Western Botanical

Leonora Rail Yard Expansion Project

Level 1 Flora and Vegetation Survey

Australia Western Railroad – Aurizon Holdings Limited (Aurizon)

January 2013

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Version	Prepared By	Approved for Issue	Issue Date
1.0	Jonathan Warden	Geoff Cockerton	18/2/2013

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Executive Summary

Project Background

Australia Western Railroad – Aurizon Holdings Limited (Aurizon) proposes to undertake an expansion of the existing rail yard located approximately 2 km north of the Leonora Township within the northern goldfields of Western Australia. The proposed works includes the clearance of 7.66 ha of vegetation for the construction of a vehicle and container wash bay, truck turn around area, and other infrastructure.

Aurizon commissioned Western Botanical to undertake a level 1 flora and vegetation survey of the 7.66 ha area to meet the requirements of a clearing permit. The survey was conducted on the 11th January 2013 by Western Botanical botanists Ben Eckermann and Simon Colwill, with the guidance of Aurizon's Senior Environmental Advisor, Paul Parkinson.

Vegetation Associations

There was one vegetation association recorded across the rail yard expansion project area described using Muirs Vegetation classifications as Scattered Low Mulga Trees B over a mosaic understorey consisting of a Dwarf Shrubland C dominated by Chenopods and Mid Dense Hummock Grass dominated by *Cenchrus ciliaris**. There were no Priority Ecological Communities (PECs) or Threatened Ecological Communities (TECs) discovered across the Leonora Rail Yard project during the desktop search.

Flora

A total of 59 taxa, representing 19 families and 32 genera were recorded from within the rail yard expansion project site, with no Priority or Threatened flora identified during the survey. Seven introduced flora (weed) species were located during the survey of the project area with nine range extensions. Significantly, five of the recorded range extensions are introduced weed species.

Vegetation Condition

Vegetation Condition in the area was considered to be in Good (Good)(4) to Degraded 1 (Poor) (5) condition based on the ranking scale presented in Keighery (1994). The basic vegetation structure across the project area has been significantly to severely disturbed and impacted by introduced (weed) species and partial clearing for vehicle access.

Recommendations

Western Botanical recommends that good hygiene practices are adopted during expansion of the rail yard, to minimise spread of the identified introduced weed species.

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1 Introduction

1.1 Project Background

Australia Western Railroad – Aurizon Holdings Limited (Aurizon) proposes to undertake an expansion of the existing rail yard located approximately 2 km north of the Leonora Township within the northern goldfields of Western Australia. The proposed works includes the clearance of 7.66 ha of vegetation for the construction of a vehicle and container wash bay, truck turn around area, and other infrastructure.

Aurizon commissioned Western Botanical to undertake a level 1 flora and vegetation survey of the 7.66 ha area to meet the requirements of a clearing permit. The survey was conducted on the 11th January 2013 by Western Botanical botanists Ben Eckermann and Simon Colwill.

1.2 Scope and Limitations of this Document

This report presents the data collected on flora and vegetation (with a focus on conservation significant flora) that could be impacted by clearing and disturbance associated with the proposed rail yard expansion. This report also aims to identify and collate the vegetation associations within the project area.

As part of a level 1 survey and following the Environmental Protection Authority (EPA) guidance statement 51 (Environmental Protection Authority, 2004), the main objectives of the vegetation and flora assessment were to:

- Undertake a desktop assessment to identify potential Threatened and Priority Flora and Threatened and Priority Ecological Communities in the project area;
- Describe the vegetation associations recognised;
- Prepare an inventory of the vascular flora;
- To record and map populations of any Threatened and Priority Flora;
- Record the presence of introduced (weed) species; and
- Note the condition of the vegetation.

This report should not be treated as an exhaustive inventory of the vascular flora that occurs in the area due to the targeted nature of this survey. Although the survey was conducted in late spring, due to low seasonal rainfall across the project area, the annual flora species were poorly represented and could not be definitively assessed.

1.3 Physical Environment

1.3.1 Climate

The climate of the north eastern Goldfields region is described as arid to semi arid with the average annual rainfall decreasing from about 250 mm in the southwest to 200 mm in the north east. Rainfall can vary widely between different years and droughts and floods are features of the climate. The heaviest rainfall usually occurs in summer and is associated with thunderstorms and cyclonic activity (Pringle *et al*. 1994)

The 2012 rainfall period preceding the survey at Leonora was above average, with 282.4 mm being recorded (Bureau of Meteorology 2013) Figure 1. Significantly, there were good falls recorded between November and December with 61 mm recorded in this period (Bureau of Meteorology 2013). This contributed to the relatively good health of the vegetation, considering the time of the field survey, January 2013.

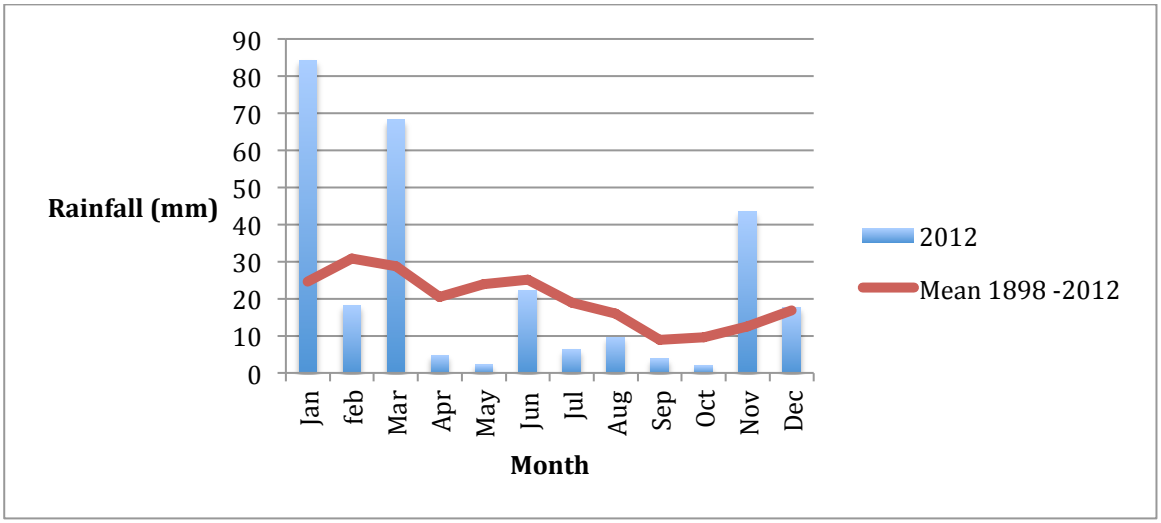

Figure 1 Rainfall recorded at the Leonora weather station during 2012 showing comparison to the long term average (Bureau of Meteorology 2013).

1.4 Vegetation Associations

1.4.1 Regional Scale

The project area is within the Murchison Interim Biogeographic Regionalisation for Australia, and more specifically the Eastern Murchison Sub region. A number of biological surveys have been conducted at a regional scale over the past 50 years within this region. The earliest was conducted by the CSIRO with the objective of scientifically mapping and describing large areas of country using land systems as the descriptive unit. Land systems are defined by the recurring pattern of landforms, soils and vegetation and these were mapped throughout the region using aerial photography at a scale of 1:250,000 (Pringle *et al* 1994). The project is located near the intersection of two land systems described in Pringle *et al* (1994), Gundockerta and Leonora Land systems. A brief description of each is given below in Table 1.

Table 1. Land Systems recorded within the vicinity of the Project area

Land System Code	Land System Name	Description
Gun	Gundockerta	Extensive, gently undulating calcareous, stony plains, supporting bluebush shrublands
Leo	Leonora	Low greenstone hills and stony plains, supporting mixed stony chenopod shrublands.

2 Methods

2.1 Desktop Survey

Prior to commencement of the January 2013 survey, a database search (encompassing the project area) was conducted for known Department of Environment and Conservation (DEC) Threatened (Declared rare-extant) Flora (T), Priority-listed flora (P) and Priority and Threatened Ecological Communities (PECs and TECs). The databases searched included:

- Threatened (Declared Rare) and Priority Flora Database (DEC 2012)
- Threatened and Priority Flora List (searched using 'place names') (DEC 2012)
- Western Australian Herbarium (WA Herbarium) Specimen database, for priority species opportunistically collected in the area of interest (DEC 2012); and
- Threatened and Priority Ecological Communities Database (DEC 2012)

The NatureMap database (DEC 2007) was used to obtain a current list of all flora species known to occur within a 20 km buffer of the Leonora rail yard project area. The search was centred on the co-ordinate 121° 19' 28" E, 28° 52' 24" S.

