vegetation sampling was undertaken as part of the current field survey. However, notes were made regarding the accuracy of VT polygon identification and boundaries, with polygon identities and boundaries modified if considered appropriate. In addition, the Development Area was assessed for significant vegetation based on current TEC and PEC lists (DBCA 2018; 2020). For the full methods used in the VT mapping undertaken within the Development Envelope refer to section 3.1 of Woodman Environmental (2020b).

Vegetation condition was also assessed during the current survey. A total of nine sites were assessed and notes were also taken while traversing the Development Envelope. At each site, GPS location, weed cover, vegetation condition (EPA 2016a; scale presented in Section 3.4) and a site photograph were recorded.

Traverses in the Study Area undertaken in Spring 2020 and vegetation condition recording sites are presented on Figure 3.



Track Logs and Sites	Author: Alison Saligari	 Figure 3
	WEC Ref: RCMA20-54-01	
Filename: RCMA20-54-01-f03		
Scale: 1:18,000 (A4)		
Projection: GDA 1994 MGA Zone 50		
 WOODMAN ENVIRONMENTAL	Revision: A - 22 Oct 2020	
	<small>This map should only be used in conjunction with WEC report RCMA20-54-01.</small>	

3.4 Vegetation Condition

Vegetation condition within the Development Envelope was described using the vegetation condition scale presented in EPA (2016a) as presented in Table 3.

Table 3: Vegetation Condition Scale for the South-West and Interzone Botanical Provinces (EPA 2016a)

Condition Ranking	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.

3.5 Plant Collection and Identification

Specimens of any unknown taxa were collected and were pressed for later identification at the WA Herbarium. External experts of particular families or genera were consulted for any specimens considered to be difficult to identify or of taxonomic interest.

Taxon nomenclature generally follows *FloraBase* (WA Herbarium 1998-) with all names checked against the current DBCA Max database to ensure their validity. However, in cases where names of plant taxa have been published recently in scientific literature but have not yet been adopted on *FloraBase* due to time and/or resource constraints, nomenclature in the published literature is followed. The conservation status of each taxon was checked against *FloraBase*, which provides the most up-to-date information regarding the conservation status of flora taxa in Western Australia.

Specimens of interest, including significant flora taxa, range extensions of taxa and potential new taxa, will be sent to the WA Herbarium for consideration for vouchering as soon as practicable. However, this process is via donation, and the WA Herbarium may not voucher all specimens, in accordance with its own requirements. The specimen vouchering will be supported by completed Threatened and Priority Flora Report Forms submitted to DBCA (Species and Communities Branch) in the case of listed significant flora (e.g. Threatened and Priority flora taxa).

3.6 Significant Flora and Vegetation

3.6.1 Significant Flora

As per EPA (2016b), flora taxa may be significant for a range of reasons, including, but not limited to the following:

- Being identified as a Threatened or Priority species (formally listed significant taxa – includes taxa listed under both State and Commonwealth legislation, and classified as Priority by DBCA);
- Being locally endemic or associated with a restricted habitat type (e.g. surface water or groundwater dependent ecosystems);
- Being new species or species with anomalous features that indicate a potential new species;
- Being representative of the range of a species (particularly at the extremes of range, recently discovered range extensions, or isolated outliers of the main range);
- Being unusual species, including restricted subspecies, varieties or naturally occurring hybrids; and
- Having relictual status, being representative of taxonomic groups that no longer occur widely in the broader landscape.

Significant taxa recorded within the Development Envelope are discussed in Section 5.2.2 with reference to the above categories.

3.6.2 Significant Vegetation

As per EPA (2016b), vegetation may be significant for a range of reasons, including, but not limited to the following:

- Being identified as a TEC or PEC (formally listed significant vegetation – includes vegetation listed under Commonwealth legislation, endorsed as a TEC by the Western Australian Government, or classified as a PEC by DBCA);
- Having restricted distribution;
- Degree of historical impact from threatened processes;
- A role as a refuge; and
- Providing an important function required to maintain ecological integrity of a significant ecosystem.

Significant vegetation recorded within the Development Envelope is discussed in Section 5.1 with reference to the above categories.

4. LIMITATIONS

There were no constraints which affected the results of the survey of the Development Envelope. Rainfall prior to the field survey was below average (see section 2.1), however was considered adequate to identify annual taxa and all target significant flora taxa.

5. RESULTS AND DISCUSSION

5.1 Vegetation

5.1.1 Vegetation Types



The VT mapping within the Development Envelope initially undertaken as part of a the Denison 3D Seismic Survey Project (Woodman Environmental 2005) was updated in 2020 by Woodman Environmental (2020b), and subsequently reviewed and confirmed during the 2020 field survey.



The spring assessment refined mapping in the northern part of the access track to add an additional mapped area described as '*Acacia rostellifera* over introduced taxa' which consisted of regrowth vegetation along track edges (disturbance community Ar). This area was previously mapped as Cleared (Woodman Environmental 2020b). Figure 4 displays the updated vegetation type mapping, which includes the minor amendments in vegetation boundaries based on ground truthing during field work conducted in 2020. The extent of each VT mapped within the Denison Project Area, the Development Envelope and the Disturbance Area is presented in Table 4. A description of these VTs are presented in Table 5.


Table 4: Summary of Areas of each Vegetation Type within the Denison Project Area, the Development Envelope and the Disturbance Area

VT	Area Mapped in Denison 3D Seismic Survey Project Area (Woodman Environmental 2005) (ha)	Area Mapped within the Development Envelope (ha)	Area Mapped with the Disturbance Area (ha)
H8	2261.8	19.9	2.87
T2	1528.1	2.3	0.05
T3	591.5	0.6	0.1
W1	681.1	8.3	1.0
Ar	-	1.7	0.15
Cl	-	3.7	2.09

Table 5: Summary of Vegetation Types Confirmed within the Development Envelope 2020 (Woodman Environmental 2020b)

Community Code / VT	Summary	Photograph
H8	<p>NVIS description: Tall to mid open shrubland of <i>Acacia rostelifera</i>, <i>Melaleuca cardiophylla</i>, <i>Melaleuca huegelii</i> subsp. <i>huegelii</i> and <i>Santalum acuminatum</i> over low sparse shrubland of <i>Melaleuca systema</i> over low open sedgeland of <i>Gahnia</i> sp. South West (K.L. Wilson & K. Frank K LW 9266) on grey clayey sand in swales between dunes.</p> <p>Original Muir (1977) description: Heath dominated by <i>Melaleuca systema</i>, <i>Melaleuca huegelii</i> subsp. <i>huegelii</i>, <i>Acacia</i> spp. and <i>Santalum acuminatum</i> over sedges on grey sand with limestone outcropping in swales</p> <p>Sampling: 4 relevés (MET05, MET06, MET07, MET11)</p>	 <p>Plate 1: Vegetation Type H8 – Relevé MET06</p>
T2	<p>NVIS description: Tall closed shrubland of <i>Melaleuca cardiophylla</i> and/or <i>Melaleuca huegelii</i> subsp. <i>huegelii</i> on slopes of grey-brown sandy loam.</p> <p>Original Muir (1977) description: Thicket of <i>Melaleuca huegelii</i> subsp. <i>huegelii</i> and <i>Melaleuca cardiophylla</i> over mixed shrubs on grey sand on dune crests</p> <p>Sampling: 3 relevés (MET04, MET12, MET15)</p>	 <p>Plate 2: Vegetation Type T2 – Relevé MET12</p>

