BHP Billiton Iron Ore

FLORA AND VEGETATION SURVEY

Marillana ML70/270

May 2013

ONSHORE ENVIRONMENTAL

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Executive Summary

In January 2011 BHP Billiton Iron Ore Pty Ltd (BHP Billiton) commissioned Onshore Environmental Consultants Pty Ltd (Onshore Environmental) to undertake a Level 2 flora and vegetation survey of the Marillana Project situated on Mining Lease ML70/270 (referred herein as the Study area). The Study area is situated within the Hamersley Range approximately 10 km north-east of the Yandi Mine and within 3 km of the Mount Newman (Mainline) Railway (Figure 1).

The aim of the survey was to consolidate and update vegetation and flora data previously recorded within the Study area by Ecologia Environment (2007a), by completing a second season survey of the entire Study area. The project included a desktop and literature review of previous survey work within and surrounding the Study area, followed by two field trips between 27th and 30th April and 28th September and 6th October 2011. Both field trips occurred during optimal seasonal conditions and set out to review and further document flora and vegetation values.

A total number of 268 plant taxa (including varieties and subspecies) from 44 families and 117 genera were recorded from the Study area. Species representation was greatest among the Fabaceae, Poaceae, Malvaceae, Amaranthaceae, Asteraceae, Myrtaceae and Goodeniaceae families, which is typical for the Pilbara Bioregion. None of the plant taxa recorded from the Study area were gazetted as Threatened (Declared Rare) Flora pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950)* (WC Act) or listed under the *Envrionmental Protection and Biodiversity Conservation Act* (EPBC Act 1999). There was no Priority flora (as listed by the Department of Environment and Conservation) recorded from the Study area. A total of seven introduced (weed) species were recorded from the Study area; **Acetosa vesicaria, *Aerva javanica, *Argemone ochroleuca, *Bidens bipinnata, *Cenchrus ciliaris, *Cenchrus setiger* and **Sisymbrium orientale*. None of these taxa are listed as Declared Weeds under the *Agriculture and Related Resources Protection Act, 1976* (ARRP Act).

A total of 18 Vegetation Associations were described and mapped within the Study area. The vegetation associations were classified into six Broad Floristic Formations (the majority of which are widespread in the Pilbara region) on the basis of the dominant vegetation stratum. Vegetation condition ranged from Pristine in the remote mountainous regions of the Study area, to Degraded on floodplains of the major drainage line in the south-east. Vegetation within the mountainous areas, which comprises over three quarters of the total Study area, was mostly classified as Excellent with the exception of some medium sized drainage lines and associated stony floodplains. These were generally classified to be in Good condition, but this varied depending on the dominance of **Cenchrus ciliaris* (Buffel Grass) in the understory and the level of soil disturbance associated with mining exploration activities. Vegetation condition was reduced along floodplains associated with the major drainage line in the south-east corner of the Study area in response to grazing by domestic cattle and introduction of weeds.

The field survey confirmed that no TECs occurred within the Study area. However, the Priority 3 PEC Fortescue Valley Sand Dunes occurred on linear sand dunes present in the eastern sector of the Study area. The community was characterised by red linear sand dunes supporting 'Hummock Grassland of *Triodia schinzii* and *Triodia basedowii* with High Shrubland of *Acacia dictyophleba* over Very Open Tussock Grassland of *Aristida holathera* var. *holathera, *Cenchrus ciliaris* and *Eriachne gardneri* in red brown sand'. The Sand Dune community is considered regionally rare and susceptible.

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1.0 Introduction

1.1 Preamble

The Study area is located in the Central Pilbara region of Western Australia approximately 95 km north-west of Newman. It is part of Mining Lease ML70/270, which also includes the Yandi Iron Ore Mine to the south-west, as well as the Munjina exploration area. The Study area is covered by hills and ridges that from part of the Hamersley Range. The lease is located partly on unallocated crown land and partly on Marillana Station.

Onshore Environmental was commissioned by BHP Billiton to undertake a Level 2 flora and vegetation survey of the Study area. The scope included a desktop review of previous surveys completed within and adjacent to the Study area, noting that a first season survey of the Study area had previously been completed in October 2005 and March 2006 (Ecologia Environment 2007a), combined with a second season field assessment.

1.2 Previous Surveys

There has been one previous flora and vegetation survey completed within the perimeter of the current Study area (Ecologia Environment 2007a). Field assessments were completed across approximately 75% of the Study area in October 2005 and March 2006, with access at the time restricted into the south-west corner. In addition, there have been at least 21 surveys completed in close proximity to the Study area. These surveys are listed below and described in more detail in Section 4.1.1:

Marillana North

- ENV (2008a) *RGP5 M270SA Flora and Vegetation Assessment.*

Yandi

- Onshore Environmental (2011a) *Yandi Flora and Vegetation Survey;* and
- Ecologia Environment (2008) *Yandi to Kurrajura Siding and Yandi Repeater One Flora and Vegetation Report.*

Upper Marillana

- ENV (2007a) *Upper Marillana Exploration Lease Flora and Vegetation Assessment;* and
- Ecologia Environment (2005a) *Upper Marillana Exploration Project Biological Survey.*

Munjina

- ENV (2009) *Munjina Exploration Lease Flora and Vegetation Assessment.*

Mindy/Coondiner

- ENV (2007b) *Mindy North Exploration Lease Flora and Vegetation Assessment;*
- Ecologia Environment (2005b) *Mindy-Coondiner Exploration Project Biological Survey;* and
- ENV (2007c) *Coondiner and Mindy East Exploration Lease Flora and Vegetation Assessment.*

Ministers North

- Ecologia Environment (2006) *Ministers North Biological Survey;* and
- ENV (2008b) *Ministers North Flora and Vegetation Assessment.*

Jinidi/Jinayri

- Onshore Environmental (2011b) *Jinidi Study Area – Review of Flora and Vegetation;* and
- Woodman Environmental (2010) *Area C to Jinayri to Mount Newman Rail Flora and Vegetation Survey.*

Area C

- Onshore Environmental (2011c) *Area C and Surrounds Study Area – Review of Flora and Vegetation.*

Rail Line

- Hope Downs Management Services (2002) *Hope Downs Iron Ore Project Rail and Port Public Environmental Review.*
- Ecologia Environment (2005c) *BHPIO Rail Sidings Flora and Vegetation Assessment;*
- Ecologia Environment (2007b) *RPG5: Cowra to Kurrajurra Sidings and Cowra Camp Site Flora and Vegetation Survey*. Prepared for BHP Billiton Iron Ore; *and*
- ENV (2008c) *RGP5: Jimblebar Junction to Yandi Junction Railway Reserve Flora and Vegetation Assessment.*

Hope Downs

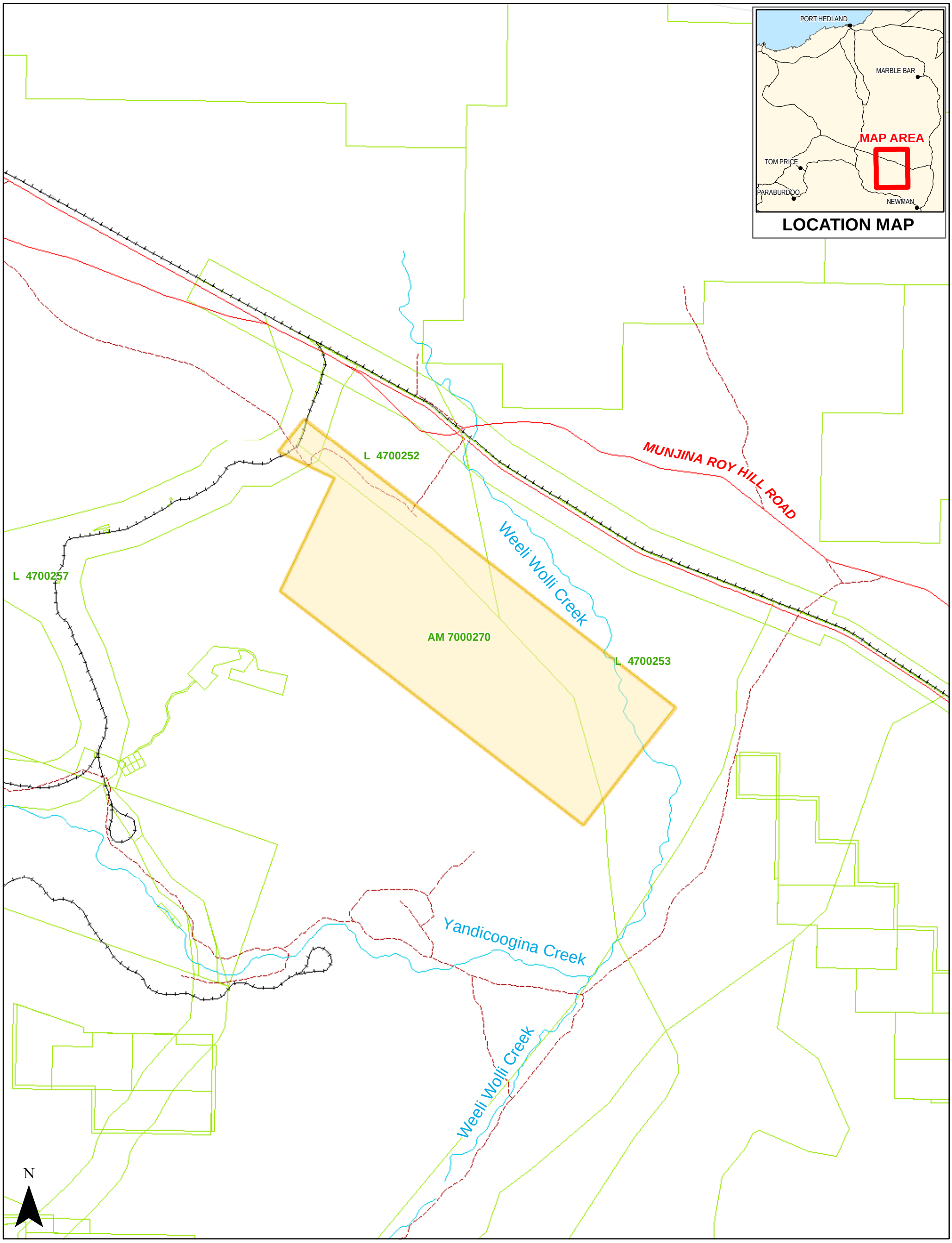
- Hope Downs Management Services (2000) *Hope Downs Iron Ore Project Public Environmental Review.*

Weeli Wolli Creek

- Ecologia Environment (1998) *Weeli Wolli Creek Biological Assessment Survey.*

Roy Hill

- ENV (2007d) *Roy Hill Exploration Lease Flora and Vegetation Assessment.*



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MARILLANA

Location of the Study Area

Figure 1

0 2 4 6 8 10
Kilometers

1:150,000
Datum: GDA94
Projection: MGA Zone 50

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Legend

- Study Area - Marillana
- Tenements

1.3 Climate

The climate of the Central Pilbara is arid-tropical with hot summers extending from October to April and mild winters from May to September. Tille (2006) describes the climate as tropical semi-desert with nine to eleven dry months a year. The dominant feature of the climate is dryness with annual evaporation greatly exceeding rainfall. The climate also features low but unreliable rainfall, high temperatures and large diurnal temperature variations.

Rainfall is variable and unreliable with the majority received in the summer months when tropical storms from the north bring thunderstorms and heavy rain. Tropical cyclones also produce heavy rains when they cross the coast and move inland. These storms are especially prevalent between the months of January and March although the official cyclone season lasts from November to the end of April. Winter rainfall is generally lighter and typically associated with cold fronts extending from southern parts into the Pilbara region. Rainfall is sporadic and unreliable with large differences from year to year. Annual average rainfall for the Pilbara ranges from 180 millimeters (mm) to over 400 mm (Beard 1975) with a long-term average of 312 mm for the town of Newman (Bureau of Meteorology, Newman 2011).

The area experiences a wide range of temperatures. Maximum summer temperatures can reach 49^{o}C, while in winter light frosts and temperatures as low as -2^{o}C can occur. Average maximum summer temperatures are typically between 35°C to 40°C, and winter maximum temperatures are between 22°C and 30°C. The prevailing wind direction for Newman is east south-east between May and August, with stronger west-north-west winds dominant between September and March.

BHP Billiton maintains a weather station at the Yandi Mine, located approximately 10 km south of the Study area. Weather data from this weather station provides a more accurate account of weather experienced at Marillana, and has been summarised below. Long-term weather data is not available for Yandi, so long-term averages from the Bureau of Meteorology station at Newman has been used for comparison.

The total rainfall for the Yandi mine site for the 12 month period prior to the survey in April 2011 was 507.4 mm (BHP Billiton 2011). This is significantly higher than the long term average for the region of 312mm. Above average monthly falls were recorded for the months of September (54.6 mm), November (16.8 mm), December (54.3 mm), February (166 mm) and March (78.2 mm) (Figure 2).

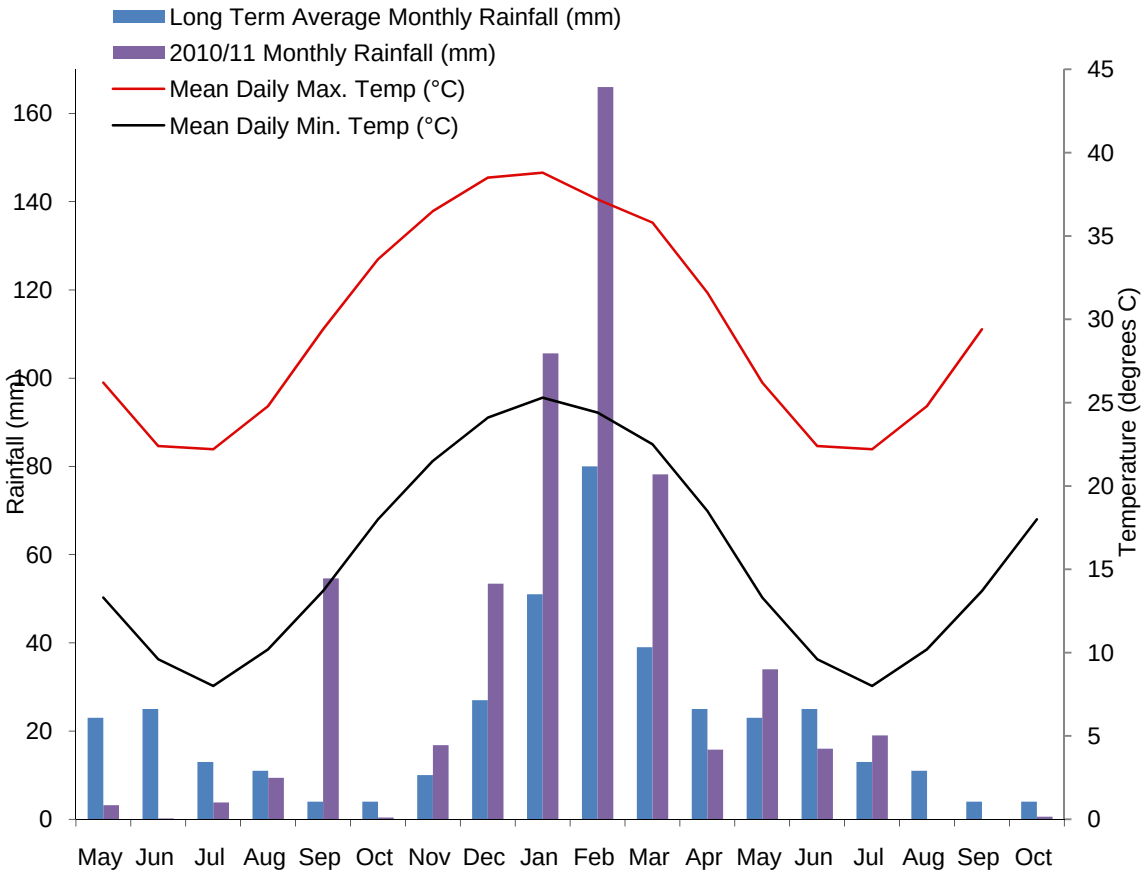


Figure 2 **Climatic data for the Yandi Mine from May 2010 to October 2011(BHP Billiton 2011), with long-term averages for the same period supplied by the Bureau of Meteorlogy Newman (2011). The field survey at Marillana was undertaken in April and October 2011.**

1.4 Biogeographic Regions

The current Interim Biogeographic Regionalisation for Australia (IBRA7) describes a system of 89 'biogeographic regions' (bioregions) and 419 'biogeographic subregions' covering the Australian continent (Thackway and Cresswell 1995 and DSEWPaC 2013). Bioregions are classified based on major biological and geographical/geological characteristics such as climate, geology, landforms, vegetation and fauna. The Study area lies within the Hamersley subregion (PIL3) of the Pilbara bioregion (Thackway and Cresswell 1995), which is located in the southern section of the Pilbara Craton (Kendrick 2001). The Hamersley subregion is 6,215,092 hectares (ha) in size and is characterised by mountain ranges, ridges and plateaux of Proterozoic sedimentary rock dissected by gorges. The dominant vegetation in the valleys is Low Mulga woodland (*Acacia aneura*) over bunch grasses growing on fine textured soils. Ranges and mountainous areas have skeletal soils with Snappy Gum (*Eucalyptus leucophloia)* over Hummock grasses (*Triodia brizoides).* The major drainage features are the Fortescue River to the north, the Ashburton to the south or the Robe to the west (Kendrick 2001). Beard (1975) described the Hamersley subregion as "rounded hills and ranges, mainly of jaspilite and dolomite with some shale, siltstone and volcanics.

1.5 Existing Land Use

Land tenure in the Pilbara region consists of Aboriginal and leasehold reserves, national parks and reserves and crown land which fall under a range of pastoral and mining leases. The dominant landuses in the Pilbara are pastoralism (cattle grazing), mining, conservation (and associated tourism), unallocated crown land, crown reserves and urban areas (Kendrick 2001).

1.5.1 Pastoral

European settlement of the Pilbara region began with the establishment of pastoral leases in the late 1860s and for the next 100 years pastoralism was the dominant industry in the area. The pastoral industry in the Pilbara has become increasingly reliant on live export of cattle through Port Hedland, with a progressive decline in sheep numbers. The Marillana Study lies partly within Marillana Station and partly on unallocated crown land. Marillana Station is managed by BHP Billiton.

1.5.2 Mining

Mining exploration first began in the Pilbara in 1888 when gold was discovered in the Pilbara Creek. Since then tin, copper, asbestos and manganese have all been mined in the region. In the 1960's the Commonwealth lifted the export embargo on iron ore leading to an increase in the development of the Iron Ore industry (Beard 1975). Newman was developed in the early 1970s to provide accommodation for the Mt Whaleback Iron Ore mine. Ports such as Dampier and Port Hedland were also constructed with rail lines linking major mining areas to the Ports (Beard 1975).

The region now produces the majority of WA's petroleum, gas and iron ore exports, with the Central Pilbara region generating the majority of WA's iron ore production. A number of existing and new iron ore mines are located in close vicinity to the Study area, including Yandi (BHP Billiton), Mining Area C (BHP Billiton), Hope Downs (Rio Tinto) and Yandicoogina (Rio Tinto). There are also a number of other exploration areas in the region and the industry is set to expand rapidly in the future.

1.5.3 Tourism

Tourism is the only other major industry in the region besides mining and pastoral activities. It is a small but rapidly developing industry, with Karijini National Park and other conservation reserves being the major destinations. Karijini lies approximately 55 km to the west of the Study area and is the second largest National Park in Western Australia. The Hamersley subregion has 14.1% of its total area reserved under some form of conservation, including the majority of Karijini National Park (Kendrick 2001).

1.6 Landforms

The Study area lies within the Hamersley Range on the Hamersley Plateau, which is surrounded to the north, east and west by escarpments. The Study area lies on the edge of the north-eastern escarpment adjacent to the Fortescue Plain. Rounded hills and ranges dominate the landscape. The Hamersley Range characterised by long strike ridges rising from valley floors reaching a height of up to 300m. The flat valley floors consist of Cainozoic sediments.

The Study area is primarily composed of deeply dissected high ridges and hills aligned south-east to north-west. The highest areas of relief occur along the western boundary. The ridges are dissected by numerous large gorges and gullies that drain to the north-east and south-west. Many of the gorges in the Study area have steep sides, overhangs and

outcropping with vegetation mostly concentrated in drainage channels. The major drainage occurs to the south-east towards Weeli Wolli Creek, which then flows in to the Fortescue Valley further north. A series of low linear dunes occur on plains in the eastern sector of the Study area.

1.7 Soils

The soils of the Pilbara Region have been defined and mapped at a scale of 1:2,000,000 by Bettenay *et al.* (1967). The Study area lies within a large area classified as deep, coherent and porous loam soils with weak pedologic development, with areas of shallow coherent and porous loamy soils. This soil type is most commonly present in areas of *Spinifex* steppe with *Eucalyptus leucophloia.* The area is described as high-level valley plains with extensive areas of pisolitic limonite deposits, ranges of banded jaspilite and chert as well as shales, dolomites and iron ore formations.

Tille (2006) collated the most recent and detailed mapping of Western Australia's Rangelands and Arid Interior into a hierarchy of soil-landscape mapping units. The Study area falls within the Fortescue Province, an area that occupies approximately 160,050 km^2 (6.3% of Western Australia) and includes the towns of Port Hedland, Karratha, Dampier, Roebourne, Newman, Tom Price, Paraburdoo, Pannawonica, Marble Bar, Nullagine and Jigalong. Soils and landforms for the Fortescue Province are described as "Hills and ranges (with stony plains and some alluvial plains and sandplains) on the volcanic, granitic and sedimentary rocks of the Pilbara Craton. Stony soils with red loamy earths and red shallow loams (and some red/brown non-cracking clays, red deep sandy duplexes and red deep sands)" (Tille 2006). The Fortescue Province is divided into ten soil-landscape zones:

- Nullagine Hills Zone;
- De Grey-Roebourne Lowlands Zone;
- Chichester Ranges Zone;
- Abydos Plains and Hills Zone;
- Fortescue Valley Zone;
- Hamersley Plateaux Zone;
- Karratha Coast Zone;
- Warrawagine Hills Zone;
- Jigalong Plains Zone; and
- Harding Hills and Plains Zone.

The Study area occurs within the Hamersley Plateaux Zone. The dominant landform features within this zone are rocky ranges/hills and stony plains (Tille 2006). Rugged hills, ridges, dissected plateaux and mountains occur on the basalt, banded iron formation and sandstone of the Hamersley Basin, the most notable examples being the Chichester and Hamersley Ranges. The Study area occurs within the central Hamersley Ranges, which together with the Ophthalmia Range comprise the majority of the Hamersley Plateau.

Soils throughout the area are generally stony and shallow with large areas of no soil cover. Sparse vegetation cover on the ranges and the force of heavy summer rain transports large amounts of soil from the ranges down into the valleys. This results in shallow or non-existent soil cover on the ranges and hence vegetation types in these areas are generally correlated to geology rather than soils (Beard 1975). The hill slopes support uniform medium or fine textured soils consisting of loams and sands that are generally shallow, stony and lack nutrients. On the plains soils are better developed and deeper, represented most commonly as hard alkaline red loams. A layer of quartz and jaspilite gravel may cover the surface in some areas. The soils in the major drainage channels are alluvial sands with banks formed by a combination of alluvial sands and duplex soils. In drainage

lines the vegetation type is influenced by superficial deposits, as well as the presence of surface and groundwater. Minor drainage channels consist primarily of duplex soils.

1.8 Geology

The Pilbara region comprises a portion of the ancient continental Western Shield that dominates the geology of Western Australia. The Western Shield consists of pre-Cambrian Proterozoic and Archaean rocks, which contain some of the earth's oldest rock formations, thought to be around 3.5 billion years old (ANRA 2008). These rock formations contain important mineral reserves, including iron ore, which is prevalent in the Pilbara. The Archean rocks of the region constitute a block known as the Pilbara Craton.

The Pilbara Craton lies beneath the Proterozoic rocks of the Hamersley and Bangemall Basins. The Hamersley Basin covers the majority of the southern part of the Pilbara Craton and is separated into three statigraphic groups; the Fortescue, Hamersley and Turee Creek Groups.

The Fortescue Group consists mainly of basalt with beds of siltstone, mudstone, shale, dolomite and jaspilite. These rocks form the Chichester Plateau, which lies beneath the Hamersley Plateau. The Turee Creek Group consists of interbedded mudstone, silt stone, sandstone, conglomerate and carbonate. These rocks are the youngest of the three groups and are exposed mainly in the Ashburton Valley.

The Hamersley Group is the most relevant to the Study area as it contains both the Brockman Iron Formation and the Marra Mamba Iron Formation, which together provide most of the major iron ore deposits in the Pilbara (O'Brien and Associates 1992). The Hamersley Range has formed on the late Archaean-Palaeoproterozoic metamorphosed banded iron formations, shales, dolerite, carbonate, chert and rhyolite of the South Pilbara Sub-basin. These rocks belong to the Hamersley Group and make up part of the Ophthalmia Fold Belt (Tille 2006). The Hamersley Range and Plateau consist mainly of jaspilite and dolomite and the jaspilite produces deposits of haematite and limonite, which are mined for iron ore.

The main geological features around the Study area have been mapped and described by Thorne and Tyler (1997). The dominant geological unit is the Tertiary Colluvium (Tc) comprised of partially cemented valley-fill deposits with boulders of limonite. Interspersed within this unit are areas of limestone and calcareous gravels with opaline silica, which are part of the Oakover Formation (To). The Tertiary Robe Pisolite (Tp) formation is also present in the Study area and is comprised of pisolitic limonite with fossil wood fragments. This unit contains iron ore deposits and is the main source of iron ore mined at Yandi. The Weeli Wolli Formation (Phj) consists of banded jaspilite with interbedded shale intruded by medium grained dolerite, and is also found in the Study area.

1.9 Flora and Vegetation

The Study area is positioned near the southern boundary of the Fortescue Botanical District, within the Eremaean Botanical Province (Figure 3). The Fortescue Botanical District is characterised by tree and shrub steeps with some short grass savannas on the coast. Historical systematic flora surveys of the Pilbara are limited to work completed by Burbidge (1959) and Beard (1975), and further refining of the original Beard mapping by Shepherd *et al*. (2002). Beard (1975) mapped vegetation of the Pilbara at a scale of 1:1,000,000. The most common vegetation association within the Study area was the

vegetation of the ranges consisting of *Eucalyptus leucophloia* (snappy gum) and *Triodia wiseana* (hard spinifex) tree steppe. The vegetation of valley plains is dominated by *Acacia aneura* woodlands and areas of open grassland.

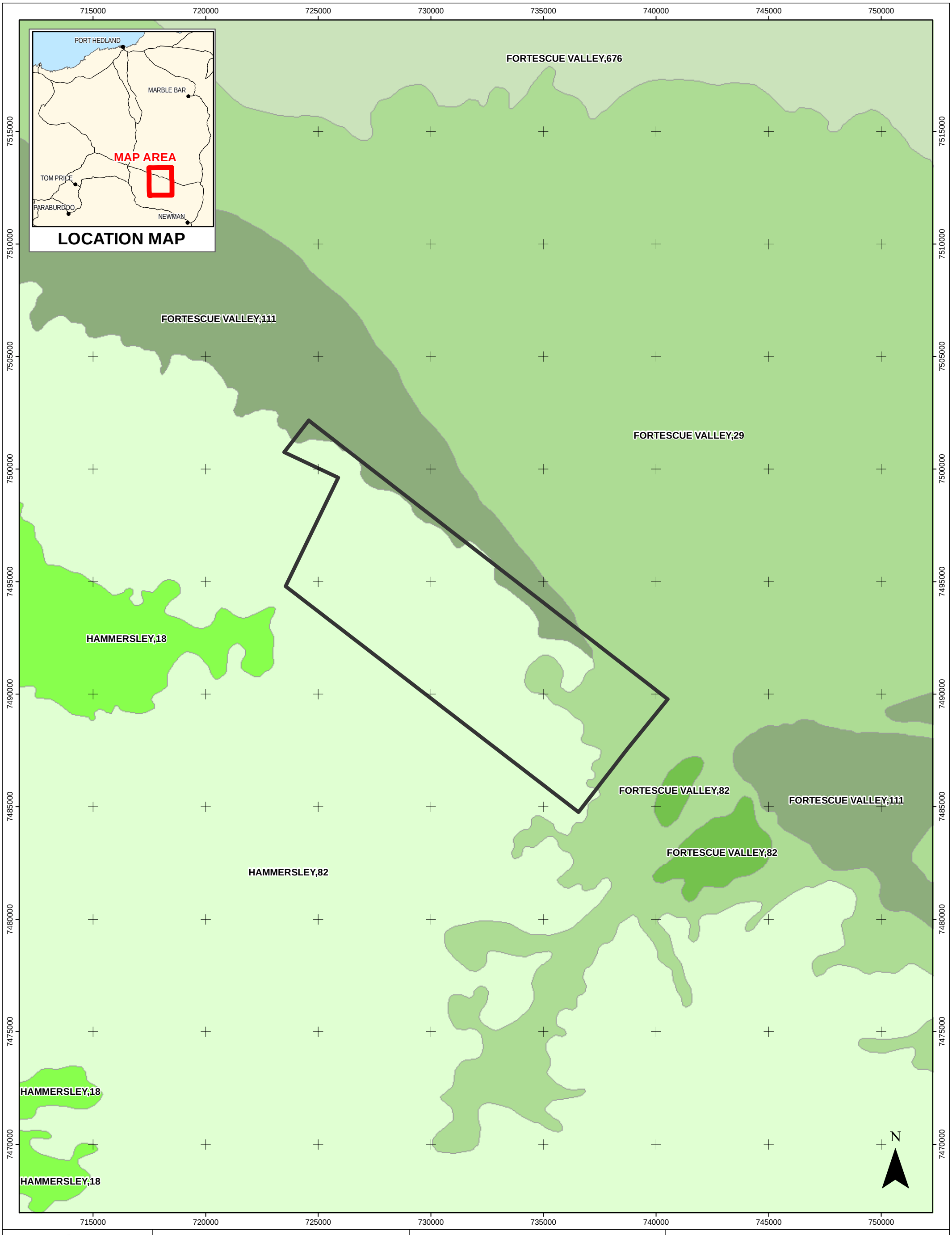
The original mapping by Beard was updated in 2001 (Shepherd *et al.* 2002*)* to account for clearing in the intensive land use zone. Some of the large vegetation classes were also refined into smaller units. Under the Environmental Protection Authority's (EPA's) *Position Statement 2* (EPA 2000), proposals should not take vegetation below the "threshold level" of 30% of the pre-European settlement extent of the vegetation type. Shepherd *et al.* (2002) provides an estimate of the percentage of each vegetation association remaining compared to their pre-European settlement extent. The Pre-European extent remaining for both the vegetation associations within the Study area is 99.9 % or greater. However, less than ten percent of each association occurs within formal or informal reserves (Table 1).

Table 1 Pre-European Extent of Vegetation Associations occurring over the Study area (Shepherd *et al.* 2002).

Vegetation Sub-Association	Description	Pre-Euro. Extent Remaining	% remaining IUCN Class I-IV Reserves	% remaining Other Reserves	% remaining DEC Managed PL
82.3	Hummock grasslands, low tree steppe; snappy gum over *Triodia wiseana*	100.0	8.9	0.2	1.0
18.11	Low woodland; mulga *(Acacia aneura)*	99.9	2.0	0.3	2.5

A comprehensive and systematic field review of the Pilbara's entire regional flora, fauna, aquatic life and ecosystems is currently in preparation by the Department of Environment and Conservation (DEC). The biological survey has included 800 study sites distributed across the entire Pilbara region between 2002 and 2007. The survey results have been published in parts between 2009 and 2011.

The resources boom in the Pilbara over the past decade has resulted in a significant number of site-specific biological surveys being completed as part of the formal environmental approvals process. Although there has only been one previous survey within the Study area many additional surveys have occurred in close proximity to the site. The developed Yandi Mine has had a total of 28 surveys completed since mining began in 1991. These site-specific surveys contribute significantly to the development of knowledge of the local and regional flora.