A search of the Environmental Protection of Biodiversity and Conservation (EPBC) Act 1999 Protected Matters Search was conducted on the 7th December 2012 using the coordinates 28.87289 S, 121.3246 E. The search was conducted for guidance on matters of national significance and other matters protected by the EPBC Act across the rail yard project area.

2.2 Field Survey

The Aurizon rail yard expansion survey area was accessed via 4WD vehicle, and the 7.66 ha site was traversed on foot by Western Botanical staff Ben Eckermann and Simon Colwill on the 11th January 2013, with the guidance of Aurizon's Senior Environmental Advisor, Paul Parkinson.

During the survey the vegetation associations were described using Muirs Vegetation Classification System (Muirs 1977). An inventory of the vascular flora present across the project area at the time of the survey was compiled, and any flora species not readily identified in the field or thought to be of conservation significance were collected, pressed and verified using the resources available at WA Herbarium. A handheld Garmin GPS 76 (WGS84 datum,

accuracy ± 5 m) was used to record the locations of collected specimens and maintain accuracy and direction within the project area. Where possible photographs were taken using a 10.1 megapixel digital camera.

3 Results

3.1 Desktop Survey

The Department of Environment and Conservation (DEC) Threatened (Declared Rare) and Priority Flora (TPFL) database (DEC 2012) search within 50 km of the Rail yard expansion survey area, returned two Priority 1 species, one Priority 2 species, one Priority 3 species and two Priority 4 species as presented in Table 2.

A search of the WA Herbarium database (DEC 2012) within 50 km of the Rail yard expansion returned two Priority 1 species, one Priority 2 species, nine Priority 3 species and one Priority 4 species as presented in Table 2.

The NatureMap search presented a total of 240 flora species with potential to occur within a 20 km radius of the project area, Appendix 1. This search also identified the potential for one Priority 3 species *Angianthus prostratus* to occur within a 20 km radius of the project area as in Table 2. Descriptions of all fourteen identified conservation significant species are provided in Appendix 2.

The EPBC Act search resulted in no Listed threatened flora, Priority flora, or Threatened Ecological communities of National significance to occur within 5 km of the Rail Yard Project area. Two weed species of National significance however were recorded as potentially occurring across the site. These weed species were *Cenchrus ciliaris* (Buffel Grass) and *Carrichtera annua* (Ward's Weed). The results of the EPBC Act search are presented in Appendix 3.

Table 2. Threatened and Priority Flora recorded within 50 km and 20 km centred on the Rail Yard Project site

Species	Conservation Status	DEC TPFL 50 km radius	WAHERB 50 km radius	NatureMap 20 km radius
Ptilotus tetrandrus	P1	✓	✓	×
Stenanthemum patens	P1	✓	✓	×
Eremophila mirabilis	P2	✓	✓	×
Angianthus prostratus	P3	✓	✓	✓
Calytrix praecipua	P3	×	✓	×
Cratystylis centralis	P3	×	✓	×
Eremophila simulans subsp. *megacalyx*	P3	×	✓	×
Eremophila veronica	P3	×	✓	×
Gunniopsis propinqua	P3	×	✓	×
Hybanthus floribundus subsp. *chloroxanthus*	P3	×	✓	×
Micromyrtus serrulata	P3	×	✓	×
Triglochin protuberans	P3	×	✓	×
Grevillea inconspicua	P4	✓	×	×
Hemigenia exilis	P4	✓	✓	×

3.2 Threatened and Priority Ecological Communities

There were no Priority Ecological Communities (PECs) or Threatened Ecological Communities (TECs) discovered across the Leonora Rail Yard project during the desktop search.

3.3 Field Survey

3.3.1 Flora

A total of 59 taxa, representing 19 families and 32 genera were recorded from within the Rail yard expansion project site, these taxa are presented in Appendix 4. The families represented by the greatest number of species were Fabaceae (12) and Chenopodiaceae (10). The Genera represented by the greatest number of species were Acacia (8) and Eremophila (6). One specimen was unable to be identified due to inadequate material being available. No Priority or Threatened Flora was identified during the survey.

3.3.2 Range extensions and New locations

There were nine range extensions or new locations recorded across the project area, significantly five of the range extensions or new locations were introduced weed species. All these species have previously been recorded within 100 to 200 km of the rail yard project area. The maps below show the current recorded locations for each of the new locations, with the blue dots representing the current known distribution and the red dot the approximate location of the rail yard project area. These records are from various herbaria across Australia (CHAH, 2013)

Enneapogon avenaceus ~200 km from Leonora Rail yard project area

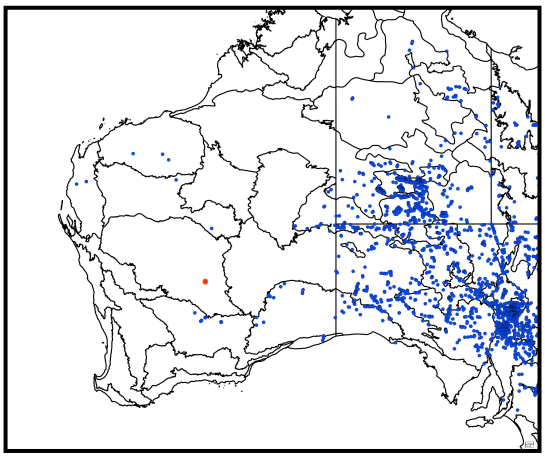

Figure 2. The IBRA regions of Western Australia, blue dots show locations recorded for *Enneapogon avenaceus* (across various Australian herbaria, red dot represents approximate location of project area (CHAH 2013).

Chrysocephalum apiculatum ~100 km from Leonora

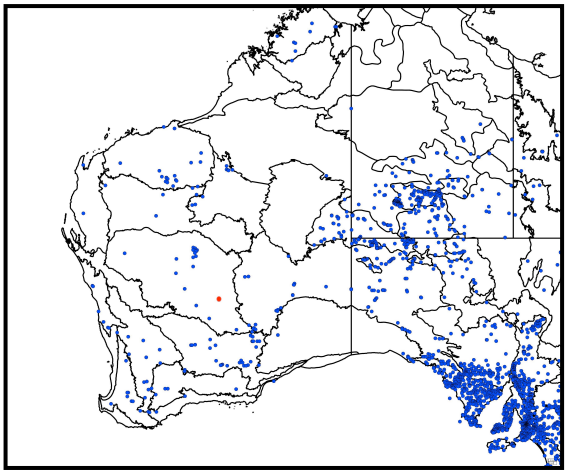

Figure 3. The IBRA regions of Western Australia, blue dots show locations recorded for *Chrysocephalum apiculatum* (across various Australian herbaria, red dot represents approximate location of project area (CHAH 2013)

*Conyza bonariensis**~100 km from Leonora

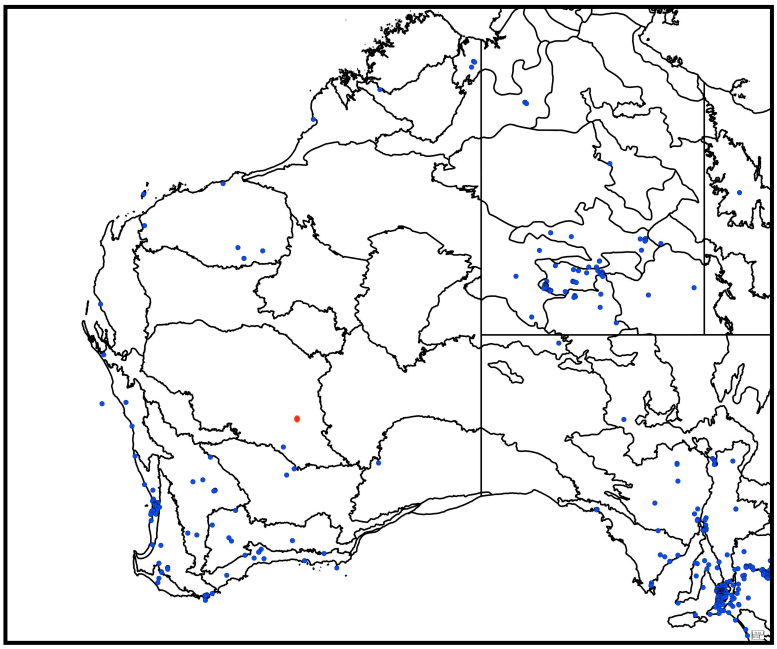

Figure 4. The IBRA regions of Western Australia, blue dots show locations recorded for *Conyza bonariensis* (across various Australian herbaria, red dot represents approximate location of project area (CHAH 2012).