Community Code / VT	Summary	Photograph
T3	<p>NVIS description: Tall closed shrubland to low sparse shrubland of <i>Acacia rostellifera</i>, <i>Melaleuca cardiophylla</i>, <i>Melaleuca huegelii</i> subsp. <i>huegelii</i>, <i>Melaleuca systema</i>, <i>Olearia</i> sp. Kennedy Range (G. Byrne 66) over low sedgeland of <i>Lepidosperma calcicola</i> on flats of grey-brown sandy loam.</p> <p>Original Muir (1977) description: Dense Thicket dominated by <i>Melaleuca cardiophylla</i> over herbs and grasses.</p> <p>Sampling: 4 relevés (MET01, MET02, MET03, MET13)</p>	 <p data-bbox="1458 655 1957 679">Plate 3: Vegetation Type T3 – Relevé MET02</p>
W1	<p>NVIS description: Mid open to closed mallee forest of <i>Eucalyptus obtusiflora</i> subsp. <i>dongarraensis</i> and <i>Eucalyptus oraria</i> over mid to tall sparse shrubland of <i>Melaleuca cardiophylla</i> and <i>Melaleuca huegelii</i> subsp. <i>huegelii</i>, with occasional <i>Acacia rostellifera</i> and <i>Melaleuca lanceolata</i> on slopes of grey sand.</p> <p>Original Muir (1977) description: Low Woodland of mixed mallees (includes <i>Eucalyptus obtusiflora</i> subsp. <i>dongarraensis</i> and <i>Eucalyptus oraria</i>)</p> <p>Sampling: 4 quadrats (MET08, MET09, MET10, MET14)</p>	 <p data-bbox="1447 1102 1971 1126">Plate 4: Vegetation Type W1 – Quadrat MET09</p>

Community Code / VT	Summary	Photograph
Ar	<i>Acacia rostelifera</i> over weeds (disturbance community)	 <p data-bbox="1509 715 1906 737">Plate 5: Disturbance Community Ar</p>

303500

303750

304000

304250

Legend

Development Envelope

Disturbance Area

Significant Flora

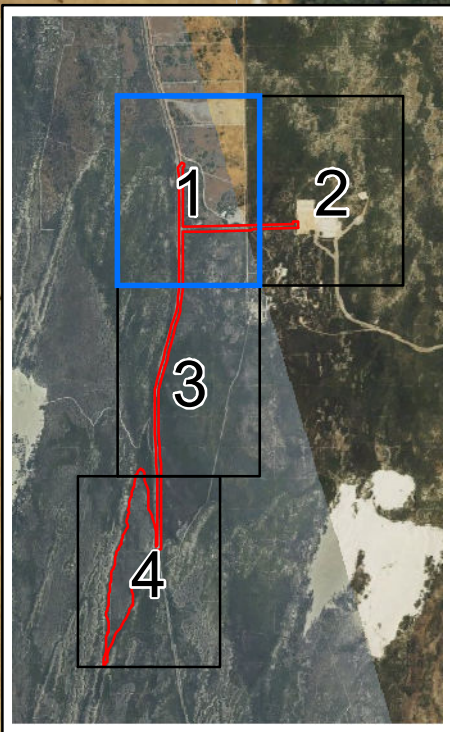
• *Eucalyptus zopherophloia* (P4)

Vegetation Type

Ar *Acacia rostellifera* over weeds

CL Cleared

W1 Mid open to closed mallee forest of *Eucalyptus obtusiflora* subsp. *dongarraensis* and *Eucalyptus oraria* over mid to tall sparse shrubland of *Melaleuca cardiophylla* and *Melaleuca huegelii* subsp. *huegelii*, with occasional *Acacia rostellifera* and *Melaleuca lanceolata* on slopes of grey sand



0 50 100 200 Meters

6753500

6753500

6753250

6753250

6753000

6753000

6752750

6752750

6752500

6752500

6752250

6752250

303500

303750

304000

304250



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Vegetation Type Mapping and Significant Flora within the Development Envelope

Author: Alison Saligari

WEC Ref: RCMA20-54-01

Filename: RCMA20-54-01-f04

Figure

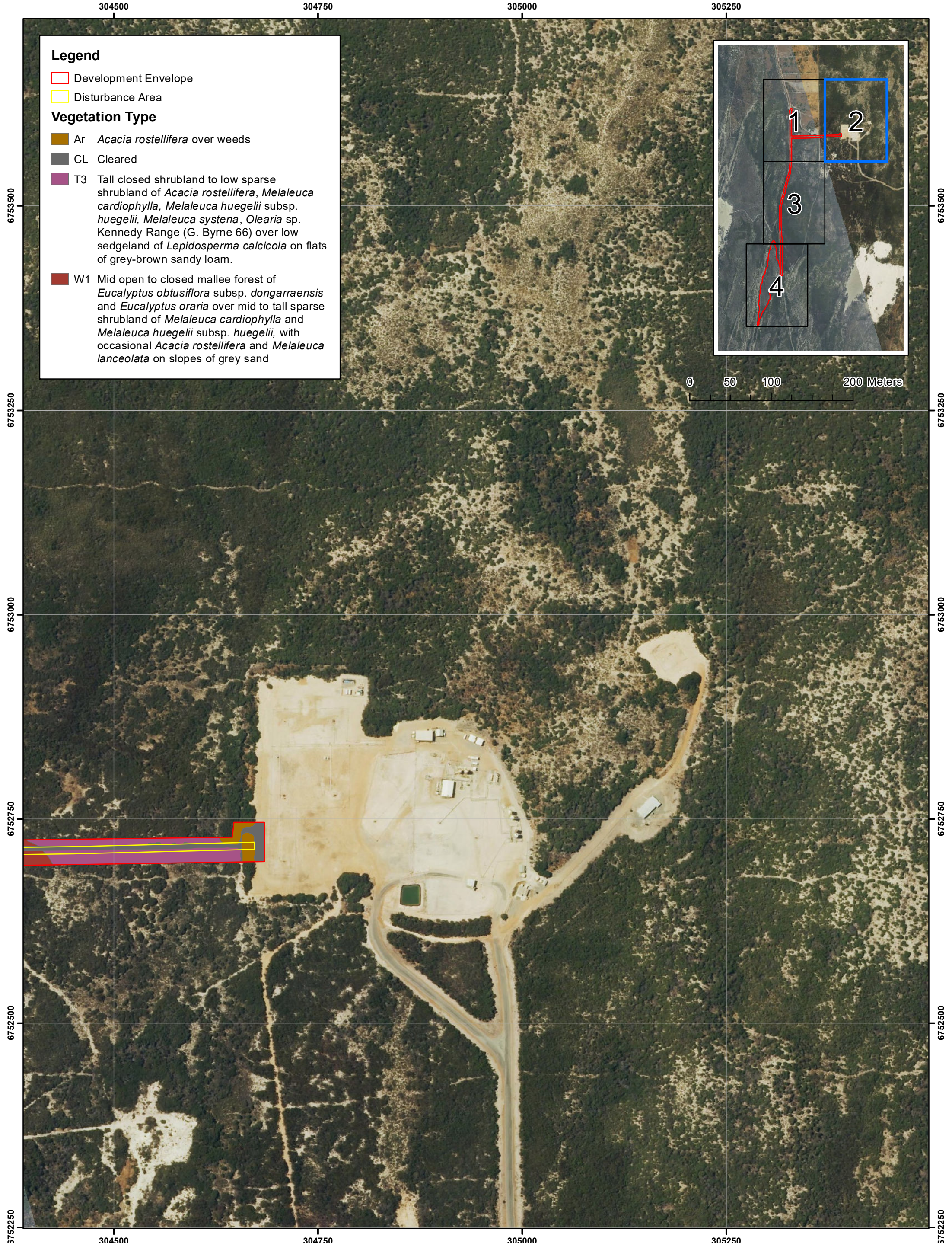
4.1

This map should only be used in conjunction with WEC project RCMA20-54-01.