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MARILLANA

Beard (1975) vegetation complexes within the Study area and surrounds

Figure 3

0 2 4 6 8 10
Kilometers
1:150,000
Datum: GDA94
Projection: MGA Zone50

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Legend

Study Area - Marillana

Pre-European Vegetation (Beard 1975)
System, Vegetation Association

- FORTESCUE VALLEY, 111
- FORTESCUE VALLEY, 29
- FORTESCUE VALLEY, 676
- FORTESCUE VALLEY, 82
- HAMMERSLEY, 18
- HAMMERSLEY, 82

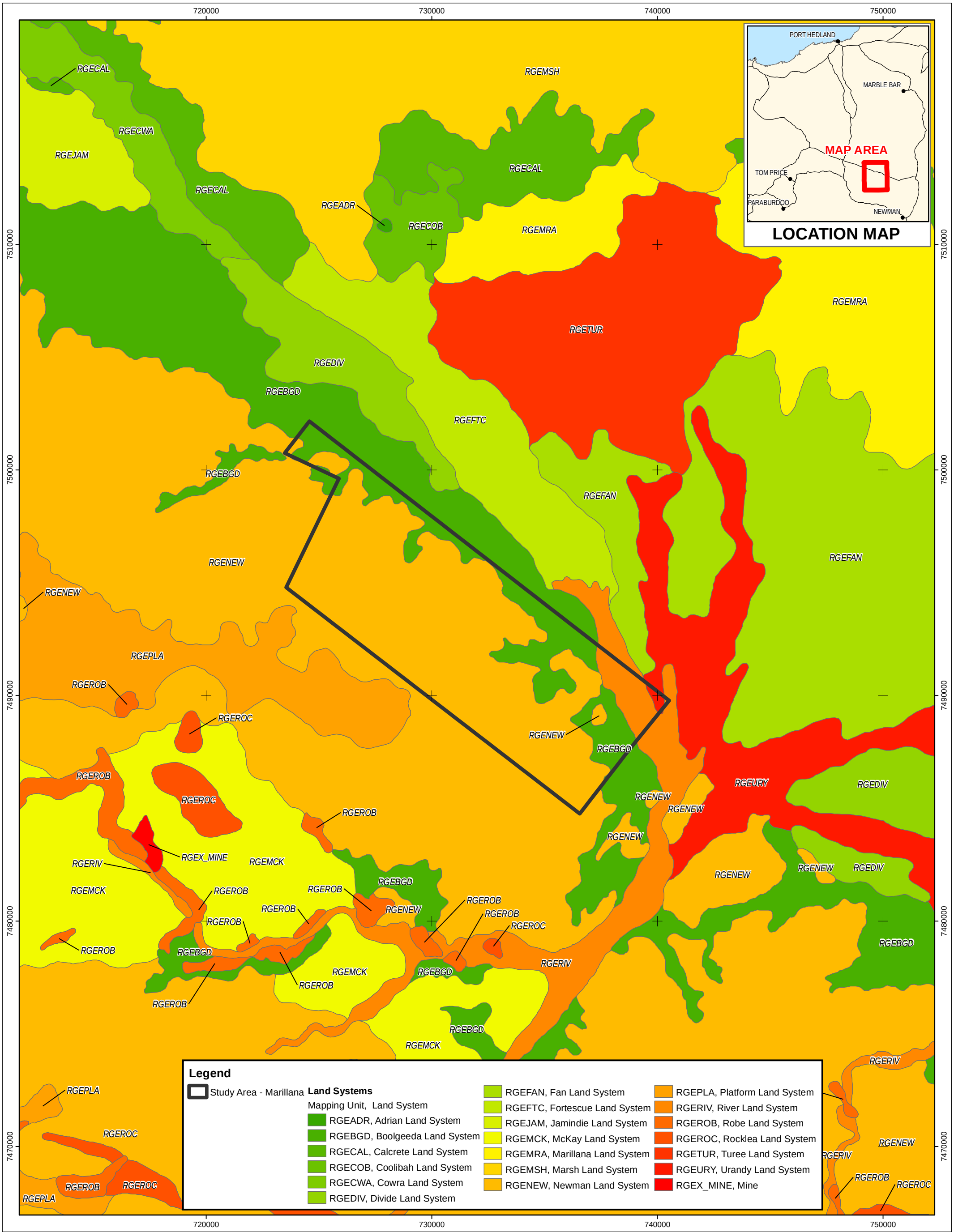
1.10 Land Systems

The Department of Agriculture has conducted inventory and condition surveys of the Pilbara (van Vreeswyk *et al.* 2004) using an integrated survey method involving the land system approach to rangeland description and evaluation. The primary objective of the surveys was to provide comprehensive descriptions and mapping of the biophysical resources of the region as well as an evaluation on the condition of soils and vegetation. The mapping is based on patterns in topography, soils and vegetation.

A total of 102 land systems were defined in the Pilbara at a scale of 1:250,000 (van Vreeswyk *et al.* 2004), with three land systems occurring within the Study area (Table 2, Figure 4). The dominant land system is the Newman Land System, which forms the main ridge at Marillana. The Boolgeeda Land System is present along the north-eastern border of the Study area extending to the south-east corner. It forms the lowers slopes of the range leading down into the plains of the Fortescue Valley. These are generally depositional surfaces of very gently inclined stoney slopes leading to flat plains. This system is not prone to erosion or grazing. The Fortescue Land System occupies the eastern corner of the Study area, consisting of alluvial plains and floodplains around Weeli Wolli Creek as it enters the Fortescue Valley. These areas are periodically flooded and the vegetation is highly attractive to grazing animals.

Table 2 Land Systems occurring within the Study area (descriptions from van Vreeswyk *et al.* 2004).

Land system	Representation in the Pilbara	Description
Newman	14,580 km^2 or 8.0%	Rugged jaspilite plateaux, ridges and mountains supporting hard spinifex grasslands.
Boolgeeda	7,748 km^{2-} or 4.3%	Stony lower slopes and plains below hill systems supporting hard and soft Spinifex grasslands and mulga shrublands. Geology is Quaternary colluvium.
Fortescue	504 km^2 or 0.3%	Alluvial plains and floodplains supporting patchy grassy woodlands and shrublands and tussock grasslands.



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MARILLANA

Land Systems within the Study area and surrounds (descriptions from Van Vreeswyk et al. 2004).

Figure 4

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N

0 2 4 6 8 10
Kilometers

1:150,000

Datum: GDA94
Projection: MGA Zone50

2.0 Methodology

2.1 Background

2.1.1 Legislation and Guidance Statements

The Marillana flora and vegetation survey was carried out in a manner that was compliant with Environmental Protection Authority (EPA) requirements for the environmental surveying and reporting of flora and vegetation in Western Australia:

- *Environmental Protection of Native Vegetation in Western Australia: Clearing of Native Vegetation with Particular Reference to Agricultural Areas. Position Statement No. 2* (EPA 2000);
- *Terrestrial Biological Surveys as an Element of Biodiversity Protection. Position Statement No. 3* (EPA 2002); and
- *EPA Guidance for the Assessment of Environmental Factors: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia No. 51* (EPA 2004).

The survey was also conducted in accordance with BHPBIO's Guidance for Flora and Vegetation Surveys in the Pilbara (BHP Billiton 2010).

2.2 Desktop Searches

The desktop survey involved a search of three databases for information relating to rare flora (DEC 2011a). The central co-ordinates used were 713000E 7484000N 50K (GDA). The State database search investigated three DEC databases:

1. The DEC Threatened (Declared Rare) Flora Database;
2. The DEC Declared Rare and Priority Flora List; and
3. The Western Australian Herbarium Specimen Database for priority species opportunistically collected in the area of interest.

A search of the EPBC Act Protected Matters database was undertaken (DSEWPaC 2012), as well as a search of the International Union for Conservation of Nature (IUCN 2012) database. A comprehensive literature review of surveys previously completed within or in close proximity to the Study area was also undertaken.

2.3 Field Survey Methodology

2.3.1 Timing and Personnel

The first season survey of the Study area was completed by two botanists from Ecologia Environment between the 5th and 14th October 2005 and 22nd and 27th March 2006. The south-west corner of the Study area was inaccessible during the first season survey due to rough terrain and absence of any exploration tracks. This area was subsequently surveyed by six botanists from Onshore Environmental between the 27th and 30th April 2011. Four botanists from Onshore Environmental then completed a second season survey of the entire Study area between the 28th September and 6th October 2011.

2.3.2 Sampling of Study Sites

The survey consisted of systematic sampling using quadrats (referred to as study sites) and transects linking the quadrats. A total of 194 quadrats were used to provide detailed information on the presence of species and structure of the vegetation within the Study

area (Figure 5). Transects linking individual quadrats are used to ground truth vegetation mapping and as a method of searching of species of conservation significance and additional opportunistic plant collections.

The study sites were generally 50 x 50 metres, or an equivalent area (2,500 m^2) along narrow associations such as minor drainage lines. The area sampled for each study site is standard for the Pilbara bioregion. The number of study sites sampled was determined by the size and heterogeneity the Study area. Study sites were chosen to represent vegetation associations present. Topographical maps and aerial photography were examined and study sites were marked on the maps then finalised in the field according to the characteristics of the site.

The study sites were assessed to provide a comprehensive list of the total flora occurring within the Study area, and data on a range of environmental parameters was also recorded. The site sheet for each quadrat included information such as:

- Landform and habitat;
- Aspect;
- Soil colour and soil type;
- Rock type;
- Slope (angle);
- Percentage of bare ground, logs, twigs and leaves;
- Vegetation condition;
- Disturbance (caused by fire, clearing, grazing etc);
- Age since fire;
- Broad floristic formation;
- Vegetation association description; and
- Height and percentage ground cover provided by individual plant taxa.

Other parameters recorded for each study site were:

- Study site number and date of assessment;
- Names of the botanists undertaking the assessment;
- Location description and waypoint - GPS coordinate (GDA94) using a handheld GPS; and
- Photograph number.

2.3.3 Targeted Surveys for Conservation Significant Species

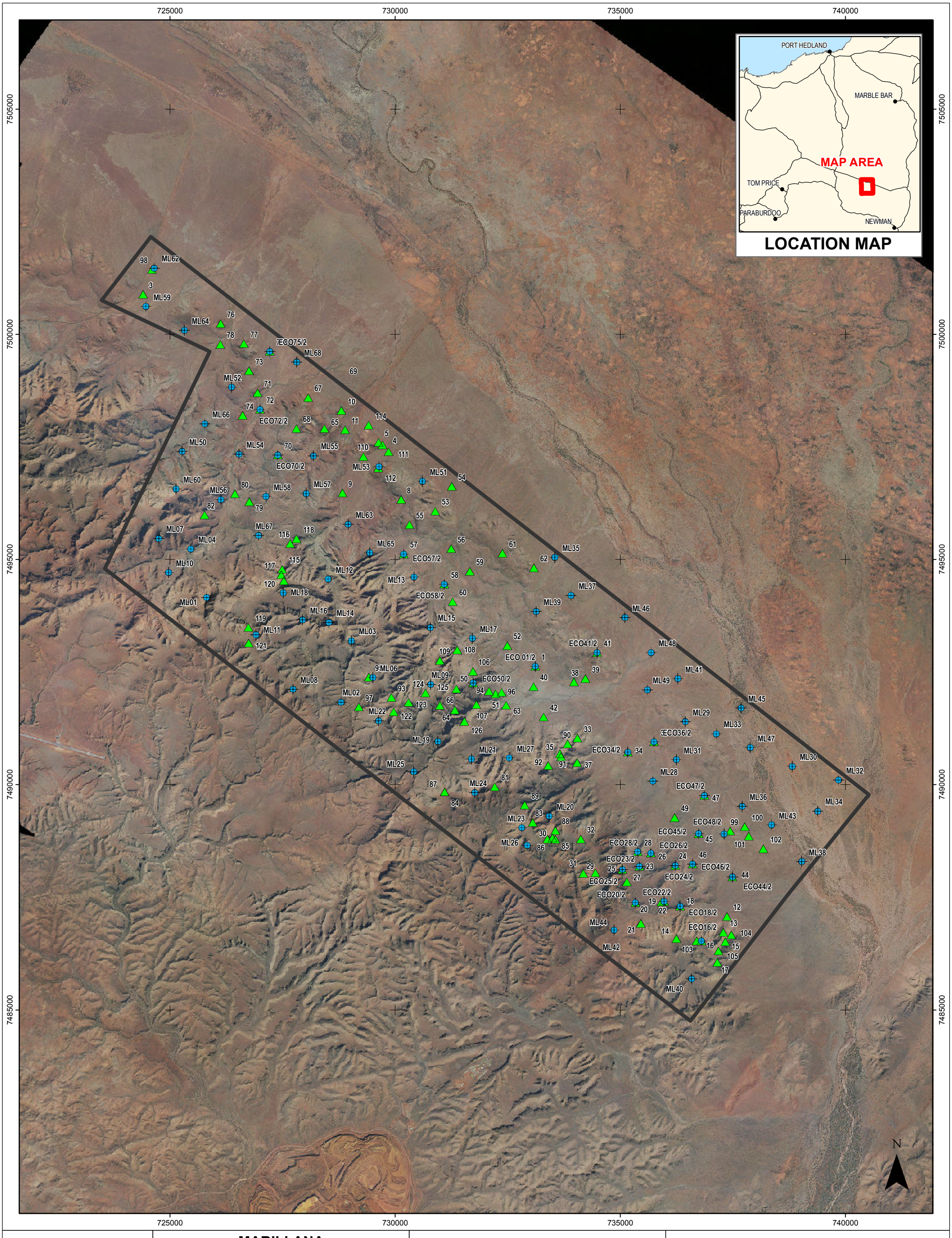
There are no previous records of currently listed significant flora occurring within the Study area. However, there is one previous record of a Priority flora species found within the Survey area that is no longer considered to be of conservation significance as it has been de-listed (Ecologia's (2007a) record of *Triumfetta leptacantha*). The entire Study area was ground truthed at 1 km intervals over the two-season survey. This ground coverage provided the opportunity to record opportunistic locations for any significant flora present, and also undertake closer examination of specific landforms where significant flora may be expected to occur. These landforms included medium and large drainage lines, floodplains, sand dunes, gorges and areas supporting outcropping mudstone and siltstone.

2.3.4 Weed Survey and Mapping

Two weed species had previously been located within the Study area; Ruby Dock (**Acetosa vesicaria*[1]*)* and Buffel Grass (**Cenchrus ciliaris)*. These records were re-visited by botanists from Onshore Environmental to confirm their occurrence. Opportunistic records for weed

[1] There was no GPS point recorded during the first season survey by Ecologia Environment (2007a).

species were made while moving around the Study area, and targeted weed searches were completed in high moisture habitats including drainage lines and floodplains.



MARILLANA

Location of 194 study sites assessed within the Study area.

Figure 5

0 1 2 3 4

Kilometers

1:75,000

Datum: GDA94

Projection: MGA Zone50

Griffin Spatial & Mapping

2 Epacris Elbow Pelican Point

Bunbury WA 6230

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ONSHORE ENVIRONMENTAL

ONSHORE ENVIRONMENTAL CONSULTANTS		Date:	6/05/2013
Sheet Size:	A3	Status:	Final
Drawn by GSM	Requested by DB	Internal Reference Maril_Study_sites_RevMay2013	

Legend

Study Area - Marillana

Sample Sites

Organisation Sampling

Ecologia

Onshore Environmental Consultants

2.3.5 Vegetation Association Mapping

The vegetation mapping utilised high-resolution aerial photography of the Study area at a scale of 1:20,000, with definition of vegetation polygons based on the different shading patterns evident. Ground truthing by up to six botanists occurred on a grid-like pattern. Releve vegetation descriptions were made within defined vegetation polygons to confirm dominant structural layers and associated plant taxa where formal study sites were not assessed.

Vegetation associations were defined on the basis of structure and species composition data collected during the surveys from 194 quadrats and numerous releves. The description of vegetation structure follows the height, life form and density classes of Specht (1970) as modified by Aplin (1979) and Trudgen (2009) (see Appendix 1). This is largely a structural classification suitable for broader scale mapping, but taking all ecologically significant strata into account. Vegetation condition for each of the sampling sites was determined using a recognised rating scale (based on Keighery 1994, see Appendix 2).

2.3.6 Vouchering and Taxonomic Identification

Voucher specimens were taken for species recorded to verify identification. Where field identification of plant taxa was not possible, specimens were collected in a systematic manner for later identification by expert taxonomists utilising the resources of the Western Australian Herbarium (WAH). Species were identified through comparison with the reference collection and the use of identification keys. Voucher specimens were provided to a botanist at the Western Australian Herbarium, Mr Steve Dillon. All names were checked against the Florabase database to ensure their currency. Nomenclature follows Green (1985 and 1987), Paczkowska and Chapman (2000) and the Western Australian Herbarium.

2.3.7 Field Survey Constraints

The EPA Guidance Statement for Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia (EPA 2004) list twelve potential constraints that field surveys may encounter. These constraints are addressed in Table 3.

Table 3 Relevance of constraints, as identified by EPA (2004), to the Marillana flora and vegetation survey.

Constraint	Relevance
Scope	The scope was established by BHP Billiton Iron Ore in compliance with relevant EPA Guidance Statements.
Proportion of flora collected and identified	It is likely that a large proportion of the flora present has been collected, given that four field trips by two different environmental consultancies have been completed over three different years (2005, 2006 and 2011) and during different seasons and conditions. It is noted that the main range is heavily dissected by many large and steep gorges. A small number of safely accessible, representative gorges were sampled but there was limited access to the majority of the larger, steeper gorges.
Sources of information	21 flora and vegetation surveys and targeted rare flora surveys have been completed in close proximity to the Study area. These additional surveys undertaken in close proximity provide an extensive local database.

Constraint	Relevance
The proportion of the task achieved and further work which might be needed	The four field surveys have covered the entire Study area and it has been determined that tasks have been adequately completed and no further work is required at the site.
Timing / weather / season / cycle	The four field surveys where completed at optimum periods following significant rainfall and therefore weater was not determined to be a constraint.
Disturbances, e.g. fire, flood	Disturbance was not a constraint to the survey with a large proportion of the Study area being long unburnt.
Intensity	The Study area was adequately surveyed with 194 study sites formally assessed along with numerous releve descriptions.
Completeness	This report represents a comprehensive survey of the Study area including a detailed literature review.
Resources	Appropriate resources were applied over the four field surveys.
Access problems	The south-west corner of the lease was inaccessible during the first season survey. However this area was covered during the two 2011 surveys in April and October 2011. It is also noted that a number of the larger gorges along the main range could not be safely accessed during the survey.
Availability of contextual information	Numerous flora and vegetation surveys have been undertaken within a 50km radius of the Study area, providing an extensive local database.
Experience levels	Personnel are qualified natural scientists with significant field experience among them. The taxonomists responsible for plant specimen determination/taxonomy are highly experienced in flora of the Pilbara.

2.3.8 Assessment of Conservation Significance

The conservation significance of flora and ecological communities are classified on a Commonwealth, State and Local level on the basis of various Acts and Agreements (EPA Guidance Statement No. 51, EPA 2004), including:

Commonwealth Level:

- EPBC Act: The Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) lists Threatened Flora and Ecological Communities, which are determined by the Western Australian Threatened Species Scientific Committee according to criteria set out in the Act. The Act lists flora that are considered to be of conservation significance under one of six categories (Appendix 4).

State Level:

- WC Act: At a State level native flora species are protected under the WC Act – Wildlife Conservation (Rare Flora) Notice. A number of plant species are assigned an additional level of conservation significance based on a limited number of known populations and the perceived threats to these locations. Species of the highest conservation significance are gazetted Declared Rare Flora (DRF) under subsection 2 of section 23F of the Act. It is an offence to take or damage DRF without Ministerial approval. Section 23F of the Act defines 'to take' as "to gather, pick, cut, pull up, destroy, dig up, remove or injure the flora or to cause or permit the same to be done by any means".
- DEC Priority list: DEC produces a list of Priority species and ecological communities (PECs) that have not been assigned statutory protection under the

WC Act. Priority Flora are under consideration for declaration as 'Rare Flora', classified as in urgent need of further survey (Priority One to Three), require monitoring every 5-10 years (Priority Four) or require a specific conservation program to prevent the taxon becoming threatened within five years (Priority 5), see Appendix 4. The list of PECs identifies those that need further investigation before nomination for TEC status.

Local Level:

- Species may be considered of local conservation significance because of their patterns of distribution and abundance. Although not formally protected by legislation, such species are acknowledged to be in decline as a result of threatening processes, primarily habitat loss through land clearing.

2.3.9 Multivariate Statistical Analysis

A multivariate statistical analysis of floristic quadrat data from the 194 study sites established within the Study area was completed to assist in understanding the vegetation-habitat relationships. Results are presented as Appendix 5.

3.0 Results

3.1 Desktop Review

3.1.1 Previous Flora Surveys within the Study Area

Results from the one previous flora and vegetation survey previously completed within the Study area is presented in Table 4 and summarised below.

Marillana ML70/270 SA Sec 2 Flora and Vegetation Assessment (Ecologia Environment 2007a)

A flora and vegetation survey was conducted at the Marillana Project area (with the same boundaries as the current Study area) ML70/270SA ahead of exploration drilling activities. The area was surveyed in October 2005 and March 2006.

The survey recorded 243 plant taxa predominantly consisting of grasses (Poaceae) and wattles (Fabaceae). Seventeen families were represented by a single taxon. No DRF were identified. However, *Triumfetta leptacantha* was recorded from rocky slopes and breakaways, and is known to occur in gorges (this taxon is no longer listed as a Priority flora species). Two introduced weed species were also recorded during the survey: **Acetosa vesicaria* and **Cenchrus ciliaris.* No vegetation communities listed as Threatened Ecological Communities (TECs) under the EPBC Act or as Environmentally Sensitive Areas (ESAs) under the *Environmental Protection Act (EP Act, 1986)* or as Priority Ecological Communities (PECs) according to the DEC Priority list were identified during the survey. The boundaries of the Study area, however lie within the boundary of the currently listed Fortescue Marsh (Priority 1) PEC zone.

There were 16 vegetation associations identified from the Study area with the following six broad classifications made on the basis of landform:

1) Range Crests;
2) Range Slopes;
3) Rocky Range Slopes;
4) Valley Plains;
5) Gorges and Gullies; and
6) Drainage Channels.

3.1.2 Previous Flora Surveys surrounding the Study Area

The results from previous flora and vegetation surveys completed within close proximity to the Study area are presented in Table 4 and summarised below.

RPG5: M270SA Flora and Vegetation Assessment (ENV 2008a)

A survey of the North Marillana mining lease (M270SA) occurred on the 22nd April 2008. This 106 ha lease lies immediately to the northwest of the Study area, straddling the railway line from Yandi in the southeast. A total of 114 plant taxa from 58 genera and 30 families were recorded from seven quadrats assessed within the lease. No significant flora was located within the area surveyed. Three introduced species were recorded: **Aerva javanica*, **Cenchrus ciliaris* and **Portulaca oleracea.* Five vegetation associations were described in the project area, none of which are listed as TECs or PECs. Vegetation condition was degraded up to 20 m either side of the existing rail line, with numerous weeds present. Within the larger area vegetation condition was recorded as Good to Very

Good. Disturbance from cattle grazing and fire was evident at all sites assessed. No PECs TECs or ESAs were recorded during this survey. The boundaries of the Study area, however lie within the boundary of the currently listed Fortescue Marsh (Priority 1) PEC zone.

Yandi Flora and Vegetation Survey (Onshore Environmental 2011a)

In 2011 Onshore Environmental completed a review of the vegetation and flora for a 132km^2 area surrounding the Yandi mine site located approximately 12 km to the south-west of the Study area. A desktop and literature review was carried out, along with a targeted field survey to check and update locations for significant and introduced flora. A total of 28 previous surveys from Yandi and surrounds were reviewed for this report. Four hundred and fifty seven plant taxa from 56 families and 179 genera were recorded within the project area from surveys dating back to 1991. Species representation was greatest among the Fabaceae, Poaceae, Malvaceae, Asteraceae, Amaranthaceae, Myrtaceae, Goodeniaceae, Solanaceae, Chenopodiaceae and Scrophulariaceae families. One DRF species was recorded from the central southern section of the study area: *Lepidium catapycnon.* Three Priority species also occur within the study area; *Acacia subtiliformis* (Priority 3), *Rostellularia adscendens* var. *latifolia* (Priority 3) and *Goodenia nuda* (Priority 4). A total of 23 introduced species had previously been recorded at Yandi; none of these were listed as Declared Weeds under the ARRP Act*:*

- **Acetosa vesicaria*
- **Aerva javanica*
- **Argemone ochroleuca* subsp. *ochroleuca*
- **Bidens bipinnata*
- **Brassica rapa*
- **Cenchrus ciliaris*
- **Centaurea melitensis*
- **Chloris virgata*
- **Citrullus lanatus*
- **Conyza bonariensis*
- **Cucumis melo* subsp. *agrestis*
- **Cynodon dactylon*
- **Lactuca serriola* forma *serriola*
- **Malvastrum americanum*
- **Polypogon monspeliensis*
- **Portulaca oleracea*
- **Rostraria cristata*
- **Setaria verticillata*
- **Sigesbeckia orientalis*
- **Solanum nigrum*
- **Sonchus asper*
- **Sonchus oleraceus*
- **Vachellia farnesiana*

A total of 24 vegetation associations were mapped within the Yandi Study area. No TECs or ESAs are listed within the study area however the PEC Weeli Wolli Spring Community (Priority 1) occurred approximately 9 km to the south-east. The PEC was defined by the continuous occurrence of the tall tree *Melaleuca argentea.* A vegetation association occurring along the major drainage line (Marillana Creek) adjacent to the Yandi Mine supported a High Open Forrest of *Melaleuca argentea:*

- Vegetation Association 1 - High Open Forest of *Melaleuca argentea, Eucalyptus camaldulensis* var. *obtusa* over High Shrubland of *Melaleuca glomerata, Acacia bivenosa, Acacia sericophylla* over Very Open Sedges of *Cyperus vaginatus* in alluvial gravelly soils along major drainage channels.

The association was not continuous but occurred in localised areas around ephemeral pools along the major drainage line. A meeting with Mr Stephen van Leeuwin of the DEC on the 7th June 2011 confirmed that Vegetation Association 1 was not part of the Weeli Wolli PEC.

Yandi to Kurrajura Siding and Yandi Repeater One Flora and Vegetation Report (Ecologia Environment 2008)

A flora and vegetation assessment of a section of the rail line between Yandi and Kurrajura Siding (immediately south-west of the Study area) was completed in 2008. An area surrounding the Yandi Repeater 1 was also surveyed. A total of 175 taxa were recorded from 39 families and 91 genera, including five weed species: **Acetosa vesicaria, *Aerva javanica*, **Bidens bipinnata*, **Cenchrus ciliaris*, and **Citrullus colocynthis*. Eighty-five taxa were recorded from the survey of the Yandi Repeater 1 lease area including four weed species; **Acetosa vesicaria, *Bidens bipinnata*, **Cenchrus ciliaris* and **Setaria verticillata.* There was no significant flora, TECs, or PECs or ESAs recorded from either of the two areas surveyed. Some of the survey area boundaries however, lie within the currently listed Fortescue Marsh (Priority 1) PEC zone

Upper Marillana Exploration Lease Flora and Vegetation Assessment (ENV 2007a)

A Level 2 survey of the Upper Marillana Exploration lease was completed by ENV in May 2007 in preparation for the commencement of exploration drilling in the area. Upper Marillana is positioned about 40 km to the west of the Study area. A total of 296 plant taxa were recorded comprising 135 genera and 46 families. The Priority 3 flora *Rostellularia adscendens* var. *latifolia* was recorded from a total of four locations. There was no additional significant flora recorded from the area. Four introduced species were also recorded; **Bidens bipinnata, *Cenchrus ciliaris, *Malvastrum americanum* and **Cucumis melo* subsp. *agrestis.* No TECs, PECs or ESAs were recorded during the Survey, Some of the survey area boundaries however, lie within the currently listed Fortescue Marsh (Priority 1) PEC zone.

Upper Marillana Exploration Project Biological Survey (Ecologia Environment 2005a)

A biological survey of the Upper Marillana Exploration area located approximately 40 km west of the Study area was undertaken in April 2005. A total of 156 plant taxa were recorded during the survey with eight plant families represented by a single taxon. No species listed as DRF or Priority flora were recorded. However, two species of interest were identified; *Sida* aff. *arenicola* and *Sida* aff. *cardiophylla.* Two introduced species were also recorded; **Malvastrum americanum* and **Bidens bipinnata.* A total of eight vegetation association / habitat types were described from the project area. None of these were listed as TECs, PECs or ESAs. Some of the survey area boundaries however, lie within the currently listed Fortescue Marsh (Priority 1) PEC zone

Munjina Exploration Lease Flora and Vegetation Assessment (ENV 2009)

A survey of the Munjina Exploration lease was completed in September 2007 by ENV. This lease lies adjacent to the Upper Marillana lease, approximately 35 km to the west of the Study area. From 78 quadrats a total of 296 taxa were recorded consisting of 115 genera and 42 families. The most commonly recorded taxa were *Acacia (*37 taxa), *Senna* (15 taxa), and *Sida* (14 taxa). No Threatened (Declared Rare) Flora were recorded from the study area. However the Priority Flora species, *Acacia subtiliformis* (Priority 3) and *Rostellularia adscendens* var. *latifolia* (Priority 3), were collected from the study area. Six introduced species were found in the project area: **Bidens bipinnata, *Chloris virgata, *Malvastrum americanum, *Portulaca oleracea, *Setaria verticillata* and **Vachellia farnesiana.* None of these species are Declared Plants as per the *Agriculture and Related Resources Protection Act 1976* (WA).

Sixteen vegetation associations were mapped from the Munjina Exploration lease. None of the communities are listed as PECs, TECs or ESAs, however the survey area boundaries lie within the currently listed Fortescue Marsh (Priority 1) PEC zone

Mindy North Exploration Lease Flora and Vegetation Assessment (ENV 2007b)

A survey of the Mindy North Exploration lease that lies approximately 6 km to the southeast of Marillana was carried out by ENV in April 2007. The Level Two survey recorded a total of 200 taxa from 93 genera and 38 families. The most frequently recorded families were Poaceae, Fabaceae and Malvaceae. No Priority Flora species or Threatened (Declared Rare) Flora were located during the survey. One Priority Ecological Community (the 'Coolibah-lignum flats: *Eucalyptus victrix* over *Muehlenbeckia* community' of which there are three subtypes currently listed as Priority 3(i), Priority 1 and Priority 1 Ecological Communities respectively by the DEC) was listed as potentially occurring in the area, however it was not recorded as present during the survey. The northwestern section of the survey area also lies within the currently listed Fortescue Marsh (Priority 1) PEC zone. No TECs or ESAs were recorded during the survey. The introduced species **Cenchrus ciliaris, *Malvastrum americanum, *Setaria verticillata* and **Bidens bipinnata* were recorded in the study area.

Mindy-Coondiner Exploration Project Biological Survey (Ecologia Environment 2005b)

The Mindy-Mindy and Coondiner Exploration leases are positioned approximately 6 km and 40 km respectively to the south east of the Study area. In November of 2005 Ecologia completed a baseline survey of flora of these two areas. A baseline fauna survey was also completed. A total of 137 taxa were recorded from 32 families and 66 genera. The most species rich genera were *Acacia* (15 taxa) and *Ptilotus* (10 taxa). A total of 12 families were represented by a single taxon. No Threatened (Declared Rare) Flora or Priority Flora were recorded from the study area. A total of three weed species were recorded: **Cenchrus ciliaris, *Acetosa vesicaria,* and **Aerva javanica*.

Seven vegetation associations were described in the study areas. The dominant vegetation community was Open to Sparse Mixed Woodlands of *Corymbia hamersleyana, Acacia citrinoviridis,* and *Acacia pruinocarpa* over *Acacia pyrifolia* or *Gossypium robinsonii* and other tall to medium shrubs, over low shrubs such as *Tephrosia rosea* var. *glabrior* over mixed dwarf shrubs, herbs and tussock grasses such as **Cenchrus ciliaris* and *Eragrostis eriopoda*, with *Triodia epactia* moderately dense to scattered hummock grassland. No PECs, TECs or ESAs were recorded during the survey, however the northwestern section of the Mindy survey area lies within the currently listed Fortescue Marsh (Priority 1) PEC zone.