*Citrullus lanatus**~200 km from Leonora

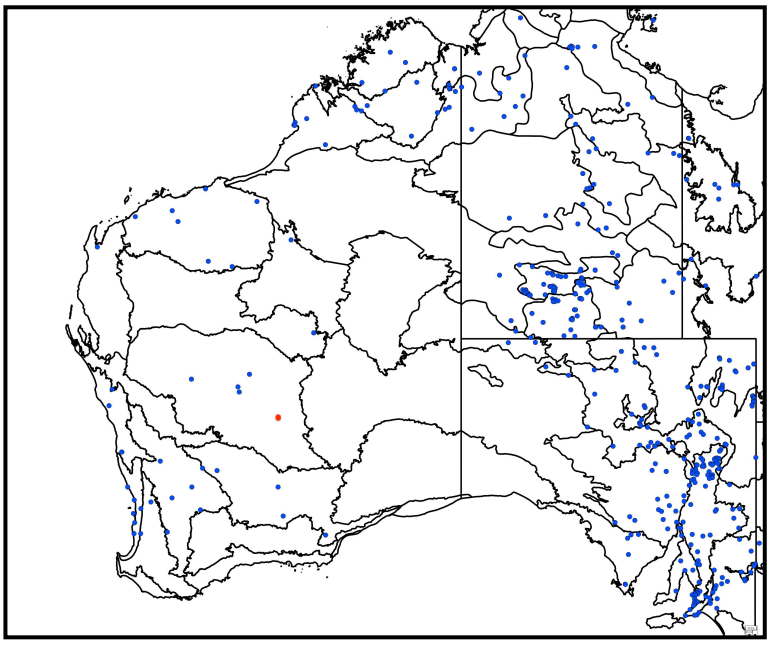

Figure 5. The IBRA regions of Western Australia, blue dots show locations recorded for *Citrullus lanatus (across various Australian herbaria, red dot represents approximate location of project area (CHAH 2012)**

*Salvia verbenaca**~100 km from Leonora

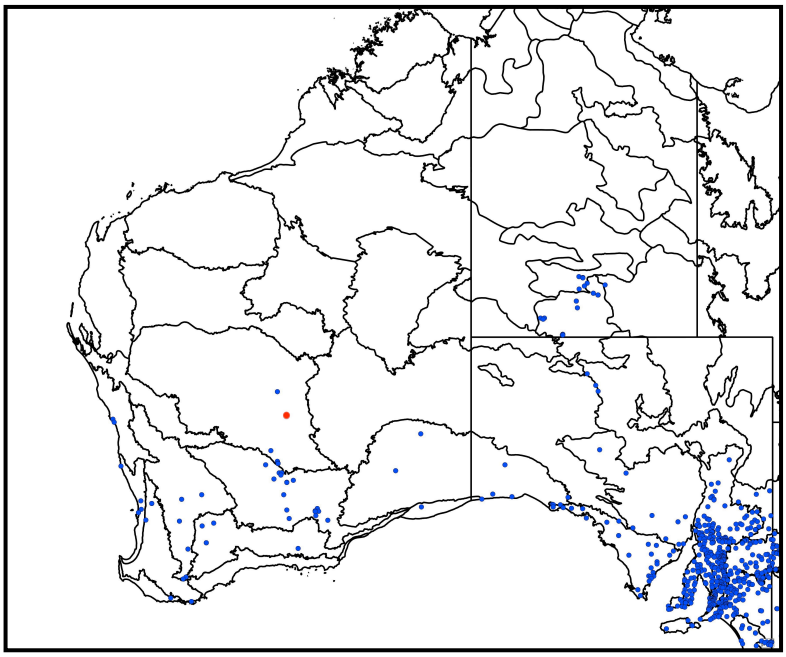

Figure 6. The IBRA regions of Western Australia, blue dots show locations recorded for *Salvia verbenaca(across various Australian herbaria, red dot represents approximate location of project area (CHAH 2012)**

Boerhavia coccinea ~100 km from Leonora

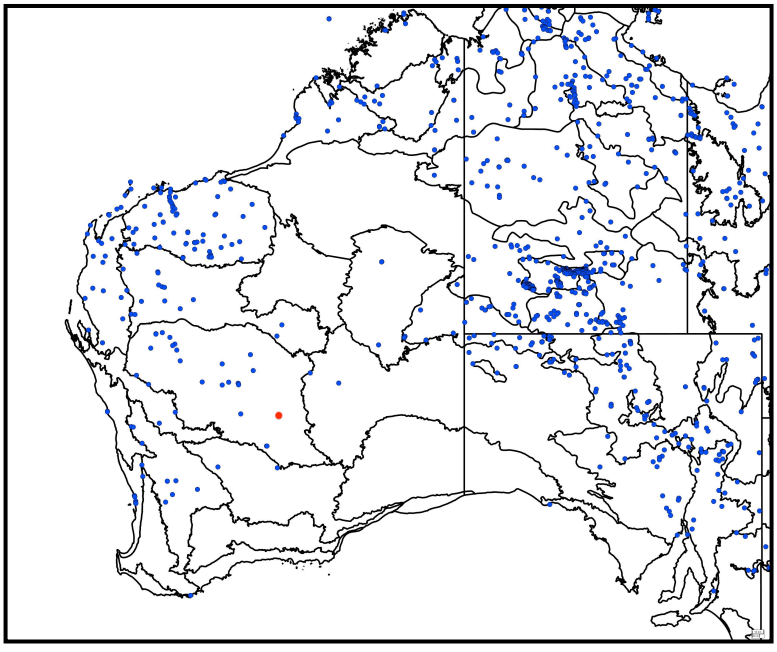

Figure 7. The IBRA regions of Western Australia, blue dots show locations recorded for *Boerhavia coccinea* across various Australian herbaria, red dot represents approximate location of project area (CHAH 2012)

*Cenchrus ciliaris**~200 km from Leonora *

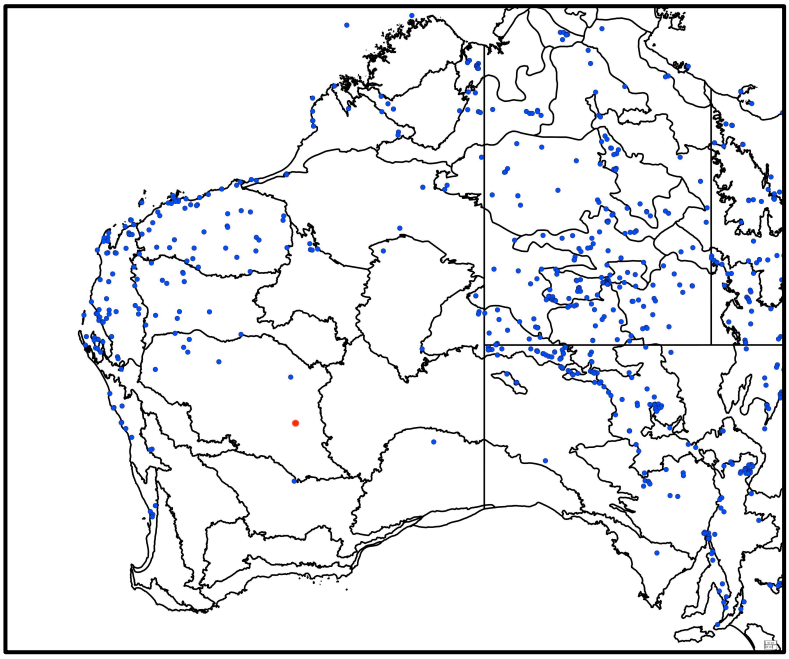

Figure 8. The IBRA regions of Western Australia, blue dots show locations recorded for *Cenchrus ciliaris* across various Australian herbaria, red dot represents approximate location of project area (CHAH 2012)