Revision: A - 22 Oct 2020

Scale: 1:4,000 (A3)

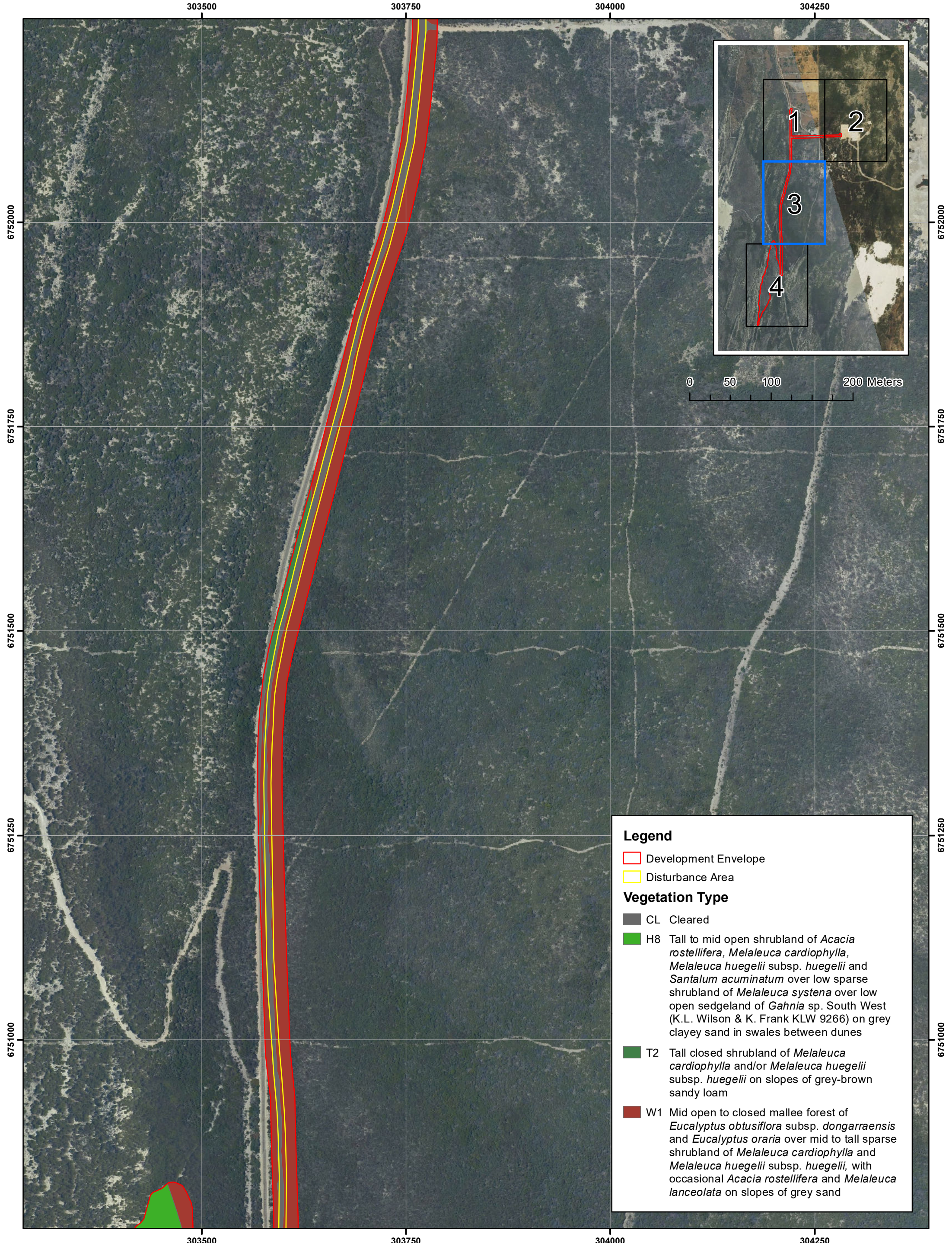
Projection: GDA 1994 MGA Zone 50



Vegetation Type Mapping and Significant Flora within the Development Envelope

Author: Alison Saligari
 WEC Ref: RCMA20-54-01
 Filename: RCMA20-54-01-f04

Figure
 4.2

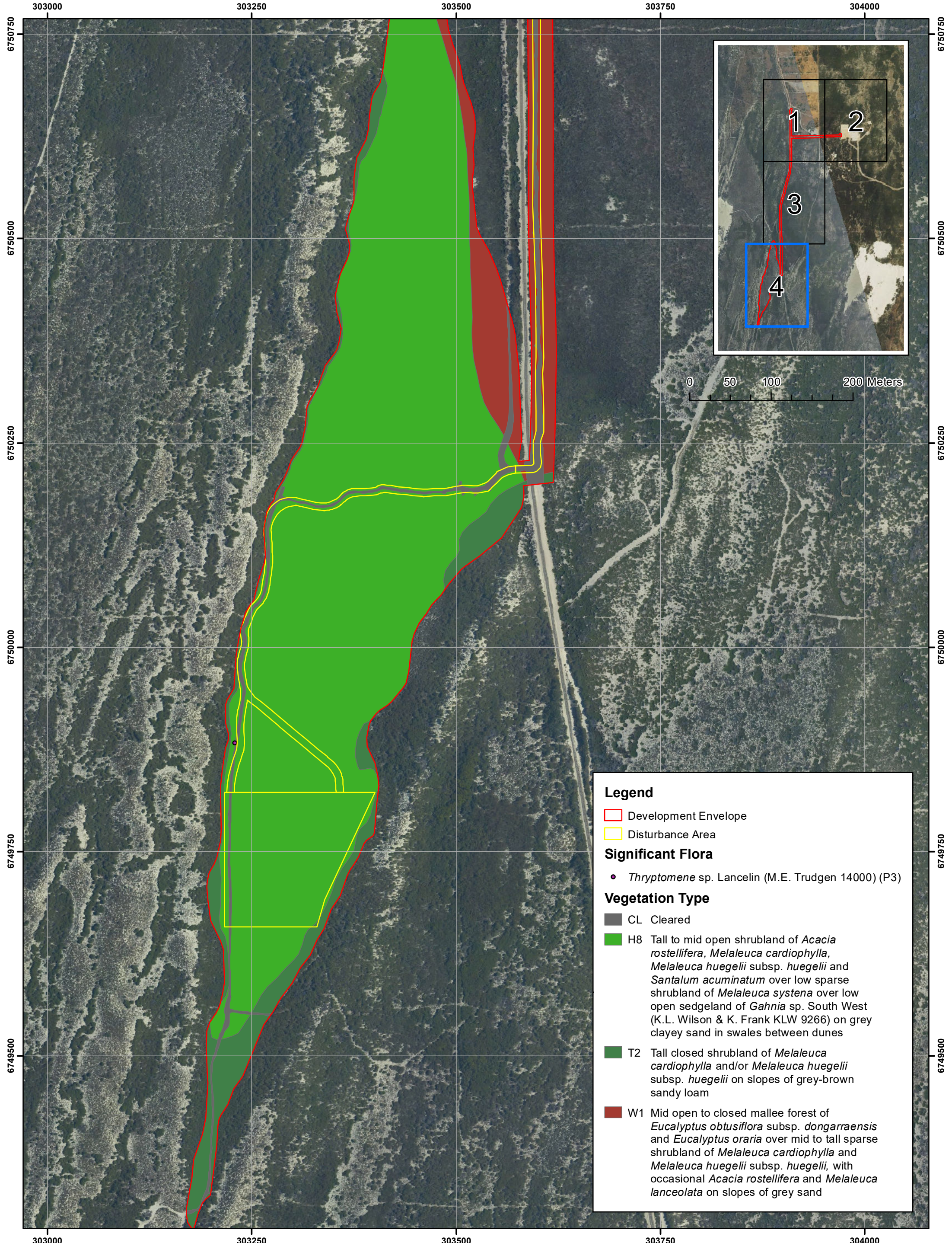


Legend

- Development Envelope
- Disturbance Area

Vegetation Type

- CL Cleared
- H8 Tall to mid open shrubland of *Acacia rostellifera*, *Melaleuca cardiophylla*, *Melaleuca huegelii* subsp. *huegelii* and *Santalum acuminatum* over low sparse shrubland of *Melaleuca systema* over low open sedgeland of *Gahnia* sp. South West (K.L. Wilson & K. Frank KLV 9266) on grey clayey sand in swales between dunes
- T2 Tall closed shrubland of *Melaleuca cardiophylla* and/or *Melaleuca huegelii* subsp. *huegelii* on slopes of grey-brown sandy loam
- W1 Mid open to closed mallee forest of *Eucalyptus obtusiflora* subsp. *dongarraensis* and *Eucalyptus oraria* over mid to tall sparse shrubland of *Melaleuca cardiophylla* and *Melaleuca huegelii* subsp. *huegelii*, with occasional *Acacia rostellifera* and *Melaleuca lanceolata* on slopes of grey sand



Legend

- Development Envelope
- Disturbance Area

Significant Flora

- *Thryptomene* sp. Lancelin (M.E. Trudgen 14000) (P3)