Coondiner and Mindy East Exploration Lease Flora and Vegetation Assessment (ENV 2007c)

A biological assessment of the Mindy and Coondiner Exploration Leases located approximately 6 km and 40 km to the southeast of the Study area was completed in April 2007. Thirty-one quadrats were assessed at the Coondiner lease and five at the Mindy East tenement. A total of 248 taxa were recorded with 217 recorded at Coondiner and 95 recorded at Mindy East. Four Priority species were recorded at Coondiner tenement. Of these only one is currently a Priority species: *Sida* sp. Barlee Range (Priority 3), which was recorded at 5 sites. The other species were *Olearia fluvialis, Tylophora flexuosa* (was known as *Cynanchum* sp. Hamersley) and *Triumfetta leptacantha.* No Priority species were recorded at the Mindy East tenement. No TECs, PECs or ESAs were recorded from the survey, however the northwestern section of the Mindy East survey area lies within the currently listed Fortescue Marsh (Priority 1) PEC zone. . Five introduced species were recorded from the two tenements; **Aerva javanica, *Cenchrus ciliaris, *Malvastrum*

*americanum, *Setaria verticillata* and **Solanum nigrum*. None of these plants are listed as Declared Plants by the Department of Agriculture.

Ministers North Biological Survey (Ecologia Environment 2006)

Ecologia Environment surveyed the Ministers North exploration area located approximately 17 km southwest of the Study area and approximately 5 km south of the Yandi mine site in May 2006. The survey aimed to provide an inventory of vascular flora, biologically significant species and vegetation associations. Vegetation associations that were poorly represented or essential to the survival of rare flora were recorded. A review of species of conservation significance likely to be present in the area was undertaken. The survey also included an assessment of the conservation value (regional and local) of the flora of the area and the impact of land use on vegetation associations.

One hundred and twenty five taxa were recorded from the study representing 37 families and 72 genera. No Threatened (Declared Rare) Flora species listed under the WC Act, Priority species or species listed under the EPBC Act were recorded within the survey area. The introduced species **Acetosa vesicaria, *Bidens bipinnata,* and **Cenchrus ciliaris* were identified during the survey. No vegetation communities listed as TECs under the EPBC Act or as Environmentally Sensitive Areas (ESAs) under the *Environmental Protection Act (EP Act, 1986)* or as PECs according to the DEC Priority list were identified.

Ministers North Flora and Vegetation Assessment (ENV 2008b)

Ministers North located approximately 17 km to the southwest of the Study area was surveyed by ENV in September of 2007. This flora and vegetation survey recorded the presence of plant species within the area including a description of any species of conservation significance. The vegetation associations and their conservation significance were also described. A major focus of the survey was to identify the species of conservation significance within the impact footprint of proposed drill pads and access tracks.

Sixty-five 50 x 50 quadrats were surveyed within the study area. The total number of taxa recorded was 216 from 44 families and 97 genera. The Priority 3 species *Sida* sp. Barlee Range was recorded at two locations. The introduced species **Sonchus oleraceus*, **Chloris virgata* and **Cenchrus setiger* were also recorded in the study area. No TECs PECs or ESAs were recorded during the survey.

Jinidi Survey (Onshore Environmental 2011b)

A Level 2 flora and vegetation survey of the Jinidi survey area was completed by Onshore Environmental in 2011. The Jinidi exploration area lies approximately 20 km south of the Study area and approximately 2 km south-east of Weeli Wolli Spring. The DRF *Lepidium catapycnon* was recorded at a total of 231 locations throughout the southern sector of the survey area. In addition, nine Priority flora were recorded; *Acacia subtiliformis* (Priority 3), *Goodenia* sp. East Pilbara (Priority 3), *Goodenia nuda* (Priority 4), *Rostellularia adscendens* var. *latifolia* (Priority 3), *Triodia* sp. Mt Ella (Priority 3), *Rhagodia* sp. Hamersley (Priority 3), and *Indigofera gilesii* subsp. *gilesii* (Priority 3). During the survey several excellent specimens of the then undescribed taxon now referred to as *Grevillea* sp. Turee (J. Bull & G. Hopkinson ONS JJ 01.01, Priority 1) were recordecd and collected. Seven introduced (weed) species were also recorded; **Cenchrus ciliaris, *Bidens bipinnata, *Vachellia farnesiana, *Portulaca oleracea, *Cucumis melo* subsp. *agrestis, *Malvastrum americanum* and **Setaria verticillata.*

Eighteen vegetation associations were described and mapped within the Jinidi Study area, none of these associations are currently listed as TECs, PECs or ESAs. However the Priority

1 PEC: Weeli Wolli Spring occurs less than 1 km west of the north-west corner of the Study area.

Area C to Jinayri to Mount Newman Railway Flora and Vegetation Survey (Woodman Environmental 2010)

A one-season flora and vegetation survey was completed along the corridor between Area C, Jinayri and the Mount Newman Railway in 2009. The Study area lies to the east and south of the Study area, approximately 5 km at the nearest point. A total of 203 quadrats were sampled during the survey. Three hundred and seventy nine taxa were recorded within the study area from 149 genera and 53 families. One Threatened (Declared Rare) flora, *Lepidium catapycnon,* and eight priority flora species were recorded: *Brunonia* sp. Long hairs *(*D.E. Symon 2440*)* (Priority 1)*, Goodenia* sp. East Pilbara (A.A. Mitchell PRP 727) (Priority 3), and *Goodenia nuda* (Priority 4), *Stylidium weeliwolli* (Priority 2), *Acacia subtiliformis* (Priority 3), *Fimbristylis sieberiana* (Priority 3), *Rhagodia* sp. Hamersley (M. Trudgen 17794) (Priority 3) and *Rostellularia adscendens* var. *latifolia* (Priority 3). Ten introduced species were recorded in the survey: **Aerva javanica* (Kapok Bush), **Argemone ochroleuca* subsp. *ochroleuca* (Mexican Poppy), **Bidens bipinnata* (Bipinnate Beggartick), **Cenchrus ciliaris* (Buffel Grass), **Cenchrus setiger* (Birdwood Grass), **Cynodon dactylon* (Couch Grass), **Flaveria trinerva*, **Malvastrum americanum* (Spiked Malvastrum), **Portulaca oleracea* (Purslane) and **Setaria verticillata* (Whorled Pigeon Grass). A total of 19 vegetation associations were described none of which are listed as TECs or ESAs. Vegetation type 14a corresponds to the Weeli Wolli Spring Community, which is a Priority 1 PEC.

Area C and Surrounds Level 2 Flora and Vegetation Survey (Onshore Environmental 2011c)

In 2010 Onshore Environmental completed Level 2 flora and vegetation survey of the Area C and Surrounds Study area, which lies to the west of Weeli Wolli Spring and approximately 42 km to the southwest of the Study area. The assessment included a review of historical flora and vegetation surveys completed in the area from 1997 to 2010. A survey of two areas proposed for future development, Packsaddle East and R-Deposit, was also completed. A total of 479 plant taxa from 53 families and 166 genera were recorded from the Area C and Surrounds Study area. Species representation was highest among the Fabaceae, Poaceae, Malvaceae, Asteraceae, Amaranthaceae, Myrtaceae, Chenopodiaceae, Goodeniaceae, Scrophulariaceae and Solanaceae families. The survey of Packsaddle East recorded 206 taxa while the survey of R-Deposit recorded 219 taxa. One DRF was recorded at the eastern end of Packsaddle Range, *Lepidium catapycnon.* Fifteen Priority flora were also confirmed as occurring within the Study area; *Aristida jerichoensis* var. *subspinulifera* (Priority 1); *Aristida lazaridis* (Priority 2); S*partothamnella puberula* (Priority 2); *Stylidium weeliwolli* (Priority 2); *Vittadinia* sp. Coondewanna Flats (S. van Leeuwen 4684) (Priority 1); *Acacia subtiliformis* (Priority3); *Euphorbia inappendiculata* (Priority3); *Fimbristylis sieberiana* (Priority 3); *Goodenia* sp. East Pilbara (A.A. Mitchell PRP 727) (Priority 3); *Nicotiana umbratica* (Priority 3); *Rhagodia* sp. Hamersley (M. Trudgen 17794) (Priority 3); *Rostellularia adscendens* var. *latifolia* (Priority 3); *Sida* sp. Barlee Range (S. van Leeuwen 1642) (Priority 3); *Eremophila magnifica* subsp. *magnifica* (Priority 4) and *Goodenia nuda* (Priority 4). There were eleven introduced (weed) species recorded from the area; **Bidens bipinnata; *Cenchrus ciliaris; *Chloris barbata; *Chloris virgata; *Cynodon dactylon; *Datura leichhardtii; *Malvastrum americanum; *Portulaca oleracea; *Setaria verticillata; *Sigesbeckia orientalis;* and **Vachellia farnesiana.*

The Weeli Wolli Spring PEC occurred at the eastern fringe of the Study area. No TECs or ESAs were recorded during the survey. In total 37 vegetation associations were mapped. Vegetation condition was described as Excellent to Very Good with the highest level of disturbance occurring on flood plains and along drainage lines as a result of cattle grazing.

RPG5: Cowra to Kurrajurra Sidings and Cowra Camp Site Flora and Vegetation Survey (Ecologia Environment 2007b)

As part of the Rapid Growth Project 5 BHPIO proposed to duplicated a 49km section of rail line between Cowra and Kurrajurra Sidings, and construct a new camp site at Cowra. A Level 1 survey of these areas was completed during October 2007 by Ecologia. The area surveyed includes an area 40 meters either side of the rail line and runs past the Study area to the west. The corridor occurs immediately west of the Study area and a small section of it passes through the extreme northwest section of the Study area. Two hundred and six taxa were recorded during the survey of the rail line. This comprised species from 38 families, 92 genera and 188 species. 15 families were represented by a single taxon. One hundred and forty four taxa were recorded during the survey of the proposed Cowra Camp area. No Threatened (Declared Rare) F was recorded at either location. One Priority species was located during the survey, *Abutilon trudgenii,* which is no longer a Priority species. One declared weed, **Tamarix aphylla* (P1) and two other weeds, **Cenchrus ciliaris* and **Malvastrum americanum,* were recorded as Cowra Camp. Along the rail corridor five weed species were recorded: **Acetosa vesicaria, *Aerva javanica, *Cenchrus ciliaris, *Malvastrum americanum* and **Setaria verticillata*. No TECs, PECs or ESAs were identified during the survey, however the survey area lies within the currently listed Fortescue Marsh (Priority 1) PEC zone.

RGP5: Jimblebar Junction to Yandi Junction Railway Reserve Flora and Vegetation Assessment (ENV 2008c)

In April 2008 a 120 km section of the mainline from Jimblebar Junction (10km north of Newman) to Yandi Junction (just north of the western end of the Study area, with the rail and survey area running parallel to the top edge of the Study area less than 5 km to the northeast) was surveyed by ENV. The survey included an area 80 meters either side of the rail line. A total of 353 taxa from 123 genera were recorded through the study area. This included four Priority species, of which three are still currently listed as Priority species: *Rostellularia adscendens* subsp. *adscendens* var. *latifolia* (Priority 3), *Goodenia nuda (*Priority 4) and *Bulbostylis burbidgeae* (Priority 4). Eleven introduced species were also recorded: **Aerva javanica, *Bidens bipinnata, *Cenchrus ciliaris, *Cenchrus setiger, *Chloris virgata, *Cucumis melo* subsp*. agrestis, *Cynodon dactylon*, *Malvastrum americanum, *Portulaca oleracea*, **Setaria verticillata,* and **Vachellia farnesiana*. Fourteen vegetation communities were mapped in the study area with vegetation condition ranging from Completely Degraded to Very Good. No currently listed TECs, PECs or ESAs were identified.

BHPIO Rail Sidings Flora and Vegetation Assessment (Ecologia Environment 2005c)

In 2005 Ecologia undertook an assessment of 6 areas for the construction of rail sidings along the BHPIO mainline from Newman to Port Hedland. One of these areas, the Weeli Siding is situated less than 10 km to the north-east of the Study area. The area was described as a low degraded plain with scattered to open *Acacia pruinocarpa* shrubland over sparse grasses and loamy ground. The area had previously been used during the construction of the rail line and contains a borrow pit. Hence the understory was primarily open ground and there was low species diversity at the site. Common species included *Acacia synchronicia, *Cenchrus ciliaris, Corchorus elachocarpus, Corchorus sidoides* subsp. *sidoides, Eremophila forrestii* subsp. *forrestii, Panicum decompositum, Sclerolaena cornishiana, Senna artemisioides* subsp. *helmsii* and *Solanum lasiophyllum.* No species of conservation significance were recorded in the area. Two weed species, **Cenchrus ciliaris* and **Aerva javanica* were recorded. No TECs, PECs or ESAs were identified.

RGP: Rail Rare and Priority Flora Survey (Ecologia Environment 2004)

In 2004 Ecologia undertook a survey of three areas to be considered for additional siding along the rail line between Port Hedland and Newman. The Yandi siding is relevant to the current survey as it lies to the south west of the Study area. The survey was conducted in November 2003.

The western end of the Yandi Siding area is situated on an open plain of *Triodia* basedowii grassland with common species including *Grevillea wickhamii* subsp. *aprica*, *Acacia spondylophylla, Acacia dictyophleba* and *Cleome viscosa.* Further to the east vegetation consists of grasses such as *Cenchrus* sp. and *Triodia epactia.* Large laterite outcrops are present in this area with *Corymbia ferriticola* and *Ficus brachypoda* growing from the rock faces. The siding then enters a gorge where the vegetation consists of *Acacia tumida* var. *pilbarensis* and *Acacia inaequilatera* open shrubland and *Eucalyptus gamophylla.* No Threatened (Declared Rare) Flora or Priority Species were found in the study area. The *Cenchrus* sp. found within the Yandi siding area is likely to be a weed as all four of the *Cenchrus* species found in the Pilbara are introduced.

Railroad Interim Expansion Project Rare and Priority Flora Survey (Ecologia Environment 2003)

In 2003 Ecologia surveyed three areas for additional sidings along the rail line between Port Headland and Newman. The Cowra siding is relevant to the current study as it lies approximately 30 km to the north west of the Study area. A total of 245 taxa were recorded from the survey overall. Three priority species were recorded during the survey of which one, *Themeda* sp. Hamersley Station, is currently a Priority species (The other species recorded that are no longer listed as Priority flora were *Sida* sp. Wittenoom and *Abutilon trudgenii*). However this species was not recorded at Cowra siding. **Cenchrus ciliaris* was the only weed species recorded at the Cowra Siding. There was no currently listed TECs, PECs or ESAs identified during the survey, however the survey area lies within the currently listed Fortescue Marsh (Priority 1) PEC zone.

Hope Downs Iron Ore Project Rail and Port: Public Environmental Review (Hope Downs Management Services 2002)

The results of a survey completed in 1997 for a proposed railway route from Port Hedland to Weeli Wolli Creek were reported in this PER. The southern section of the rail route is relevant to the Study area as the area surveyed ran from Weeli Wolli Creek through the eastern part of the Marillana lease, where the Hope Downs Railway line currently cuts through the study area. Several introduced species were recorded at Weeli Wolli Creek during this survey: **Argemone ochroleuca, *Cenchrus ciliaris, *Cenchrus setiger, *Cucumis melo* subsp. *agrestis* and **Setaria verticillata.* The vegetation of Welli Wolli Creek which is adjacent to the study area was mapped as *Eucalyptus victrix* scattered low trees over *Acacia citrinoviridis* high open shrubland over **Cenchrus ciliaris* closed tussock grassland. The Sand dune vegetation (*Acacia dictyophleba* scattered tall shrubs over *Crotalaria cunninghamii*, *Trichodesma zeylanicum* open shrubland), which lies to the north of Weeli Wolli Creek, was considered rare and recommended for nomination as a Threatened Ecological Community. The area is currently listed as a Priority 3 Ecological Community. No TECs or ESAs were identified.

Hope Downs Iron Ore Project Public Environmental Report/Public Environmental Review (Hope Downs Management Services 2000)

A survey of the Hope Downs rail alignment was completed by Halpern Glick Maunsell in 2000. The results of this survey were reported in the Public Environmental Review. A total of 354 taxa were present in the area surveyed which covered several options for the alignment of the railway for Hope Downs. One of the options surveyed is close to the Study

area and runs northeast from Hope Downs towards the main Newman to Port Hedland Line. The northern section of this area is directly east from the Study area. There were six Priority species recorded from this study, of these, three are relevant to the Study area: *Goodenia lyrata* (Priority 3), *Eremophila magnifica* subsp. *magnifica* (Priority 4) and *Indigofera gilesii* subsp. *gilesii* (Priority 3). No TECs, PECs or ESAs were identified.

Weeli Wolli Creek Biological Assessment Survey (Ecologia Environment 1998)

A flora and vegetation survey of an 8 km length of the Weeli Wolli Creek was undertaken by Ecologia Environment during December 1994 and April 1995. The area surveyed was close to the Weeli Wolli Spring and located approximately 27 km to the southwest of the Study area. The assessment aimed to determine the presence of any significant flora in order to reduce the impact of the construction of the Hope Downs Mine on these species. Twenty 100 x 100 metre quadrats were sampled in the area. The total number of taxa recorded was 251 from 55 families and 137 genera. No priority flora were identified during the study, however five species of interest were recorded. Eight introduced species were also recorded **Datura leichardtii, *Aerva javanica, *Bidens bipinnata, *Cenchrus ciliaris *Phoenix dactylifera, *Malvastrum americanum, *Oxalis corniculata and *Sonchus oleraceus*. Fourteen vegetation associations were described within the area. The eastern area of the area surveyed contains the Weeli Wolli Spring community currently listed as a Priority 1 PEC. No TECs or ESAs were identified.

Roy Hill Exploration Lease Flora and Vegetation Assessment (ENV 2007d)

In May 2007 ENV undertook a biological assessment of the Roy Hill Exploration area situated to the approximately 45 km to the north- north west of Marillana and 143km northwest of Newman. A total of 216 taxa were recorded from 42 families and 103 genera. One Priority species was recorded, *Scaevola* sp. Hamersley Range basalts (S. van Leeuwen 3675) (Priority 2). This species was recorded at five locations including a footslope, two drainage lines, a floodplain and an incised creekline.

Vegetation condition within the project area ranged from Good to Excellent. The major disturbances recorded were clearing from past drill pads and vehicles, grazing, weeds and fire. Four introduced species were recorded from the study area. They were: **Bidens bipinnata, *Cenchrus ciliaris, *Malvastrum americanum,* and **Cucumis melo* subsp. *agrestis.* None of these species are listed as declared weeds by the Department of Agriculture. No TECs, PECs or ESAs were identified.

Table 4 Summary of significant flora and environmental weeds recorded during previous flora and vegetation surveys within, or in close proximity to, the Study area.

Survey	Consultant	Year	Survey Date	Significant Flora Recorded	TECs, PECs & ESAs Recorded	Introduced (Weed) Taxa Recorded
Marillana ML70/270 SA Section 2 Flora and Vegetation Assessment	Ecologia	2007a	October 2005	None	None The survey area boundaries lie within the currently listed Fortescue Marsh (Priority 1) PEC zone	**Cenchrus ciliaris, *Acetosa vesicaria*
RPG5:M270SA Flora and Vegetation Assessment	ENV	2008a	22nd April 2008	None	None The survey area boundaries lie within the currently listed Fortescue Marsh (Priority 1) PEC zone	**Aerva javanica, *Cenchrus ciliaris, *Portulaca oleracea*
Yandi Flora and Vegetation Survey	Onshore Environmental	2011a	December 2010	*Lepidium catapycnon* (DRF), *Acacia subtiliformis* (Priority 3), *Rostellularia adscendens* var. *latifolia* (Priority 3), *Goodenia nuda* (Priority 4)	None The PEC Weeli Wolli Spring Community (Priority 1) occurs approximately 9 km to the south-east. Vegetation association 1 - High Open Forest of *Melaleuca argentea, Eucalyptus camaldulensis* var. *obtusa* over High Shrubland of *Melaleuca glomerata, Acacia bivenosa, Acacia sericophylla* over Very Open Sedges of *Cyperus vaginatus* in alluvial gravelly soils along major drainage channels was confirmed as not part of the Weeli Wolli PEC by Mr Stephen van Leeuwin of the DEC on the 7th June 2011. The northeastern section of the survey area lies within the currently listed Fortescue Marsh (Priority 1) PEC zone.	**Aerva javanica, *Argemone ochroleuca* subsp. *ochroleuca, *Bidens bipinnata, *Brassica rapa, *Cenchrus ciliaris, *Centaurea melitensis, *Chloris virgata, *Citrullus lanatus, *Conyza bonariensis, *Cucumis melo* subsp. *agrestis, *Cynodon dactylon, *Lactuca serriola forma serriola, *Malvastrum americanum, *Polypogon monspeliensis, *Portulaca oleracea, *Rostraria cristata, *Setaria verticillata, *Sigesbeckia orientalis, *Solanum nigrum, *Sonchus asper, *Sonchus oleraceus, *Vachellia farnesiana*

Survey	Consultant	Year	Survey Date	Significant Flora Recorded	TECs, PECs & ESAs Recorded	Introduced (Weed) Taxa Recorded
Yandi to Kurrajura Siding and Yandi Repeater One Flora and Vegetation Report	Ecologia	2008	March 2008	None	None Some of the survey area boundaries lie within the currently listed Fortescue Marsh (Priority 1) PEC zone	*Acetosa vesicaria, *Aerva javanica*, **Bidens bipinnata*, **Cenchrus ciliaris*, **Citrullus colocynthis, *Setaria verticillata*
Upper Marillana Exploration Lease Flora and Vegetation Assessment	ENV	2007a	May 2007	*Rostellularia adscendens* var. *latifolia* (Priority 3)	None Some boundaries of the survey area lie within the currently listed Fortescue Marsh (Priority 1) PEC zone.	**Cenchrus ciliaris, *Malvastrum americanum, *Bidens bipinnata, *Cucumis melo* subsp. *agrestis*
Upper Marillana Exploration Project Biological Survey	Ecologia	2005a	April 2005	None	None Some boundaries of the survey area lie within the currently listed Fortescue Marsh (Priority 1) PEC zone.	**Malvastrum americanum, *Bidens bipinnata*
Munjina Exploration Lease Flora and Vegetation Assessment	ENV	2009	September 2007	*Acacia subtiliformis* (Priority 3), *Rostellularia adscendens* var. *latifolia* (Priority 3)	None The survey area boundaries lie within the currently listed Fortescue Marsh (Priority 1) PEC zone	**Bidens bipinnata, *Chloris virgata, *Malvastrum americanum, *Portulaca oleracea, *Setaria verticillata, *Vachellia farnesiana*
Mindy North Exploration Lease Flora and Vegetation	ENV	2007b	April 2007	None	None 'Coolibah-lignum flats: *Eucalyptus victrix* over *Muehlenbeckia* community' PEC was listed as potentially occurring in the area, but was not recorded during the survey. The northwestern section of the survey area also lies within the currently listed Fortescue Marsh (Priority 1) PEC zone.	*Cenchrus ciliaris, *Malvastrum americanum, *Setaria* verticillata and **Bidens bipinnata*

Survey	Consultant	Year	Survey Date	Significant Flora Recorded	TECs, PECs & ESAs Recorded	Introduced (Weed) Taxa Recorded
Mindy-Coondiner Exploration Project Biological Survey	Ecologia	2005b	November 2005	None	None The northwestern section of the Mindy survey area lies within the currently listed Fortescue Marsh (Priority 1) PEC zone.	**Cenchrus ciliaris, *Acetosa vesicaria, *Aerva javanica*
Coondiner and Mindy East Exploration Lease Flora and Vegetation Assessment	ENV	2007c	April 2007	*Sida* sp. Barlee Range (Priority 3)	None The northwestern section of the Mindy East survey area lies within the currently listed Fortescue Marsh (Priority 1) PEC zone.	**Aerva javanica, *Cenchrus ciliaris, *Malvastrum americanum, *Setaria verticillata, *Solanum nigrum*
Ministers North Biological Survey	Ecologia	2006	May 2006	None	None	**Acetosa vesicaria, *Bidens bipinnata, *Cenchrus ciliaris*
Ministers North Flora and Vegetation Assessment	ENV	2008b	September 2007	*Sida* sp. Barlee Range (Priority 3)	None	**Sonchus oleraceus, *Chloris virgata, *Cenchrus setiger*
Jinidi Study Area-Review of Flora and Vegetation	Onshore Environmental	2011b	February, April, May 20011	*Lepidium catapycnon* (DRF), *Grevillea* sp. Turee (J. Bull & G. Hopkinson ONS JJ 01.01, Priority 1), *Acacia subtiliformis* (Priority 3), *Goodenia* sp. East Pilbara (Priority 3), *Goodenia nuda* (Priority 4), *Rostellularia adscendens* var. *latifolia* (Priority 3), *Triodia* sp. Mt Ella (Priority 3), *Rhagodia* sp. Hamersley (Priority 3), *Indigofera* sp. Gilesii (Priority 3)	None Priority 1 PEC: Weeli Wolli Spring occurs less than 1 km west of the north-west corner of the Study area.	**Cenchrus ciliaris, *Bidens bipinnata, *Vachellia farnesiana, *Portulaca oleracea, *Cucumis melo* subsp. *agrestis, *Malvastrum americanum, *Setaria verticillata.*
Area C to Jinayri to Mt Newman Railway Flora and Vegetation Survey	Woodman Environmental	2010	May, June, September 2009	*Lepidium catapycnon, Brunonia* sp. Long hairs (D.E. Symon 2440) (Priority 1), *Goodenia* sp. East Pilbara (A.A. Mitchell PRP 727) (Priority 3), and *Goodenia nuda* (Priority 4), *Stylidium weeliwolli* (Priority 2), *Acacia subtiliformis* (Priority 3), *Fimbristylis sieberiana* (Priority 3), *Rhagodia* sp. Hamersley (M. Trudgen 17794) (Priority 3), *Rostellularia adscendens* var. *latifolia* (Priority 3)	Vegetation type 14a corresponds to the Weeli Wolli Spring Community, which is a Priority 1 PEC. No TECs or ESAs were recorded.	*Aerva javanica*, *Argemone ochroleuca* subsp. *ochroleuca*, *Bidens bipinnata*, *Cenchrus ciliaris*, *Cenchrus setiger*, *Cynodon dactylon*, *Flaveria trinerva*, *Malvastrum americanum*, *Portulaca oleracea*, *Setaria verticillata*

Survey	Consultant	Year	Survey Date	Significant Flora Recorded	TECs, PECs & ESAs Recorded	Introduced (Weed) Taxa Recorded
Area C And Surrounds Study Area- Review of Flora and Vegetation	Onshore Environmental	2011c	December 2009, February 2010, June 2010	*Aristida jerichoensis* var. *subspinulifera* (Priority 1), *Aristida lazaridis* (Priority 2), *Spartothamnella puberula* (Priority 2), *Stylidium weeliwolli* (Priority 2), *Vittadinia* sp. Coondewanna Flats (S. van Leeuwen 4684) (Priority 1), *Acacia subtiliformis* (Priority3), *Euphorbia inappendiculata* (Priority3); *Fimbristylis sieberiana* (Priority 3), *Goodenia* sp. East Pilbara (A.A. Mitchell PRP 727) (Priority 3), *Nicotiana umbratica* (Priority 3), *Rhagodia* sp. Hamersley (M. Trudgen 17794) (Priority 3), *Rostellularia adscendens* var. *latifolia* (Priority 3), *Sida* sp. Barlee Range (S. van Leeuwen 1642) (Priority 3), *Eremophila magnifica* subsp. *magnifica* (Priority 4), *Goodenia nuda* (Priority 4)	None The Weeli Wolli Spring PEC (Priority 1) occurrs at the eastern fringe of the Study area	**Bidens bipinnata, *Cenchrus ciliaris, *Chloris barbata, *Chloris virgata, *Cynodon dactylon, *Datura leichardtii, *Malvastrum americanum, *Portulaca oleracea, *Setaria verticillata, *Sigesbeckia orientalis, *Vachellia farnesiana.*
RPG5: Cowra to Kurrajurra Sidings and Cowra Camp Site Flora and Vegetation Survey	Ecologia	2007b	October 2007	None	None The survey area lies within the currently listed Fortescue Marsh (Priority 1) PEC zone.	**Tamarix aphylla, *Cenchrus ciliaris, *Malvastrum americanum, *Acetosa vesicaria, *Aerva javanica, *Setaria verticillata.*
RGP5: Jimblebar Junction to Yandi Junction Railway Reserve Flora and Vegetation Assessment	ENV	2008a	April 2008	*Rostellularia adscendens* var. *latifolia* (Priority 3), *Goodenia nuda* (Priority 4), *Bulbostylis burbidgeae* (Priority 4)	None	**Aerva javanica, *Bidens bipinnata, *Cenchrus ciliaris, *Cenchrus setiger, *Chloris virgata, *Cucumis melo* subsp. *agrestis, *Cynodon dactylon, *Malvastrum americanum, *Portulaca oleracea, *Setaria verticillata, *Vachellia farnesiana*
BHPIO Rail Sidings Flora and Vegetation Assessment	Ecologia	2005c	March 2005	None	None	**Cenchrus ciliaris, *Aerva javanica*
RGP: Rail Rare and Priority Flora Survey	Ecologia	2004	November 2003	None		*Cenchrus* sp. (not confirmed as a weed species)

Survey	Consultant	Year	Survey Date	Significant Flora Recorded	TECs, PECs & ESAs Recorded	Introduced (Weed) Taxa Recorded
Railroad Interim Expansion Project Rare and Priority Flora Survey	Ecologia	2003	May, August 2003	None	None The Cowra siding survey area lies within the currently listed Fortescue Marsh (Priority 1) PEC zone.	**Cenchrus ciliaris*
Hope Downs Iron Ore Project Rail and Port Public Environmental Review	Hope Downs Management Services	2002	No field survey conducted	None	No TECs or ESAs The Fortescue Valley Sand Dunes (Priority 3) PEC was recorded within the survey area	**Argemone ochroleuca, *Cenchrus ciliaris, *Cenchrus setiger, *Cucumis melo* subsp. *agrestis, *Setaria verticillata*
Hope Downs Iron Ore Project Public Environmental Review	Hope Downs Management Services	2000	No field survey conducted	*Goodenia lyrata* (Priority 3), *Eremophila magnifica* subsp. *magnifica* (Priority 4), *Indigofera gilesii* subsp. *gilesii* (M. Trudgen 15869, Priority 3)	None	None
Weeli Wolli Creek Biological Assessment Survey	Ecologia	1998	December 1994, April 1995	None	No TECs or ESAs The eastern area of the area surveyed contains the Weeli Wolli Spring community currently listed as a Priority 1 PEC	**Datura leichardtii, *Aerva javanica, *Bidens bipinnata, *Cenchrus ciliaris *Phoenix dactylifera, *Malvastrum americanum, *Oxalis corniculata, *Sonchus oleraceus*
Roy Hill Exploration Lease Flora and Vegetation Assessment	ENV	2007d	May 2007	*Scaevola* sp. Hamersley Range basalts (Priority 2)	None	**Bidens bipinnata, *Cenchrus ciliaris, *Malvastrum americanum, *Cucumis melo* subsp. *agrestis*

3.1.3 Threatened Flora listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*

A search of the EPBC Act Protected Matters Database (DSEWPaC 2012) identified one record a 'Vulnerable' plant taxa as potentially occurring within the Study area; *Lepidium catapycnon.* There were no records identified from the IUCN database search.

3.1.4 Declared Rare and Threatened Flora listed under the *WA Wildlife Conservation (Rare Flora) Notice 2010*

The DEC search identified two Threatened (Declared Rare) Flora as occurring within a 50 km radius of the Study area; *Lepidium catapycnon* and *Thryptomene wittweri* (Table 5, DEC 2011a). *Lepidium catapycnon* has previously been recorded from a number of locations between 5 km and 30 km south and west of the Study area. *Thryptomene wittweri* has previously been recorded from the peaks of Mt Meharry situated approximately 65 km south-west of the Study area.