Enteropogon ramosus~100 km from Leonora

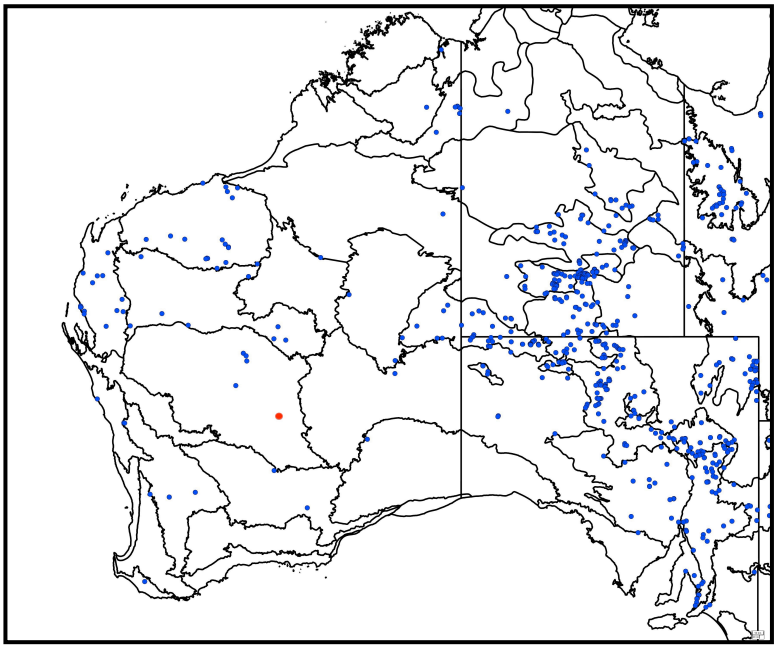

Figure 9. The IBRA regions of Western Australia, blue dots show locations recorded for *Enteropogon ramosus* across various Australian herbaria, red dot represents approximate location of project area (CHAH 2012)

*Eragrostis curvula** (African Lovegrass)~200 km from Leonora

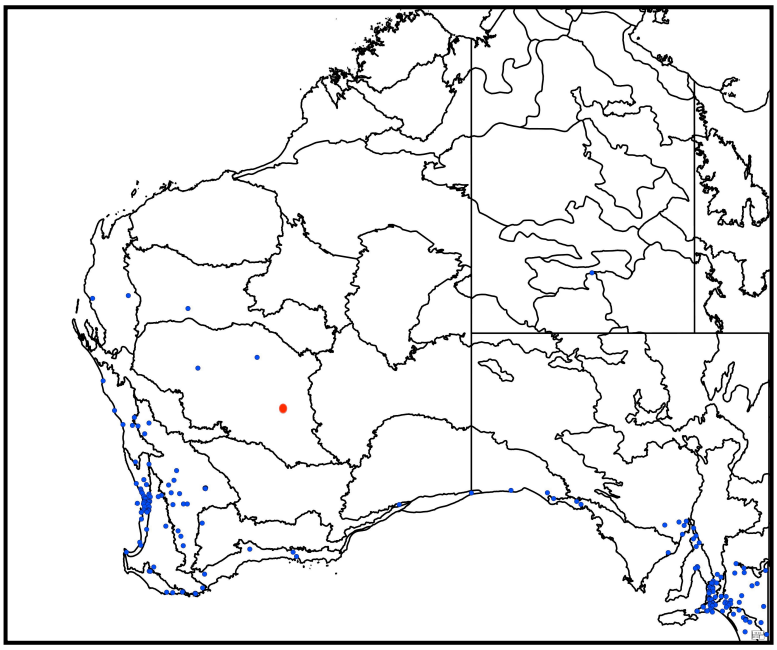

Figure 10. The IBRA regions of Western Australia, blue dots show locations recorded for *Eragrostis curvula across various Australian herbaria, red dot represents approximate location of project area (CHAH 2012)**

3.4 Introduced Species

Seven introduced flora (weed) species were located within the rail yard expansion project area

- *Cenchrus ciliaris* (Buffel Grass)
- *Centaurea melitensis* (Maltese Cockspur)
- *Citrullus lanatus* (Pie Melon)
- *Conyza bonariensis* (Flaxleaf Fleabane)
- *Eragrostis curvula* (African Lovegrass)
- *Portulaca oleracea* (Purslane)
- *Salvia verbenaca* (Wild Sage)

None of the introduced flora listed above are declared weeds in Western Australia (Department of Agriculture and Food, 2013). *Cenchrus ciliaris* was found wide spread across the project area in large numbers, while the other six weed species were present in small numbers along existing impact zones such as tracks and rail lines.

Cenchrus ciliaris (Buffel Grass) is a widespread tufted or stoloniferous perennial grass in the South-West, goldfields, Pilbara and Kimberley regions of Western Australia. *Cenchrus ciliaris* is listed as an Environmental Weed by the DEC (WA Herbarium 2013).

An Environmental Weed is classified on three criteria, scored as 'yes' or 'no':

- Invasiveness; ability to invade bushland in good to excellent condition.
- Distribution; current or potential distribution.
- Environmental impacts; ability to change the structure, composition and function of ecosystems, in particular the ability to form a monoculture.

**Cenchrus ciliaris* is rated as High by these criteria, indicating that it scored 'yes' to all three criteria.

Centaurea melitensis (Maltese Cockspur) is an erect annual or biennial, herb that grows between 0.2-1 m high. It flowers between September and March with yellow thistle like flowers. It is a common weed along roadsides, cultivated areas & other disturbed areas (WA Herbarium 2013).

Citrullus lanatus (Afghan Melon, Pie Melon, Wild Melon, Camel Melon) is a trailing or climbing annual herb, producing yellow flowers year round but mainly in summer and autumn. Native to tropical and southern Africa, it favours roadsides, disturbed watercourses and agricultural paddocks (WA Herbarium 2013, Hussey et al 2007).

Conyza bonariensis (Flaxleaf Fleabane) is an erect annual herb, between 0.15-1.5 m high. It is best distinguished by its stem, which branches below each pyramid of inflorescences, resulting in a candelabra shape. The flowers are white and will occur throughout the year depending on conditions. It grows within a variety of soils and is often associated with cultivation, waste places and along roadsides (WA Herbarium 2013).

Eragrostis curvula (African Love Grass) A densely caespitose perennial often purple near base grass that grows from 0.3-1.2 m high. The flowers are purple/green in colour, and have been recorded from August through to May. It occurs in a variety of soils and is primarily associated with disturbed sites (WA Herbarium 2013).

Portulaca oleracea (Purslane, Pigweed) is a prostrate, succulent annual, growing to 0.2 m high and producing yellow flowers from February to May. It favours disturbed sites and has been recorded in a variety of soils across various features of the landscape (WA Herbarium 2013, Hussey et al 2007). The WA Herbarium currently lists it as a weed species, but this status is unsettled as the Australian Native Plants Society (Australia) regards it as a native species (ANPSA 2008). For the purpose of this report, the WA Herbarium status has been used, but it should be noted this might change with further taxonomic developments in the future.

Salvia verbenaca (Wild Sage) is a slightly aromatic perennial herb that grows from 0.1-1 m high. The flowers are blue-pink-purple, and occur between April and October. It is a weed often along roadsides (WA Herbarium 2013).

3.5 Vegetation

3.5.1 Vegetation Association

There was one vegetation association recorded across the rail yard expansion project area described using Muirs Vegetation classifications as Scattered Low Mulga Trees B over a mosaic understorey consisting of a Dwarf Shrubland C dominated by Chenopods and Mid Dense Hummock Grass dominated by *Cenchrus ciliaris*. A more detailed description is given below and representative photo presented in Plate 1 together with a site map (Figure 11) showing the mosaic of Dwarf Shrubland C dominated by Chenopods and Mid Dense Hummock Grass dominated by *Cenchrus ciliaris* together with areas of existing disturbance across the site.

Scattered Low Trees B dominated by *Acacia pteraneura* to 4 m, A. mulganeura (hybrid) to 4 m, A. incurvaneura to 4 m with a PFC <2%, over a mosaic of Dwarf Shrubland C at a PFC of 20-30% and a Mid Dense Hummock Grass with a PFC 40-60%. The Dwarf Shrubland C is dominated by *Senna artemisioides* subsp. *sturtii* to 1 m, *Maireana pyramidata* to 1 m, *Rhagodia drummondii* to 1 m, *M. georgei* to 0.7 m, *M. tomentosa* to 0.5 m, *Sclerolaena diacantha* to 0.2 m, Sida sp. indeterminate to 0.3 m. Grasses include *Cenchrus ciliaris* to 0.6m, *Enneapogon avenaceus*, and *E.caerulescens* to 0.2 m. Where zones of disturbance are present (Roadside drainage channels), *Cenchrus ciliaris* is dominant, grading to occasional presence with increasing distance from these areas. PFC where *Cenchrus ciliaris* is dominant is high (40-60%).