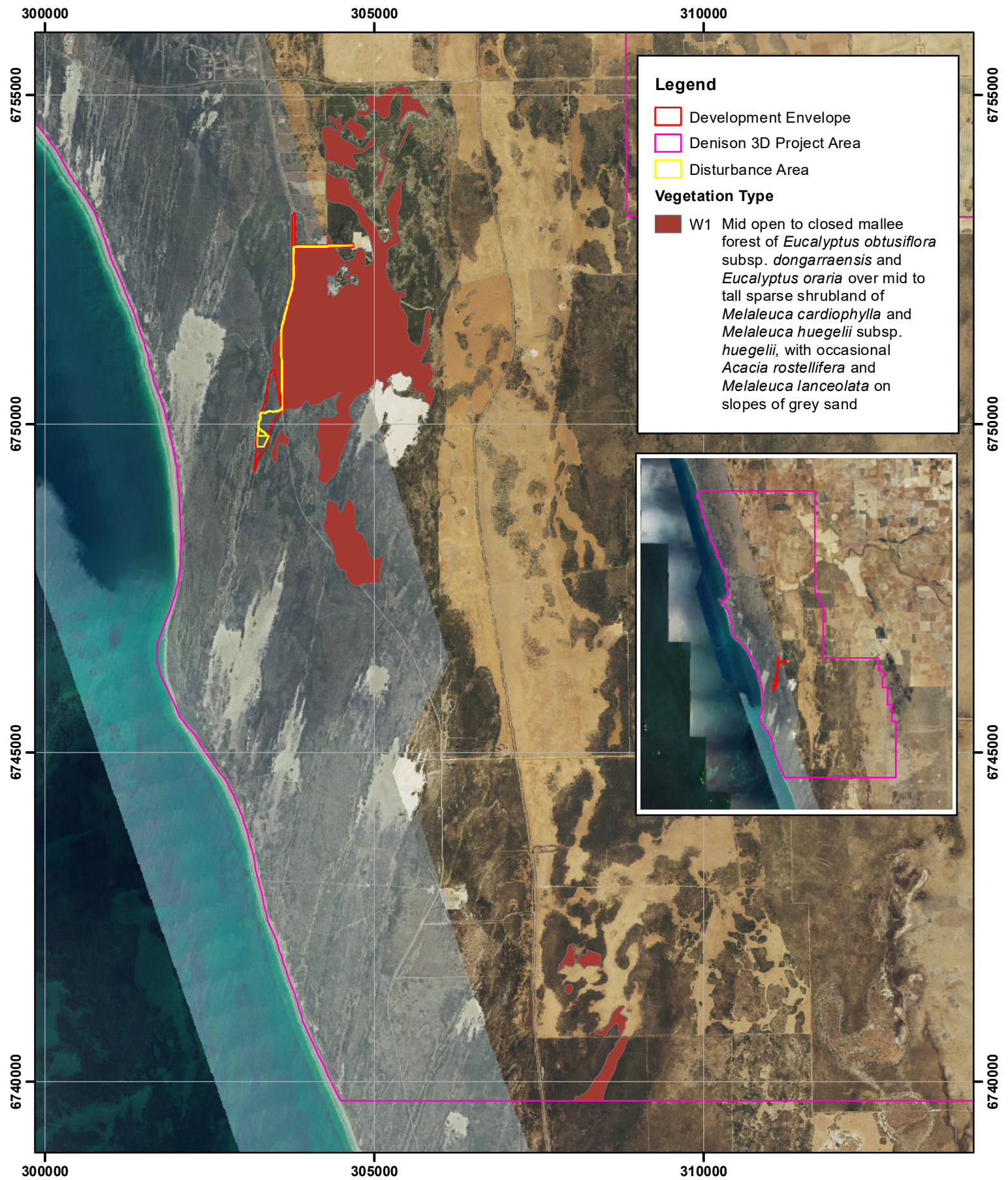
Vegetation Type

- CL Cleared
- H8 Tall to mid open shrubland of *Acacia rostellifera*, *Melaleuca cardiophylla*, *Melaleuca huegelii* subsp. *huegelii* and *Santalum acuminatum* over low sparse shrubland of *Melaleuca systena* over low open sedgeland of *Gahnia* sp. South West (K.L. Wilson & K. Frank KLW 9266) on grey clayey sand in swales between dunes
- T2 Tall closed shrubland of *Melaleuca cardiophylla* and/or *Melaleuca huegelii* subsp. *huegelii* on slopes of grey-brown sandy loam
- W1 Mid open to closed mallee forest of *Eucalyptus obtusiflora* subsp. *dongarraensis* and *Eucalyptus oraria* over mid to tall sparse shrubland of *Melaleuca cardiophylla* and *Melaleuca huegelii* subsp. *huegelii*, with occasional *Acacia rostellifera* and *Melaleuca lanceolata* on slopes of grey sand

5.1.2 Significant Vegetation

VT W1 is considered to represent the state listed 'Coastal sands dominated by *Acacia rostellifera*, *Eucalyptus oraria* and *Eucalyptus obtusiflora*' PEC (P1) (Woodman Environmental 2020b). The presence and extent of this PEC as previously mapped by Woodman Environmental (2020b) was confirmed during the 2020 field survey.

Vegetation type W1 was mapped widely in the local area during the Denison 3D Seismic Survey, with 681.07 ha mapped (Woodman 2005). Only 1.2 % (8.29 ha) of the total area mapped as W1 during the survey is located within the Development Envelope and 0.1 % (0.99 ha) of the total area mapped is located within the Disturbance Area (Figure 5)



Vegetation Type W1 (Priority Ecological Community 'Coastal sands dominated by *Acacia rostellifera*, *Eucalyptus oraria* and *Eucalyptus obtusiflora*') within Development Envelope and the Local Area



This map should only be used in conjunction with WEC report RCMA20-54-01.

Author: Alison Saligari

WEC Ref: RCMA20-54-01

Filename: RCMA20-54-01-f05

Scale: 1:75,000 (A4)

Projection: GDA 1994 MGA Zone 50

Revision: A - 22 Oct 2020



Figure

5

5.2 Flora

5.2.1 Annual Flora Summary

A total of 51 flora taxa were recorded within the Development Envelope during the survey. This includes 20 discrete weed taxa and 31 discrete native taxa. A full list of taxa recorded during the survey and their locations are presented in Appendix A.

5.2.2 Significant Flora

Two significant flora taxa were recorded within the Development Envelope during this survey, being *Eucalyptus zopherophloia* (P4) and *Thryptomene* sp. Lancelin (M.E. Trudgen 14000) (P3). Locations of significant flora taxa recorded in the Development Envelope are presented on Figure 4 and GPS locations are presented on Appendix A. Both locations of priority flora are being avoided for disturbance.

Table 6: Summary of Significant Flora Taxa Recorded within the Development Envelope

Taxon	Status	No. of Locations Recorded	No. of Individuals Recorded	Vegetation Types
<i>Eucalyptus zopherophloia</i>	P4	1	1	W1
<i>Thryptomene</i> sp. Lancelin (M.E. Trudgen 14000)	P3	1	1	H8

***Eucalyptus zopherophloia* (P4)**

Eucalyptus zopherophloia (P4) is a spreading mallee growing to 4 m high occurring on slopes and dunes with grey/white sand., often with limestone (WA Herbarium 1998-) (Plate 6). This taxon is endemic to Western Australia (excluding cultivated locations) (Atlas of Living Australia (ALA) 2020), occurring over a range of approximately 535 km from Shark Bay in the north to Jurien Bay in the south (DBCA 2007-). There are 75 location records of this taxon representing approximately 39 populations, 18 of which occur in conservation tenure including Francois Peron National Park, Zuytdorp Nature Reserve, Beekeepers Nature Reserve, Stockyard Gully Reserve and Yandanogo Nature Reserve (DBCA 2007-).

Eucalyptus zopherophloia (P4) was searched for as part of targeted survey within the Development Envelope. This taxon was recorded at one location consisting of one individual within the Development Envelope in VT W1. The single tree was found within a dense stand of mixed mallees, located immediately south of the proposed access east – west running portion of the access track (Figure 4). This location will be physically marked for avoidance by botanists prior to commencement of disturbance activities.