Lepidium catapycnon populations identified from the Department of Environment and Conservation (DEC) database search are broadly distributed between the Pilbara towns of Newman, Nullagine and Wittenoom. The total area of extent approximates 21,736 km^2 with eight confirmed populations occurring within Karijini National Park. A conservative estimate on the total number of plants recorded is 18,041 with an estimated 1,243 plants occurring within Karijini National Park (Onshore Environmental 2012). Recently a number of populations of *Lepidium catapycnon* have been recorded on BHP Billiton mining leases in the Central Pilbara. Onshore Environmental botanists have recorded new populations at Mining Area C Onshore Jinidi and Yandi all of which are within 30 km of the Marillana Study area.

Thryptomene wittweri (Mountain Thryptomene) is only known from high-altitude mountaintops in the Pilbara, with its distribution extending south into the Gascoyne and Great Victoria Desert bioregions. It is found on steep rocky scree slopes and breakaways near the summits of large ranges. This species has been recorded on Mt Meharry located approximately 65 km to the south-west of the Study area (Onshore Environmental 2012).

3.1.5 Priority Flora recognised by the DEC

The DEC database search (DEC 2011b) identified 69 Priority flora within a 50 km search radius of the Study area (Table 5, DEC 2011a).

Table 5 Significant flora previously recorded from a 50 km search radius of the Study area.

SCC - State Conservation Code (WC Act) and DEC (2012)
FCC – Federal Conservation Code (EPBC Act)

Species	SCC	FCC
Acacia bromilowiana	4	
Acacia daweana	3	
Acacia effusa	3	
Acacia subtiliformis	3	
Adiantum capillus-veneris	2	
Adiantum hispidulum var. *hispidulum*	2	
Ampelopteris prolifera	3	

Species	SCC	FCC
Aristida calycina var*. calycina*	2	
Aristida lazaridis	2	
Aristida jerichoensis var*. subspinulifera*	1	
Astrebla lappacea	3	
Barbula ehrenbergii	1	
Bothriochloa decipiens var*. cloncurrensis*	1	
Brachyscome sp. Wanna Munna Flats (S. van Leeuwen 4662)	1	
Calotis latiuscula	3	
Calotis squamigera	1	
Cladium procerum	2	
Dampiera anonyma ms	3	
Dampiera metallorum ms	3	
Dicladanthera glabra	2	
Eragrostis sp. Mt Robinson (S. van Leeuwen 4109)	1	
Eremophila forrestii ssp. Pingandy (M.E. Trudgen 2662)	2	
Eremophila forrestii ssp. *viridis*	3	
Eremophila magnifica ssp. magnifica	4	
Eremophila magnifica ssp. *velutina*	3	
Eremophila sp. West Angelas (S. van Leeuwen 4086)	1	
Eremophila sp. Snowy Mountain (S. van. Leeuwen 3737)	1	
Eriachne semiciliata	3	
Eucalyptus lucens	1	
Euphorbia sp. Mt Bruce Flats (S. van Leeuwen 3861)	2	
Euphorbia stevenii	3	
Fimbristylis sieberiana	3	
Geijera salicifolia	3	
Genus sp. Hamersley Range hilltops (S van Leeuwen 4345)	1	
Glycine falcata	3	
Goodenia lyrata	1	
Goodenia sp. East Pilbara (AA Mitchell PRP 727)	3	
Indigofera gilesii ssp. gilesii	3	
Indigofera ixocarpa	2	
Indigofera sp. Bungaroo Creek (S. van Leeuwen 4301)	3	
Iotasperma sessilifolium	3	
Isotropis parviflora	2	
Josephinia sp. Marandoo (M.E. Trudgen 1554)	1	
Lepidium catapycnon	R	V
Nicotiana umbratica	3	
Oldenlandia sp. Hamersley Station (A.A. Mitchell PRP 1479)	3	
Olearia mucronata	3	
Oxalis sp. Pilbara (M.E. Trudgen 12725)	2	
Pilbara trudgenii	2	
Polymeria sp. Hamersley (ME Trudgen 11353)	3	
Ptilotus subspinescens	3	
Rhagodia sp. Hamersley (M. Trudgen 17794)	3	
Rhynchosia bungarensis	4	
Rhodanthe ascendens	1	
Rostellularia adscendens var.latifolia	3	
Scaevola sp. Hamersley Range basalts (S. van Leeuwen 3675)	2	
Sida sp. Barlee Range (S van Leeuwen 1642)	3	
Sida sp. Hamersley Range (K. Newbey 10692)	1	
Spartothamnella puberula	2	
Swainsona sp. Hamersley Station (A.A. Mitchell 196)	3	

Species	SCC	FCC
Tecticornia sp. Roy Hill (H. Pringle 62)	3	
Tetratheca fordiana ms	1	
Themeda sp. Hamersley Station (M.E. Trudgen 11431)	3	
Thryptomene wittweri	R	V
Triodia sp. Mt. Ella (ME Trudgen 12739)	3	
Triodia sp. Robe River (M.E. Trudgen et al. MET 12367)	3	
Vigna sp. Central (M.E. Trudgen 1626)	2	
Vittadinia sp. Coondewanna Flats (s. van Leeuwen 4684)	1	
Whiteochloa capillipes	3	

3.1.6 Threatened Ecological Communities (TEC's) listed under State and Federal legislation

A search of the EPBC Act Protected Matters database (DSEWPaC 2012) confirmed there were no Federal listed TEC's previously recorded within, or adjacent to, the Study area. Similarly, a search of the State database by DEC (2011b) confirmed there were no listed TEC records for the immediate Study area. The EPBC Protected Matters database search did confirm that the Fortescue Marsh is situated within the 10 km buffer of the Study area. This area is listed as a Wetland of National Significance and is also on the Register of the National Estate.

3.1.7 Priority Ecological Communities (PEC's) recognised by DEC

A search of the DEC State database confirmed that the Fortescue Valley Sand Dune Community (Priority 3 (iii)) may occur within the Study area (Figure 6, DEC 2011b). The linear dunes are small, rare and highly susceptible to threatening processes. The PEC is described in further detail in Section 3.5.

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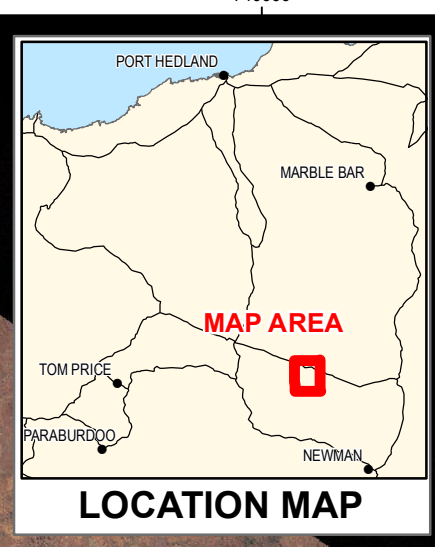

LOCATION MAP

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Location of the Fortescue Valley Sand Dunes PEC in relation to the Study area, as mapped by Onshore Environmental.

Figure 6

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Kilometers
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Projection: MGA Zone50

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Legend

- Study Area - Marillana
- Fortescue Sand Dunes PEC

3.2 Flora Species

A total number of 268 plant taxa (including varieties and subspecies) from 44 families and 117 genera were recorded from the Study area (Table 6, Appendix 6). Species representation was greatest among the Fabaceae, Poaceae, Malvaceae, Amaranthaceae, Asteraceae, Myrtaceae and Goodeniaceae families, which is typical for the Pilbara Bioregion. The most speciose genus was *Acacia* (26 taxa), followed by *Ptilotus* (14 taxa), *Senna* (10 taxa), *Sida* (7 taxa), *Triodia* (7 taxa) *Corchorus* (7 taxa) and *Hibiscus* (7 taxa).

Table 6 Statistics for total flora recorded from the Study area.

Parameter	No. Taxa
No. Families	44
No. Genera	117
No. Species (incl. subspecies & varieties)	268
No. Native Species (incl. subsp. & var.)	261
Threatened (Declared) Rare Flora	0
Priority Flora	0
No. Introduced Species	7
Speciose Families	
FABACEAE	50
POACEAE	39
MALVACEAE	35
AMARANTHACEAE	22
ASTERACEAE	10
GOODENIACEAE	10
MYRTACEAE	9
SOLANACEAE	8
SCROPHULARIACEAE	6
CHENOPODIACEAE	5
Speciose Genera	
Acacia (Fabaceae)	26
Senna (Fabaceae)	10
Ptilotus (Amaranthaceae)	14
Sida (Malvaceae)	7
Triodia (Poaceae)	7
Corchorus (Malvaceae)	7
Hibiscus (Malvaceae)	7
Goodenia (Goodeniaceae)	6
Abutilon (Malvaceae)	6
Eremophila (Scrophulariaceae)	6
Euphorbia (Euphorbiaceae)	6
Aristida (Poaceae)	6
Solanum (Solanaceae)	6
Eucalyptus (Myrtaceae)	5

3.3 Conservation Significant Flora Species

3.3.1 Threatened (Declared Rare) Flora

No plant taxa gazetted as Threatened (Declared Rare) Flora pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950)* or listed under the EPBC Act (1999) were recorded from the Study area.

3.3.2 Priority Flora

There was no current Priority flora as listed by the DEC recorded from the Study area.

3.4 Introduced Flora

A total of seven introduced (weed) species were recorded from the Study area (Table 7, Figure 7, Appendix 7). None of these taxa are listed as Declared Weeds under the *Agriculture and Related Resources Protection Act, 1976* (ARRP Act) (Department of Agriculture 2012).

Table 7 Environmental weed species recorded within the Study area.

Taxon	Common Name	Distribution within the Study area
**Acetosa vesicaria*	Ruby Dock	A single record from the original Ecologia survey – no GPS record taken and not recorded during subsequent surveys.
**Aerva javanica*	Kapok Bush	A scattered component in vegetation on sandy levee banks and riverbeds associated with the major drainage line in the south-east of the Study area.
**Argemone ochroleuca*	Mexican Poppy	Restricted to the gravelly riverbed of a major drainage line in the south-east of the Study area. Where present, it was common though a minor component of the vegetation.
**Bidens bipinnata*	Bipinnate Beggars tick	Only scattered occurrences within the Study area preferring small groves of *Acacia aneura* frequented by cattle, as well as the overhang of rock ledges along disturbed cliff lines.
**Cenchrus ciliaris*	Buffel Grass	Common across the entire Study area with highest ground coverage provided along drainage lines, loamy floodplains, stony floodplains, sand dunes and other sites of soil disturbance. It was especially dominant on floodplains adjacent to the major drainage line in the south-east of the Study area.

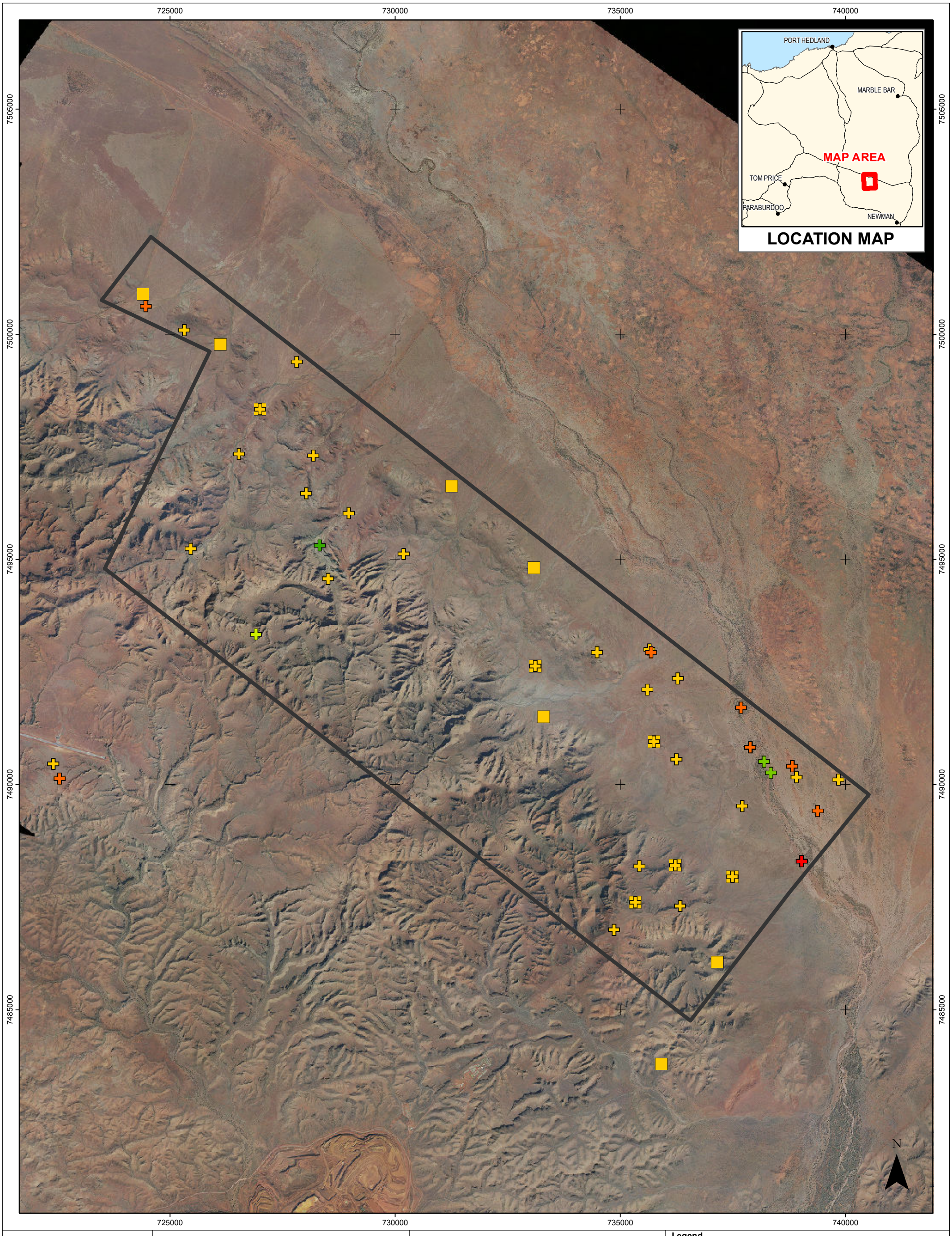
Taxon	Common Name	Distribution within the Study area
**Cenchrus setiger*	Birdwood Grass	More restricted than **Cenchrus ciliaris* and was almost completely confined to floodplains associated with the major drainage line in the south-east. Along with **Cenchrus ciliaris, *Cenchrus setiger* was usually a dominant component of the understory in these vegetation types.
**Sisymbrium orientale*	Indian Weed	Recorded from a single location within the riverbed of the major drainage line in the south-east of the Study area.

Weeds were very common on the floodplain and riverine vegetation associations occurring in close proximity to the major drainage line in the south-east corner of the Study area. Both **Cenchrus ciliaris* (Buffel Grass) and **Cenchrus setiger* (Birdwood Grass) were dominant ground cover species on floodplains and levee banks associated with the major drainage line.

Elsewhere, **Cenchrus ciliaris* was common along the majority of medium and minor drainage lines present across the lower hills and sandplains in northern parts of the Study area. Populations of **Cenchrus ciliaris* were also recorded within the mountainous regions in the southern and western parts of the Study area; however these were generally restricted to larger drainage lines and associated stony floodplains.

**Argemone ochroleuca* (Mexican Poppy) was largely restricted to the major drainage line in the south-east of the Study area. It was found to occupy areas of loose riverine gravels within the river bed. **Aerva javanica* (Kapok Bush) was scattered across the same river bed, along with surrounding floodplains and levee banks.

A summary for each weed species is provided in Appendix 8.



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Location of introduced (weed) species within the Study area.

Figure 7

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Projection: MGA Zone50

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Study Area - Marillana

Introduced Flora

Ecologia Records

Onshore Records

Genus, Species

**Aerva javanica*

**Argemone ochroleuca*

**Bidens bipinnata*

**Cenchrus ciliaris*

**Cenchrus setiger*

**Sisymbrium orientale*

3.5 Threatened & Priority Ecological Communities

The field survey confirmed that no TECs occurred within the Study area. However, one PEC was recorded within the boundary of the Study area, and a second PEC was noted in close proximity to the north.

The Fortescue Valley Sand Dunes PEC (Priority 3 iii) is a series of linear red sand dunes situated along the eastern fringe of the Study area, and in close proximity outside the northern boundary (Figure 6). The dunes support 'Hummock Grassland of *Triodia schinzii* and *Triodia basedowii* with High Shrubland of *Acacia dictyophleba* over Very Open Tussock Grassland of *Aristida holathera* var. *holathera, *Cenchrus ciliaris* and *Eriachne gardneri* in red brown sand'. The community is regionally rare, and the dunes are small and highly susceptible to threatening processes such as erosion and weed invasion, especially from **Cenchrus ciliaris.*

The Fortescue Marsh PEC (Priority 1) lies to the north of the Study area on the Fortescue River. The marsh supports endemic *Eremophila* species and several near endemic or new to science samphire species. It is also a known location for the endangered Night Parrot (*Pezoporus occidentalis)* and the vulnerable Greater Bilby (*Macrotis lagotis*) listed under the EPBC Act.

3.6 Vegetation

A total of 18 vegetation associations were described and mapped within the Study area (Figure 8). The vegetation associations have been classified into six Broad Floristic Formations that are widespread within the Pilbara region on the basis of the dominant vegetation stratum (Table 8). All raw data collected during 2011 by Onshore Environmental is presented in Appendix 9).

Table 8 Vegetation descriptions for 18 vegetation associations mapped within the Study area.

	Broad Floristic Formation	Vegetation Association Description	Vegetation Condition
1	*Acacia* Low Open Forest	Low Open Forest of *Acacia aneura* over Open Tussock Grassland of **Cenchrus ciliaris* and *Chrysopogon fallax* over Very Open Hummock Grassland of *Triodia pungens* and *Triodia basedowii* in brown clayey sand on sandy plains	Degraded
2	*Acacia* Low Open Woodland	Low Open Woodland of *Acacia paraneura* and *Acacia pruinocarpa* over Very Open Tussock Grassland of **Cenchrus ciliaris* with Scattered Shrubs of *Acacia paraneura* in red sandy clay loam on stony rise amongst degraded floodplain	Very Good
3	*Acacia* Open Scrub	Open Scrub of *Acacia tumida, Acacia pyrifolia* and *Grevillea wickhamii* over Hummock Grassland of *Triodia pungens* and *Triodia basedowii* over Open Tussock grassland of **Cenchrus ciliaris* in brown sandy loam along minor and medium drainage lines	Good
4	*Acacia* Open Shrubland	Open Shrubland of *Acacia pyrifolia* over Low Open Shrubland of *Corchorus crozophorifolius* and *Cleome viscosa* with Scattered Trees of *Eucalyptus camaldulensis* in red brown loamy sand along scoured bed of major drainage lines	Degraded
5a	*Triodia* Hummock Grassland	Hummock Grassland of *Triodia pungens* with High Open Shrubland of *Acacia pruinocarpa* and *Acacia synchronicia* over Very Open Tussock Grassland of **Cenchrus ciliaris* in red brown sandy loam on plain	Good
5b	*Triodia* Hummock Grassland	Hummock Grassland of *Triodia schinzii* and *Triodia basedowii* with High Shrubland of *Acacia dictyophleba* over Very Open Tussock Grassland of *Aristida holathera* var. *holathera, *Cenchrus ciliaris* and *Eriachne gardneri* in red brown sand on linear sand dunes	Good
5c	*Triodia* Hummock Grassland	Hummock Grassland of *Triodia basedowii* and *Triodia pungens* with High Shrubland of *Acacia ancistrocarpa, Grevillea wickhamii* and *Acacia inaequilatera* over Open Shrubland of *Petalostylis cassioides* in red brown loamy sand on plains	Excellent
5d	*Triodia* Hummock Grassland	Hummock Grassland of *Triodia* sp. Shovelanna Hill (S. van leeuwen 3835) and *Triodia pungens* with Low Shrubland of *Acacia spondylophylla, Acacia hilliana* and *Corchorus lasiocarpus* with Very Open Mallee of *Eucalyptus gamophylla* in red brown sandy loam on hill crests	Excellent
5e	*Triodia* Hummock Grassland	Hummock Grassland of *Triodia pungens* over Open Tussock Grassland of **Cenchrus ciliaris, Aristida holathera* var. *holathera* with Open Shrubland of *Acacia pyrifolia* in brown sandy loam on stony outwash plains	Excellent
5f(i)	*Triodia* Hummock Grassland	Hummock Grassland of *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835), *Triodia wiseana* and *Triodia pungens* with High Open Shrubland of *Grevillea wickhamii* and *Hakea chordophylla* over Low Open Shrubland of *Acacia spondylophylla* and *Acacia hilliana* in red brown sandy loam on low undulating hills	Excellent

	Broad Floristic Formation	Vegetation Association Description	Vegetation Condition
5f(ii)	*Triodia* Hummock Grassland	Hummock Grasland of *Triodia wiseana* and *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) with Low Shrubland of *Acacia bivenosa* with Low Open Woodland of *Eucalyptus leucophloia* subsp. *leucophloia* in red brown silty loam on lower hill slopes	Excellent
5g(i)	*Triodia* Hummock Grassland	Hummock Grassland of *Triodia wiseana, Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) and *Triodia brizoides* with Low Open Woodland of *Eucalyptus leucophloia* subsp. *leucophloia* over High Open Shrubland of *Grevillea wickhamii* and *Hakea chordophylla* in brown sandy loam on steep upper hill slopes	Excellent
5g(ii)	*Triodia* Hummock Grassland	Hummock Grassland of *Triodia wiseana* over Very Open Tussock Grassland of *Enneapogon lindleyanus, Cymbopogon ambiguus* and *Aristida contorta* with Low Open Shrubland of *Corchorus laniflorus* and *Ptilotus obovatus* in brown sandy loam along cliff edges of gorges	Excellent
5g(iii)	*Acacia* Open Scrub	Open Scrub of *Acacia tumida* and *Grevillea wickhamii* over Open Hummock Grassland of *Triodia pungens* and *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) over Scattered Low Trees of *Corymbia hamersleyana* in brown loam along drainage lines dissecting the range	Degraded
5g(iv)	*Corymbia* Low Woodland	Low Woodland of *Corymbia ferriticola* and *Eucalyptus leucophloia* subsp. *leucophloia* over High Shrubland of *Acacia tumida, Stylobasium spathulatum* and *Grevillea wickhamii* over Open Tussock Grassland of *Themeda triandra, Eriachne mucronata* and *Cymbopogon ambiguus* and Open Hummock Grassland of *Triodia pungens* in brown sandy loam in gorges	Very Good
5g(v)	*Triodia* Closed Hummock Grassland	Closed Hummock Grassland of *Triodia brizioides* and *Triodia* sp. Shovelanna Hill (S. Van Leeuwen 3835) with High Open Shrubland of *Grevillea wickhamii, Acacia inaequilatera* and *Acacia bivenosa* with Scattered Low Trees of *Eucalyptus leucophloia* subsp. *leucophloia* in brown sandy loam on breakaway scree slopes	Excellent
6a	*Cenchrus* Closed Tussock Grassland	Closed Tussock Grassland of **Cenchrus ciliaris* and **Cenchrus setiger* with Low Open Forest of *Acacia citrinoviridis, Atalaya hemiglauca* and *Hakea lorea* subsp. *lorea* and Scattered Trees of *Eucalyptus victrix* in brown loamy sand along levee banks of major drainage lines	Very Good
6b	*Cenchrus* Closed Tussock Grassland	Closed Tussock Grassland of **Cenchrus setiger* and **Cenchrus ciliaris* with Low Open Woodland of *Acacia citrinoviridis, Atalaya hemiglauca, Hakea lorea* subsp. *lorea* and Scattered Trees of *Eucalyptus victrix* in red brown loamy sand on floodplains	Very Good

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MARILLANA

Vegetation map for the Study Area

Figure 8

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Kilometers

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Datum: GDA94
Projection: MGA Zone50

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Study Area - Marillana

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Vegetation Mapping

Acacia Low Open Forest

1 Low Open Forest of *Acacia aneura* over Open Tussock Grassland of **Cenchrus ciliaris, Chrysopogon fallax* over Very Open Hummock Grassland of *Triodia pungens, Triodia basedowii* in brown clayey sand on sandy plains.

Acacia Low Open Woodland

2 Low Open Woodland of *Acacia paraneura, Acacia pruinocarpa* over Very Open Tussock Grassland of **Cenchrus ciliaris* with Scattered Shrubs of *Acacia paraneura* in red sandy clay loam on stony rise amongst degraded floodplain

Acacia Open Scrub

3 Open Scrub of *Acacia tumida, Acacia pyrifolia, Grevillea wickhamii* over Hummock Grassland of *Triodia pungens, Triodia basedowii* over Open Tussock grassland of **Cenchrus ciliaris* in brown sandy loam along minor and medium drainage lines.

Acacia Open Shrubland

4 Open Shrubland of *Acacia pyrifolia* over Low Open Shrubland of *Corchorus crozophorifolius, Cleome viscosa* with Scattered Trees of *Eucalyptus camaldulensis* in red brown loamy sand along scoured bed of major drainage lines.

Triodia Hummock Grassland

5a Hummock Grassland of *Triodia pungens* with High Open Shrubland of *Acacia pruinocarpa, Acacia synchronicia* over Very Open Tussock Grassland of **Cenchrus ciliaris* in red brown sandy loam on plain.

5b Hummock Grassland of *Triodia schinzii, Triodia basedowii* with High Shrubland of *Acacia dictyophleba* over Very Open Tussock Grassland of *Aristida holathera var. holathera, *Cenchrus ciliaris, Eriachne gardneri* in red brown sand on linear sand dunes.

5c Hummock Grassland of *Triodia basedowii, Triodia pungens* with High Shrubland of *Acacia ancistrocarpa, Grevillea wickhamii, Acacia inaequilatera* over Open Shrubland of *Petalostylis cassioides* in red brown loamy.

5d Hummock Grassland of *Triodia sp. Shovelanna Hill (S. Van leeuwen 3835), Triodia pungens* with Low Shrubland of *Acacia spondylophylla, Acacia hilliana, Corchorus lasiocarpus* with Very Open Mallee of *Eucalyptus gamophylla* in red brown sandy loam on hill crest.

5e Hummock Grassland of *Triodia pungens* over Open Tussock Grassland of **Cenchrus ciliaris, Aristida holathera var. holathera* with Open Shrubland of *Acacia pyrifolia* in brown sandy loam on stony outwash plains.

Mosaic *Triodia* Hummock Grassland

5f(i) & 5f(ii) Mosaic of Hummock Grassland of *Triodia sp. Shovelanna Hill (S. Van Leeuwen 3835), Triodia wiseana, Triodia pungens* with High Open Shrubland of *Grevillea wickhamii, Hakea chordophylla* over Low Open Shrubland of *Acacia spondylophylla, Acacia hilliana* in red brown sandy loam on low undulating hills and Hummock Grassland of *Triodia wiseana, Triodia sp. Shovelanna Hill (S. Van Leeuwen 3835)* with Low Shrubland of *Acacia bivenosa* with Low Open Woodland of *Eucalyptus leucophloia subsp. leucophloia* in red brown silty loam on lower hill slopes.

Mosaic *Triodia* (Closed) Hummock Grassland / *Acacia* Open Scrub / *Corymbia* Low Woodland

5g(i) - 5g(v) Mosaic of Hummock Grassland of *Triodia wiseana, Triodia sp. Shovelanna Hill (S. Van Leeuwen 3835), Triodia brizoides* with Low Open Woodland of *Eucalyptus leucophloia subsp. leucophloia* over High Open Shrubland of *Grevillea wickhamii, Hakea chordophylla* in brown sandy loam on steep upper hill slopes,Hummock Grassland of *Triodia wiseana* over Very OpenTussock Grassland of *Enneapogon lindleyanus, Cymbopogon ambiguus, Aristida contorta* with Low Open Shrubland of *Corchorus laniflorus, Ptilotus obovatus* in brown sandy loam along cliff edges of gorges,Open Scrub of *Acacia tumida, Grevillea wickhamii* over Open Hummock Grassland of *Triodia pungens, Triodia sp. Shovelanna Hill (S. Van Leeuwen 3835)* over Scattered Low Trees of *Corymbia hamersleyana* in brown loam along drainage lines dissecting the range,Low Woodland of *Corymbia ferriticola, Eucalyptus leucophloia subsp. leucophloia* over High Shrubland of *Acacia tumida, Stylobasium spathulatum, Grevillea wickhamii* over Open Tussock Grassland of *Themeda triandra, Eriachne mucronata, Cymbopogon ambiguus* over Open Hummock Grassland of *Triodia pungens* in brown sandy loam in gorges,Closed Hummock Grassland of *Triodia brizioides, Triodia sp. Shovelanna Hill (S. Van Leeuwen 3835)* with High Open Shrubland of *Grevillea wickhamii, Acacia inaequilatera, Acacia bivenosa* with Scattered Low Trees of *Eucalyptus leucophloia subsp. leucophloia in brown* sandy loam on breakaway scree slopes.

Cenchrus Closed Tussock Grassland

6a Closed Tussock Grassland of **Cenchrus ciliaris, *Cenchrus setiger* with Low Open Forest of *Acacia citrinoviridis, Atalaya hemiglauca, Hakea lorea subsp. lorea* with Scattered Trees of *Eucalyptus victrix* in brown loamy sand along levee banks of major drainage lines.

6b Closed Tussock Grassland of **Cenchrus setiger, *Cenchrus ciliaris* with Low Open Woodland of *Acacia citrinoviridis, Atalaya hemiglauca, Hakea lorea subsp. lorea* with Scattered Trees of *Eucalyptus victrix* in red brown loamy sand on floodplains.

Roads & Infrastructure

Roads Roads and infrastructure.