Plate 1. Scattered Mulga over Chenopod and mixed grasses

Figure 11. Site map highlighting the Existing areas of disturbance and the Mosaic of Remnant Dwarf Shrubland C dominated by Chenopods and the invasive Mid Dense Hummock Grass dominated by *Cenchrus ciliaris*

Source of Imagery: Landgate (2008)

Author: J. Warden ~ Drawn: CAD Resources ~ Tel 9246 3242 ~ URL www.cadresources.com.au ~ Feb 2013 ~ A4 ~ Rev: A ~ CAD Ref g2108_F003.dgn

3.5.2 Vegetation Condition

Vegetation Condition in the area was considered to be in Good (Good)(4) to Degraded 1 (Poor) (5) condition based on the ranking scale presented in Keighery (1994), (Appendix 5). The basic vegetation structure across the project area has been significantly to severely disturbed and impacted by introduced (weed) species. Seven introduced (weed) species were recorded across the project area, with large sections dominated by *Cenchrus ciliaris* (Buffel Grass). This combined with the multiple areas that have been partially cleared for tracks, truck turn-around bays and the existing rail infrastructure means the original vegetation condition within the project area has been severely compromised.

4 Recommendations

Western Botanical recommends that good weed hygiene practices are adopted during expansion of the rail yard, to minimise spread of the identified introduced weed species.

5 List of Participants

Field Survey:

Ben Eckermann (BSc Env. Sc., Grad. Cert. Sc. (Land & Water Mgt))

Simon Colwill (BSc Env. Bio.)

Report Preparation:

Simon Colwill (BSc Env. Bio.)

Jonathan Warden (BSc. Env. Bio)

Report Review:

Jonathan Warden

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Appendix 1. Priority Species within 50 km of Rail yard Project area

Ptilotus tetrandrus P1

Ptilotus tetrandrus is an aannual herbaceous plant, growing up to 0.15-0.3 m high, and is a member of the *Amaranthaceae* family. It is found growing in loamy sand and Flowering occurs in October. There are two current records for this species, one found in the Murchison Biogeographic region and the other within the Little Sandy Desert Biogeographic region.

Stenanthemum patens P1

Stenanthemum patens is a small shrub associated with rocky hillsides, it grows up to 0.5 m high, and is a member of the *Rhamnaceae* family. There are eight records of this species located across the Murchison Biogeographic region.

Eremophila mirabilis P2

Eremophila mirabilis is a shrub that grows up to 0.3 to 2 m high and is part of the *Scrophulariaceae* family. It has been recorded growing in clay sand, or stony clay loam and is associated with granite country. The flowers are yellow with flowering occurring between July and September. There are ten records of this species located across the Murchison and Yalgoo Biogeographic regions.

Plate 1. ***Eremophila mirabilis*** **(P2)**

Angianthus prostratus P3

Angianthus prostratus is a prostrate annual, herb that is part of the *Asteraceae* family, found growing on red clay or loamy soils associated with saline depressions. It has white to yellow flowers that occur between July and September. There are ten records of this species located across the Murchison and Avon Wheatbelt Biogeographic regions.

Calytrix praecipua P3

Calytrix praecipua is a shrub, growing from 0.3 to 0.7 m high and is part of the *Myrtaceae* family. It has been found growing on skeletal sandy soils over granite or laterite often associated with breakaway outcrops. The flowers are pink-white, and occur from June to July or from September to November. There are 23 records for this species located across Gascoyne, Great Victoria Desert, Little Sandy Desert, and Murchison Biogeographic regions.

Cratystylis centralis P3

Cratystylis centralis is a much-branched, brittle, greyish shrub, growing to 1 m high and is part of the *Asteraceae* family. It has been found associated with red sandy loams with ironstone gravel, on flat plains and breakaway country. There are currently eight records of *Cratystylis centralis* recorded across the Murchison Biogeographic region.

Hemigenia exilis P4

Hemigenia exilis is an erect, multi-stemmed shrub, growing to 0.5 to 2 m high, and is part of the *Lamiaceae* family often associated with Lateritic Breakaways, and slopes. The flowers are blue-purple/white, and have been recorded in April or from September through to November. There are currently 36 records of Hemigenia exilis recorded across the Murchison Biogeographic region.

Eremophila simulans subsp. *megacalyx* P3

Eremophila simulans subsp. *megacalyx* is a shrub, growing from 0.9 to 2 m high and is part of the *Scrophulariaceae* family. The flowers are violet, and occur between August to September. There are currently 11 records of *Eremophila simulans* subsp. *megacalyx* recorded across the Murchison Biogeographic region.

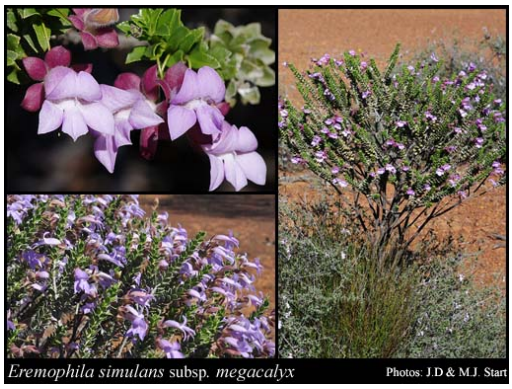


Plate 2. ***Eremophila simulans* subsp. *megacalyx* P3**

Eremophila veronica P3

Eremophila veronica is a spreading to erect shrub, growing from 0.5 to 1 m high and is part of the *Scrophulariaceae* family. Its flowers are purple, and occur during April to May. It has been found growing on stony clay, clay loam associated with lateritic breakaways. There are currently nine records of Eremophila veronica recorded across the Coolgardie and Murchison Biogeographic regions.

Plate 3. *Eremophila veronica* P3

Gunniopsis propinqua P3

Gunniopsis propinqua (P3) is an annual or perennial herb, growing to 10 cm high, and is part of the *Aizoaceae* family. It can be distinguished from other species of *Gunniopsis* by its white to pink perianth lobes, in conjunction with having 4-12 stamen (as appose to 30+) in four bundles alternate with the lobes (Flora of Australia Vol.4).

This species is endemic in WA growing in rocky loams, along lateritic outcrops and in winter-wet sites. The WA Herbarium has currently 16 records of *Gunniopsis propinqua* recorded across the Gascoyne, Murchison and Pilbara Biogeographic regions.

Plate 4. *Gunniopsis propinqua* P3

Hybanthus floribundus subsp. *chloroxanthus* P3

Hybanthus floribundus subsp. *chloroxanthus* is a multi-stemmed shrub, growing to 0.7 m high, and is a member of the Violaceae family. The flowers are blue & white, and occur from August to October. It has been found growing in dark red-brown soil, never sandy, rich in iron oxide, laterite often associated with rocky areas, creek banks, and along drainage lines. The WA Herbarium has currently 18 records of *Hybanthus floribundus* subsp. *chloroxanthus* recorded across the Murchison Biogeographic region.

Micromyrtus serrulata P3

Micromyrtus serrulata Erect or somewhat spreading shrub, growing from 0.4 to 1.5 m high and is a member of the *Myrtaceae* family. The flowers are white, and occur from June to November. It has been recorded growing in brownish sandy and clayey soils over granite. The WA Herbarium currently has 15 records of *Micromyrtus serrulata* recorded across the Coolgardie and Murchison Biogeographic region.

Triglochin protuberans P3

Triglochin protuberans is an annual herb, growing to 0.03-0.13 m high and is a member of the *Juncaginaceae* family. It is associated with red loam soils, and grey mud over clay located in winter-wet sites, claypans, near salt lakes, and on the margins of pools. The WA Herbarium currently has 10 records of Triglochin protuberans recorded across the Avon Wheatbelt, Geraldton Sandplains, Murchison, Yalgoo Biogeographic regions.

Plate 5. *Triglochin protuberans* P3

Grevillea inconspicua P4

Grevillea inconspicua is a shrubs growing from 0.6 to 2 m high and is a member of the Proteaceae family. The flowers form a terminal raceme and are white to grey. The WA Herbarium currently has 55 records of *Grevillea inconspicua* recorded across the Murchison Biogeographic region.

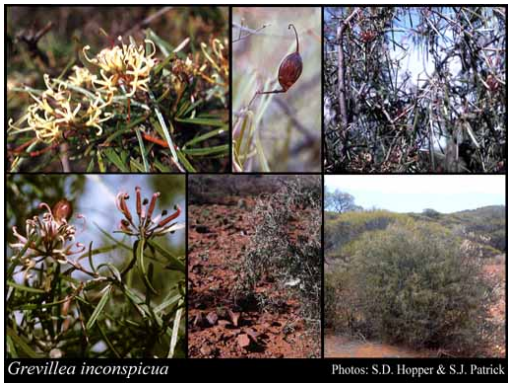


Plate 6. *Grevillea inconspicua* P4

Appendix 2. NatureMap search results for the Leonora Rail Yard Expansion Project.