Plate 6: *Eucalyptus zopherophloia* (P4) (Woodman Environmental)

***Thryptomene* sp. Lancelin (M.E. Trudgen 14000) (P3)**

Thryptomene sp. Lancelin (M.E. Trudgen 14000) (P3) is an erect compact shrub growing to 0.5 m high (Plate 7) occurring on dunes and slopes with sand often with limestone. (WA Herbarium 1998-). This taxon is endemic to Western Australia (Atlas of Living Australia (ALA) 2020), occurring over a range of approximately 194 km from south of Dongara in the north to Ledge Point in the south (DBCA 2007-). There are 28 location records of this taxon representing approximately 19 populations, three of which occurs in conservation tenure including Beekeepers Nature Reserve, Nilgen Nature Reserve and Stockyard Gully Reserve (DBCA 2007-).

Thryptomene sp. Lancelin (M.E. Trudgen 14000) (P3) was searched for as part of targeted survey within the Development Envelope. This taxon was recorded at one location consisting of one individual within the Development Envelope, within VT H8. The single shrub was found growing out from under a larger *Melaleuca* tree, located within the south-west part of the Development Envelope, immediately west of the proposed access track (Figure 4). This location is 4 km NNE of the most northern DBCA record of this taxon and is therefore on the edge of the range. This location will be physically marked for avoidance by botanists prior to commencement of disturbance activities.



Plate 7: *Thryptomene* sp. Lancelin (M.E. Trudgen 14000) (P3) (Woodman Environmental)

5.3 Vegetation Condition

Vegetation condition within the Development Envelope was mapped during the Cervantes 1 Conventional Well Reconnaissance and Targeted Flora and Vegetation Survey (Woodman Environmental 2020b). However, as this survey was undertaken in February, the level of annual weeds present at the time of survey was very low and not representative of weed levels present during wetter months of the year (including spring). Therefore, weeds levels were assessed during the current survey, with a total of nine sites (as presented on Figure 3) undertaken during the current survey assessing for weed cover levels and vegetation condition. This site data is presented in Appendix B.

The vegetation condition recorded within the Development Envelope ranged from Excellent to Degraded with the majority of the vegetation in Excellent condition. Disturbances include weeds, clearing and disturbances associated with edge effects. The area of vegetation condition ratings for each VT is presented in Table 7. VT W1 (considered to represent the state listed 'Coastal sands dominated by *Acacia rostellifera*, *Eucalyptus oraria* and *Eucalyptus obtusiflora*' PEC) was in predominantly in Excellent condition with minimal disturbances recorded and weed cover generally less than 1%.

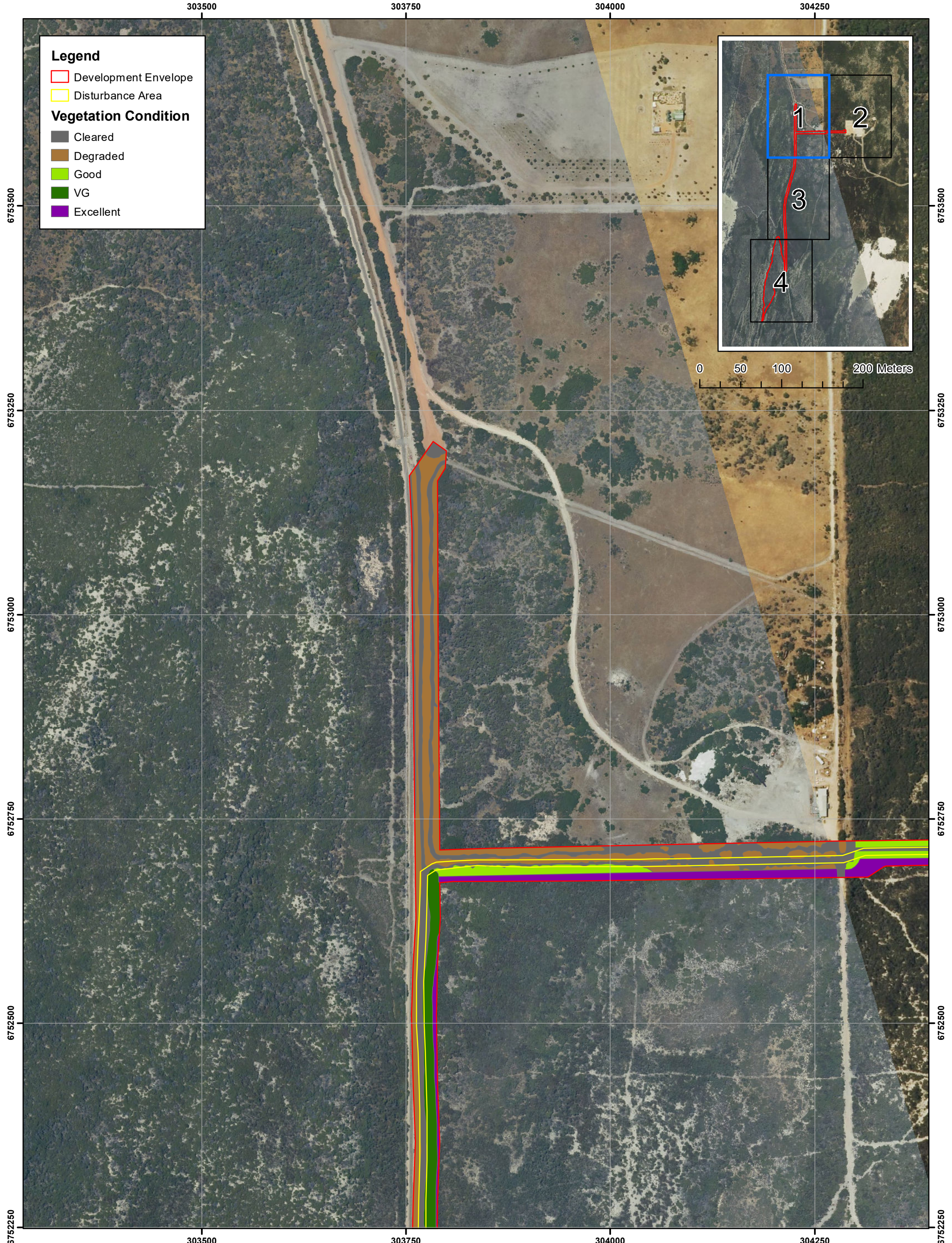
Table 7: Vegetation Condition Ratings for each Vegetation Type Mapped within the Development Envelope

VT	Area Mapped (ha)							
	Cleared	Completely Degraded	Degraded	Good	Very Good	Excellent	Pristine	Total
H8	-	-	-	-	0.1	19.8	-	19.9
T2	-	-	0.2	(0.01)	-	2.1	-	2.3
T3	-	-	-	0.1	-	0.5	-	0.6
W1	-	-	1.6	0.5	3.6	2.6	-	8.3
Ar	-	-	1.7	-	-	-	-	1.7
Cleared	3.7	-	-	-	-	-	-	3.7
Total	3.7	-	3.5	0.6	3.7	25.1	-	36.5

Approximately one third of the disturbance area is currently Cleared. The proportions of other vegetation condition categories to be disturbed are as presented in Table 8.

