360 environmental

Learmonth Pipeline
Fabrication Facility

Detailed Flora, Vegetation and Targeted Survey

Prepared for:
Subsea 7

November 2018

people • planet • professional

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Abbreviations

ABBREVIATION	DEFINITION
360 Environmental	360 Environmental Pty Ltd
BAM Act	Biodiversity and Agriculture Management Act 2007 (state)
BoM	Bureau of Meteorology
DAFWA	Department of Agriculture and Food Western Australia
DBCA	Department of Biodiversity, Conservation and Attractions (Formerly DPaW [Department of Parks and Wildlife]) (state)
DEE	Department of Environment and Energy
EPA	Environmental Protection Authority (state)
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)
ESA	Environmentally Sensitive Area
ha	Hectare
IBRA	Interim Biogeographic Regionalisation for Australia
km	Kilometres
mm	Millimetres
MNES	Matters of National Environmental Significance
PEC	Priority Ecological Community
PMST	Protected Matters Search Tool
TEC	Threatened Ecological Community
TPFL	Threatened and Priority Flora Database
TP List	Threatened and Priority Flora List
WAH	Western Australian Herbarium
WAOL	Western Australian Organism List
WC Act	Wildlife Conservation Act 1950 (state)
WoNS	Weeds of National Significance

Executive Summary

In support of the Learmonth Pipeline Fabrication Facility (Learmonth Facility), Subsea 7 commissioned 360 Environmental Pty Ltd to undertake a series of Flora and Vegetation Surveys at the site, which is located approximately 35 km south of Exmouth, Western Australia (the Survey Area).

The Flora and Vegetation Assessment was completed over three field surveys. From these, a total of 126 flora species, representing 87 genera and 32 families were identified in the Survey Area. The most commonly occurring families were Fabaceae (24 taxa), Chenopodiaceae (10 taxa) and Poaceae (10 taxa). The most frequently recorded genus was *Acacia*.

No Threatened flora were recorded during the field survey. One Priority flora, *Corchorus congener* (P3) was recorded in abundance across the wider Survey Area including within the Project Envelope. Based on the desktop study, other than *C. congener*, no other priority flora are considered likely to occur. One potentially new species, *Calytrix* sp., was recorded in the wider Survey Area and was vouchered at the WA Herbarium for further study. It is likely to receive a phrase name and Priority status in the future. *Calytrix* sp. only occurred at one location and does not occur in the Project Envelope.

Ten vegetation types were described and mapped during the survey. The vegetation types recorded during the survey are considered typical of the Carnarvon bioregion. The most common vegetation type was AgTe, which makes up 37.9 % of the Survey Area.

The results from the DBCA Threatened and Priority Ecological Community Database did not identify any TECs or PECs occurring within a 50 km radius of the Project Envelope. Based on a combination of the database searches, desktop study and comparison of vegetation present in the Survey Area with descriptions of known TECs and PECs of the Pilbara Region (DBCA region boundaries) none of the vegetation types recorded during the survey are considered to represent a TEC or PEC.

Vegetation condition ranged from Very Good to Completely Degraded. The majority of the Survey Area is considered to be in Very Good condition (82%).

Weed diversity was considered low with eight weed species recorded, none of which represent a Declared weed or Weed of National Significance. Abundance of **Cenchrus ciliaris* was high across much of the Survey Area, particularly within the drainage lines and along tracks. Other disturbances in the Survey Area includes heavy grazing and trampling by sheep, vehicle tracks and litter.

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1 Introduction

1.1 Background

Subsea 7 (SS7) commissioned 360 Environmental Pty Ltd (360 Environmental) to undertake a series of flora and vegetation assessments within the proposed Learmonth Facility, Western Australia (herein referred to as the Survey Area). The Survey Area is approximately 540 hectares (ha) (Figure 1) and located approximately 35 km south of Exmouth in the Carnarvon bioregion.

This report presents the outcomes from three flora and vegetation surveys within and surrounding the Survey Area.

1.1.1 May 2017 Survey

A detailed flora and vegetation survey was completed by 360 Environmental in May 2017. The survey was completed over five days and included the installation of 22 quadrats within the Survey Area.

1.1.2 September 2017 Survey

A second detailed flora and vegetation survey was completed by 360 Environmental in September 2017. The three-day survey included additional vegetation mapping and the installation of seven quadrats to survey an extension of the original Survey Area.

1.1.3 August 2018 Survey

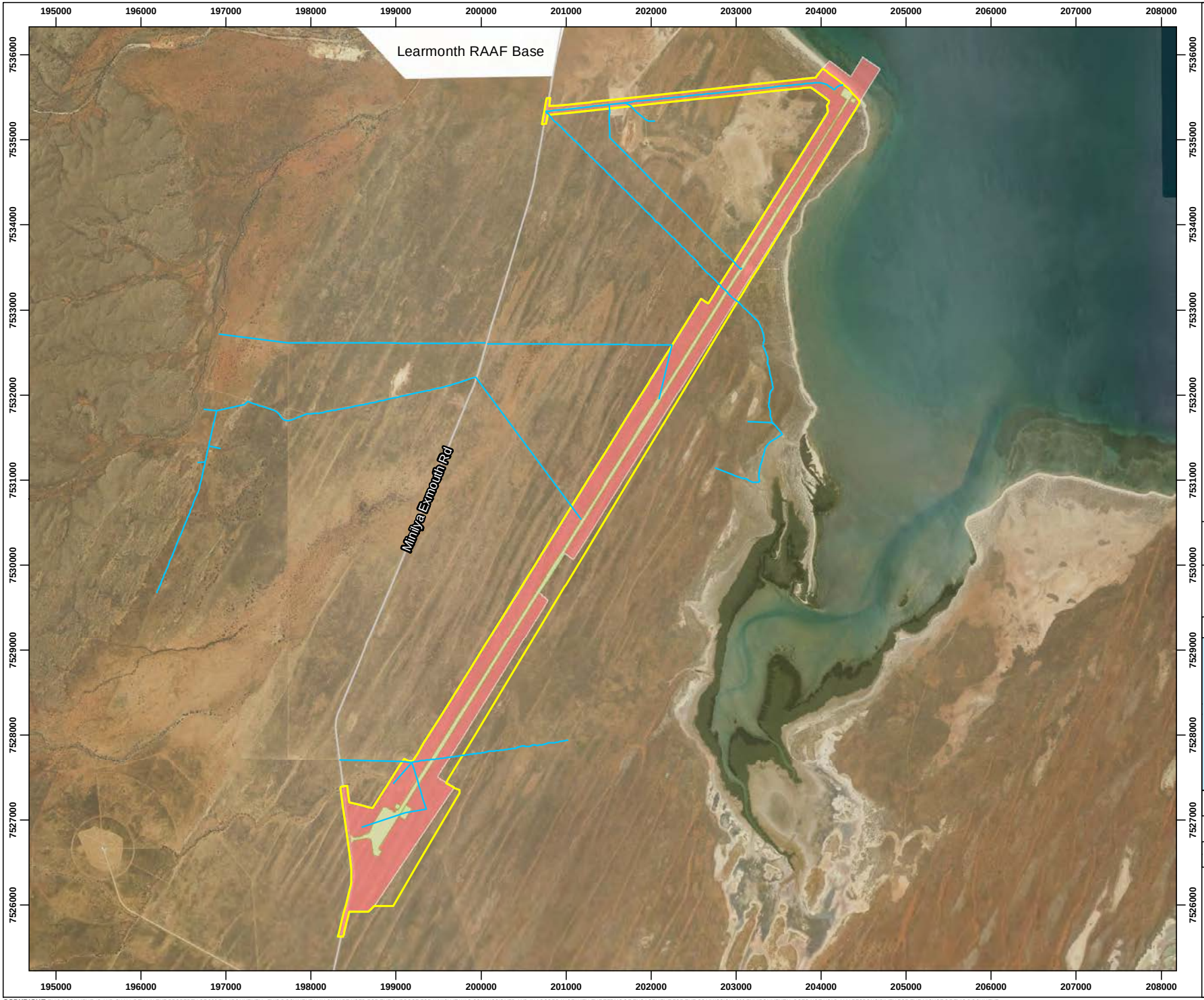
A third detailed flora and vegetation survey was completed by 360 Environmental in August 2018. The eight-day survey was completed after a significant rainfall event and included a targeted flora survey and the installation of an additional 17 quadrats within and surrounding the Survey Area.

1.2 Objectives and Scope

The purpose of the flora and vegetation survey was to determine the environmental values within and surrounding the proposed development envelope. This survey and report has been completed in accordance with the requirements of the Environmental Protection Authorities (EPA) *Technical Guidance – Flora and Vegetation Survey for Environmental Impact Assessment* (2016). The scope of work for the program includes:

- A desktop assessment of relevant literature, databases and spatial datasets to determine the environmental values and any potential issues, such as Threatened/Rare and significant species, Threatened Ecological Communities (TECs) and Priority Ecological Communities (PECs), that may be present in the Survey Area and the surrounding areas;

- A series of flora and vegetation surveys that included:
    - detailed flora and vegetation field surveys with the use of quadrats within and surrounding the Survey Area; and
    - a targeted flora survey for species of conservation significance within the Survey Area;
- Map vegetation types and condition within the Survey Area;
- Map locations of conservation significant flora within and surrounding the Survey Area; and
- Provide a comprehensive report outlining key findings from the survey data collected over the three field events.



Legend

- Priority Flora Search Area (Pre-clearing Survey Area)
- Detailed Flora Survey Area
- Targeted Flora Survey Area
- Project Envelope
- State Road

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- LOCALITY MAP SOURCED LANDGATE 2017
- CADASTRE SOURCED LANDGATE 2018
- AERIAL PHOTOGRAPHY SOURCED LANDGATE 2018
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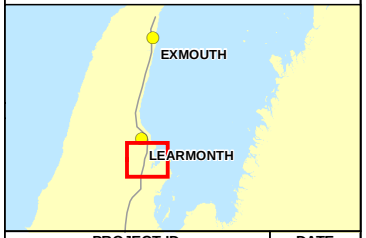
LOCALITY MAP



PROJECT ID	DATE
2755	8/11/2018

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
SL	SF	SW	0

Subsea 7

Learmonth Fabrication Facility

Detailed Flora and Vegetation Survey

Figure 1
Location of the Survey Area

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2 Environmental Context

2.1 Biophysical Environment

2.1.1 Climate

The closest long-term Bureau of Meteorology (BoM) weather station with a complete dataset is Learmonth Airport (station 5007), located approximately 2.5 km north of the Survey Area.

The EPA guidelines recommend that flora surveys within the Eremaean province are completed six – eight weeks post wet season (March – June), and a supplementary survey be completed during the dry season (after winter rainfall if available) (Environmental Protection Authority, 2016).

The three flora surveys were completed during different seasonal conditions, after variable rainfall events. Rainfall varied seasonally and monthly when compared against the long-term averages.

May 2017 Survey

Learmonth Airport recorded 269.30 mm of rain in the 12 months prior to the first survey (May 2016 – April 2017). This is 43.7 mm above the long-term average rainfall of 260.7 mm for the same period. For the three months prior to the first survey (February 2017 - April 2017), Learmonth recorded 62 mm of rainfall, 38.2% (38.3 mm) below the 100.3 mm long term average rainfall for the same period (Bureau of Meteorology, 2018).

September 2017 Survey

Learmonth Airport recorded 96.8 mm of rain in the 12 months prior to the second survey (Sept 2016 – Aug 2017). This is 154.4 mm below the long-term average rainfall of 251.2 mm for the same period (Bureau of Meteorology, 2018)(Bureau of Meteorology, 2018). For the three months prior to the second survey (June - August 2017), Learmonth recorded 11.7mm of rainfall, 84.7 % (64.7 mm) below the 76.4 mm long term average rainfall to the same period (Bureau of Meteorology, 2018).

August 2018 Survey

Learmonth Airport recorded 165.2 mm of rain in the 12 months prior to the third survey, (August 2017 – July 2018). This is 95.5 mm below the long-term average rainfall of 260.7 mm for the same period (Bureau of Meteorology, 2018). For the three months prior to the survey (May 2018 - July 2018), Learmonth recorded 108 mm of rainfall, almost the same as the long-term average rainfall of 107 mm for the same period. The cumulative rainfall was from a significant event on the 19th June 2018 which recorded 72.2 mm in one day (Figure 2). The August 2018 survey date was chosen to allow 6 weeks after this large rainfall event, as per the EPA requirements. This event allowed flora species, particularly annual species, sufficient time to germinate or flower post-rainfall.

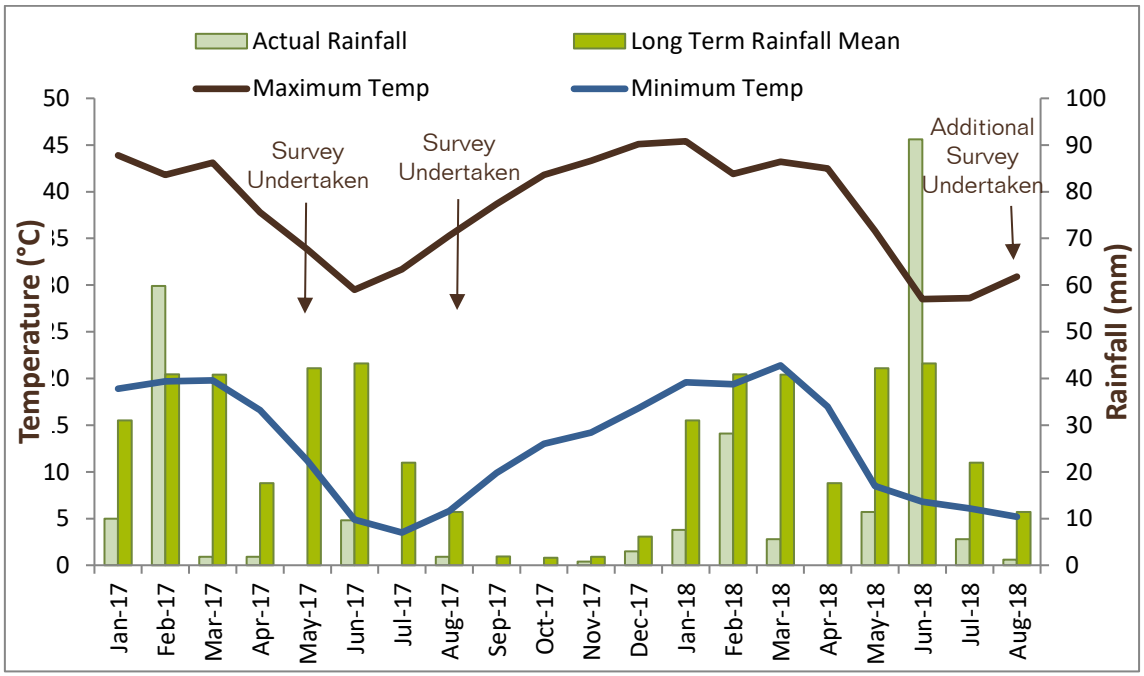


Figure 2: Monthly Rainfall, Long-term Average Rainfall, Maximum and Minimum Temperatures from May 2017 – August 2018 from Learmonth Airport (Bureau of Meteorology, 2018).

2.1.2 Surface Hydrology

According to the Department of Water and Environmental Regulation, 2016, the Survey Area contains some minor surface hydrology (Figure 5), including minor drainage channels running from the Cape Range hills, some areas of swamp and areas of inundation.

2.2 Biological Environment

2.2.1 Interim Biogeographic Regionalisation for Australia

The Interim Biogeographic Regionalisation of Australia (IBRA7) divides Australia into 89 bioregions based on major biological and geographical/geological attributes. These bioregions are subdivided into 419 subregions, as part of a refinement of the IBRA framework (Department of the Environment and Energy, 2016). The Survey Area is located in the Cape Range subregion of the Carnarvon Bioregion.

The Carnarvon bioregion is composed of quaternary alluvial, aeolian and marine sediments overlying Cretaceous strata. A mosaic of saline alluvial plains with samphire and saltbush low shrublands, Bowgada low woodland on sandy ridges and plains, Snakewood scrub on clay flats and tree to shrub steppe over hummock grasslands on and between red sand dune fields. Limestone strata with *Acacia stuartii* or *A. bivenosa* shrubland outcrop in the north, where extensive tidal flats in sheltered embayment support Mangal (Kendrick and Mau, 2002).

2.2.2 Land Systems and Surface Geology

Land systems of the Western Australian rangelands have been mapped and described by the Department of Agriculture and Food WA (DAFWA), providing comprehensive descriptions and maps of the biophysical resources of the region, together with an evaluation of the condition of the soils and vegetation throughout. Two land systems occur within the Survey Area, the Cardabia and Littoral Systems (Figure 6). Table 1 describes the extent of both systems within the Carnarvon bioregion and proportion occurring within the Survey Area.

Table 1: Land Systems within the Survey Area

Land system	Total Area within Carnarvon bioregion (ha)	Proportion Occurring within the Survey Area	
		(ha)	(%)
Cardabia System; Undulating sandy plains with linear dunes, minor limestone plains and low rises, supporting mainly soft spinifex hummock grasslands with scattered acacias and other shrubs.	251,318	436	0.17
Littoral System; Bare coastal mudflats (unvegetated), samphire flats, sand islands, coastal dunes and beaches, supporting samphire low shrublands, sparse *Acacia* shrublands and mangrove forests.	155,983	74	0.05
Total	**407,301**	**510**	**0.22**

Soil-landscape mapping of south WA has been captured at scales ranging from 1:20,000 to 1:250,000 (Department of Agriculture and Food WA, 2012). Soil-landscape mapping describes broad soil and landscape characteristics from regional to local scales. The Survey Area contains the following soil system units:

- **Colluvium 38491**: Colluvium and/or residual deposits, talus, scree, sheet wash; boulder, gravel, sand; may include minor alluvial or sand plain deposits;
- **Dunes 38496**: Dunes, sand plain with dunes and swales; may include numerous interdune claypans; residual and aeolian sand with minor silt and clay; aeolian red quartz sand, clay and silt, in places gypsiferous; yellow hummocky sand; and
- **Estuarine and delta deposits 38489**: Coastal silt and evaporate deposits; estuarine, lagoonal and lacustrine deposits.

2.2.3 Pre-European Vegetation Types

Mapping of Pre-European vegetation within Western Australia was completed on a broad scale (1:1,000,000) by Beard (1975) and later re-assessed by Shepherd et al. (2001) with some larger vegetation units divided into smaller units. The combined Pre-European database contains a total of 819 vegetation types within Western Australia where two broad vegetation types were identified and mapped over the Survey Area (Figure 7). The Shepherd et al. (2001) vegetation types are described below, and their representation in the subregion, region and state is shown in Table 2.

- **Cape Range 117** – Grass-steppe - Hummock grassland *Triodia* spp.; and
- **Coastal Dunes 662** – Hummock grassland; shrub steppe; mixed *Acacia* scrub and dwarf scrub with soft spinifex and *Triodia basedowii*.

Table 2: Pre-European Vegetation Types within the State and Regional Representation (Government of Western Australia, 2018a)

Vegetation Type	Pre-European Extent (ha)	Current extent (ha)	Current extent (%) Remaining	Current extent % in IUCN Class I-IV (Reserved for Conservation)
Vegetation Types in Western Australia				
Cape Range 117	919,517.05	886,005.79	96.36	13.66
Coastal Dunes 662	284,795.92	282,125.59	99.06	1.82
Vegetation Types in the Carnarvon bioregion				
Cape Range 117	12,424.35	10,907.99	87.80	24.11
Coastal Dunes 662	282,709.68	281,679.33	99.64	1.82
Vegetation Types in the Cape Range subregion				
Cape Range 117	12,424.35	10,907.99	87.80	24.11
Coastal Dunes 662	282,709.68	281,679.33	99.64	1.82

2.2.4 Environmentally Sensitive Areas

Environmentally Sensitive Areas (ESAs) are declared to prevent degradation of important environmental values such as Threatened flora, TECs or significant wetlands. The Cape Range National Park occurs approximately 4 km to the west, and running parallel to the Survey Area, and the Survey Area is partially within the extent of the Cape Range Subterranean Waterways ESA (Figure 8). This ESA is related to the underground aquifer system which has been identified in the *Directory of Important Wetlands in Australia* (Australian Government, 2010a) and is not directly related to the values of the flora and vegetation in the Survey Area.

2.2.5 Introduced Flora

The Australian Weed Strategy identifies Weeds of National Significance (WoNS) based on four major criteria (Appendix A) (Thorp and Lynch, 2000). Each WoNS has a national strategy and a national coordinator, responsible for implementing the strategy. WoNS

are regarded as the worst weeds in Australia because of their invasiveness, potential for spread, and economic and environmental impacts (Thorp and Lynch, 2000).

Plants may also be 'Declared' under the *Biosecurity and Agriculture Management Act 2007* (BAM Act) through the provisions of the Western Australian Organism List (WAOL). The WAOL contains information on the area(s) in which a plant is Declared and provides information for the control and keeping categories to which it has been assigned in Western Australia (Department of Primary Industries and Regional Development, 2018). Species listed as Declared under the BAM Act are allocated to one of three categories which are described in Appendix A.

3 Methods

3.1 Desktop Study

3.1.1 Database Searches

Database searches were undertaken to identify potential conservation significant flora species and Ecological Communities within or surrounding the Survey Area. Database search particulars are outlined in Table 3 and results are presented in Appendix A.

Searches of the Department of Biodiversity, Conservation and Attractions (DBCA) Threatened and Priority Flora database, DBCA Threated and Priority Ecological Communities database, DBCA Western Australian Herbarium, NatureMap and *Environment Protection and Biodiversity Conservation Act* (EPBC Act) Protected Matters Search Tool were undertaken for the Survey Area (Table 3) (Appendix C).

The Survey Area is located within the Pilbara regional boundary and contains 42 terrestrial Priority Ecological Communities (PECs). These PECs were examined to determine if any corresponded with the Ecological Communities recorded in the Survey Area. In addition, an EPBC Protected Matters Search (PMST) was undertaken to identify the potential for Matters of National Environmental Significance (MNES) to occur in the Survey Area (Department of the Environment and Energy, 2017).

Table 3: Database Search Particulars

DATABASE NAME	RECEIPT DATE	SEARCH TARGET	SEARCH BUFFER
DBCA Threatened and Priority Ecological Communities database (Department of Biodiversity Conservation and Attractions, 2018a)	02/2017	Listed TECs and PECs	50 km
DBCA Threatened and Priority Flora Database (TPFL) (Department of Biodiversity Conservation and Attractions, 2018b)	05/2017	Threatened and Priority flora	50 km
DBCA Threatened and Priority Flora Species List (TP list) (Department of Biodiversity Conservation and Attractions, 2017a)	05/2017		50 km
Western Australian Herbarium flora (Department of Biodiversity Conservation and Attractions, 2017b)	05/2017		50 km
NatureMap (Department of Biodiversity Conservation and Attractions, 2017c)	06/2017		10 km

DATABASE NAME	RECEIPT DATE	SEARCH TARGET	SEARCH BUFFER
EPBC Protected Matters Search Tool (Department of the Environment and Energy, 2017)	02/2017		10 km

3.1.1.1 Likelihood of Occurrence

A likelihood of occurrence assessment was completed prior to undertaking the field survey of the conservation significant flora recorded from the database search results. The assessment was completed based on the following likelihood of occurrence criteria:

- High - Previously recorded within Survey Area; or within 20 km and suitable habitat potentially occurs in the Survey Area;
- Medium - Previously recorded within 20 to 35 km of the Survey Area; and/or suitable habitat potentially occurs in the Survey Area; and
- Low - No suitable habitat appears to be present in the Survey Area.

The likelihood of occurrence assessment was undertaken prior to the May 2017 survey and re-examined prior to the August 2018 survey. The conservation significant species identified as having a medium to high likelihood of occurrence within the Survey Area were targeted during the August 2018 targeted flora survey. A total of eight species were targeted, with the likelihood of occurrence of these species again being revised after the third survey was completed (Appendix F).

3.1.2 Literature Review

Reports from previous flora and vegetation surveys which were completed near to the Survey Area were reviewed to assist with understanding of the flora and vegetation of the region. The following reports were reviewed:

- Keighery, G. and Gibson, N. (1993) *Biogeography and composition of the flora of the Cape Range peninsula*, Western Australia;
- *Priority Flora Survey, Cape Range National Park* (Department of Environment and Conservation, 2010a);
- *Level 1 Flora and Vegetation Assessment of Truscott Crescent, Exmouth* (360 Environmental Pty Ltd, 2015);
- *Detailed Flora and Vegetation Assessment* (GHD, 2016); and
- *Detailed Flora and Vegetation Assessment* (360 Environmental Pty Ltd, 2017).

3.2 Field Surveys

Three separate field surveys were completed within the Learmonth Facility by Experienced Botanists Sophie Fox (Flora Licence SL012192 and DRF Permit 74-1718), Catherine Krens (Flora Licence SL012203) and Amy Dalton (Flora Licence SL011882), and Ecologist Steve Cossington.

3.2.1 May 2017

A detailed flora and vegetation survey was completed from 22nd – 26th May 2017. A total of 22 quadrats were installed in representative vegetation types within the Survey Area.

3.2.2 September 2017

An additional detailed flora and vegetation survey was completed from 20th – 23rd September 2017. During the three-day survey, additional vegetation mapping as completed and seven additional quadrats were installed within an extension of the original Survey Area.

3.2.3 August 2018

A third detailed flora and vegetation survey was completed from the 2nd – 9th August 2018. During the eight-day survey, a total of 17 additional quadrats were installed. This comprised six quadrats within the Survey Area to comply with the EPA Technical Flora Guidance requirements (Environmental Protection Authority, 2016), which state that a minimum of three quadrats be installed for each vegetation type within the Survey Area; and 11 quadrats were installed outside the Survey Area to provide regional context of vegetation. A minimum of one additional quadrat per vegetation type was completed outside of the Project Envelope, totalling 11 quadrats.. These 11 quadrats were selected to represent each of the ten vegetation types mapped within the Survey Area from the May 2017 and September 2018 surveys. The purpose of completing 11 quadrats outside of the Project Envelope was to provide regional context of vegetation, to show that the vegetation types within the detailed Survey Area are represented in the surrounding area.

A targeted survey for flora of conservation significance was also conducted during this field survey, with systematic traversing of the Targeted Flora Survey Area (Figures 9a – 9b). The Targeted Flora Survey Area corresponded to the projects Development Footprint (Figure 1). The purpose of the targeted flora survey was to locate and record populations of conservation significant flora and map their boundary, where possible, within the Survey Area. During the survey it became clear that the presence of *Corchorus congener* (P3) was extensive throughout the Survey Area, and that it would not be possible to record a clear population boundary. Therefore, for the purposes of this survey, the Targeted Flora Survey Area was traversed on foot by two people, at 25 m spacing, covering within and 25 m outside of the Targeted Flora Survey Area. Clusters of

C. congener were recorded along the way, to gather population numbers within the Targeted Flora Survey Area.

3.2.4 Survey Methods

Quadrats were installed at 20 m x 20 m to cover a surface area of 400 m^2 which is standard for the Carnarvon bioregion (EPA 2016). This was altered to 10 m x 40 m in some areas where the vegetation type and area could not accommodate the traditional square shape (for e.g. the top of the sand dunes). Quadrats were accurately measured using measuring tapes and the northwest corner was demarcated with a steel fence dropper and pink flagging tape. Photographs were taken from the northwest corner. Quadrat locations and survey effort is presented in Figure 9a – 9b.

At each quadrat, the following data was recorded:

- Site code - a unique identifier allocated to each quadrat;
- Date and recorder – a record of the date of quadrat sample and a list of the personnel involved in sampling the quadrat;
- Location – GPS coordinates (MGA94) measured from the north west corner of the quadrat;
- Dimensions – the size and shape of the quadrat;
- Landform and soil description – a description of the quadrat habitat;
- Additional site descriptors – location information that might be useful in vegetation classification including, slope, aspect, litter cover, bare ground cover and fire history;
- Species list – a comprehensive vascular flora species list;
- Foliar cover – the estimated total percentage foliar cover for each species recorded;
- Height – the average height (in meters) of each species recorded;
- Vegetation description – a description of the vegetation according to the National Vegetation Information System (NVIS), Level 5. According to this level, vegetation is classified to 'association', where the dominant growth form, height, cover and species (three species) for the three traditional strata (upper, mid and ground) are described;
- Vegetation condition – assessed according to the vegetation condition scale (EPA 2016) (Appendix A); and
- Photographs – a photograph from the north west corner looking toward the south east corner was taken.

A total of 46 quadrats were installed within and surrounding the Survey Area which included:

- 35 quadrats within the Survey Area; and
- 11 quadrats outside the Survey Area.

3.2.5 Taxonomy and Nomenclature

Where field identification of flora taxa was not possible, specimens were collected systematically for later identification utilising resources of the Western Australian Herbarium (WAH).

The finalised species list was checked against FloraBase (Department of Biodiversity Conservation and Attractions, 2017b) to determine the species' conservation status and known distribution. Introduced flora species were compared to the WoNS list (Thorp and Lynch, 2000) and the DAFWA list to determine if any are listed as Declared (Department of Primary Industries and Regional Development, 2018).

3.2.6 Vegetation Type and Condition Mapping

Vegetation mapping was described based on the structure and species composition, as defined by the quadrat data observations and field observations. Vegetation types and vegetation condition was mapped in the field using handheld GPS (Garmin) units and high-resolution aerial photographs, which were digitised in the office using GIS software (ArcGIS 9.3.1).

Vegetation structure was classified according to the National Vegetation Information Scale (NVIS) IV scale and vegetation condition was classified using EPA Technical Guidelines (Environmental Protection Authority, 2016).

3.2.7 Statistical Analyses

All statistics were carried out using Primer-E version 6.1.5 (Clarke and Gorley, 2006). Quadrats were classified on the basis of similarity in species composition. Using the results of the observations made in the field, boundaries of the vegetation communities were finalised on aerial photographs, at a scale of 1:20,000, with the aid of GPS coordinates taken during the field survey. The vegetation communities were digitised and produced as electronic mapping data using GIS software.

In order to assess the adequacy of the field survey, a species accumulation curve was generated. The species accumulation curve analyses accumulation rates of new species added during the survey period. That is, as the number of quadrats increases, the number of newly recorded species should increase until the accumulation of new species declines (the graph reaches an asymptote). This indicates that the majority of species have been recorded and that the area has been adequately surveyed (species accumulation curves can be useful in estimating total species richness). The accumulation curve was based on presence absence data and the sample order being

random with a maximum 999 permutations with four estimator curves (Chao 2, Jacknife 1, Jacknife 2 and Bootstrap) (Clarke and Gorley, 2006). These estimator curves help predict the true total number of species that would be observed as the number of sites tends to infinity.

A dendrogram was also generated to illustrate and group quadrat information based on cluster analysis using a Bray-Curtis similarity matrix. Quadrat species present-absent data was transformed (Square root) and then tested for similarity with outcomes presented in a dendrogram graph.

3.2.8 EPA Guidance

The EPA guidelines recommend that flora surveys within the Eremaean province are completed six – eight weeks post wet season (March – June), and a supplementary survey be completed during the dry season (after winter rainfall if available) (Environmental Protection Authority, 2016).

Two of the flora surveys (the May and September 2017 surveys) were completed during the dry season, and one (the August 2018 survey) was completed six weeks post significant rainfall event. Combining the results from these three surveys allows for a good opportunity to record a high number of species at different flowering periods within the Survey Area.

The EPA guideline recommends a minimum of three quadrats per vegetation type be completed within the survey area (EPA 2016). For the purposes of this survey, a minimum of three quadrats were completed per vegetation type within the Survey Area. In addition to this, a minimum of one quadrat per vegetation type was completed outside of the Survey Area, to provide contextual information of vegetation and to ensure that the vegetation types within the Survey Area are represented outside of the Project Envelope.

4 Results

4.1 Limitations and Constraints

Survey constraints and limitations are presented in Table 4.

Table 4: Limitations and Constraints Associated with the Survey Area

VARIABLE		IMPACT ON SURVEY OUTCOMES
Access	No limitation	During the three field surveys, the entire Survey Area was accessed and traversed either by vehicle or on foot. Particular focus was given to areas expected to be impacted and areas that may have species of conservation significance. Some locations outside of the Survey Area were also traversed to provide regional context of *Corchorus congener* (P3) populations and vegetation associations.
Experience	No limitation	The personnel who executed the three surveys were practitioners suitably qualified in their respective fields: ● Field Staff: Sophie Fox (Botanist), Catherine Krens (Senior Botanist), Amy Dalton (Botanist); Steve Cossington (Ecologist); ● Taxonomy: Kathya Tippur (first flora survey 2017), Sophie Fox (second flora survey 2017), Frank Obbens (third flora survey 2018); ● Data Interpretation and Reporting: Sophie Fox; ● Technical Review: Narelle Whittington (Principal Botanist); and ● Report Review: Scott Walker (Principal Ecologist/ Group Leader).
Timing	No limitation	The EPA guidelines recommend that flora surveys within the Eremaean region are completed 6-8 weeks post wet season (March – June, or 6-8 weeks after significant rainfall events), and that supplementary surveys be completed during the dry season (after winder rainfall is available). Flora composition changes with time, particularly seasonally as a result of changes in conditions such as rainfall. Therefore, botanical surveys completed at different times of the year will often produce varying results, such is the case for this Survey Area. Three field surveys were completed at different times of year;

VARIABLE		IMPACT ON SURVEY OUTCOMES
		• The first survey was conducted during May which is within the recommended flora survey period for the Eremaean Province, however, after low rainfall, meaning that not many annual species were recorded, and some species were unable to be identified due to lack of fruiting or flowering material; • The second survey was conducted in September which is outside of the suggested flora survey period for the Eremaean Province, and after low rainfall, meaning that not many annual species were recorded, and some species were unable to be identified due to lack of fruiting or flowering material; and • The third survey was conducted in August, outside of the recommended months for the Eremaean Province, however, six weeks after a significant rainfall event (72 mm), meaning that annual species were present within the Survey Area, and many perennial species were flowering, allowing for identification of species which were unable to be identified during the first and second surveys.
Proportion of flora collected	No limitation	The first and second field surveys were completed during a period of low rainfall. During this time, there were few annual species present, and much of the flora collected had no fruiting or flowering material. A total of 74 taxa were recorded from the first two field surveys, eight of these could not be identified to species level and required re-collection during the August 2018 flora survey. The August 2018 flora survey was completed six weeks post a significant rainfall event. Many species were flowering and fruiting and annual species were present. Many of the species which had been unable to be identified previously, were re-collected and able to be identified to species level. 52 additional species were recorded, totalling 126 flora taxa, including one Priority species, *Corchorus congener* (P3), and potentially new species, *Calytrix* sp., (see section 4.3.3). Five species could not be fully identified due to lack of fruiting material, none were considered to represent species of conservation significance.

VARIABLE		IMPACT ON SURVEY OUTCOMES
Completeness	No limitation	Three flora surveys were completed within the Survey Area during different seasons. A total of 46 quadrats were completed. Vegetation Types were adequately surveyed, with a minimum of three quadrats per vegetation type completed within the Survey Area as per the EPA requirements, and a minimum of one quadrat per vegetation type completed outside of the Survey Area to provide regional context of vegetation. The Survey Area was well traversed for the purpose of the Targeted Survey for flora of conservation significance. Particular attention was given to areas considered to be habitat for conservation significant species. Some areas outside of the Survey Area were searched for species of conservation significance (predominately *Corchorus congener*), to provide regional context of population extent.
Disturbances/Current land use	Moderate limitation	The Survey Area has existing stock in sheep occupying the area, which has resulted in heavy grazing and soil disturbance. Some areas have a high weed density of **Cenchrus ciliaris* with other areas having been cleared and/or impacted by vehicle tracks driving over vegetation.

4.2 Desktop Study

4.2.1 Database Searches

The DBCA database search results identified the following as occurring within a 50 km buffer of the Survey Area (Department of Biodiversity Conservation and Attractions, 2018b; Department of the Environment and Energy, 2018):

- No Threatened flora was recorded;
- 26 Priority flora has previously been recorded including:
    - Two Priority 1;
    - Ten Priority 2;
    - Ten Priority 3; and
    - Four Priority 4 (Figure 10, Appendix F).
- No occurrences of Threatened or Priority Ecological Communities have been recorded.

4.2.1.1 Likelihood

The likelihood assessment identified eight species as having medium to high likelihood of occurrence within the Survey Area. This number was revised to no species as having a medium or high likelihood of occurrence within the Survey Area excluding the Priority three species *Corchorus congener* as this species was extensively recorded throughout the Survey Area.

4.2.2 Literature Review

Relevant and comprehensive botanical surveys that have been undertaken in the Cape Range peninsula regions by DBCA (formerly Department of Environment and Conservation [DEC]) and biological consulting companies are summarised below:

Biogeography and composition of the flora of the Cape Range peninsula, Western Australia (Keighery, G. and Gibson, N. 1993)

The vascular flora of the Cape Range peninsula has not been extensively surveyed and its relationship with the flora of other similar areas is poorly known (Keighery and Gibson, 1993). A survey of the limestone hills, ranges and calcarenite outcrops extending north from Lake MacLeod to Vlaming head was undertaken by Keighery and Gibson, (1993). A total of 209 taxa were recorded from 30 quadrats (each 100 m^2) during the survey with the species richness ranging from 12 to 44 species per quadrat. The vegetation types and habitat recorded is not considered to be relevant for the Learmonth Facility Survey Area. Landforms within the Survey Area are very different due to the topography of the Cape Range, and having no limestone hills, ranges or calcarenite outcrops.

Priority Flora Survey, Cape Range National Park (Department of Environment and Conservation, 2010b)

The DEC priority search was conducted in September and October of 2009 in the Cape Range National Park. Five priority listed species were recorded in this survey, *Brachychiton obtusilobus* (Priority 4), *Grevillea calcicola* (Priority 3), *Eremophila forrestii* subsp. *capensis* (Priority 3), *Corchorus congener* (Priority 3) and *Tinospora esiangkara* (Priority 2).

Level 1 Flora and Vegetation Assessment of Truscott Crescent, Exmouth (360 Environmental Pty Ltd, 2015)

360 Environmental conducted a Level 1 Flora and Vegetation Assessment on Truscott Crescent, Exmouth in February 2015. The Survey Area was approximately 23.1 ha and located in the Cape Range biogeographic region of Western Australia. A total of 69 taxa were identified during the survey, with the most commonly occurring families being Fabaceae, Poaceae and Asteraceae (360 Environmental Pty Ltd, 2015).

Minilya – Exmouth Road Biological Survey for Main Roads Western Australia (GHD, 2016)

GHD was commissioned by Main Roads Western Australia to conduct a fauna, flora and vegetation assessment in the Minilya – Exmouth region of Western Australia, for the purposes of a potential upgrade to the Minilya – Exmouth Road.

Sixteen natural vegetation communities were mapped within the Survey Area. No TECs or PECs were considered to occur within the Survey Area. The survey recorded 343 flora taxa, including three Priority taxa; *Acacia alexandri* (P3), *Corchorus congener* (P3) and *Owenia acidula* (P3).

Level 2 Flora and Vegetation Assessment within Shark Bay and Exmouth- Minilya (360 Environmental Pty Ltd, 2018b)

A detailed flora and vegetation survey was completed within Shark Bay and Exmouth-Minilya. Within the Exmouth-Minilya portion of the field survey, two vegetation types were recorded within the Survey area, neither represent a TECs or PEC. *Corchorus congener* was recorded at multiple locations within the Survey Area.

4.3 Field Survey

4.3.1 Flora

A total of 126 flora species (including species, subspecies, varieties and forms) from 87 genera and 32 families were identified in the Survey Area from 46 quadrats, a targeted search and opportunistic collections. The most commonly occurring families were Fabaceae (24 taxa), Chenopodiaceae (10 taxa) and Poaceae (10 taxa). The most frequently recorded genus was *Acacia*. A combined species list from all three flora surveys is presented in Appendix G and a survey site by species matrix is provided in Appendix H.

A total of four species within the Survey Area were unable to be fully identified to species level due to lack of identifying material. Three species of *Tecticornia* in *T.* ?*indica*, *T.* ?*pruinosa* and *T.* ?*pterygosperma* subsp. *denticulata* were unable to be confidently identified to species level due to lack of identifying fruit. *Triodia* ?*wiseana* could not be confidently identified due to insect predation on the seeds of the collected specimen.

One species, Convolvulaceae sp., was unable to be fully identified to genus level due to lack of identifying material.

One species, *Calytrix* sp., was collected outside of the Project Envelope, and is under investigation as potentially being a new species (see Section 4.3.3).

None of these species are considered to represent any WoNS, or Priority species as per the likelihood of occurrence table (Appendix A).

A species accumulation curve was generated using quadrat floristic data showing diversity of actual species collected (Sobs) and estimated floristic diversity based on the four estimator tests in Chao 2 (155), Jacknife 1 (148), Jacknife 2 (170) and Bootstrap (127) (Figure 3). A total of 127 taxa were recorded from 46 quadrats, while the four species extrapolator curves gave an estimated range of 127 to 170 taxa for the Survey Area. The site verses species matrix can be viewed in Appendix H.

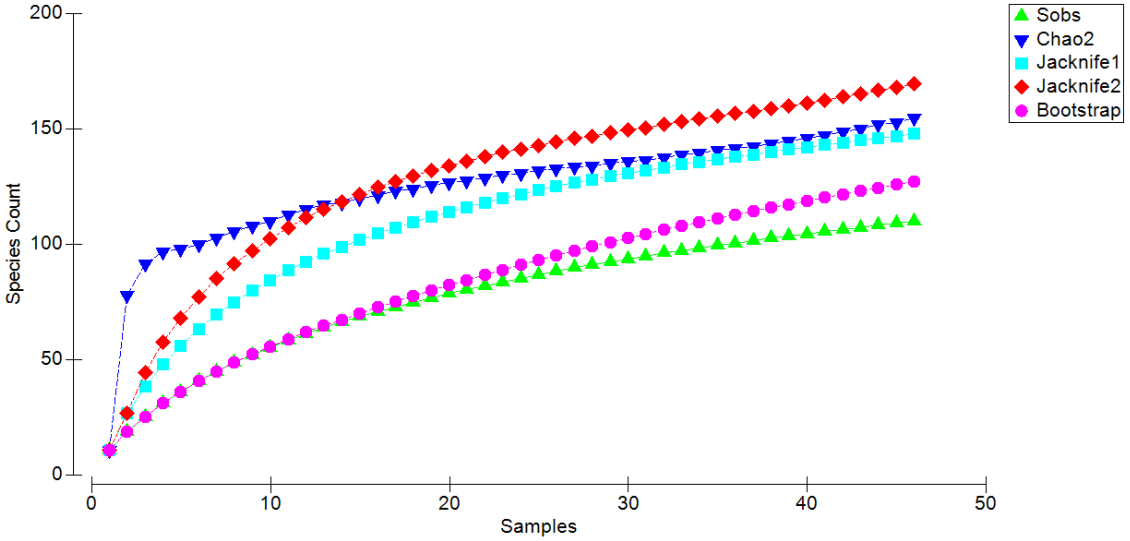


Figure 3: Species Accumulation Curve for Species Recorded within the Survey Area

4.3.2 Conservation Significant Flora

No Threatened species listed under the EPBC Act or gazetted as Declared Rare Flora (Threatened) pursuant to the WC Act were recorded in the Survey Area. One Priority species as listed by DBCA was recorded in the Survey Area, *Corchorus congener* (P3). The extent of *C. congener* within the Survey Area is shown in Figures 11a-11b.

The abundance of this species was ubiquitous due to it being locally endemic. *C. congener* individuals were recorded during the August 2018 Targeted Survey, which corresponds to the Project's Development Footprint. The locations and population of *C. congener* extend beyond the Targeted Survey Area and was therefore extrapolated to best represent the wider community boundary.

An additional Priority Flora Search was undertaken in the surrounding areas beyond the Survey Area which has also provided regional locations of *C. congener*. The recorded locations of these species in the Priority Flora Search Area have also been extrapolated to the known extent of the population (Appendix J).

Corchorus congener (P3)

C. congener is a low, spreading shrub growing to 0.6m in height. It produces yellow flowers from April to June, or August to November. It grows on red sand, sandy loam with limestone and is a localised endemic to the top north western region of Western

Australia (Department of Biodiversity Conservation and Attractions, 2017b) (Figure 4, Plates 1 - 5).

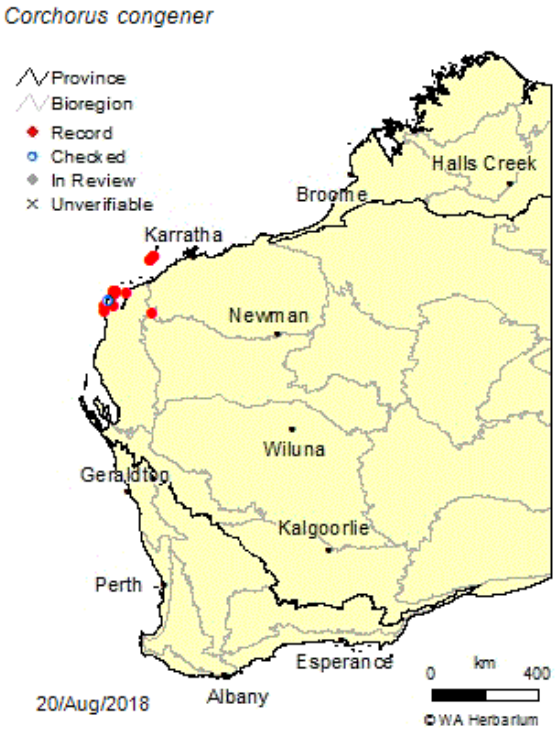


Figure 4: *C. congener* Distribution within Western Australia (Department of Biodiversity Conservation and Attractions, 2017b).