NatureMap
Mapping Western Australia's biodiversity

NatureMap Species Report

Created By Guest user on 08/01/2013

Kingdom	Plantae
Current Names Only	Yes
Core Datasets Only	Yes
Method	'By Circle'
Centre	121°19' 28" E,28°52' 24" S
Buffer	20km
Group By	Kingdom

Kingdom	Species	Records
Plantae	240	435
TOTAL	**240**	**435**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Plantae					
1.	3217	*Acacia aneura (Mulga)*			
2.	37260	*Acacia aptaneura*			
3.	3248	*Acacia burkittii (Sandhill Wattle)*			
4.	36417	*Acacia caesaneura*			
5.	3273	*Acacia craspedocarpa (Hop Mulga)*			
6.	32118	*Acacia effusifolia*			
7.	36418	*Acacia incurvaneura*			
8.	36416	*Acacia mulganeura*			
9.	3452	*Acacia murrayana (Sandplain Wattle)*			
10.	36800	*Acacia pteraneura*			
11.	3507	*Acacia quadrimarginea*			
12.	19483	*Acacia ramulosa var. linophylla*			
13.	19499	*Acacia ramulosa var. ramulosa*			
14.	3513	*Acacia resinimarginea*			
15.	8949	*Acacia sibirica (Bastard Mulga)*			
16.	3577	*Acacia tetragonophylla (Kurara)*			
17.	31511	*Acacia victoriae subsp. victoriae*			
18.	17739	*Acetosa vesicaria*	Y		
19.	19470	*Aluta maisonneuvei subsp. auriculata*			
20.	13265	*Amyema miraculosa subsp. boormanii*			
21.	40910	*Androcalva luteiflora (Yellow-flowered Rulingia)*			
22.	7826	*Angianthus cornutus*			
23.	7834	*Angianthus prostratus*		P3	
24.	7836	*Angianthus tomentosus (Camel-grass)*			
25.	2333	*Anthobolus leptomerioides*			
26.	207	*Aristida contorta (Bunched Kerosene Grass)*			
27.	7846	*Asteridea athrixioides*			
28.	2451	*Atriplex bunburyana (Silver Saltbush)*			
29.	17801	*Atriplex cephalantha*			
30.	2453	*Atriplex codonocarpa (Flat-topped Saltbush)*			
31.	2476	*Atriplex semilunaris (Annual Saltbush)*			
32.	2478	*Atriplex spongiosa (Pop Saltbush)*			
33.	17246	*Austrostipa nitida*			
34.	17251	*Austrostipa scabra*			
35.	11726	*Bergia perennis subsp. exigua*			
36.	3722	*Bossiaea walkeri*			
37.	11884	*Brachyscome ciliaris var. lanuginosa*			
38.	7881	*Brachyscome oncocarpa*			
39.	5395	*Callistemon phoeniceus (Lesser Bottlebrush)*			
40.	5398	*Calothamnus aridus*			
41.	7903	*Calotis hispidula (Bindy Eye)*			
42.	7905	*Calotis multicaulis (Many-stemmed Burr-daisy)*			
43.	3008	*Carrichtera annua (Ward's Weed)*	Y		
44.	7916	*Centaurea melitensis (Maltese Cockspur)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
			Y		
45.	7922	*Cephalipterum drummondii (Pompom Head)*			
46.	2489	*Chenopodium gaudichaudianum (Cottony Saltbush)*			
47.	6614	*Convolvulus remotus*			
48.	20759	*Cylindropuntia fulgida var. mamillata*	Y		
49.	279	*Cymbopogon ambiguus (Scentgrass)*			
50.	281	*Cymbopogon obtectus (Silkyheads)*			
51.	4773	*Dodonaea petiolaris*			
52.	4779	*Dodonaea rigida*			
53.	11674	*Dodonaea viscosa subsp. mucronata*			
54.	2502	*Dysphania kalpari (Rat's Tail)*			
55.	2506	*Dysphania rhadinostachya*			
56.	33483	*Dysphania saxatilis*			
57.	12064	*Enchylaena tomentosa var. tomentosa (Barrier Saltbush)*			
58.	357	*Enneapogon caerulescens (Limestone Grass)*			
59.	365	*Enneapogon polyphyllus (Leafy Nineawn)*			
60.	378	*Eragrostis dielsii (Mallee Lovegrass)*			
61.	387	*Eragrostis lanipes (Creeping Wanderrie)*			
62.	7189	*Eremophila clarkei (Turpentine Bush)*			
63.	17157	*Eremophila compacta subsp. compacta*			
64.	7207	*Eremophila foliosissima*			
65.	7208	*Eremophila forrestii (Wilcox Bush)*			
66.	15052	*Eremophila forrestii subsp. forrestii*			
67.	29532	*Eremophila galeata*			
68.	14340	*Eremophila glabra subsp. glabra*			
69.	14191	*Eremophila glabra subsp. tomentosa*			
70.	19560	*Eremophila glabra subsp. verrucosa*			
71.	16475	*Eremophila glandulifera*			
72.	7219	*Eremophila granitica (Thin-leaved Poverty Bush)*			
73.	7221	*Eremophila homoplastica*			
74.	17189	*Eremophila hygrophana*			
75.	7230	*Eremophila latrobei (Warty Fuchsia Bush)*			
76.	17576	*Eremophila latrobei subsp. latrobei*			
77.	7234	*Eremophila longifolia (Berrigan)*			
78.	15158	*Eremophila mackinlayi subsp. spathulata*			
79.	16362	*Eremophila maculata subsp. maculata*			
80.	7239	*Eremophila margarethae (Sandbank Poverty Bush)*			
81.	7240	*Eremophila metallicorum*			
82.	7242	*Eremophila miniata (Kopi Poverty Bush)*			
83.	15003	*Eremophila oldfieldii subsp. angustifolia*			
84.	15058	*Eremophila platycalyx subsp. platycalyx*			
85.	7261	*Eremophila ramiflora*			
86.	7267	*Eremophila scoparia (Broom Bush ()*			
87.	7285	*Eremophila youngii*			
88.	15155	*Eremophila youngii subsp. youngii*			
89.	16485	*Eriachne pulchella subsp. dominii*			
90.	16486	*Eriachne pulchella subsp. pulchella*			
91.	2514	*Eriochiton sclerolaenoides (Woolly Bindii)*			
92.	7970	*Erodiophyllum acanthocephalum*			
93.	4334	*Erodium crinitum (Corkscrew)*			
94.	14377	*Erymophyllum ramosum subsp. ramosum*			
95.	35344	*Eucalyptus camaldulensis subsp. arida*			
96.	35345	*Eucalyptus camaldulensis subsp. obtusa (Blunt-budded River Red Gum)*			
97.	5660	*Eucalyptus gongylocarpa (Marble Gum)*			
98.	13058	*Eucalyptus leptopoda subsp. elevata*			
99.	5697	*Eucalyptus lesouefii (Goldfields Blackbutt)*			
100.	4617	*Euphorbia australis (Namana)*			
101.	12097	*Euphorbia tannensis subsp. eremophila (Desert Spurge)*			
102.	5201	*Frankenia georgei*			
103.	5212	*Frankenia setosa (Bristly Frankenia)*			
104.	7977	*Gilruthia osbornei*			
105.	12624	*Gnephosis angianthoides*			
106.	7988	*Gnephosis arachnoidea (Cobwebby-headed Gnephosis)*			
107.	7989	*Gnephosis brevifolia (Short-leaved Gnephosis)*			
108.	7998	*Gnephosis macrocephala*			
109.	7514	*Goodenia havilandii*			
110.	12530	*Goodenia macroplectra*			
111.	7527	*Goodenia mimuloides*			
112.	7531	*Goodenia occidentalis*			
113.	1949	*Grevillea acuaria*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