Table 8: Vegetation Condition Ratings for each Vegetation Type in the Disturbance Area

VT	Area Mapped (ha)							
	Cleared	Completely Degraded	Degraded	Good	Very Good	Excellent	Pristine	Total
H8	-	-	-	-	-	2.9	-	2.9
T2	-	-	(0.008)	-	-	(0.04)	-	(0.05)
T3	-	-	-	-	(0.005)	0.1	-	0.1
W1	-	-	0.2	0.1	0.7	(0.002)	-	1.0
Ar	-	-	0.2	-	-	-	-	-
Cleared	2.1	-	-	-	-	-	-	-
Total	2.1	-	0.3	0.1	0.7	3.0	-	6.2

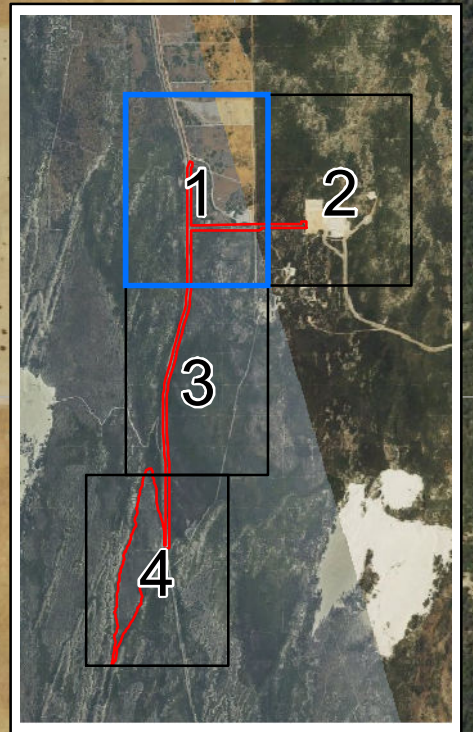


Legend

- Development Envelope
- Disturbance Area

Vegetation Condition

- Cleared
- Degraded
- Good
- VG
- Excellent



0 50 100 200 Meters

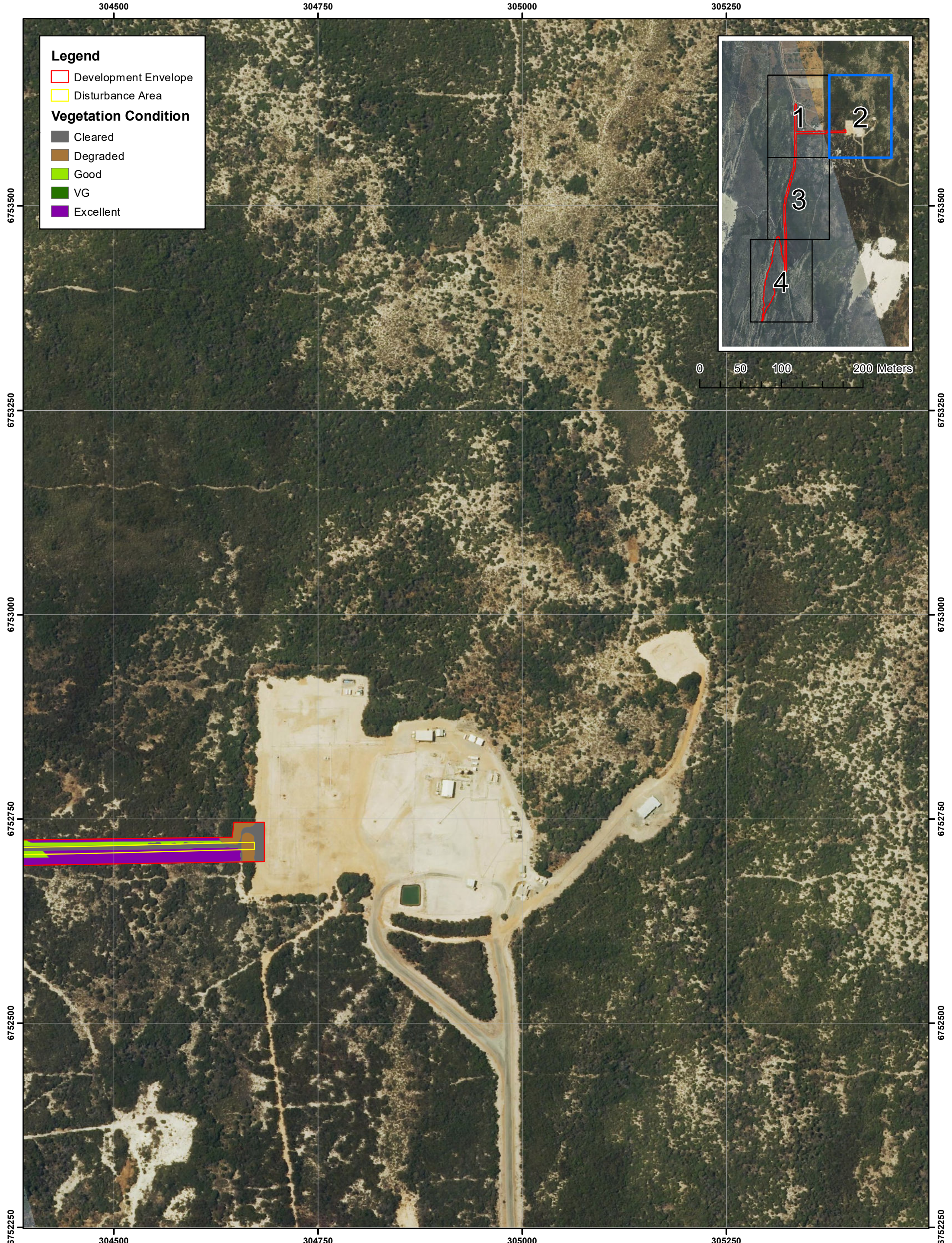
This map should only be used in conjunction with WEC project RCMA20-54-01.

**Vegetation Condition within the
Development Envelope
and Disturbance Area**

Revision: A - 22 Oct 2020 Scale: 1:4,000 (A3)

Author: Alison Saligari
 WEC Ref: RCMA20-54-01
 Filename: RCMA20-54-01-f06
 Projection: GDA 1994 MGA Zone 50

**Figure
6.1**



Legend

- Development Envelope
- Disturbance Area
- Vegetation Condition**
- Cleared
- Degraded
- Good
- VG
- Excellent

0 50 100 200 Meters



Vegetation Condition within the Development Envelope and Disturbance Area

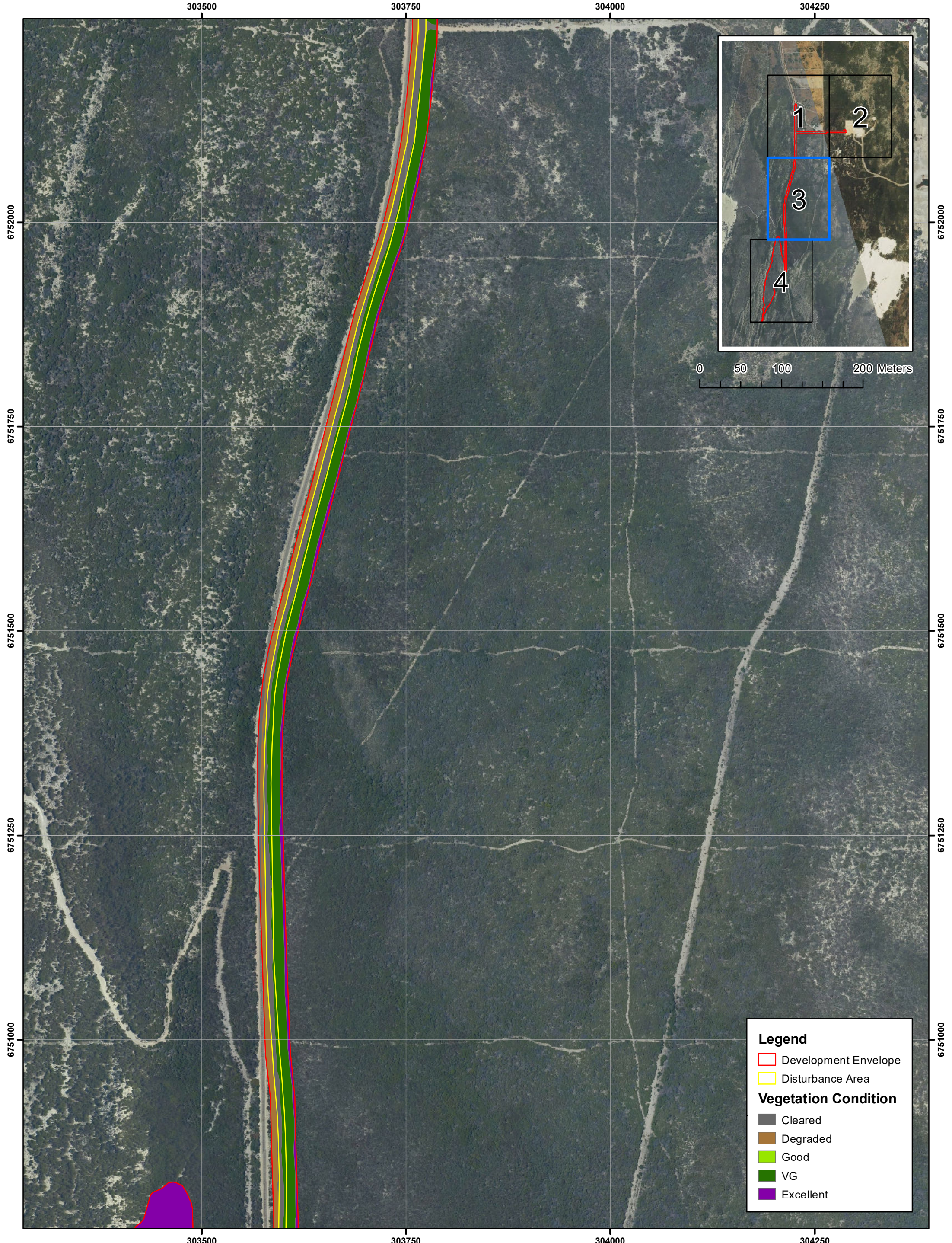
Author: Alison Saligari
 WEC Ref: RCMA20-54-01
 Filename: RCMA20-54-01-f06
 Projection: GDA 1994 MGA Zone 50