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Vegetation map for the study area. Legend

Figure 8

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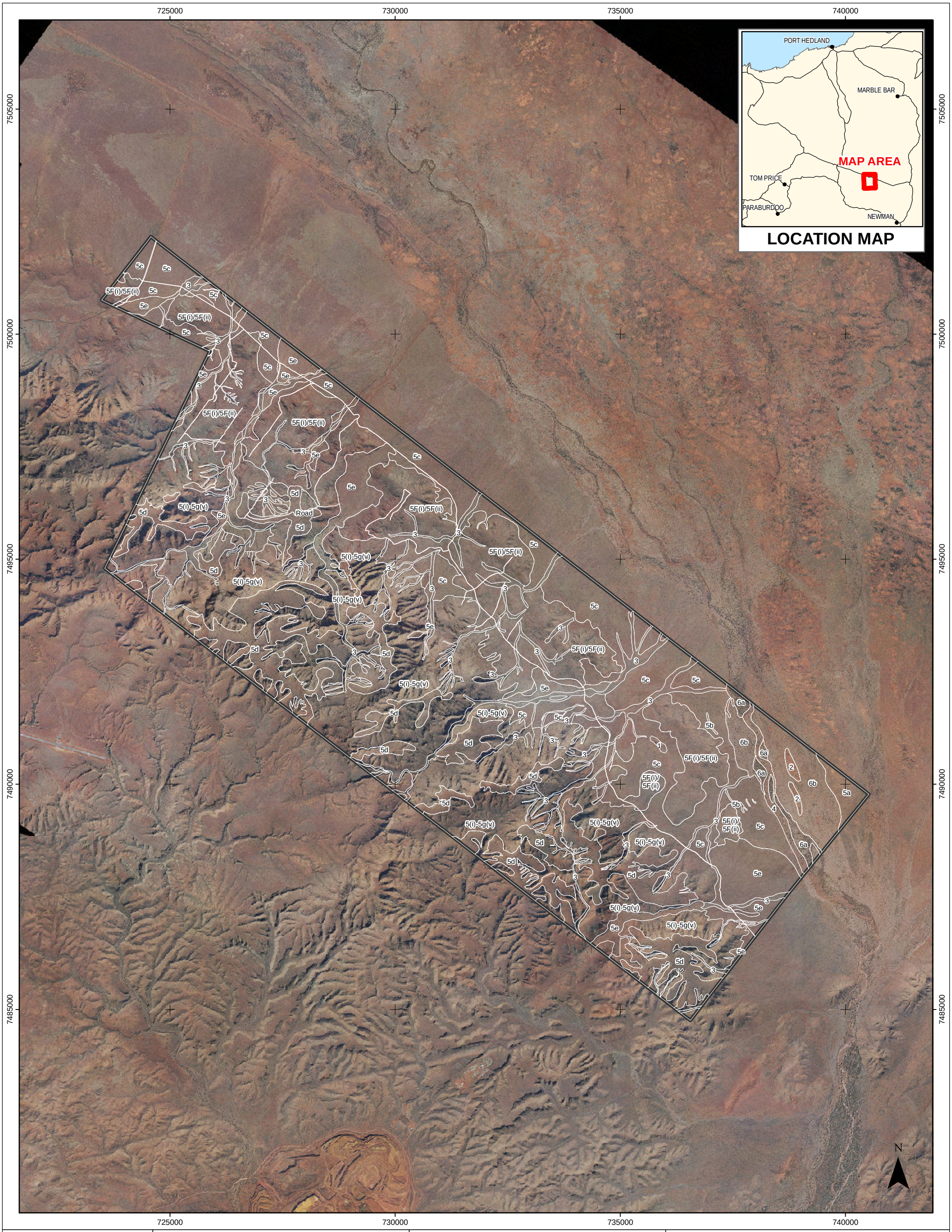

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MARILLANA

Vegetation map for the Study Area

Figure 8

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Study Area - Marillana

Broad Floristic Formation	***Acacia* Low Open Forest**
Vegetation Association	1. Low Open Forest of *Acacia catenualta* subsp. *occidentalis* over Open Tussock Grassland of **Cenchrus ciliaris* and *Chrysopogon fallax* over Very Open Hummock Grassland of *Triodia pungens* and *Triodia basedowii* in brown clayey sand on sandy plains
	
Area Mapped	5.74 ha
Quadrats Sampled	ECO36/2
Location	Small area in the north east of the Study area.
Leaf Litter Cover (%)	10%
Bare Ground (%)	15%
Soils and Geology	Brown Clayey sand
Land System	Newman
Land Form	Sandy Plain
Priority Ecological Community	None
Rare Flora	None
Introduced (Weed) Species	**Cenchrus ciliaris*
Vegetation Condition	Degraded
Disturbances	Introduced species, Drilling operations nearby, livestock
Average Fire Age	Old
Vegetation Structure & Floristics	
Trees <10m	*Acacia catenulata* subsp. *occidentalis*
Tussock Grasses	**Cenchrus ciliaris, Chrysopogon fallax*
Hummock Grasses	*Triodia pungens, Triodia basedowii*

Broad Floristic Formation	***Acacia* Low Open Woodland**
Vegetation Association	2. Low Open Woodland of *Acacia paraneura* and *Acacia pruinocarpa* over Very Open Tussock Grassland of **Cenchrus ciliaris* with Scattered Shrubs of *Acacia paraneura* in red sandy clay loam on stony rise amongst degraded floodplain
	
Area Mapped	20.47 ha
Quadrats Sampled	ML30
Location	Two small areas in the north-east corner of the study area
Leaf Litter Cover (%)	<1%
Bare Ground (%)	80%
Soils and Geology	Ironstone and chert cobbles and pebbles on red sandy clay loam
Land System	River
Land Form	Flood-out
Priority Ecological Community	None
Rare Flora	None
Introduced (Weed) Species	**Cenchrus setiger*, **Cenchrus ciliaris*
Vegetation Condition	Very Good
Disturbances	Livestock, introduced species
Average Fire Age	Moderate
Vegetation Structure & Floristics	
Trees <10m	*Acacia paraneura, Acacia pruinocarpa*
Tall Shrubs >2m	*Acacia adsurgens, Acacia synchronicia*
Hummock Grasses	*Triodia pungens*
Tussock Grasses	**Cenchrus ciliaris*

Broad Floristic Formation	***Acacia* Open Scrub**
Vegetation Association	3. Open Scrub of *Acacia tumida*, *Acacia pyrifolia* and *Grevillea wickhamii* over Hummock Grassland of *Triodia pungens* and *Triodia basedowii* over Open Tussock Grassland of **Cenchrus ciliaris* in brown sandy loam along minor and medium drainage lines

Area Mapped	720.68ha
Quadrats Sampled	ML04, ML35, ML48, ML58, ECO1, ECO24, ECO57, ECO72, 107,63,37
Location	Minor and medium drainage lines throughout the study area
Leaf Litter Cover (%)	1-8%
Bare Ground (%)	20-30%
Soils and Geology	Brown sandy loam with mixed riverine gravel and ironstone cobbles and pebbles
Land System	Newman, Boolgeeda
Land Form	Minor and medium drainage lines
Priority Ecological Community	None
Rare Flora	None
Introduced (Weed) Species	**Cenchrus ciliaris, *Cenchrus setiger*
Vegetation Condition	Good
Disturbances	Introduced species, access tracks, drill pads, livestock, fire
Average Fire Age	Old
Vegetation Structure & Floristics	
Trees <10m	*Corymbia hamersleyana*
Mallee	*Eucalyptus gamophylla*
Tall Shrubs >2m	*Clerodendrum floribundum, Grevillea wickhamii, Acacia tumida, Acacia pyrifolia, Gossypium robinsonii, Petalostylis labichioidies, Acacia bivenosa, Acacia spondylophylla*

Shrubs <1m	*Acacia tumida, Cleome viscose, Indigofera monophylla, Stylobasium spathulatum, Corchorus lasiocarpus, Ptilotus exaltatus*
Hummock Grasses	*Triodia pungens, Triodia* sp. Shovelanna Hill, *Triodia basedowii*
Tussock Grasses	**Cenchrus ciliaris, Enneapogon lindleyanus, Enneapogon polyphyllus, *Cenchrus setiger, Themeda triandra*
Herbs	*Boerhavia coccinea*

Broad Floristic Formation	***Acacia* Open Shrubland**
Vegetation Association	4. Open Shrubland of *Acacia pyrifolia* over Low Open Shrubland of *Corchorus crozophorifolius* and *Cleome viscosa* with Scattered Trees of *Eucalyptus camaldulensis* in red brown loamy sand along scoured bed of major drainage lines

Area Mapped	57.41ha
Quadrats Sampled	ML38
Location	The major drainage line in the north-east corner of the study area
Leaf Litter Cover (%)	0.5%
Bare Ground (%)	90%
Soils and Geology	Red loamy sand with riverine gravel
Land System	River
Land Form	Stream bed
Priority Ecological Community	No
Rare Flora	None
Introduced (Weed) Species	**Argemone ochroleuca, *Cenchrus ciliaris*
Vegetation Condition	Very Good
Disturbances	Livestock, introduced species, vehicle tracks, flooding
Average Fire Age	Very Old
Vegetation Structure & Floristics	
Trees <10m	*Eucalyptus leucophloia* subsp. *leucophloia,*
Tall Shrubs >2m	*Acacia pyrifolia*
Shrubs 1-2m	*Corchorus crozophorifolius*
Shrubs <1m	*Cleome viscosa*

Broad Floristic Formation	***Triodia* Hummock Grassland**
Vegetation Association	5a. Hummock Grassland of *Triodia pungens* with High Open Shrubland of *Acacia pruinocarpa* and *Acacia synchronicia* over Very Open Tussock Grassland of **Cenchrus ciliaris* in red brown sandy loam on plain

Area Mapped	63.71ha
Quadrats Sampled	ML32
Location	Small area in the far eastern corner of the study area
Leaf Litter Cover (%)	0.5%
Bare Ground (%)	
Soils and Geology	Red sandy loam with scattered chert pebbles
Land System	River, Urandy
Land Form	Plain
Priority Ecological Community	None
Rare Flora	None
Introduced (Weed) Species	**Cenchrus ciliaris, *Cechrus setiger*
Vegetation Condition	Good
Disturbances	Access track, drill pads, introduced species, livestock
Average Fire Age	Old
Vegetation Structure & Floristics	
Trees <10m	*Acacia pruinocarpa*
Tall Shrubs >2m	*Acacia synchronicia*
Shrubs <1m	*Corchorus sidoides*
Hummock Grasses	*Triodia pungens*
Tussock Grasses	**Cenchrus ciliaris*

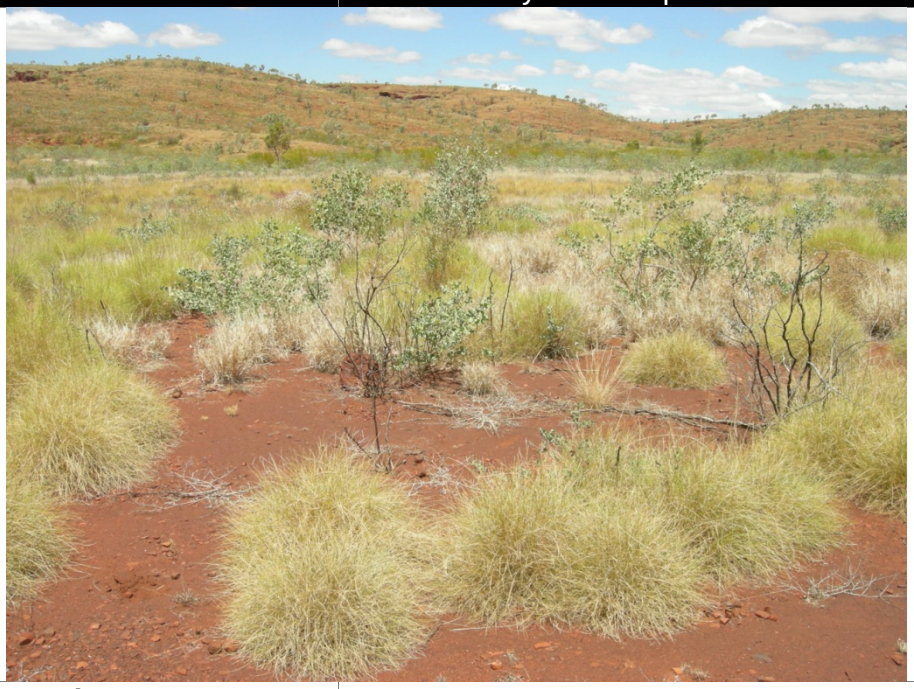
Broad Floristic Formation	***Triodia* Hummock Grassland**
Vegetation Association	5b. Hummock Grassland of *Triodia schinzii* and *Triodia basedowii* with High Shrubland of *Acacia dictyophleba* over Very Open Tussock Grassland of *Aristida holathera var. holathera*, **Cenchrus ciliaris* and *Eriachne gardneri* in red brown sand on linear sand dunes
	
Area Mapped	8.08ha
Quadrats Sampled	ML36, ML33
Location	Two long linear sand dune areas at the eastern end of the study area
Leaf Litter Cover (%)	<1%
Bare Ground (%)	40-55%
Soils and Geology	Red sand
Land System	Newman, Boolgeeda
Land Form	Dune
Priority Ecological Community	Fortescue Valley Sand Dunes (Priority 3)
Rare Flora	None
Introduced (Weed) Species	**Cenchrus ciliaris*
Vegetation Condition	Good
Disturbances	Access tracks, drill pads, weeds, fence posts
Average Fire Age	Old
Vegetation Structure & Floristics	
Tall Shrubs >2m	*Acacia dictyophleba, Acacia pachyacra*
Shrubs 1-2m	*Petalostylis cassioides, Trichodesma zeylanicum* var. *zeylanicum*
Shrubs <1m	*Senna notabilis, Trianthema pilosa, Corchorus sidoides*
Hummock Grassland	*Triodia basedowii, Triodia shinzii*
Tussock Grassland	*Aristida holathera* var. *holathera*

Broad Floristic Formation	***Tridoia* Hummock Grassland**
Vegetation Association	5c. Hummock Grassland of *Triodia basedowii* and *Triodia pungens* with High Shrubland of *Acacia ancistrocarpa, Grevillea wickhamii* and *Acacia inaequilatera* over Open Shrubland of *Petalostylis cassioides* in red brown loamy sand on plains
	
Area Mapped	1720.42ha
Quadrats Sampled	ML31, ML37, ML41, ML43, ML46, ML49, ML62, ML64, ML67, ECO45/2, ECO58/2,ECO75/2, 3,69,114,59,39,42,100,101,102,12,98,54,62, 38
Location	Plains, mainly in the northern part of the study area
Leaf Litter Cover (%)	<1 -5%
Bare Ground (%)	20-45%
Soils and Geology	Red brown loamy sand with ironstone and chert cobbles and pebbles
Land System	Newman, Boolgeeda
Land Form	Plain
Priority Ecological Community	None
Rare Flora	None
Introduced (Weed) Species	**Cenchrus ciliaris*
Vegetation Condition	Excellent
Disturbances	Access tracks, drill pads, livestock, fire, introduced species
Average Fire Age	Old
Vegetation Structure & Floristics	
Trees <10m	*Corymbia hamersleyana*
Mallee	*Eucalyptus gamophylla*

Tall Shrubs >2m	*Acacia ancistrocarpa, Grevillea wickhamii, Acacia tumida* var. *pilbaraensis, Acacia pachyacra, Acacia dictyophleba, Acacia inaequilatera, Hakea chordophylla, Hakea macrocarpa, Acacia pruinocarpa*
Shrubs 1-2m	*Petalostylis cassioides, Senna artemisioides* subsp. *oligophylla, Senna glaucifolia, Acacia bivenosa, Acacia adsurgens, Acacia pyrifolia, Senna ferraria, Santalum lanceolatum, Gossypium australe, Stylobasium spathulatum, Petalostylis labichioides*
Shrubs <1m	*Acacia spondylophylla, Ptilotus calostachyus, Ptilotus exaltatus* var. *exaltatus, Bonamia rosea, Ptilotus astrolasicus, Dicrastylis cordifolia, Ptilotus obovatus, Acacia adoxa* var. *adoxa, Hybanthus aurantiacus, Corchorus lasiocarpus, Scaevola browniana, Ptilotus polystachyus*
Hummock Grassland	*Triodia pungens, Triodia basedowii, Triodia schinzii, Triodia wiseana*
Tussock Grassland	**Cenchrus ciliaris, Eragrostis eriopoda, Aristida holathera* var. *holathera, Paraneurachne muelleri, Aristida hygrometrica, Aristida contorta*
Herbs	*Mollugo molluginea*

Broad Floristic Formation	***Triodia* Hummock Grassland**
Vegetation Association	5d. Hummock Grassland of *Triodia* sp. Shovelanna Hill (S. Van leeuwen 3835) and *Triodia pungens* with Low Shrubland *of Acacia spondylophylla, Acacia hilliana* and *Corchorus lasiocarpus* with Very Open Mallee of *Eucalyptus gamophylla* in red brown sandy loam on hill crests
	
Area Mapped	7428.94ha
Quadrats Sampled	ML06, ML08, ML18, ML21, ML22, ML23, ML40, ECO16, ECO22, ECO25, ECO26, 116, 118 87, 125,106,93,124,92,81,84,83,32,29,14,103,121, 95
Location	Hillcrests in the southern and western parts of the study area
Leaf Litter Cover (%)	<5%
Bare Ground (%)	20-30%
Soils and Geology	Red brown sandy loam with ironstone cobbles and pebbles
Land System	Newman
Land Form	Hillcrests
Priority Ecological Community	None
Rare Flora	None
Introduced (Weed) Species	None
Vegetation Condition	Excellent
Disturbances	Access tracks, drill pads, old exploration tracks, fire
Average Fire Age	Old
Vegetation Structure & Floristics	
Trees <10m	*Eucalyptus leucophloia* subsp. *leucophloia,*

	Corymbia hamersleyana
Mallee	*Eucalyptus gamophylla, Eucalyptus kingsmillii*
Tall Shrubs >2m	*Grevillea wickhamii, Hakea chordophylla, Acacia pruinocarpa*
Shrubs <1m	*Acacia hilliana, Acacia adoxa, Tephrosia gardneri, Acacia spondylophylla, Corchorus lasiocarpus, Ptilotus calostachyus, Dampiera candicans, Corchorus sidoides, Acacia arida, Gopholobium karijini*
Hummock Grasses	*Tridoia* sp. Shovelanna Hill, *Triodia basedowii*
Tussock Grassland	*Amphipogon caricinus* var. *caricinus*
Herbs	*Goodenia stobbsiana*

Broad Floristic Formation	***Triodia* Hummock Grassland**
Vegetation Association	5e. Hummock Grassland of *Triodia pungens* over Open Tussock Grassland of **Cenchrus ciliaris* and *Aristida holathera* var. *holathera* with Open Shrubland of *Acacia pyrifolia* in brown sandy loam on stony outwash plains
	
Area Mapped	765.59ha
Quadrats Sampled	ML12, ML15, ML44, ML54, ML55, ML59, ML68, 110, 9, ECO44, 78, 111
Location	Outwash plains flowing from the hills in the south down in to the Fortescue Valley
Leaf Litter Cover (%)	<1-5%
Bare Ground (%)	10-30%
Soils and Geology	Red brown sandy loam with ironstone and chert cobbles and pebbles
Land System	Newman, Boolgeeda
Land Form	Outwash plains
Priority Ecological Community	None
Rare Flora	None
Introduced (Weed) Species	**Cenchrus ciliaris, *Cenchrus setiger*
Vegetation Condition	Excellent
Disturbances	Introduced species, fire, livestock, drill pads
Average Fire Age	Old
Vegetation Structure & Floristics	
Tall Shrubs >2m	*Acacia pyrifolia, Atalaya hemiglauca, Gossypium robinsonii, Acacia inaquilatera, Grevillea wickhamii, Acacia tumida*
Shrub 1-2m	*Senna artemisiodies* subsp. *oligophylla x helmsii*
Shrubs <1m	*Corchorus crozophorifolius, Indigofera monophylla, Ptilotus exaltatus* var. *exaltatus, Mollugo molluginis*

Hummock Grasses	*Triodia pungens, Triodia basedowii*
Tussock Grasses	**Cenchrus ciliaris, Cymbopogon obtectus, Aristida holathera* var. *holathera*
Herbs	*Tribulus macrocarpus*

Broad Floristic Formation	***Triodia* Hummock Grassland**
Vegetation Association	5f(i). Hummock Grassland of *Triodia* sp. Shovelanna Hill (S. Van Leeuwen 3835), *Triodia wiseana* and *Triodia pungens* with High Open Shrubland of *Grevillea wickhamii* and *Hakea chordophylla* over Low Open Shrubland of *Acacia spondylophylla* and *Acacia hilliana* in red brown sandy loam on low undulating hills
	
Area Mapped	2,318.78 ha - includes vegetation association 5f(ii)
Quadrats Sampled	ML28, ML39, ML52, ML53, ML63, ML66, ECO34, ECO47, ECO48, ECO70, 49, 52, 53, 55,56,65,68, 71, 73, 74,76,99, 112, 8,10, 11, 40
Location	North eastern parts of the study area on low undulating hills
Leaf Litter Cover (%)	0.5%
Bare Ground (%)	30-60%
Soils and Geology	Red brown sandy loam with ironstone cobbles and pebbles
Land System	Newman, Boolgeeda
Land Form	Low undulating hills
Priority Ecological Community	None
Rare Flora	None
Introduced (Weed) Species	None
Vegetation Condition	Excellent
Disturbances	Tracks nearby, drilling operations, fire
Average Fire Age	Old
Vegetation Structure & Floristics	
Trees <10m	*Eucalyptus leucophloia*
Mallee	*Eucalyptus gamophylla*

Tall Shrubs >2m	*Grevillea wickhamii, Acacia inaequilatera*
Shrubs 1-2m	*Acacia ancistrocarpa, Mirbelia viminalis, Acacia bivenosa*
Shrubs <1m	*Acacia hilliana, Acacia spondylophylla, Acacia pruinocarpa*
Hummock Grasses	*Triodia* sp. Shovelanna Hill, *Triodia punges, Triodia wiseana*

Broad Floristic Formation	***Triodia* Hummock Grassland**
Vegetation Association	5f(ii). Hummock Grasland of *Triodia wiseana* and *Triodia* sp. Shovelanna Hill (S. Van Leeuwen 3835) with Low Shrubland of *Acacia bivenosa* with Low Open Woodland of *Eucalyptus leucophloia* subsp. l*eucophloia* in red brown silty loam on lower hill slopes

Area Mapped	2,318.78ha - includes vegetation association 5f(i)
Quadrats Sampled	ML29, ML51, ECO41, 67,77, 4
Location	North eastern parts of the study area on low undulating hills
Leaf Litter Cover (%)	<1%
Bare Ground (%)	20-40%
Soils and Geology	Red brown silty loam with ironstone
Land System	Newman, Boolgeeda
Land Form	Lower hill slopes
Priority Ecological Community	None
Rare Flora	None
Introduced (Weed) Species	None
Vegetation Condition	Excellent
Disturbances	Drilling operations, access tracks
Average Fire Age	Old
Vegetation Structure & Floristics	
Trees <10m	*Eucalyptus leucophloia* subsp. *leucophloia*
Tall Shrubs >2m	*Acacia bivenosa, Grevillea wickhamii*
Hummock Grass	*Triodia wiseana, Triodia* sp. Shovellana Hill

Broad Floristic Formation	***Triodia* Hummock Grassland**
Vegetation Association	5g(i).Hummock Grassland of *Triodia wiseana, Triodia* sp. Shovelanna Hill (S. Van Leeuwen 3835) and *Triodia brizoides* with Low Open Woodland of *Eucalyptus leucophloia* subsp. *leucophloia* over High Open Shrubland of *Grevillea wickhamii* and *Hakea chordophylla* in brown sandy loam on steep upper hill slopes
	
Area Mapped	3,830.86 ha (area includes 5g(i) to 5g(v))
Quadrats Sampled	ML02, ML07, ML09, ML10, ML16, ML17, ML19, ML20, ML24, ML25, ML26, ML27,ML56, ML60, ML65, ECO18, ECO20, ECO23, ECO28, ECO46, ECO50, 82,79, 115, 97, 60, 108, 123, 64, 94, 51, 96, 33, 91, 89, 27, 15, 13, 90, 104
Location	Steep upper hill slopes of the main range in the south and west of the study area.
Leaf Litter Cover (%)	<1-5%
Bare Ground (%)	25-40%
Soils and Geology	Red/brown sandy loam with ironstone cobbles and pebbles
Land System	Newman
Land Form	Steep upper hill slopes
Priority Ecological Community	No
Rare Flora	None
Introduced (Weed) Species	**Cenchrus ciliaris*
Vegetation Condition	Excellent
Disturbances	Access tracks, fire, drill pads, introduced species
Average Fire Age	Old
Vegetation Structure & Floristics	
Trees <10m	*Eucalyptus leucophloia, Corymbia hamersleyana, Corymbia ferriticola, Atalaya hemiglauca, Ficus*

	brachypoda, Acacia pruinocarpa, Corymbia deserticola
Mallee	*Eucalyptus gamophylla*
Tall Shrubs >2m	*Grevillea wickhamii, Petalostylis labichioides, Acacia tumida, Acacia bivenosa, Acacia maitlandii*
Shrubs 1-2m	*Acacia tumida, Acacia pruinocarpa, Abutilon dioecum, Eremophila jucunda* subsp. *pulcherrima, Sida* sp. Spiciform panicles, *Cullen leucochaites, Senna glutinosa* subsp. *glutinosa*
Shrubs <1m	*Acacia spondylophylla, Ptilotus calostachyus, Acacia adoxa, Acacia hilliana, Sida* sp. Golden Calyces, *Acacia arida, Mirbelia viminalis, Corchorus lasiocarpus, Solanum phlomoides, Tribulus suberosus, Dampiea candicans*
Hummock Grasses	*Triodia wiseana, Triodia pungens, Triodia* sp. Shovelanna, *Triodia brizoides*
Tussock Grasses	*Cymbopogon obtectus, Themeda triandra, Eriachne mucronata, Cymbopogon ambiguus, *Cenchrus ciliaris, Paspalidium clementii, Paraneurachne muelleri*
Herbs	*Euphorbia wheeleri*

Broad Floristic Formation	***Triodia* Hummock Grassland**
Vegetation Association	5g(ii). Hummock Grassland of *Triodia wiseana* over Very Open Tussock Grassland of *Enneapogon lindleyanus, Cymbopogon ambiguous* and *Aristida contorta* with Low Open Shrubland of *Corchorus laniflorus* and *Ptilotus obovatus* in brown sandy loam along cliff edges of gorges
	
Area Mapped	3,830.86 ha (area includes 5g(i) to 5g(v))
Quadrats Sampled	ML14, 80, 109, 66, 88, 31, 105
Location	Cliff edges and gorges along the main range in the south and west of the study area.
Leaf Litter Cover (%)	<1-10%
Bare Ground (%)	70%
Soils and Geology	Brown sandy loam with ironstone cobbles, pebble/scree, outcropping, and boulders, BIF
Land System	Newman
Land Form	Gorges and cliffs
Priority Ecological Community	None
Rare Flora	None
Introduced (Weed) Species	None
Vegetation Condition	Excellent
Disturbances	Fire
Average Fire Age	Moderate
Vegetation Structure & Floristics	
Trees <10m	*Eucalyptus leucophloia, Corymbia ferriticola, Acacia pruinocarpa*
Tall Shrubs >2m	*Acacia pruinocarpa, Petalostylis labichioides, Acacia pyrifolia, Grevillea wickhamii, Acacia tumida*

Shrubs <1m	*Sida cardiophylla, Ptilotus obovatus*
Sedges	*Triodia pungens, Triodia wiseana, Triodia epactia*
Tussock Grasses	*Aristida burbidgeae, Cymbopogon ambiguous, Enneapogon lindleyanus*

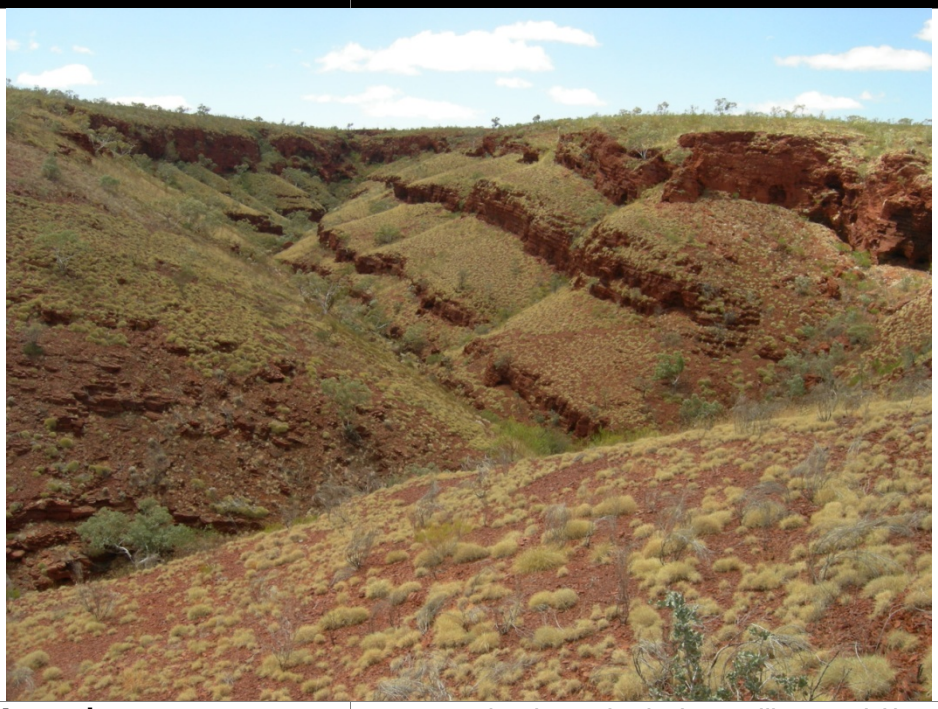
Broad Floristic Formation	***Acacia* Open Scrub**
Vegetation Association	5g(iii) Open Scrub of *Acacia tumida* and *Grevillea wickhamii* over Open Hummock Grassland of *Triodia pungens* and *Triodia* sp. Shovelanna Hill (S. Van Leeuwen 3835) over Scattered Low Trees of *Corymbia hamersleyana* in red sandy clay loam on drainage lines and gullies
	
Area Mapped	3,830.86 ha (area includes 5g(i) to 5g(v))
Quadrats Sampled	ML03, ML13, 20, 122, 21
Location	Drainage lines and gullies along the main range in the south and west of the study area.
Leaf Litter Cover (%)	2.5-8%
Bare Ground (%)	10-15%
Soils and Geology	Red sandy clay loam
Land System	Newman
Land Form	Drainage lines and gullies
Priority Ecological Community	None
Rare Flora	None
Introduced (Weed) Species	**Cenchrus ciliaris*
Vegetation Condition	Excellent
Disturbances	Senescence, access tracks, drill pads, introduced species
Average Fire Age	Not recorded
Vegetation Structure & Floristics	
Trees <10m	*Eucalyptus leucophloia* subsp. *leucophloia, Corymbia hamersleyana, Corymbia ferriticola, Ficus brachypoda*
Mallee	*Eucalyptus gamophylla*
Tall Shrubs >2m	*Petalostylis labichioides, Grevillea wickhamii,*

	Acacia pruinocarpa, Acacia tumida, Acacia citronoviridus, Acacia monticola, Santalum lanceolatum, Acacia maitlandii, Atalaya hemiglauca
Shrubs <1m	*Acacia spondylophylla, Corchorus lasiocarpus*
Hummock Grasses	*Triodia pungens, Triodia* sp. Shovelanna Hill, *Triodia basedowii*
Tussock Grasses	*Themeda australis, Paraneurachne muelleri, Themeda triandra*
Herbs	*Duperreya commixta*

Broad Floristic Formation	*Corymbia* **Low Woodland**
Vegetation Association	5g(iv) Low Woodland of *Corymbia ferriticola, Eucalyptus leucophloia* subsp. *leucophloia* over High Shrubland of *Acacia tumida, Stylobasium spathulatum* and *Grevillea wickhamii* over Open Tussock Grassland of *Themeda triandra, Eriachne mucronata* and *Cymbopogon ambiguus* over Open Hummock Grassland of *Triodia pungens* in brown sandy loam in gorges

Area Mapped	3,830.86 ha (area includes 5g(i) to 5g(v))
Quadrats Sampled	ML11, ML50, ML57, 30
Location	Drainage lines and gullies along the main range in the south and west of the study area.
Leaf Litter Cover (%)	0.5-5%
Bare Ground (%)	20-35%
Soils and Geology	Red brown sandy loam with ironstone cobbles, pebbles, boulders, outcrops and cliffs
Land System	Newman
Land Form	Gorges
Priority Ecological Community	None
Rare Flora	None
Introduced (Weed) Species	**Bidens bipinnata*
Vegetation Condition	Excellent
Disturbances	Access tracks, drill pads nearby, introduced weeds
Average Fire Age	Moderate
Vegetation Structure & Floristics	
Trees <10m	*Corymbia ferriticola, Eucalyptus leucophloia* subsp. *leucophloia, Brachychiton acuminatus, Corymbia hamersleyana*
Mallee	*Eucalyptus gamophylla*

Tall Shrubs >2m	*Acacia tumida, Grevillea wickhamii, Acacia monticola, Acacia pruinocarpa, Santalum lanceolatum, Acacia inaequilatera*
Shrubs 1-2m	*Gossypium robinsonii, Sida arenicola, Stylobasium spathulatum, Acacia maitlandii*
Shrubs <1m	*Acacia spondylophylla, Cleome viscosa, Acacia hilliana*
Hummock Grasses	*Trioida pungens, Triodia wiseana, Triodia brizoides*
Tussock Grasses	*Eriachne mucronata, Themeda triandra*

Broad Floristic Formation	***Triodia* Closed Hummock Grassland**
Vegetation Association	5g(v). Closed Hummock Grassland of *Triodia brizoides* and *Triodia* sp. Shovelanna Hill (S. Van Leeuwen 3835) with High Open Shrubland of *Grevillea wickhamii, Acacia inaequilatera* and *Acacia bivenosa* with Scattered Low Trees of *Eucalyptus leucophloia* subsp. *leucophloia* in red clayey sand on breakaway scree slopes
	
Area Mapped	3,830.86 ha (area includes 5g(i) to 5g(v))
Quadrats Sampled	17, 35, 85, 117, 119, 120
Location	Breakaways and scree slopes along the main range in the south and west of the study area
Leaf Litter Cover (%)	<1%
Bare Ground (%)	15-30%
Soils and Geology	Red clayey sand with ironstone
Land System	Newman
Land Form	Breakaway scree slopes
Priority Ecological Community	None
Rare Flora	None
Introduced (Weed) Species	None
Vegetation Condition	Excellent
Disturbances	Old tracks, fire
Average Fire Age	Old
Vegetation Structure & Floristics	
Trees <10m	*Eucalyptus leucophloia* subsp. *leucophloia, Corymbia ferriticola*
Mallee	*Eucalyptus gamophylla*
Tall Shrubs >2m	*Grevillea wickhamii, Petalostylis labichioides*

Shrubs <1m	*Eremophila forrestii* subsp. *forrestii, Scaeveola browniana, Dampiera candicans, Ptilotus calostachyus, Lepidium pedicellosum, Triumfetta macronochieana*
Hummock Grassland	*Triodia basedowii, Triodia wiseana*
Tussock Grassland	*Eriachne mucronata, Cymbopogon ambiguus*

Broad Floristic Formation	*Cenchrus* **Closed Tussock Grassland**
Vegetation Association	6. Closed Tussock Grassland of **Cenchrus ciliaris* and **Cenchrus setiger* with Low Open Forest of *Acacia citrinoviridis, Atalaya hemiglauca* and *Hakea lorea* subsp. *lorea* with Scattered Trees of *Eucalyptus victrix* in brown loamy sand along levee banks of major drainage lines

Area Mapped	71.35 ha
Quadrats Sampled	ML45
Location	Levee banks along drainage line in the north east of the study area.
Leaf Litter Cover (%)	30%
Bare Ground (%)	15%
Soils and Geology	Brown loamy sand with riverine gravels
Land System	River
Land Form	Levee banks of major drainage line
Priority Ecological Community	None
Rare Flora	None
Introduced (Weed) Species	**Cenchrus ciliaris, *Cenchrus setiger*
Vegetation Condition	Degraded
Disturbances	Introduced species, livestock
Average Fire Age	Very Old
Vegetation Structure & Floristics	
Trees <10m	*Atalaya hemiglauca, Eucalyptus vitrix*
Tall Shrubs >2m	*Acacia citinoviridis, Hakea lorea* var. *lorea*
Tussock Grasses	**Cenchrus ciliaris, *Cenchrus setiger*

Broad Floristic Formation	*Cenchrus* **Closed Hummock Grassland**
Vegetation Association	6b. Closed Tussock Grassland of **Cenchrus setiger* and **Cenchrus ciliaris* with Low Open Woodland of *Acacia citrinoviridis, Atalaya hemiglauca* and *Hakea lorea* subsp. *lorea* with Scattered Trees of *Eucalyptus victrix* in red brown sandy loam on floodplains

Area Mapped	326.73 ha
Quadrats Sampled	ML34, ML47
Location	Floodplain surrounding drainage line in the far eastern part of the study area
Leaf Litter Cover (%)	10-35%
Bare Ground (%)	10-40%
Soils and Geology	Red brown sandy loam with scattered mixed riverine gravels
Land System	River
Land Form	Flood-out
Priority Ecological Community	None
Rare Flora	None
Introduced (Weed) Species	**Cenchrus ciliaris, *Cenchrus setiger, *Aerva javanica*
Vegetation Condition	Degraded
Disturbances	Introduced species, access tracks, drill pads
Average Fire Age	Moderate
Vegetation Structure & Floristics	
Trees <10m	*Eucalyptus victrix, Atalaya hemiglauca, Hakea lorea* var. *lorea*
Tall Shrubs >2m	*Acacia citrinoviridis*
Tussock Grasses	**Cenchrus ciliaris, *Cenchrus setiger*

3.7 Vegetation Condition

Vegetation condition ranged from Excellent in the remote mountainous regions of the Study area, to Degraded on floodplains of the major tributary of Weeli Wolli Creek in the south-east.