114.	19542	*Grevillea nematophylla subsp. supraplana*			
115.	2807	*Gunniopsis quadrifida (Sturts Pigface)*			
116.	19137	*Hakea lorea subsp. lorea*			
117.	2182	*Hakea minyma*			
118.	2196	*Hakea preissii (Needle Tree)*			
119.	17557	*Hakea recurva subsp. recurva*			
120.	6180	*Haloragis trigonocarpa*			
121.	8045	*Helipterum craspedioides (Yellow Billy Buttons)*			
122.	2688	*Hemichroa diandra*			
123.	15448	*Hyalosperma glutinosum subsp. venustum*			
124.	11973	*Hybanthus floribundus subsp. curvifolius*			
125.	3972	*Indigofera brevidens (Widji)*			
126.	459	*Iseilema eremaeum*			
127.	7397	*Isotoma petraea (Rock Isotome)*			
128.	4953	*Lawrencia densiflora*			
129.	4956	*Lawrencia helmsii (Dunna Dunna)*			
130.	4959	*Lawrencia squamata*			
131.	19727	*Leiocarpa semicalva subsp. semicalva*			
132.	19237	*Leiocarpa websteri*			
133.	3033	*Lepidium oxytrichum*			
134.	3039	*Lepidium platypetalum (Slender Peppercress)*			
135.	2396	*Lysiana casuarinae*			
136.	2398	*Lysiana murrayi (Mistletoe)*			
137.	2536	*Maireana atkinsiana (Bronze Bluebush)*			
138.	2538	*Maireana carnosa (Cottony Bluebush)*			
139.	2543	*Maireana eriosphaera*			
140.	2544	*Maireana georgei (Satiny Bluebush)*			
141.	2545	*Maireana glomerifolia (Ball Leaf Bluebush)*			
142.	2556	*Maireana planifolia (Low Bluebush)*			
143.	2560	*Maireana pyramidata (Sago Bush)*			
144.	2563	*Maireana sedifolia (Pearl Bluebush)*			
145.	2566	*Maireana thesioides (Lax Bluebush)*			
146.	11662	*Maireana tomentosa subsp. tomentosa*			
147.	2568	*Maireana trichoptera (Downy Bluebush)*			
148.	2569	*Maireana triptera (Threewinged Bluebush)*			
149.	2571	*Maireana villosa*			
150.	12949	*Marsdenia australis*			
151.	20288	*Melaleuca interioris*			
152.	5991	*Melaleuca xerophila*			
153.	8107	*Minuria cunninghamii (Bush Minuria)*			
154.	8110	*Minuria leptophylla (Minnie Daisy)*			
155.	490	*Monachather paradoxus*			
156.	17925	*Myriocephalus oldfieldii*			
157.	14186	*Myriocephalus pygmaeus*			
158.	11327	*Nicotiana occidentalis subsp. hesperis*			
159.	11734	*Nicotiana rosulata subsp. rosulata*			
160.	17	*Ophioglossum lusitanicum (Adders Tongue)*			
161.	31799	*Opuntia elata*	Y		
162.	29276	*Opuntia monacantha (Barbary Fig)*	Y		
163.	10975	*Paspalidium basicladum*			
164.	19744	*Pittosporum angustifolium*			
165.	7299	*Plantago debilis*			
166.	7300	*Plantago drummondii (Sago Weed)*			
167.	8172	*Podolepis canescens*			
168.	8176	*Podolepis kendallii*			
169.	8188	*Pogonolepis stricta*			
170.	581	*Polypogon maritimus (Coast Beardgrass)*	Y		
171.	15822	*Prostanthera althoferi subsp. althoferi*			
172.	18210	*Psydrax rigidula*			
173.	18155	*Psydrax suaveolens*			
174.	2690	*Ptilotus aervoides*			
175.	2717	*Ptilotus divaricatus (Climbing Mulla Mulla)*			
176.	2718	*Ptilotus drummondii (Narrowleaf Mulla Mulla)*			
177.	11797	*Ptilotus drummondii var. minor*			
178.	41506	*Ptilotus gaudichaudii subsp. gaudichaudii*			
179.	2731	*Ptilotus helipteroides (Hairy Mulla Mulla)*			
180.	2741	*Ptilotus macrocephalus (Featherheads)*			
181.	41001	*Ptilotus nobilis subsp. nobilis (Yellow Tails)*			
182.	2747	*Ptilotus obovatus (Cotton Bush)*			
183.	2754	*Ptilotus roei*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
184.	2757	*Ptilotus schwartzii*			
185.	15855	*Ptilotus schwartzii var. schwartzii*			
186.	8196	*Quinqueremulus linearis*			
187.	11927	*Ranunculus sessiliflorus var. sessiliflorus*			
188.	13306	*Rhodanthe battii*			
189.	13308	*Rhodanthe charsleyae*			
190.	13241	*Rhodanthe chlorocephala subsp. rosea*			
191.	13238	*Rhodanthe maryonii*			
192.	13251	*Rhodanthe propinqua*			
193.	13252	*Rhodanthe pygmaea*			
194.	13254	*Rhodanthe stricta*			
195.	17985	*Rutidosis helichrysoides subsp. helichrysoides*			
196.	2357	*Santalum lanceolatum (Northern Sandalwood)*			
197.	7644	*Scaevola spinescens (Currant Bush)*			
198.	8200	*Schoenia cassiniana (Schoenia)*			
199.	962	*Schoenoplectus dissachanthus*			
200.	2606	*Sclerolaena cuneata (Yellow Bindii)*			
201.	2607	*Sclerolaena densiflora*			
202.	2608	*Sclerolaena deserticola*			
203.	2611	*Sclerolaena eriacantha (Tall Bindii)*			
204.	2612	*Sclerolaena eurotioides (Fluffy Bindii)*			
205.	2619	*Sclerolaena lanicuspis (Spinach Burr)*			
206.	8213	*Senecio magnificus (Showy Groundsel)*			
207.	17645	*Senna artemisioides*			
208.	12279	*Senna artemisioides subsp. helmsii*			
209.	12280	*Senna artemisioides subsp. oligophylla*			
210.	12283	*Senna artemisioides subsp. x sturtii*			
211.	18430	*Senna cardiosperma*			
212.	18444	*Senna charlesiana*			
213.	12305	*Senna glutinosa subsp. chatelainiana*			
214.	18440	*Senna manicula*			
215.	14577	*Senna sp. Meekatharra (E. Bailey 1-26)*			
216.	6998	*Solanum cleistogamum*			
217.	7018	*Solanum lasiophyllum (Flannel Bush)*			
218.	11241	*Solanum orbiculatum subsp. orbiculatum (Round-leaved Solanum)*			
219.	3074	*Stenopetalum anfractum*			
220.	3076	*Stenopetalum filifolium*			
221.	8238	*Streptoglossa liatroides*			
222.	12355	*Swainsona affinis*			
223.	4220	*Swainsona canescens (Grey Swainsona)*			
224.	4243	*Swainsona rostellata*			
225.	13339	*Synaptantha tillaeacea var. tillaeacea*			
226.	35841	*Templetonia incrassata*			
227.	2822	*Tetragonia eremaea*			
228.	6279	*Trachymene ornata (Spongefruit)*			
229.	678	*Tragus australianus (Small Burrgrass)*			
230.	12652	*Trichanthodium skirrophorum*			
231.	6727	*Trichodesma zeylanicum (Camel Bush)*			
232.	18587	*Triglochin nana*			
233.	7661	*Velleia hispida (Hispid Velleia)*			
234.	7664	*Velleia rosea (Pink Velleia)*			
235.	15725	*Verbesina encelioides*	Y		
236.	12436	*Verticordia interioris*			
237.	7393	*Wahlenbergia tumidifructa*			
238.	1391	*Wurmbea densiflora*			
239.	4389	*Zygophyllum eremaeum*			
240.	4392	*Zygophyllum iodocarpum*			