Figure 6.2

This map should only be used in conjunction with WEC project RCMA20-54-01.

Revision: A - 22 Oct 2020

Scale: 1:4,000 (A3)

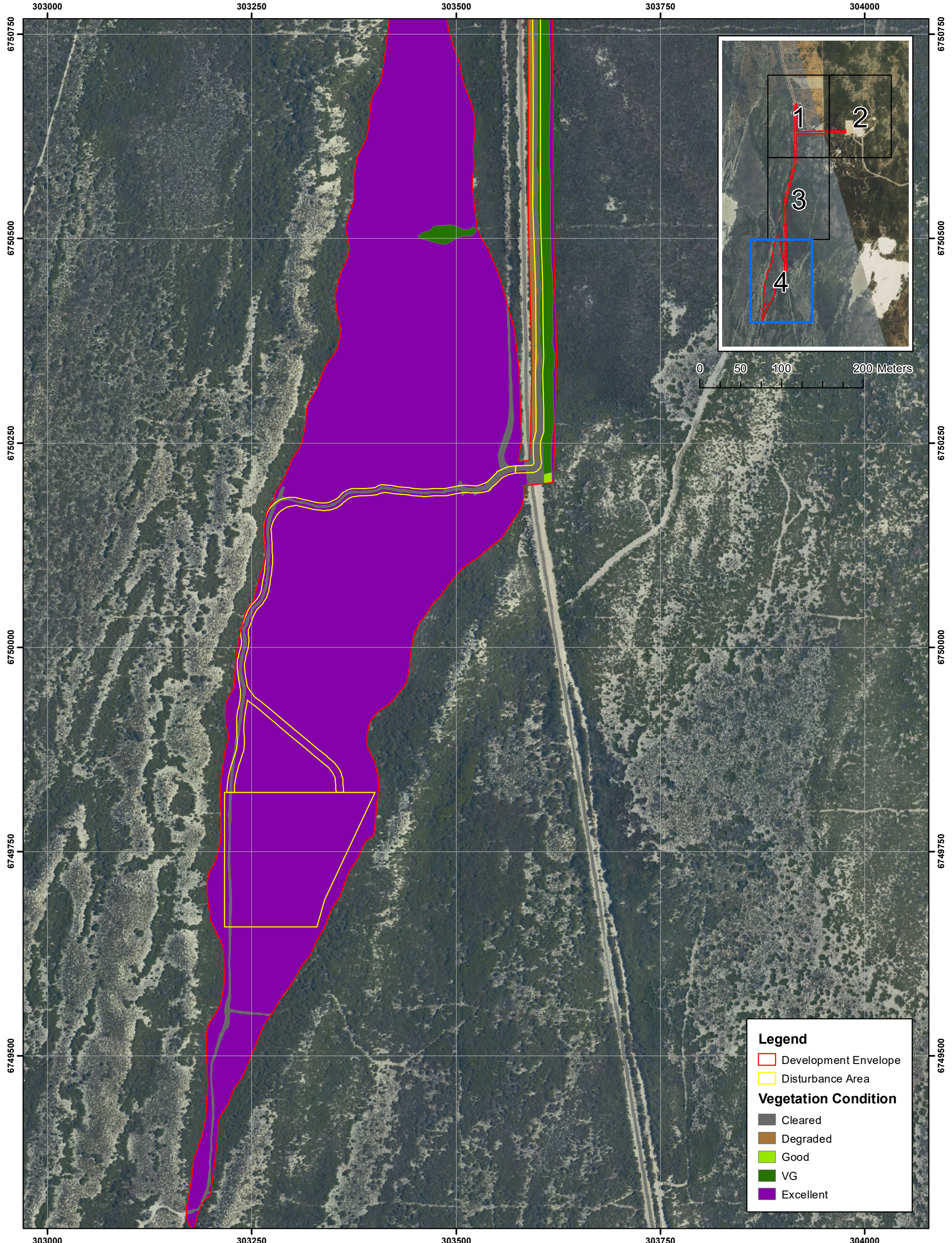


Legend

- Development Envelope
- Disturbance Area

Vegetation Condition

- Cleared
- Degraded
- Good
- VG
- Excellent



Legend

- Development Envelope
- Disturbance Area

Vegetation Condition

- Cleared
- Degraded
- Good
- VG
- Excellent

6. CONCLUSION

The previous Reconnaissance and Targeted survey undertaken in summer 2020 by Woodman Environmental (2020b) identified four VTs and a total of 20.3 ha of the state listed 'Coastal sands dominated by *Acacia rostellifera*, *Eucalyptus oraria* and *Eucalyptus obtusiflora*' PEC (P1) (as represented by VT W1) within the Development Envelope. The presence and extent of these VTs and the PEC were confirmed by the results of the 2020 spring Targeted survey. Overall, a total of 0.99 ha of the PEC occurs within the Disturbance Area representing 0.1 % of the locally mapped extent of the PEC mapped.

The spring Targeted flora survey identified two significant flora taxa within the Development Envelope being *Eucalyptus zopherophloia* (P4) and *Thryptomene* sp. Lancelin (M.E. Trudgen 14000) (P3) following extensive searching of the Development Envelope. The locations of *Eucalyptus zopherophloia* (P4) and *Thryptomene* sp. Lancelin (M.E. Trudgen 14000) (P3) (each represented by one individual) occur outside of the Disturbance Area. The locations of these significant taxa will be physically marked for avoidance by botanists prior to commencement of disturbance activities.

In addition, the majority of the Development Envelope and the Disturbance Area occurs within Beekeepers Nature Reserve. The majority of the vegetation condition within the Disturbance Area is in Excellent condition. Areas rated as Very Good, Good and Degraded were also mapped and were generally associated with track edges.

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Appendix A: Significant Flora, Introduced Flora and other Opportunistic Flora Locations Recorded within the Development Envelope