C. congener was locally common throughout both the Targeted Survey Area and the wider Survey Area, occurring readily along tracks and road sides, and throughout the vegetation within the Survey Area. Regional locations were also surveyed outside of the Project Envelope to gather population details in a regional context (Figure 9a - 9b). The results of these regional priority flora searches found the *C. Congener* to be widespread throughout Learmonth area. Figures 11a – 11b show the locations of the *C. congener* recorded during the August 2018 Targeted Survey as well as the regional priority flora searches. The figures also show the extrapolated population of the species which was based on observations from the field, and locations of populations recorded outside of the Project Envelope. Advice sought from the DBCA in regards to the impacts of clearing *C. Congener* within the Priority Flora Search Area; DBCA advised that the species has been identified as widespread within this area and therefore should still be well represented even if some individuals cannot be avoided. Therefore, the proposed clearing should not be significant to the conservation of the species (DBCA 2018c).

Plate 1: *C. congener* within the Survey Area (360 Environmental Pty Ltd, 2018a).

Plate 2: *C. congener* image from Florabase (Department of Biodiversity Conservation and Attractions, 2017b).

Plate 3: *C. congener* on limestone, within the Survey Area (360 Environmental Pty Ltd, 2018a).

Plate 4: *C. congener* within the Survey Area (360 Environmental Pty Ltd, 2018a).

Plate 5: *C congener* within the Survey Area (360 Environmental Pty Ltd, 2018a).

4.3.3 Flora of Interest

Calytrix sp.

One potentially new species, *Calytrix* sp., (Plate 6 - 8) was recorded outside the Project Envelope (Figure 11a) A population of approximately 200 individuals was recorded (UTM50K 200743E; 7534146N).

This collection of *Calytrix* sp. bares resemblance to the *Calytrix strigosa* group (Barbara Rye, personal communication). The northern-most species currently known from this group is *Calytrix* sp. Kennedy Range (A. Markey & S. Dillon 6301), which occurs approximately 250 km south of Learmonth. *Calytrix* sp. was recorded as occurring exclusively on a rocky rise of Ningaloo coral reef deposit (Plate 8). This habitat type occurred in limited locations within the Survey Area, and a targeted search was conducted within these areas in search of *Calytrix* sp. No populations of *Calytrix* sp. were recorded within the Survey Area.

Specimens of this species have been submitted to Taxonomist Barbara Rye at the WA herbarium for further study. It is likely that this species will be given a phrase name and a priority status in the future.

Plate 6: Calytrix sp. flower (360 Environmental Pty Ltd, 2018a).

Plate 7: Calytrix sp. (360 Environmental Pty Ltd, 2018a).

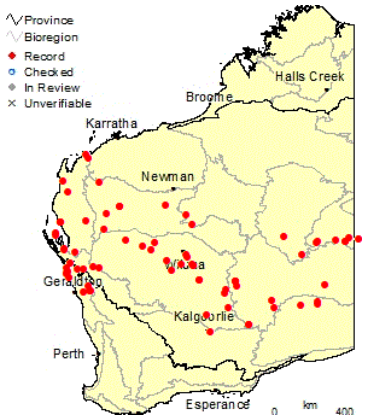
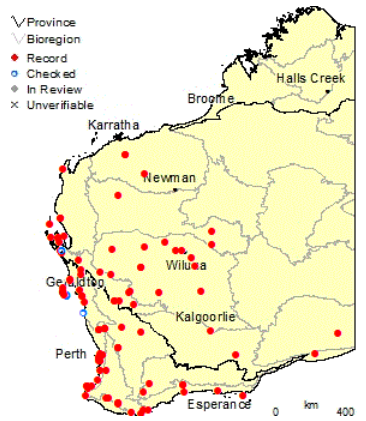
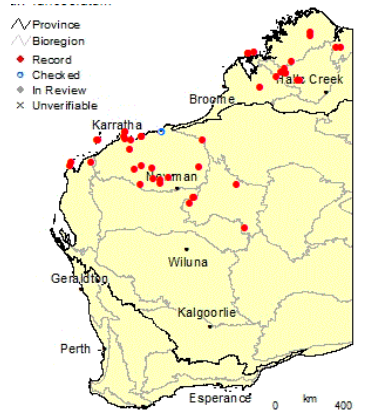
Plate 8: Population of Calytrix sp. occurring on Ningaloo reef deposit rocky hill (360 Environmental Pty Ltd, 2018a).

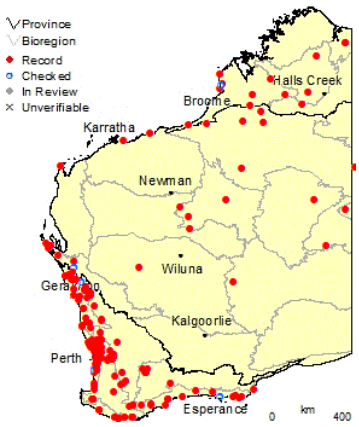
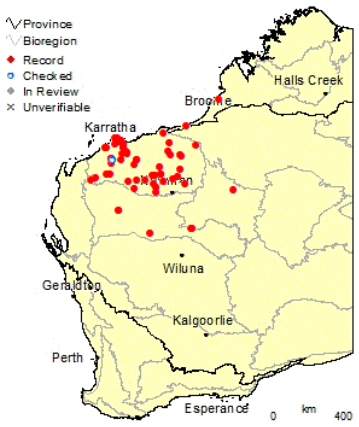
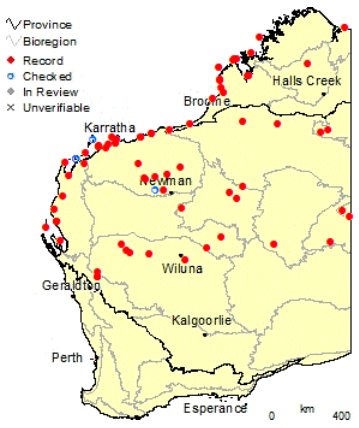
Other flora of interest

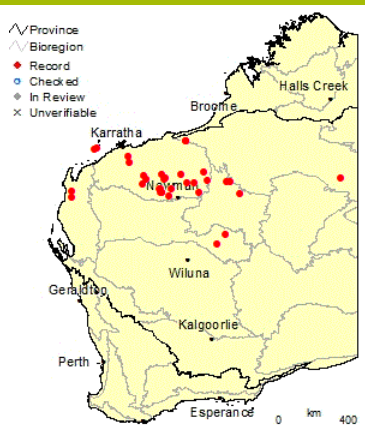
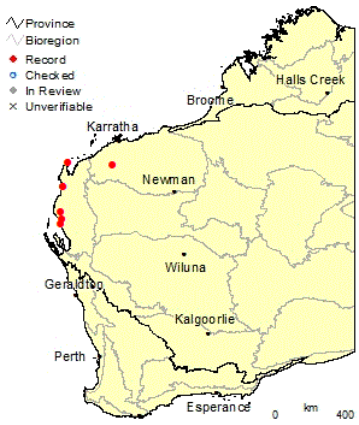
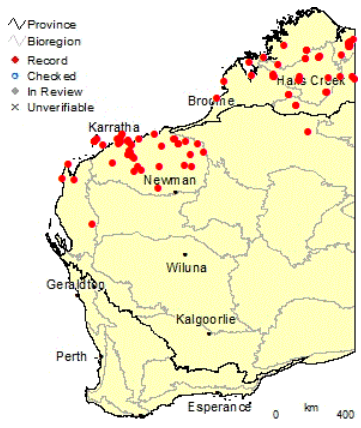
Although there are records in the Eremaean bioregion, 13 species recorded within the Survey Area were considered to occur as an extension of their usual range (Department

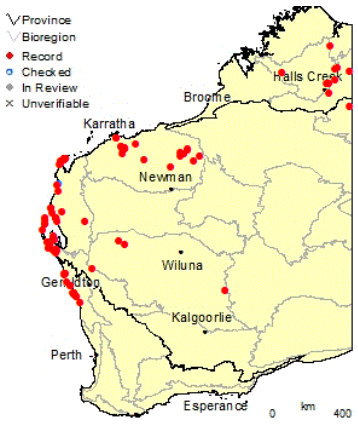
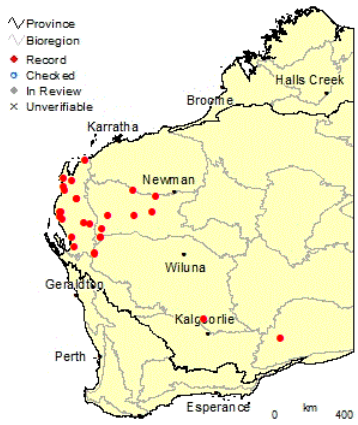
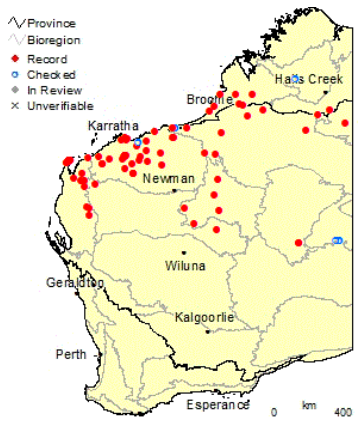
of Biodiversity Conservation and Attractions, 2017b) (Table 5). Specimens collected in the field of these species have been submitted to the WA Herbarium.

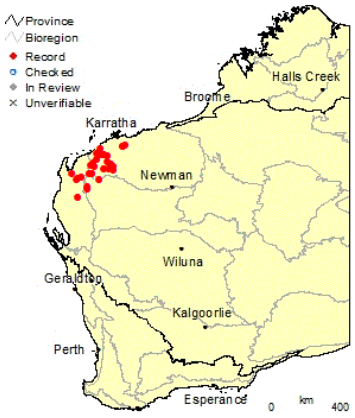
Table 5: Range Extensions of Species Recorded within the Survey Area

SPECIES	USUAL RANGE
Calandrinia ? polyandra	
*Chenopodium murale**	
Clerodendrum tomentosum var. *lanceolatum*	

SPECIES	USUAL RANGE
Corynotheca micrantha	
Cucumis variabilis	
Cyperus bulbosus	

SPECIES	USUAL RANGE
Hibiscus sturtii var. *platychlamys*	
Indigofera chamaeclada subsp. *pubens*	
Indigofera trita	

SPECIES	USUAL RANGE
Lotus australis	
Maireana lanosa	
Pimelea ammocharis	

SPECIES	USUAL RANGE
Tephrosia uniovulata	

4.3.4 Introduced Flora

A total of eight introduced species were recorded within the Survey Area, representing approximately 6% of the total taxa. None of these are listed as Declared Pests (Department of Primary Industries and Regional Development, 2018) or WoNS under the BAM Act (Table 6).

Table 6: Introduced Flora Recorded in the Survey Area

TAXA	COMMON NAME
Aerva javanica	Kapok Bush
Bidens subalternans var. *simulans*	n/a
Cenchrus ciliaris	Buffel Grass
Chenopodium murale	Nettle-leaf Goosefoot
Solanum nigrum	Black Berry Nightshade
Sonchus oleraceus	Common Sowthistle
Sisymbrium orientale	Indian Hedge Mustard
Vachellia farnesiana	Mimosa Bush

Kapok (**Aerva javanica*) was introduced to assist with the revegetation of degraded rangelands. It is now widespread in many types of vegetation from Carnarvon to the Kimberley. Buffel grass (**Cenchrus ciliaris*) is a widespread weed, widely planted in pastoral regions as a pasture grass; it has become common along roadsides, creeklines, river edges and most vegetation types from Shark Bay to the Pilbara and adjacent desert. Mimosa bush (**Vachellia farnesiana*) is also a widespread weed of roadsides, creeks, rivers and disturbed flood plains, from the Kimberley to Carnarvon and occasionally further south (Hussey *et al.*, 2007).

4.3.5 Vegetation Types

Ten natural Vegetation Types were mapped for the Survey Area (Table 7, Figures 12a - 12b). The site sheets, which present the data collected from each quadrat, is presented in Appendix I.

Table 7: Vegetation Type Descriptions and Extent in the Survey Area.

Landform	Vegetation Type Code	Broad Floristic Community	Description	Sites within the Project Envelope	Sites outside the Project Envelope	Area (ha)	Area (%)
Plain	AgTe	*Acacia* shrubland	*Acacia gregorii* low open shrubland over *Triodia epactia* closed grassland	Q1, Q2, Q5, Q22 QE26, QE29	PCS02	210	37.9
Plain	AcAt	*Acacia* shrubland	*Acacia coriacea* subsp. *coriacea* and *Acacia tetragonophylla* open shrubland over *Triodia epactia* hummock grassland	Q3, Q21 PCS16	PCS07	21	3.8
Plain	AsTe	*Acacia* shrubland	*Acacia sclerosperma* subsp. *sclerosperma* shrubland over *Triodia epactia* hummock grassland	Q4, Q19 PCS17	PCS08	43	7.8
Plain	AbAc	*Acacia* shrubland	*Acacia bivenosa* and *Acacia coriacea* subsp. *coriacea* open shrubland over *Spinifex longifolius* and *Triodia epactia* open grassland	Q13, Q14 PCS05	PCS03, PCS04	4	0.72
Plain	AbTe	*Acacia* shrubland	*Acacia bivenosa* open shrubland over *Triodia epactia* hummock grassland	Q12, Q15, Q17	PCS15	85	15.3
Plain	McTe	*Melaleuca* shrubland	*Melaleuca cardiophylla* low shrubland over *Triodia epactia* hummock grassland	Q7, Q18 QE31	PCS06	19	3.4
Plain	SoTe	*Stemodia* shrubland	*Stemodia* sp. Onslow low open shrubland over *Triodia epactia* hummock grassland	Q8, Q16 PCS14	PCS12	6	1.1
Saline flat	Tspp.Fp	*Tecticornia* shrubland	*Tecticornia* spp. and *Frankenia pauciflora* low shrubland on saline flat	Q10, Q11 PCS13	PCS09	14	2.5
Dune crest	AsSs	*Acacia* shrubland	*Acacia stellaticeps* and *Scaevola sericophylla* low open shrubland over *Triodia epactia* open grassland	Q6, Q9 QE27, QE28, QE30	PCS01	123	22.2
Drainage line	AcCl	*Cullen* and *Acacia* shrubland	*Acacia coriacea* subsp. *coriacea* and *Cullen lachnostachys* shrubland over *Sida rohlenae* subsp. *rohlenae* low shrubland over *Triodia epactia*	Q20 QE25 PCS10	PCS11	7	1.3
Beach area		Coastal area, Rocky and sandy beach only, no vegetation		n/a	n/a	14.1	2.5
Completely Degraded		Area cleared of vegetation		n/a	n/a	8	1.4
					Total	**554**	**100**

4.3.6 Site Similarity

A total of 46 quadrats were surveyed, with 35 of those being completed within the Project Envelope and 11 outside of the Project Envelope. This was to demonstrate that the vegetation types which were mapped within the Survey Area, also exist outside of the Survey Area for regional context.

Statistical analysis of the data identified floristically similar quadrats of up to 90% similarity between some individual quadrats (Table 8; Appendix E). These groupings helped confirm field identification of vegetation types, and the similarity between quadrats within and outside of the Project Envelope. However, due to the mosaic nature of the landscape, there was a lot of overlap of species throughout quadrats. Qualitative assessment of the resemblance percentages determined the following similarity percentages per vegetation type.

These statistically similar grouping of quadrats aligned with the vegetation types mapped within and outside of the Survey Area.

Table 8: Percentage Similarity of Sites within the Survey Area

Vegetation Type	Sites inside the Survey Envelope	Sites outside the Survey Envelope	Site SIMILARITY (%)
AgTe	Q1, Q2, Q5, Q22, QE26, QE29	PCS02	Approx. 71
AcAt	Q3, Q21, PCS16	PCS07	Approx. 61
AsTe	Q4, Q19, PCS17	PCS08	Approx. 55
AbAc	Q13, Q14, PCS05	PCS03, PCS04	Approx. 90
AbTe	Q12, Q15, Q17	PCS15	Approx. 57
McTe	Q7, Q18, QE31	PCS06	Approx. 60
SoTe	Q8, Q16, PCS14	PCS12	Approx. 63
Tspp.Fp	Q10, Q11, PCS13	PCS09	Approx. 50
AsSs	Q6, Q9, QE27, QE28, QE30	PCS01	Approx. 53
AcCl	Q20, QE25, PCS10	PCS11	Approx. 72

4.3.7 Conservation Significance of Vegetation

The results from the DBCA Threatened and Priority Ecological Community Database did not identify any TECs or PECs occurring within a 50 km radius of the Survey Area.

Based on a combination of the database searches, desktop study and comparison of vegetation present in the Survey Area with descriptions of known TECs and PECs of the

Pilbara Region (DBCA region boundaries) none of the vegetation types recorded during the survey are considered to represent a TEC or PEC.

All Vegetation Types mapped within the Survey Area are considered typical of what is expected in the Carnarvon bioregion (Keighery and Gibson, 1993).

4.3.8 Vegetation Condition

Vegetation condition ranged from Very Good to Completely Degraded. The majority of the Survey Area is considered to be in Very Good condition. Vegetation condition mapping is presented in (Figures 13a - 13b) and a summary of vegetation condition extent within the Survey Area is outlined in Table 9.

Disturbance within the Survey Area consisted of grazing pressures associated with the area being a sheep pastural lease, litter, vehicle tracks and weeds.

Table 9: Vegetation Condition Extent in the Survey Area

VEGETATION CONDITION	EXTENT IN SURVEY AREA (HA)	PROPORTION IN SURVEY AREA (%)
Very Good	455	83
Good	59	11
Poor	6	1.2
Degraded	12	2.2
Completed Degraded	8	1.5
Total	**540**	**100**

5 Discussion

5.1 Flora

5.1.1 Flora Overview

The floristic diversity data was gathered over three field surveys, which were completed in different seasons. The Survey Area was adequately surveyed and the flora within the Survey Area was considered to be typical for the Carnarvon bioregion.

A total of 127 flora species (including species, subspecies, varieties and forms) from 88 genera and 33 families were recorded within the Survey Area.

5.1.2 Likelihood of Occurrence Assessment

The post-survey likelihood of occurrence assessment found that no species had a high or medium likelihood of occurrence within the Survey Area, with exception of *Corchorus congener* which was recorded extensively within and surrounding the Survey Area.

5.1.3 Flora of Interest

One potentially new species, *Calytrix* sp., was recorded outside of the Project Envelope. Specimens of this species have been vouchered at the WA Herbarium for further study and are likely to receive a phrase name and Priority status in the future. This species was found to occur on a rocky hill top near the northern end of the Survey Area (outside of the Project Envelope). Additional targeted searches were undertaken to locate more populations of the species; however, none were found. It can therefore be concluded that *Calytrix* sp. does not occur in the Project Envelope.

A total of 13 species were considered to be an extension of their known range. This is likely to be attributed to the lack of surveys that have been undertaken in the region and consequently there is limited information available on the distribution of flora species. At this time, they are considered to be a range extension and the specimens have been vouchered at the WA Herbarium.

5.1.4 Priority Flora

One Priority flora species, *Corchorus congener* (P3) was recorded as occurring commonly within the wider Survey Area during the May 2017, September 2017 and August 2018 field surveys. Populations were also recorded outside of the Survey Area during the August 2018 field survey.

Corchorus carnarvonensis (which is not a threatened or Priority species) is also known to occur in the Exmouth Region. This species is very similar to *C. congener*, however, the distinguishing feature between species is the difference of the hairs on the fruits (F. Obbens, personal communication August 2018). *C. congener* has been identified

previously from numerous collections during the Learmonth Facility, Detailed Flora and Vegetation Assessment (360 Environmental Pty Ltd, 2017). During the 2018 survey, the specimens were in flower and had no fruit, therefore they were identified by the taxonomist as *Corchorus ?congener* as the lack of fruit meant the specimens could not be definitely identified as either *C. congener* or *C. carnarvonensis*. When historical data was evaluated, however, the specimens are more likely to be *C. congener*, based on the below:

- *C. carnarvonensis* has only ever been recorded once within Exmouth at Shothole canyon (Department of Biodiversity Conservation and Attractions, 2017b) which is approximately 24 km north of the Survey Area; and
- *C. congener* has been previously identified within the Survey Area from multiple locations and collections, which have been vouchered at the WA Herbarium (360 Environmental Pty Ltd, 2017).

5.1.5 Weeds

No Declared species or WoNS were recorded within the Survey Area, and weed diversity was considered low, with only eight weed species recorded. **Cenchrus ciliaris* was abundant across the Survey Area, especially within the drainage line and along tracks.

5.2 Vegetation

5.2.1 Vegetation Types

The results from the DBCA Threatened and Priority Ecological Community Database did not identify any TECs or PECs as occurring within a 50 km radius of the Survey Area.

Ten Vegetation Types were described for the Survey Area, none of which are considered to represent any TEC's or PECs. A total of 46 quadrats were completed over the three field surveys, with 35 being completed within the Survey Area, and 11 quadrats completed outside of the Survey Area to gather contextual data.

The off-envelope quadrats have shown high similarity with vegetation types within the Project Envelope. This demonstrates that the vegetation types within the Survey Area are not exclusive to the Project Envelope and are represented in the surrounding area.

5.2.2 Vegetation Condition

The majority of the vegetation condition within the Survey Area was considered to be in Very Good condition (83%). The Survey Area is situated within a sheep pastoral station, and therefore disturbance within the Survey Area consisted of grazing by sheep but also included high densities of **C. ciliaris* in some areas, vehicle tracks on vegetation and some litter. **C. ciliaris* is present as a dominant understory in some areas of the Survey Area and has been widely planted in pastoral regions as pasture grass. This weed has

become a widespread throughout roadsides, creek lines, river edges and most vegetation types from Geraldton to the Pilbara region. It generates higher fuel loads, is more flammable and increases frequency of fires (Hussey *et al.*, 2007).

5.3 ESAs

ESAs are declared to prevent degradation of important environmental values such as Threatened flora, TECs or significant wetlands. Exemptions contained in the *Environmental Protection (Clearing of Native vegetation) Regulations 2004* for low impact land clearing do not apply in ESAs and a clearing permit is required. An ESA is mapped as occurring in the northern section of the Survey Area, however, this ESA is not related to the values of the flora and vegetation in the Survey Area, and instead part of the underground aquifer, Cape Range Subterranean Waterways system which has been identified in the *Directory of Important Wetlands in Australia* (Australian Government, 2010b).

5.4 Regional Representation

To encompass current recognised levels of remnant native vegetation retention, the EPA uses a standard level of native vegetation retention of at least 30% of the pre-clearing extent of the ecological communities. These levels have been most recently recognised in the *National Objectives and Targets for Biodiversity Conservation 2001-2005*, which recognised that the retention of 30%, or more, of the pre-clearing extent of each ecological community is necessary if Australia's biological diversity is to be protected (Department of the Environment and Heritage, 2001).

The two Pre-European vegetation types occupying the Survey Area in Cape Range 117 and Coastal Dunes 662 have 96.36% and 99% remaining State-wide and 87.80% and 99.6% remaining at a bioregional level respectively (Government of Western Australia, 2018b). This is above the 30% threshold set by the EPA and neither would the clearing of the vegetation within the Survey Area result in it falling below this threshold.

6 Limitations

This report is produced strictly in accordance with the scope of services set out in the contract or otherwise agreed in accordance with the contract. 360 Environmental makes no representations or warranties in relation to the nature and quality of soil and water other than the visual observation and analytical data in this report.

In the preparation of this report, 360 Environmental has relied upon documents, information, data and analyses ("client's information") provided by the client and other individuals and entities. In most cases where client's information has been relied upon, such reliance has been indicated in this report. Unless expressly set out in this report, 360 Environmental has not verified that the client's information is accurate, exhaustive or current and the validity and accuracy of any aspect of the report including, or based upon, any part of the client's information is contingent upon the accuracy, exhaustiveness and currency of the client's information. 360 Environmental shall not be liable to the client or any other person in connection with any invalid or inaccurate aspect of this report where that invalidity or inaccuracy arose because the client's information was not accurate, exhaustive and current or arose because of any information or condition that was concealed, withheld, misrepresented, or otherwise not fully disclosed or available to 360 Environmental.

Aspects of this report, including the opinions, conclusions and recommendations it contains, are based on the results of the investigation, sampling and testing set out in the contract and otherwise in accordance with normal practices and standards. The investigation, sampling and testing are designed to produce results that represent a reasonable interpretation of the general conditions of the site that is the subject of this report. However, due to the characteristics of the site, including natural variations in site conditions, the results of the investigation, sampling and testing may not accurately represent the actual state of the whole site at all points.

It is important to recognise that site conditions, including the extent and concentration of contaminants, can change with time. This is particularly relevant if this report, including the data, opinions, conclusions and recommendations it contains, are to be used a considerable time after it was prepared. In these circumstances, further investigation of the site may be necessary.

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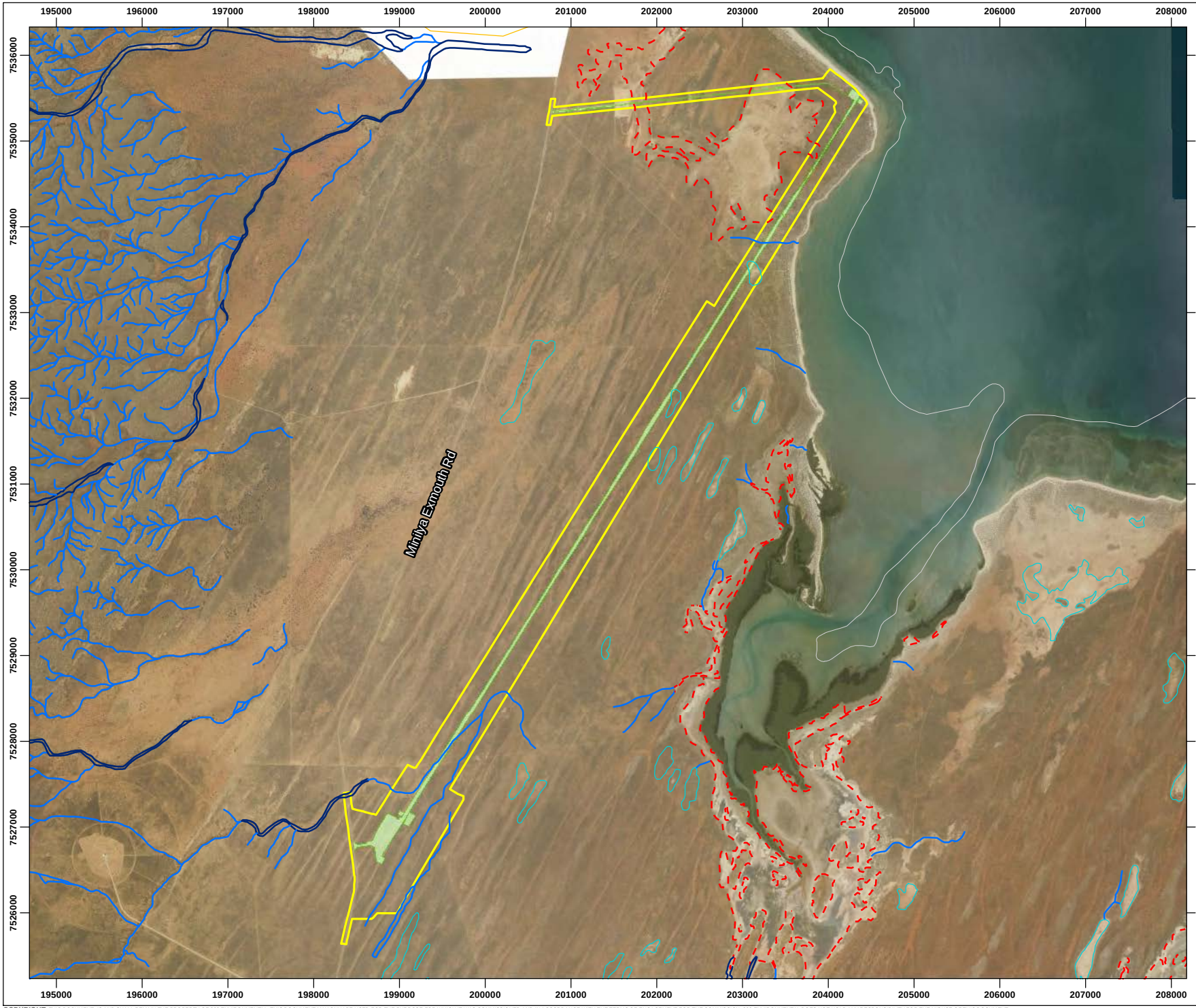
FIGURES



Legend

- Detailed Flora Survey Area
- Targeted Flora Survey Area

Hydrography

- Watercourse Bank
- Watercourse - minor
- Levee Bank
- Swamp
- Area Subject to Inundation
- Tidal Flat

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- LOCALITY MAP SOURCED LANDGATE 2017
- HYDROGRPAHY SOURCED DWER 2018
- CADASTRE SOURCED LANDGATE 2018
- AERIAL PHOTOGRAPHY SOURCED LANDGATE 2018
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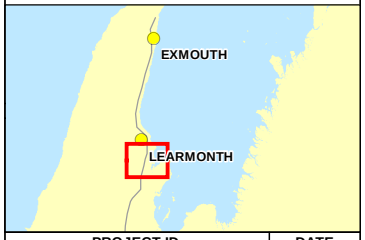

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Detailed Flora and Vegetation Survey

Figure 5
Surface Hydrology

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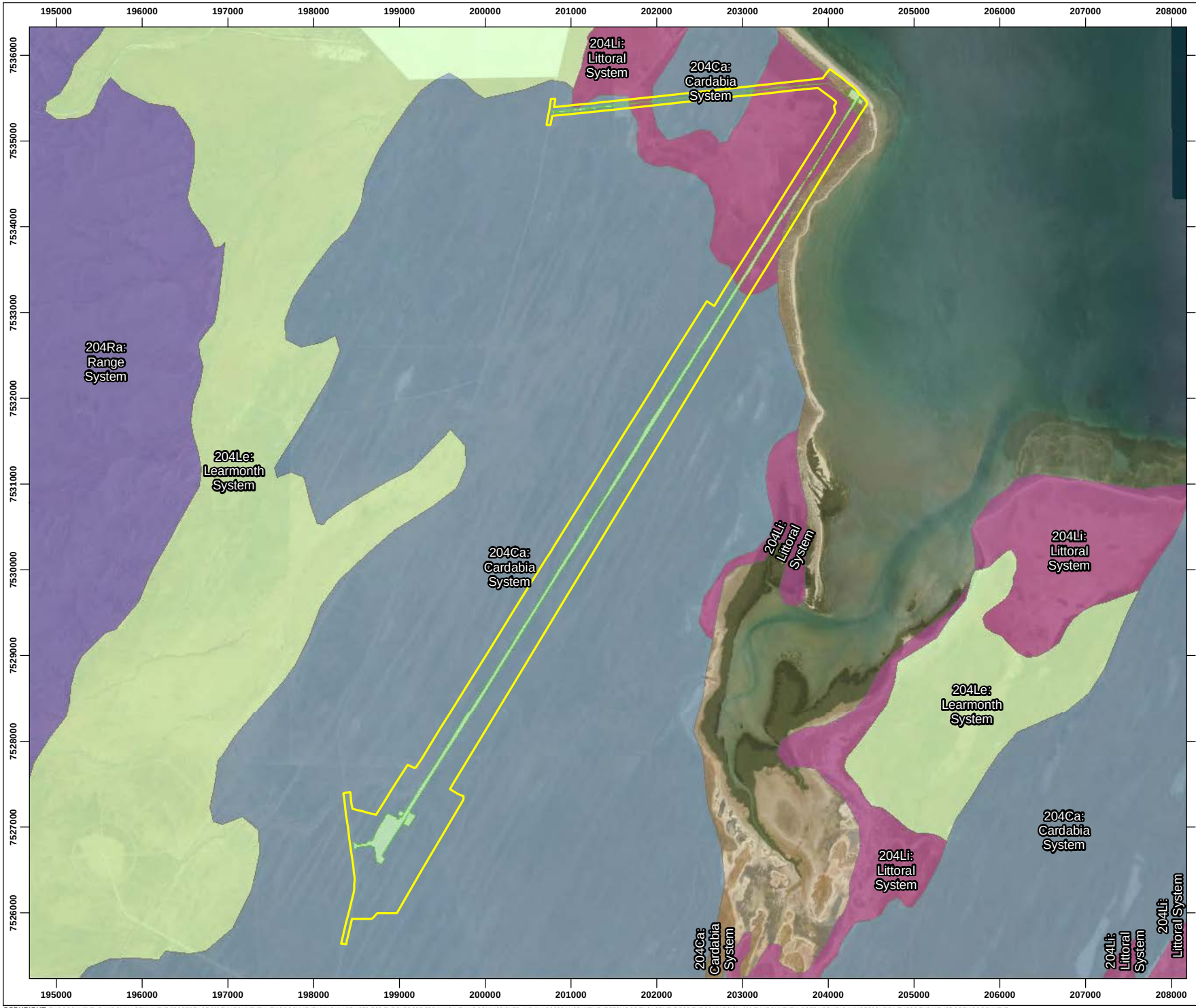

Legend

Detailed Flora Survey Area

Targeted Flora Survey Area

Soil Land System

204Ca: Undulating sandy plains with linear dunes, minor limestone plains and low rises, supporting mainly soft spinifex hummock grasslands with scattered acacias and other shrubs.

204Le: Sandy outwash plains marginal to the Cape Range, supporting mainly soft spinifex hummock grasslands with scattered acacia shrubs.

204Li: Bare coastal mudflats (unvegetated), samphire flats, sandy islands, coastal dunes and beaches, supporting samphire low shrublands, sparse acacia shrublands and mangrove forests.

204Ra: Dissected limestone plateaux, hills and ridges with gorges and steep stony slopes supporting hard spinifex, sparse shrubs and eucalypts.

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- LOCALITY MAP SOURCED LANDGATE 2017
- LANDSYSTEM SOURCED DAFWA 2018
- CADASTRE SOURCED LANDGATE 2018
- AERIAL PHOTOGRAPHY SOURCED LANDGATE 2018
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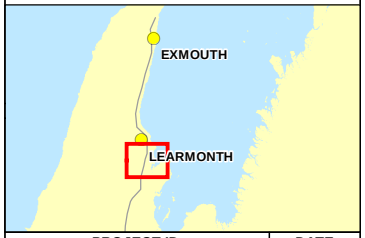

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Detailed Flora and Vegetation Survey

Figure 6
Land Systems

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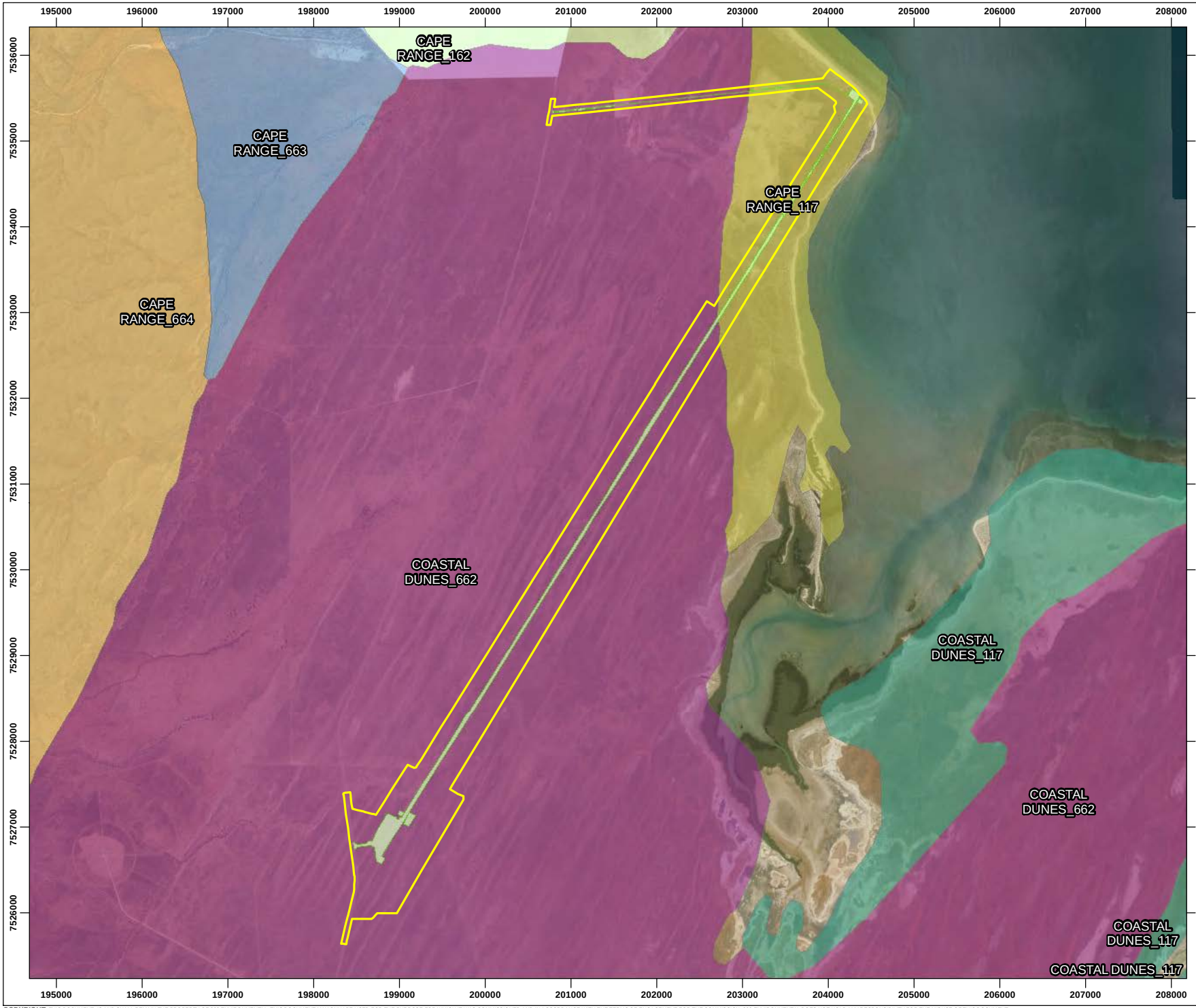

Legend

- Detailed Flora Survey Area
- Targeted Flora Survey Area

Pre-European Vegetation

- CAPE RANGE_117
- CAPE RANGE_162
- CAPE RANGE_663
- CAPE RANGE_664
- COASTAL DUNES_117
- COASTAL DUNES_662

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- LOCALITY MAP SOURCED LANDGATE 2017
- VEGETATION SOURCED DBCA 2018
- CADASTRE SOURCED LANDGATE 2018
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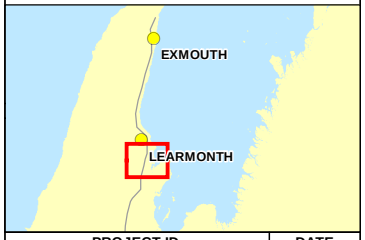

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Detailed Flora and Vegetation Survey

Figure 7
Pre-European Vegetation

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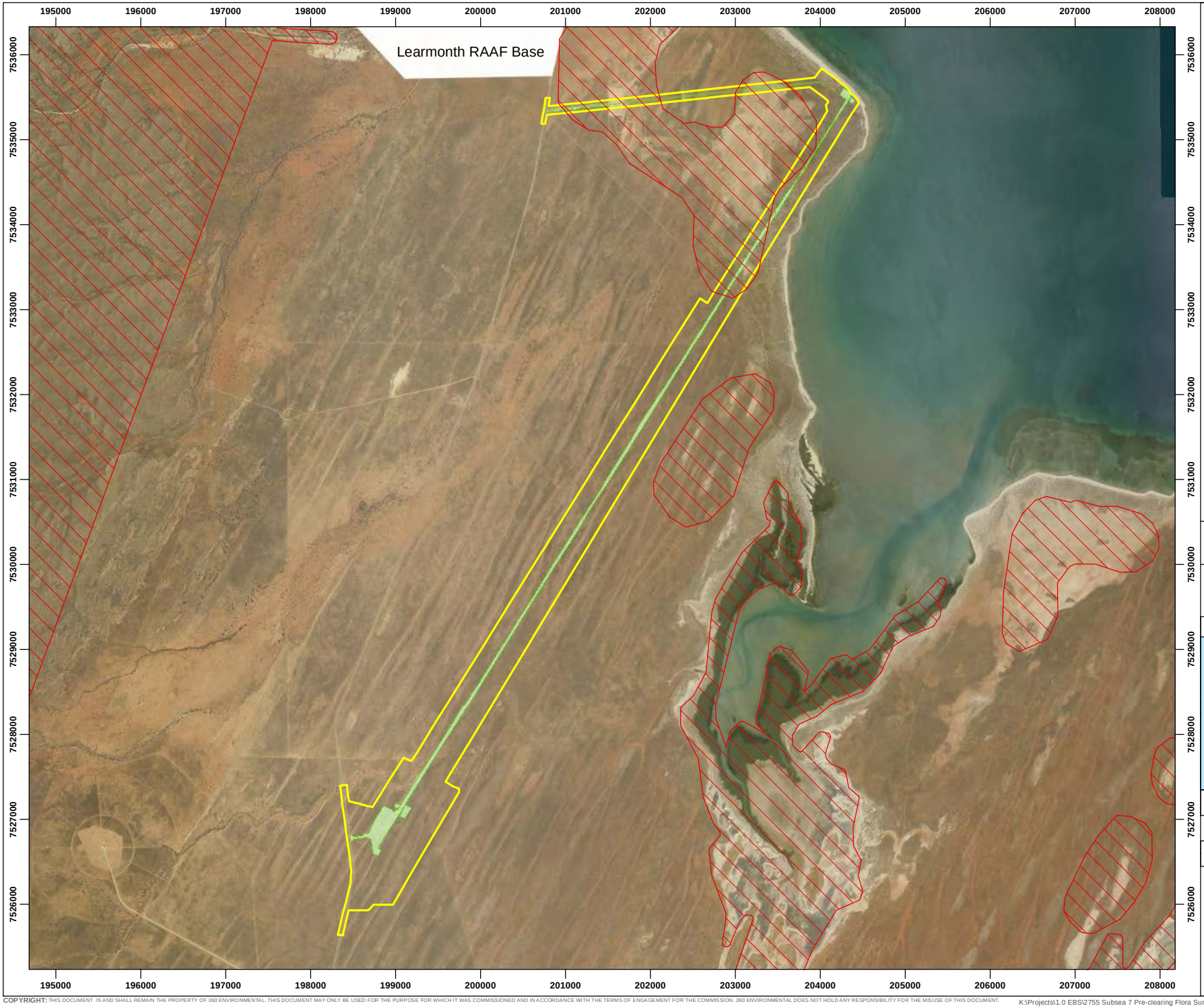

Legend

- Detailed Flora Survey Area
- Targeted Flora Survey Area
- Environmentally Sensitive Areas

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- LOCALITY MAP SOURCED LANDGATE 2017
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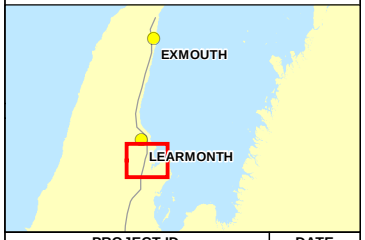

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Detailed Flora and Vegetation Survey