Vegetation within the mountainous areas, which comprises over three quarters of the total Study area, was mostly classified as Excellent with the exception of some medium sized drainage lines and associated stony floodplains (Figure 9). These were generally classified to be in Good condition, but this varied depending on the dominance of **Cenchrus ciliaris* (Buffel Grass) in the understory and the level of soil disturbance associated with mining exploration activities.

In contrast, the vegetation at lower elevations (such as those on floodplains, riverbeds and sandplains) varied from Very Good to Degraded (Figure 9). Vegetation condition was reduced along floodplains associated with the major tributary of Weeli Wolli Creek in response to grazing by domestic cattle and introduction of weeds. River channels, although typically supporting a diversity of weed species, were generally in Very Good condition.

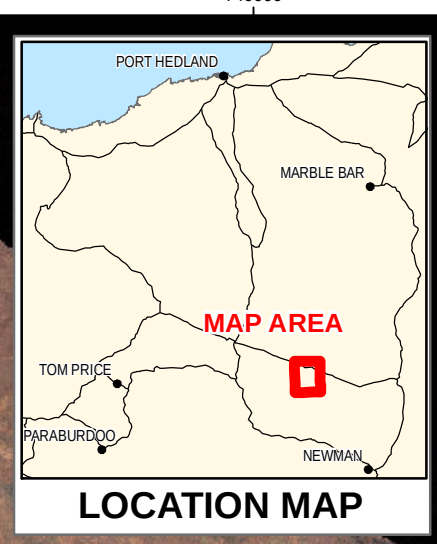
Vegetation condition for the sandplain and sand dune associations ranged from Excellent to Good, influenced by the local level of soil disturbance and associated weed eastablishment.

No sites were determined to be Completely Degraded; however, there were a number of localised areas of clearing for access tracks, drill pads and laydown areas.

There was no evidence of recent fire at any of the sites formally assessed, although localized areas of young burn age (1-2 years) were scattered across the Study area.

725000 730000 735000 740000

7505000 7500000 7495000 7490000 7485000



LOCATION MAP

N

Griffin Spatial & Mapping
2 Epacris Elbow Pelican Point
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MARILLANA

Vegetation condition for the Study Area

Figure 9

0 1 2 3 4
Kilometers

1:75,000
Datum: GDA94
Projection: MGA Zone50

ONSHORE ENVIRONMENTAL

ONSHORE ENVIRONMENTAL CONSULTANTS		Date:	1/02/2012
Sheet Size:	A3	Status:	Draft
Drawn by GSM	Requested by DB	Internal Reference Fig8_MAR_Vegcond	

Legend

Study Area - Marillana

Vegetation Mapping Condition

- Degraded
- Good
- Very Good
- Excellent

4.0 Summary

A two season flora and vegetation survey incorporated assessment of 194 study sites across the 11,367 ha Marillana Study area. The survey was undertaken by Onshore Environmental during excellent seasonal conditions between April and October 2011, and incorporated data from a previous survey by Ecologia Environment in October 2005 and March 2006.

A total number of 268 plant taxa (including varieties and subspecies) from 44 families and 117 genera were recorded from the Study area. Species representation was greatest among the Fabaceae, Poaceae, Malvaceae, Amaranthaceae, Asteraceae, Myrtaceae and Goodeniaceae families, which is typical for the Pilbara Bioregion. The most speciose genus was *Acacia* (26 taxa), followed by *Ptilotus* (14 taxa), *Senna* (10 taxa), *Sida* (7 taxa), *Triodia* (7 taxa) *Corchorus* (7 taxa) and *Hibiscus* (7 taxa).

None of the plant taxa recorded from the Study area were gazetted as Threatened (Declared Rare) Flora pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950)* or listed under the EPBC Act. There was no Priority flora (as listed by the DEC) recorded from the Study area.

A total of seven introduced (weed) species were recorded from the Study area; **Acetosa vesicaria, *Aerva javanica, *Argemone ochroleuca, *Bidens bipinnata, *Cenchrus ciliaris, *Cenchrus setiger* and **Sisymbrium orientale*. None of these taxa are listed as Declared Weeds under the ARRP Act.

A total of 18 Vegetation Associations were described and mapped within the Study area. The vegetation associations were classified into six Broad Floristic Formations on the basis of the dominant vegetation stratum. The vegetation associations were typically well represented within the Pilbara, with the exception of 5b 'Hummock Grassland of *Triodia schinzii* and *Triodia basedowii* with High Shrubland of *Acacia dictyophleba* over Very Open Tussock Grassland of *Aristida holathera var. holathera, *Cenchrus ciliaris* and *Eriachne gardneri* in red brown sand on linear sand dunes' which is considered regionally restricted and poorly represented.

Vegetation condition ranged from Pristine in the remote mountainous regions of the Study area, to Degraded on floodplains of the major drainage line in the south-east. Vegetation within the mountainous areas, which comprises over three quarters of the total Study area, was mostly classified as Excellent with the exception of some medium sized drainage lines and associated stony floodplains. These were generally classified to be in Good condition, but this varied depending on the dominance of **Cenchrus ciliaris* (Buffel Grass) in the understory and the level of soil disturbance associated with mining exploration activities. Vegetation condition was reduced along floodplains associated with the major drainage line in the south-east corner of the Study area in response to grazing by domestic cattle and introduction of weeds.

The field survey confirmed that no TECs occurred within the Study area. However, the Priority 3 PEC Fortescue Valley Sand Dunes occurred on linear sand dunes present in the eastern sector of the Study area. The community was characterised by red linear sand dunes supporting Vegetation Association 5b 'Hummock Grassland of *Triodia schinzii* and *Triodia basedowii* with High Shrubland of *Acacia dictyophleba* over Very Open Tussock Grassland of *Aristida holathera* var. *holathera, *Cenchrus ciliaris* and *Eriachne gardneri* in red brown sand'. The Sand Dune community is considered regionally rare and susceptible.

5.0 Study Team

The Level 2 flora and vegetation survey of the Study area was planned, coordinated and executed by the following personnel:

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Project Staff

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Mr Daniel Roberts	BSc	Botanist
Mr Glyn Hopkinson	BSc	Botanist
Mr Peter Sweeny	B	Botanist
Mrs Kerry Keenan		Data Analyst
Mr Todd Griffin		GIS Specialist
Mr Russell Smith		Statistician

Licences

The field survey was conducted under the authorization of the following licences issued by the Department of Environment & Conservation:

- Darren Brearley, Onshore Environmental Consultants 'Licence to take flora for scientific & other prescribed purposes' Licence No. SL009578
- Jerome Bull, Onshore Environmental Consultants 'Licence to take flora for scientific & other prescribed purposes' Licence No. SL009579
- Ellen Palmer, Onshore Environmental Consultants 'Licence to take flora for scientific & other prescribed purposes' Licence No. SL009564
- Jessica Waters, Onshore Environmental Consultants 'Licence to take flora for scientific & other prescribed purposes' Licence No. SL009562
- Peter Sweeny, Onshore Environmental Consultants 'Licence to take flora for scientific & other prescribed purposes' Licence No. SL009563
- Daniel Roberts, Onshore Environmental Consultants 'Licence to take flora for scientific & other prescribed purposes' Licence No. SL009561

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APPENDIX 1

Vegetation Classifications for the Pilbara based on Specht (1970), as modified by Aplin (1979) and Trudgen (2009).

Height Class	Canopy Cover				
	100 - 70%	70 - 30%	30 - 10%	10 - 2%	< 2%
Trees > 30 m	High Closed Forest	High Open Forest	High Woodland	High Open Woodland	Scattered Tall Trees
Trees 10-30 m	Closed Forest	Open Forest	Woodland	Open Woodland	Scattered Trees
Trees < 10 m	Low Closed Forest	Low Open Forest	Low Woodland	Low Open Woodland	Scattered Low Trees
Mallee	Closed Mallee	Mallee	Open Mallee	Very Open Mallee	Scattered Mallees
Shrubs > 2 m	Closed Scrub	Open Scrub	High Shrubland	High Open Shrubland	Scattered Tall Shrubs
Shrubs 1-2 m	Closed Heath	Open Heath	Shrubland	Open Shrubland	Scattered Shrubs
Shrubs < 1 m	Low Closed Heath	Low Open Heath	Low Shrubland	Low Open Shrubland	Low Scattered Shrubs
Hummock Grass	Closed Hummock Grassland	Hummock Grassland	Open Hummock Grassland	Very Open Hummock Grassland	Scattered Hummock Grass
Tussock Grass	Closed Tussock Grassland	Tussock Grassland	Open Tussock Grassland	Very Open Tussock Grassland	Scattered Tussock Grass
Bunch Grass	Closed Bunch Grassland	Bunch Grassland	Open Bunch Grassland	Very Open Bunch Grassland	Scattered Bunch Grass
Sedges	Closed Sedges	Sedges	Open Sedges	Very Open Sedges	Scattered Sedges
Herbs	Closed Herbs	Herbs	Open Herbs	Very Open Herbs	Scattered Herbs

Source: S. van Leeuwen (DEC)

APPENDIX 2

Vegetation condition scale (as developed by Keighery 1994)

CONDITION	SCALE	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.
Good	4	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it.
Degraded	5	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching Very Good condition without intensive management.
Completely Degraded	6	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species.

APPENDIX 3

Conservation categories for flora described under the EPBC Act

CATEGORY	DESCRIPTION
Extinct	A species is extinct if there is no reasonable doubt that the last member of the species has died.
Extinct in the Wild	A species is categorised as extinct in the wild if it is only known to survive in cultivations, in captivity, or as a naturalised population well outside its past range; or if it has not been recorded in its known/expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate ti its life cycle and form.
Critically Endangered	The species is facing an exteremly high risk of extinction in the wild and in the immediate future.
Endangered	The species is likely to become extinct unless the circumstances and factors threatening its abundance, survival, or evolutionary development cease to operate; or its numbers have been reduced to such a critical level, or its habitats have been so drastically reduced, that it is in immediate danger of extinction.
Vulnerable	Within the next 25 years, the species is likely to become endangered unless the circumstances and factors threatening its abundance, survival or evolutionary development cease to operate.
Conservation Dependent	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.

APPENDIX 4

Conservation categories for flora described
under the Conservation Codes for Western Australian Flora

R: Threatened (Declared Rare) Flora - Extant Taxa

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.

1: Priority One - Poorly Known Taxa

Taxa that 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.

2: Priority Two - Poorly Known Taxa

Taxa that 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.

3: Priority Three - Poorly Known Taxa

Taxa that are known from collections or sight records from several localities not under imminent threat, or from 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.

4: Priority Four - Rare, Near Threatened and other taxa in need of monitoring

(a) **Rare.** Taxa 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 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.

5: 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 taxa becoming threatened within five years.

APPENDIX 5

Multivariate statistical analysis for floristic data collected from study sites within the study area

APPENDIX 6

Total flora list recorded from the study area

FAMILY	SPECIES
ADIANTACEAE	*Cheilanthes brownii*
	Cheilanthes lasiophylla
	Cheilanthes sieberi subsp. *sieberi*
AIZOACEAE	*Trianthema glossostigma*
	Trianthema pilosa
AMARANTHACEAE	**Aerva javanica*
	Achyranthes aspera
	Alternanthera nodiflora
	Amaranthus cuspidifolius
	Amaranthus undulatus
	Gomphrena affinis subsp. *pilbarensis*
	Gomphrena canescens subsp. *canescens*
	Gomphrena cunninghamii
	Ptilotus aervoides
	Ptilotus astrolasius var. *astrolasius*
	Ptilotus auriculifolius
	Ptilotus calostachyus
	Ptilotus clementii
	Ptilotus exaltatus var. *exaltatus*
	Ptilotus fusiformis
	Ptilotus gaudichaudii
	Ptilotus helipteroides
	Ptilotus latifolius
	Ptilotus macrocephalus
	Ptilotus obovatus
	Ptilotus polystachyus
	Ptilotus rotundifolius
APOCYNACEAE	*Cynanchum floribundum*
ARALIACEAE	*Astrotricha hamptonii*
	Trachymene oleracea subsp. *oleracea*
ASTERACEAE	**Bidens bipinnata*
	Calocephalus beardii
	Calotis porphyroglossa
	Peripleura virgata
	Pluchea dunlopii

FAMILY	SPECIES
	Pluchea ferdinandi-muelleri
	Pterocaulon serrulatum
	Pterocaulon sphacelatum
	Pterocaulon sphaeranthoides
	Rhodanthe margarethae
BORAGINACEAE	*Ehretia saligna*
	Halgania solanacea
	Heliotropium pachyphyllum
	Heliotropium tenuifolium
	Trichodesma zeylanicum var. *zeylanicum*
BRASSICACEAE	*Lepidium muelleri-ferdinandii*
	Lepidium pedicellosum
	**Sisymbrium orientale*
	Stenopetalum cf. *velutinum*
CAPPARACEAE	*Capparis lasiantha*
	Capparis spinosa var. *nummularia*
CARYOPHYLLACEAE	*Polycarpaea corymbosa* var. *corymbosa*
	Polycarpaea holtzei
	Polycarpaea longiflora
CELASTRACEAE	*Stackhousia intermedia*
	Stackhousia muricata
CHENOPODIACEAE	*Chenopodium auricomum*
	Maireana villosa
	Rhagodia eremaea
	Salsola australis
	Sclerolaena cornishiana
CLEOMACEAE	*Cleome viscosa*
CONVOLVULACEAE	*Bonamia media* var. *villosa*
	Bonamia rosea
	Duperreya commixta
	Evolvulus alsinoides var. *villosicalyx*
	Operculina aequisepala

FAMILY	SPECIES
CUCURBITACEAE	*Cucumis maderaspatanus*
CYPERACEAE	*Bulbostylis barbata*
	Cyperus hesperius
	Fimbristylis dichotoma
	Fimbristylis simulans
EUPHORBIACEAE	*Euphorbia alsiniflora*
	Euphorbia australis
	Euphorbia biconvexa
	Euphorbia boophthona
	Euphorbia schultzii
	Euphorbia tannensis subsp. *eremophila*
FABACEAE	*Acacia adoxa var. adoxa*
	Acacia adsurgens
	Acacia ancistrocarpa
	Acacia aneura var. aneura
	Acacia aptaneura Maslin & J.E.Reid ms
	Acacia arida
	Acacia bivenosa
	Acacia catenulata subsp. *occidentalis*
	Acacia citrinoviridis
	Acacia dictyophleba
	Acacia hamersleyensis
	Acacia hilliana
	Acacia inaequilatera
	Acacia maitlandii
	Acacia marramamba
	Acacia monticola
	Acacia pachyacra
	Acacia paraneura
	Acacia pruinocarpa
	Acacia pyrifolia var. *pyrifolia*
	Acacia rhodophloia
	Acacia sibirica
	Acacia spondylophylla
	Acacia synchronicia
	Acacia tenuissima

FAMILY	SPECIES
	Acacia tumida var. *pilbarensis*
	Crotalaria cunninghamii
	Crotalaria medicaginea var. *neglecta*
	Cullen leucochaites
	Indigofera monophylla
	Isotropis atropurpurea
	Mirbelia viminalis
	Petalostylis cassioides
	Petalostylis labicheoides
	Rhynchosia minima
	Senna artemisioides subsp. *helmsii*
	Senna artemisioides subsp. *oligophylla*
	Senna artemisioides subsp. x *sturtii*
	Senna ferraria
	Senna glaucifolia
	Senna glutinosa subsp. *glutinosa*
	Senna glutinosa subsp. *pruinosa*
	Senna glutinosa subsp. x *luerssenii*
	Senna notabilis
	Senna venusta
	Templetonia egena
	Tephrosia arenicola
	Tephrosia clementii
	Tephrosia densa
	Tephrosia rosea var. *glabrior* Pedley ms
GOODENIACEAE	*Dampiera candicans*
	Goodenia cusackiana
	Goodenia microptera
	Goodenia prostrata
	Goodenia stobbsiana
	Goodenia triodiophila
	Goodenia vilmoriniae
	Scaevola browniana subsp. *browniana*
	Scaevola parvifolia subsp. *pilbarae*
	Scaevola spinescens
GYROSTEMONACEAE	*Codonocarpus cotinifolius*
HALORAGACEAE	*Haloragis gossei* var. *gossei*

FAMILY	SPECIES
LAMIACEAE	*Dicrastylis cordifolia*
	Prostanthera albiflora
LAURACEAE	*Cassytha capillaris*
MALVACEAE	*Abutilon cryptopetalum*
	Abutilon dioicum R.M.Barker ms
	Abutilon lepidum
	Abutilon cf. *leucopetalum*
	Abutilon malvifolium
	Abutilon otocarpum
	Brachychiton acuminatus
	Corchorus crozophorifolius
	Corchorus laniflorus
	Corchorus lasiocarpus subsp. *lasiocarpus*
	Corchorus lasiocarpus subsp. *parvus*
	Corchorus sidoides subsp. *sidoides*
	Corchorus tectus
	Corchorus tridens
	Gossypium australe
	Gossypium robinsonii
	Hibiscus brachylaenus
	Hibiscus burtonii
	Hibiscus coatesii
	Hibiscus goldsworthii
	Hibiscus haynaldii
	Hibiscus sturtii var. *campylochlamys*
	Hibiscus sturtii var. *platychlamys*
	Keraudrenia velutina subsp. *elliptica*
	Melhania oblongifolia
	Sida arenicola
	Sida cardiophylla
	Sida clementii
	Sida echinocarpa
	Sida fibulifera
	Sida sp. Excedentifolia (J.L. Egan 1925)
	Sida sp. Pilbara (A.A. Mitchell PRP 1543)
	Triumfetta leptacantha
	Triumfetta maconochieana

FAMILY	SPECIES
	Waltheria indica
MENISPERMACEAE	*Tinospora smilacina*
MORACEAE	*Ficus brachypoda*
MYRTACEAE	*Calytrix carinata*
	Corymbia deserticola subsp. *deserticola*
	Corymbia ferriticola
	Corymbia hamersleyana
	Eucalyptus camaldulensis subsp. *obtusa*
	Eucalyptus gamophylla
	Eucalyptus kingsmillii subsp. *kingsmillii*
	Eucalyptus victrix
	Eucalyptus xerothermica
NYCTAGINACEAE	*Boerhavia coccinea*
	Boerhavia repleta
OLEACEAE	*Jasminum didymum* subsp. *lineare*
PAPAVERACEAE	**Argemone ochroleuca*
PHYLLANTHACEAE	*Flueggea virosa* subsp. *melanthesoides*
	Notoleptopus decaisnei
	Phyllanthus maderaspatensis
	Phyllanthus reticulatus
PLANTAGINACEAE	*Stemodia grossa*
POACEAE	**Cenchrus ciliaris*
	**Cenchrus setiger*
	Amphipogon sericeus
	Aristida burbidgeae
	Aristida contorta
	Aristida holathera var. *holathera*
	Aristida hygrometrica
	Aristida inaequiglumis
	Aristida latifolia
	Chrysopogon fallax

FAMILY	SPECIES
	Cymbopogon ambiguus
	Cymbopogon obtectus
	Cymbopogon procerus
	Enneapogon caerulescens
	Enneapogon lindleyanus
	Enneapogon polyphyllus
	Eragrostis cumingii
	Eragrostis eriopoda
	Eriachne aristidea
	Eriachne gardneri
	Eriachne lanata
	Eriachne mucronata
	Eriachne pulchella subsp. dominii
	Eulalia aurea
	Paraneurachne muelleri
	Paspalidium clementii
	Paspalidium tabulatum
	Perotis rara
	Schizachyrium fragile
	Sporobolus australasicus
	Themeda triandra
	Tragus australianus
	Triodia basedowii
	Triodia brizoides
	Triodia epactia
	Triodia longiceps
	Triodia pungens
	Triodia schinzii
	Triodia wiseana
POLYGALACEAE	*Polygala isingii*
POLYGONACEAE	**Acetosa vesicaria*
PROTEACEAE	*Grevillea wickhamii* subsp. *hispidula*
	Hakea chordophylla
	Hakea lorea subsp. *lorea*
	Hakea macrocarpa
RUBIACEAE	*Oldenlandia crouchiana*

FAMILY	SPECIES
	Psydrax latifolia
SANTALACEAE	*Anthobolus leptomerioides*
	Santalum lanceolatum
SAPINDACEAE	*Atalaya hemiglauca*
	Dodonaea coriacea
	Dodonaea pachyneura
SCROPHULARIACEAE	*Eremophila forrestii* subsp. *forrestii*
	Eremophila jucunda subsp. *pulcherrima*
	Eremophila lanceolata
	Eremophila latrobei subsp. *filiformis*
	Eremophila longifolia
	Eremophila tietkensii
SOLANACEAE	*Nicotiana benthamiana*
	Nicotiana occidentalis
	Solanum ellipticum
	Solanum ferocissimum
	Solanum gabrielae
	Solanum horridum
	Solanum lasiophyllum
	Solanum phlomoides
SURIANACEAE	*Stylobasium spathulatum*
VIOLACEAE	*Hybanthus aurantiacus*
ZYGOPHYLLACEAE	*Tribulus macrocarpus*
	Tribulus suberosus

APPENDIX 7

Records for introduced weed species recorded from the study area

Organisation Sampling	Genus	Species	GDA94 Latitude (Decimal Degrees)	GDA94 Longitude (Decimal Degrees)	No Individuals
Onshore Environmental Consultants	**Aerva*	*javanica*	728516	7494567	10-20
Onshore Environmental Consultants	**Aerva*	*javanica*	737884	7490826	5
Onshore Environmental Consultants	**Aerva*	*javanica*	2238.028	11913.3	15
Onshore Environmental Consultants	**Aerva*	*javanica*	2240.066	11918.837	10
Onshore Environmental Consultants	**Aerva*	*javanica*	2240.235	11918.947	10
Onshore Environmental Consultants	**Aerva*	*javanica*	2240.265	11918.942	10
Onshore Environmental Consultants	**Aerva*	*javanica*	2240.553	11919.153	10
Onshore Environmental Consultants	**Aerva*	*javanica*	2240.908	11919.208	1
Onshore Environmental Consultants	**Argemone*	*ochroleuca*	739023	7488299	100
Onshore Environmental Consultants	**Argemone*	*ochroleuca*	2239.908	11918.755	10
Onshore Environmental Consultants	**Argemone*	*ochroleuca*	2239.972	11918.793	11
Onshore Environmental Consultants	**Argemone*	*ochroleuca*	2240.061	11918.844	200
Onshore Environmental Consultants	**Argemone*	*ochroleuca*	2238.106	11913.948	15
Onshore Environmental Consultants	**Argemone*	*ochroleuca*	2240.546	11919.1	500
Onshore Environmental Consultants	**Argemone*	*ochroleuca*	2240.943	11919.265	
Onshore Environmental Consultants	**Argemone*	*ochroleuca*	2240.908	11919.208	10
Onshore Environmental Consultants	**Argemone*	*ochroleuca*	2240.737	11919.209	60
Onshore Environmental Consultants	**Argemone*	*ochroleuca*	2240.679	11919.19	150
Onshore Environmental Consultants	**Bidens*	*bipinnata*	726916	7493337	
Onshore Environmental Consultants	**Bidens*	*bipinnata*	2238.137	11911.603	10
Ecologia	**Cenchrus*	*ciliaris*	733116	7492633	
Ecologia	**Cenchrus*	*ciliaris*	742517	7500625	
Ecologia	**Cenchrus*	*ciliaris*	724404	7500888	
Ecologia	**Cenchrus*	*ciliaris*	737153	7486061	
Ecologia	**Cenchrus*	*ciliaris*	735912	7483798	
Ecologia	**Cenchrus*	*ciliaris*	735337	7487389	
Ecologia	**Cenchrus*	*ciliaris*	736222	7488215	
Ecologia	**Cenchrus*	*ciliaris*	735750	7490954	
Ecologia	**Cenchrus*	*ciliaris*	733300	7491507	
Ecologia	**Cenchrus*	*ciliaris*	737487	7487958	
Ecologia	**Cenchrus*	*ciliaris*	731256	7496625	
Ecologia	**Cenchrus*	*ciliaris*	733079	7494819	

Organisation Sampling	Genus	Species	GDA94 Latitude (Decimal Degrees)	GDA94 Longitude (Decimal Degrees)	No Individuals
Ecologia	*Cenchrus	ciliaris	727000	7498336	
Ecologia	*Cenchrus	ciliaris	726122	7499780	
Onshore Environmental Consultants	*Cenchrus	ciliaris	725469	7495238	>500
Onshore Environmental Consultants	*Cenchrus	ciliaris	728516	7494567	7500
Onshore Environmental Consultants	*Cenchrus	ciliaris	738815	7490413	200
Onshore Environmental Consultants	*Cenchrus	ciliaris	736243	7490560	25
Onshore Environmental Consultants	*Cenchrus	ciliaris	739846	7490112	300
Onshore Environmental Consultants	*Cenchrus	ciliaris	739380	7489421	>1000
Onshore Environmental Consultants	*Cenchrus	ciliaris	833546	7495051	>500
Onshore Environmental Consultants	*Cenchrus	ciliaris	737705	7489525	>100
Onshore Environmental Consultants	*Cenchrus	ciliaris	739023	7488299	2
Onshore Environmental Consultants	*Cenchrus	ciliaris	736276	7492359	
Onshore Environmental Consultants	*Cenchrus	ciliaris	734858	7486776	>200
Onshore Environmental Consultants	*Cenchrus	ciliaris	737677	7491712	>1000
Onshore Environmental Consultants	*Cenchrus	ciliaris	737884	7490826	>500
Onshore Environmental Consultants	*Cenchrus	ciliaris	735687	7492939	>500
Onshore Environmental Consultants	*Cenchrus	ciliaris	735603	7492113	5
Onshore Environmental Consultants	*Cenchrus	ciliaris	726533	7497345	
Onshore Environmental Consultants	*Cenchrus	ciliaris	728183	7497310	50-100
Onshore Environmental Consultants	*Cenchrus	ciliaris	728027	7496468	1
Onshore Environmental Consultants	*Cenchrus	ciliaris	724469	7500620	>1000
Onshore Environmental Consultants	*Cenchrus	ciliaris	725313	750130	>100
Onshore Environmental Consultants	*Cenchrus	ciliaris	725318	7500096	>50
Onshore Environmental Consultants	*Cenchrus	ciliaris	727816	7499391	>500
Onshore Environmental Consultants	*Cenchrus	ciliaris	733116	7492633	>250
Onshore Environmental Consultants	*Cenchrus	ciliaris	736327	7487302	>50
Onshore Environmental Consultants	*Cenchrus	ciliaris	735337	7487389	2
Onshore Environmental Consultants	*Cenchrus	ciliaris	735427	7488195	1
Onshore Environmental Consultants	*Cenchrus	ciliaris	736222	7488215	>100
Onshore Environmental Consultants	*Cenchrus	ciliaris	735750	7490954	>200
Onshore Environmental Consultants	*Cenchrus	ciliaris	734485	7492939	1
Onshore Environmental Consultants	*Cenchrus	ciliaris	737487	7487958	>50

Organisation Sampling	Genus	Species	GDA94 Latitude (Decimal Degrees)	GDA94 Longitude (Decimal Degrees)	No Individuals
Onshore Environmental Consultants	**Cenchrus*	*ciliaris*	730189	7495124	1
Onshore Environmental Consultants	**Cenchrus*	*ciliaris*	727000	7498336	>500
Onshore Environmental Consultants	**Cenchrus*	*ciliaris*	2238.137	11911.603	50
Onshore Environmental Consultants	**Cenchrus*	*ciliaris*	2239.996	11918.347	
Onshore Environmental Consultants	**Cenchrus*	*ciliaris*	2239.96	11918.539	
Onshore Environmental Consultants	**Cenchrus*	*ciliaris*	2239.943	11918.632	
Onshore Environmental Consultants	**Cenchrus*	*ciliaris*	2239.918	11918.711	
Onshore Environmental Consultants	**Cenchrus*	*ciliaris*	2240.728	11919.52	
Onshore Environmental Consultants	**Cenchrus*	*ciliaris*	2240.705	11919.888	
Onshore Environmental Consultants	**Cenchrus*	*ciliaris*	2240.879	11919.973	
Onshore Environmental Consultants	**Cenchrus*	*ciliaris*	2241.011	11918.681	
Onshore Environmental Consultants	**Cenchrus*	*ciliaris*	2242.717	11917.225	50
Onshore Environmental Consultants	**Cenchrus*	*ciliaris*	2242.41	11917.633	
Onshore Environmental Consultants	**Cenchrus*	*ciliaris*	2239.22	11917.59	
Onshore Environmental Consultants	**Cenchrus*	*ciliaris*	2236.949	11913.271	
Onshore Environmental Consultants	**Cenchrus*	*ciliaris*	2235.184	11911.177	
Onshore Environmental Consultants	**Cenchrus*	*ciliaris*	2237.633	11913.67	
Onshore Environmental Consultants	**Cenchrus*	*setiger*	738815	7490413	20
Onshore Environmental Consultants	**Cenchrus*	*setiger*	739846	7490112	5
Onshore Environmental Consultants	**Cenchrus*	*setiger*	739380	7489421	20
Onshore Environmental Consultants	**Cenchrus*	*setiger*	833546	7495051	75
Onshore Environmental Consultants	**Cenchrus*	*setiger*	737677	7491712	>1000
Onshore Environmental Consultants	**Cenchrus*	*setiger*	737884	7490826	>1000
Onshore Environmental Consultants	**Cenchrus*	*setiger*	735687	7492939	>300
Onshore Environmental Consultants	**Cenchrus*	*setiger*	724469	7500620	25-50
Onshore Environmental Consultants	**Cenchrus*	*setiger*	2239.96	11918.539	
Onshore Environmental Consultants	**Cenchrus*	*setiger*	2239.943	11918.632	
Onshore Environmental Consultants	**Cenchrus*	*setiger*	2239.918	11918.711	
Onshore Environmental Consultants	**Cenchrus*	*setiger*	2240.879	11919.973	
Onshore Environmental Consultants	**Sisymbrium*	*orientale*	739023	7488299	25

APPENDIX 8

Summary of introduced weed species recorded from the study area

Acetosa vesicaria

**Acetosa vesicaria* (Ruby Dock) is an erect, stout, fleshy, hollow-stemmed annual herb growing between 0.2 m and 1 m height, flowering (pink to red) from July to September (Plate 1). Ruby Dock is found on sandy alluvial soils, or gravelly ironstone soils along roadsides or in disturbed areas. It is a common and widespread weed of the arid zone and is found in a variety of disturbed areas from the Pilbara to the Nullarbor. It is native to North Africa, the Middle East and India (Hussey *et al*. 1997). It is a highly aggressive and prolific colonizer, particularly of disturbed areas, and should be included in all weed management programmes within the Pilbara.