Note: GPS locations are GDA 94, Zone 50

Taxon	Date	Easting	Northing	Number
Introduced Taxa				
* <i>Arctotheca calendula</i>	3/09/2020	303611	6751537	
* <i>Avena barbata</i>	3/09/2020	303779	6753165	
* <i>Brassica tournefortii</i>	3/09/2020	303779	6753165	
* <i>Brassica tournefortii</i>	4/09/2020	303232	6749888	
* <i>Briza minor</i>	3/09/2020	304455	6752717	
* <i>Dischisma arenarium</i>	4/09/2020	303243	6749927	
* <i>Echium plantagineum</i>	3/09/2020	303772	6752420	
* <i>Erodium cicutarium</i>	3/09/2020	303779	6753165	
* <i>Euphorbia peplus</i>	3/09/2020	303781	6753051	
* <i>Euphorbia terracina</i>	3/09/2020	303784	6752941	
* <i>Galium murale</i>	3/09/2020	303781	6753033	
* <i>Leontodon rhagadioloides</i>	3/09/2020	303773	6752750	5+
* <i>Leontodon rhagadioloides</i>	3/09/2020	303779	6753165	
* <i>Lycium ferocissimum</i>	3/09/2020	303780	6752442	
* <i>Lycium ferocissimum</i>	3/09/2020	303583	6751045	5
* <i>Lycium ferocissimum</i>	3/09/2020	303582	6751060	5
* <i>Lycium ferocissimum</i>	3/09/2020	303580	6751095	8
* <i>Lycium ferocissimum</i>	3/09/2020	303771	6752344	1
* <i>Lysimachia arvensis</i>	3/09/2020	303779	6753165	
* <i>Lysimachia arvensis</i>	4/09/2020	303472	6750506	
* <i>Medicago polymorpha</i>	3/09/2020	304229	6752703	
* <i>Melilotus indicus</i>	3/09/2020	303779	6753165	
* <i>Reichardia tingitana</i>	3/09/2020	303779	6753165	
* <i>Rostraria pumila</i>	3/09/2020	303781	6752980	
* <i>Silene gallica</i> var. <i>gallica</i>	3/09/2020	304608	6752718	
?* <i>Silybum marianum</i>	3/09/2020	304634	6752717	
* <i>Sonchus oleraceus</i>	3/09/2020	304229	6752703	
* <i>Sonchus</i> sp.	4/09/2020	303280	6750172	
* <i>Vulpia myuros</i> forma <i>myuros</i>	3/09/2020	303781	6752980	
* <i>Vulpia</i> sp.	3/09/2020	304633	6752720	
Priority Flora Taxa				
<i>Eucalyptus zopherophloia</i> (P4)	3/09/2020	303837	6752690	1
<i>Thryptomene</i> sp. Lancelin (M.E. Trudgen 14000) (P3)	4/09/2020	303229	6749882	1
Other Native Taxa				
<i>Adriana quadripartita</i>	3/09/2020	303787	6752689	
<i>Angianthus</i> sp.	4/09/2020	303309	6749691	

Taxon	Date	Easting	Northing	Number
<i>Caladenia latifolia</i>	3/09/2020	303780	6752442	2
<i>Calandrinia tholiformis</i>	3/09/2020	304608	6752718	
<i>Calandrinia tholiformis</i>	4/09/2020	303232	6749888	
<i>Calandrinia tholiformis</i>	4/09/2020	303472	6750506	
<i>Crassula colorata</i> var. <i>colorata</i>	3/09/2020	304608	6752718	
<i>Crassula colorata</i> var. <i>colorata</i>	4/09/2020	303423	6750196	
<i>Daucus glochidiatus</i>	3/09/2020	303914	6752686	
<i>Drosera pallida</i>	4/09/2020	303423	6750196	
<i>Gnaphalium indutum</i>	4/09/2020	303423	6750196	
<i>Goodenia berardiana</i>	3/09/2020	303787	6752665	
<i>Goodenia berardiana</i>	4/09/2020	303280	6750172	
<i>Hydrocotyle intertexta</i>	3/09/2020	304608	6752718	
<i>Hydrocotyle intertexta</i>	4/09/2020	303423	6750196	
<i>Hydrocotyle intertexta</i>	4/09/2020	303472	6750506	
<i>Isolepis marginata</i>	3/09/2020	304608	6752718	
<i>Parietaria debilis</i>	4/09/2020	303472	6750506	
<i>Pelargonium littorale</i>	4/09/2020	303472	6750506	
<i>Phyllangium divergens</i>	4/09/2020	303297	6750184	
<i>Podolepis aristata</i> subsp. <i>aristata</i>	3/09/2020	304528	6752718	
<i>Podolepis aristata</i> subsp. <i>aristata</i>	4/09/2020	303423	6750196	
<i>Podolepis aristata</i> subsp. <i>aristata</i>	4/09/2020	303472	6750506	
<i>Podotheca angustifolia</i>	3/09/2020	304528	6752718	
<i>Podotheca angustifolia</i>	4/09/2020	303423	6750196	
<i>Podotheca angustifolia</i>	4/09/2020	303472	6750506	
<i>Polypogon tenellus</i>	4/09/2020	303423	6750196	
<i>Prasophyllum giganteum</i>	4/09/2020	303273	6750092	
<i>Prasophyllum giganteum</i>	4/09/2020	303317	6749657	
<i>Rhodanthe citrina</i>	4/09/2020	303423	6750196	
<i>Rhodanthe citrina</i>	4/09/2020	303257	6750051	
<i>Roepora billardierei</i>	3/09/2020	303782	6752842	
<i>Roepora billardierei</i>	4/09/2020	303423	6750196	
<i>Roepora billardierei</i>	4/09/2020	303472	6750506	
<i>Salsola australis</i>	3/09/2020	303779	6753165	
<i>Senecio pinnatifolius</i>	3/09/2020	303780	6753106	1
<i>Senecio pinnatifolius</i> var. <i>pinnatifolius</i>	3/09/2020	303784	6752941	
<i>Senecio pinnatifolius</i> var. <i>pinnatifolius</i>	4/09/2020	303293	6750184	
<i>Stackhousia pubescens</i>	3/09/2020	304312	6752713	
<i>Thysanotus patersonii</i>	3/09/2020	304454	6752719	
<i>Trachymene ?pilosa</i>	4/09/2020	303280	6750172	
<i>Trachymene ?pilosa</i>	4/09/2020	303472	6750506	
<i>Triglochin trichophora</i>	4/09/2020	303423	6750196	
<i>Triglochin trichophora</i>	4/09/2020	303297	6750184	
<i>Triglochin trichophora</i>	4/09/2020	303472	6750506	

Taxon	Date	Easting	Northing	Number
<i>Waitzia podolepis</i>	3/09/2020	303782	6753087	
<i>Wurmbea monantha</i>	4/09/2020	303423	6750196	

Appendix B: Site Data

Site Name: Site 1
Site Type: RELEVE
Survey Date: 03/09/2020
GPS Location: GDA94 Zone 50 303778.92E 6753165.15N
Vegetation Condition: Southern Vegetation Condition -Degraded
Weed Cover: >70%

PHOTO



Site Name: Site 2
Site Type: RELEVE
Survey Date: 04/09/2020
GPS Location: GDA94 Zone 50 303310.44E 6749689.79N
Vegetation Condition: Southern Vegetation Condition - 2 – Excellent
Weed Cover: 0 - 0.1%

PHOTO



Site Name: Site 3
Site Type: RELEVE
Survey Date: 04/09/2020
GPS Location: GDA94 Zone 50 303243.54E 6749996.84N
Vegetation Condition: Southern Vegetation Condition - 2 – Excellent
Weed Cover: 0 - 0.1%

PHOTO



Site Name: Site 4
Site Type: RELEVE
Survey Date: 04/09/2020
GPS Location: GDA94 Zone 50 303538.13E 6750196.3N
Vegetation Condition: Southern Vegetation Condition - 2 – Excellent
Weed Cover: 0 - 0.1%

PHOTO



Site Name: Site 5
Site Type: RELEVE
Survey Date: 04/09/2020
GPS Location: GDA94 Zone 50 303471.96E 6750506.25N
Vegetation Condition:
Weed Cover: 25%

PHOTO



Site Name: Site 7
Site Type: RELEVE
Survey Date: 04/09/2020
GPS Location: GDA94 Zone 50 303593.5118E 6750509.129N
Vegetation Condition: Southern Vegetation Condition - - Degraded
Weed Cover: 15%

PHOTO



Site Name: Site 8
Site Type: RELEVE
Survey Date: 04/09/2020
GPS Location: GDA94 Zone 50 303595.0477E 6750712.042N
Vegetation Condition: Southern Vegetation Condition - 5 – Degraded
Weed Cover: 40%

PHOTO



Site Name: Site 9
Site Type: RELEVE
Survey Date: 04/09/2020
GPS Location: GDA94 Zone 50 303714.5606E 6751938.299N
Vegetation Condition: Southern Vegetation Condition - 5 – Degraded
Weed Cover: 50%

PHOTO



Site Name: Site 10
Site Type: RELEVE
Survey Date: 04/09/2020
GPS Location: GDA94 Zone 50 303776.4813E 6752693.927N
Vegetation Condition: Southern Vegetation Condition - 3 - Very Good
Weed Cover: 20%

PHOTO