Figure 8
Environmentally Sensitive Areas

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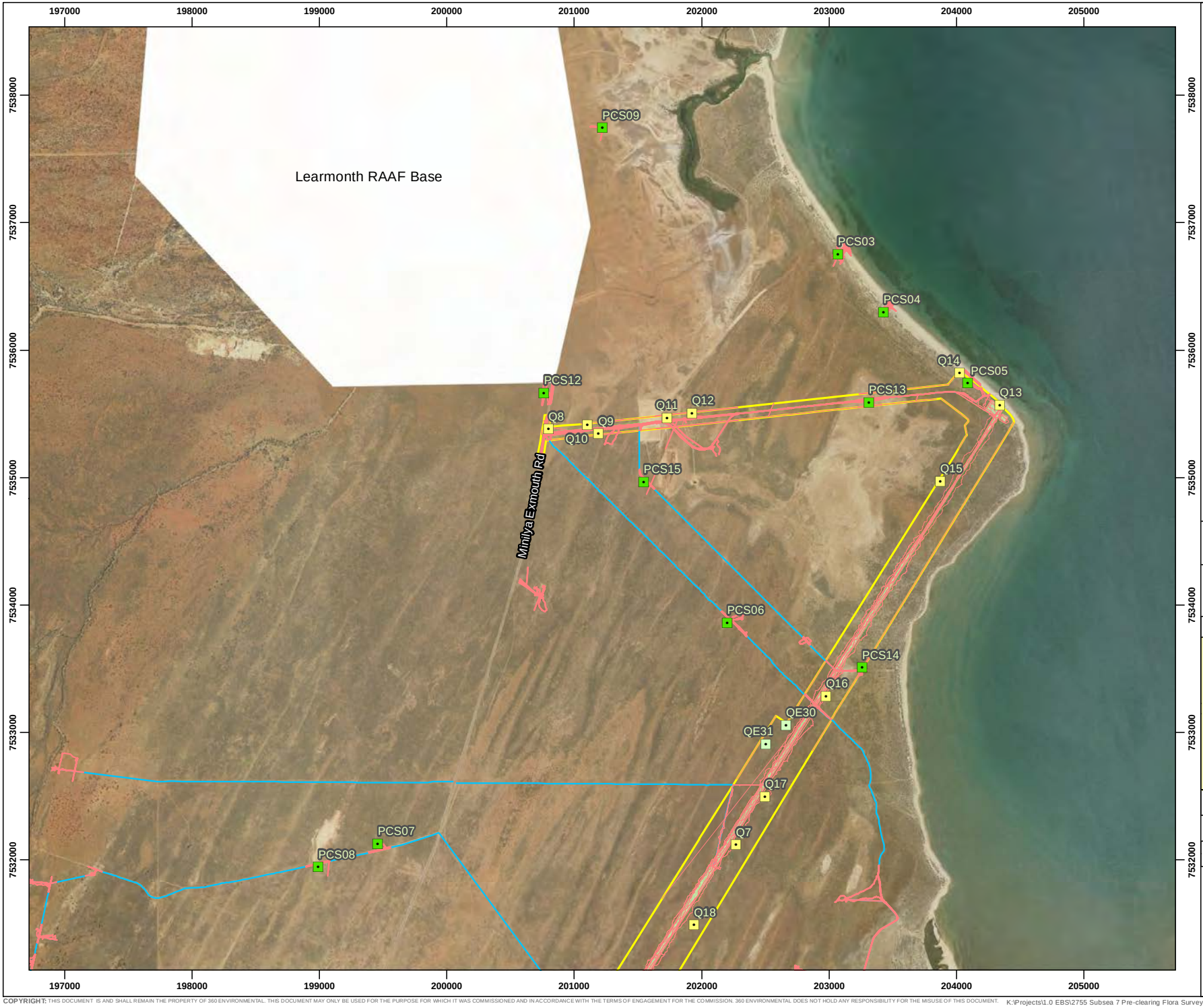

Legend

- Quadrat Locations - Aug. 2018
- Quadrat Locations - Sep. 2017
- Quadrat Locations - May 2017
- GPS Tracks from Targeted Survey
- Priority Flora Search Area
- Detailed Flora Survey Area
- Targeted Flora Survey Area

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
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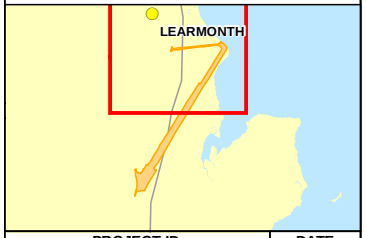

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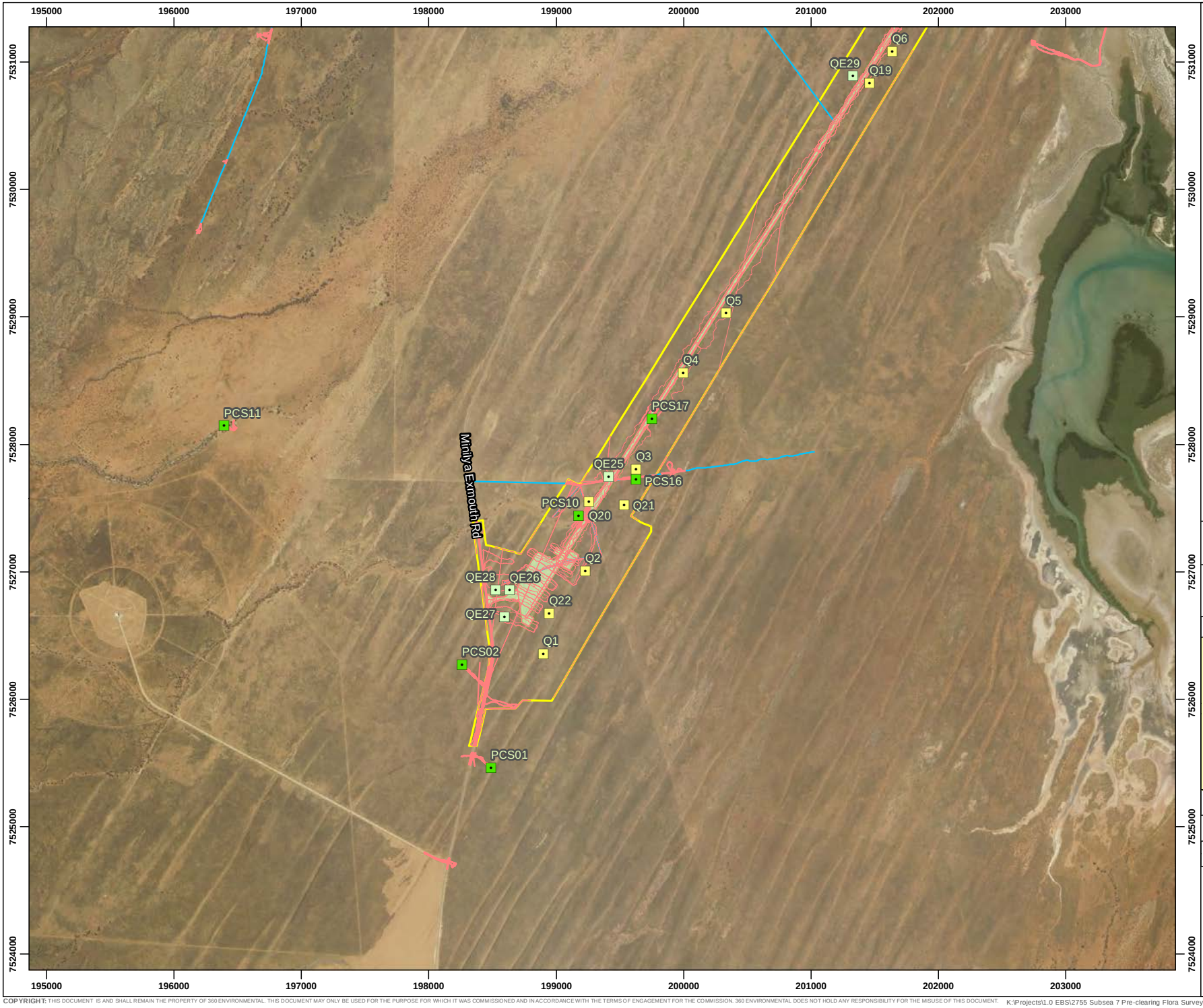
Detailed Flora and Vegetation Survey

Figure 9a Quadrat Locations and Survey Effort

K:\Projects\1.0 EBS\2755 Subsea 7 Pre-clearing Flora Survey\2755 Detailed Flora Survey - F8 Quadrat Locations and Survey Effort.mxd



Legend

- Quadrat Locations - Aug. 2018
- Quadrat Locations - Sep. 2017
- Quadrat Locations - May 2017
- GPS Tracks from Targeted Survey
- Priority Flora Search Area
- Detailed Flora Survey Area
- Targeted Flora Survey Area

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- LOCALITY MAP SOURCED LANDGATE 2017
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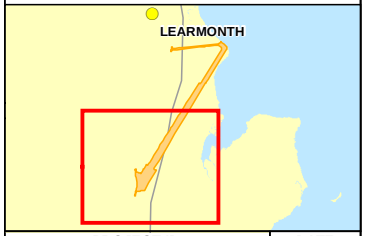

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Detailed Flora and Vegetation Survey

Figure 9b Quadrat Locations and Survey Effort

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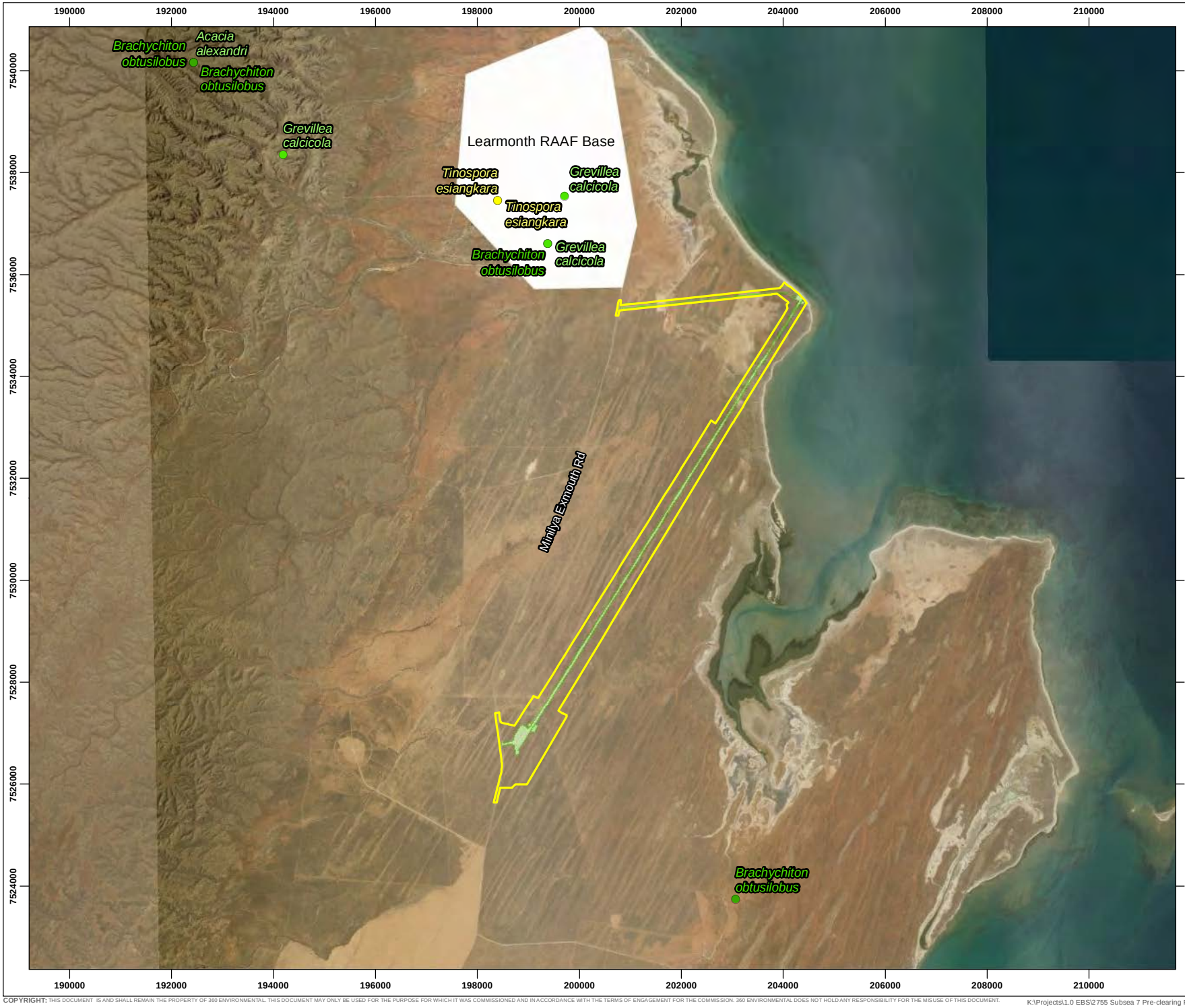

Legend

- Detailed Flora Survey Area
- Targeted Flora Survey Area

Rare and Priority Flora

- Priority 1
- Priority 2
- Priority 3
- Priority 4

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- LOCALITY MAP SOURCED LANDGATE 2017
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- FLORA DATA SOURCED DBCA 2017
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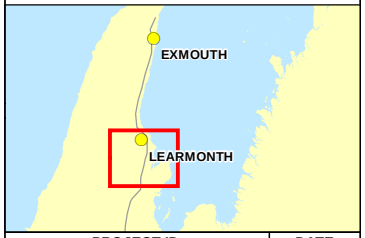

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Subsea 7

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Detailed Flora and Vegetation Survey

Figure 10
DBCA Priority Flora Locations

Legend

- *Calytrix sp.* Location
- *Corchorus congener* (P3) Targeted Survey Record
- Detailed Flora Survey Area
- Priority Flora Search Area (Pre-Clearing Survey Area)
- Location of *Corchorus congener* Population

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
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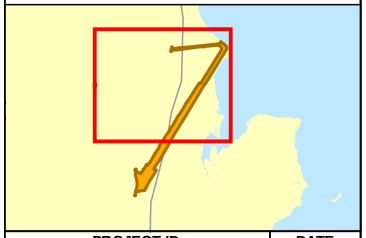

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GDA 1994 MGA Zone 50

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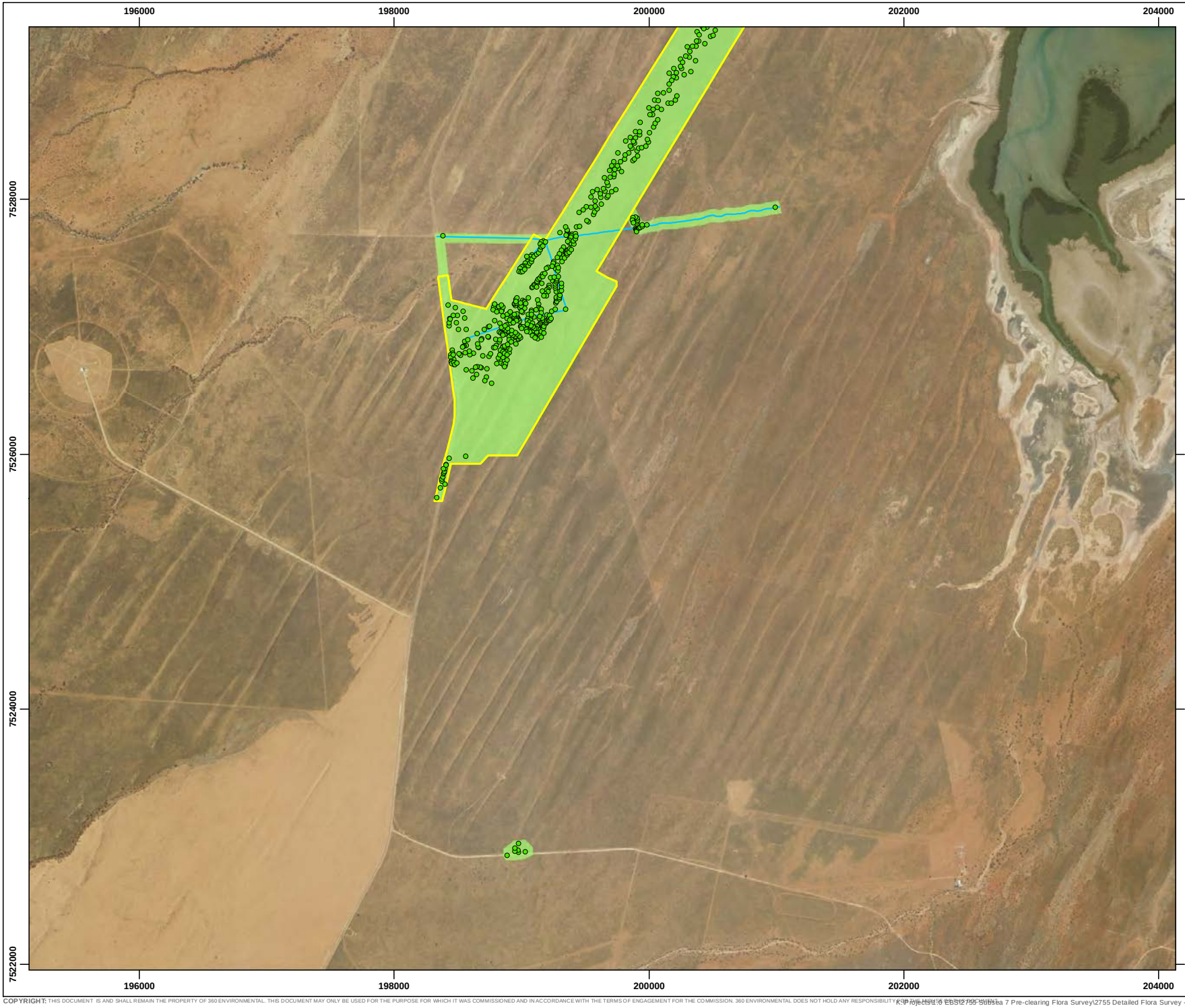
SL	SF	SW	0

Subsea 7

Learmonth Fabrication Facility

Detailed Flora and Vegetation Survey

Figure 11a *Corchorus congener* and *Calytrix* sp. Locations



Legend

- *Corchorus congener* (P3) Targeted Survey Record
- Detailed Flora Survey Area
- Priority Flora Search Area (Pre-clearing Survey Area)
- Location of *Corchorus congener* Population

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
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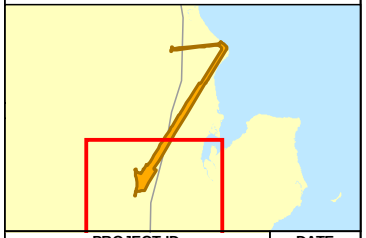

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Detailed Flora and Vegetation Survey

Figure 11b *Corchorus congener* Locations

K:\Projects\2755 Subsea 7 Pre-clearing Flora Survey\2755 Detailed Flora Survey - F10 Corchorus congener and Calytrix sp. Locations within the Survey Area.mxd

Legend

- Detailed Flora Survey Area

Vegetation Types

- AgTe: *Acacia gregorii* low open shrubland over *Trioida epactia* closed grassland
- AsTe: *Acacia sclerosperma subsp. sclerosperma* shrubland over *Triodia epactia* hummock grassland
- AsSs: *Acacia stellaticeps* and *Scaevola sericophylla* open shrubland over *Triodia epactia* hummock grassland
- McTe: *Melaleuca cardiophylla* low shrubland over *Triodia epactia* hummock grassland
- TiFp: *Tecticornia ?indica* and *Frankenia pauciflora* low shrubland on saline flat
- AbTe: *Acacia bivenosa* open shrubland over *Triodia epactia* hummock grassland
- SoTe: *Stemodia sp. Onslow* low open shrubland over *Triodia epactia* hummock grassland
- AbAc: *Acacia bivenosa* and *Acacia coriacea* open shrubland over *Spinifex longifolius* and *Triodia epactia* open grassland
- CD/Track: Completely Degraded/Track

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- LOCALITY MAP SOURCED LANDGATE 2017
- AERIAL PHOTOGRAPHY SOURCED LANDGATE 2018
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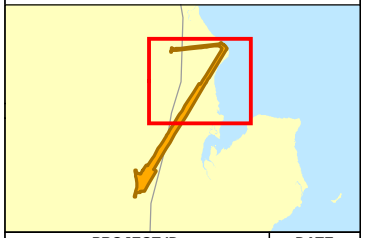
LOCALITY MAP



PROJECT ID	DATE
2755	1/10/2018

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
SL	SF	SW	0

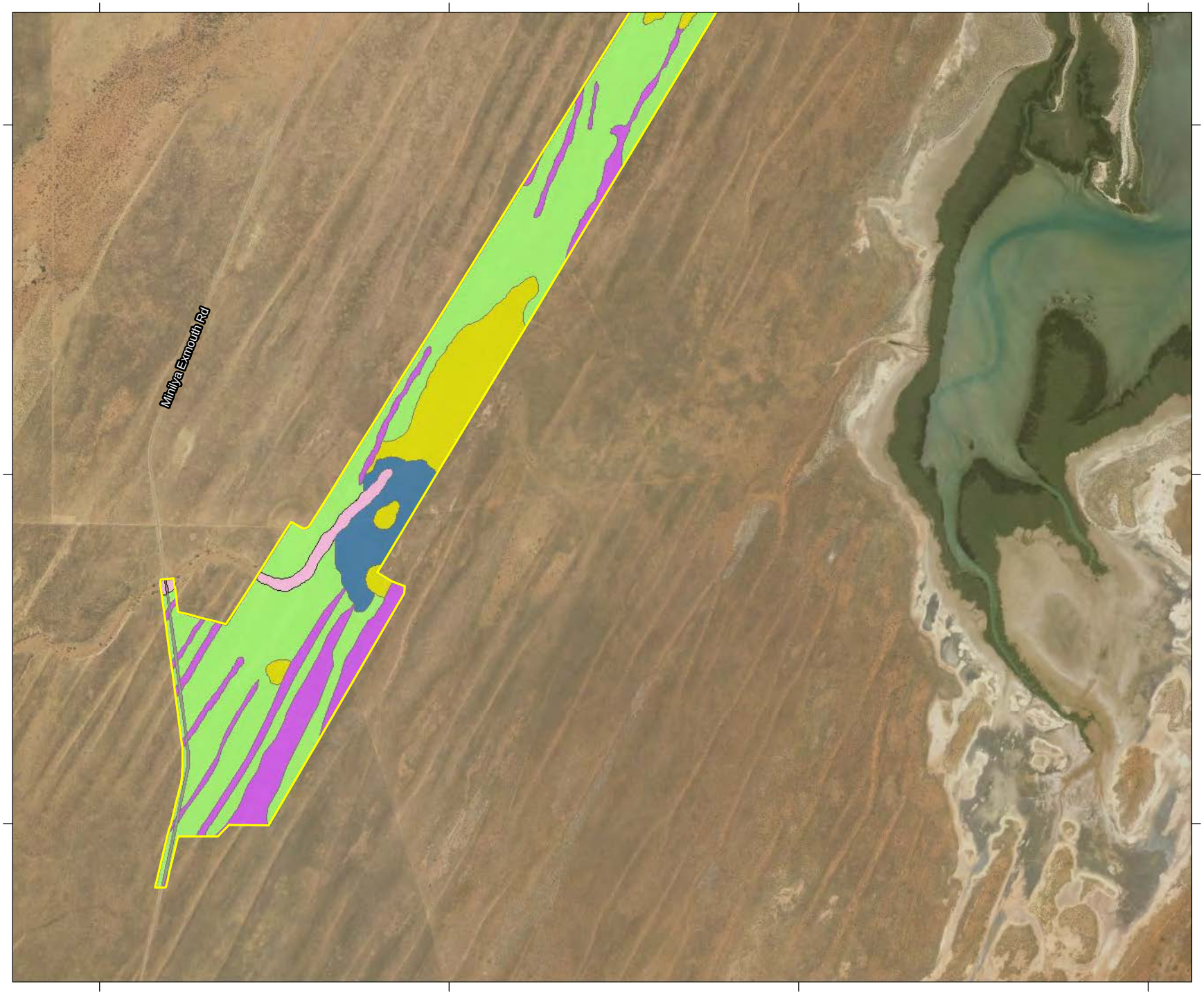
Subsea 7

Learmonth Fabrication Facility

Detailed Flora and Vegetation Survey

Figure 12a
Vegetation Types

K:\Projects\1.0 EBS\2755 Subsea 7 Pre-clearing Flora Survey\2755 Detailed Flora Survey - F11 Vegetation Types.mxd



Legend

Detailed Flora Survey Area

Vegetation Types

- AcCl: Acacia coriaecea and Cullen sp. shrubland over Sida rohlenae subsp. rohlenae low shrubland over Triodia epactia
- AgTe: *Acacia gregorii* low open shrubland over *Trioida epactia* closed grassland
- AcAt: *Acacia coriacea* and *Acacia tetragonophylla* open shrubland over *Triodia epactia* hummock grassland
- AsTe: *Acacia sclerosperma subsp. sclerosperma* shrubland over *Triodia epactia* hummock grassland
- AsSs: *Acacia stellaticeps* and *Scaevola sericophylla* open shrubland over *Triodia epactia* hummock grassland
- CD/Track: Completely Degraded/Track

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- LOCALITY MAP SOURCED LANDGATE 2017
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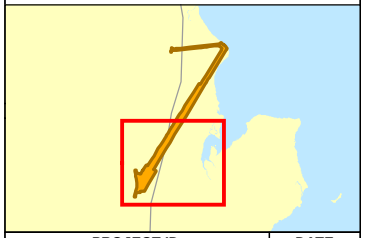
LOCALITY MAP



PROJECT ID	DATE
2755	1/10/2018

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
SL	SF	SW	0

Subsea 7

Learmonth Fabrication Facility

Detailed Flora and vegetation Survey

Figure 12b
Vegetation Types

K:\Projects\1.0 EBS\2755 Subsea 7 Pre-clearing Flora Survey\2755 Detailed Flora Survey - F11 Vegetation Types.mxd

Legend

Detailed Flora Survey Area

Vegetation Condition

- **VG:** Very Good
- **G:** Good
- **P:** Poor
- **D:** Degraded
- **CD:** Completely Degraded

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- LOCALITY MAP SOURCED LANDGATE 2017
- CADASTRE SOURCED LANDGATE 2018
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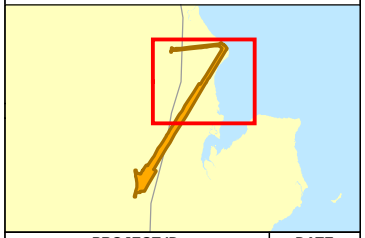
LOCALITY MAP



PROJECT ID	DATE
2755	1/10/2018

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
SL	SF	SW	0

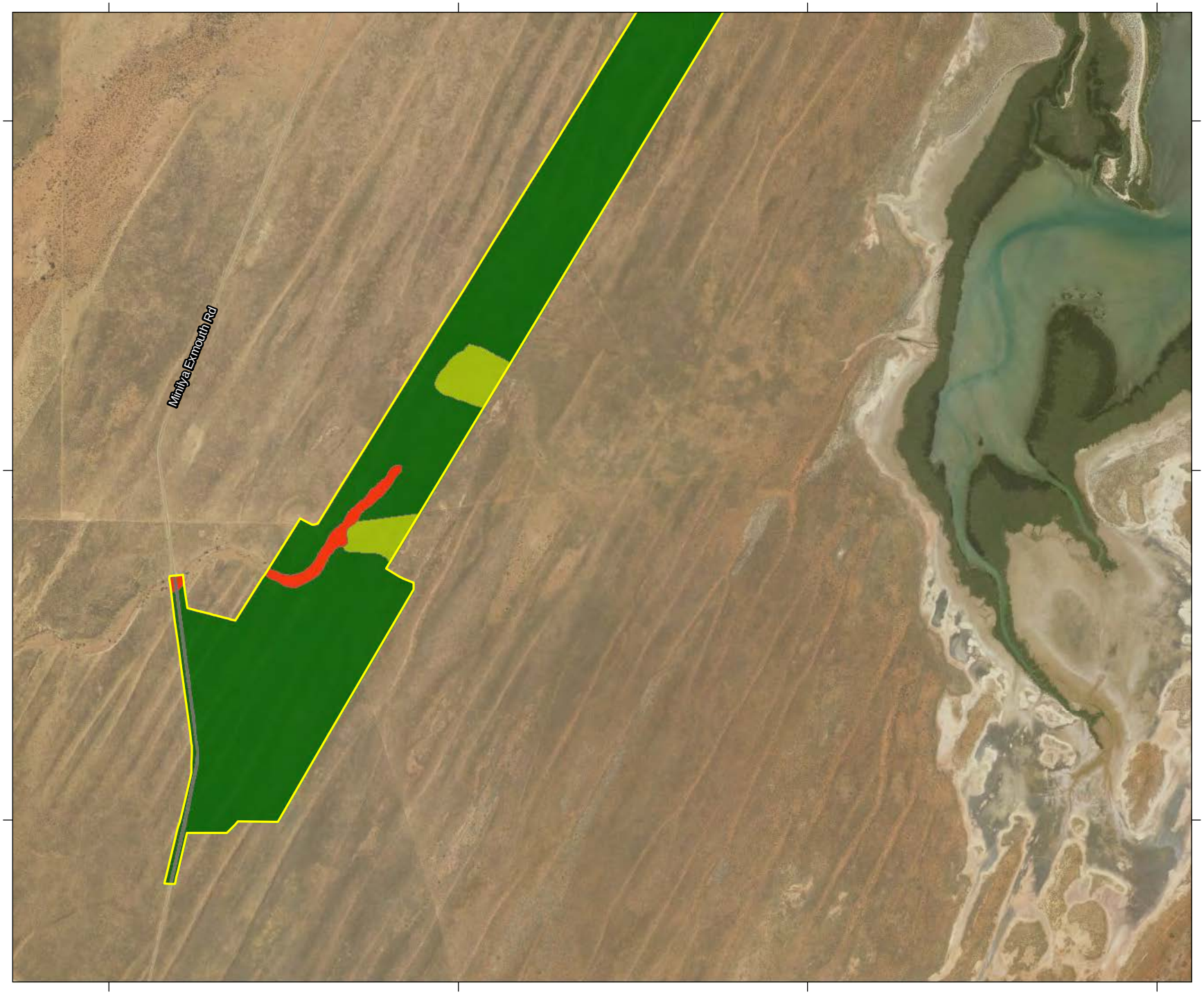
Subsea 7

Learmonth Fabrication Facility

Detailed Flora and Vegetation Survey

Figure 13a
Vegetation Condition

K:\Projects\1.0 EBS\2755 Subsea 7 Pre-clearing Flora Survey\2755 Detailed Flora Survey - F12 Vegetation Condition.mxd



Legend

Detailed Flora Survey Area

Vegetation Condition

- **VG:** Very Good
- **G:** Good
- **D:** Degraded
- **CD:** Completely Degraded

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- LOCALITY MAP SOURCED LANDGATE 2017
- CADASTRE SOURCED LANDGATE 2018
- AERIAL PHOTOGRAPHY SOURCED LANDGATE 2018
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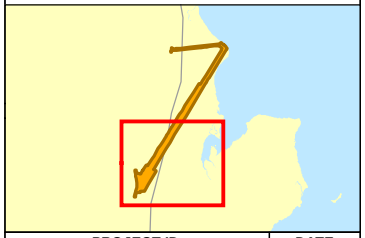
LOCALITY MAP



PROJECT ID	DATE
2755	1/10/2018

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
SL	SF	SW	0

Subsea 7

Learmonth Fabrication Facility

Detailed Flora and Vegetation Survey

Figure 13b
Vegetation Condition

K:\Projects\1.0 EBS\2755 Subsea 7 Pre-clearing Flora Survey\2755 Detailed Flora Survey - F12 Vegetation Condition.mxd

APPENDIX A

Protection of Flora and Vegetation

Table 10: Categories of Threatened Flora Species under the EPBC Act (Department of Environment and Conservation, 2013)

Conservation Code	Description
Ex	**Extinct** Taxa which at a particular time if, at the time, there is no reasonable doubt that the last member of the species has died.
ExW	**Extinct in the Wild** Taxa which is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
CE	**Critically Endangered** Taxa which at a particular time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
E	**Endangered** Taxa which is not critically endangered and it is facing a very high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
V	**Vulnerable** Taxa which is not critically endangered or endangered and is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
CD	**Conservation Dependent** Taxa which at a particular time if, at that time, the species is the focus of a specific conservation program, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within a period of 5 years.

Table 11: Categories of Declared Rare Flora (WC Act) and DBCA Priority Flora Rankings (Department of Biodiversity Conservation and Attractions, 2018b)

Conservation Code	Description
X	**Presumed Extinct Flora (Declared Rare Flora – Extinct)** "Taxa which have been adequately searched for and there is no reasonable doubt that the last individual has died, and have been gazetted as such (Schedule 2 under the *Wildlife Conservation Act 1950*)."
T	**Threatened Flora (Declared Rare Flora – Extant)** "Taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such (Schedule 1 under the *Wildlife Conservation Act 1950*)." "Threatened Flora (Schedule 1) are further ranked by the Department according to their level of threat using IUCN Red List criteria: CR: Critically Endangered – considered to be facing an extremely high risk of extinction in the wild; EN: Endangered – considered to be facing a very high risk of extinction in the wild; VU: Vulnerable – considered to be facing a high risk of extinction in the wild."
P1	**Priority One: Poorly-known taxa** "Taxa which are known from one or a few collections or sight records (generally less than five), all on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, Shire, Westrail and Main Roads WA road, gravel and soil reserves, and active mineral leases and under threat of habitat destruction or degradation. Taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes."
P2	**Priority Two: Poorly-known taxa** "Taxa which are known from one or a few collections or sight records, some of which are on lands not under imminent threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown Land, water reserves, etc. Taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes."

Conservation Code	Description
P3	**Priority Three: Poorly-known taxa** "Taxa which are known from collections or sight records from several localities not under imminent threat, or few but widespread localities with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Taxa may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and known threatening processes exist that could affect them."
P4	**Priority Four: Rare, Near Threatened and other taxa in need of monitoring** a. Rare. "Taxa which 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 taxa are usually represented on conservation lands." b. Near Threatened. "Taxa that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable." c. "Taxa that have been removed from the list of threatened species during the past five years for reasons other than taxonomy."
P5	**Priority Five: Conservation Dependent taxa** "Taxa that are not threatened but are subject to a specific conservation program, the cessation of which would result in the taxon becoming threatened within five years."

Table 12: Definitions of Threatened Ecological Communities as Endorsed by the Western Australian Minister for the Environment (Department of Biodiversity Conservation and Attractions, 2018a)

PRESUMED TOTALLY DESTROYED (PD)
An ecological community will be listed as presumed totally destroyed if there are no recent records of the community being extant and either of the following applies (A or B); A) Records within the last 50 years have not been confirmed despite thorough searches or known or likely habitats or B) All occurrences recorded within the last 50 years have since been destroyed.
CRITICALLY ENDANGERED (CR)
An ecological community will be listed as Critically Endangered when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future. This will be determined on the basis of the best available information, by it meeting any one or more of the following criteria (A, B or C): A) The estimated geographic range, and/or total area occupied, and/or number of discrete occurrences since European settlement have been reduced by at least 90% and either or both of the following apply (i or ii) i) geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is imminent (within approximately 5 years) ii) modification throughout its range is continuing such that in the immediate future (within approximately 5 years) the community is unlikely to be capable of being substantially rehabilitated. B) Current distribution is limited, and one or more of the following apply (i, ii or iii): i) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the immediate future (within approximately 5 years) ii) there are very few occurrences, each of which is small and/or isolated and extremely vulnerable to known threatening processes iii) there may be many occurrences but total area is very small and each occurrence is small and/or isolated and extremely vulnerable to known threatening processes C) The ecological community exists only as highly modified occurrences which may be capable of being rehabilitated if such work begins in the immediate future (within approximately 5 years)

ENDANGERED (EN)
An ecological community will be listed as Endangered when it has been adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future. This will be determined on the basis of the best available information, by it meeting any one or more of the following criteria (A, B or C): A) The estimated geographic range, and/or total area occupied, and/or number of discrete occurrences since European settlement have been reduced by at least 70% and either or both of the following apply (i or ii) i) geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is likely in the short term (within approximately 10 years) ii) modification throughout its range is continuing such that in the short term future (within approximately 10 years) the community is unlikely to be capable of being substantially restored or rehabilitated. B) Current distribution is limited, and one or more of the following apply (i, ii or iii): i) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the short term future (within approximately 10 years) ii) there are very few occurrences, each of which is small and/or isolated and extremely vulnerable to known threatening processes iii) there may be many occurrences but total area is very small and each occurrence is small and/or isolated and extremely vulnerable to known threatening processes C) The ecological community exists only as highly modified occurrences which may be capable of being rehabilitated if such work begins in the short term future (within approximately 10 years).
VULNERABLE (VU)
An ecological community will be listed as Vulnerable when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing a high risk of total destruction in the medium to long term future. This will be determined on the basis of the best available information, by it meeting any one or more of the following criteria (A, B or C): A) The ecological community exists largely as modified occurrences which are likely to be capable of being substantially restored or rehabilitated. B) The ecological community can be modified or destroyed and would be vulnerable to threatening processes, is restricted in area and/or range and/or is only found at a few locations. C) The ecological community may still be widespread but is believed likely to move into a category of higher threat in the medium to long term future because of existing or impending threatening processes.

Table 13. Definitions of Priority Ecological Communities as Listed DPCA (Department of Biodiversity Conservation and Attractions, 2018a)

Possible threatened ecological communities that do not meet survey criteria or that are not adequately defined are added to the Priority Ecological Community Lists under Priorities 1, 2 and 3. These three categories are ranked in order of priority for survey and/or definition of the community, and evaluation of conservation status, so that consideration can be given to their declaration as threatened ecological communities. Ecological Communities that are adequately known, and are rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list, are placed in Priority 4. These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5.

PRIORITY ONE: POORLY KNOWN ECOLOGICAL COMMUNITIES
Ecological communities with apparently few, small occurrences, all or most not actively managed for conservation (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) and for which current threats exist. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.
PRIORITY TWO: POORLY KNOWN ECOLOGICAL COMMUNITIES
Communities that are known from few small occurrences, all or most of which are actively managed for conservation (e.g. within national parks, conservation parks, nature reserves, State forest, unallocated Crown land, water reserves, etc.) and not under imminent threat of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.
PRIORITY THREE: POORLY KNOWN ECOLOGICAL COMMUNITIES
(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 within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or; (iii) Communities made up of large, and/or widespread occurrences, that may or 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, and inappropriate fire regimes. Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.

PRIORITY FOUR: 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. (a) Rare. Ecological communities known from few occurrences 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 communities are usually represented on conservation lands. (b) Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. (c) Ecological communities that have been removed from the list of threatened communities during the past five years.
PRIORITY FIVE: CONSERVATION DEPENDENT ECOLOGICAL COMMUNITIES.
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

APPENDIX B

WONS, Declared Plant and Environmental Weed Categories

To help focus national efforts to address weed problems in Australia, a list of Weeds of National Significance (WoNS) was compiled. Plant species were selected on the basis of their invasiveness and impact characteristics, their potential and current area of spread and their primary industry, environmental and socioeconomic impacts. Thirty-two WoNS have been identified by Australian governments. In Western Australia many of these WoNS are also declared pests under the *Biosecurity and Agriculture Management Act 2007*.

To protect Western Australia's agriculture, the Department of Primary Industries and Regional Development:

- Regulates weeds under the Biosecurity and Agriculture Management Act 2007 (BAM Act);
- Provides a weed identification service; and
- Provides information on weed control, crop weeds, regulated/declared plants and herbicides.

Under the BAM Act, all declared pests are placed in one of three categories, namely C1 (exclusion), C2 (eradication) or C3 (management) (Table 14).

Table 14: Declared Pest Categories Under the BAM Act (Department of Primary Industries and Regional Development, 2018)

C1 CATEGORY (EXCLUSION)
Pests will be assigned to this category if they are not established in WA and control measures are to be taken, including border checks, in order to prevent them entering and establishing in the State.
C2 CATEGORY (ERADICATION)
Pests will be assigned to this category if they are present in WA in low enough numbers or in sufficiently limited areas that their eradication is still a possibility
C3 CATEGORY (MANAGEMENT)
Pests will be assigned to this category if they are established in WA but it is feasible, or desirable, to manage them in order to limit their damage. Control measures can prevent a C3 pest from increasing in population size or density or moving from an area in which it is established into an area which currently is free of that pest.

The Weed Prioritisation Process for DBCA contains criteria for the assessment and ranking of weeds in terms of their environmental impact on biodiversity(Department of Parks and Wildlife, 2013). These criteria are as follows:

- **Potential Distribution** – Area of potential habitat in the Region that could be occupied or the area at risk of invasion by the weed;
- **Current Distribution -** Area of habitat in the Region currently occupied by the weed, in relation to the habitat that it could invade;
- **Ecological Impact -** Impact of species within the Region, from low impact (causes minimal disruption to ecological processes or loss of biodiversity) to high (causes acute disruption of ecological processes, dominates and/or significantly alters vegetation structure, composition and function of ecosystems);
- **Invasiveness** – Rate of spread of a weed in native vegetative, encompassing factors of establishment, reproduction and long distance dispersal (>100m); and
- **Feasibility of Control** - The longer a coordinated control program takes to achieve its desired goal, the more expensive and less feasible it becomes. Is it feasible to eradicate or at least contain the infestation?

Weed Prioritisation Process prioritises weeds in each DBCA region in terms of Ecological impact under each of the categories of very high (VH), high (H), medium (M), low (L) and negligible (N)). Weeds are also prioritised by regions in relation to invasiveness according to the categories of slow (S), Moderate (M), Rapid (R) and Unknown (U) (Department of Parks and Wildlife, 2013).