There was a single record from the original Ecologia Environment survey but no GPS record was made, and the taxon was not recorded during subsequent surveys in 2011 by Onshore Environmental.

Plate 1 ***Acetosa vesicaria* with distinctive red fruits and fleshy leaves.**

Aerva javanica

**Aerva javanica (*Kapok Bush*) is an erect branched perennial herb that grows between 0.4 m and 1.6 m in height, flowering (white) between January and October (Plate 2). This species prefers sandy soils and is commonly found along drainage lines. Kapok Bush is native to northern Africa and south-west Asia but is found across northern Western Australian, Queensland, South Australia and the Northern Territory (Hussey *et al.* 1997).

**Aerva javanica* occurred as scattered plants within vegetation on sandy levee banks and riverbeds associated with the major drainage line in the south-east of the Study area. It has previously been recorded at disturbed locations in close proximity to the nearby the Yandi Mine (Onshore Environmental 2011a).

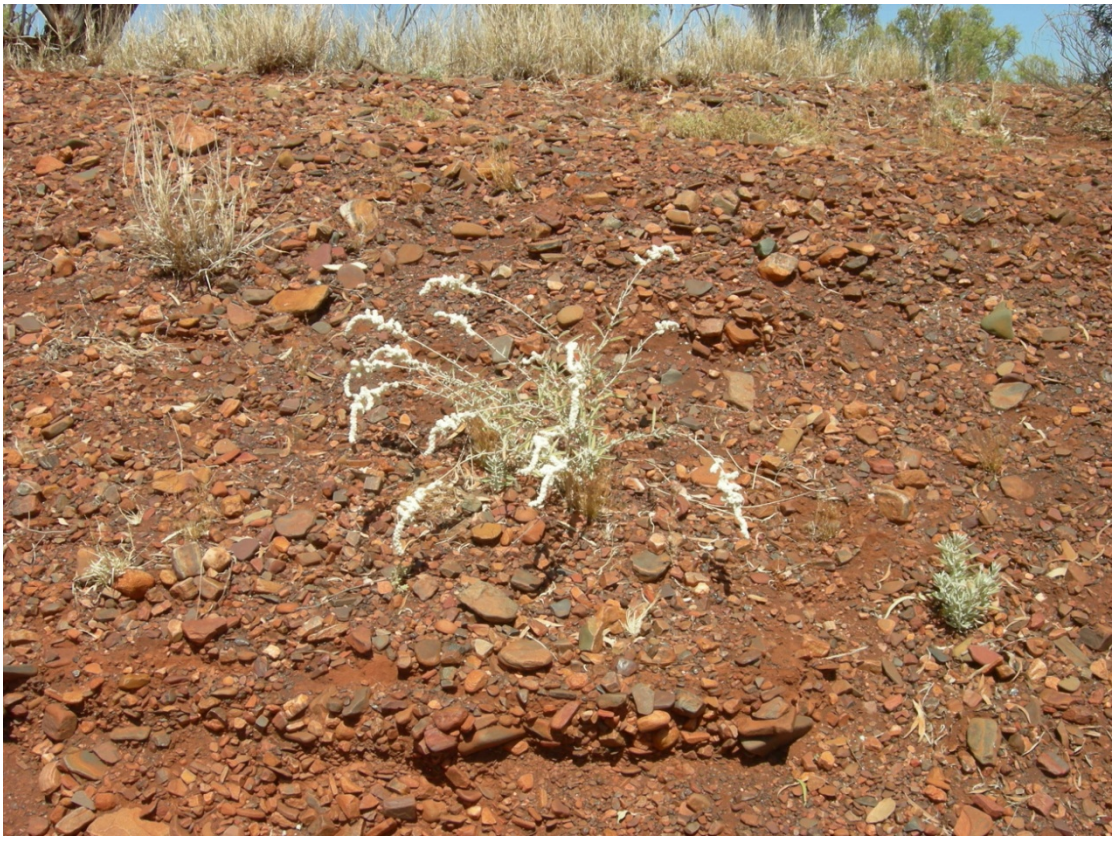

Plate 2 ***Aerva javanica* in flower.**

Argemone ochroleuca

**Argermone ochroleuca* (Mexican Poppy) is a spiny annual herb growing up to 1 m in height and flowering (white, cream or yellow) between February to March and July to November (Plate 3). This species grows on red, white and grey sand, or red brown clay loam along creeklines, river banks and roadsides. It is an aggressive colonizer originating from Mexico and has become a troublesome weed in parts of Western Australia.

**Argermone ochroleuca* was restricted to the gravelly riverbed of a major drainage line in the south-east corner of the Study area. Where present it was common, though a minor component of the larger vegetation association. It has previously been recorded along major drainage lines and associated floodplain and outwash plain habitats surrounding the Yandi Mine (Onshore Environmental 2011a).

Plate 3 **Argermone ochroleuca*.

Bidens bipinnata

Bidens bipinnata (Beggars Ticks) is an erect annual herb with a four-angled stem and deeply lobbed leaves (Plate 4). It grows up to 1 m in height and produces yellow flowers between March and September. The flower head develops a narrow black fruit with barbed awns at one end, which readily attach to clothing or the coats of grazing animals. This species is widespread throughout the Pilbara, particularly where domestic cattle are present. It favours moist habitats such as wetlands, drainage lines, floodplains and gorges and responds vigorously to rainfall.

Bidens bipinnata was recorded as scattered occurrences within the Study area preferring small groves of *Acacia aneura* frequented by cattle, as well as the overhang of rock ledges along disturbed cliff lines. It has previously been recorded extensively from surrounding areas including the Yandi Mine, where it shows a preference for minor, medium and major drainage lines (Onshore Environmental 2011a).

Plate 4 *Bidens bipinnata* **seedling in the shaded environment of a drainage line.**

Cenchrus ciliaris

Cenchrus ciliaris (Buffel Grass) is a tufted perennial grass introduced from the Middle East as a fodder species by pastoralists. Flowers are purple and are typically present for most of the year. It grows in dense tussocks up to 1 m tall and occurs in monospecific stands on loamy plains and creekline levee banks (Plate 5). It is an aggressive colonizing species that has become well established along road sides, creeks, river edges and various other habitats throughout the Pilbara, Gascoyne and Murchison regions of Western Australia, and is continuing to spread in the south west (Hussey *et al.* 1997).

Cenchrus ciliaris was common across the entire Study area with highest ground coverage provided along drainage lines, loamy floodplains, stony floodplains, sand dunes and other sites where soil disturbance occurred. It was especially dominant on floodplains adjacent to the major drainage line in the south-east of the Study area.

Plate 5 *Cenchrus ciliaris.*

*Cenchrus setiger

Cenchrus setiger (Birdwood Grass) is an erect tussocky, stoloniferous perennial grass that reaches up to 0.5 m in height with cream or purple flowers (between April and May) (Plate 6). It favours brown sand, red loam and pindan soils on sand dunes, plains, stoney hillsides and floodplains. It is distributed across Western Australia in areas north of Geralton (Hussey *et al.* 1997).

Cenchrus setiger typically occurred in association with *Cenchrus ciliaris,* but more restricted in distribution. It was almost completely confined to floodplains associated with the major drainage line in the south-east. Along with *Cenchrus ciliaris, *Cenchrus setiger* was usually a dominant component of the understory in these vegetation types.

Cenchrus setiger has previously been recorded from vegetation surrounding the Yandi Mine, associated with plains, floodplains, hill slopes and drainage lines on a variety of different soil types. It often occurred as a dominant ground cover species in association with *Cenchrus ciliaris* (Onshore Environmental 2011a).

Plate 6 ***Cenchrus setiger*** (photograph sourced from Florabase).

Sisymbrium orientale

**Sisymbrium orientale* (Indian Hedge Mustard) is found in the south-west of Western Australia as well as in the Pilbara. It is an erect, slender annual herb that grows to a height of 1 m in loamy soils over limestone or granite, and is usually found in rocky gullies, limestone ranges and along creek beds. It flowers (yellow) from January to December (Plate 7).

**Sisymbrium orientale* was recorded from a single location within the riverbed of the major drainage line in the south-east sector of the Study area. It has also been recorded recorded from a single location at the Yandi Mine, in close proximity to Marillana Creek (Maunsell 2003).

Plate 7 **Sisymbrium orientale.*

APPENDIX 9

Site sheets for quadrats assessed by Onshore Environmental in April and October 2011.

Site	ML - Site ML 01
Date	28/04/2011
Recorder	PS/GH
Photo	GH0080
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	725814
Northing	7494162
Habitat	Hillcrest (HCR)
Slope	Moderately Inclined (MO) (5°46' to 18°)
Aspect	30°
Soil	Sandy loam (brown)
Rock Type	Ironstone (cobbles, pebbles, outcropping)
% Leaves:Logs	<1:<1
Vegetation Condition	Excellent
Disturbance Type	None evident
Fire Age	
Vegetation	Open Hummock Grassland of Triodia wiseana, Triodia sp. Shovelanna Hill (S. Van Leeuwen 3835) with Open Shrubland of Acacia pruinocarpa, Grevillea wickhamii subsp. hispidula with Scattered Low Trees of Eucalyptus leucophloia subsp. lecuophloia, Corymbia ferriticola subsp. ferriticola

	Species		%Cover	Height
Acacia	*spondylophylla*		2.5	-2
Acacia	*pruinocarpa*		3	0.6
Capparis	*spinosa*	*var. nummularia*	<1	1
Cleome	*viscosa*		<1	0.3
Corymbia	*deserticola*	*subsp. deserticola*	<1	2-3
Cucumis	*maderaspatanus*		<1	Cl
Cymbopogon	*ambiguus*		<1	0.6
Dysphania	*rhadinostachya*	*subsp. rhadinostachya*	<1	0.05
Eriachne	*mucronata*		1	0.6
Eriachne	*pulchella*		<1	0.1
Eucalyptus	*leucophloia*	*subsp. leucophloia*	1	3-4
Eucalyptus	*gamophylla*		<1	2-5
Eucalyptus	*leucophloia*	*subsp. leucophloia*	<1	4
Fimbristylis	*simulans*		<1	0.3
Gomphrena	*cunninghamii*		<1	0.15
Grevillea	*wickhamii*	*subsp. hispidula*	2	1.5
Hakea	*chordophylla*		1	1-4
Newcastelia	*sp. Mt Windell (S. van Leeuwen 846)*		0.5	0.4
Ptilotus	*obovatus*		0.5	0.3
Senna	*glutinosa*	*subsp. glutinosa*	<1	0.6
Trichodesma	*zeylanicum*	*var. zeylanicum*	<1	0.1
Triodia	*sp. Shovelanna Hill (S. van Leeuwen 3835)*		5	1

Species			%Cover	Height
Triodia	*wiseana*		20	0.5
Triodia	*pungens*		<1	0.3
Triumfetta	*leptacantha*		<1	0.3

Site	ML - Site ML 02
Date	28/04/2011
Recorder	DB/JW
Photo	DB1
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	728800
Northing	7491842
Habitat	Hillslope (HSL)
Slope	Moderately Inclined (MO) (5°46' to 18°)
Aspect	130°
Soil	Loamy sand (red)
Rock Type	Ironstone
% Leaves:Logs	2:<1
Vegetation Condition	Excellent
Disturbance Type	Access track nearby
Fire Age	
Vegetation	Hummock Grassland of Triodia sp. Shovelanna Hill (S. Van Leeuwen 3835) wtih Low Open Woodland of Eucalyptus leucophloia subsp. leucophloia, Corymbia hamersleyana over High Open Shrubland of Grevillea wickhamii subsp. hispidula

	Species		%Cover	Height
Acacia	*hilliana*		2	0.6
Acacia	*arida*		<1	1.5
Calytrix	*carinata*		<1	1
Cleordendrum	*floribundum*		<1	1.5
Corymbia	*hamersleyana*		2	6-8
Cucumis	*maderaspatanus*		<1	Cl
Cymbopogon	*ambiguus*		<1	1.5
Cymbopogon	*procerus*		<1	0.5
Eriachne	*lanata*		<1	0.5
Eriachne	*mucronata*		<1	0.5
Eucalyptus	*leucophloia*	*subsp. leucophloia*	3	5
Euphorbia	*alsiniflora*		<1	0.3
Fimbristylis	*dichotoma*		<1	2
Gompholobium	*sp. Pilbara*		<1	1
Grevillea	*wickhamii*	*subsp. hispidula*	5	1-3
Oldenlandia	*crouchiana*		<1	0.1
Santalum	*lanceolatum*		<1	2
Senna	*glutinosa*	*subsp. glutinosa*	<1	1-2
Stackhousia	*muricata*		<1	<0.3
Tephrosia	*arenicola*		1	1-2
Triodia	*sp. Shovelanna Hill (S. van Leeuwen 3835)*		40	0.5
Triodia	*pungens*		<1	0.5
Triodia	*wiseana*		<1	0.5

Site	ML - Site ML 03
Date	28/04/11
Recorder	JB/EP
Photo	324
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	729528
Northing	7493199
Habitat	Minor drainage line
Slope	Gently Inlined
Aspect	SW
Soil	Red brown loam
Rock Type	BIF, ironstone
% Leaves:Logs	2.5:2.5
Vegetation Condition	Excellent
Disturbance Type	None
Fire Age	Very Old
Vegetation	Low Woodland of *Eucalyptus leucophloia* and *Corymbia hamersleyana* over High Shrubland of *Petalostylis labicheoides, Grevillea wickhamii* and *Acacia pruinocarpa* over Hummock Grassland of *Triodia pungens* and *Triodia* sp. Shovelanna Hill

	Species		%Cover	Height
Acacia	*spondylophylla*		2.5	1-1.5
Acacia	*pruinocarpa*		2.5	3-4
Acacia	*adoxa*	*var. adoxa*	0.5	0.3
Acacia	*pyrifolia*		0.5	2-3
Aristida	*holathera*	*var. holathera*	<1	0.4
Clerodendrum	*floribundum*	*var. angustifolium*	<1	0.3-0.4
Corchorus	*lasiocarpus*	*subsp. lasiocarpus*	<1	0.2
Corymbia	*hamersleyana*		3.5	2.5
Cucumis	*maderaspatanus*		<1	Cl
Cymbopogon	*ambiguus*		<1	0.5-1
Duperreya	*commixta*		<1	Cl
Eriachne	*mucronata*		<1	0.4
Eucalyptus	*leucophloia*	*subsp. leucophloia*	8	3-6
Eucalyptus	*gamophylla*		3	2-4
Grevillea	*wickhamii*	*subsp. hispidula*	4	2-4
Hibiscus	*coatesii*		<1	0.4-0.5
Jasminum	*didymum*	*subsp. lineare*	<1	0.5-1.5
Mirbelia	*viminalis*		<1	0.5-1
Oldenlandia	*crouchiana*		<1	0.15
Paspalidium	*clementii*		<1	0.1
Peripleura	*virgata*		<1	0.2
Petalostylis	*labicheoides*		5	2-3
Polygala	*isingii*		<1	0.05
Pterocaulon	*sphaeranthoides*		<1	0.1
Santalum	*lanceolatum*		0.5	2-3
Scaevola	*browniana*	*subsp. browniana*	<1	0.25

Species			%Cover	Height
Senna	*glutinosa*	*subsp. glutinosa*	1	1-2
Sida	*sp. Golden calyces glabrous (H.N. Foote 32)*		<1	0.1
Themeda	*triandra*		10	0.5
Trichodesma	*zeylanicum*	*var. zeylanicum*	<1	0.5
Triodia	*sp. Shovelanna Hill (S. van Leeuwen 3835)*		3	0.7
Triodia	*pungens*		50	0.5-1

Site	ML - Site ML 04
Date	28/04/2011
Recorder	PS/GH
Photo	GH0081
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	725469
Northing	7495238
Habitat	Drainage Depression (DDE)
Slope	
Aspect	
Soil	Sand (brown)
Rock Type	Mixed riverine gravel
% Leaves:Logs	3:5
Vegetation Condition	Degraded
Disturbance Type	Weeds
Fire Age	
Vegetation	Tussock Grassland of *Cencrhus ciliaris over Open Hummock Grassland of Triodia pungens with High Open Shrubland of Grevillea wickhamii subsp. hispidula, Clerodendrum floribundum var. angustifolium

	Species		%Cover	Height
**Cenchrus*	*ciliaris*		50	0.6
Abutilon	*dioicum*		<1	1.2
Abutilon	*cf. Cryptopetalum*		<1	0.3
Acacia	*tumida*	*var. pilbarensis*	1	0.8
Acacia	*inaequilatera*		<1	0.6
Amaranthus	*undulatas*		<1	0.4
Boerhavia	*coccinea*		1	GC
Cleome	*viscosa*		2	0.75
Clerodendrum	*floribundum*	*var. angustifolium*	2	3
Corchorus	*tridens*		<1	GC
Dysphania	*rhadinostachya*	*subsp. rhadinostachya*	<1	0.2
Enneapogon	*lindleyanus*		3	0.6
Enneapogon	*polyphyllus*		1	0.75
Eulalia	*aurea*		<1	0.4
Euphorbia	*alsiniflora*		<1	1.1
Gomphrena	*cunninghamii*		<1	0.3
Gossypium	*robinsonii*		<1	1
Grevillea	*wickhamii*	*subsp. hispidula*	4	4-6
Hybanthus	*aurantiacus*		<1	0.5
Indigofera	*monophylla*		1.5	0.6
Paraneurachne	*muelleri*		0.5	1
Polycarpaea	*longiflora*		<1	0.15
Ptilotus	*obovatus*		<1	0.4
Rhagodia	*eremaea*		<1	0.4
Santalum	*lanceolatum*		<1	0.8

Species			%Cover	Height
Senna	*artemisioides*	*subsp. oligophylla*	0.5	1.2
Tephrosia	*rosea*	*var. glabrior*	0.5	0.8
Trachymene	*oleracea*		<1	0.3
Trachymene	*oleracea*		<1	0.15
Tribulus	*macrocarpus*		<1	GC
Trichodesma	*zeylanicum*	*var. zeylanicum*	<1	0.4
Triodia	*pungens*		10	0.5
Triodia	*sp. Shovelanna Hill (S. van Leeuwen 3835)*		<1	0.4

Site	ML - Site ML 05
Date	28/04/2011
Recorder	DB5DB/JW
Photo	DB5
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	728559
Northing	7462693
Habitat	Hillslope (HSL)
Slope	Moderately Inclined (MO) (5°46' to 18°)
Soil	Loamy sand (red)
Rock Type	Ironstone (outcropping)
% Leaves:Logs	10:<1
Vegetation Condition	Excellent
Disturbance Type	None Evident
Fire Age	
Vegetation	Hummock Grassland of Triodia sp. Shovelanna Hill (S. Van Leeuwen 3835), Triodia pungens with Low Woodland of Eucalyptus leucophloia subsp. leucophloia over Shrubland of Acacia arida, Grevillea wickhamii subsp. hispidula

Species			%Cover	Height
Acacia	arida		20	1-2
Acacia	pruinocarpa		<1	1-2
Acacia	maitlandii		<1	1.8
Aristida	holathera	var. holathera	<1	0.5
Cleome	viscosa		<1	0.5
Clerodendrum	floribundum	var. angustifolium	<1	3
Corchorus	lasiocarpus	subsp. lasiocarpus	<1	0.5
Corymbia	hamersleyana		<1	5
Cymbopogon	procerus		0.5	0.2
Eriachne	pulchella		<1	0.2
Eucalyptus	leucophloia	subsp. leucophloia	15	<10
Eucalyptus	gamophylla		<1	3
Fimbristylis	dichotoma		<1	0.3
Goodenia	stobbsiana		<1	0.1
Grevillea	wickhamii	subsp. hispidula	3	1-5
Hakea	chordophylla		<1	4-5
Jasminum	didymum	subsp. lineare	<1	1.5
Oldenlandia	crouchiana		<1	0.1
Polycarpaea	holtzei		<1	0.1
Polycarpaea	longiflora		<1	0.3
Ptilotus	calostachyus		<1	0.2
Scaevola	browniana	subsp. browniana	<1	0.5
Senna	glutinosa	subsp. glutinosa	<1	1.8
Triodia	sp. Shovelanna Hill (S. van Leeuwen 3835)		45	0.5
Triodia	pungens		10	<1

Site	ML - Site ML 06
Date	28/04/2011
Recorder	JB/EP
Photo	325
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	729503
Northing	7492384
Habitat	Hillcrest (HCR)
Slope	Gently Inclined (GE) (1°46' to 5°45')
Aspect	330°
Soil	Silty loam (red)
Rock Type	Ironstone (cobbles, pebbles)
% Leaves:Logs	0.5:<1
Vegetation Condition	Excellent
Disturbance Type	Access track nearby; Old CALM survey peg nearby (200m track)
Fire Age	
Vegetation	Closed Hummock Grassland of Triodia sp. Shovelanna Hill (S. Van Leeuwen 3835) with Low Shrubland of Acacia hilliana, Tephrosia arenicola, Acacia adoxa var. adoxa with Very Open Mallee of Eucalyptus gamophylla

	Species		%Cover	Height
Acacia	*hilliana*		8	0.3
Acacia	*adoxa*	*var. adoxa*	2	0.3
Acacia	*spondylophylla*		0.5	0.4
Corymbia	*hamersleyana*		<1	2-3
Eucalyptus	*gamophylla*		8	2-4
Eucalyptus	*leucophloia*	*subsp. leucophloia*	1.5	2-4
Fimbristylis	*dichotoma*		<1	0.2
Grevillea	*wickhamii*	*subsp. hispidula*	1	2-3
Hakea	*chordophylla*		1	3-5
Petalostylis	*labicheoides*		<1	1-2
Scaevola	*browniana*	*subsp. browniana*	<1	0.3
Stackhousia	*intermedia*		<1	0.3
Tephrosia	*arenicola*		3	0.5-1
Triodia	*sp. Shovelanna Hill (S. van Leeuwen 3835)*		72	0.5

Site	ML - Site ML 07
Date	28/04/2011
Recorder	PS/GH
Photo	GH0082
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	724757
Northing	7495474
Habitat	Gully (GUL)
Slope	Steep (ST) (18°1' to 30°)
Aspect	220°
Soil	Sandy loam (brown)
Rock Type	Ironstone (boulders, cobbles, pebbles, outcropping)
% Leaves:Logs	0.5:0.5
Vegetation Condition	Very Good
Disturbance Type	Fire (2-5yrs)
Fire Age	Moderate 2-5 yrs
Vegetation	Open Hummock Grassland of Triodia sp. Shovelanna Hill (S. Van Leeuwen 3835), Triodia pungens with Low Open Woodland of Eucalyptus leucophloia subsp. leucophloia, Corymbia hamersleyana over Low Open Shrubland of Sida sp. Golden calyces glabrous (H.N. Foote 32) , Gossypium robinsonii

	Species		%Cover	Height
Acacia	*pruinocarpa*		<1	0.5
Aristidea	*inaequilumis*		<1	0.5
Cleome	*viscosa*		<1	0.3
Corchorus	*lasiocarpus*	*subsp. lasiocarpus*	<1	0.3
Corymbia	*deserticola*	*subsp. deserticola*	<1	2
Corymbia	*hamersleyana*		<1	2-4
Cymbopogon	*ambiguus*		1	0.4
Dampiera	*candicans*		<1	0.4
Dysphania	*rhadinostachya*	*subsp. rhadinostachya*	<1	0.05
Eriachne	*mucronata*		0.5	0.4
Eucalyptus	*leucophloia*	*subsp. leucophloia*	2.5	5-6
Eucalyptus	*gamophylla*		0.5	3
Gomphrena	*cunninghamii*		<1	0.1
Gossypium	*robinsonii*		1	0.4-1
Grevillea	*wickhamii*	*subsp. hispidula*	<1	0.5
Hakea	*chordophylla*		<1	1.5
Hibiscus	*sturtii*	*var. campylochlamys*	<1	0.4
Hibiscus	*coatesii*		1	0.3-1
Ptilotus	*exaltatus*	*var. exaltatus*	<1	0.3
Ptilotus	*obovatus*		<1	0.4
Ptilotus	*calostachyus*		<1	0.3
Senna	*glutinosa*	*subsp. glutinosa*	<1	0.6
Senna	*glutinosa*	*subsp. glutinosa*	<1	1.5
Sida	*sp. Golden calyces*		2	0.2

Species			%Cover	Height
	glabrous (H.N. Foote 32)			
Solanum	*lasiophyllum*		<1	0.4
Stylobasium	*spathulatum*		0.5	3
Trachymene	*oleracea*		<1	0.15
Triodia	*sp. Shovelanna Hill (S. van Leeuwen 3835)*		12	0.5
Triodia	*pungens*		4	0.4

Site	ML - Site ML 08
Date	28/04/2011
Recorder	DB/JW
Photo	DB8
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	727733
Northing	7492123
Habitat	Hillcrest (HCR)
Slope	Gently Inclined (GE) (1°46' to 5°45')
Aspect	180°
Soil	Loamy sand (red)
Rock Type	Ironstone (cobbles, pebbles)
% Leaves:Logs	3:<1
Vegetation Condition	Excellent
Disturbance Type	Access track nearby
Fire Age	
Vegetation	Hummock Grassland of Triodia sp. Shovelanna Hill (S. Van Leeuwen 3835) with Low Shrubland of Acacia hilliana, Acacia adoxa with Low Open Woodland of Eucalyptus leucophloia subsp. leucophloia, Corymbia hamersleyana over Scattered Mallees of Eucalyptus gamophylla

	Species		%Cover	Height
Acacia	*hilliana*		10	0.5
Acacia	*adoxa*		6	0.5
Amphipogon	*sericeus*		<1	0.5
Aristida	*holathera*	*var. holathera*	<1	0.2
Corchorus	*lasiocarpus*	*subsp. lasiocarpus*	<1	0.6
Corymbia	*hamersleyana*		3	2-5
Cymbopogon	*procerus*		<1	0.7
Eriachne	*pulchella*		<1	0.1
Eucalyptus	*leucophloia*	*subsp. leucophloia*	2	<10
Eucalyptus	*gamophylla*		1	4
Gompholobium	*sp. Pilbara*		0.5	0.8
Goodenia	*triodiophila*		<1	0.7
Grevillea	*wickhamii*	*subsp. hispidula*	1.5	1-4
Hakea	*chordophylla*		2	1-3
Hybanthus	*aurantiacus*		<1	0.3
Ptilotus	*calostachyus*		<1	1
Scaevola	*browniana*	*subsp. browniana*	<1	0.5
Senna	*glutinosa*	*subsp. glutinosa*	<1	1-2
Stackhousia	*muricata*		<1	0.1
Stylobasium	*spathulatum*		<1	1.6
Tephrosia	*arenicola*		<1	1.5
Triodia	*sp. Shovelanna Hill (S. van Leeuwen 3835)*		55	0.5
Triodia	*pungens*		1	0.6

Site	ML - Site ML 09
Date	28/04/2011
Recorder	JB/EP
Photo	326
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	730791
Northing	7492234
Habitat	Hillslope (HSL)
Slope	Steep (ST) (18°1' to 30°)
Aspect	20°
Soil	Loamy sand (red)
Rock Type	Ironstone (outcrops, boulders, cobbles)
% Leaves:Logs	5:1.5
Vegetation Condition	Excellent
Disturbance Type	None evident
Fire Age	
Vegetation	Hummock Grassland of Triodia wiseana with Open Shrubland of Acacia arida over Scattered Tussock Grass of Paspalidium tabulatum, Cymbopogon ambiguus, Eriachne mucronata

	Species		%Cover	Height
Acacia	*arida*		6	1-2
Aristida	*holathera*	*var. holathera*	<1	0.4
Cleome	*viscosa*		<1	0.5-1
Corchorus	*lasiocarpus*	*subsp. lasiocarpus*	<1	0.2
Cucumis	*maderaspatanus*		<1	Cl
Cymbopogon	*ambiguus*		<1	1.2
Dysphania	*rhadinostachya*		<1	0.15
Enneapogon	*polyphyllus*		<1	0.2
Eriachne	*mucronata*		<1	0.4
Eriachne	*pulchella*		<1	0.2
Eucalyptus	*leucophloia*	*subsp. leucophloia*	<1	2-3
Euphorbia	*schultzii*		<1	0.1
Ficus	*brachypoda*		<1	2.5
Fimbristylis	*dichotoma*		<1	0.2
Gomphrena	*cunninghamii*		<1	0.3
Goodenia	*stobbsiana*		<1	0.1
Paspalidium	*tabulatum*		<1	0.2
Peripleura	*virgata*		0.5	0.3
Polycarpaea	*holtzei*		<1	0.05
Polygala	*isingii*		<1	0.05
Polycarpaea	*longiflora*		<1	0.35
Ptilotus	*polystachyus*		<1	0.5-1
Ptilotus	*exaltatus*	*var. exaltatus*	<1	0.5
Ptilotus	*fusiformis*		<1	0.35
Senna	*glutinosa*	*subsp. glutinosa*	<1	1-1.5
Tinospora	*smilacina*		<1	Cl
Trachymene	*oleracea*		<1	0.5

Species			%Cover	Height
Trichodesma	*zeylanicum*	*var. zeylanicum*	<1	0.3
Triodia	*wiseana*		30	1-1.3
Triodia	*sp. Shovelanna Hill (S. van Leeuwen 3835)*		2	0.5
Triumfetta	*maconochieana*		0.5	0.4

Site	ML - Site ML 10
Date	28/04/2011
Recorder	PS/GH
Photo	GH0083
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	724969
Northing	7494713
Habitat	Footslope (FOO)
Slope	Gently Inclined (GE) (1°46' to 5°45')
Aspect	320°
Soil	Sandy loam (brown)
Rock Type	Ironstone (cobbles, pebbles)
% Leaves:Logs	1:<1
Vegetation Condition	Very Good
Disturbance Type	Fire (2-5yrs)
Fire Age	Moderate 2-5 yrs
Vegetation	High Open Shrubland of Grevillea wickhamii subsp. hispidula, Acacia tumida var. pilbarensis, Acacia inaequilatera over Low Open Shrubland of Acacia spondylophylla, Ptilotus calostachyus, Corchorus lasiocarpus subsp. lasiocarpus over Very Open Hummock Grassland of Trioda sp. Shovelanna Hill (S. Van Leeuwen 3835)