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.

Appendix 3. EPBC Protected Matters Search results for the Leonora Rail Yard Expansion Project.

Australian Government

Department of Sustainability, Environment, Water, Population and Communities

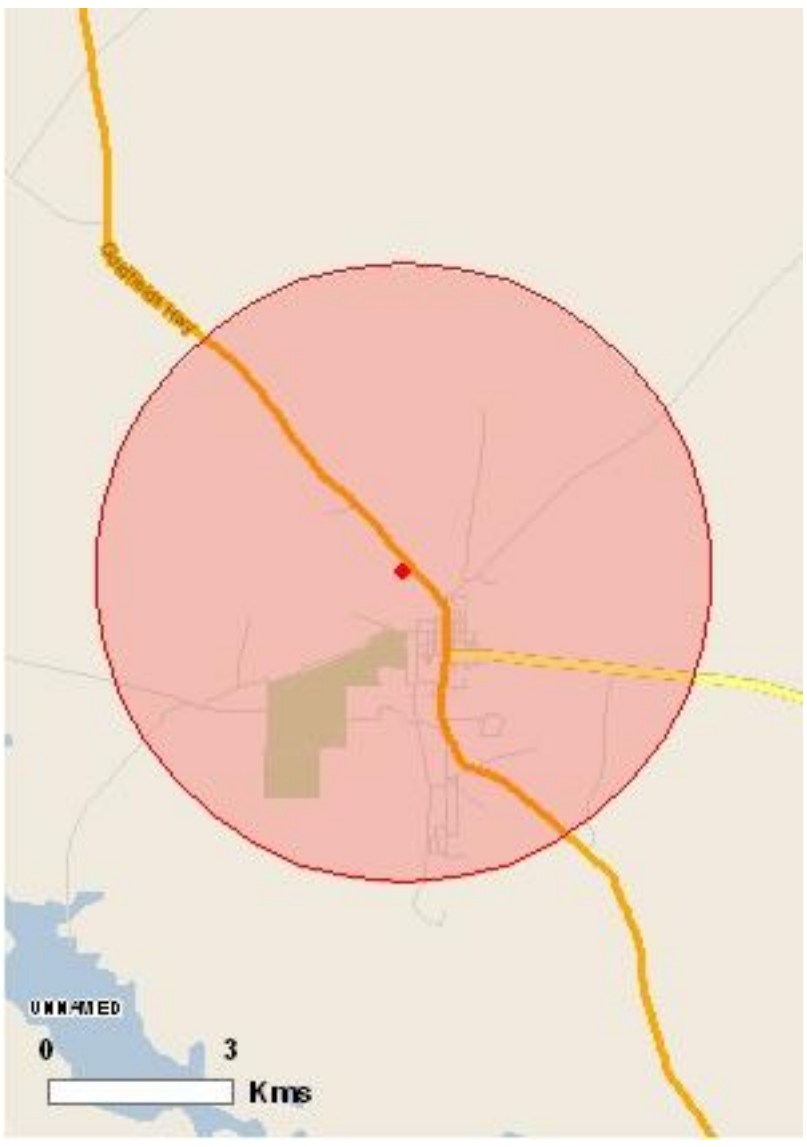
EPBC Act Protected Matters Report

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.

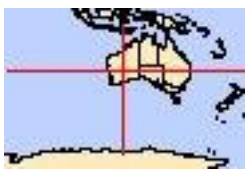
Report created: 07/12/12 11:08:15



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

Coordinates

Buffer: 5.0Km



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 Areas:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	1
Listed Migratory Species:	4

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 and the heritage values of a place on the Register of the National Estate.

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.

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:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	3
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves:	None

Extra Information

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

Place on the RNE:	15
State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	6
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Acanthiza iredalei iredalei		
Slender-billed Thornbill (western) [25967]	Vulnerable	Species or species habitat likely to 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		
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 may occur within area
Migratory Terrestrial Species		
Merops ornatus		
Rainbow Bee-eater [670]		Species or species habitat may occur within area
Migratory Wetlands Species		
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat may 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
Commonwealth Land -

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		
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 may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area

Extra Information

Places on the RNE [Resource Information]

Note that not all Indigenous sites may be listed.

Name	State	Status
Historic		
Arts Place	WA	Registered
Garden of Mine Managers House	WA	Registered
Grand Hotel (former)	WA	Registered
Gwalia State Hotel (former)	WA	Registered
Headframe and Winder House	WA	Registered
Leonora - Gwalia Conservation Area	WA	Registered
Leonora Post Office	WA	Registered
Little Pink Camp	WA	Registered
Mick Omedis Camp	WA	Registered
Mine Superintendents House	WA	Registered
Patronis Guest House (former)	WA	Registered
Sons of Gwalia Mine Office (former)	WA	Registered
Tower Street East Side Group	WA	Registered
Tower Street West Side Group	WA	Registered
White House Hotel	WA	Registered

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

Name	Status	Type of Presence
Mammals		
Capra hircus Goat [2]		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
Oryctolagus cuniculus Rabbit, European Rabbit [128]		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		
Carrichtera annua Ward's Weed [9511]		Species or species habitat may occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area

Coordinates

-28.87289 121.3246

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 Heritage and Register of National Estate properties, Wetlands of International 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.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

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.

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:

-Department of Environment, Climate Change and Water, New South Wales
-Department of Sustainability and Environment, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment and Natural Resources, South Australia
-Parks and Wildlife Service NT, NT Dept of Natural Resources, Environment and the Arts
-Environmental and Resource Management, Queensland
-Department of Environment and Conservation, Western Australia
-Department of the Environment, Climate Change, Energy and Water
-Birds Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-SA 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, Atherton and Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
-State Forests of NSW
-Geoscience Australia
-CSIRO
-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 4. Systematic species list located within the Leonora Rail Yard Expansion Project

Family	Genus	Species
Amaranthaceae	*Ptilotus*	*Divaricatus*
Amaranthaceae	*Ptilotus*	*nobilis* subsp. *nobilis*
Amaranthaceae	*Ptilotus*	*Obovatus*
Apocynaceae	*Marsdenia*	*Australis*
Asteraceae	*Brachyscome*	*Oncocarpa*
Asteraceae	*Centaurea*	*melitensis**
Asteraceae	*Chrysocephalum*	*Apiculatum*
Asteraceae	*Conyza*	*bonariensis**
Asteraceae	*Pluchea*	*Dentex*
Brassicaceae	*Lepidium*	*muelleri-ferdinandii*
Chenopodiaceae	*Atriplex*	*Semilunaris*
Chenopodiaceae	*Maireana*	*Georgei*
Chenopodiaceae	*Maireana*	*Pyramidata*
Chenopodiaceae	*Maireana*	*Tomentosa*
Chenopodiaceae	*Maireana*	*Triptera*
Chenopodiaceae	*Salsola*	*Australis*
Chenopodiaceae	*Sclerolaena*	*Cuneata*
Chenopodiaceae	*Sclerolaena*	*Diacantha*
Chenopodiaceae	*Sclerolaena*	*Eriacantha*
Chenopodiaceae	*Sclerolaena*	*patenticuspis*
Convolvulaceae	*Convolvulus*	*Remotus*
Cucurbitaceae	*Citrullus*	*lanatus**
Euphorbiaceae	*Euphorbia*	*drummondii* subsp. *drummondii*
Fabaceae	*Acacia*	*Burkittii*
Fabaceae	*Acacia*	*Caesaneura*
Fabaceae	*Acacia*	*craspedocarpa*
Fabaceae	*Acacia*	*incurvaneura*
Fabaceae	*Acacia*	*mulganeura* hybrid
Fabaceae	*Acacia*	*Pteraneura*
Fabaceae	*Acacia*	*tetragonophylla*
Fabaceae	*Acacia*	*victoriae* subsp. *victoriae*
Fabaceae	*Senna*	*artemisioides subsp. filifolia*
Fabaceae	*Senna*	*artemisioides subsp. x artemisioides*
Fabaceae	*Senna*	*artemisioides subsp. x sturtii*
Fabaceae	*Senna*	*glutinosa subsp. chatelainiana*
Goodeniaceae	*Scaevola*	*Spinescens*
Lamiaceae	*Salvia*	*verbenaca**
Loranthaceae	*Lysiana*	*exocarpi* subsp. *exocarpi*
Malvaceae	*Abutilon*	*oxycarpum* subsp. *prostratum*
Malvaceae	*Sida*	*calyxhymenia*
Malvaceae	*Sida*	sp. dark green fruits (S. van Leeuwin 2260)
Malvaceae	*Sida*	sp. Excedentifolia (J.L. Egan 1925)
Malvaceae	*Sida*	sp. Indeterminate

Family	Genus	Species
Myrtaceae	*Eucalyptus*	*camaldulensis* subsp. *obtusa*
Nyctaginaceae	*Boerhavia*	*Coccinea*
Poaceae	*Aristida*	*Contorta*
Poaceae	*Cenchrus*	*ciliaris**
Poaceae	*Enneapogon*	*avenaceus*
Poaceae	*Enneapogon*	*caerulescens*
Poaceae	*Enteropogon*	*Ramosus*
Poaceae	*Eragrostis*	*curvula**
Portulacaceae	*Portulaca*	*oleracea**
Scrophulariaceae	*Eremophila*	*youngii* subsp. *youngii*
Scrophulariaceae	*Eremophila*	*glandulifera*
Scrophulariaceae	*Eremophila*	*Longifolia*
Scrophulariaceae	*Eremophila*	*metallicorum*
Scrophulariaceae	*Eremophila*	*oldfieldii* subsp. *angustifolia*
Scrophulariaceae	*Eremophila*	*platycalyx* subsp. *platycalyx*
Solanaceae	*Solanum*	*lasiophyllum*

* Denotes weed status

Appendix 5. Keighery Vegetation Condition Scale

Vegetation Condition Assessment

Summary of Vegetation Condition Scale as reported by Keighery (1994) and as summarized in Bush Forever (Government of Western Australia 2000) Condition Scale Description.

Code	Description
Pristine (1)	Pristine or nearly so, no obvious signs of disturbance.
Excellent (2)	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
Very Good (3)	Vegetation structure altered, obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
Good (4)	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.
Degraded (5)	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing
Completely Degraded (6)	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as "parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.

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