APPENDIX C

Database Searches

Pop Id	Name id	Taxon	Cons Status	Pop Number	Sub Pop Code	Location	District	Vesting	Purpose	Count Date	Method	Mature Count	Juvenile	Seedling	Live Total	Area Occupi	in Flower
90691	13074	*Acacia alexandri*	3	1		5.3 km west of Exmouth-Minilya Road on Charles Knife Road, 22.5 km south of Exmouth, North West Cape. Crown Lease L 3114 996: Lyndon Lot 164.	EXMOUTH	PLB	PAS	29-Aug-88		0	0	0	0	0	Y
90692	13074	*Acacia alexandri*	3	2		9.6 km west on Shothole [Canyon] Road, 16 km south of Exmouth, North West Cape.	EXMOUTH	NON	UCL	29-Jul-80		0	0	0	0	0	N
90693	13074	*Acacia alexandri*	3	3		Charles Knife Road, 3.8 km west of T-junction with Minilya Exmouth Road, ca 14 km west-north-west of Learmonth. Crown Lease L 3114 996: Lyndon Lot 164.	EXMOUTH	PLB	PAS	5-Aug-86		0	0	0	1	0	N
90694	13074	*Acacia alexandri*	3	4		Charles Knife Road, 6.2 km west of T-junction with Minilya Exmouth Road, ca 15.5 km north-north-west of Learmonth. Crown Lease L 3114 996: Lydon Lot 164.	EXMOUTH	PLB	PAS	5-Aug-86		0	0	0	0	0	N
90695	13074	*Acacia alexandri*	3	5		Charles Knife Road, 11.1 km west of T-junction with Minilya Exmouth Road, ca 20 km north-west of Learmonth. Cape Range National Park, Crown Reserve 27288: Lyndon Lot 52.	EXMOUTH	CC	NPK	5-Aug-86		0	0	0	0	0	N
90696	13074	*Acacia alexandri*	3	6		Top of Cape Range. Yardie Creek on track not far from Learmonth Rifle Range. Cape Range National Park, Crown Reserve 27288: Lot 106, Lyndon.	EXMOUTH	CC	NPK	30-Aug-88		0	0	0	0	0	Y
101530	13074	*Acacia alexandri*	3	7	A	About 8 km south of Exmouth, extending from [Cape Range] limestone Mine, ca 3 km west of Exmouth Minilya Road, through to the coast (4.6 km).	EXMOUTH	NON	UCL	24-Nov-97	ACT_IND	286	0	0	286	0	N
101531	13074	*Acacia alexandri*	3	7	B	About 8 km south of Exmouth, extending from [Cape Range] limestone Mine, ca 3 km west of Exmouth Minilya Road, through to the coast (4.6 km).Crown Reserve 34055, Learmonth Street, Exmouth.	EXMOUTH	WAT	WAT	24-Nov-97		0	0	0	0	0	N
101532	13074	*Acacia alexandri*	3	7	C	About 8 km south of Exmouth, extending from [Cape Range] limestone Mine, ca 3 km west of Exmouth Minilya Road, through to the coast (4.6 km).	EXMOUTH	NON	UCL	24-Nov-97		0	0	0	0	0	N
101533	13074	*Acacia alexandri*	3	7	D	About 8 km south of Exmouth, extending from [Cape Range] limestone Mine, ca 3 km west of Exmouth Minilya Road, through to the coast (4.6 km). 50 Murat Road, North West Cape.	EXMOUTH	PRI		24-Nov-97	ESTMT	2500	0	0	2500	0	N
90680	13071	*Acacia ryaniana*	2	4		Sandy Bay Camp, Exmouth. [Cape Range National Park (Reserve No. 27288)].	EXMOUTH	CC	NPK	15-Aug-87		0	0	0	0	0	N
90697	13076	*Acacia startii*	3	1		5 km east of Bullara Homestead [along Burkett Road].	EXMOUTH	MRD	VER	20-Aug-83		0	0	0	0	0	N
90706	13076	*Acacia startii*	3	3		13.2 km along Bullara-Giralia Road (now Burkett Road) from Exmouth [-Minilya] Road. About 10 km east of Bullara Homestead.	EXMOUTH	MRD	VER	29-Aug-88		0	0	0	0	0	N
90707	13076	*Acacia startii*	3	4		About 60 km from Y-junction of North West Coastal Highway and [old] road to Marilla, Giralia and Bullara Homesteads, ca 50 km south-south-east of Learmonth. Ex-Giralia Leasehold for proposed conservation.	EXMOUTH	EXD	EPL	3-Aug-86		0	0	0	0	0	Y
90708	13076	*Acacia startii*	3	5		About 66 km from Y-junction of North West Coastal Highway and [old] road to Marilla, Giralia and Bullara Homesteads, ca 50 km south-south-east of Learmonth. Ex-Giralia Leasehold for proposed conservation.	EXMOUTH	EXD	EPL	3-Aug-86		0	0	0	0	0	Y
90709	13076	*Acacia startii*	3	6		About 74.6 km north-west then west from Y-junction of North West Coastal Highway and [old] road to Marilla, Giralia and Bullara Homesteads, ca 46 km south-south-east of Learmonth. Crown Lease 3114 623.	EXMOUTH	PLB	PAS	3-Aug-86		0	0	0	0	0	Y

90710	13076	*Acacia startii*	3	7		About 81 km north-west then west from Y-junction of North West Coastal Highway and [old] road to Marilla, Giralia and Bullara Homesteads, ca 50 km south-south-east of Learmonth [on Burkett Road].	EXMOUTH	MRD	VER	3-Aug-86		0	0	0	0	0	Y
90699	13076	*Acacia startii*	3	11		About 16.5 km east of Exmouth-Minilya Road along Bullara-Giralia Road (now Burkett Road).	EXMOUTH	MRD	VER	29-Aug-88		0	0	0	0	0	Y
90701	13076	*Acacia startii*	3	13		[Near] Cape Range National Park, 16.6 km east from [Ningaloo-] Yardie Creek Road, along track to Sandy Point. Crown Lease 3114 996.	EXMOUTH	PLB	PAS	30-Aug-88		0	0	0	0	0	Y
84584	1210	*Acanthocarpus rupestris*	2	1		UCL. 6 km along old Wapet Shothole Canyon Road, 100 m north of road, Cape Range.	EXMOUTH	NON	UCL	29-Aug-64		0	0	0	0	0	N
84585	1210	*Acanthocarpus rupestris*	2	2		UCL. 3.5 miles (5.633 km) south of Exmouth township.	EXMOUTH	NON	UCL	15-May-65		0	0	0	0	0	Y
84586	1210	*Acanthocarpus rupestris*	2	3		Cape Range [National Park], west of No. 2 Oil Well. Crown Reserve 27288.	EXMOUTH	CC	NPK	23-May-65		0	0	0	0	0	N
84587	1210	*Acanthocarpus rupestris*	2	4		Walk-track in Mandu Mandu Gorge, Cape Range national Park (Reserve 27288), 25 km west-north-west of Learmonth.	EXMOUTH	CC	NPK	4-Aug-86		0	0	0	0	0	N
94462	18411	*Corchorus congener*	3	2		N of Yardie Creek. Cape Range NP. Herbarium Record Only.	EXMOUTH	CC	NPK	27-May-65		0	0	0	0	0	N
94463	18411	*Corchorus congener*	3	3		UCL. Cape Range Peninsula, entrance to Shothole Canyon, [along Shothole Canyon Road, 4.2 km from Exmouth Minilya Road].	EXMOUTH	NON	UCL	2-Oct-95		0	0	0	0	0	Y
94465	18411	*Corchorus congener*	3	5		Road Reserve, Exmouth Minilya Road, 60 km south of Exmounth centre, Exmouth Gulf Station.	EXMOUTH	MRD	VER	14-Jul-05	ESTMT	0	0	0	35	0	Y
94466	18411	*Corchorus congener*	3	6		Ex-Giralia Leasehold, south end of Exmouth Gulf, 13.7 km NNE of Artesian Well, NE of homestead.	EXMOUTH	NON	EPL	24-Jun-06		0	0	0	0	0	Y
84913	1491	*Crinum flaccidum*	2	2		5 miles (8.047 km) north of Yardie Creek. Cape Range National Park (Reserve No. 27288).	EXMOUTH	CC	NPK	27-May-65		0	0	0	0	0	N
84914	1491	*Crinum flaccidum*	2	3		Pilgramunna [Campsite, at Pilgonaman Creek Pilgonaman Bay], Cape Range National Park (Reserve No. 27288).	EXMOUTH	CC	NPK	24-Jun-87		0	0	0	0	0	Y
92194	14375	*Daviesia pleurophylla*	2	1		In dune ca 150 m north of northern fence of Harold Holt Naval Base, Exmouth. Rifle Range, Lot 284 Murat Road. Crown Reserve 37664.	EXMOUTH	LGA	FIR	12-Oct-01		0	0	0	0	0	Y
92195	14375	*Daviesia pleurophylla*	2	2		Learmonth Air Weapons Range (ca 30 km south-west of RAAF Learmonth, and directly south-adjacent to Cape Range National Park).	EXMOUTH	COM	DEF	9-Oct-04		0	0	0	0	0	N
92927	15032	*Eremophila occidens*	2	1		Cape Range National Park (Reserve No. 27288) at No. 2 Oil Well, terminus of Charles Knife Road.	EXMOUTH	CC	NPK	9-Aug-85		0	0	0	0	0	Y
85455	1972	*Grevillea calcicola*	3	1		Cape Range National Park (Crown Reserve 27288; Expl. Lic. 081786 Pending, Bauxite Australia). 7 km from main road (Minilya Exmouth Road), on Charles Knife Road.	EXMOUTH	CC	NPK	30-Aug-64		0	0	0	0	0	N
85456	1972	*Grevillea calcicola*	3	2		Cape Range National Park (Crown Reserve 27288; Expl. Lic. 081786 Pending, Bauxite Australia), ca 4 km NE of (Cape Range) No. 2 (Oil) Well on Charles Knife Road.	EXMOUTH	CC	NPK	3-May-77		0	0	0	0	0	Y
85457	1972	*Grevillea calcicola*	3	3		Cape Range National Park (Crown Reserve 27288), west of Sandy Point No. 2 Oil Well (WAPET: W000795), in and next to small gorge formed by southern tributary of Yardie Creek.	EXMOUTH	CC	NPK	15-Apr-89		0	0	0	0	0	N
93912	17327	*Harnieria kempeana subsp. rhadinophylla*	2	1		77 Learmonth Street, Exmouth (Crown Reserve 34055. Expl. Lic. 0801786 Pending, Bauxite Australia). North West Cape, ca 10 km (9.7 km) S of Exmouth centre, in (un-named) creek S of Mowbowra Creek and 2 km (2.6 km) W of the Exmouth Minilya Rd.	EXMOUTH	WAT	WAT	24-Jul-95	ESTMT	0	0	0	20	0	Y
93913	17327	*Harnieria kempeana subsp. rhadinophylla*	2	2		Cape Range National Park (Crown Reserve 27288), Mandu Mandu Gorge [ca 2 km east, upstream from coastline].	EXMOUTH	CC	NPK	21-Jul-06	ESTMT	0	0	0	4	0	Y
93915	17345	*Tinospora esiangkara*	2	1		Cape Range, ca 3 km west of main road and 500 m south of Mowbowra Creek. Crown Reserve 34055: 77 Learmonth Street, Exmouth.	EXMOUTH	MWA	WAT	23-Jul-95		0	0	0	0	0	N
93916	17345	*Tinospora esiangkara*	2	2		UCL. North West Cape, ca 10 km south of Exmouth centre in creek south of Mowbowra Creek, 150 to 200 m west of powerline parallel to main road.	EXMOUTH	NON	UCL	24-Jul-95		0	0	0	0	0	Y
90119	12457	*Verticordia serotina*	2	1		Yardie Creek, [ca 2.5 km inland from coast, vicinity of Yardie Creek Gorge,] Cape Range National Park, Crown Reserve 27288: Lyndon Lot 106.	EXMOUTH	CC	NPK	23-Aug-92		0	0	0	0	0	Y

Taxon	Status	DPaWRegion	DPaWDistrict	Distribution	Flowering Period
Acacia alexandri	3	PILB	EXMOUTH	Cape Range, Exmouth	Jun-Sep
Acacia startii	3	MWST,PILB	EXMOUTH,GERALDTON	Cape Range, Rough Range, Minilya River, Bullara Station	Jul-Aug
Corchorus congener	3	PILB	EXMOUTH,KARRATHA	Exmouth, Ningaloo Station, Barrow Is.	Apr-Oct
Cyperus victoriensis	1	KIMB,PILB	EXMOUTH,WEST KIMBERLEY	Oobagooma, E of Exmouth	
Dysphania congestiflora	3	PILB	EXMOUTH,KARRATHA	Fortescue Marsh, Lyndon River	Jun-Aug
Eremophila youngii subsp. lepidota	4	GOLD,MWST,PILB	KALGOORLIE,EXMOUTH,KARRATHA,GERALDTON	Exmouth, Fortescue Marsh, Paraburdoo, Mulga Downs Stn., Jigalong Creek, Giralia Stn., Minilya	Mar,Jun
Grevillea calcicola	3	PILB	EXMOUTH	Cape Range, Learmonth, Yardie Creek Stn	Aug,Sep
Tephrosia sp. North West Cape (G. Marsh 81)	2	PILB	EXMOUTH	Exmouth	May

Sheet	Name ID	Taxon	Cons Code	Plant_Desc	Site	Vegetation	Frequency	Notes	Locality	Geocode Me	Precision	Collector	Coll_Num	Date
8154392	14114	*Abutilon sp. Quobba (H. Demarz 3858)*	2	Annual herb 1 m high x 0.2 m wide. Flowers yellow.	Plain. Brown rocky.	Low shrubland, grassland.	6-20 plants.		Cape Range National Park, Exmouth	GPS	1	J. English	JE 0234	22/07/2008
669482	13074	*Acacia alexandri*	3	Open bush to 1.5 m.					Shothole Canyon, Exmouth	MAN	2	W.B. Edgecombe	s.n.	28/10/1983
880450	13074	*Acacia alexandri*	3	erect shrub 3 m tall creamy yellow	steep rocky slope	Acacia bivenosa and Triodia			5.3 km W of Exmouth-Minilya road on Charles I	AUTO	3	B.R. Maslin	6284	29/08/1988
5310199	13074	*Acacia alexandri*	3	Spreading shrub 2 m tall; canopy erect, yellow green as are branches; phyllodes 10 cm x 5 mm, soft, fleshy, subtended by paired spiny stipules.	E slope of range, massive outcropp	Open mallee Eucalyptus opaca (glossy leaves), ove	solitary.		On Charles Knife Road 3.8 km W of T-junction	MAN	0	S.D. Hopper	5085	5/08/1986
157600	13074	*Acacia alexandri*	3	Shrub to 3.5 m.					Cape Range - Charles Knife Road	MAN	4	A.S. George	1334	30/08/1960
153362	13074	*Acacia alexandri*	3	Slender shrub to 2 m. Flowers cream.					Cape Range - road to Nos. 3 and 4 Wells [the r	MAN	4	A.S. George	2479	2/06/1961
157678	13074	*Acacia alexandri*	3	Slender shrub to 2 m. Flowers cream.					Cape Range - road to Nos. 3 and 4 Wells [the r	MAN	4	A.S. George	2479	2/06/1961
151939	13074	*Acacia alexandri*	3	Open bush to 1.5 m.					Shothole Canyon, Exmouth	MAN	2	W.B. Edgecombe	12	9/09/1983
153354	13074	*Acacia alexandri*	3	Open bush to 1.5 m.					Shothole Canyon, Exmouth	MAN	2	W.B. Edgecombe	s.n.	9/09/1983
1713175	13074	*Acacia alexandri*	3	Slender tree to 4 m.	In rocky gully, also on limestones o		local occurrence.		Cape Range near Exmouth Gulf coastline	AUTO	3	K.L. Tinley	s.n.	24/11/1991
886777	13074	*Acacia alexandri*	3						6 km from main road on old Wapet Shothill Can	MAN	2	Y. Chadwick	s.n.	/08/1964
176346	13074	*Acacia alexandri*	3	Much branched shrub to 1.5 m.	Growing on karst formation.				5.3 km W of Charles Knife Road, 22.5 km S of I	MAN	2	K.F. Kenneally	7344	29/07/1980
841099	13074	*Acacia alexandri*	3	Spindly open shrub 2 m tall. Bark smooth grey. Ultimate branchlets yellow-brown, heads cream, 8 mm diameter.	Banks of stony creek.				Cape Range National Park	MAN	4	B.R. Maslin	6289	30/08/1988
153370	13074	*Acacia alexandri*	3	Whispy shrub to 2 m, (long phyllode variant).	Growing in creek bed.	With (KFK 7336).			9.6 km W on Shothole Road, 16 km S of Exmou	MAN	2	K.F. Kenneally	7337	29/07/1980
153389	13074	*Acacia alexandri*	3						6 km from main road on Old Wapet Shothole C	MAN	2	Y. Chadwick	1353	29/08/1964
5310229	13074	*Acacia alexandri*	3	Glabrous shrub 2.5 m tall; stems slender, erect; smooth grey bark, becoming greenish brown then dull reddish yellow-green on branchlets; phyllodes erect, dull, fleshy, yellow green, subtended by 2 dark brown spiny stipules; infl. paired, spreading away f	Gradual slope NW aspect, near foo	Open shrub mallee of Eucalyptus aff. opaca over sc			On Charles Knife Road, 11.1 km W of T-junctio	MAN	0	S.D. Hopper	5088	5/08/1986
5310202	13074	*Acacia alexandri*	3	Sterile, spreading shrub to 1.5 m x 1.5 m; basal bark dark grey, fissured irregularly; moderately dense canopy; phyllodes erect fleshy, olive green; branchlets red brown then greenish brown as they mature.	Gravel pit, pink powdery loam and	Eucalyptus aff. foecunda OSM over low scrub with			On Charles Knife Road 6.2 km W of T-junction	MAN	0	S.D. Hopper	5086	5/08/1986
8154260	13074	*Acacia alexandri*	3	Perennial, erect compact shrub 3 m high x 3 m wide. Flowers yellow.	Flood plain. Brown rocky.	Tall shrubland, grassland.	2-5 plants.		Cape Range National Park, Exmouth	GPS	1	J. English	JE 0242	27/07/2008
157686	13074	*Acacia alexandri*	3	Slender shrub 3 m; flowers cream.	In limestone.	In tall open shrubland with Triodia.			Cape Range, ca 6 miles W of Learmonth Airfiel	MAN	3	A.S. George	10270	5/09/1970
669431	13074	*Acacia alexandri*	3	Open bush to 1.5 m.					Shothole Canyon, Exmouth	MAN	2	W.B. Edgecombe	13	28/10/1983
805769	13071	*Acacia ryaniana*	2	? Low shrub.	Coastal dunes.			Latitude and longitude corrected on WAHerb. Specimen unable to be corrected as it is on loan as at 22/11/2005.	Sandy Bay Camp, Exmouth	TOPO	3	H. Pringle	s.n.	/08/1987
7871961	13071	*Acacia ryaniana*	2	Low spreading shrub of 2 m diameter and 0.5 m high.	Leeward side of primary dunes.	Amongst Spinifex longifolius.			12 km S Tantabiddi well, Cape Range National	UNK	3	A.N. Start	s.n.	/06/1982

6072658	13071	*Acacia ryaniana*	2	Prostrate shrub.	On coastal dune.				N of Yardie Creek	MAN	3	A.S. George	6660	27/05/1965
5431956	13076	*Acacia startii*	3	Dense canopied to ground level, spreading 1.5 m tall, 2 m wide; green phyllodes bark smooth grey, pale brown to ground, persistent bracts, old pods on ground <3 m wide.	Hillslope aspect.				Ca 60 km from Y-junction of North West Coast	MAN	0	S.D. Hopper	5058	3/08/1986
854425	13076	*Acacia startii*	3	Dense rounded shrub to 1.5 m tall; stems more or less erect, bark grey to grey-brown, smooth. Phyllodes green, 2-nerved.	In flat country on shallow pale brow	With Acacia bivenosa, A. sclerosperma, A. tetragor		Abundance: occasional.	13.2 km E along Bullara - Giralia Road from Exr	MAN	2	A.R. Chapman	593	29/08/1988
854441	13076	*Acacia startii*	3	Dense rounded shrub to 1 m and 2.5 m wide. Bark smooth, light grey, 'chalky' pruinose extending to branchlets. Phyllodes green or glaucous, often with sandpapery texture. Heads lemon yellow.	On slope between red sand dune a	With A. tetragonophylla and Triodia.		Abundance: locally abundant.	Cape Range National Park, 16.6 km E from Yar	MAN	4	A.R. Chapman	597	30/08/1988
880477	13076	*Acacia startii*	3	Compact round shrub 1.5 m tall, much-branched at ground level, main branches straighter and less widely spreading than in A. bivenosa (BRM 6207) which also grew at this locality. New shoots milky green, hairy. Phyllodes dark green. Heads lemon yellow, 10	Low limestone hill.	With Triodia ground cover.		Abundance: common.	16.5 km E of Exmouth-Minilya road on road to (	MAN	4	B.R. Maslin	6283	29/08/1988
880493	13076	*Acacia startii*	3	Compact rounded shrub ca 1 m tall and 2 m across, peripheral branches prostrate. Stems characteristically grey-white and slightly pruinose. Phyllodes dark green when mature (milky green when young). Heads 10 mm diameter, lemon yellow to mid-golden. Pedu	Flat between sand ridge and stony	Triodia dominated ground cover.		Abundance: locally abundant.	Cape Range National Park	MAN	4	B.R. Maslin	6292	30/08/1988
195537	13076	*Acacia startii*	3	Low wattle 3 ft. Fleshy leaves, like A. inaequiloba.	Stony hills.	With spinifex.			Rough Range	MAN	3	J.S. Beard	3549	21/07/1964
886440	13076	*Acacia startii*	3	Reasonably compact shrub to 1 + m tall. Phyllodes dull green.	On flat on gentle slopes. In red gra	In shrubland/hummock grassland.		Abundance: frequent.	Cape Range National Park	MAN	4	P.C. Ryan	D	3/08/1987
854433	13076	*Acacia startii*	3	Dense rounded shrub to 1.5 m tall, 2 m wide. Bark grey; branches erect. Phyllodes green or tomentose and milky-green when young. Heads lemon, racemes growing out.	On top of limestone rise 200 m W (	In Acacia, Triodia scrub with A. bivenosa.		Abundance: locally common.	16.6 km E along Bullara - Giralia Road from Exr	MAN	2	A.R. Chapman	595	29/08/1988
5310148	13076	*Acacia startii*	3	Spreading shrub 1.5 m tall, 2 m wide; canopy to ground level dense, green, finely hirsute; bark smooth and grey; flowers golden yellow.	Broad flat, powdery pale pinkish br	Open low scrub with Acacia sclerosperma, A. victo			Ca 81 km NW then W from Y-junction of North	MAN	0	S.D. Hopper	5062	3/08/1986
685321	13076	*Acacia startii*	3	Shrub to 1 m tall and 2 m diameter.	Pale red sandy loam with limestone	In low scrub dominated by Acacia spp., Santalum a	abundant.		5 km E of Bullara Homestead,	MAN	3	A.N. Start	7	20/08/1983
685313	13076	*Acacia startii*	3	Round shrub to 1.5 m tall.	On thin pale loam on limestone.	Growing with A. bivenosa and Hummock Grass.	frequent.		Approx 10 km E of Bullara Homestead on Bulla	MAN	3	A.N. Start	65	21/09/1984
5310121	13076	*Acacia startii*	3	Spreading shrub 2 m x 4 m; canopy to ground level, dense, green, finely hirsute; bark smooth and grey; flowers just opening, golden yellow.	Broad flat between low hills, powde	Scrub of Acacia tetragonophylla, A. bivenosa & A. \			Ca 74.6 km NW then W from Y-junction of Nor	MAN	0	S.D. Hopper	5061	3/08/1986
5310113	13076	*Acacia startii*	3	Spreading shrub to 1.5 x 3.5 m; bark smooth, pale grey to ground; canopy green, finely hirsute when young; flowers golden yellow.	Gradual hillslope NE aspect, pale p	Open low scrub over spinifex hummock grassland.	common.		Ca 66 km from Y-junction of North West Coast	MAN	0	S.D. Hopper	5059	3/08/1986
189294	13076	*Acacia startii*	3	Round shrub to 1.5 m tall.	On pale loam on limestone.	Growing with Acacia bivenosa and Hummock grass	frequent.		Approx 10 km E of Bullara Homestead on Bulla	MAN	3	A.N. Start	16	21/07/1984
685305	13076	*Acacia startii*	3	Round shrub to 1.5 m tall.	In thin pale loam on limestone.	Growing with Acacia bivenosa dn Hummock grass.	frequent.		Approx 10 km E of Bullara Homestead on Bulla	MAN	3	A.N. Start	16	21/07/1984
5310083	13076	*Acacia startii*	3	Spreading shrub, spreading canopy to ground level 1.5 m tall, 3 m across; bark smooth grey-pale brown to ground; phyllodes green hirsute; inflorescences with persistent bracts; old pods on ground <3 mm wide.	Gradual slope E aspect, powdery p		common.		Ca 60 km from Y-junction of North West Coast	MAN	0	S.D. Hopper	5054	3/08/1986

854468	13076	*Acacia startii*	3	dense, rounded, compact shrub to 1 m tall and 2.5 m wide, occasionally infundibular heads lemon yellow	pale red loam with limestone rubble	Acacia tetragonophylla, Triodia			Cape Range National Park, 16.6 km E from Yar	MAN	4	A.R. Chapman	596	30/08/1988
189316	13076	*Acacia startii*	3	Shrub to 1 m tall and 2 m diameter.	In pale red sandy loam with limesto	In low scrub dominated by Acacia spp., Santalum a	abundant.		5 km E of Bullara Homestead	MAN	3	A.N. Start	7	20/08/1983
7890257	13076	*Acacia startii*	3	Shrub <1 m. Globular flower and coily legumes in bunches smaller than Acacia bivenosa. Young twigs finely pinnate. Older are reticulate.	In sandy loam with much limestone	In association with occasional A. bivenosa and hum	occasional.		22 km W of Bullara Homestead, Carnarvon Bot	UNK	3	A.N. Start	s.n.	17/12/1981
189286	13076	*Acacia startii*	3	Round shrub to 1.5 m tall.	On thin pale loam on limestone.	Growing with A. bivenosa and Hummock grass.	frequent.		Approx 10 km E of Bullara Homestead on Bulla	MAN	3	A.N. Start	65	21/09/1984
5072050	1210	*Acanthocarpus rupestris*	2	Prickly shrub.	Upslope from post 12, on main cre	Rock heath.			Walk-track in Mandu Mandu Gorge in Cape Ra	MAN	3	S.D. Hopper	5074	4/08/1986
1025538	1210	*Acanthocarpus rupestris*	2						6 km along old Wapet Shothole Canyon Road,	MAN	2	D.W. Goodall	1371	29/08/1964
1025503	1210	*Acanthocarpus rupestris*	2		In limestone soil.				Cape Range, W of No. 2 Oil Well	MAN	4	A.S. George	6543	23/05/1965
1001418	1210	*Acanthocarpus rupestris*	2	Flowers white.	In red sand over limestone, along c				3.5 miles S of Exmouth township.	MAN	3	A.S. George	6590	15/05/1965
1025511	1210	*Acanthocarpus rupestris*	2	Flowers small. Shrub 12-18 inches tall: leaves dark green, more or less pungent.	Among rocks.				Cape Range, North West Cape	MAN	3	R.D. Royce	8378	8/06/1967
1141570	12714	*Brachychiton obtusilobus*	4	Tree with young leaves developing.					1.3 W of Learmonth Airfield, Cape Range, Nort	MAN	0	C. Blumer	s.n.	4/09/1988
1142518	12714	*Brachychiton obtusilobus*	4						5 km S of Yardie Creek Station, E to Cape Ran	MAN	3	Y. Chadwick	1404	/08/1964
1142569	12714	*Brachychiton obtusilobus*	4	Tree to 3 m. Trunk pale grey, leaves shiny green. Mature fruits black.	Growing in limestone range.				Edge of Cape Range, 7 km S of Vlaming Head	MAN	0	K.F. Kenneally	7370	31/07/1980
1142542	12714	*Brachychiton obtusilobus*	4	Tree ca 5 m tall. Bark smooth, pale grey. Leaves glossy green. Fruits mainly dry, empty. Pods matte black, in clusters of up to 5.	Limestone ridge.	With low tree and shrub vegetation.			Charles Knife Road, Cape Range National Park	MAN	4	R. Pullen	10.952	2/05/1977
1142550	12714	*Brachychiton obtusilobus*	4	Tree 15 ft. In pod.	Sandy plain.	Spinifex and scrub.		Kurrajong.	Between Exmouth township and U.S. Base at N	MAN	3	J.S. Beard	3557	21/07/1964
1141589	12714	*Brachychiton obtusilobus*	4	Tree, leaves palmate, long petioles.					Site 3 Cape Range, North West Cape	MAN	0	J.M. Waldock	s.n.	25/09/1988
1142526	12714	*Brachychiton obtusilobus*	4	Spreading tree to 25 ft.	At base of gorge.			A small tree to 15 ft on top [of gorge].	Charles Knife Road, Cape Range	MAN	4	A.S. George	1323	30/08/1960
1142534	12714	*Brachychiton obtusilobus*	4	Spreading tree to 25 ft. Flowers greenish; fruit black.	On hill top at base of gorge.			A small tree to 15 ft on top [of gorge].	Cape Range, 9 miles N of Learmonth	MAN	3	A.S. George	1323	30/08/1960
1619217	12714	*Brachychiton obtusilobus*	4	Tree to 5 m; leaves falling; flowers cream.	In rocky limestone soil.	In open shrub - Triodia steppe.			Cape Range, ca 6 miles W of Learmonth	MAN	0	A.S. George	10268	5/09/1970
1619225	12714	*Brachychiton obtusilobus*	4	Tree to 5 m; leaves falling; flowers cream.	In rocky limestone soil.	In open shrub - Triodia steppe.			Cape Range, ca 6 miles W of Learmonth	MAN	0	A.S. George	10268	5/09/1970
5607353	12714	*Brachychiton obtusilobus*	4	Tree 5 m.	In rocky, limestone soil.				Charles Knife Road, Cape Range National Park	MAN	0	A.S. George	s.n.	3/05/1977
5880793	12714	*Brachychiton obtusilobus*	4		Range land system.		scattered trees.		Exmouth Gulf Station,	MAN	4	J. Stretch	s.n.	6/05/2001
7267851	12714	*Brachychiton obtusilobus*	4	Fine large tree. Thick trunk, deeply tesselated one side, smooth the other. Dark grey bark. White flowers only just coming out. Compact bunches on end branches. Leaves turning to autumn but still not falling. Female flowers as well as male found. Old pod	Marginal red soil and rocks.	Shrubs small Eucalypt tree.	several seen in area and Cape Range		Charles Knife Road, Exmouth opposite marker	GPS	1	J. Dennis	189	4/10/2005
8142076	18359	*Carpobrotus sp. Thevenard Island (M. White 050)*	3	Perennial ground cover. Flowers cream.	On rocky ridge near side of creek.	Low shrubland.	2-5 plants.		Cape Range National Park	GPS	1	J. English	JE 0109	11/08/2006
8489327	18411	*Corchorus congener*	3					Card ref. 60.	Hall Street, Exmouth townsite	GPS	1	DEC Exmouth	s.n.	26/07/2011
1532707	18411	*Corchorus congener*	3						2 km E of Lighthouse, Exmouth, Cape Range	AUTO	3	Y. Chadwick	1338	18/09/1964
1532758	18411	*Corchorus congener*	3	More or less prostrate. Flowers yellow.	Limestone soil.				Ca 1 miles S of Lighthouse, W side of Cape Ra	AUTO	4	A.S. George	2563	3/06/1961
1532715	18411	*Corchorus congener*	3	Spreading shrub, flowers yellow.	On sandy plain.				N of Yardie Creek	AUTO	4	A.S. George	6671	27/05/1965

6723926	18411	*Corchorus congener*	3			Shrubland.			Cape Range Peninsula, Ningaloo Yardie Creek	MAN	3	S. Hunger & N. Kilian	4155	30/09/1995
6733735	18411	*Corchorus congener*	3	Subshrub, flowers lemon-yellow.		Shrub vegetation with some trees.			Cape Range Peninsula, entrance to Shothole C	MAN	3	S. Hunger & N. Kilian	4201	2/10/1995
7437080	18411	*Corchorus congener*	3	Perennial, erect, compact shrub 50 cm high x 1.1 m wide. Concolorous serrated linear leaves 18-45 mm long x 4-16 mm wide, 304 mm stipules subulate oblong. Petiole 5-10 mm long. Calyx stellate hairy, lobes split to base, acuminate 5 mm long. Yellow six pe	Plain. Rangeland. Road verge. Red	Low shrubland and grassland. Buffel grass, Sida sp	21-50 plants.	Population structure: 100% flowering.	Exmouth-Minilya Road, 60 km S of Exmouth Ce	GPS	1	J.E. Wajon	1351	14/07/2005
8154295	18411	*Corchorus congener*	3	Perennial, compact shrub 0.4 m high x 0.6 m wide. Flowers yellow.	Plain. Brown loam.	Low shrubland, grassland.	6-20 plants.		Cape Range National Park, Exmouth	TOPO	3	J. English	JE 0255	5/08/2008
1526510	18411	*Corchorus congener*	3	Spreading shrub 35 cm; flowers yellow.	In red loam with limestone.				5-6 miles S of Exmouth	AUTO	3	A.S. George	6604	25/05/1965
3913759	1491	*Crinum flaccidum*	2		In red sandy loam on coastal plain.				5 miles N of Yardie Creek	AUTO	3	A.S. George	6681	27/05/1965
2578913	1491	*Crinum flaccidum*	2	Erect in clumps to 1 m. Lilliaceae wide strap like leaves. Flowers white, sweet scent.	Low lying area between coastal du	Hummock Grassland/Spinifex.		Abundance: locally frequent	Pilgramunna, Cape Range National Park	AUTO	3	R. Karniewicz	RBK 119	26/05/1992
3913740	1491	*Crinum flaccidum*	2						Cape Range National Park, Pilgramanup [Pilgra	TOPO	3	T. Tapper	21	24/06/1987
4403819	14375	*Daviesia pleurophylla*	2	Much branched shrub 70 cm.	On sand dune.	In shrub steppe.			W side of Cape Range, ca 7 miles N of Yardie C	MAN	0	A.S. George	10288	5/09/1970
6375448	14375	*Daviesia pleurophylla*	2	Broom-like, single or few stemmed, to 3 m. Petals yellow and dark red.	N-S sand dune, summit of dune. D	Shrubland dominated by this species.	abundant.		Exmouth, Harold Holt Navel Base, c. 150 m N c	MAN	2	M.D. Crisp & L.G. Cook	MDC 9380	12/10/2001
8179972	29715	*Eremophila forrestii subsp. capensis*	3	Shrubs to 1 m. Unusually few stemmed, rarely much branched, corolla pale carmine on both surfaces unspotted or spotted deep carmine in the tube and on the base of the lower lip but very variable, new growth often lemon yellow.	On limestone slopes.	Amongst Mallee over spinifex.	common.		2.9 km E of No 2 Oil Well, Charles Knife Road,	UNK	2	R.J. Chinnock	6903	24/08/1986
7355718	29715	*Eremophila forrestii subsp. capensis*	3						Summit of Cape Range	TOPO	3	K.M. McWhae	s.n.	18/08/1956
7355726	29715	*Eremophila forrestii subsp. capensis*	3	Spindly shrub 4 ft, leaves tomentose, round. Corolla pink.	On limestone.	Spinifex and Eucalypts.			Charles Knife Road, Cape Range	TOPO	3	J.S. Beard	3571	22/07/1964
7355734	29715	*Eremophila forrestii subsp. capensis*	3	Shrub 70-100 cm. Flowers deep pink.					Cape Range - Charles Knife Road	TOPO	3	A.S. George	1326	30/08/1960
7482434	29715	*Eremophila forrestii subsp. capensis*	3	Perennial shrub 1 m high x 0.6 m wide. Flowers pink.	Ridge. Brown rocky soil.	Low shrubland.	2-5 plants.	Reproductive method: seed.	ca 4 km E of Osprey Bay	GPS	1	J. English	56	1/07/2006
7356080	29715	*Eremophila forrestii subsp. capensis*	3	Shrub to 1.4 m. Flowers pink.					Cape Range - road to Nos 3 & 4 Wells	TOPO	4	A.S. George	2460	2/06/1961
8527830	15032	*Eremophila occidens*	2	Erect open shrub, 1 m high x 0.5 m wide. Flowers purple.	Dune in rangeland with brown sand	Medium trees / tall shrubland.	6 - 20 plants.	Population structure: immature. Reproductive method: seeds.	150 m W of No. 2 Well car park. Top of Charles	TOPO	3	R.J. Dadd	39	3/08/2011
4057279	15032	*Eremophila occidens*	2	Shrub, several slender stems from base. Leaves light green - erect, on top 20-30 cm only. Flowers deep violet - white hairs in throat.	Extensive limestone on top of rang	Open heath, few Grevillea, Acacia, dominant spinif	rare.		Cape Range at No. 2 Oil Well, terminus of Cha	MAN	2	M.E. Ballingall	1858	9/08/1985
4048830	16040	*Eremophila youngii subsp. lepidota*	4	Straggly shrub, 2-2.5 m. Flowers red-pink; leaves narrow, lanceolate, grey.	Red soil.				56 km on Exmouth Road	AUTO	3	H. Demarz	11306	21/08/1986
7515529	16040	*Eremophila youngii subsp. lepidota*	4	Dense spreading shrub 1 - 3 m high, flowers red.	Firecracker Land System.				Bungarra Dam in Giralia Station S of Exmouth (	GPS	1	M. Maier, K. McCreery, B. Muir & R. Hughes	GIRBUNG - 07	19/06/2004
7515537	16040	*Eremophila youngii subsp. lepidota*	4	Dense spreading shrub 1 - 3 m high, flowers cream.	Firecracker Land System.				Bungarra Dam in Giralia Station S of Exmouth (	GPS	1	M. Maier, K. McCreery, B. Muir & R. Hughes	GIRBUNG - 08	19/06/2004
1764462	1972	*Grevillea calcicola*	3	Shrub 4 m; bark grey; flowers cream.	In limestone, at E edge of range.				Cape Range, ca 5 miles W of Learmonth	MAN	0	A.S. George	10265	5/09/1970
1764438	1972	*Grevillea calcicola*	3						5 miles S of Yardie Creek Station, E Cape Ran	AUTO	3	Y. Chadwick	1393	28/08/1964

1764446	1972	*Grevillea calcicola*	3						7 km from main road on Charles Knife Road	MAN	3	Y. Chadwick	1348	30/08/1964
1764411	1972	*Grevillea calcicola*	3	Several stemmed shrub to 3 m tall.	On limestone hilltops.				Cape Range, 3 miles S of Yardie Creek Homes	AUTO	3	A.S. George	6613	26/05/1965
1764403	1972	*Grevillea calcicola*	3	Tree 3 m high.					Learmonth	AUTO	3	D.W. Goodall	1168	12/07/1964
3358828	1972	*Grevillea calcicola*	3	Flowers creamy.					Cape Range National Park, Charles Knife Road	MAN	0	Hj. Eichler	22584	3/05/1977
1764470	1972	*Grevillea calcicola*	3						5 miles S of Yardie Creek Station	AUTO	3	Y. Chadwick	1393	28/08/1964
1764381	1972	*Grevillea calcicola*	3						Cape Range National Park, Milyering	AUTO	4	T. Tapper	77	20/08/1987
1574868	1972	*Grevillea calcicola*	3	Shrub 3-4 m high. Flowers cream.					Cape Range, N of Learmonth	MAN	3	A.S. George	1331	30/08/1960
1932438	1972	*Grevillea calcicola*	3	Shrub 3-4 m high with cream flowers.					Cape Range, N of Learmonth	MAN	3	A.S. George	1331	30/08/1960
1764454	1972	*Grevillea calcicola*	3	Tree; flowers cream.					Cape Range, North West Cape	MAN	0	J.M. Waldock	s.n.	26/09/1988
3701271	17327	*Harnieria kempeana subsp. rhadinophylla*	2						Cape Range National Park, Pilgramunup Gorge	AUTO	4	T. Tapper	64	1/08/1987
3701344	17327	*Harnieria kempeana subsp. rhadinophylla*	2	Straggling shrub 70 cm; flowers deep pink.					W of No. 2 oil well site, Cape Range	AUTO	4	A.S. George	6547	23/05/1965
4414039	17327	*Harnieria kempeana subsp. rhadinophylla*	2	Shrub 1 m; flowers deep pink.	Among limestone rocks, at base of				Cape Range, N of Charles Knife Road	MAN	4	A.S. George	1311	30/08/1960
4177878	17327	*Harnieria kempeana subsp. rhadinophylla*	2	Sprawling perennial shrub 60 cm tall and 1 x 0.5 m across (other individuals more erect). Three lower corolla lobes magenta, the centre one with raised, white, herringbone markings at its base. The upper two lobes fused except for small tips, also magent	On a gently sloping creek bank (the	Eucalyptus cf. hamersleyana mallee low open fores	the population had ca 20 individuals.	Another population was seen ca 700 m upstream.	North West Cape, ca 10 km S of the centre of	TOPO	3	M.E. Trudgen	12864	24/07/1995
7482531	17327	*Harnieria kempeana subsp. rhadinophylla*	2	Perennial shrub 0.8 m high x 0.8 m wide. Flowers pink - purple.	Watercourse. Brown sand, rocky.	Low shrubland.	2-5 plants.	Prefers shade and grows in damper areas.	Mandu Mandu Gorge, Cape Range National Pa	GPS	1	J. English	95	21/07/2006
3701328	17327	*Harnieria kempeana subsp. rhadinophylla*	2	Shrub 1 m; flowers deep pink.	Among limestone rocks, at base of				Cape Range, N of Charles Knife Road	AUTO	4	A.S. George	1311	30/08/1960
8755299	3020	*Lepidium biplicatum*	3	Tiny white flowers, purple green foliage/fruit?	Rocky ledge running approx north s	Low open Acacia bivenosa and Frankenia sp shrubl	rare.		Burnside Island Nature Reserve	GPS	1	N. Godfrey	NG 95/15	26/08/2015
8228256	1039	*Livistona alfredii*	4	Healthy, new fronds shooting from the centre - ca 15 fronds. Old fronds are persistent - 5 old fronds, 7 old flowering heads. Trunk colour is dark brown. Trunk from base 4930 mm. Width: Diameter at chest height (basal growth 1500 mm) = 540 mm.	Landform: limestone. Soil surface:	Buffel grass covering majority of the site, dead palr		Old seeds found at the base of adult palm - ca 20, 4 of these appear to be in good condition, 2 have been sent to Herbarium [on sheet], 2 left in Cape Range National Park for propagation.	Site 2, Exmouth Station	GPS	1	T. Gourlay, S. Owen & T. Coyle	SWO 11347	18/05/2009
1079611	1039	*Livistona alfredii*	4	Palm.	By dry creek bed.		one of only three, dying.		Cape Range, North West Cape	MAN	3	J.M. Waldock	s.n.	29/09/1988
1620061	4677	*Phyllanthus fuernrohrii*	3	Shrub c. 70 cm high, flowers green.	Along small creek bed.				14 miles S of Learmonth	AUTO	3	A.S. George	1275	29/08/1960
1620088	4677	*Phyllanthus fuernrohrii*	3						Cape Range, c. 1 miles S of Lighthouse	AUTO	4	A.S. George	2562	3/06/1961
1620096	4677	*Phyllanthus fuernrohrii*	3						3 km N of Pitgramunne Well, Cape Range	AUTO	4	D.W. Goodall	2261	27/05/1965
2908425	20862	*Rhynchosia bungarensis*	4	Shrub, 50 cm high. Flowers yellow.	Growing on rocks.				Yardie Creek	AUTO	3	K.M. Allan	446	6/09/1970

2908409	20862	*Rhynchosia bungarensis*	4	Perennial herb; flowers yellow with brown standard.	In limestone gully.				Yardie Creek	UNK	3	A.S. George	10297	6/09/1970
2908395	20862	*Rhynchosia bungarensis*	4	Shrub 50 cm, viscid-hirsute.	Among limestone rocks in gorge.				Yardie Creek	AUTO	3	A.S. George	6638	27/05/1965
7492375	2629	*Sclerolaena stylosa*	1	Prostrate perennial herb 10 cm high, flowers pale yellow.	In quadrat in light orange sandy cla	Acacia synchronicia tall open shrubland over Maire			Quadrat GIR-016, ca 10 km SW of homestead	GPS	1	K. McCreery	GIR 16-14	15/06/2004
1139428	4736	*Stackhousia umbellata*	3	A straggling perennial herb to 70 cm. Flowers yellow, scented.	In red sand over limestone.				Cape Range, near No. 2 Well	MAN	4	A.S. George	2585	4/06/1961
1139436	4736	*Stackhousia umbellata*	3	A straggling perennial herb to 70 cm. Flowers yellow, scented.	In red sand over limestone.				Cape Range, near No. 2 Well	MAN	4	A.S. George	2585	4/06/1961
1139444	4736	*Stackhousia umbellata*	3	A straggling perennial herb to 70 cm. Flowers yellow, scented.	In red sand over limestone.				Cape Range, near No. 2 Well	MAN	4	A.S. George	2585	4/06/1961
1118277	4736	*Stackhousia umbellata*	3						Cape Range - Charles Knife Road	MAN	3	A.S. George	1336	30/08/1960
4625870	4736	*Stackhousia umbellata*	3	Open twiggy shrub 30 cm high. Flowers yellow, in full flower.	Low limestone hill, skeletal sand ov	Grassland over heath. Triodia wiseana, Dampiera ir	abundant.		200 m S Mandu Mandu Gorge, Cape Range Na	MAN	0	G.J. Keighery	14410	15/08/1996
4872452	4736	*Stackhousia umbellata*	3						10.5 km along Charles Knife Road, S 640 M, C	AUTO	4	Y. Chadwick	s.n.	/09/1964
5072085	4736	*Stackhousia umbellata*	3	Scandent leafless shrub, climbing up through spinifex hummocks; flowers yellow, fragrant (but not sweet).	Stony creekline.	Acacia bivenosa, A. pyrifolia thicket over tall spinife			On Shothole Canyon Road 4.8 km W from junc	MAN	0	S.D. Hopper	5083	5/08/1986
2753510	4736	*Stackhousia umbellata*	3	Woody herb spreading from base, flowers yellow. Hypanthium and sepals 1.5-2 mm. Corolla tube 3-4 mm. Corolla lobes ovate - elliptic, acute. Sepals streaked red at apex. Up to 12 flowers per inflorescence. Leaves minute - scale like.	Limestone fossiliferous reef in brok	Hummock grassland with Ficus and Brachychiton d	occasional.		Cape Range National Park, range above Milyer	AUTO	4	S. Osborne	EL 14	12/07/1992
5072042	4736	*Stackhousia umbellata*	3	Spindly shrub to 80 cm; flowers golden yellow; often growing up through spinifex.	Open rocky S-facing slope.		few thousand plants.		Walk track in Mandu Mandu Gorge in Cape Ra	MAN	3	S.D. Hopper	5073	4/08/1986
5072069	4736	*Stackhousia umbellata*	3	Wispy shrub to 1 m tall; flowers bright yellow, fragrant.	Ridge line on scarp, pinkish brown	Growing up through spinifex.	scarce.		Cape Range National Park, ca 11 km N of Yard	MAN	0	S.D. Hopper	5076	4/08/1986
7708858	4736	*Stackhousia umbellata*	3	Perennial, proatrate, compact shrub 0.3 m high x 0.4 m wide. Flowers yellow. Spindly growth with leafless stems.	Breakaway in reserve. Brown rocky	Low shrubland and grassland with Spinifex.	2 - 5 plants.	Reproductive method; seeds.	Cape Range National Park. Half way up to top	GPS	1	J. English	JE 66	8/07/2006
6368093	4736	*Stackhousia umbellata*	3	Shrub 50 cm tall and 70 cm wide. Perennial, erect, open and growing out of spinifex. Yellow flowers with spherical head of 10-12 flowers.	Flood plain reserve. White sand.	Low trees. Spinifex.	21-50 plants. 100% flowering.	Also on Yardie Creek Road.	Near Exmouth. 12.5 km W of Murat Road on St	MAN	3	J.E. Wajon	491	21/07/2002
6008321	4736	*Stackhousia umbellata*	3	Shrub to 1 m high; flowers bright yellow and in a terminal umbel.	Near top of hill; heavy limestone.	Low shrubs including Dampiera incana, Grevillea va			2 km E of Yardie Creek Road along road into hi	MAN	3	A.P. Brown	305	4/08/1986
8150435	4736	*Stackhousia umbellata*	3	Sparse, branched, apparently leafless perennial, the stems emergent from Triodia hummocks. Flowers rich yellow.	Limestone range crest.	Low shrubland with Triodia.	infrequent.		Cape Range National Park -Crest of range (W	GPS	1	K.R.Thiele	3567	10/07/2008
7789769	4736	*Stackhousia umbellata*	3	Petals bright yellow.	Creek bed in canyon. Limestone ru				Shothole Canyon Road	TOPO	3	G. Perry	838	/08/1978
1118269	4736	*Stackhousia umbellata*	3	Clumped, leafless sub-shrub; flowers yellow.	On limestone.	Amongst spinifex (Triodia) under Acacia arida, A. p	common.		Pilgonaman Creek, 67 km from Exmouth on Yar	MAN	3	K.F. Kenneally	7307	26/07/1980
4896300	46053	*Tephrosia sp. North West Cape (G. Marsh 81)*	2	Small pea 200 mm high, orange flowers, greyish leaves, tomentose beneath.	White stones in brown loam.				About 300 m W of main road, 6 km S of Exmou	AUTO	3	G. Marsh	81	8/05/1996
8729344	46053	*Tephrosia sp. North West Cape (G. Marsh 81)*	2	Shrub, 0.2 m high x 0.7 m wide. Flowers maybe yellow or white.	Red / orange soil over limestone.				Yardie Terrace 2 Control	UNK	2	D. Sandow	s.n.	9/07/2015
4109449	17345	*Tinospora esiangkara*	2	Large liane, scrambling to 2 m tall over Acacia tetragonophylla, larger stems with brown flaky bark. Outer three sepals small, light green. Inner three sepals reflexed in open flowers, light green. Petals small, light green, five?. Stamens six, with ligh	Area of rocky (limestone) outcrop	Commicarpus australis, Enchylaena tomentosa, Evo			North West Cape, c. 10 km S of the centre of E	AUTO	3	M. Trudgen	MET 12865	24/07/1995
4109430	17345	*Tinospora esiangkara*	2	Creeper, climbing to 1.5 m tall.	Crest of a limestone ridge. Pebbly,	Scattered Eucalyptus hamersleyana over Melaleuc			Cape Range, c. 3 km W of the main road and 5	AUTO	3	M. Trudgen	12866	23/07/1995
6162681	17345	*Tinospora esiangkara*	2						Cape Range, Exmouth	MAN	3	W. Rogerson	300	/10/1966

8154228	17345	*Tinospora esiangkara*	2	Annual climbing compact twining climber 2.5 m high x 2 m wide. Flowers yellow.	Plain. Brown loam.	Low shrubland - grassland.	one only.		Cape Range National Park, Exmouth	GPS	1	J. English	JE 0265	11/08/2008
8762864	17345	*Tinospora esiangkara*	2	Climer, flowers light green.	Low lying clay/sand plain. Red san	Acacia xiphophylla, Acacia bivenosa, Acacia tetrag	three plants.		Learmonth RAAF Base, c. 2.7 km WNW of junc	GPS	1	J.M. Collins & S.A. Dalgleish	ELA 45	17/07/2015
8763275	17345	*Tinospora esiangkara*	2	Climer, flowers light green.	Low lying clay/sand plain. Red san	Acacia xiphophylla, Acacia bivenosa, Acacia tetrag	three plants.		Learmonth RAAF Base, c. 2.7 km WNW of junc	GPS	1	J.M. Collins & S.A. Dalgleish	ELA 45	17/07/2015
4109457	17345	*Tinospora esiangkara*	2	Large liane, scrambling to 2 m tall over Acacia tetragonophylla, larger stems with brown flaky bark. Outer three sepals small, light green. Inner three sepals reflexed in open flowers, light green. PEtals small, light green, five?. Stamens six, with ligh	Area of rocky (limestone) outcrop	Commicarpus australis, Enchylaena tomentosa, Evo			North West Cape, c. 10 km S of the centre of E	AUTO	3	M. Trudgen	MET 12865	24/07/1995
4055497	12457	*Verticordia serotina*	2	Low spreading shrub to 50 cm, flowers pink, largely in bud.	Red sand over limestone.	Banksia ashbyi open heath.		Abundance: uncommon in area.	Yardie Creek, Cape Range	MAN	0	G.J. Keighery & N. Gibson	273	23/08/1992
1624067	12457	*Verticordia serotina*	2	Spreading shrub 70 cm tall x 1.5 m broad; flowers deep pink.	On sand dune.	With shrubland.			Cape Range, SW of Learmonth	MAN	0	A.S. George	10285	5/09/1970
1399314	12457	*Verticordia serotina*	2	Shrub 1.5 m x to 1 m. Flowers deep vivid pink in centre, paler pink calyx lobes. Only 2 plants were found in bloom.	Red sandy soil.			Abundance: plant restricted to this area and only 2 were found in bloom, probably due to very little rainfall in area this year (July 21.5 mm, *	E of Sandy Bay, Cape Range National Park	AUTO	4	B. Taylor	1	27/09/1983

NatureMap
Mapping Western Australia's biodiversity

NatureMap Species Report

Created By Guest user on 28/06/2017

Kingdom Plantae
Current Names Only Yes
Core Datasets Only Yes
Method 'By Circle'
Centre 114° 06' 02" E,22° 17' 48" S
Buffer 10km

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
1.	3223	*Acacia arida*			
2.	3241	*Acacia bivenosa*			
3.	13500	*Acacia coriacea subsp. coriacea*			
4.	3356	*Acacia gregorii (Gregory's Wattle)*			
5.	3452	*Acacia murrayana (Sandplain Wattle)*			
6.	3506	*Acacia pyrifolia (Ranji Bush, Kandji)*			
7.	29015	*Acacia pyrifolia var. pyrifolia*			
8.	13078	*Acacia sclerosperma subsp. sclerosperma*			
9.	3549	*Acacia spathulifolia*			
10.	19456	*Acacia stellaticeps*			
11.	3577	*Acacia tetragonophylla (Kurara, Wakalpuka)*			
12.	3606	*Acacia xiphophylla*			
13.	6486	*Aegialitis annulata (Club Mangrove)*			
14.	2383	*Amyema preissii (Wireleaf Mistletoe)*			
15.	7822	*Angianthus acrohyalinus (Hook-leaf Angianthus)*			
16.	12063	*Aristida holathera var. holathera*			
17.	217	*Aristida nitidula (Flat-awned Threeawn)*			
18.	2456	*Atriplex elachophylla*			
19.	2463	*Atriplex isatidea (Coast Saltbush)*			
20.	2476	*Atriplex semilunaris (Annual Saltbush)*			
21.	6828	*Avicennia marina (White Mangrove)*			
22.	12714	*Brachychiton obtusilobus*		P4	
23.	35798	*Calothamnus borealis subsp. borealis*			
24.	7906	*Calotis plumulifera*			
25.	2976	*Capparis lasiantha (Split Jack, Balqarda)*			
26.	48291	*Capparis spinosa subsp. nummularia*			
27.	12073	*Cassytha aurea var. aurea*			
28.	11242	*Cassytha racemosa forma pilosa*			
29.	39680	*Ceriops australis*			
30.	47174	*Chrysocephalum apiculatum subsp. pilbarense*			
31.	17093	*Corymbia hamersleyana*			
32.	1286	*Corynotheca pungens*			
33.	3774	*Crotalaria cunninghamii (Green Birdflower, Bilbun)*			
34.	20179	*Crotalaria medicaginea var. neglecta*			
35.	7958	*Decazesia hecatocephala*			
36.	7164	*Dicladanthera forrestii*			
37.	2504	*Dysphania plantaginella*			
38.	357	*Enneapogon caerulescens (Limestone Grass)*			
39.	2513	*Eremophea spinosa*			
40.	16733	*Eremophila setacea*			
41.	23997	*Eremophila tietkensii*			
42.	4335	*Erodium cygnorum (Blue Heronsbill)*			
43.	5752	*Eucalyptus prominens*			
44.	15592	*Eucalyptus xerothermica*			
45.	35307	*Euphorbia australis var. australis*			
46.	42879	*Euphorbia trigonosperma*			
47.	10977	*Exocarpos aphyllus (Leafless Ballart)*			
48.	10765	*Exocarpos sparteus (Broom Ballart, Djuk)*			
49.	35558	*Flaveria trinervia (Speedy Weed)*	Y		
50.	5209	*Frankenia pauciflora (Seaheath)*			
51.	1972	*Grevillea calcicola*		P3	
52.	2096	*Grevillea stenobotrya*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
53.	2784	*Gyrostemon ramulosus (Corkybark)*			
54.	16897	*Hakea stenophylla subsp. stenophylla*			
55.	23464	*Haloragis gossei var. inflata*			
56.	6641	*Ipomoea yardiensis (Yardie Morning Glory)*			
57.	29056	*Jasminum sp. Exmouth (G. Marsh 77)*			
58.	4061	*Lotus cruentus (Redflower Lotus)*			
59.	4962	*Malvastrum americanum (Spiked Malvastrum)*	Y		
60.	5887	*Melaleuca cardiophylla (Tangling Melaleuca)*			
61.	8105	*Millotia myosotidifolia*			
62.	2364	*Olax aurantia*			
63.	42024	*Olearia sp. Kennedy Range (G. Byrne 66)*			
64.	34997	*Peripleura arida*			
65.	45696	*Phyllanthus hamelinii (Shark Bay Phyllanthus)*			
66.	18260	*Pileanthus septentrionalis*			
67.	17816	*Pluchea ferdinandi-muelleri*			
68.	8168	*Pluchea rubelliflora*			
69.	6491	*Plumbago zeylanica (Native Plumbago)*			
70.	8192	*Pterocaulon sphacelatum (Apple Bush, Fruit Salad Plant)*			
71.	41506	*Ptilotus gaudichaudii subsp. gaudichaudii*			
72.	2731	*Ptilotus helipteroides (Hairy Mulla Mulla)*			
73.	41001	*Ptilotus nobilis subsp. nobilis (Yellow Tails)*			
74.	2747	*Ptilotus obovatus (Cotton Bush)*			
75.	2766	*Ptilotus villosiflorus*			
76.	41063	*Quoya loxocarpa*			
77.	11240	*Rhagodia preissii subsp. obovata*			
78.	5295	*Rhizophora stylosa (Spotted-leaved Red Mangrove)*			
79.	13246	*Rhodanthe humboldtiana*			
80.	4191	*Rhynchosia minima (Rhynchosia)*			
81.	4706	*Sauropus crassifolius*			
82.	7643	*Scaevola sericophylla*			
83.	7644	*Scaevola spinescens (Currant Bush, Maroon)*			
84.	7648	*Scaevola tomentosa (Raggedleaf Fanflower)*			
85.	41646	*Schenkia clementii*			
86.	2628	*Sclerolaena recurvicuspis*			
87.	8213	*Senecio magnificus (Showy Groundsel)*			
88.	25883	*Senecio pinnatifolius var. pinnatifolius*			
89.	12280	*Senna artemisioides subsp. oligophylla*			
90.		*Sesbania sp.*			
91.	8223	*Sigesbeckia orientalis (Indian Weed)*	Y		
92.	3072	*Sisymbrium orientale (Indian Hedge Mustard)*	Y		
93.	8237	*Streptoglossa decurrens*			
94.	8238	*Streptoglossa liatroides*			
95.	3182	*Stylobasium spathulatum (Pebble Bush)*			
96.	2638	*Suaeda arbusculoides*			
97.	13592	*Swainsona calcicola*			
98.	4231	*Swainsona kingii*			
99.	4242	*Swainsona pterostylis*			
100.	17345	*Tinospora esiangkara*		P2	
101.	18072	*Tribulus suberosus*			
102.	679	*Triodia angusta*			
103.	704	*Triodia wiseana (Limestone Spinifex)*			
104.	706	*Triraphis mollis (Needle Grass)*			
105.	6081	*Verticordia forrestii (Forrest's Featherflower)*			
106.	4395	*Zygophyllum retivalve*			

Conservation Codes
T - Rare or likely to become extinct
X - Presumed extinct
IA - Protected under international agreement
S - Other specially protected fauna
1 - Priority 1
2 - Priority 2
3 - Priority 3
4 - Priority 4
5 - Priority 5

[1] For NatureMap's purposes, species flagged as endemic are those whose records are wholely contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

Australian Government
Department of the Environment and Energy

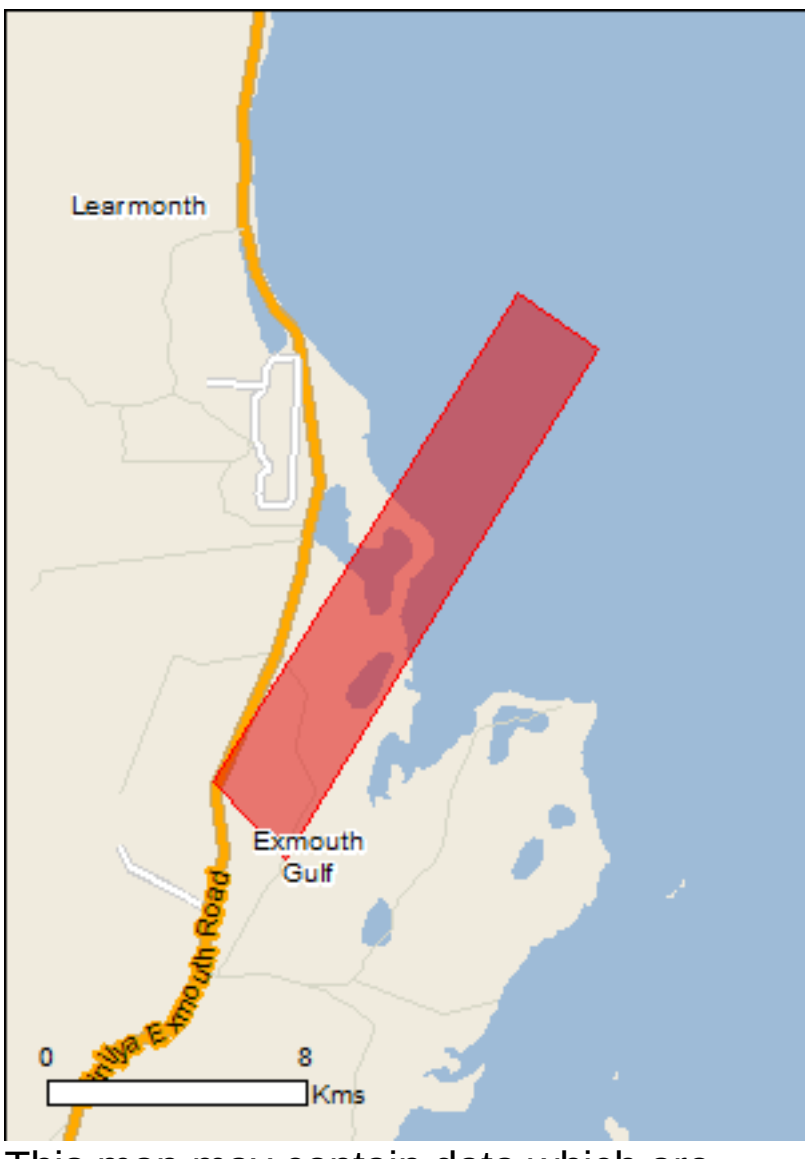
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 22/02/17 13:35:49



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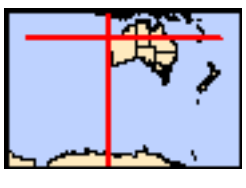

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	24
Listed Migratory Species:	33

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	2
Commonwealth Heritage Places:	None
Listed Marine Species:	64
Whales and Other Cetaceans:	12
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	10
Nationally Important Wetlands:	1
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Limosa lapponica baueri		
Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat may occur within area
Limosa lapponica menzbieri		
Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus		
Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat likely to occur within area
Pezoporus occidentalis		
Night Parrot [59350]	Endangered	Species or species habitat may occur within area
Sternula nereis nereis		
Australian Fairy Tern [82950]	Vulnerable	Breeding likely to occur within area
Thalassarche impavida		
Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Mammals		
Dasyurus hallucatus		
Northern Quoll, Digul [331]	Endangered	Species or species habitat likely to occur within area
Eubalaena australis		
Southern Right Whale [40]	Endangered	Species or species habitat may occur within area
Megaptera novaeangliae		
Humpback Whale [38]	Vulnerable	Congregation or aggregation known to occur within area
Petrogale lateralis lateralis		
Black-flanked Rock-wallaby, Mororong, Black-footed Rock Wallaby [66647]	Endangered	Species or species habitat known to occur within area
Rhinonicteris aurantia (Pilbara form)		
Pilbara Leaf-nosed Bat [82790]	Vulnerable	Species or species

Name	Status	Type of Presence
		habitat may occur within area
Reptiles		
Aipysurus apraefrontalis Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat likely to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Sharks		
Carcharias taurus (west coast population) Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat likely to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat likely to occur within area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Species or species habitat may occur within area
Migratory Marine Species		

Name	Threatened	Type of Presence
[Balaenoptera edeni](#) Bryde's Whale [35]		Species or species habitat may occur within area
[Carcharodon carcharias](#) White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat likely to occur within area
[Caretta caretta](#) Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
[Chelonia mydas](#) Green Turtle [1765]	Vulnerable	Breeding known to occur within area
[Dermochelys coriacea](#) Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
[Dugong dugon](#) Dugong [28]		Breeding known to occur within area
[Eretmochelys imbricata](#) Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
[Eubalaena australis](#) Southern Right Whale [40]	Endangered	Species or species habitat may occur within area
[Manta alfredi](#) Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat known to occur within area
[Manta birostris](#) Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat known to occur within area
[Megaptera novaeangliae](#) Humpback Whale [38]	Vulnerable	Congregation or aggregation known to occur within area
[Natator depressus](#) Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
[Orcinus orca](#) Killer Whale, Orca [46]		Species or species habitat may occur within area
[Pristis clavata](#) Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
[Pristis zijsron](#) Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
[Rhincodon typus](#) Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
[Sousa chinensis](#) Indo-Pacific Humpback Dolphin [50]		Species or species habitat may occur within area
[Tursiops aduncus (Arafura/Timor Sea populations)](#) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
[Hirundo rustica](#) Barn Swallow [662]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Migratory Wetlands Species		
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat may occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat likely to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Defence - EXMOUTH NAVAL HF RECEIVING STATION (H/F Receiving Station, Learmonth, WA)
Defence - LEARMONTH TRANSMITTING STATION

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat likely to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat likely to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area
Fish		
Bulbonaricus brauni Braun's Pughead Pipefish, Pug-headed Pipefish [66189]		Species or species habitat may occur within area
Campichthys tricarinatus Three-keel Pipefish [66192]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Choeroichthys brachysoma Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area
Choeroichthys suillus Pig-snouted Pipefish [66198]		Species or species habitat may occur within area
Doryrhamphus janssi Cleaner Pipefish, Janss' Pipefish [66212]		Species or species habitat may occur within area
Doryrhamphus negrosensis Flagtail Pipefish, Masthead Island Pipefish [66213]		Species or species habitat may occur within area
Festucalex scalaris Ladder Pipefish [66216]		Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area
Halicampus brocki Brock's Pipefish [66219]		Species or species habitat may occur within area
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area
Halicampus nitidus Glittering Pipefish [66224]		Species or species habitat may occur within area
Halicampus spinirostris Spiny-snout Pipefish [66225]		Species or species habitat may occur within area
Haliichthys taeniophorus Ribboned Pipehorse, Ribboned Seadragon [66226]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area
Hippocampus histrix Spiny Seahorse, Thorny Seahorse [66236]		Species or species habitat may occur within area
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area
Hippocampus trimaculatus Three-spot Seahorse, Low-crowned Seahorse, Flat-faced Seahorse [66720]		Species or species habitat may occur within area
Micrognathus micronotopterus Tidepool Pipefish [66255]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
Solenostomus paegnius Rough-snout Ghost Pipefish [68425]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Trachyrhamphus longirostris Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area
Mammals		
Dugong dugon Dugong [28]		Breeding known to occur within area
Reptiles		
Aipysurus apraefrontalis Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat likely to occur within area
Aipysurus duboisii Dubois' Seasnake [1116]		Species or species habitat may occur within area
Aipysurus eydouxii Spine-tailed Seasnake [1117]		Species or species habitat may occur within area
Aipysurus laevis Olive Seasnake [1120]		Species or species habitat may occur within area
Astrotia stokesii Stokes' Seasnake [1122]		Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Disteira kingii Spectacled Seasnake [1123]		Species or species habitat may occur within area
Disteira major Olive-headed Seasnake [1124]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Emydocephalus annulatus Turtle-headed Seasnake [1125]		Species or species habitat may occur within area
Ephalophis greyi North-western Mangrove Seasnake [1127]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Hydrophis elegans Elegant Seasnake [1104]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans [Resource Information]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat may occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Congregation or aggregation known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat may occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species

Name	Status	Type of Presence
		habitat may occur within area

Extra Information

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Mammals		
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Equus caballus Horse [5]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat likely to occur within area
Reptiles		
Hemidactylus frenatus Asian House Gecko [1708]		Species or species

Name	Status	Type of Presence
		habitat likely to occur within area

Nationally Important Wetlands [Resource Information]

Name	State
Cape Range Subterranean Waterways	WA

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-22.19801 114.155674,-22.212314 114.178334,-22.34384 114.091473,-22.32415 114.071217,-22.19801 114.155674,-22.19801 114.155674

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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APPENDIX D

Vegetation Condition Scale

Table 15: Vegetation Condition Scale (Environmental Protection Authority, 2016)

VEGETATION CONDITION	EREMAEAN AND NORTHERN BOTANICAL PROVINCES (TRUDGEN 1988)
Pristine	
Excellent	Pristine or nearly so, no obvious signs of damage caused by human activities since European settlement.
Very Good	Some relatively slight signs of damage caused by human activities since European settlement. For example, some signs of damage to tree trunks caused by repeated fire, the presence of some relatively non-aggressive weeds, or occasional vehicle tracks.
Good	More obvious signs of damage caused by human activity since European settlement, including some obvious impact on the vegetation structure such as that caused by low levels of grazing or slightly aggressive weeds.
Poor	Still retains basic vegetation structure or ability to regenerate it after very obvious impacts of human activities since European settlement, such as grazing, partial clearing, frequent fires or aggressive weeds.
Degraded	Severely impacted by grazing, very frequent fires, clearing or a combination of these activities. Scope for some regeneration but not to a state approaching good condition without intensive management. Usually with a number of weed species present including very aggressive species.
Completely Degraded	Areas that are completely or almost completely without native species in the structure of their vegetation; i.e. areas that are cleared or 'parkland cleared' with their flora comprising weed or crop species with isolated native trees or shrubs.

APPENDIX E

Vegetation Community Dendrogram

Group average

Resemblance: S17 Bray Curtis similarity

Similarity

0
20
40
60
80
100

PCS09
PCS13
Q10
Q11
PCS11
QE31
Q08
Q16
PCS14
PCS12
PCS15
PCS05
PCS03
PCS04
Q13
Q14
QE27
QE28
PCS07
Q04
PCS01
PCS02
QE25
Q19
Q09
Q12
Q03
PCS16
Q21
PCS10
Q20
PCS08
PCS17
Q15
Q17
QE29
QE30
Q01
Q06
Q02
Q05
QE26
Q22
PCS06
Q07
Q18

Samples

APPENDIX F

Flora Likelihood Assessment

Assessment of the Likely Occurrence of Priority Flora (as per DBCA and EPBC Database Searches) in the Survey Area

[1]Closest record to Survey Area based on DBCA 2017. High Likelihood = Suitable habitat present and/or records less than 20 km from the Survey Area, Medium Likelihood = Suitable habitat present and/or records between 20 km and 35 km from the Survey Area, and Low Likelihood = No suitable habitat present and/or records greater than 35 km from the Survey Area. En = Listed as Endangered under the EBPC Act, Vu = Listed as Vulnerable under the EBPC, Ce= Critically Endangered under the EBPC Act, P = Listed as Priority by the DBCA DRF = Declared Rare Flora as listed by the State. Revised Likelihood of Occurrence post field survey; based on knowledge of habitat within the Survey Area and knowledge gained from the extensive survey effort during the Targeted Survey.

Source	Conservation Status		Species	Habitat information	Distance to nearest Record	Species specifics	Suitable Habitat present	Likelihood of occurrence in the Survey area	Revised Likelihood of occurrence post field trip
	EPBC	DBCA							
DBCA	-	P1	*Cyperus victoriensis*	Along creeks.	88 km	-	No	Low	Low
DBCA	-	P1	*Sclerolaena stylosa*	Orange sandy clay. With Tecticornia indica and Atriplex.	35 km	Perennial shrub/herb to 0.5m. Known to flower in June	Yes	Medium	Low
DBCA	-	P2	*Abutilon* sp. Quobba	Brown clayey sand.	Unknown exactly but recorded in Cape Range National Park, Beagle Hill, Peron Peninsula and Dorre Island	-	No	Low	Low
DBCA	-	P2	*Acacia ryaniana*	White or red sand, coastal sand dunes, flats	26 km	Prostrate spinescent shrub to 0.4m high. Flowering Jun to Nov	Yes	Medium	Low
DBCA	-	P2	*Acanthocarpus rupestris*	Red sand, rocky limestone, creeks	29 km	Perennial herb to 0.5m. Flowers May to June	Yes	Medium	Low
DBCA	-	P2	*Crinum flaccidum*	Loam, clay, sandstone. Swamps, creeks.	22 km	-	No	Low	Low
DBCA	-	P2	*Daviesia pleurophylla*	Sand dunes, tops of dunes with A. coriacea, G. stenobotrya	21 km	Perennial shrub to 0.7m. Known to flower in Jan, Oct, Jun, Sept, and Aug	Yes	Medium	Low
DBCA	-	P2	*Eremophila occidens*	Orange/brown sand. Limestone ranges, dunes.	30 km	-	No	Low	Low
DBCA	-	P2	*Harnieria kempeana* subsp.	Calcareous loam. Amongst limestone rocks, creek	32 km		No	Low	Low

Source	Conservation Status		Species	Habitat information	Distance to nearest Record	Species specifics	Suitable Habitat present	Likelihood of occurrence in the Survey area	Revised Likelihood of occurrence post field trip
	EPBC	DBCA							
			rhadinophylla	banks.					
DBCA	-	P2	*Tephrosia* sp. North West Cape	Red/brown soil, over limestone, white stones.	Exmouth	Low perennial shrub to 0.3m high. Known to flower in May, Jul, Oct	Yes	Medium	Low
DBCA	-	P2	*Tinospora esiangkara*	Pebbly orange-brown calcareous loam. Limestone outcrops or ridges, near creek bank.	17 km	-	No	Low	Low
DBCA	-	P2	*Verticordia serotina*	Red sand. Sand dunes.	22 km	Perennial shrub to 1.5m high. Flowers Aug – Sept.	Yes	Medium	Low
DBCA	-	P3	*Acacia alexandri*	Limestone. Stony creeks, steep rocky slopes.	16 km	-	No	Low	Low
DBCA	-	P3	*Acacia startii*	Calcareous loam with limestone pebbles. Stony hills and water courses.	15 km	-	No	Low	Low
DBCA	-	P3	*Carpobrotus* sp. Thevenard Island	Coarse white sand. Dune tops, disturbed areas.	Unknown	-	No	Low	Low
DBCA	-	P3	*Corchorus congener*	Sand, red sandy loam with limestone. Sand dunes, plains.	6 km	-	Yes	Recorded in Survey Area	-
DBCA	-	P3	*Dysphania congestiflora*	Saline flood plain.	120 km	-	Yes	Low	Low
DBCA	-	P3	*Eremophila forrestii* subsp. *capensis*	Brown rocky soils, limestone. Ridges.	26 km	-	No	Low	Low
DBCA	-	P3	*Grevillea calcicola*	Limestone hilltops.	12 km	-	No	Low	Low
DBCA	-	P3	*Lepidium biplicatum*	Coastal regions.	70 km	-	Yes	Low	Low

Source	Conservation Status		Species	Habitat information	Distance to nearest Record	Species specifics	Suitable Habitat present	Likelihood of occurrence in the Survey area	Revised Likelihood of occurrence post field trip
	EPBC	DBCA							
DBCA	-	P3	*Phyllanthus fuernrohrii*	Sand over Limestone, creek beds, limestone cliffs	6 km	Perennial shrub. Flowers in Feb, May, Jun, Jul, Aug, Sept	Yes	High	Low
DBCA	-	P3	*Stackhousia umbellata*	Sandy soils on limestone.	25 km	-	No	Low	Low
DBCA	-	P4	*Brachychiton obtusilobus*	Skeletal soils. Rocky limestone ranges, gorges, occasionally sandplains.	3 km, Cape range National Park	-	No	Low	Low
DBCA	-	P4	*Eremophila youngii* subsp. *lepidota*	Stony red sandy loam. Flat plains, floodplains, sometimes semi-saline, clay flats.	39 km	-	Yes	Low	Low
DBCA	-	P4	*Livistona alfredii*	Edges of permanent pools.	17 km	-	No	Low	Low
DBCA	-	P4	*Rhynchosia bungarensis*	Pebbly, shingly coarse sand amongst boulders. Banks of flow line in the mouth of a gully in a valley wall.	17 km	-	No	Low	Low

APPENDIX G

Flora Inventory

Family	Name	Notes
Amaranthaceae	*Aerva javanica	
	Achyranthes aspera	
	*Chenopodium murale	range extension, submitted to the WA herbarium
	Ptilotus obovatus	
	Ptilotus villosiflorus	
Asparagaceae	Acanthocarpus verticillatus	
Asteraceae	*Bidens subalternans var. simulans	
	Chrysocephalum apiculatum subsp. pilbarense	
	Decazesia hecatocephala	
	Olearia sp. Kennedy Range (G. Byrne 66)	
	Peripleura arida	
	Pluchea ferdinandi-muelleri	
	Pterocaulon sphacelatum	
	Roebuckiella oncocarpa	
	*Sonchus oleraceus	
Boraginaceae	Heliotropium crispatum	
	Heliotropium glanduliferum	
	Heliotropium pachyphyllum	
Brassicaceae	*Sisymbrium orientale	
Capparaceae	Capparis spinosa subsp. nummularia	
Chenopodiaceae	Dysphania plantaginella	
	Dysphania melanocarpa forma leucocarpa	
	Enchylaena tomentosa	
	Maireana lanosa	range extension, submitted to the WA herbarium
	Rhagodia preissii subsp. obovata	
	Salsola australis	
	Tecticornia ? indica	no seeds
	Tecticornia ? pruinosa	no seeds
	Tecticornia ? pterygosperma subsp. denticulata	no seeds
	Threlkeldia diffusa	
Cleomaceae	Cleome viscosa	
Colchicaceae	Wurmbea odorata	
Convolvulaceae	Convolvulaceae sp.	sterile
	Duperreya commixta	
	Evolvulus alsinoides var. villosicalyx	
	Ipomoea costata	
Cucurbitaceae	Cucumis variabilis	range extension, submitted to the WA herbarium
Cyperaceae	Cyperus bulbosus	range extension, submitted to the WA herbarium
Euphorbiaceae	Adriana tomentosa var. tomentosa	
	Euphorbia australis	
	Euphorbia drummondii	
	Euphorbia tannensis subsp. eremophila	
Fabaceae	Acacia bivenosa	
	Acacia coriacea subsp. coriacea	
	Acacia gregorii	

Family	Name	Notes
	Acacia pyrifolia	
	Acacia sclerosperma subsp. sclerosperma	
	Acacia sericophylla	
	Acacia stellaticeps	
	Acacia synchronicia	
	Acacia tetragonocarpa	
	Cullen lachnostachys	
	Indigofera chamaeclada subsp. pubens	range extension, submitted to the WA herbarium
	Indigofera trita	range extension, submitted to the WA herbarium
	Isotropis atropurpurea	
	Labichea cassioides	
	Lotus australis	range extension, submitted to the WA herbarium
	Rhynchosia minima	
	Senna artemisioides subsp. helmsii x oligophylla	
	Senna artemisioides subsp. oligophylla	
	Senna glutinosa	
	Senna notabilis	
	Senna glutinosa subsp. chatelainiana	
	Swainsona pterostylis	
	Tephrosia uniovulata	range extension, submitted to the WA herbarium
	**Vachellia farnesiana*	
Frankeniaceae	*Frankenia pauciflora*	
Geraniaceae	*Erodium cygnorum*	
Goodeniaceae	*Dampiera incana var. incana*	
	Goodenia forrestii	
	Goodenia microptera	
	Goodenia tenuiloba	
	Lechenaultia subcymosa	
	Scaevola cunninghamii	
	Scaevola sericophylla	
	Scaevola spinescens	
	Scaevola tomentosa	
Hemerocallidaceae	*Corynotheca micrantha*	range extension, submitted to the WA herbarium
Lamiaceae	*Clerodendrum tomentosum var. lanceolatum*	range extension, submitted to the WA herbarium
	Quoya loxocarpa	
Lauraceae	*Cassytha aurea var. aurea*	
Loranthaceae	*Amyema preissii*	
Malvaceae	*Abutilon cunninghamii*	
	Corchorus ? congener	collection from 2018 field survey, can't confirm due to no fruits however is most likely *C. congener.* Submitted to the WA Herbarium
	Corchorus congener (P3)	Submitted to the WA Herbarium
	Corchorus crozophorifolius	
	Hannafordia quadrivalvis subsp. recurva	

Family	Name	Notes
	Hibiscus sturtii var. platychlamys	range extension, submitted to the WA herbarium
	Sida rohlenae subsp. rohlenae	
Myrtaceae	*Calytrix sp. new species*	Potentially new species within the Calytrix strigosa group. Found outside but near the Survey Area. Has been submitted to the WA herbarium
	Corymbia hamersleyana	
	Eucalyptus victrix	
	Melaleuca cardiophylla	
	Pileanthus septentrionalis	
Nyctaginaceae	*Commicarpus australis*	
	Phyllanthus hamelinii	
Plantaginaceae	*Stemodia grossa*	
	Stemodia sp. Onslow (A.A. Mitchell 76/148)	
Plumbaginaceae	*Muellerolimon salicorniaceum*	
Poaceae	**Cenchrus ciliaris*	
	Chrysopogon fallax	
	Eragrostis eriopoda	
	Eragrostis falcata	
	Eriachne obtusa	
	Eriachne mucronata	
	Spinifex longifolius	
	Triodia ?wiseana	sterile
	Triodia epactia	
	Triodia schinzii	
Proteaceae	*Hakea stenophylla*	
Santalaceae	*Exocarpos aphyllus*	
	Santalum lanceolatum	
Sapindaceae	*Alectryon oleifolius subsp. oleifolius*	
	Diplopeltis intermedia var. intermedia	
	Diplopeltis eriocarpa	
Scrophulariaceae	*Eremophila longifolia*	
	Eremophila maculata subsp. brevifolia	
	Eremophila setacea	
Solanaceae	*Nicotiana occidentalis subsp. occidentalis*	
	Solanum lasiophyllum	
	**Solanum nigrum*	
	Solanum cleistogamum	
Surianaceae	*Stylobasium spathulatum*	
Thymelaeaceae	*Pimelea ammocharis*	range extension, submitted to the WA herbarium
	Pimelea microcephala subsp. microcephala	
Zygophyllaceae	*Tribulus occidentalis*	

APPENDIX H

Flora Species Matrix

NAME	PCS01	PCS02	PCS03	PCS04	PCS05	PCS06	PCS07	PCS08	PCS09	PCS10	PCS11	PCS12	PCS13	PCS14	PCS15	PCS16	PCS17	QE25	QE26	QE27	QE28	QE29	QE30	QE31	SUBQ01	SUBQ02	SUBQ03	SUBQ04	SUBQ05	SUBQ06	SUBQ07	SUBQ08	SUBQ09	SUBQ10	SUBQ11	SUBQ12	SUBQ13	SUBQ14	SUBQ15	SUBQ16	SUBQ17	SUBQ18	SUBQ19	SUBQ20	SUBQ21	SUBQ22
Convolvulaceae sp.										1																																			
Cassytha aurea var. aurea						1		1						1			1		1						1	1			1	1																1
Wurmbea adorata	1					1		1									1																												
Acanthocarpus verticillatus		1				1	1	1								1			1					1	1			1	1		1									1					1
Corynotheca micrantha		1				1	1									1	1																											
Cyperus bulbosus						1		1	1			1				1																													
Cenchrus ciliaris	1	1	1	1	1		1	1		1	1	1	1	1	1	1	1	1			1							1				1	1			1	1		1	1	1		
Chrysopogon fallax																1	1																											
Eragrostis eriopoda																																												1	
Eragrostis falcata													1																															
Eriachne obtusa						1		1		1						1	1		1			1			1	1	1		1	1	1		1							1	1	1		1	1
Eriachne mucronata		1												1																														
Spinifex longifolius			1	1	1																																1	1						
Triodia epactia	1	1	1	1	1	1	1	1		1		1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1
Triodia ?wiseana					1																																							
Hakea stenophylla																						1	1							1															
Tribulus occidentalis			1	1																																								
Indigofera chamaeclada subsp. pubens						1		1								1	1																												
Cullen lachnostachys										1						1		1							1	1							1			1						1	1	1	
Indigofera chamaeclada																										1	1			1	1									1	1			1	
Labichea cassioides																														1															
Lotus australis		1												1	1																														
Rhynchosia minima							1							1		1								1			1			1											1	1			
Senna glutinosa subsp. chatelainiana						1																																							
Swainsona pterostylis												1		1																															
Tephrosia uniovulata																1									1																				
Acacia bivenosa					1										1																					1	1	1	1		1				
Acacia coriacea subsp. coriacea	1		1	1	1		1			1	1					1		1								1	1			1			1			1	1					1	1	1	
Acacia gregorii		1				1	1									1			1			1	1		1	1			1	1	1										1	1			1
Acacia pyrifolia											1																																		
Acacia sclerosperma subsp. sclerosperma							1	1																		1	1																1			
Acacia sericophylla																1	1																												
Acacia stellaticeps			1	1	1															1	1		1							1				1						1				
Acacia synchronicia												1			1										1																				
Acacia tetragonophylla							1			1						1										1										1							1	1		
Senna artemisioides subsp. helmsii x oligophylla																1																												
Senna artemisioides subsp. oligophylla																		1																			1						1			
Stylobasium spathulatum																																												1		
Cucumis variabilis																																											1		
Adriana tomentosa var. tomentosa					1																																								
Euphorbia australis	1	1																																											
Euphorbia drummondii																													1																
Euphorbia tannensis subsp. eremophila					1																																								
Phyllanthus hamelinii	1	1								1						1	1									1	1	1																1	1	1
Erodium cygnorum							1			1	1																																		
Corymbia hamersleyana										1	1							1																												
Eucalyptus victrix												1													1																				
Melaleuca cardiophylla						1																	1	1							1														1
Pileanthus septentrionalis	1	1																1		1	1	1			1	1			1															1	
Alectryon oleifolius subsp. oleifolius	1																				1																								
Diplopeltis eriocarpa	1	1					1																																						
Diplopeltis intermedia var. intermedia																			1			1				1																			1
Abutilon cunninghamii																	1	1				1						1															1		
Corchorus congener	1	1				1	1	1		1				1		1	1	1			1					1	1	1	1		1			1			1			1		1	1	1	1
Corchorus crozophorifolius											1																																		
Hannafordia quadrivalvis subsp. recurva																										1	1	1																	
Hibiscus sturtii var. platychlamys							1																																						
Sida rohlenae subsp. rohlenae							1			1							1																											1		
Pimelea ammocharis							1																																						
Pimelea microcephala subsp. microcephala							1																																						
Capparis spinosa var. nummularia											1																																		
Sisymbrium orientale											1																																		
Exocarpos aphyllus							1																																						
Santalum lanceolatum																			1																										
Frankenia pauciflora									1				1																			1			1	1									
Muellerolimon salicorniaceum																																			1	1									
Achyranthes aspera											1																																		
Aerva javanica			1	1														1																				1							
Ptilotus obovatus																									1				1																
Ptilotus villosiflorus			1	1	1																																								
Chenopodium murale											1																																		
Dysphania melanocarpa forma leucocarpa	1	1				1	1	1		1		1		1	1	1	1																												
Dysphania plantaginella	1		1																																										
Enchylaena tomentosa							1																																						
Maireana lanosa						1																															1								
Rhagodia preissii subsp. obovata			1	1	1																																							
Salsola australis				1	1																																1	1							
Tecticornia ?pterygosperma									1																																				
Tecticornia ?pruinosa									1																																				
Tecticornia s?pterygosperma subsp. denticulata													1																						1	1									
Threlkeldia diffusa			1	1	1																																								
Commicarpus australis				1																																									
Heliotropium crispatum					1												1																												
Heliotropium glanduliferum																1						1																							1	
Duperreya commixta																	1																												
Evolvulus alsinoides var. villosicalyx	1																																												
Ipomoea costata																																		1											
Nicotiana occidentalis subsp. occidentalis	1		1					1		1				1	1	1	1																												
Solanum cleistogamum					1																																								
Solanum lasiophyllum	1	1			1	1	1	1		1	1					1	1	1							1	1		1	1	1				1			1			1		1			
Solanum nigrum											1																																		
Stemodia grossa												1		1	1																														
Stemodia sp. Onslow (A.A. Mitchell 76/148)																									1																				
Eremophila setacea																	1				1																								
Quoya loxocarpa																				1																									
Clerodendrum tomentosum										1																																			
Dampiera incana var. incana						1											1												1	1	1												1	1	1	
Goodenia forrestii															1																														
Goodenia tenuiloba																													1																
Lechenaultia subcymosa						1																																							
Scaevola cunninghamii						1																1	1																						
Scaevola sericophylla	1		1	1	1														1	1		1	1							1				1			1	1					1		
Scaevola spinescens							1																																						
Olearia sp. Kennedy Range (G. Byrne 66)								1									1																		1									
Bidens subalternans var. simulans											1																																		
Chrysocephalum apiculatum																								1																					
Decazesia hecatocephala	1						1		1			1	1	1																															
Peripleura arida																															1										1				
Pluchea ferdinandi-muelleri														1									1								1										1	1			
Pterocaulon sphacelatum								1																	1									1			1								
Sonchus oleraceus										1	1																																		

APPENDIX I

Flora Site Sheets

Site PCS01
Described by SF
Date 31/07/2018
Type Q 20 x 20m
Location Learmonth
MGA Zone 50
198490 **mE** 7525463 **mN**
Habitat Sand dune top and side
Soil Orange sand
Rock Type n/a
Vegetation AsSs
Veg Condition Good
Fire Age > 5 years
Notes
Disturbance; grazing by sheep, weeds
Total PFC 70%
Bare ground 20%
Leaf litter 10%
Logs 0%

SPECIES LIST:

Name	Cover (%)	Height (m)	Notes
Acacia coriacea subsp. *coriacea*	0	1.6	
Alectryon oleifolius subsp. *oleifolius*	0.1	1.2	
*Cenchrus ciliaris**	7	0.5	
Corchorus congener	0.1	0.1	P3
Decazesia hecatocephala	1	0.1	
Diplopeltis eriocarpa	0.5	0.3	
Dysphania melanocarpa forma *leucocarpa*	0.1	0.05	
Dysphania plantaginella	0.1	0.05	
Euphorbia australis	0.1	0.01	
Evolvulus alsinoides var. *villosicalyx*	0.1	0.1	
Nicotiana occidentalis subsp. *occidentalis*	1	0.1	
Phyllanthus hamelinii	0.1	1	
Pileanthus septentrionalis	15	0.5	
Scaevola sericophylla	5	1	
Solanum lasiophyllum	0.5	0.2	
Triodia epactia	45	0.5	
Wurmbea odorata	0.1	0.1	

Site PCS02
Described by SF
Date 31/07/2018
Type Q 20 x 20m
Location Learmonth
MGA Zone 50
198262 **mE** 7526272 **mN**
Habitat in between sand dunes
Soil orange sand, medium clay
Rock Type n/a
Vegetation AgTe
Veg Condition very good
Fire Age > 5 years
Notes
Disturbance; sheep grazing
Total PFC 70%
Bare ground 20%
Leaf litter 8%
Logs 0%

SPECIES LIST:

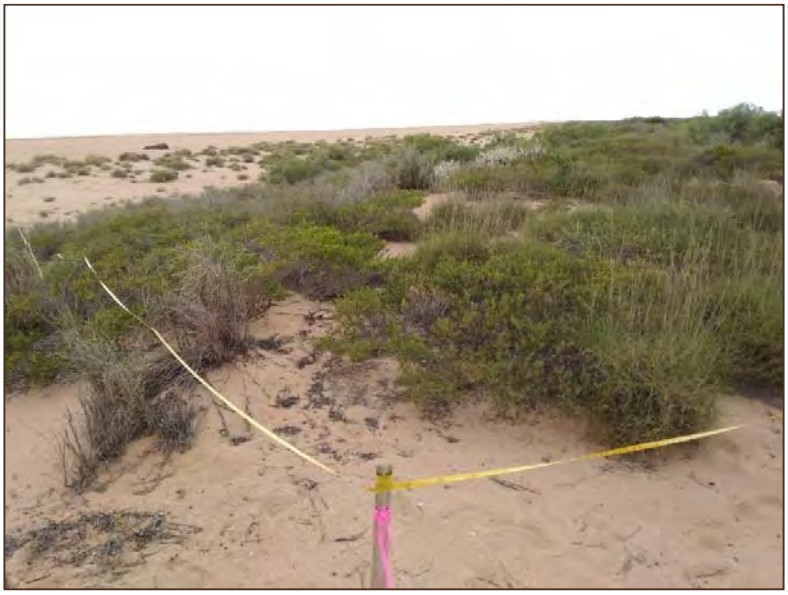
Name	Cover (%)	Height (m)	Notes
Acacia gregorii	8	0.5	
Acanthocarpus verticillatus	0.5	0.5	
*Cenchrus ciliaris**	0.1	0.3	
Corchorus congener	0.1	0.4	P3
Corynotheca micrantha	0.1	0.2	
Diplopeltis eriocarpa	1	0.2	
Dysphania melanocarpa forma *leucocarpa*	0.1	0.01	
Eriachne obtusa	0.2	0.3	
Euphorbia australis	0.1	0.01	
Lotus australis	0.1	0.01	
Phyllanthus hamelinii	0.1	0.4	
Pileanthus septentrionalis	3	0.8	
Solanum lasiophyllum	0.1	0.5	
Triodia epactia	60	0.5	

Site PCS03
Described by SF
Date 1/08/2018
Type Q 20 x 20m
Location Learmonth
MGA Zone 50
203084 **mE** 753630 **mN**
Habitat Coastal sand dune
Soil light brown sand
Rock Type limestone
Vegetation AbAc
Veg Condition Very Good
Fire Age > 5 years
Notes
Total PFC; 65%
Bare ground 25%
Leaf litter 10%
Logs 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia coriacea subsp. *coriacea*	0.1	0.05
Acacia stellaticeps	10	0.6
*Aerva javanica**	0.1	0.4
*Cenchrus ciliaris**	0.1	0.1
Dysphania plantaginella	0.1	0.05
Nicotiana occidentalis subsp. *occidentalis*	0.1	0.1
Ptilotus villosiflorus	1	0.1
Rhagodia preissii subsp. *obovata*	0.1	0.6
Scaevola sericophylla	8	0.5
Spinifex longifolius	10	0.1
Threlkeldia diffusa	0.1	0.5
Tribulus occidentalis	10	1
Triodia epactia	20	0.5

Site PCS04
Described by SF
Date 1/08/2018
Type Q 20 x 20m
Location Learmonth
MGA Zone 50
203084 **mE** 7536300 **mN**
Habitat coastal sand dune
Soil light brown sand
Rock Type limestone
Vegetation AbAc
Veg Condition Good
Fire Age > 5 years
Notes
Disturbance; weeds
Total PFC 55%
Bare ground 30%
Leaf litter 15%
Logs 0%



SPECIES LIST:

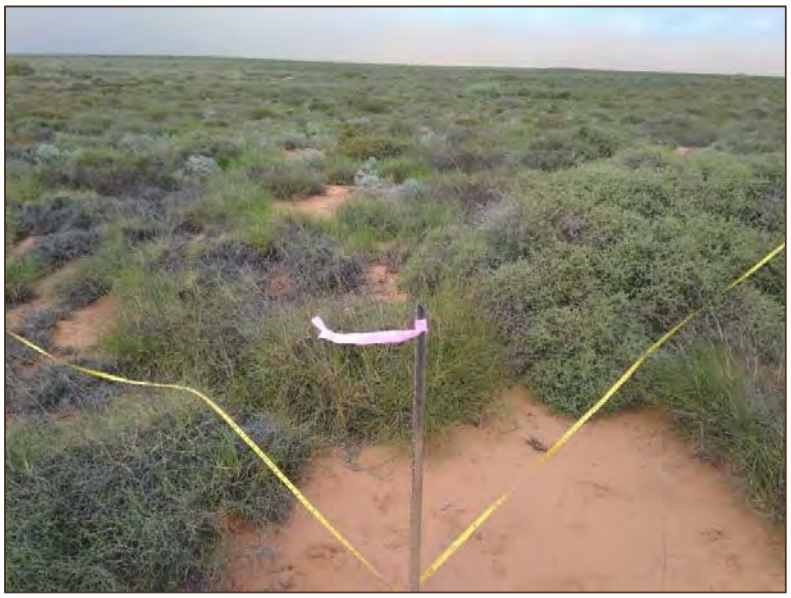
Name	Cover (%)	Height (m)
Acacia coriacea subsp. *coriacea*	2	2.2
Acacia stellaticeps	15	0.6
*Aerva javanica**	2	1
*Cenchrus ciliaris**	0.1	0.1
Commicarpus australis	0.1	0.3
Ptilotus villosiflorus	0.1	0.01
Rhagodia preissii subsp. *obovata*	1	0.6
Salsola australis	0.1	0.1
Scaevola sericophylla	0.5	0.6
Spinifex longifolius	15	1.1
Threlkeldia diffusa	1	0.6
Tribulus occidentalis	0.1	0.6
Triodia epactia	10	0.5

Site PCS05
Described by SF
Date 1/08/2018
Type Q 20 x 20m
Location Learmonth
MGA Zone 50
204090 **mE** 7535743 **mN**
Habitat Coastal sand dune
Soil light brown sand
Rock Type limestone
Vegetation AbAc
Veg Condition Poor
Fire Age > 5 years
Notes
Disturbance grazing by sheep, vehicle tracks, weeds
Total PFC 35%
Bare ground 55%
Leaf litter 10%
Logs 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia bivenosa	1	1
Acacia coriacea subsp. *coriacea*	2	1.8
Acacia stellaticeps	2	0.4
Adriana tomentosa var. *tomentosa*	0.1	1.5
*Cenchrus ciliaris**	0.1	0.1
Euphorbia tannensis subsp. *eremophila*	0.1	0.2
Heliotropium crispatum	0.1	0.4
Ptilotus villosiflorus	0.1	0.1
Rhagodia preissii subsp. *obovata*	0.1	0.4
Salsola australis	0.1	0.2
Scaevola sericophylla	3	0.5
Solanum cleistogamum	0.1	0.1
Solanum lasiophyllum	1	0.5
Spinifex longifolius	5	1.2
Threlkeldia diffusa	0.1	0.4
Triodia ?wiseana	0.1	0.1
Triodia epactia	4	0.5

Site PCS06
Described by SF
Date 1/08/2018
Type Q 20 x 20m
Location Learmonth
MGA Zone 50
202197 **mE** 7533865 **mN**
Habitat Plain
Soil orange sand
Rock Type limestone
Vegetation McTe
Veg Condition Very Good
Fire Age > 5 years
Notes
Disturbance; grazing by sheep
Total PFC 75%
Bare ground 15%
Leaf litter 10%
Logs 0%



SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia gregorii	10	0.5
Acanthocarpus verticillatus	0.5	0.6
Cassytha aurea var. *aurea*	0.1	c
Corchorus congener	1	0.6
Corynotheca micrantha	0.1	0.2
Cyperus bulbosus	0.1	0.01
Dampiera incana var. *incana*	3	0.6
Dysphania melanocarpa forma *leucocarpa*	0.1	0.01
Eriachne obtusa	7	0.3
Indigofera chamaeclada subsp. *pubens*	0.2	0.1
Lechenaultia subcymosa	0.1	0.1
Maireana lanosa	0.5	0.5
Melaleuca cardiophylla	10	1.1
Scaevola cunninghamii	5	0.5
Senna glutinosa subsp. *chatelainiana*	0.1	0.5
Solanum lasiophyllum	0.1	0.2
Triodia epactia	35	0.5
Wurmbea odorata	0.1	0.05

Site PCS07
Described by SF
Date 1/08/2018
Type Q
Location Learmonth
MGA Zone 50
199457 **mE** 7532132 **mN**
Habitat Plain
Soil orange soft clay
Rock Type
Vegetation AcAt
Veg Condition Good
Fire Age > 5 years
Notes
Disturbance; grazing by sheep, weeds
Total PFC 80%
Bare ground 10%
Leaf litter 10%
Logs 0%

SPECIES LIST:

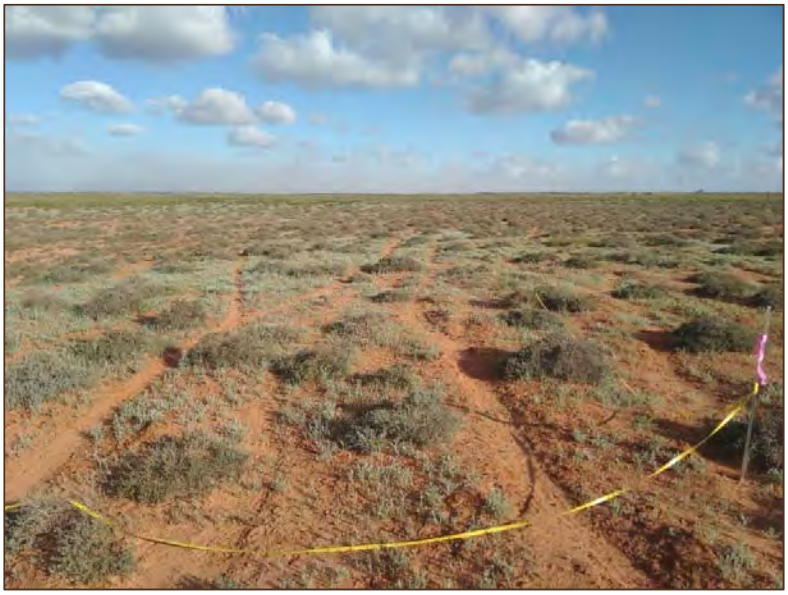
Name	Cover (%)	Height (m)	Notes
Acacia coriacea subsp. *coriacea*	1.5	2	
Acacia gregorii	0.1	0.3	
Acacia sclerosperma subsp. *sclerosperma*	1	0.6	
Acacia tetragonophylla	2	2	
Acanthocarpus verticillatus	0.1	0.5	
*Cenchrus ciliaris**	1	0.2	
Corchorus congener	0.5	0.2	P3
Corynotheca micrantha	0.1	0.2	
Decazesia hecatocephala	0.1	0.05	
Diplopeltis eriocarpa	1	0.5	
Dysphania melanocarpa forma *leucocarpa*	0.1	0.01	
Enchylaena tomentosa	0.2	0.1	
Erodium cygnorum	0.1	0.1	
Exocarpos aphyllus	0.5	1.5	
Pimelea ammocharis	0.1	0.6	
Pimelea microcephala subsp. *microcephala*	0.1	1	
Rhynchosia minima	0.1	0.05	
Scaevola spinescens	0.5	1.3	
Sida rohlenae subsp. *rohlenae*	0.1	0.6	
Solanum lasiophyllum	1	1	
Triodia epactia	75	0.5	

Site PCS08
Described by SF
Date 1/08/2018
Type Q 20 x 20m
Location Learmonth
MGA Zone 50
198992 **mE** 7531950 **mN**
Habitat undulating plain
Soil orange sand, loam
Rock Type
Vegetation AsTe
Veg Condition Good
Fire Age > 5 years
Notes
Disturbance, grazing by sheep, weeds
Total PFC 60%
Bare ground 25%
Leaf litter 10%
Logs 0%

SPECIES LIST:

Name	Cover (%)	Height (m)	Notes
Acacia sclerosperma subsp. *sclerosperma*	20	1.2	
Acanthocarpus verticillatus	0.1	1.2	
Cassytha aurea var. *aurea*	0.1	c	
*Cenchrus ciliaris**	15	0.2	
Corchorus congener	1	0.5	P3
Cyperus bulbosus	0.1	0.05	
Dysphania melanocarpa forma *leucocarpa*	0.1	0.01	
Eriachne obtusa	0.1	0.2	
Hibiscus sturtii var. *platychlamys*	0.1	0.2	
Indigofera chamaeclada subsp. *pubens*	0.1	0.3	
Nicotiana occidentalis subsp. *occidentalis*	0.1	0.1	
Olearia sp. Kennedy Range (G. Byrne 66)	0.1	1	
Pterocaulon sphacelatum	0.1	0.3	
Solanum lasiophyllum	0.1	0.5	
Triodia epactia	40	0.5	
Wurmbea odorata	0.1	0.05	

Site PCS09
Described by SF
Date 1/08/2018
Type Q 20 x 20m
Location Learmonth
MGA Zone 50
201193 **mE** 7537727 **mN**
Habitat Plain
Soil orange medium/heavy clay
Rock Type
Vegetation Tspp.Fp
Veg Condition Poor
Fire Age > 5 years
Notes
Disturbance, grazing by sheep, trampling
Total PFC 50%
Bare ground 50%
Leaf litter 0.1%
Logs 0%



SPECIES LIST:

Name	Cover	Height	Notes
Cyperus bulbosus	0.1	0.1	
Decazesia hecatocephala	10	0.05	
Frankenia pauciflora	20	0.2	
Tecticornia ?*pterygosperma* subsp. *denticulata*	15	0.1	unable to identify fully
Tecticornia ?pruinosa	0.1	0.4	due to lack of fruits/seeds

Site PCS10
Described by SF
Date 2/08/2018
Type Q 20 x 20m
Location Learmonth
MGA Zone 50
199176 **mE** 7527444 **mN**
Habitat Drainage line
Soil light brown loam, sand, soft clay
Rock Type limestone
Vegetation AcCl
Veg Condition Poor
Fire Age 1-5 years
Notes
Disturbance; grazing by sheep, weeds
Total PFC 70%
Bare ground 10%
Leaf litter 15%
Logs 15%

SPECIES LIST:

Name	Cover (%)	Height (m)	Notes
Acacia coriacea subsp. *coriacea*	2	2	
Acacia tetragonophylla	1	1.3	
*Cenchrus ciliaris**	50	0.3	
Clerodendrum tomentosum	0.1	1	
Convolvulaceae sp.	0.1	0.01	
Corchorus congener	1	0.5	P3
Corymbia hamersleyana	15	3.5	
Cullen lachnostachys	1	1	
Dysphania melanocarpa forma *leucocarpa*	0.1	0.01	
Eriachne obtusa	0.1	0.4	
Erodium cygnorum	0.1	0.05	
Nicotiana occidentalis subsp. *occidentalis*	0.1	0.1	
Phyllanthus hamelinii	0.1	0.1	
Sida rohlenae subsp. *rohlenae*	0.5	1	
Solanum lasiophyllum	0.1	0.4	
Sonchus oleraceus	0.1	0.01	
Triodia epactia	0.1	0.5	

Site PCS11
Described by SF
Date 2/08/2018
Type Q 20 x 20m
Location Learmonth
MGA Zone 50
196396 **mE** 7528147 **mN**
Habitat Drainage line
Soil light brown loam, sand, soft clay
Rock Type limestone
Vegetation AcCl
Veg Condition Poor
Fire Age > 5 years
Notes
Disturbance; grazing by sheep, cattle, horses, weeds
Total PFC 25%
Bare ground 70%
Leaf litter 2%
Logs 2%

SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia coriacea subsp. *coriacea*	5	4
Acacia pyrifolia	0.1	0.2
Achyranthes aspera	0.5	0.4
Bidens subalternans var. *simulans*	0.1	0.1
Capparis spinosa var. *nummularia*	0.1	0.1
*Cenchrus ciliaris**	10	0.2
Chenopodium murale	0.5	0.4
Corchorus crozophorifolius	0.1	0.2
Corymbia hamersleyana	10	6
Erodium cygnorum	0.1	0.05
Sisymbrium orientale	1	0.3
Solanum lasiophyllum	0.1	0.4
Solanum nigrum	0.1	0.1
Sonchus oleraceus	0.1	0.05

Site PCS12
Described by SF
Date 2/08/2018
Type Q 20 x 20m
Location Learmonth
MGA Zone 50
200763 **mE** 7535668 **mN**
Habitat Plain
Soil Orange medium clay
Rock Type
Vegetation SoTe
Veg Condition Good
Fire Age > 5 years
Notes
Disturbance; grazing by sheep, weeds
Total PFC 70%
Bare ground 15%
Leaf litter 5%
Logs 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia synchronicia	0.5	1
*Cenchrus ciliaris**	5	0.2
Cyperus bulbosus	0.1	0.05
Decazesia hecatocephala	0.1	0.1
Dysphania melanocarpa forma *leucocarpa*	0.1	0.01
Eucalyptus victrix	0.1	2
Stemodia grossa	50	0.6
Swainsona pterostylis	0.1	0.1
Triodia epactia	15	0.6

Site PCS13
Described by SF
Date 2/08/2018
Type Q 20 x 20m
Location Learmonth
MGA Zone 50
203325 **mE** 7535590 **mN**
Habitat Plain
Soil light brown heavy clay
Rock Type n/a
Vegetation Tspp.Fp
Veg Condition Good
Fire Age > 5 years
Notes
Disturbance; grazing by sheep
Total PFC 55%
Bare ground 44%
Leaf litter 1%
Logs 0%

SPECIES LIST:

Name	Cover (%)	Height (m)	
*Cenchrus ciliaris**	0.1	0.1	
Decazesia hecatocephala	2	0.01	
Eragrostis falcata	0.1	0.05	
Frankenia pauciflora	50	0.1	
Tecticornia ?pterygosperma subsp. *denticulata*	3	0.1	unable to identify fully due to lack of fruits and seeds

Site PCS14
Described by SF
Date 2/08/2018
Type Q 20 x 20m
Location Learmonth
MGA Zone 50
203236 **mE** 7533472 **mN**
Habitat Plain
Soil light brown, orange sand
Rock Type
Vegetation SoTe
Veg Condition Good
Fire Age > 5 years
Notes
Disturbance; grazing by sheep, weeds
Total PFC 80%
Bare ground 10%
Leaf litter 10%
Logs 0%

SPECIES LIST:

Name	Cover (%)	Height (m)	Notes
Cassytha aurea var. *aurea*	0.1	c	
*Cenchrus ciliaris**	15	0.4	
Corchorus congener	0.5	0.4	P3
Decazesia hecatocephala	0.01	0.01	
Dysphania melanocarpa forma *leucocarpa*	0.1	0.01	
Eriachne ovata	0.1	0.4	
Lotus australis	0.1	0.01	
Nicotiana occidentalis subsp. *occidentalis*	0.1	0.01	
Pluchea ferdinandi-muelleri	0.5	0.7	
Rhynchosia minima	0.5	0.01	
Stemodia grossa	5	0.6	
Swainsona pterostylis	0.1	0.1	
Triodia epactia	65	0.5	

Site PCS15
Described by SF
Date 2/08/2018
Type Q 20 x 20m
Location Learmonth
MGA Zone 50
201538 **mE** 7534973 **mN**
Habitat Plain
Soil orange clay
Rock Type
Vegetation AbTe
Veg Condition
Fire Age > 5 years
Notes
Disturbance; grazing by sheep
Total PFC 70%
Bare ground 20%
Leaf litter 10%
Logs 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia bivenosa	20	2.2
Acacia synchronicia	0.1	1.6
*Cenchrus ciliaris**	2	0.2
Dysphania melanocarpa forma *leucocarpa*	0.1	0.01
Goodenia forrestii	0.1	0.05
Lotus australis	0.1	0.1
Nicotiana occidentalis subsp. *occidentalis*	0.1	0.1
Stemodia grossa	0.1	0.3
Triodia epactia	50	0.5

Site PCS16
Described by SF
Date 2/08/2018
Type Q 20 x 20m
Location Learmonth
MGA Zone 50
201538 **mE** 7534973 **mN**
Habitat Plain
Soil orange sand
Rock Type
Vegetation AcAt
Veg Condition Very Good
Fire Age > 5 years
Notes
Disturbance; grazing by sheep
Total PFC 80%
Bare ground 10%
Leaf litter 10%
Logs 0%

SPECIES LIST:

Name	Cover (%)	Height (m)	Notes
Acacia coriacea subsp. *coriacea*	3	1.8	
Acacia gregorii	0.1	0.3	
Acacia sericophylla	0.1	0.4	
Acacia tetragonophylla	20	2	
Acanthocarpus verticillatus	0.1	0.6	
*Cenchrus ciliaris**	1	0.2	
Chrysopogon fallax	0.1	1	
Corchorus congener	1	0.5	P3
Corynotheca micrantha	0.1	0.5	
Cullen lachnostachys	0.1	1.1	
Cyperus bulbosus	0.1	0.1	
Dysphania melanocarpa forma *leucocarpa*	0.1	0.01	
Eriachne obtusa	2	0.3	
Heliotropium glanduliferum	0.1	0.5	
Indigofera chamaeclada subsp. *pubens*	1	0.2	
Nicotiana occidentalis subsp. *occidentalis*	0.1	0.01	
Phyllanthus hamelinii	0.1	0.1	
Rhynchosia minima	1	c	
Senna artemisioides subsp. helmsii x oligophylla	0.1	1.6	
Solanum lasiophyllum	0.1	0.3	
Tephrosia uniovulata	0.1	0.6	
Triodia epactia	60	0.6	

Site PCS17
Described by SF
Date 2/08/2018
Type Q 20 x 20m
Location Learmonth
MGA Zone 50
199746 **mE** 7528194 **mN**
Habitat undulating plain
Soil orange sand, soft clay
Rock Type
Vegetation AsTe
Veg Condition Very Good
Fire Age > 5 years
Notes
Disturbance; grazing by sheep
Total PFC 75%
Bare ground 15%
Leaf litter 10%
Logs 0%

SPECIES LIST:

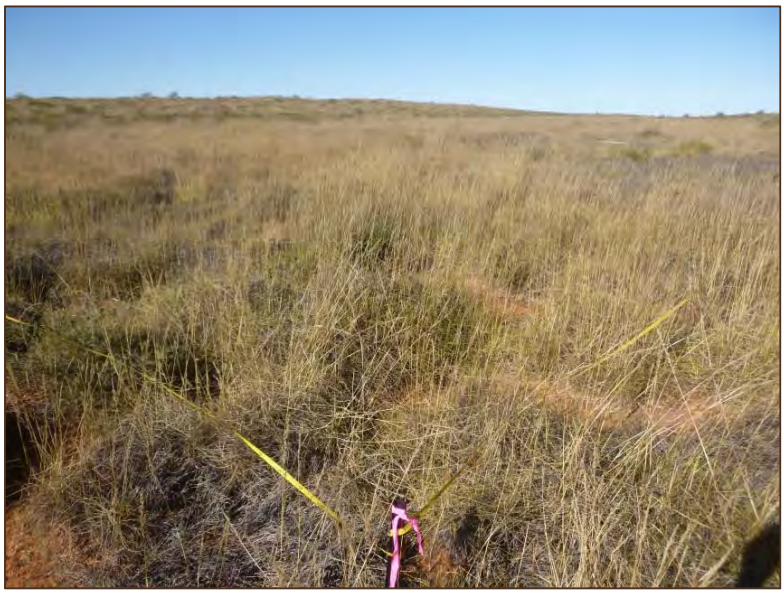
Name	Cover (%)	Height (m)	Notes
Abutilon cunninghamii	0.1	1.3	
Acacia sericophylla	40	1.8	
Cassytha aurea var. *aurea*	0.1	0.2	
*Cenchrus ciliaris**	2	0.3	
Chrysopogon fallax	0.1	0.6	
Corchorus congener	0.1	0.2	P3
Corynotheca micrantha	0.1	0.1	
Dampiera incana var. *incana*	0.1	0.1	
Duperreya commixta	0.5	0.6	
Dysphania melanocarpa forma *leucocarpa*	0.1	0.03	
Eremophila setacea	1	1.3	
Eriachne obtusa	15	0.3	
Heliotropium crispatum	0.1	0.1	
Indigofera chamaeclada subsp. *pubens*	0.1	0.2	
Nicotiana occidentalis subsp. *occidentalis*	0.1	0.1	
Olearia sp. Kennedy Range (G. Byrne 66)	0.5	1.5	
Phyllanthus hamelinii	0.1	0.3	
Sida rohlenae subsp. *rohlenae*	1	0.6	
Solanum lasiophyllum	5	0.4	
Triodia epactia	3	0.5	
Wurmbea odorata	0.1	0.1	

Site Q1
Described by SF and AD
Date 23/05/2017
Type Q 20 x 20m
Location Learmonth
MGA Zone 50
198899 **mE** 7526357 **mN**
Habitat Undulating plain between sand dunes
Soil Orange red sand
Vegetation AgTe
Veg Condition Very Good
Fire Age Very Old (>12)
Notes
Disturbance: Sheep grazing and tracks
Bare ground: 15%

SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia gregorii	0.1	0.6
Acacia synchronicia	4	1.2
Tephrosia uniovulata	0.1	0.4
Cullen lachnostachys	0.1	2
Eriachne obtusa	0.5	0.4
Solanum lasiophyllum	0.1	0.7
Triodia epactia	80	0.8
Pileanthus septentrionalis	0.1	0.8

Site Q2
Described by SF and AD
Date 23/05/2017
Type Q 20 x 20m
Location Learmonth
MGA Zone 50
199229 **mE** 7527010 **mN**
Habitat Undulating plain between sand dunes
Soil Orange red sand
Vegetation AgTe
Veg Condition Very Good
Fire Age Very Old (>12)
Notes
Disturbance: Grazing by sheep and tracks



SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia gregorii	5	0.6
Acanthocarpus verticillatus	1	0.4
Cassytha aurea var. aurea	0.1	c
Corchorus congener	0.1	0.3
Cullen lachnostachys	0.1	0.1
Eriachne obtusa	0.5	0.4
Indigofera chamaeclada subsp. pubens	0.5	0.1
Phyllanthus hamelinii	0.5	0.7
Pileanthus septentrionalis	2	0.8
Pterocaulon sphacelatum	0.1	0.5
Ptilotus obovatus	0.1	0.4
Solanum lasiophyllum	0.1	0.6
Triodia epactia	80	0.8

Site Q3
Described by SF and AD
Date 23/05/2017
Type Q 20 x 20m
Location Learmonth
MGA Zone 50
199627 **mE** 7527807 **mN**
Soil Orange red sand
Vegetation AcAt
Veg Condition Very Good
Fire Age Very Old (>12)

SPECIES LIST:

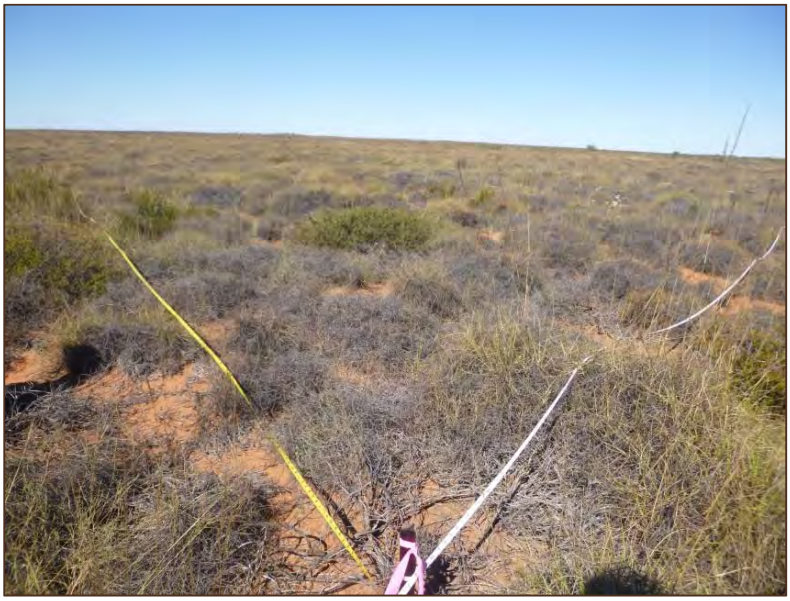
Name	Cover (%)	Height (m)	
Acacia coriacea subsp. *coriacea*	5	2.5	
Acacia sclerosperma subsp. *sclerosperma*	0.1	1.2	
Acacia tetragonophylla	4	1.7	
Cassytha aurea var. *aurea*	0.1	c	
Corchorus congener	0.1	0.5	
Eriachne obtusa	5	0.5	
Indigofera chamaeclada	0.1	0.2	
Phyllanthus hamelinii	0.1	0.4	
Rhynchosia minima	2	c	
Triodia epactia	60	0.8	
Eucalyptus victrix	-	2.2	just outside quardat

Site Q4
Described by SF and AD
Date 23/05/2017
Type Q 20 x 20m
Location Learmonth
MGA Zone 50
199956 **mE** 7528585 **mN**
Habitat Plain
Soil Orange sand
Vegetation AsTe
Veg Condition Good
Fire Age Very Old (>12)
Notes
Disturbance: grazing by sheep, weeds

SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia coriacea subsp. *coriacea*	5	2.5
Acacia sclerosperma subsp. sclerosperma	25	1.5
Acanthocarpus verticillatus	0.1	0.4
*Cenchrus ciliaris**	20	0.4
Corchorus congener	0.1	1
Hannafordia quadrivalvis subsp. *recurva*	0.1	0.6
Abutilon cunninghamii	0.1	0.5
Phyllanthus hamelinii	0.1	1
Solanum lasiophyllum	0.1	0.5
Triodia epactia	65	0.8

Site Q5
Described by SF and AD
Date 23/05/2017
Type Q 20 x 20m
Location Learmonth
MGA Zone 50
200335 **mE** 7529030 **mN**
Soil Orange red sand
Vegetation AgTe
Veg Condition Very Good
Fire Age Very Old (>12)
Notes
Disturbance: Tracks
Bare ground: 20%



SPECIES LIST:

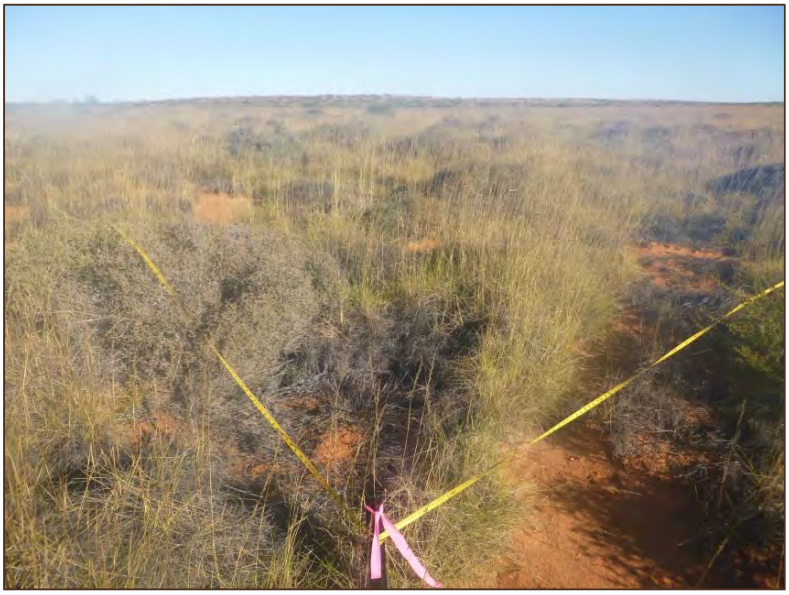
Name	Cover (%)	Height (m)
Acacia gregorii	8	0.4
Acanthocarpus verticillatus	3	0.4
Cassytha aurea var. aurea	5	c
Corchorus congener	0.1	0.4
Dampiera incana var. incana	1	0.6
Eriachne obtusa	10	0.4
Euphorbia drummondii	0.1	0.1
Hannafordia quadrivalvis subsp. *recurva*	5	0.3
Ptilotus obovatus	0.1	0.4
Solanum lasiophyllum	1	0.4
Triodia epactia	60	0.8
Goodenia tenuiloba	0.1	0.3
Pileanthus septentrionalis	2	0.5

Site Q6
Described by SF and AD
Date 23/05/2017
Type Q 20 x 20m
Location Learmonth
MGA Zone 50
201636 **mE** 7531087 **mN**
Soil Orange red sand
Vegetation AsSs
Veg Condition Very Good
Notes
Disturbance: Grazing and tracks
Bare ground: 15%

SPECIES LIST:

Name	Cover (%)	Height (m)	Notes
Acacia coriacea subsp. *coriacea*	0.1	1	just outside quadrat
Acacia gregorii	3	0.5	
Acacia stellaticeps	20	1	
Cassytha aurea var. *aurea*	0.1	c	
Dampiera incana var. *incana*	0.1	0.2	
Eriachne obtusa	20	0.4	
Hakea stenophylla	5	1.2	
Hannafordia quadrivalvis subsp. *recurva*	0.1	0.5	
Indigofera chamaeclada subsp. *pubens*	0.1	0.3	
Labichea cassioides	2	1.2	
Scaevola sericophylla	0.1	1	
Solanum lasiophyllum	0.1	0.5	
Triodia epactia	30	0.8	

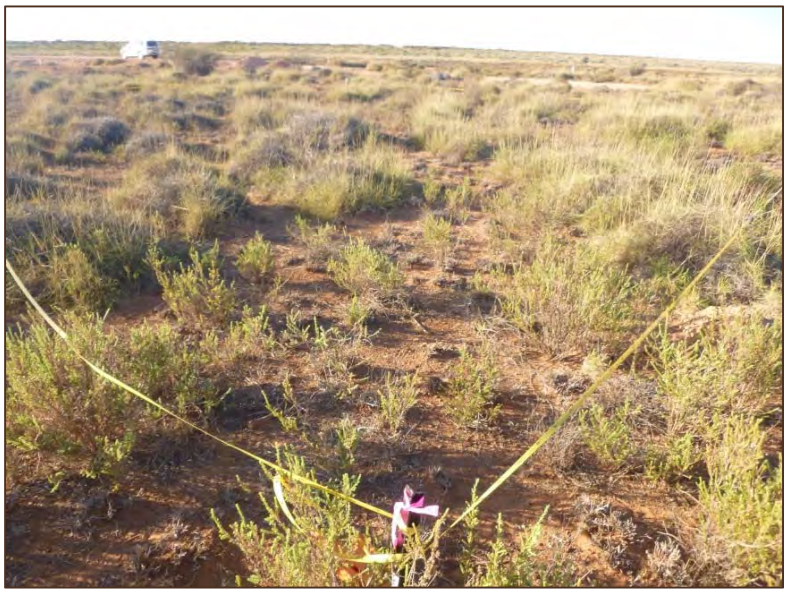
Site Q7
Described by SF and AD
Date 23/05/2017
Type Q 20 x 20m
Location Learmonth
MGA Zone 50
202270 **mE** 7532122 **mN**
Habitat Depression
Soil Orange red sand
Vegetation McTe
Veg Condition (EX) Very Good
Notes
Disturbance: grazing by sheep



SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia gregorii	5	0.5
Acanthocarpus verticillatus	0.1	0.6
Corchorus congener	0.1	0.5
Dampiera incana var. incana	1	0.5
Eriachne obtusa	3	0.4
Indigofera chamaeclada subsp. pubens	0.5	0.3
Melaleuca cardiophylla	40	0.6
Pluchea ferdinandi-muelleri	0.5	0.4
Rhynchosia minima	0.1	0.05
Triodia epactia	40	0.8

Site Q8
Described by SF and AD
Date 24/05/2017
Type Q 20 x 20m
Location Learmonth
MGA Zone 50
200799 **mE** 7535383 **mN**
Vegetation SoTe
Veg Condition Poor
Notes
Disturbance: Grazing by sheep, weeds
Bare ground 50%
Leaf Litter %



SPECIES LIST:

Name	Cover (%)	Height (m)
*Cenchrus ciliaris**	8	0.2
Frankenia pauciflora	1	0.3
Peripleura arida	1	0.15
Stemodia sp. Onslow (A.A. Mitchell 76/148)	8	0.2
Triodia epactia	30	0.8

Site Q9
Described by SF and AD
Date 24/05/2017
Type Q 20 x 20m
Location Learmonth
MGA Zone 50
201195 **mE** 7535309 **mN**
Habitat Sand dune
Soil Orange red sand
Vegetation AsSs
Veg Condition Poor
Notes
Disturbance: grazing by sheep, tracks and weeds

SPECIES LIST:

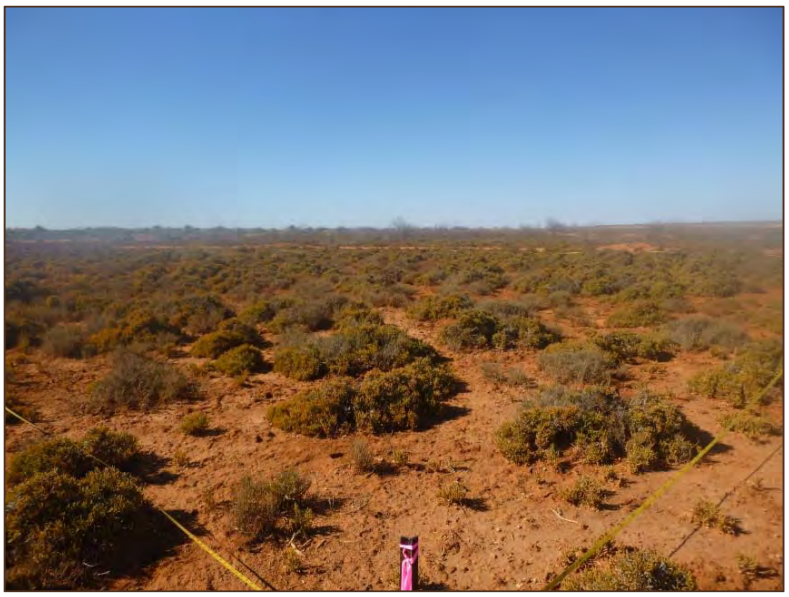
Name	Cover (%)	Height (m)	Notes
Acacia coriacea subsp. *coriacea*	0.1	0.6	just outside quadrat
Acacia stellaticeps	25	1	
*Cenchrus ciliaris**	7	0.2	
Corchorus congener	0.1	0.4	
Cullen lachnostachys	1	0.8	
Eriachne obtusa	5	0.4	
Ipomoea costata	0.1	c	
Pterocaulon sphacelatum	0.1	0.2	
Scaevola sericophylla	0.1	0.5	
Solanum lasiophyllum	0.1	0.5	
Triodia epactia	25	0.8	
Olearia sp. Kennedy Range (G. Byrne 66)	0.1	0.6	

Site Q10
Described by SF and AD
Date 24/05/2017
Type Q 20 x 20m
Location Learmonth
MGA Zone 50
201105 **mE** 7535417 **mN**
Habitat Saline flat
Soil Orange sand
Vegetation Tspp.Fp
Veg Condition Poor
Notes
Disturbance: grazing by sheep
Bare ground: 60%

SPECIES LIST:

Name	Cover (%)	Height (m)
Frankenia pauciflora	15	0.3
Muellerolimon salicorniaceum	10	0.3
Tecticornia ? indica	15	0.3

Site Q11
Described by SF and AD
Date 24/05/2017
Type Q 20 x 20 m
Location Learmonth
MGA Zone 50
201730 **mE** 7535472 **mN**
Habitat Saline flat
Soil Orange sandy clay
Vegetation Tspp.Fp
Veg Condition Good
Fire Age Very Old (>12)
Notes
Disturbance: grazing by sheep



SPECIES LIST:

Name	Cover (%)	Height (m)
Frankenia pauciflora	8	0.3
Tecticornia ? indica.	40	0.4
Muellerolimon salicorniaceum	12	0.3

Site Q12
Described by SF and AD
Date 24/05/2017
Type Q 20 x 20m
Location Learmonth
MGA Zone 50
201923 **mE** 7535509 **mN**
Habitat Hill rocky outcrop
Soil Orange sand
Vegetation
Veg Condition Very Good
Fire Age Very Old (>12)
Notes
Disturbance: grazing by sheep, weeds, tracks

SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia bivenosa	10	1.5
*Cenchrus ciliaris**	2	0.3
Corchorus congener	0.1	0.15
Cullen lachnostachys	0.1	0.8
Pterocaulon sphacelatum	0.1	0.4
Scaevola sericophylla	5	0.6
Senna artemisioides subsp. *oligophylla*	0.1	1
Solanum lasiophyllum	1	0.4
Triodia epactia	25	0.8

Site Q13
Described by SF and AD
Date 24/05/2017
Type Q 20 x 20m
Location Learmonth
MGA Zone 50
204339 **mE** 7535568 **mN**
Habitat Coastline
Soil Grey white sand
Vegetation AbAc
Veg Condition Good
Fire Age Very Old (>12)
Notes
Disturbance: grazing by sheep, tracks, weeds, litter

SPECIES LIST:

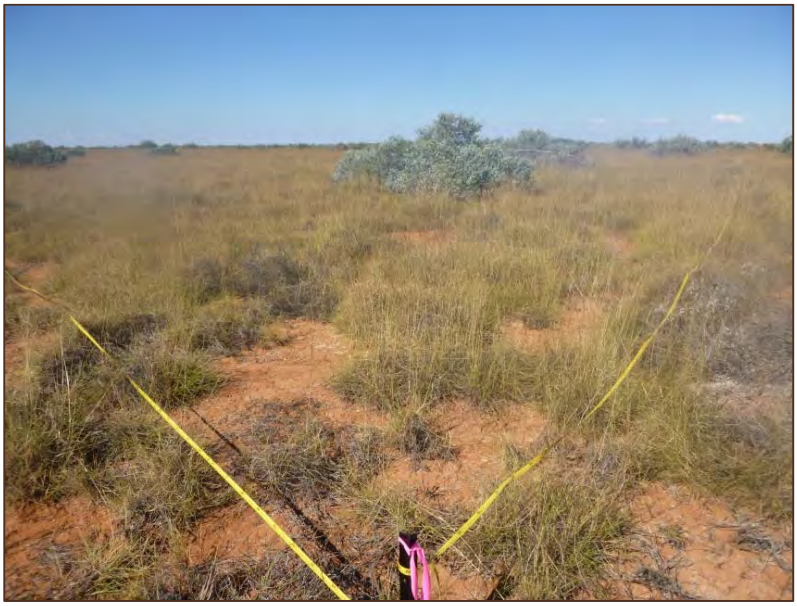
Name	Cover (%)	Height (m)
Acacia bivenosa	1	1
Acacia coriacea subsp. *coriacea*	2	1.2
Acacia tetragonophylla	0.1	0.1
*Aerva javanica**	0.1	0.5
*Cenchrus ciliaris**	0.1	0.2
Salsola australis	0.1	0.4
Scaevola sericophylla	0.1	0.3
Spinifex longifolius	5	1
Triodia epactia	18	0.5

Site Q14
Described by SF and AD
Date 24/05/2017
Type Q 20 x 20m
Location Learmonth
MGA Zone 50
204022 **mE** 7535822 **mN**
Habitat Along coastline - bottom of sand dune
Soil white grey sand
Vegetation AbAc
Veg Condition Good
Fire Age Very Old (>12)
Notes
Disturbance: litter and 4WD tracks
Bare ground: 50%

SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia bivenosa	0.5	0.4
Acacia coriacea subsp. *coriacea*	4	1.2
Acacia stellaticeps	0.1	0.4
Maireana lanosa	0.1	0.15
Salsola australis	0.5	0.4
Spinifex longifolius	15	0.8
Triodia epactia	1	0.8

Site Q15
Described by SF and AD
Date 24/05/2017
Type Q 20 x 20m
Location Learmonth
MGA Zone 50
203754 **mE** 7535042 **mN**
Habitat Plain
Soil Orange red sand
Vegetation AbTe
Veg Condition Very Good
Fire Age Very Old (>12)
Notes
Bare ground: 15%



SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia bivenosa	20	2.8
Cassytha aurea var. *aurea*	0.1	c
Corchorus congener	0.1	0.2
Solanum lasiophyllum	0.1	0.6
Triodia epactia	65	0.8

Site Q16
Described by SF and AD
Date 24/05/2017
Type Q 20 x 20m
Location Learmonth
MGA Zone 50
202976 **mE** 7533285 **mN**
Habitat Plain between dunes
Soil Orange red sand
Vegetation SoTe
Veg Condition (EX) Very Good
Fire Age Very Old (>12)

SPECIES LIST:

Name	Cover (%)	Height (m)
Acanthocarpus verticillatus	15	0.3
Cassytha aurea var. *aurea*	0.1	c
*Cenchrus ciliaris**	8	0.2
Indigofera chamaeclada subsp. *pubens*	0.1	1.5
Peripleura arida	0.1	1.5
Pluchea ferdinandi-muelleri	0.1	0.6
Rhynchosia minima	0.1	1.5
Stemodia sp. Onslow (A.A. Mitchell 76/148)	8	0.2
Triodia epactia	60	0.8

Site Q17
Described by SF and AD
Date 25/05/2017
Type Q 20 x 20m
Location Learmonth
MGA Zone 50
202497 **mE** 7532499 **mN**
Habitat Plain between sand dunes
Soil Orange red sand
Vegetation AbTe
Veg Condition Good
Fire Age Very Old (>12)
Notes
Disturbance: grazing by sheep, weeds

SPECIES LIST:

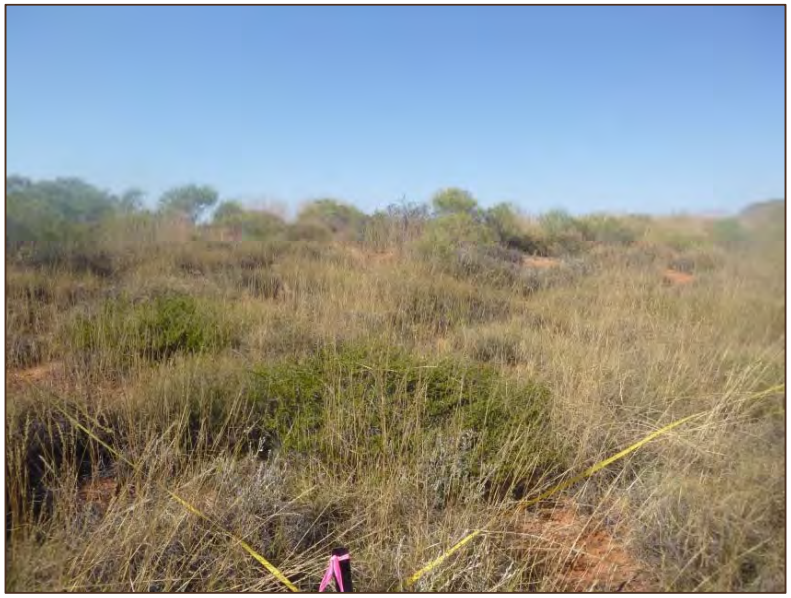
Name	Cover (%)	Height (m)
Acacia bivenosa	20	2
*Cenchrus ciliaris**	3	0.2
Corchorus congener	0.1	0.3
Dampiera incana var. incana	0.1	0.3
Eriachne obtusa	7	0.4
Indigofera chamaeclada subsp. pubens	0.1	0.2
Pluchea ferdinandi-muelleri	5	0.6
Rhynchosia minima	2	c
Solanum lasiophyllum	0.1	0.5
Stemodia sp. Onslow (A.A. Mitchell 76/148)	10	0.7
Triodia epactia	25	0.8

Site Q18
Described by SF and AD
Date 25/05/2017
Type Q 20 x 20m
Location Learmonth
MGA Zone 50
201938 **mE** 7531490 **mN**
Habitat Plain between sand dunes
Soil Orange red sand
Vegetation McTe
Veg Condition Very Good
Fire Age Very Old (>12)
Notes
Disturbance: grazing by sheep
Bare ground: 15%
Leave Litter: 5%

SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia gregorii	1	0.4
Acacia stellaticeps	2	0.8
Dampiera incana var. incana	0.5	0.3
Eriachne obtusa	4	0.3
Melaleuca cardiophylla	40	0.7
Triodia epactia	34	0.8

Site Q19
Described by SF and AD
Date 25/05/2017
Type Q 20 x 20m
Location Learmonth
MGA Zone 50
201459 **mE** 7530835 **mN**
Habitat Sand dune
Soil Orange red sand
Vegetation AsTe
Veg Condition Very Good
Notes
Disturbance: grazing by sheep, weeds
Bare ground: 25%
Leaf Litter: 10%



SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia coriacea subsp. *coriacea*	0.1	1
Acacia gregorii	4	0.5
Acacia sclerosperma subsp. *sclerosperma*	20	2
*Cenchrus ciliaris**	4	0.2
Corchorus congener	0.1	0.3
Cullen lachnostachys	0.1	0.5
Dampiera incana var. *incana*	0.1	0.3
Eriachne obtusa	15	0.4
Scaevola sericophylla	3	0.5
Senna artemisioides subsp. *oligophylla*	2	0.7
Solanum lasiophyllum	0.1	0.6
Triodia epactia	20	0.8

Site Q20
Described by SF and AD
Date 25/05/2017
Type Q 20 x 20m
Location Learmonth
MGA Zone 50
199258 **mE** 7527551 **mN**
Habitat Drainage line
Soil Orange sand
Vegetation AcCl
Veg Condition Degraded
Fire Age Very Old (>12)
Notes
Disturbance: grazing by sheep, weeds
Bare ground: 10%
Leaf Litter: 15%

SPECIES LIST:

Name	Cover (%)	Height (m)	
Abutilon cunninghamii	0.5	0.8	
Acacia coriacea subsp. coriacea	15	3	
Acacia tetragonophylla	0.1	1	just outside quadrat
*Cenchrus ciliaris**	25	0.4	
Corchorus congener	0.1	0.5	
Cucumis variabilis	0.1	c	
Cullen lachnostachys	50	2.8	
Phyllanthus hamelinii	0.1	0.4	
Sida rohlenae subsp. *rohlenae*	5	1	
Triodia epactia	5	0.8	

Site Q21
Described by SF
Date 25/05/2017
Type Q 20 x 20m
Location Learmonth
MGA Zone 50
199535 **mE** 7527528 **mN**
Habitat Plain between dunes
Soil Orange sand
Vegetation AcAt
Veg Condition Good
Notes
Disturbance: weeds
Bare ground: 15 %

SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia coriacea subsp. *coriacea*	20	3
Acacia tetragonophylla	5	1
*Cenchrus ciliaris**	3	0.4
Corchorus congener	0.1	0.5
Cullen lachnostachys	0.1	0.4
Eragrostis eriopoda	0.1	0.3
Eriachne obtusa	5	0.3
Heliotropium glanduliferum	0.1	0.3
Indigofera chamaeclada subsp. *pubens*	1	0.2
Phyllanthus hamelinii	0.1	0.6
Stylobasium spathulatum	0.5	1.5
Pileanthus septentrionalis	2	1
Triodia epactia	50	0.8

Site Q22
Described by SF and AD
Date 25/05/2017
Type Q 20 x 20m
Location Learmonth
MGA Zone 50
198946 **mE** 7526676 **mN**
Habitat Plain between dunes
Soil Orange red sand
Vegetation AgTe
Veg Condition Very Good
Notes
Disturbance: grazing by sheep, vehicle tracks
Bare ground: 15%
Leave Litter: 5%

SPECIES LIST:

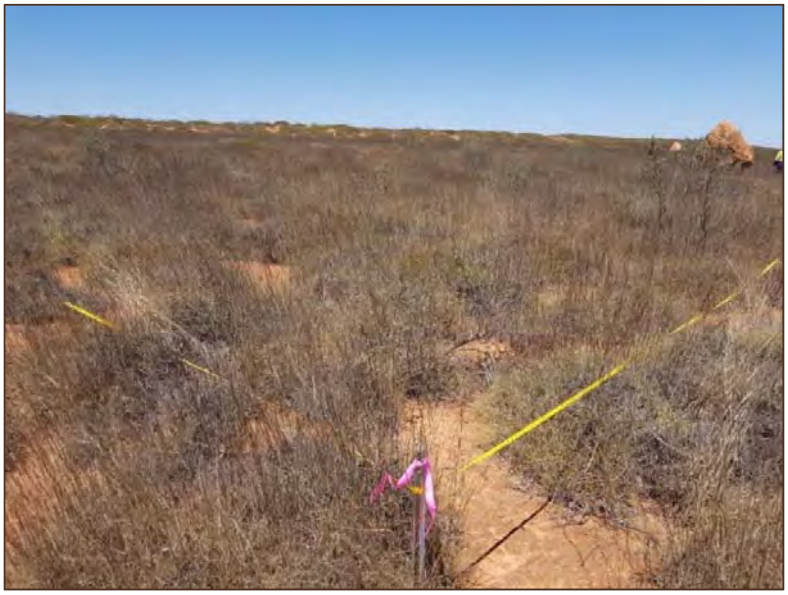
Name	Cover (%)	Height (m)
Acacia gregorii	15	0.6
Acanthocarpus verticillatus	5	0.5
Cassytha aurea var. *aurea*	0.1	c
Corchorus congener	0.1	0.3
Eriachne obtusa	5	0.4
Melaleuca cardiophylla	5	0.6
Phyllanthus hamelinii	0.1	0.4
Triodia epactia	50	0.8
Diplopeltis intermedia var. *intermedia*	3	0.3

Site QE25
Described by SF
Date 21/09/2017
Type Q 20 x 20m
Location Learmonth
MGA Zone 50
199411 **mE** 7527749 **mN**
Habitat Coastal vegetation
Soil Sand, Soft Clay, beige, orange
Vegetation AcCl
Veg Condition Poor
Fire Age >10 years
Notes
Bare ground 60%, Leaf Litter 20%, Logs 2%; Total pfc 40%
Disturbance Type: Heavy grazing by sheep, weeds

SPECIES LIST:

Name	Cover (%)	Height (m)	
Abutilon cunninghamii	0.1	1.2	
Acacia coriacea subsp. *coriacea*	20	3	
*Aerva javanica**	0.1	0.5	
*Cenchrus ciliaris**	35	0.5	
Corchorus congener	0.1	0.3	
Corymbia hamersleyana	-	6	just outside quadrat
Cullen lachnostachys	10	3	
Pileanthus septentrionalis	1	0.4	
Senna artemisioides subsp. oligophylla	1	1.8	
Solanum lasiophyllum	0.1	0.5	
Triodia epactia	4	0.3	

Site QE26
Described by SF
Date 21/09/2017
Type Q 20 x 20m
Location Learmonth
MGA Zone 50
198634 **mE** 7526860 **mN**
Habitat Coastal Vegetation
Soil Clay, sand, soft clay, beige, orange
Vegetation AgTe
Veg Condition Very Good
Fire Age >10 years
Notes
Disturbance Type: grazing by sheep
Bare ground 30%
Leaf Litter 4%
Logs 2%



SPECIES LIST:

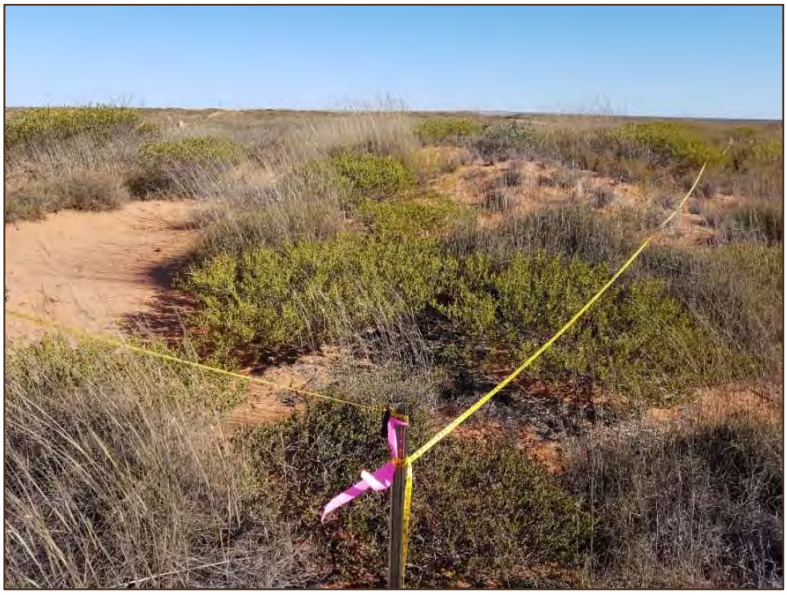
Name	Cover (%)	Height (m)
Acacia gregorii	10	0.4
Acanthocarpus verticillatus	1	0.5
Cassytha aurea var. aurea	0.1	0.3
Diplopeltis intermedia var. *intermedia*	0.1	0.3
Eriachne obtusa	15	0.4
Santalum lanceolatum	0.5	1
Scaevola sericophylla	1	0.5
Triodia epactia	35	0.5

Site QE27
Described by SF
Date 21/09/2017
Type Q 20 x 20m
Location Learmonth
MGA Zone 50
198594 **mE** 7526648 **mN**
Habitat Coastal Vegetation
Soil orange sand
Vegetation AsSs
Veg Condition Very Good
Fire Age >10 years
Notes
Disturbance Type: grazing by sheep
Bare ground 30%
Leaf Litter 7%
Logs 0%

SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia stellaticeps	30	0.6
Pileanthus septentrionalis	10	0.6
Quoya loxocarpa	0.1	0.5
Scaevola sericophylla	5	0.5
Triodia epactia	25	0.5

Site QE28
Described by SF
Date 21/09/2017
Type Q 10m x 30m
Location Learmonth
MGA Zone 50
198531 **mE** 7526896 **mN**
Habitat Coastal vegetation
Soil orange sand
Vegetation AsSs
Veg Condition Very Good
Fire Age >10 years
Notes
Disturbance type: grazing by sheep
Bare ground 30%
Leaf litter 15%
Logs 0%



SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia stellaticeps	30	0.6
Alectryon oleifolius subsp. *oleifolius*	0.1	0.5
*Cenchrus ciliaris**	2	0.5
Corchorus congener	0.1	0.3
Eremophila setacea	0.1	1
Pileanthus septentrionalis	15	0.5
Triodia epactia	20	0.5

Site QE29
Described by SF
Date 22/09/2017
Type Q 20 x 20m
Location Learmonth
MGA Zone 50
201327 **mE** 7530891 **mN**
Habitat dune base
Soil orange sand
Vegetation AgTe
Veg Condition Very Good
Fire Age >10 years
Notes
Disturbance Type: grazing by sheep
Bare ground 30%
Leaf Litter 11%
Logs 0%

SPECIES LIST:

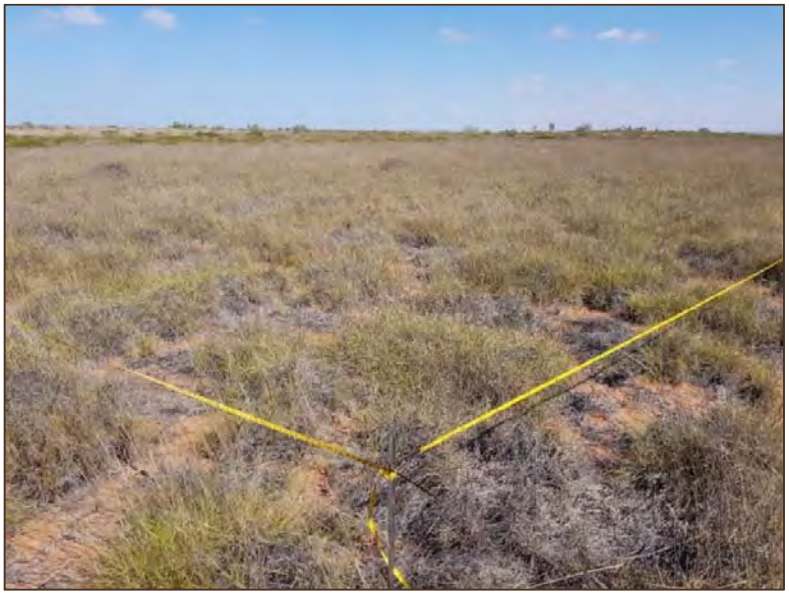
Name	Cover (%)	Height (m)
Acacia gregorii	20	0.5
Diplopeltis intermedia var. *intermedia*	1	0.5
Eriachne obtusa	15	0.5
Hakea stenophylla	0.1	0.5
Heliotropium glanduliferum	0.1	0.5
Pileanthus septentrionalis	10	0.5
Scaevola cunninghamii	0.1	0.5
Scaevola sericophylla	0.1	0.6
Triodia epactia	15	0.5
Abutilon cunninghamii	0.1	0.5

Site QE30
Described by SF
Date 22/09/2017
Type Q 20 x 20m
Location Learmonth
top
MGA Zone 50
202663 **mE** 7533056 **mN**
Habitat Coastal Vegetation, sand dune top
Soil orange sand
Vegetation AsSs
Veg Condition Very Good
Fire Age > 15 years
Notes
Disturbance Type: grazing by sheep
Bare ground 16%
Leaf Litter 10%
Logs 0.1%

SPECIES LIST:

Name	Cover (%)	Height (m)
Acacia gregorii	0.5	0.5
Acacia stellaticeps	25	0.6
Hakea stenophylla	2	1.1
Melaleuca cardiophylla	2	0.6
Pluchea ferdinandi-muelleri	0.1	0.6
Scaevola cunninghamii	0.1	0.3
Scaevola sericophylla	10	0.5
Triodia epactia	40	0.5

Site QE31
Described by SF
Date 22/09/2017
Type Q 20 x 20m
Location Learmonth
MGA Zone 50
202506 **mE** 7532914 **mN**
Habitat Coastal vegetation, plain
Soil sand, soft clay, beige, orange
Vegetation McTe
Veg Condition Very Good
Fire Age > 15 years
Notes
Disturbance type: grazing by sheep
Bare ground 15%
Leaf Litter 5%
Logs 0%



SPECIES LIST:

Name	Cover (%)	Height (m)
Acanthocarpus verticillatus	20	0.5
Chrysocephalum apiculatum subsp. *pilbarensis*	0.1	0.5
Melaleuca cardiophylla	1	1
Rhynchosia minima	0.1	0.1
Triodia epactia	65	0.6

Opportunistic collections

Described by SF

Location Learmonth

SPECIES LIST:

Name	Notes
Amyema preissii	
Calytrix sp.	just outside of Survey Area; new species, has been vouchered at the WA Herbarium
Cleome viscosa	just outside of Survey Area
Clerodendrum tomentosum var. *lanceolatum*	
Corymbia hamersleyana	
Cucumis variabilis	
Diplopeltis eriocarpa	
Dysphania plantaginella	
Eremophila longifolia	
Eremophila maculata subsp. *brevifolia*	
Goodenia forrestii	
Goodenia microptera	
Goodenia tenuiloba	
Hannafordia quadrivalvis subsp. *recurva*	
Heliotropium pachyphyllum	
Indigofera chamaeclada	
Indigofera trita	
Ipomoea costata	
Isotropis atropurpurea	
Labichea cassioides	
Maireana lanosa	
Pimelea ammocharis	
Pityrodia loxocarpa	
Quoya loxocarpa	
Scaevola tomentosa	
Senna glutinosa	
Senna notabilis	
Stylobasium spathulatum	
Triodia schinzii	
Vachellia farnesiana	
Wurmbea odorata	

APPENDIX J

Pre-Clearing Survey Report

Our Ref: 2755AA

12 November 2018

Tom Radic
Project Manager
Subsea 7
Australia Place, William Street
Perth WA 6000
Via Email: tom.radic@subsea7.com

Dear Tom,

Priority Flora Pre-clearing Survey at Learmonth Bundle Project Area

1. Introduction

Subsea 7 applied for a Native Vegetation Clearing Permit (NVCP) across the clearing footprint depicted in Figure 1. The clearing footprint is for the purpose of installing tracks and drill pads to support subterranean and geotechnical investigations required to inform the Learmonth Bundle Site's Section 38 referral to the Environmental Protection Authority (EPA). The proposed clearing footprint was aligned to existing tracks and disturbed areas where possible to minimise the clearing of native vegetation.

As part of the NVCP application, Subsea 7 committed to undertaking a pre-clearing survey across the proposed clearing footprint to identify Declared Rare Flora (DRF) or Priority flora. The objective of the pre-clearing survey was to identify, record (GPS) and demarcate DRF and Priority flora; and to adjust the final alignment of the proposed tracks and drill pads to avoid species where possible.

1.1. Project Background

360 Environmental has previously undertaken a number of flora and vegetation surveys across the proposed Learmonth Bundle Site project envelope in 2017 and 2018 (Figure 2). The Learmonth Bundle Site project envelope is the subject of the Section 38 referral to the EPA and abuts and overlaps the pre-clearing survey area. The results of these surveys provided relevant background information which informed the pre-clearing survey.

1. Detailed Flora and Vegetation Assessment (360 Environmental Pty Ltd, 2017)

A Detailed Flora and Vegetation survey was undertaken across the Learmonth Bundle site project envelope (534 ha) in May and September 2017. This survey is being used to inform the Learmonth Bundle sites Section 38 referral to the Environmental Protection Authority (EPA). The survey report was provided as a supporting document to the NVCP application CPS7946/1 and was reviewed by Department of Biodiversity Conservation and Attractions (DBCA) as part of their advice to Department of Water and Environmental Regulation (DWER).

The results of the survey found one Priority species (*Corchorus congener* [P3]) that occurred across the Survey Area.

2. Targeted Priority Species Survey (360 Environmental Pty Ltd, 2018b)

Subsea 7 took into consideration a number of comments made by the DBCA on the Detailed Flora and Vegetation Assessment (360 Environmental Pty Ltd, 2017). This resulted in a Targeted Priority Flora Survey across the development footprint and either side (approx. 340 ha) within the Learmonth Bundle site project envelope (Figure 2). The survey occurred between 31 July and 6 August 2018.

The purpose of the survey was to target priority flora species that had a medium or high likelihood of occurrence within the development footprint. The survey was undertaken during an optimum season (a significant rainfall event occurred six weeks earlier in Learmonth [72 mm]).

Only one Priority species was recorded – *Corchorus congener* (P3), and it was found extensively throughout the Survey Area. 1,200 locations of *C. congener* and approximately 2,400 individual plants were recorded (Figure 3a-b). The on-ground investigations identified this species as being widespread within the project envelope as well as outside of the project envelope.

2. Methods

The pre-clearing survey was undertaken in two stages, the first occurred 7th – 9th August 2018, this survey ensured the alignment of the drill pads and tracks avoided priority species where possible. A second survey occurred 24th – 25th August 2018, after the clearing permit was issued - to confirm surveyed locations complied with the conditions of the permit.

2.1. Desktop assessment

360 Environmental, (2017) undertook a desktop assessment for the pre-clearing survey area and completed a Likelihood of Occurrence of flora of conservation significance. The Likelihood of a species occurring within the Survey Area was based on the following criteria:

- High likelihood of occurrence - Previously recorded within Survey Area or within 20 km and suitable habitat potentially occurs in the Survey Area;
- Medium likelihood of occurrence - Previously recorded within 20 to 35 km of the Survey Area and/or suitable habitat potentially occurs in the Survey Area; and
- Low likelihood of occurrence - No suitable habitat appears to be present in the Survey Area.

The following species were listed as having either a Medium or High Likelihood of occurrence, or were previously recorded within the Survey Area:

- *Sclerolaena stylosa* P1 (Medium);
- *Acacia ryaniana* P2 (Medium);
- *Daviesia pleurophylla* P2 (Medium);
- *Tephrosia* sp. North West Cape P2 (Medium);
- *Verticordia serotina* P2 (Medium);
- *Corchorus congener* P3 (recorded previously in the Survey Area, (360 Environmental Pty Ltd, 2017)); and
- *Phyllanthus fuernrohrii* P3 (High).

2.2. Pre-clearing field surveys

Two pre-clearing surveys were completed by a 360 Environmental botanist for the proposed drill tracks and pads. The timing of each survey occurred as:

- Pre-clearing survey 1: 7 to 9 August 2018; and
- Pre-clearing survey 2: 24 to 25 August 2018.

The first pre-clearing survey was undertaken prior to the issuing of the clearing permit (to fulfil the commitment made by Subsea 7 to undertake a pre-clearing survey). The proposed access tracks and drill pads were surveyed on foot and existing tracks via vehicle. The alignment of the tracks and drill pads were positioned so as to avoid dense populations of the Priority 3 species *Corchorus congener*. However due to the extensive distribution of individuals it was not possible to re-align proposed clearing areas around all individuals.

The second pre-clearing survey was undertaken with the clearing and drilling team members to confirm track alignments to avoid every individual of the Priority species *Corchorus congener*. In areas that this was not possible, these areas were demarcated and avoided until a clearing permit amendment could be sought.

3. Results

3.1. Pre-clearing survey 1

During the initial pre-clearing survey, all proposed access tracks and drill pad sites were traversed by vehicle on existing tracks or on foot to search for species of conservation significance. One priority species, *Corchorus congener*, was recorded. GPS coordinates were taken of either each individual or population depending on how many plants were found at each occurrence (Appendix B).

C. congener appeared to prefer disturbed areas and was abundant on tracks and other areas of disturbance (Plates 1-2 and 3-4). Tracks in the Survey Area appeared to be well used by the pastoral station or tourist traffic.

3.2. Pre-clearing survey 2

During the second pre-clearing survey, all proposed access tracks and drill pad sites were re-assessed in an attempt to avoid every individual of *C. congener* as per the permit conditions. Locations of *C. congener* were flagged with orange tape during the survey. All of the tracks were confirmed to avoid *C. congener*, except for sites S1, S2, ST02 (Figure 1). The proposed tracks for these three sites were surveyed to minimise vegetation clearing where possible, and the information was provided to DWER to seek an amendment to the existing clearing permit.

Plate 1. *C. congener* within the Survey Area (360 Environmental Pty Ltd, 2018c).

Plate 2. *C. congener* within the Telstra pipeline within the Survey Area (360 Environmental Pty Ltd, 2018c).

4. Discussion

C. congener is a low, spreading shrub growing to 0.6 m in height. It produces yellow flowers from April to June, or August to November. It grows on red sand, sandy loam with limestone and is a localised endemic to the top north western region of Western Australia (Plates 3 and 4).

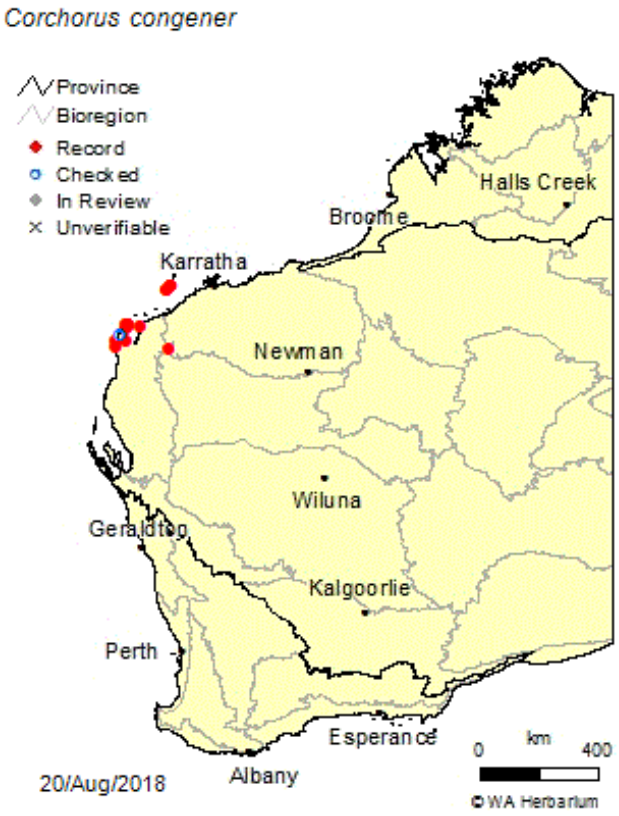


Plate 3. *C. congener* distribution within Western Australia (Department of Biodiversity Conservation and Attractions, 2018).

Plate 4. *C. congener* image from Florabase (Department of Biodiversity Conservation and Attractions, 2018).

C. congener was locally common throughout the pre-clearing survey area, occurring readily along tracks and road sides, and throughout the vegetation within the survey area (Plates 5-9). Regional locations were also surveyed outside of the pre-clearing survey area to gather population details in a regional context (360 Environmental 2017, 2018b), and *C. congener* was recorded throughout the Learmonth area (Figure 3a – 3b).

Plate 5. *Corchorus congener* within the Survey Area (360 Environmental Pty Ltd, 2018c).

Plate 6. *Corchorus congener* and *Solanum lasiophyllum* within the Survey Area (360 Environmental Pty Ltd, 2018c).

Plate 7. *C. congener* within the Survey Area (360 Environmental Pty Ltd, 2018c).

Plate 8. *C congener* within the Survey Area (360 Environmental Pty Ltd, 2018c).

Plate 9. *C. congener* on limestone, within the Survey Area (360 Environmental Pty Ltd, 2018c).

Corchorus carnarvonensis (which is not a threatened or Priority species) is also known to occur in the Exmouth Region (Department of Biodiversity Conservation and Attractions 2018). This species is very similar to *C. congener*, the difference between them being the differences of the hairs on the fruits (F. Obbens, personal communication August 2018). *C. congener* has been identified previously from numerous collections during the Australian Bundle Site Detailed Flora and Vegetation Assessment (360

Environmental Pty Ltd, 2017). During the pre-clearing survey, the specimens were in flower and had no fruit, therefore they were identified by the taxonomist as *Corchorus ?congener*. The lack of fruit meant the specimens could not be definitely identified as either *C. congener* or *C. carnarvonensis*. However, when historical data was evaluated, the specimens are more likely to be *C. congener*, based on the following:

- *C. carnarvonensis* has only ever been recorded once within Exmouth, at Shothole Canyon (Department of Biodiversity Conservation and Attractions 2018) which is approximately 24 km north of the Survey Area; and
- *C. congener* has been previously identified within the Survey Area from multiple locations and collections, which have been vouchered at the WA Herbarium (360 Environmental Pty Ltd, 2017).

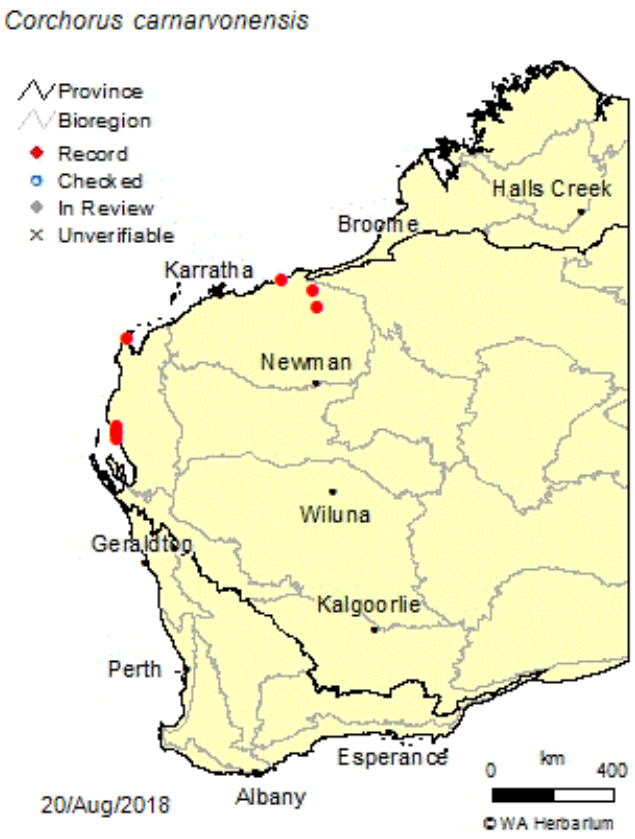


Plate 10. *C. carnarvonensis* distribution within Western Australia (Florabase 2018).

We trust this meets your requirements at this time. Should you have any questions or require further action please do not hesitate to contact Botanist Sophie Fox, Heidi Taylor or the undersigned on (08) 9388 8360. We look forward to hearing from you.

For and on behalf of

360 Environmental Pty Ltd

Tamara Smith Director, Principal

Enc. Figures 1-3b
Appendix A: Site Photos
Appendix B: Locations of

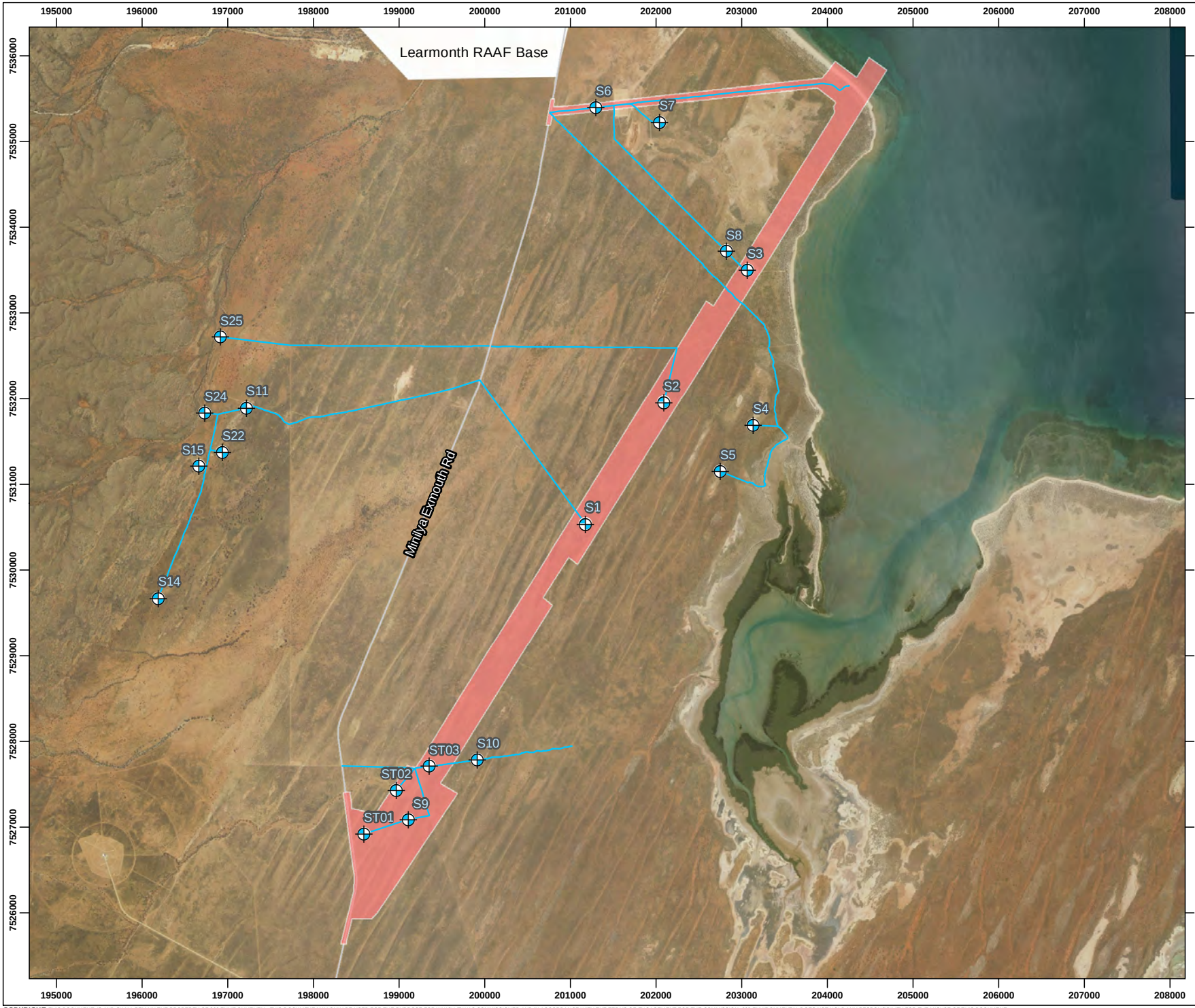
5. References

360 Environmental Pty Ltd (2017) *Australian Bundle Site - Detailed Flora and Vegetation Assessment*.

360 Environmental Pty Ltd (2018b) *Targeted Prioirty Flora Report (unpublished)*.

360 Environmental Pty Ltd (2018c) Photograph - Sophie Fox.

Department of Biodiversity Conservation and Attractions (2018) *FloraBase - the Western Australian flora, Herbarium Database*. Available at: https://florabase.dpaw.wa.gov.au/.



Legend

- Stygofauna Sampling Bores
- Pre-Clearing Survey Area (360 Environmental 2018a)
- Project Envelope
- State Road

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- LOCALITY MAP SOURCED LANDGATE 2017
- CADASTRE SOURCED LANDGATE 2018
- AERIAL PHOTOGRAPHY SOURCED LANDGATE 2018 (© Western Australian Land Information Authority 2017)

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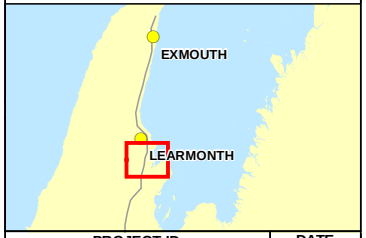
LOCALITY MAP



PROJECT ID	DATE
2755	12/11/2018

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

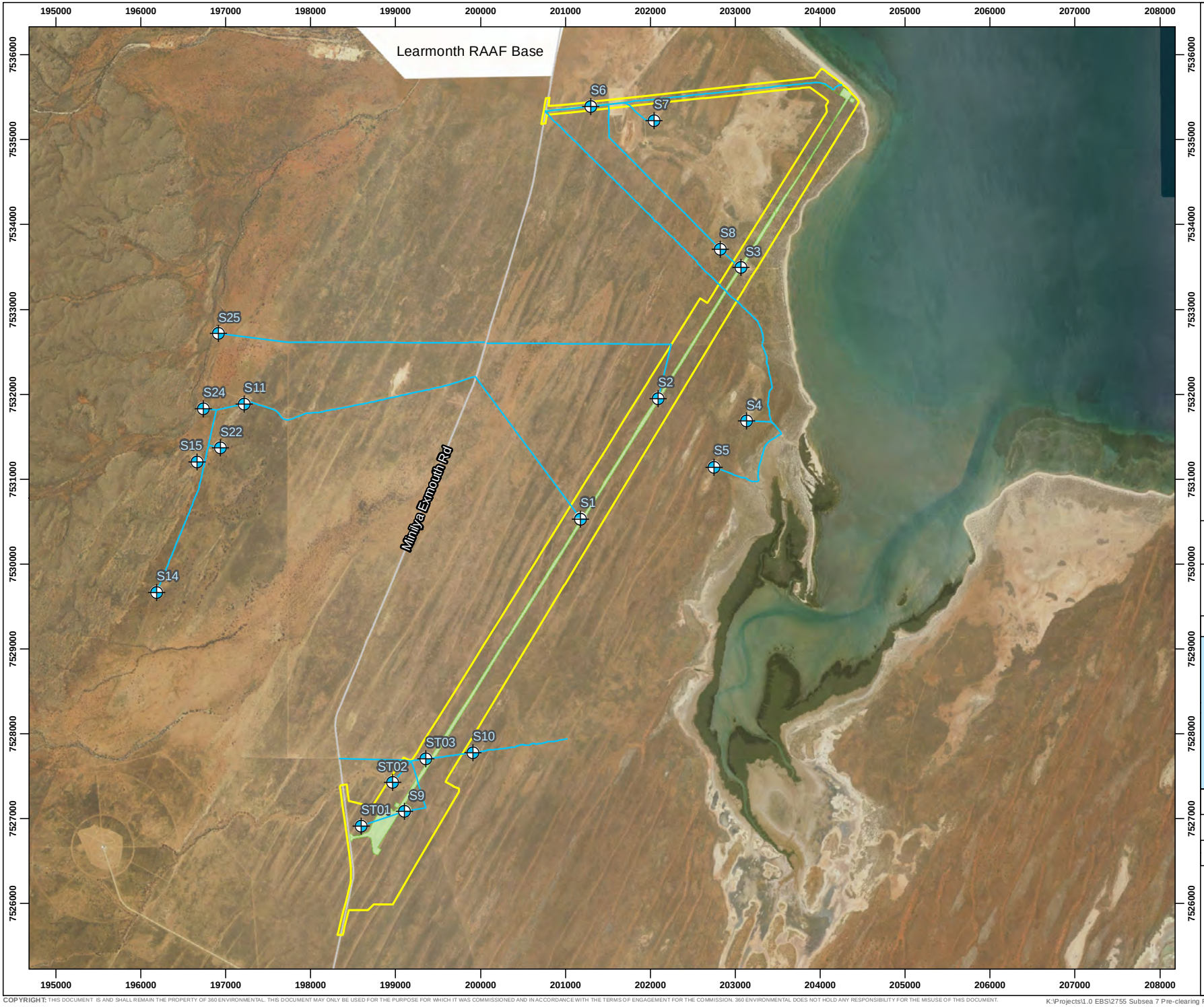
CREATED	CHECKED	APPROVED	REVISION
SL	SF	SW	0

Subsea 7
Bundle Site, Learmonth

Pre- Clearing Flora Survey

Figure 1
Pre- Clearing Survey Area

K:\Projects\1.0 EBS\2755 Subsea 7 Pre-clearing Flora Survey\2755 F1 - Survey Area Location.mxd



Legend

- Stygofauna Sampling Bores
- Pre-Clearing Survey Area (360 Environmental 2018a)
- Detailed Flora Survey Area (360 Environmental 2017)
- Targeted Flora Survey Area (360 Environmental 2018b)
- State Road

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- LOCALITY MAP SOURCED LANDGATE 2017
- CADASTRE SOURCED LANDGATE 2018
- AERIAL PHOTOGRAPHY SOURCED LANDGATE 2018
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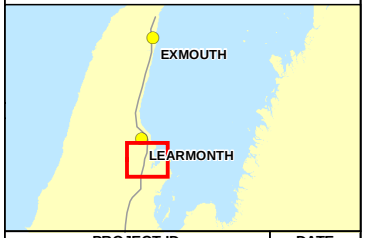
LOCALITY MAP



PROJECT ID	DATE
2755	12/11/2018

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
SL	SF	SW	0

Subsea 7
Learmonth Bundle Site

Pre-Clearing Flora Survey

Figure 2
Previous Flora Survey Efforts

K:\Projects\1.0 EBS\2755 Subsea 7 Pre-clearing Flora Survey\2755 Detailed Flora Survey - F1 Location of Survey Area.mxd

Legend

- *Corchorus congener* (P3) Targeted Survey Record
- Detailed Flora Survey Area
- Priority Flora Search Area
- Location of *Corchorus congener* Population

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- LOCALITY MAP SOURCED LANDGATE 2017
- CADASTRE SOURCED LANDGATE 2018
- AERIAL PHOTOGRAPHY SOURCED LANDGATE 2018
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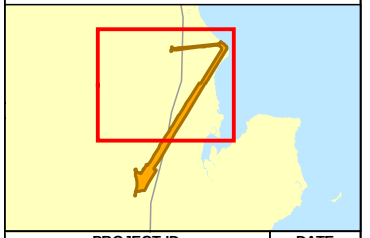
LOCALITY MAP



PROJECT ID	DATE
2755	12/11/2018

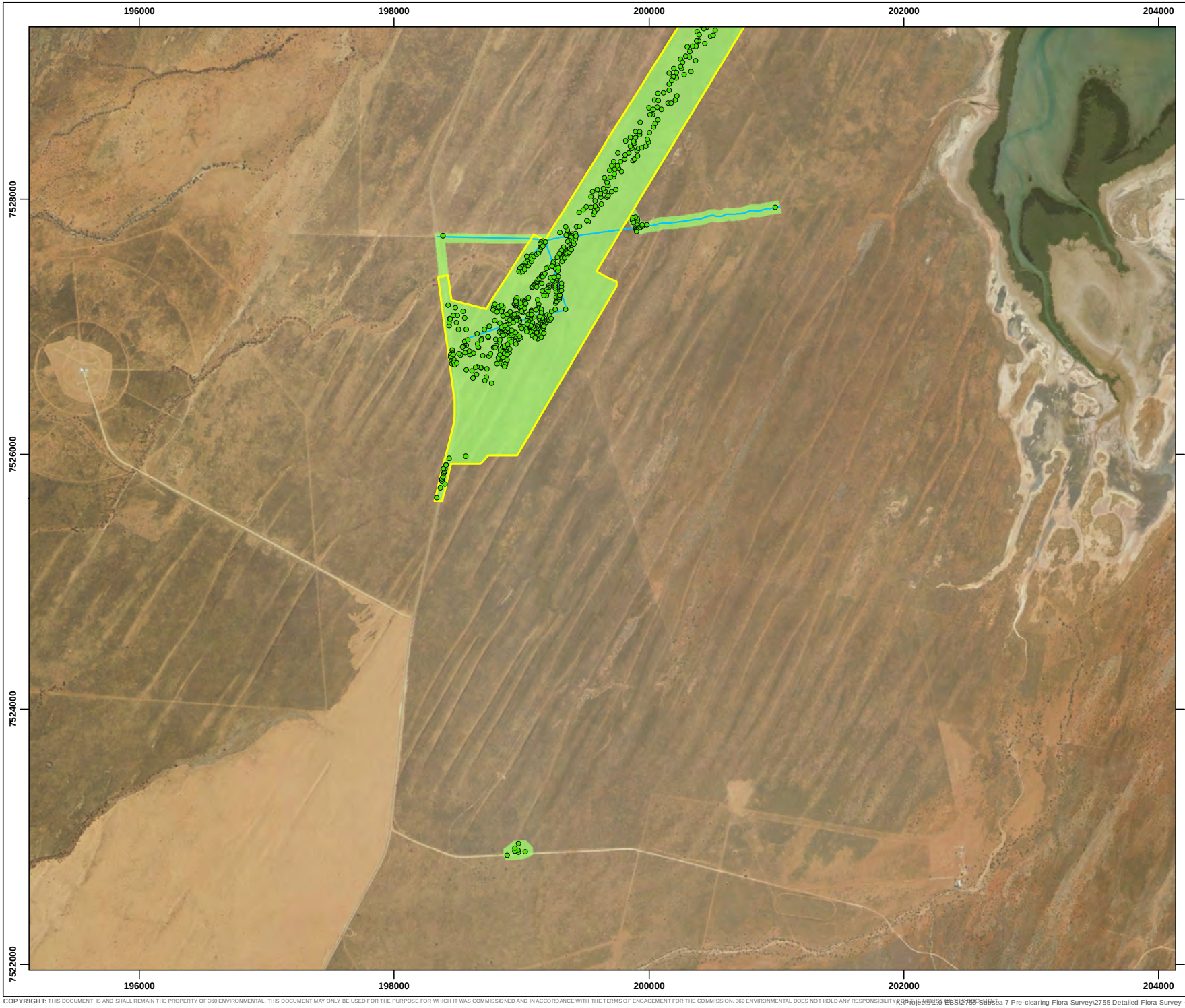
HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
SL	SF	SW	0

Subsea 7
Learmonth Bundle Site

Pre-clearing Flora Survey

Figure 3a Location of ***Corchorus congener* (P3)**



Legend

- *Corchorus congener* (P3) Targeted Survey Record
- Detailed Flora Survey Area
- Priority Flora Search Area
- Location of *Corchorus congener* Population

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- LOCALITY MAP SOURCED LANDGATE 2017
- CADASTRE SOURCED LANDGATE 2018
- AERIAL PHOTOGRAPHY SOURCED LANDGATE 2018
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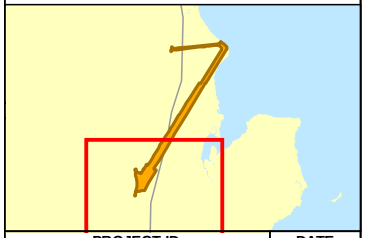
LOCALITY MAP



PROJECT ID	DATE
2755	12/11/2018

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
SL	SF	SW	0

Subsea 7
Learmonth Bundle Site

Pre-clearing Flora Survey

Figure 3b Location of *Corchorus congener* (P3)

APPENDIX A:

SITE PHOTOS

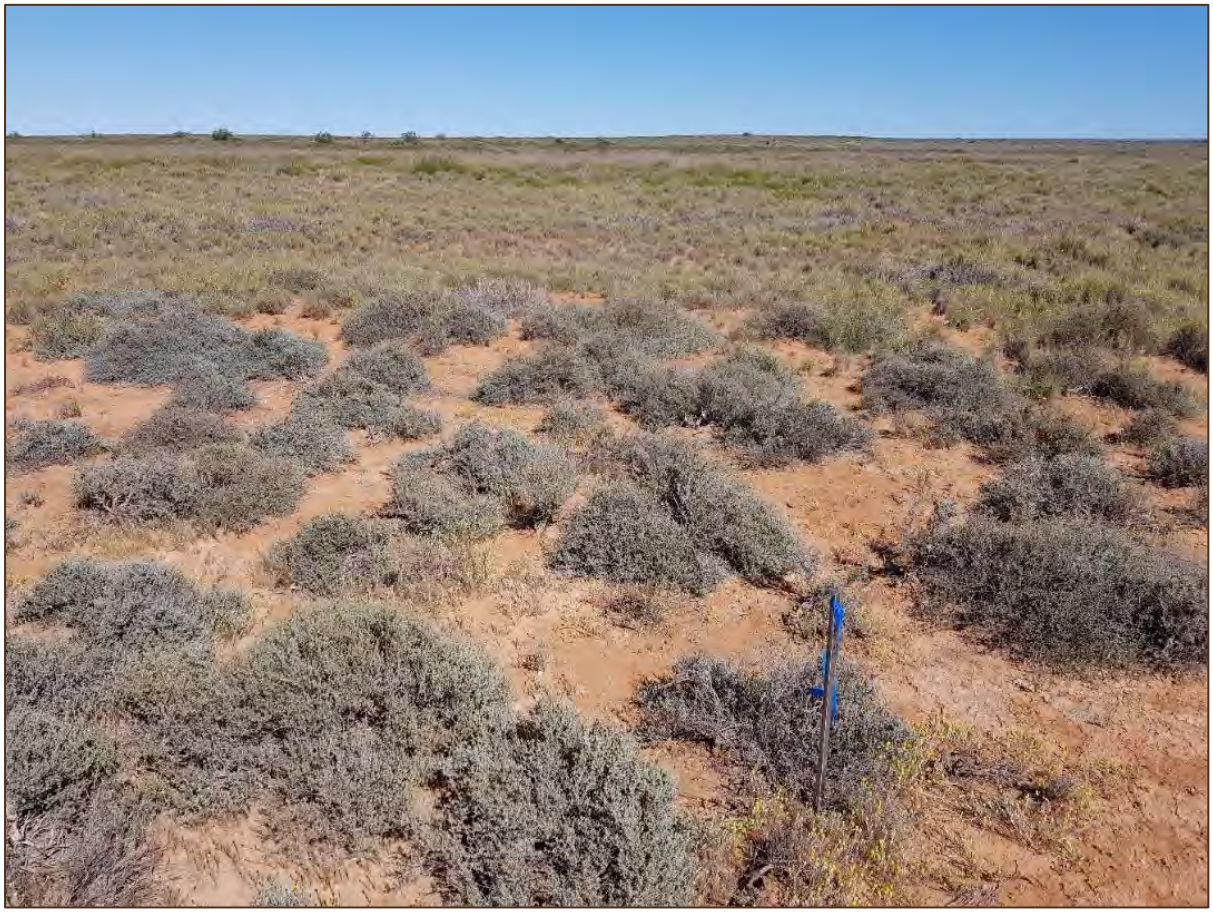
Pre-Clearing site photos

Blue tape indicates the bore location boundary

Orange tape indicates *Corchorus congener* individuals or populations

S01

S03



S04

S05

S06

S07

S08

S09

S10

S11

S14

S15

S16

S22

S24

APPENDIX B:

Locations of Corchorus Congener

Locations of Priority 3 Species, *Corchorus Congener*		
GDA94 Zone 50		
	Easting	Northing
1	199208.63	7527466.22
2	199196.13	7527456.55
3	203246.50	7533485.37
4	201868.35	7534674.08
5	198563.08	7525983.01
6	198377.56	7525788.99
7	198375.69	7525805.58
8	198385.99	7525821.96
9	198389.85	7525845.97
10	198393.18	7525855.13
11	198395.42	7525867.47
12	198401.20	7525888.20
13	198407.47	7525920.80
14	198433.19	7527005.61
15	198552.95	7526886.35
16	198579.87	7526896.96
17	198566.41	7526979.27
18	198507.61	7526980.78
19	198490.30	7527032.76
20	199257.32	7527379.82
21	199246.26	7527359.77
22	199217.64	7527325.74
23	199216.43	7527308.21
24	199203.17	7527295.53
25	199196.52	7527287.43
26	199207.14	7527277.10
27	199184.17	7527259.81
28	199195.53	7527243.07
29	199176.99	7527241.83
30	199137.30	7527177.77

Locations of Priority 3 Species, *Corchorus Congener*		
31	199134.44	7527149.56
32	199145.11	7527141.46
33	199157.55	7527138.48
34	199201.43	7527092.89
35	199173.45	7527051.90
36	199140.01	7527064.44
37	199100.58	7527077.20
38	199073.22	7527084.20
39	199055.89	7527095.17
40	199003.30	7527138.04
41	198993.09	7527143.39
42	198988.35	7527148.72
43	198952.35	7527165.21
44	198943.87	7527177.01
45	198949.54	7527182.66
46	198955.72	7527198.74
47	198955.30	7527215.14
48	198965.11	7527224.86
49	199011.39	7527204.81
50	199021.74	7527197.25
51	199026.37	7527192.58
52	199032.73	7527183.72
53	199079.84	7527131.10
54	199078.28	7527115.67
55	199048.46	7527063.55
56	199070.53	7527052.67
57	199148.47	7527027.03
58	199144.78	7527020.31
59	199135.61	7527009.60
60	199129.80	7527000.84
61	199133.35	7526987.94
62	199120.79	7526960.43

Locations of Priority 3 Species, *Corchorus Congener*		
63	199085.63	7526965.52
64	199068.42	7526981.03
65	199052.73	7526992.48
66	199037.76	7526998.50
67	198986.67	7527043.84
68	198976.84	7527061.72
69	198970.47	7527071.01
70	198965.45	7527080.23
71	198959.43	7527076.78
72	198948.08	7527082.33
73	198929.97	7527091.07
74	198923.48	7527090.72
75	198904.54	7527105.31
76	198847.16	7527129.03
77	198839.47	7527142.51
78	198828.90	7527150.84
79	198823.82	7527157.50
80	198788.63	7527175.00
81	198781.29	7527154.57
82	198829.08	7527125.35
83	198842.19	7527119.62
84	198889.62	7527098.26
85	198941.74	7527074.23
86	198948.77	7527068.04
87	198956.02	7527055.99
88	198962.87	7527048.26
89	198992.63	7527002.17
90	198999.38	7527000.20
91	199013.81	7527000.14
92	199038.98	7526978.13
93	199056.62	7526967.17
94	199064.70	7526960.12

Locations of Priority 3 Species, *Corchorus Congener*		
95	199092.19	7526935.50
96	199108.50	7526923.73
97	199129.06	7526905.73
98	199145.93	7526929.00
99	199154.77	7526962.42
100	199170.88	7526988.12
101	199176.65	7527004.19
102	199193.34	7527026.24
103	199196.32	7527037.27
104	199202.33	7527046.36
105	199209.85	7527057.48
106	199217.47	7527068.60
107	199222.62	7527089.87
108	199238.21	7527120.65
109	199270.32	7527187.77
110	199273.63	7527198.04
111	199279.60	7527198.71
112	199272.66	7527221.62
113	199272.69	7527230.60
114	199275.66	7527274.00
115	199267.32	7527305.42
116	199266.35	7527318.04
117	199264.55	7527336.85
118	199273.64	7527351.99
119	199279.30	7527363.07
120	199278.12	7527375.79
121	198469.04	7526726.44
122	198470.56	7526743.32
123	198518.34	7526783.82
124	198523.10	7526777.48
125	198625.32	7526791.55
126	198746.03	7526766.52

Locations of Priority 3 Species, *Corchorus Congener*		
127	198826.02	7526725.29
128	198840.54	7526715.59
129	198860.10	7526701.34
130	198869.79	7526695.88
131	198875.08	7526710.28
132	198837.86	7526747.57
133	198820.40	7526754.55
134	198759.60	7526789.94
135	198665.20	7526835.33
136	198661.58	7526841.35
137	198657.80	7526866.11
138	198687.23	7526906.13
139	198804.08	7526851.66
140	198854.46	7526843.32
141	198852.04	7526834.85
142	198888.96	7526807.86
143	198902.46	7526797.81
144	198906.90	7526823.95
145	198882.02	7526836.43
146	198872.83	7526842.35
147	198866.21	7526848.54
148	198825.34	7526882.55
149	198799.64	7526899.89
150	198741.76	7526917.50
151	198738.87	7526923.21
152	198711.10	7526977.87
153	198742.94	7527000.43
154	198747.96	7527001.86
155	198828.58	7526959.97
156	198842.78	7526956.15
157	198864.41	7526946.59
158	198868.03	7526940.79

Locations of Priority 3 Species, *Corchorus Congener*		
159	198871.49	7526943.41
160	198905.79	7526923.79
161	198925.49	7526902.00
162	198955.39	7526865.23
163	198977.96	7526903.13
164	198971.68	7526907.78
165	198954.05	7526918.41
166	198951.13	7526925.22
167	198931.86	7526935.49
168	198918.86	7526946.10
169	198897.04	7526960.42
170	198896.73	7526965.62
171	198874.34	7526976.82
172	198853.43	7526986.39
173	198842.04	7526994.15
174	198566.20	7526852.13
175	198549.37	7526847.71
176	198543.86	7526845.05
177	198538.48	7526840.62
178	198458.80	7526818.35
179	198460.21	7526793.55
180	198444.10	7526778.83
181	198446.84	7526759.48
182	198451.09	7526731.86
183	198450.37	7526721.31
184	198473.63	7526707.80
185	198613.37	7526652.88
186	198647.65	7526623.95
187	198723.80	7526605.48
188	198683.50	7526678.85
189	198677.12	7526683.71
190	198652.03	7526685.22

Locations of Priority 3 Species, *Corchorus Congener*		
191	198639.00	7526681.75
192	198473.50	7526703.81
193	199402.15	7527701.61
194	199407.90	7527702.61
195	199389.38	7527679.31
196	199382.93	7527666.21
197	199376.48	7527658.44
198	199301.18	7527548.14
199	199245.61	7527473.47
200	199082.88	7527309.50
201	199086.94	7527312.79
202	199101.09	7527327.47
203	199106.60	7527330.24
204	199118.84	7527342.67
205	199128.07	7527350.38
206	199123.33	7527355.50
207	199132.89	7527373.09
208	199143.25	7527381.38
209	199155.42	7527396.80
210	199169.83	7527414.37
211	199269.25	7527455.75
212	199283.06	7527482.84
213	199316.79	7527541.02
214	199335.90	7527560.45
215	199346.68	7527578.73
216	199350.76	7527586.45
217	199358.33	7527589.70
218	199358.86	7527599.36
219	199368.84	7527600.55
220	199377.50	7527611.25
221	199391.40	7527654.96
222	201173.54	7535396.13

Locations of Priority 3 Species, *Corchorus Congener*		
223	201191.93	7535394.82
224	201202.79	7535393.47
225	201224.99	7535397.89
226	201232.55	7535396.37
227	201246.55	7535397.97
228	201255.46	7535401.36
229	201267.12	7535401.25
230	201287.71	7535397.65
231	201306.48	7535403.66
232	201312.86	7535404.56
233	201322.28	7535402.75
234	201329.47	7535388.37
235	201319.77	7535388.40
236	201305.94	7535388.47
237	201301.29	7535389.05
238	201291.82	7535387.76
239	201276.99	7535386.47
240	201263.66	7535382.34
241	201252.57	7535379.47
242	201230.02	7535382.69
243	201215.11	7535380.52
244	201213.28	7535373.72
245	201196.07	7535372.40
246	201184.66	7535370.29
247	201164.59	7535373.23
248	201150.69	7535372.19
249	202445.55	7532535.99
250	202314.23	7532316.03
251	202310.09	7532311.40
252	202187.61	7532141.70
253	202198.58	7532129.06
254	201940.47	7531749.61

Locations of Priority 3 Species, *Corchorus Congener*		
255	201933.89	7531737.40
256	201923.62	7531719.14
257	201866.93	7531620.41
258	201775.48	7531462.72
259	201669.23	7531318.59
260	201674.43	7531316.47
261	201668.68	7531315.03
262	201661.36	7531309.80
263	201665.63	7531307.55
264	201663.02	7531292.98
265	201643.12	7531260.46
266	201649.40	7531255.48
267	201648.12	7531252.57
268	201647.07	7531248.23
269	201631.79	7531248.94
270	201630.63	7531245.14
271	201635.46	7531240.69
272	201634.82	7531236.03
273	201623.78	7531231.16
274	201617.43	7531223.17
275	201612.87	7531219.09
276	201608.99	7531211.59
277	201602.43	7531209.58
278	201602.66	7531197.73
279	201589.00	7531183.94
280	201588.65	7531175.40
281	201579.78	7531169.80
282	201577.19	7531154.46
283	201565.93	7531139.28
284	201561.48	7531123.79
285	201554.85	7531125.43
286	201545.82	7531117.50

Locations of Priority 3 Species, *Corchorus Congener*		
287	201535.36	7531087.49
288	201535.52	7531068.87
289	201528.06	7531075.60
290	201512.13	7531062.32
291	201509.84	7531052.75
292	201428.70	7530911.32
293	201272.59	7530662.83
294	201263.74	7530646.03
295	201234.74	7530609.34
296	201073.87	7530292.15
297	201098.63	7530318.67
298	201174.65	7530424.98
299	201190.41	7530458.09
300	201234.94	7530550.83
301	201543.51	7531017.60
302	201543.61	7531028.57
303	201569.14	7531057.99
304	201596.86	7531101.97
305	201620.81	7531143.99
306	201716.20	7531279.04
307	201723.60	7531280.40
308	201807.29	7531455.46
309	201813.23	7531462.67
310	201831.41	7531472.10
311	202058.82	7531832.79
312	202058.31	7531838.10
313	202137.03	7531939.35
314	202164.58	7532024.56
315	202179.51	7532025.84
316	202209.74	7532068.53
317	202218.53	7532067.26
318	202227.57	7532079.85

Locations of Priority 3 Species, *Corchorus Congener*		
319	202449.84	7532462.81
320	202468.74	7532482.68
321	202490.43	7532486.75
322	202522.78	7532483.49
323	202542.70	7532525.55
324	202520.09	7532554.04
325	202496.84	7532582.86
326	202521.89	7532583.56
327	202514.37	7532588.40
328	202511.74	7532596.77
329	202524.34	7532601.34
330	202533.53	7532606.06
331	202542.22	7532621.07
332	202550.28	7532636.08
333	202714.18	7532895.01
334	202724.93	7532899.21
335	202729.98	7532904.84
336	202744.66	7532919.64
337	202855.49	7533041.13
338	202867.40	7533054.76
339	202873.65	7533083.70
340	202887.15	7533149.35
341	202901.67	7533182.76
342	202905.34	7533196.02
343	202912.87	7533190.73
344	202922.17	7533194.90
345	202924.02	7533206.13
346	202929.03	7533214.21
347	202929.80	7533233.28
348	202942.54	7533230.20
349	202947.62	7533239.61
350	202959.17	7533277.62

Locations of Priority 3 Species, *Corchorus Congener*		
351	202966.80	7533288.52
352	202969.21	7533297.54
353	202980.81	7533305.74
354	203023.91	7533500.96
355	202965.45	7533407.86
356	202960.78	7533403.89
357	202954.03	7533400.88
358	202946.90	7533390.77
359	202926.32	7533356.02
360	202917.37	7533338.45
361	202896.54	7533332.62
362	202890.61	7533318.98
363	202891.94	7533309.03
364	202881.52	7533287.56
365	202865.42	7533249.90
366	202856.48	7533237.76
367	202851.90	7533217.94
368	202836.50	7533192.60
369	202804.53	7533148.99
370	202776.51	7533109.55
371	202687.19	7532985.15
372	202678.09	7532975.45
373	202665.88	7532939.75
374	202661.59	7532927.03
375	202655.01	7532904.19
376	202630.80	7532891.75
377	202622.88	7532879.63
378	202577.05	7532811.48
379	202573.93	7532775.07
380	202559.37	7532765.26
381	202554.95	7532742.90
382	202529.28	7532720.24

Locations of Priority 3 Species, *Corchorus Congener*		
383	202506.40	7532708.61
384	202493.92	7532676.23
385	202489.43	7532646.77
386	202477.26	7532635.79
387	202457.48	7532624.22
388	202461.51	7532601.80
389	201824.29	7534717.67
390	202187.00	7534356.21
391	202506.75	7534033.60
392	203160.47	7533604.31
393	203175.19	7533616.68
394	203185.92	7533621.98
395	203203.77	7533654.35
396	203221.36	7533694.69
397	203369.14	7533929.37
398	203444.23	7534064.68
399	203447.46	7534068.62
400	203454.31	7534088.04
401	203471.42	7534105.10
402	203495.18	7534124.95
403	203498.01	7534133.20
404	203517.71	7534160.51
405	203564.61	7534227.35
406	203569.93	7534240.19
407	203605.74	7534288.09
408	203608.27	7534296.01
409	203614.55	7534302.22
410	203622.15	7534325.97
411	203623.42	7534334.97
412	203637.97	7534356.53
413	203643.69	7534370.16
414	203648.29	7534383.33

Locations of Priority 3 Species, *Corchorus Congener*		
415	203661.70	7534388.46
416	203672.70	7534423.14
417	203700.91	7534447.39
418	203713.55	7534461.15
419	203714.69	7534487.99
420	203726.81	7534506.96
421	203733.88	7534514.52
422	203689.00	7534536.71
423	203678.31	7534529.08
424	203663.84	7534509.30
425	203632.34	7534473.24
426	203624.89	7534463.34
427	203622.83	7534452.44
428	203605.66	7534422.63
429	203597.80	7534412.62
430	203595.25	7534405.92
431	203582.93	7534386.51
432	203576.31	7534371.09
433	203552.47	7534333.62
434	203536.03	7534325.00
435	203533.17	7534312.86
436	203516.09	7534277.85
437	203507.98	7534254.42
438	203502.30	7534243.67
439	203492.63	7534242.38
440	203483.47	7534230.46
441	203475.86	7534223.66
442	203465.64	7534213.16
443	203457.43	7534205.69
444	203440.90	7534158.16
445	203437.42	7534151.55
446	203426.43	7534149.24

Locations of Priority 3 Species, *Corchorus Congener*		
447	203397.88	7534093.72
448	203380.22	7534067.79
449	203376.15	7534059.17
450	203288.62	7533953.88
451	203289.72	7533928.63
452	203280.81	7533920.26
453	203272.54	7533904.81
454	203258.65	7533886.81
455	203252.70	7533857.66
456	203200.92	7533781.86
457	203128.56	7533670.98
458	199525.08	7527823.14
459	199566.53	7527881.69
460	199572.38	7527899.09
461	199596.24	7527923.49
462	199628.36	7527963.57
463	199673.79	7528013.88
464	199681.77	7528027.89
465	199709.30	7528060.12
466	199739.92	7528076.34
467	199783.65	7528219.72
468	199875.89	7528302.63
469	199889.06	7528314.53
470	199912.70	7528339.70
471	199906.14	7528380.69
472	199918.31	7528401.65
473	199942.39	7528404.56
474	199977.35	7528414.88
475	199996.89	7528449.39
476	199987.01	7528469.92
477	200006.28	7528523.94
478	200039.26	7528567.80

Locations of Priority 3 Species, *Corchorus Congener*		
479	200049.64	7528596.27
480	200069.40	7528624.80
481	200096.86	7528703.36
482	200151.91	7528752.41
483	200176.15	7528751.88
484	200207.61	7528778.31
485	200221.63	7528810.28
486	200277.68	7528978.72
487	200331.49	7529001.04
488	200367.30	7529085.08
489	200438.80	7529222.12
490	200483.65	7529276.41
491	200504.31	7529285.12
492	200521.37	7529325.68
493	200644.67	7529562.91
494	200684.79	7529626.86
495	200714.10	7529673.87
496	200763.72	7529715.83
497	200788.41	7529772.72
498	200850.65	7529892.73
499	200972.00	7530248.29
500	200944.42	7530234.35
501	200925.77	7530190.66
502	200895.50	7530150.51
503	200868.19	7530106.42
504	200816.75	7530009.12
505	200612.09	7529674.78
506	200592.95	7529646.15
507	200577.54	7529627.01
508	200558.98	7529599.72
509	200522.84	7529559.35
510	200510.59	7529531.51

Locations of Priority 3 Species, *Corchorus Congener*		
511	200492.53	7529500.24
512	200478.73	7529478.03
513	200473.68	7529440.03
514	200456.24	7529425.06
515	200439.09	7529394.25
516	200417.92	7529353.28
517	200377.14	7529312.70
518	200301.42	7529196.31
519	200249.44	7529100.65
520	200194.46	7529026.44
521	200157.36	7528988.26
522	200071.29	7528831.10
523	200044.44	7528780.04
524	200001.19	7528717.80
525	199931.93	7528604.30
526	199893.83	7528531.96
527	199854.01	7528484.87
528	199818.89	7528456.03
529	199756.49	7528365.83
530	199723.22	7528294.47
531	199708.92	7528261.06
532	199690.41	7528226.45
533	199650.30	7528167.26
534	199594.76	7528074.64
535	199557.04	7528057.95
536	199545.51	7528019.71
537	199508.22	7527942.96
538	199483.63	7527918.65
539	199453.94	7527896.91
540	199432.85	7527782.78
541	199401.04	7527726.97
542	204247.59	7535611.96

Locations of Priority 3 Species, *Corchorus Congener*		
543	204189.58	7535347.64
544	204175.30	7535322.54
545	204169.48	7535308.47
546	204162.79	7535286.18
547	204151.64	7535264.68
548	204106.08	7535197.76
549	204056.20	7535157.36
550	204051.83	7535153.62
551	204047.39	7535142.90
552	204010.87	7535045.45
553	203979.57	7535036.76
554	203970.58	7535010.77
555	203961.71	7534978.13
556	203869.86	7534817.34
557	203829.58	7534765.48
558	203816.02	7534730.09
559	203802.56	7534711.10
560	203783.75	7534701.88
561	203737.75	7534631.07
562	203710.21	7534587.43
563	203703.71	7534571.24
564	203709.36	7534556.61
565	203758.01	7534547.78
566	203780.50	7534590.99
567	203799.10	7534616.39
568	203832.17	7534661.90
569	203879.11	7534721.43
570	203902.18	7534777.50
571	203928.06	7534794.29
572	203970.61	7534873.56
573	204037.27	7534959.06
574	204038.41	7534969.50

Locations of Priority 3 Species, *Corchorus Congener*		
575	204046.45	7535002.35
576	204061.11	7535023.57
577	204077.83	7535055.81
578	204096.98	7535063.04
579	204129.09	7535132.15
580	204170.39	7535206.19
581	204214.73	7535261.45
582	204223.24	7535275.35
583	204242.38	7535294.12
584	204271.59	7535352.97
585	204300.90	7535428.33
586	203710.48	7535657.72
587	203747.91	7535658.66
588	203757.82	7535658.29
589	203773.68	7535659.81
590	203807.18	7535661.33
591	203827.60	7535667.15
592	203869.63	7535670.28
593	203876.64	7535670.30
594	203892.80	7535672.60
595	203901.65	7535673.55
596	203924.50	7535676.09
597	203939.64	7535677.60
598	203950.89	7535677.59
599	203979.02	7535679.12
600	204002.30	7535675.68
601	204014.77	7535670.60
602	204054.12	7535662.70
603	204134.53	7535606.16
604	204140.07	7535602.49
605	204254.37	7535640.79
606	204219.50	7535559.34

Locations of Priority 3 Species, *Corchorus Congener*		
607	204007.97	7535659.50
608	204022.63	7535664.43
609	204004.44	7535671.40
610	203992.54	7535673.17
611	203961.99	7535674.03
612	203931.34	7535674.45
613	203911.46	7535673.18
614	203906.41	7535672.97
615	203881.60	7535669.84
616	203868.93	7535669.05
617	203848.31	7535668.43
618	203811.72	7535666.63
619	203768.57	7535662.60
620	203753.87	7535659.99
621	202629.37	7535536.60
622	202618.94	7535537.50
623	202460.81	7535525.62
624	202591.85	7535535.33
625	202625.01	7535543.83
626	202656.20	7535546.97
627	201402.72	7535398.86
628	201388.80	7535398.59
629	201368.72	7535396.32
630	201349.13	7535395.73
631	201345.11	7535412.05
632	201363.39	7535410.85
633	201381.67	7535409.98
634	201412.30	7535410.13
635	201869.54	7535446.93
636	198978.43	7522875.71
637	198971.50	7522892.86
638	198950.01	7522884.68

Locations of Priority 3 Species, *Corchorus Congener*		
639	198948.49	7522909.82
640	198977.80	7522945.52
641	199028.71	7522882.34
642	200713.32	7534124.79
643	200705.19	7534128.96
644	200688.14	7534130.30
645	200684.79	7534138.43
646	200704.13	7534125.39
647	200690.47	7534078.91
648	200742.96	7534052.99
649	200760.76	7534119.83
650	200782.27	7533972.39
651	200774.96	7533955.19
652	200770.89	7533946.91
653	200749.00	7533959.01
654	200720.30	7534008.66
655	200607.86	7534163.89
656	201308.59	7535368.79
657	201293.34	7535357.19
658	201270.06	7535333.81
659	201244.19	7535284.32
660	201290.32	7535261.82
661	201312.79	7535294.84
662	201327.40	7535318.72
663	201330.42	7535333.52
664	201344.77	7535354.30
665	201349.32	7535380.77
666	202764.88	7533707.82
667	203031.27	7533461.54
668	202075.21	7535227.54
669	202082.59	7535230.01
670	202120.09	7535265.30

Locations of Priority 3 Species, *Corchorus Congener*		
671	202121.71	7535272.32
672	202130.05	7535278.35
673	202094.30	7535275.78
674	203444.31	7531663.43
675	203446.99	7531669.14
676	203126.14	7531695.71
677	203119.70	7531687.16
678	203104.74	7531682.00
679	203097.99	7531684.53
680	203092.25	7531682.65
681	203086.97	7531683.55
682	203069.87	7531682.55
683	203057.01	7531675.77
684	203044.67	7531668.22
685	203087.42	7531719.46
686	203102.27	7531719.75
687	203342.16	7531806.45
688	203352.80	7531816.63
689	203367.89	7531874.11
690	203392.87	7531846.32
691	203399.10	7531757.33
692	203403.93	7531731.27
693	203430.41	7531678.69
694	203444.70	7531665.10
695	202964.00	7531069.96
696	202924.29	7531080.84
697	202901.58	7531092.82
698	202875.70	7531097.98
699	202868.83	7531101.17
700	202781.02	7531108.69
701	202825.39	7531085.94
702	202843.57	7531079.08

Locations of Priority 3 Species, *Corchorus Congener*		
703	202853.76	7531075.17
704	202862.86	7531073.57
705	202874.77	7531065.71
706	202896.45	7531064.57
707	202933.36	7531059.74
708	202944.74	7531052.42
709	203316.86	7532608.49
710	202156.75	7532212.60
711	202149.51	7532197.50
712	202138.03	7532188.52
713	202138.72	7532168.70
714	202071.22	7531955.83
715	202115.26	7531944.70
716	202149.55	7531942.36
717	202144.28	7531926.97
718	199173.16	7527673.68
719	199156.91	7527665.71
720	199149.21	7527648.05
721	199082.55	7527565.74
722	199069.29	7527552.96
723	199055.48	7527536.73
724	199042.02	7527550.10
725	199047.00	7527511.41
726	199031.35	7527499.58
727	199027.54	7527472.46
728	199011.19	7527475.36
729	199002.36	7527468.42
730	198990.10	7527456.99
731	198981.10	7527432.21
732	198997.41	7527430.98
733	199009.63	7527433.65
734	199025.70	7527450.59

Locations of Priority 3 Species, *Corchorus Congener*		
735	199053.32	7527477.95
736	199067.90	7527497.07
737	199080.18	7527512.49
738	199083.34	7527530.07
739	199097.97	7527552.18
740	199117.58	7527567.19
741	199134.05	7527579.26
742	199146.55	7527604.78
743	199157.11	7527623.49
744	199169.51	7527633.04
745	199187.12	7527666.19
746	199369.10	7527714.94
747	199366.20	7527726.18
748	199363.92	7527737.22
749	199360.36	7527750.68
750	199357.42	7527759.04
751	199348.30	7527782.70
752	199301.44	7527736.90
753	199357.60	7527717.82
754	199352.93	7527719.28
755	199906.11	7527806.13
756	199908.63	7527825.13
757	199911.00	7527835.92
758	199905.46	7527850.23
759	199896.10	7527859.80
760	199875.85	7527856.41
761	199870.45	7527836.91
762	199880.64	7527816.83
763	199897.79	7527772.27
764	199894.74	7527770.33
765	199900.42	7527764.23
766	199904.58	7527756.89

Locations of Priority 3 Species, *Corchorus Congener*		
767	199901.32	7527755.05
768	199903.98	7527745.24
769	199921.49	7527773.06
770	199930.18	7527777.11
771	199925.30	7527773.25
772	199932.03	7527777.48
773	199948.12	7527787.99
774	199949.58	7527797.77
775	199986.46	7527799.37
776	200991.10	7527938.56
777	199348.51	7527138.08
778	198930.69	7527033.00
779	198913.45	7527028.34
780	198883.79	7527016.24
781	198651.42	7526944.68
782	196962.26	7532707.77
783	196959.90	7532701.63
784	196956.03	7532677.95
785	196948.97	7532680.25
786	196950.19	7532697.23
787	196951.59	7532714.99
788	196956.52	7532726.83
789	196968.52	7532788.47
790	196200.45	7529669.71
791	196214.66	7529681.62
792	196387.87	7530222.46
793	196477.21	7530384.81
794	196788.12	7531396.61
795	196787.63	7531453.46
796	196788.36	7531463.79
797	196784.83	7531438.56
798	196778.40	7531424.47

Locations of Priority 3 Species, *Corchorus Congener*		
799	196827.01	7531380.64
800	196860.79	7531827.75
801	196651.72	7531198.55
802	196701.17	7531211.93
803	201860.33	7535459.05
804	198888.05	7522853.55
805	199513.59	7527830.56
806	199576.54	7527945.17
807	199624.80	7528014.48
808	199655.20	7528063.29
809	199681.11	7528109.89
810	199722.62	7528176.09
811	199730.14	7528198.29
812	199759.43	7528240.42
813	199810.13	7528316.66
814	199843.48	7528362.63
815	199866.91	7528398.78
816	199887.37	7528439.18
817	199927.32	7528506.57
818	200030.30	7528662.95
819	200066.43	7528719.62
820	200158.45	7528856.83
821	200214.14	7528952.78
822	200257.76	7529027.77
823	200316.57	7529116.80
824	200369.23	7529199.06
825	200390.97	7529242.70
826	200457.29	7529349.16
827	200495.84	7529408.76
828	200566.59	7529509.87
829	200707.40	7529732.37
830	200762.22	7529820.43

Locations of Priority 3 Species, *Corchorus Congener*		
831	200775.62	7529847.73
832	200975.95	7530198.16
833	200665.01	7529700.85
834	200623.52	7529637.98
835	200560.11	7529541.11
836	200545.23	7529516.22
837	200514.79	7529474.29
838	200483.79	7529423.93
839	200464.57	7529388.54
840	200432.93	7529339.27
841	200394.87	7529291.87
842	200373.33	7529243.02
843	200342.97	7529202.10
844	200320.55	7529161.87
845	200290.65	7529124.06
846	200265.11	7529074.35
847	200248.08	7529042.77
848	200216.64	7528994.39
849	200191.21	7528959.88
850	200179.99	7528932.28
851	200158.28	7528903.27
852	200115.28	7528833.61
853	200075.72	7528772.66
854	200034.86	7528704.49
855	200007.57	7528665.50
856	199926.25	7528529.93
857	199894.22	7528479.88
858	199877.29	7528454.17
859	199854.39	7528416.82
860	199812.22	7528347.51
861	199779.44	7528293.45
862	199752.13	7528260.45

Locations of Priority 3 Species, *Corchorus Congener*		
863	199732.01	7528234.57
864	199696.50	7528172.70
865	199671.83	7528131.44
866	199642.30	7528085.20
867	199618.55	7528044.40
868	199577.62	7527985.42
869	199545.57	7527936.25
870	199457.18	7527788.46
871	199424.21	7527728.53
872	204242.57	7535631.70
873	204281.48	7535500.33
874	204364.47	7535443.73
875	204286.05	7535482.25
876	204242.94	7535373.26
877	204213.73	7535335.80
878	204189.42	7535296.10
879	204177.45	7535269.28
880	204162.58	7535248.49
881	204134.05	7535207.83
882	204069.06	7535104.74
883	204049.72	7535063.81
884	204015.45	7535021.49
885	203997.02	7534987.00
886	203937.94	7534888.12
887	203823.55	7534708.18
888	203812.48	7534688.24
889	203778.66	7534644.04
890	203739.19	7534577.12
891	203734.31	7534551.54
892	203761.96	7534594.96
893	203779.17	7534628.53
894	203817.81	7534679.36

Locations of Priority 3 Species, *Corchorus Congener*		
895	203862.53	7534752.25
896	203937.52	7534877.26
897	203992.87	7534961.43
898	204005.32	7534979.40
899	204019.18	7535004.27
900	204035.51	7535029.96
901	204136.52	7535192.14
902	204156.58	7535222.22
903	204184.56	7535264.31
904	204183.63	7535264.07
905	204211.63	7535305.28
906	203672.82	7535647.25
907	203649.25	7535644.37
908	203580.67	7535637.63
909	203605.76	7535647.64
910	203615.96	7535648.05
911	203636.28	7535648.55
912	203659.07	7535654.08
913	203673.19	7535655.02
914	203690.29	7535656.45
915	203709.51	7535649.28
916	203740.54	7535655.86
917	202693.23	7535552.89
918	202712.66	7535551.26
919	202740.58	7535553.13
920	202776.08	7535557.90
921	202847.69	7535567.92
922	202925.85	7535575.06
923	203037.55	7535587.27
924	203083.99	7535591.71
925	203049.22	7535581.29
926	203037.54	7535582.62

Locations of Priority 3 Species, *Corchorus Congener*		
927	203010.23	7535581.10
928	202960.88	7535572.29
929	202924.51	7535569.82
930	202668.28	7535536.01
931	201857.06	7535463.09
932	201928.15	7535473.10
933	201957.37	7535477.31
934	201981.50	7535477.88
935	202029.38	7535476.92
936	202235.99	7535494.39
937	202111.48	7535483.70
938	202038.66	7535477.32
939	201943.00	7535462.63
940	201915.51	7535465.21
941	201883.97	7535458.40
942	202444.28	7532554.03
943	202283.81	7532315.44
944	202259.05	7532277.95
945	202232.48	7532227.35
946	202076.94	7531996.17
947	201723.68	7531421.05
948	201718.39	7531406.43
949	201691.16	7531358.14
950	201679.88	7531349.39
951	201657.95	7531320.48
952	201650.70	7531306.27
953	201630.02	7531266.08
954	201621.81	7531253.07
955	201606.07	7531229.49
956	201580.27	7531214.47
957	201571.64	7531185.60
958	201549.27	7531142.17

Locations of Priority 3 Species, *Corchorus Congener*		
959	201528.49	7531118.05
960	201500.25	7531063.09
961	201487.05	7531041.56
962	201390.95	7530890.42
963	201200.43	7530580.64
964	201200.43	7530532.54
965	201408.27	7530853.07
966	201431.28	7530884.77
967	201517.66	7531031.95
968	201545.76	7531067.29
969	201569.28	7531115.40
970	201588.83	7531149.80
971	201635.95	7531215.10
972	201652.77	7531246.68
973	202063.52	7531905.25
974	202196.32	7532106.85
975	202202.88	7532119.72
976	202309.22	7532303.07
977	202346.49	7532349.45
978	202415.33	7532460.27
979	202428.10	7532466.83
980	202426.61	7532485.53
981	202446.00	7532512.39
982	202457.04	7532523.13
983	202494.80	7532592.35
984	202524.76	7532644.01
985	202591.80	7532741.39
986	202606.71	7532776.03
987	202728.55	7532947.27
988	202829.05	7533123.97
989	202861.77	7533176.35
990	202868.53	7533184.46

Locations of Priority 3 Species, *Corchorus Congener*		
991	202880.30	7533200.31
992	202894.84	7533216.32
993	202912.04	7533239.48
994	202917.55	7533258.98
995	202927.19	7533267.26
996	202960.44	7533324.53
997	202974.71	7533349.85
998	203037.13	7533446.24
999	203043.62	7533489.70
1000	203024.13	7533468.27
1001	202972.59	7533379.95
1002	202967.27	7533366.55
1003	202961.54	7533347.94
1004	202906.73	7533263.54
1005	202892.09	7533241.65
1006	202881.94	7533227.83
1007	202862.92	7533202.53
1008	202854.03	7533187.51
1009	202844.27	7533169.25
1010	202813.38	7533128.88
1011	202788.06	7533088.16
1012	202705.39	7532950.26
1013	202685.43	7532909.98
1014	202610.69	7532805.14
1015	202603.79	7532777.86
1016	202587.38	7532772.67
1017	202572.75	7532755.98
1018	202577.31	7532727.70
1019	202490.48	7532619.09
1020	202472.38	7532599.79
1021	203140.04	7533615.34
1022	203148.57	7533628.03

Locations of Priority 3 Species, *Corchorus Congener*		
1023	203192.88	7533700.91
1024	203291.39	7533857.62
1025	203322.63	7533907.20
1026	203333.08	7533932.12
1027	203434.74	7534086.56
1028	203445.05	7534102.93
1029	203462.65	7534126.65
1030	203470.32	7534146.42
1031	203474.51	7534169.88
1032	203494.73	7534180.58
1033	203515.07	7534207.12
1034	203576.10	7534300.82
1035	203583.21	7534323.13
1036	203587.39	7534330.85
1037	203616.95	7534365.77
1038	203629.09	7534389.50
1039	203644.13	7534412.17
1040	203661.63	7534441.21
1041	203684.14	7534466.80
1042	203697.40	7534501.85
1043	203716.23	7534526.04
1044	203709.53	7534541.98
1045	203688.84	7534496.15
1046	203663.38	7534463.08
1047	203641.64	7534439.72
1048	203631.29	7534414.81
1049	203611.21	7534402.13
1050	203595.73	7534364.26
1051	203573.25	7534331.58
1052	203555.40	7534304.75
1053	203511.57	7534233.65
1054	203488.95	7534202.41

Locations of Priority 3 Species, *Corchorus Congener*		
1055	203457.93	7534152.61
1056	203391.93	7534054.04
1057	203382.07	7534030.25
1058	203257.58	7533823.73
1059	203237.81	7533800.41
1060	203133.99	7533635.51
1061	203043.75	7533499.24
1062	199231.10	7527386.41
1063	199165.32	7527280.17
1064	199129.22	7527211.53
1065	199114.73	7527134.22
1066	199155.36	7527107.63
1067	199162.59	7527069.53
1068	199144.44	7527080.59
1069	199080.62	7527096.09
1070	199025.19	7527147.00
1071	198998.28	7527162.88
1072	198962.22	7527188.01
1073	198957.77	7527199.67
1074	198993.95	7527184.30
1075	199046.94	7527046.45
1076	199063.54	7527036.02
1077	199086.09	7527026.82
1078	199122.96	7527002.26
1079	199115.60	7526988.38
1080	199101.69	7526987.88
1081	199089.53	7526998.07
1082	199074.74	7527005.98
1083	199045.37	7527020.82
1084	199011.65	7527111.82
1085	198999.78	7527122.68
1086	198964.52	7527101.16

Locations of Priority 3 Species, *Corchorus Congener*		
1087	198945.81	7527098.47
1088	198910.99	7527117.96
1089	198856.38	7527153.26
1090	198841.34	7527168.48
1091	198788.71	7527175.88
1092	198779.10	7527134.47
1093	198807.81	7527116.51
1094	198853.99	7527085.16
1095	198887.46	7527065.86
1096	198908.15	7527052.07
1097	198937.21	7527031.35
1098	199002.33	7526986.18
1099	199041.96	7526962.78
1100	199085.99	7526931.05
1101	199106.19	7526915.48
1102	199155.83	7526918.44
1103	199177.17	7526950.78
1104	199216.53	7527047.86
1105	199224.46	7527053.77
1106	199233.87	7527062.93
1107	199265.14	7527136.14
1108	199296.36	7527216.87
1109	199299.82	7527230.02
1110	199302.49	7527246.36
1111	199304.20	7527280.65
1112	199315.88	7527284.31
1113	199315.26	7527316.22
1114	199312.59	7527342.32
1115	199289.61	7527395.08
1116	198453.42	7526712.73
1117	198471.47	7526718.18
1118	198595.14	7526779.66

Locations of Priority 3 Species, *Corchorus Congener*		
1119	198696.62	7526772.98
1120	198804.89	7526708.80
1121	198867.68	7526688.08
1122	198888.45	7526738.58
1123	198854.11	7526760.30
1124	198830.36	7526778.13
1125	198685.78	7526896.02
1126	198782.08	7526837.82
1127	198795.33	7526835.19
1128	198834.15	7526816.44
1129	198855.22	7526803.88
1130	198866.04	7526793.56
1131	198889.54	7526778.39
1132	198891.93	7526862.45
1133	198829.28	7526897.59
1134	198837.92	7526951.73
1135	198850.91	7526941.23
1136	198854.76	7526933.88
1137	198903.79	7526899.26
1138	198919.16	7526883.26
1139	198994.75	7526914.32
1140	198986.18	7526925.79
1141	198964.01	7526941.65
1142	198951.61	7526953.83
1143	198924.91	7526969.27
1144	198892.72	7526986.49
1145	198870.67	7527006.79
1146	198831.01	7527026.19
1147	198790.02	7527049.89
1148	198593.28	7526806.44
1149	198559.84	7526797.04
1150	198510.23	7526787.32

Locations of Priority 3 Species, *Corchorus Congener*		
1151	198465.20	7526780.57
1152	198476.80	7526703.76
1153	198568.38	7526660.10
1154	198618.56	7526598.23
1155	198715.05	7526578.16
1156	198766.02	7526554.76
1157	198727.62	7526668.73
1158	198492.33	7526716.37
1159	198383.04	7527713.32
1160	199391.15	7527715.92
1161	199389.44	7527702.80
1162	199374.12	7527679.12
1163	199361.43	7527668.79
1164	199331.38	7527623.10
1165	199313.44	7527602.02
1166	199296.71	7527571.55
1167	199280.13	7527543.41
1168	199255.51	7527510.57
1169	199249.24	7527499.03
1170	199240.51	7527475.92
1171	199159.59	7527341.57
1172	199055.31	7527226.28
1173	199119.54	7527311.76
1174	199169.54	7527391.97
1175	199185.96	7527417.45
1176	199257.74	7527390.25
1177	199285.06	7527438.44
1178	199289.30	7527464.12
1179	199319.25	7527509.70
1180	199339.12	7527538.02
1181	199357.60	7527563.20
1182	199361.07	7527576.01

Locations of Priority 3 Species, *Corchorus Congener*		
1183	199375.73	7527585.72
1184	199390.31	7527604.51
1185	199410.21	7527647.24
1186	199408.23	7527675.02
1187	199424.99	7527687.98
1188	199427.03	7527710.52
1189	200791.64	7535352.88
1190	200832.45	7535333.39
1191	198433.85	7525969.30
1192	198401.98	7525763.30
1193	198335.52	7525660.26
1194	198364.05	7525735.85
1195	198389.18	7525885.75
1196	198409.86	7525914.53
1197	198433.81	7527032.33
1198	198437.60	7527065.10
1199	198425.70	7527168.39
1200	198480.38	7527150.83
1201	198542.28	7527122.77
1202	198555.54	7527066.39
1203	198498.62	7527087.79
1204	198466.62	7527089.27
1205	198439.44	7527060.81

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