	Species		%Cover	Height
Acacia	*inaequilatera*		1	2-3
Acacia	*spondylophylla*		3	0.4
Acacia	*tumida*	*var. pilbarensis*	2	1.5-2
Aristida	*holathera*	*var. holathera*	<1	0.4
Corchorus	*lasiocarpus*	*subsp. lasiocarpus*	1.5	0.4
Dampiera	*candicans*		0.5	0.5
Eriachne	*pulchella*		<1	0.2
Eriachne	*aristidea*		<1	0.15
Eucalyptus	*gamophylla*		1	1
Eucalyptus	*leucophloia*	*subsp. leucophloia*	0.5	3-4
Fimbristylis	*simulans*		1	0.1
Goodenia	*stobbsiana*		<1	0.2
Grevillea	*wickhamii*	*subsp. hispidula*	6	1-3
Hibiscus	*sturtii*		<1	0.3
Polycarpaea	*holtzei*		<1	0.05
Ptilotus	*calostachyus*		2	0.8
Ptilotus	*fusiformis*		<1	0.5
Ptilotus	*exaltatus*	*var. exaltatus*	<1	0.2
Scaevola	*browniana*	*subsp. browniana*	<1	0.4
Senna	*artemisioides*	*subsp. oligophylla*	<1	0.5
Senna	*glutinosa*	*subsp. pruinosa*	<1	0.7
Senna	*glutinosa*	*subsp. glutinosa*	<1	1.8
Sida	*Sida sp. spiciform panicles (E. Leyland*		<1	2

Species			%Cover	Height
	s.n. 14/8/90)			
Tephrosia	*arenicola*		1.5	0.6
Triodia	*sp. Shovelanna Hill (S. van Leeuwen 3835)*		5	0.4
Triodia	*pungens*		2	0.6

Site	ML - Site ML 11
Date	28/04/2011
Recorder	DB/JW
Photo	DB9
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	726916
Northing	7493337
Habitat	Gully (GUL)
Slope	Steep (ST) (18°1' to 30°)
Aspect	270°
Soil	Loamy sand (red)
Rock Type	Ironstone (skeletal – cliff face)
% Leaves:Logs	5:3
Vegetation Condition	Excellent
Disturbance Type	Track nearby
Fire Age	
Vegetation	Low Woodland of Eucalyptus leucophloia subsp. leucophloia, Brachychiton acuminatus, Corymbia hamersleyana over Open Hummock Grassland of Triodia wiseana with High Open Shrubland of Santalum lanceolatum, Grevillea wickhamii subsp. hispidula

	Species		%Cover	Height
**Bidens*	*bipinnata*		<1	1
Acacia	*maitlandii*		1.5	2-3
Aristida	*holathera*	*var. holathera*	<1	0.5
Brachychiton	*acuminatus*		2	8
Cheilanthes	*sieberi*	*subsp. sieberi*	<1	0.1
Cleome	*viscosa*		1.5	0.8
Clerodendrum	*floribundum*	*var. angustifolium*	<1	0.5
Corymbia	*hamersleyana*		2	<10
Cucumis	*maderaspatanus*		<1	Cl
Cymbopogon	*ambiguus*		<1	0.6
Cynanchum	*floribundum*		<1	0.2
Cynanchum	*floribundum*		<1	Cr
Enneapogon	*polyphyllus*		<1	0.1
Eriachne	*pulchella*		<1	0.1
Eriachne	*mucronata*		<1	0.5
Eucalyptus	*leucophloia*	*subsp. leucophloia*	20	<10
Euphorbia	*schultzii*		<1	0.2
Fimbristylis	*dichotoma*		0.5	0.1
Gomphrena	*cunninghamii*		1	0.3
Gossypium	*robinsonii*		<1	0.5
Grevillea	*wickhamii*	*subsp. hispidula*	2	2-4
Indigofera	*fractiflexa Peter G. Wilson & Rowe ms*		<1	0.5
Jasminum	*didymum*	*subsp. lineare*	<1	1
Paspalidium	*clementii*		<1	0.5
Peripleura	*virgata*		<1	0.5

Species			%Cover	Height
Polycarpaea	*longiflora*		0.5	0.5
Ptilotus	*obovatus*		<1	0.5
Santalum	*lanceolatum*		6	2-4
Senna	*notabilis*		<1	0.3
Sida	*echinocarpa*		<1	0.2
Stemodia	*grossa*		0.5	0.5
Trachymene	*oleracea*		<1	0.5
Trichodesma	*zeylanicum*	*var. zeylanicum*	<1	0.5
Triodia	*wiseana*		15	<1

Site	ML - Site ML 12
Date	29/04/2011
Recorder	PS/GH
Photo	GH0084
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	728516
Northing	7494567
Habitat	Drainage Depression (DDE)
Slope	Very Gently Inclined (VG) (0°36' to 1°45')
Aspect	330°
Soil	Loamy sand (brown)
Rock Type	Mixed riverine gravel
% Leaves:Logs	5:3
Vegetation Condition	Degraded
Disturbance Type	Weeds
Fire Age	
Vegetation	Tuusock Grassland of *Cenchrus ciliaris, Cymbopogon obtectus with High Open Shrubland of Acacia pyrifolia over Low Open Shrubland of Corchorus crozophorifolius, Cleome viscosa, Indigofera monophylla over Very Open Humock Grassland of Triodia pungens

	Species		%Cover	Height
**Aerva*	*javanica*		<1	0.5
**Cenchrus*	*ciliaris*		25	0.5
Abutilon	*dioicum*		<1	1.2
Acacia	*pyrifolia*		5	2-4
Acacia	*pruinocarpa*		1	2-5
Acacia	*maitlandii*		0.5	3
Atalaya	*hemiglauca*		0.5	6
Boerhavia	*coccinea*		<1	0.1
Capparis	*spinosa*	*var. nummularia*	<1	1
Cleome	*viscosa*		1.5	0.8
Corchorus	*crozophorifolius*		2	1
Corymbia	*hamersleyana*		<1	6
Cucumis	*maderaspatanus*		0.5	Cl
Cymbopogon	*obtectus*		10	1
Cynanchum	*floribundum*		<1	GC
Eucalyptus	*victrix*		1	7-10
Euphorbia	*alsiniflora*		<1	0.5
Gomphrena	*cunninghamii*		0.5	0.25
Goodenia	*stobbsiana*		<1	0.3
Gossypium	*robinsonii*		<1	1.5
Grevillea	*wickhamii*	*subsp. hispidula*	<1	2
Indigofera	*monophylla*		2	0.5
Wedelia	*sp. Hamersley Range (A. S. Weston 8444)*		<1	1.2
Euphorbia	*schultzii*		<1	GC
Phyllanthus	*maderaspatensis*		<1	0.4

Species			%Cover	Height
Polycarpaea	*longiflora*		0.5	0.3
Ptilotus	*obovatus*		<1	0.3
Senna	*artemisioides*	*subsp. helmsii*	<1	1
Senna	*notabilis*		<1	0.4
Senna	*artemisioides*	*subsp. oligophylla*	<1	0.7
Tephrosia	*rosea*	*var. glabrior*	<1	0.4
Themeda	*triandra*		<1	0.5
Trichodesma	*zeylanicum*	*var. zeylanicum*	0.5	0.5
Triodia	*basedowii*		<1	0.8
Triodia	*pungens*		<1	0.6
Triumfetta	*maconochieana*		<1	0.5

Site	ML - Site ML 13
Date	29/04/2011
Recorder	JB/EP
Photo	327
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	730417
Northing	7494614
Habitat	Drainage Depression (DDE)
Slope	Gently Inclined (VG) (0°36' to 1°45')
Aspect	90°
Soil	Silty loam (red)
Rock Type	Ironstone (outcrops, boulders, cobbles)
% Leaves:Logs	8:15
Vegetation Condition	Very Good
Disturbance Type	Lots of access tracks nearby; Drill pads nearby
Fire Age	
Vegetation	Open Scrub of Acacia tumida var. pilbarensis, Grevillea wickhamii subsp. hispidula over Open Hummock Grassland of Triodia pungens, Triodia sp. Shovelanna Hill (S. Van Leeuwen 3835) over Scattered Low Trees of Corymbia hamersleyana

	Species		%Cover	Height
Acacia	*tumida*	*var. pilbarensis*	35	3-4
Acacia	*adoxa*	*var. adoxa*	<1	0.5
Acacia	*pruinocarpa*		<1	1-2
Acacia	*bivenosa*		0.5	1-2
Acacia	*inaequilatera*		<1	2-3
Aristida	*holathera*	*var. holathera*	<1	0.4
Corymbia	*hamersleyana*		1.5	6
Cymbopogon	*ambiguus*		<1	0.5-1
Dodonaea	*coriacea*		<1	1-1.5
Eriachne	*mucronata*		0.5	0.5
Eucalyptus	*leucophloia*	*subsp. leucophloia*	0.5	3-4
Eucalyptus	*gamophylla*		2.5	2-4
Gomphrena	*cunninghamii*		<1	0.2
Gossypium	*robinsonii*		<1	2-3
Grevillea	*wickhamii*	*subsp. hispidula*	20	3-4
Hybanthus	*aurantiacus*		<1	0.4
Indigofera	*monophylla*		<1	0.5
Mirbelia	*viminalis*		<1	1
Oldenlandia	*crouchiana*		<1	0.1
Paraneurachne	*muelleri*		2	0.5
Paspalidium	*clementii*		<1	0.1
Ptilotus	*fusiformis*		<1	0.2
Ptilotus	*calostachyus*		<1	0.2
Santalum	*lanceolatum*		0.5	2
Schizachyrium	*fragile*		<1	0.5
Senna	*glutinosa*	*subsp. glutinosa*	1	1-2

Species			%Cover	Height
Senna	*artemisioides*	*subsp. oligophylla*	<1	1.5
Trachymene	*oleracea*		<1	0.2
Trichodesma	*zeylanicum*	*var. zeylanicum*	<1	0.2
Triodia	*pungens*		20	1-1.2
Triodia	*sp. Shovelanna Hill (S. van Leeuwen 3835)*		7	0.5

Site	ML - Site ML 14
Date	29/04/2011
Recorder	PS/GH
Photo	GH0086
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	728534
Northing	7493610
Habitat	Cliff (CLI)
Slope	Precipitous (PR) (45°1' to 72°)
Aspect	120°
Soil	Sandy loam (brown)
Rock Type	Ironstone (cobbles, pebbles, scree, outcropping)
% Leaves:Logs	<1:<1
Vegetation Condition	Pristine
Disturbance Type	None evident
Fire Age	
Vegetation	Very Open Hummock Grassland of Triodia wiseana over Very Open Tussock Grassland of Enneapogon lindleyanus, Cymbopogon ambiguus, Aristida contorta with Low Open Shrubland of Corchorus laniflorus, Stylobasium spathulatum, Ptilotus obovatus

	Species		%Cover	Height
Acacia	*pruinocarpa*		2	2-4
Aristida	*burbidgeae*		2	0.4
Corchorus	*laniflorus*		1	0.6
Corymbia	*ferriticola*	*subsp. ferriticola*	<1	1.5
Cucumis	*maderaspatanus*		<1	Cl
Cymbopogon	*ambiguus*		2	0.7
Dodonaea	*pachyneura*		0.5	2-3
Dysphania	*rhadinostachya*		<1	0.1
Ehretia	*saligna*		0.5	3
Enneapogon	*lindleyanus*		2	0.3
Eremophila	*longifolia*		0.5	1
Eremophila	*tietkensii*		<1	0.6
Eriachne	*mucronata*		1.5	0.4
Wedelia	*sp. Hamersley Range (A. S. Weston 8444)*		1	0.6
Ficus	*brachypoda*		1	4-6
Fluegga	*virosa*	*subsp. melanthoides*	<1	3-4
Gomphrena	*cunninghamii*		<1	0.25
Grevillea	*wickhamii*	*subsp. hispidula*	<1	2
Fimbristylis	*dichotoma*		<1	0.3
Paspalidium	*tabulatum*		<1	0.25
Phyllanthus	*reticulatus*		1	3-4
Polycarpaea	*longiflora*		<1	0.3
Ptilotus	*obovatus*		1	0.5
Ptilotus	*calostachyus*		<1	0.3

Species			%Cover	Height
Triodia	*brizoides*		<1-	0.7
Triodia	*wiseana*		8	0.7

Site	ML - Site ML 15
Date	29/04/2011
Recorder	JB/EP
Photo	
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	730783
Northing	7493499
Habitat	Flood-out (FLD)
Slope	Very Gently Inclined (VG) (0°36' to 1°45')
Aspect	100°
Soil	Silty loam (brown)
Rock Type	Ironstone (pebbles, cobbles, scattered boulders)
% Leaves:Logs	<1:3.5
Vegetation Condition	Excellent
Disturbance Type	Fire (2-5yrs)
Fire Age	Moderate 2-5 yrs
Vegetation	Closed Hummock Grassland of Triodia pungens with Scattered Shrubs of Senna artemisioides subsp. oligophylla. Grevillea wickhamii subsp. hispidula ovr Scattered Low Shrubs of Indigofera monophylla, Cleoma viscosa

	Species		%Cover	Height
Acacia	*pyrifolia*		<1	2.5
Atalaya	*hemiglauca*		<1	1-2
Boerhavia	*coccinea*		<1	0.3 Cr
Bulbostylis	*barbata*		<1	0.2
Cleome	*viscosa*		<1	0.4
Cucumis	*maderaspatanus*		<1	Cl
Eriachne	*mucronata*		<1	0.35
Eriachne	*pulchella*		<1	0.1
Gossypium	*robinsonii*		<1	1
Grevillea	*wickhamii*	*subsp. hispidula*	<1	2
Indigofera	*monophylla*		0.5	0.5-1
Mollugo	*molluginea*		<1	0.2
Paspalidium	*clementii*		<1	0.15
Phyllanthus	*maderaspatensis*		<1	0.2
Senna	*glutinosa*	*subsp. glutinosa*	<1	1
Senna	*glutinosa*	*subsp. pruinosa*	<1	1.5
Senna	*artemisioides*	*subsp. oligophylla*	0.5	0.5
Senna	*notabilis*		<1	0.2
Senna	*venusta*		<1	0.4
Stylobasium	*spathulatum*		<1	1
Tephrosia	*densa*		<1	0.4
Trachymene	*oleracea*		<1	0.3
Trichodesma	*zeylanicum*	*var. zeylanicum*	<1	0.5
Triodia	*pungens*		85	0.5-1

Site	ML - Site ML 16
Date	29/04/2011
Recorder	JB/EP
Photo	
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	730783
Northing	7493499
Habitat	Flood-out (FLD)
Slope	Very Gently Inclined (VG) (0°36' to 1°45')
Aspect	100°
Soil	Silty loam (brown)
Rock Type	Ironstone (pebbles, cobbles, scattered boulders)
% Leaves:Logs	<1:3.5
Vegetation Condition	Excellent
Disturbance Type	Fire (2-5yrs)
Fire Age	Moderate 2-5 yrs
Vegetation	Closed Hummock Grassland of Triodia pungens with Scattered Shrubs of Senna artemisioides subsp. oligophylla. Grevillea wickhamii subsp. hispidula ovr Scattered Low Shrubs of Indigofera monophylla, Cleoma viscosa

	Species		%Cover	Height
Cleome	*viscosa*		<1	0.4
Corchorus	*lasiocarpus*	*subsp. lasiocarpus*	1	0.5
Cymbopogon	*ambiguus*		<1	0.7
Dysphania	*rhadinostachya*		<1	0.15
Eremophila	*tietkensii*		0.5	0.7
Eriachne	*pulchella*		<1	0.2
Eriachne	*mucronata*		<1	0.3
Euphorbia	*schultzii*		<1	GC
Gomphrena	*cunninghamii*		<1	0.25
Hibiscus	*coatesii*		<1	0.5
Polycarpaea	*longiflora*		<1	0.4
Ptilotus	*obovatus*		<1	0.5
Triodia	*brizoides*		30	0.5
Triodia	*wiseana*		0.5	0.4

Site	ML - Site ML 17
Date	29/04/2011
Recorder	JB/EP
Photo	328
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	731717
Northing	7493254
Habitat	Hillslope (HSL)
Slope	Steep (ST) (18°1' to 30°)
Aspect	120°
Soil	Loamy sand (red)
Rock Type	Ironstone (outcropping, boulders, cobbles)
% Leaves:Logs	0.5:2
Vegetation Condition	Excellent
Disturbance Type	Old access tracks nearby
Fire Age	
Vegetation	Hummock Grassland of Triodia sp. Shovelanna Hill (S. Van Leeuwen 3835) with Low Open Woodland of Eucalyptus leucophloia subsp. leucophloia over Open Shrubland of Acacia bivenosa

	Species		%Cover	Height
Acacia	*bivenosa*		5.5	1-2
Acacia	*pruinocarpa*		<1	1-2
Sauropus	*sp. Koodaiden detritals (J. Naaykens & J. Hurter JH11213)*		<1	0.5
Calytrix	*carinata*		0.5	0.5-1
Dampiera	*candicans*		<1	0.4
Dodonaea	*coriacea*		<1	0.3
Eriachne	*mucronata*		1	0.4
Eriachne	*lanata*		<1	3
Eriachne	*pulchella*		<1	0.2
Eucalyptus	*leucophloia*	*subsp. leucophloia*	3.5-4	3-7
Goodenia	*stobbsiana*		<1	0.1
Grevillea	*wickhamii*	*subsp. hispidula*	1	2-3
Hakea	*chordophylla*		<1	0.5
Paspalidium	*clementii*		<1	0.2
Ptilotus	*calostachyus*		<1	0.4
Ptilotus	*exaltatus*	*var. exaltatus*	<1	0.05
Senna	*ferraria*		<1	2
Senna	*glutinosa*	*subsp. glutinosa*	<1	1-2
Senna	*ferraria*		<1	0.5-1
Tribulus	*suberosus*		<1	0.3
Triodia	*sp. Shovelanna Hill (S. van Leeuwen 3835)*		45	0.5
Triodia	*pungens*		<1	0.5

Site	ML - Site ML 18
Date	29/04/11
Recorder	PS/GH
Photo	0089
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	727517
Northing	7494268
Habitat	Hill crest
Slope	Gently Inlined
Aspect	N
Soil	Brown sandy loam
Rock Type	Ironstone cobbles and pebbles
% Leaves:Logs	1:<1
Vegetation Condition	Pristine
Disturbance Type	None
Fire Age	Very Old
Vegetation	Hummock Grassland of *Triodia* sp. Shovelanna Hill with Low Shrubland of *Acacia hilliana, Acacia spondylophylla* and *Acacia adoxa* var. *adoxa* with Very Open Mallee of *Eucalyptus gamophylla* and *Eucalyptus kingsmillii*

	Species		%Cover	Height
Acacia	*spondylophylla*		6	0.7
Acacia	*hilliana*		10	0.3
Acacia	*adoxa*	*var. adoxa*	2	0.3
Acacia	*pyrifolia*		<1	3
Acacia	*pruinocarpa*		<1	2
Acacia	*bivenosa*		<1	1.5
Acacia	*rhodophloia*		<1	2.5
Corymbia	*hamersleyana*		<1	2
Eucalyptus	*leucophloia*	*subsp. leucophloia*	5	3-5
Eucalyptus	*gamophylla*		4	3-4
Eucalyptus	*kingsmillii*	*subsp. kingsmillii*	1.5	2-3
Grevillea	*wickhamii*	*subsp. hispidula*	8	2-3
Hakea	*chordophylla*		1	2-3
Mirbelia	*viminalis*		<1	0.5
Scaevola	*browniana*	*subsp. browniana*	<1	0.2
Triodia	*sp. Shovelanna Hill (S. van Leeuwen 3835)*		40	0.5

Site	ML - Site ML 19
Date	30/04/2011
Recorder	DB/JW
Photo	DB32
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	730950
Northing	7490962
Habitat	Hillslope (HSL)
Slope	Steep (ST) (18°1' to 30°)
Aspect	170°
Soil	Sandy loam (brown)
Rock Type	Ironstone (outcropping)
% Leaves:Logs	5:4
Vegetation Condition	Excellent
Disturbance Type	None evident
Fire Age	
Vegetation	Hummock Grassland of Triodia sp. Shovelanna Hill (S. Van Leeuwen 3835), Triodia pungens with Low Woodland of Eucalyptus leucophloia subsp. leucophloia over Low Shrubland of Acacia spondylophylla, Acacia arida

	Species		%Cover	Height
Acacia	*pyrifolia*		<1	2-4
Acacia	*arida*		5	1
Acacia	*spondylophylla*		30	<1
Acacia	*pruinocarpa*		<1	1-2
Corchorus	*lasiocarpus*	*subsp. lasiocarpus*	<1	0.6
Corymbia	*hamersleyana*		<1	2-5
Eriachne	*mucronata*		<1	0.5
Eucalyptus	*leucophloia*	*subsp. leucophloia*	5	3-8
Eucalyptus	*gamophylla*		8	2-4
Goodenia	*cusackiana*		<1	0.1
Grevillea	*wickhamii*	*subsp. hispidula*	1	1-4
Ptilotus	*calostachyus*		<1	1.2
Tephrosia	*arenicola*		<1	1.2
Triodia	*sp. Shovelanna Hill (S. van Leeuwen 3835)*		40	0.6
Triodia	*pungens*		20	<1

Site	ML - Site 20
Date	30/04/2011
Recorder	PS/GH
Photo	GH0090
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	733421
Northing	7490962
Habitat	Drainage Depression (DDE)
Slope	Moderately Inclined (MO) (5°46' to 18°)
Aspect	0°
Soil	Sandy loam (brown)
Rock Type	Ironstone (cobbles, pebbles, boulders, outcropping – cliffline adjacent)
% Leaves:Logs	1:1
Vegetation Condition	Excellent
Disturbance Type	Fire (5-10yrs)
Fire Age	Old 5-10 yrs
Vegetation	Open Hummock Grassland of Triodia pungens, Trioida wiseana with Low Open Woodland of Eucalyptus leucophloia subsp. leucophloia with High Open Shrubland of Petalostylis labicheoides, Grevillea wickhamii subsp. hispidula, Acacia inaequilatera

	Species		%Cover	Height
Acacia	*spondylophylla*		<1	0.6
Acacia	*pruinocarpa*		1	2-4
Acacia	*inaequilatera*		1	3-4
Acacia	*monticola*		0.5	3
Aristida	*holathera*	*var. holathera*	<1	0.4
Atalaya	*hemiglauca*		<1	2
Clerodendrum	*floribundum*	*var. angustifolium*	<1	0.5-1
Corchorus	*crozophorifolius*		<1	0.5
Cucumis	*maderaspatanus*		<1	Cl
Cymbopogon	*obtectus*		2	1
Dysphania	*rhadinostachya*	*subsp. rhadinostachya*	<1	0.3
Eremophila	*jucunda*	*subsp. pulcherrima*	1	0.3
Eriachne	*mucronata*		<1	0.3
Eucalyptus	*leucophloia*	*subsp. leucophloia*	3	6-8
Euphorbia	*schultzii*		<1	0.1
Grevillea	*wickhamii*	*subsp. hispidula*	2	3-4
Hibiscus	*coatesii*		<1	0.5-1.5
Indigofera	*fractiflexa Peter G. Wilson & Rowe ms*		<1	0.5
Petalostylis	*labicheoides*		3	2-4
Polycarpaea	*longiflora*		<1	0.3
Ptilotus	*obovatus*		<1	0.7
Senna	*glutinosa*	*subsp. glutinosa*	<1	0.5
Solanum	*gabrielae*		<1	0.4

Species			%Cover	Height
Solanum	*horridum*		<1	0.2
Stylobasium	*spathulatum*		1	0.6
Triodia	*wiseana*		10	1
Triodia	*pungens*		10	0.6
Triumfetta	*maconochieana*		<1	0.3

Site	ML - Site ML 21
Date	30/04/2011
Recorder	JB/EP
Photo	330
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	731696
Northing	7491428
Habitat	Hillslope (HSL)
Slope	Moderately Inclined (MO) (5°46' to 18°)
Aspect	280°
Soil	Loamy sand (red)
Rock Type	Ironstone (outcropping, cobbles, pebbles)
% Leaves:Logs	0.5:<1
Vegetation Condition	Excellent
Disturbance Type	Track nearby; Pad -drilling nearby
Fire Age	
Vegetation	Hummock Grassland of Triodia sp. Shovelanna Hill (s. Van Leeuwen 3835) with Low Open Woodland of Eucalyptus leucophloia subsp. leucophloia over Very Open Mallee of Eucalyptus gamophylla over High Open Shrubland of Grevillea wickhamii subsp. hispidula, Hakea chordophylla over Low Open Shrubland of Acacia spondylophylla, Acacia hilliana

	Species		%Cover	Height
Acacia	*spondylophylla*		8	0.5
Acacia	*hilliana*		1.5	0.3
Acacia	*pruinocarpa*		0.5	2
Acacia	*adoxa*	*var. adoxa*	<1	0.4
Corymbia	*deserticola*	*subsp. deserticola*	1	3
Eriachne	*pulchella*		<1	0.2
Eriachne	*aristidea*		<1	
Eriachne	*mucronata*		<1	0.3
Eriachne	*lanata*		<1	0.4
Eucalyptus	*gamophylla*		3	3-4
Eucalyptus	*leucophloia*	*subsp. leucophloia*	2.5	3-5
Fimbristylis	*dichotoma*		<1	0.3
Goodenia	*triodiophila*		<1	0.15
Goodenia	*stobbsiana*		<1	0.1
Grevillea	*wickhamii*	*subsp. hispidula*	2.5	2-4
Hakea	*chordophylla*		1.5	2-4
Polycarpaea	*holtzei*		<1	0.05
Polygala	*isingii*		<1	
Ptilotus	*calostachyus*		<1	0.5
Ptilotus	*astrolasius*		<1	0.5
Schizachyrium	*fragile*		<1	0.2
Senna	*glutinosa*	*subsp. glutinosa*	<1	1-1.5
Trianthema	*glossostigma*		<1	0.02

Species			%Cover	Height
Triodia	*sp. Shovelanna Hill (S. van Leeuwen 3835)*		60	0.5
Triodia	*brizoides*		1	0.5-1

Site	ML - Site ML 22
Date	30/04/2011
Recorder	DB/JW
Photo	DB33
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	729635
Northing	7491428
Habitat	Hillcrest (HCR)
Slope	Gently Inclined (GE) (1°46' to 5°45')
Aspect	340°
Soil	Sandy loam (brown)
Rock Type	Ironstone (dense cobbles, pebbles)
% Leaves:Logs	2:<1
Vegetation Condition	Excellent
Disturbance Type	Old exploration track; Fire (2-5yrs)
Fire Age	Moderate 2-5 yrs
Vegetation	Hummock Grassland of Triodia sp. Shovelanna Hill (S. Van Leeuwen 3835) with Low Open Shrubland of Acacia hilliana, Acacia adoxa, Mirbelia viminalis with Scattered Low Trees of Eucalyptus leucophloia subsp. leucophloia, Corymbia deserticola subsp. deserticola, Hakea chordophylla

	Species		%Cover	Height
Acacia	*hilliana*		2	0.5
Acacia	*maitlandii*		<1	0.6
Acacia	*pruinocarpa*		<1	1-2
Corchorus	*lasiocarpus*	*subsp. lasiocarpus*	<1	0.5
Corymbia	*deserticola*	*subsp. deserticola*	1	2-4
Eriachne	*mucronata*		<1	0.5
Eriachne	*lanata*		<1	0.5
Eucalyptus	*leucophloia*	*subsp. leucophloia*	1	2-6
Fimbristylis	*dichotoma*		<1	0.1
Gompholobium	*sp. Pilbara*		<1	0.6
Goodenia	*stobbsiana*		<1	0.1
Grevillea	*wickhamii*	*subsp. hispidula*	<1	1-2
Hakea	*chordophylla*		0.5	2-4
Hybanthus	*aurantiacus*		<1	0.5
Mirbelia	*viminalis*		1	0.5
Paspalidium	*clementii*		<1	<0.5
Ptilotus	*calostachyus*		<1	1.2
Santalum	*lanceolatum*		<1	1-2
Senna	*glutinosa*	*subsp. glutinosa*	<1	1
Senna	*artemisioides*	*subsp. oligophylla*	<1	0.6
Stackhousia	*muricata*		<1	0.1
Tephrosia	*arenicola*		<1	1.2
Triodia	*sp. Shovelanna Hill*		35	0.5

Site	ML - Site ML 23
Date	30/04/2011
Recorder	PS/GH
Photo	GH0095
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	732817
Northing	7489048
Habitat	Hillcrest (HCR)
Slope	Gently Inclined (GE) (1°46' to 5°45')
Aspect	290°
Soil	Sandy loam (brown)
Rock Type	Ironstone (cobbles, pebbles – very common)
% Leaves:Logs	<1:<1
Vegetation Condition	Excellent
Disturbance Type	Fire (5-10yrs)
Fire Age	Old 5-10 yrs
Vegetation	Hummock Grassland of Triodia sp. Shovelanna Hill (S. Van Leeuwen 3835) with Low Open Woodland of Eucalyptus leucophloia subsp. leucophloia over Very Open Mallee of Eucalyptus gamophylla over Low Open Shrubland of Acacia hilliana, Acacia adoxa, Corchorus lasiocarpus

	Species		%Cover	Height
Acacia	*adoxa*	*var. adoxa*	*3*	*0.3*
Acacia	*hilliana*		*6*	*0.3*
Amphipogon	*sericeus*		*1*	*0.3*
Corchorus	*lasiocarpus*	*subsp. lasiocarpus*	*0.5*	*0.3*
Cymbopogon	*ambiguus*		*<1*	*0.6*
Dampiera	*candicans*		*<1*	*0.4*
Duperreya	*commixta*		*<1*	*Cl*
Eucalyptus	*leucophloia*	*subsp. leucophloia*	*5*	*6-8*
Eucalyptus	*gamophylla*		*5*	*3-4*
Fimbristylis	*simulans*		*0.5*	*0.3*
Goodenia	*stobbsiana*		*<1*	*0.1*
Grevillea	*wickhamii*	*subsp. hispidula*	*1*	*1*
Hakea	*chordophylla*		*0.5*	*3-4*
Petalostylis	*labicheoides*		*1*	*1-2*
Ptilotus	*obovatus*		*<1*	*0.2*
Ptilotus	*calostachyus*		*<1*	*0.4*
Senna	*artemisioides*	*subsp. helmsii*	*<1*	*1*
Tephrosia	*arenicola*		*1*	*1.5*
Triodia	*sp. Shovelanna Hill (S. van Leeuwen 3835)*		*45*	*0.5*

Site	ML - Site ML 24
Date	30/04/2011
Recorder	PS/GH
Photo	GH0095
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	732817
Northing	7489048
Habitat	Hillcrest (HCR)
Slope	Gently Inclined (GE) (1°46' to 5°45')
Aspect	290°
Soil	Sandy loam (brown)
Rock Type	Ironstone (cobbles, pebbles – very common)
% Leaves:Logs	<1:<1
Vegetation Condition	Excellent
Disturbance Type	Fire (5-10yrs)
Fire Age	Old 5-10 yrs
Vegetation	Hummock Grassland of Triodia sp. Shovelanna Hill (S. Van Leeuwen 3835) with Low Open Woodland of Eucalyptus leucophloia subsp. leucophloia over Very Open Mallee of Eucalyptus gamophylla over Low Open Shrubland of Acacia hilliana, Acacia adoxa, Corchorus lasiocarpus

	Species		%Cover	Height
Acacia	*inaequilatera*		0.5	2-4
Acacia	*adoxa*	*var. adoxa*	<1	0.3
Amphipogon	*sericeus*		<1	0.25
Astrotricha	*hamptonii*		<1	2
Calytrix	*carinata*		<1	0.5
Corchorus	*lasiocarpus*	*subsp. lasiocarpus*	<1	0.2
Corymbia	*hamersleyana*		1	2-5
Cucumis	*maderaspatanus*		<1	Cl
Cymbopogon	*obtectus*		<1	0.6
Dampiera	*candicans*		<1	0.5
Dodonaea	*pachyneura*		<1	0.5-1
Dodonaea	*coriacea*		<1	0.5
Eriachne	*lanata*		<1	0.4
Eriachne	*mucronata*		0.5	0.35
Eucalyptus	*kingsmillii*	*subsp. kingsmillii*	1.5	2
Eucalyptus	*leucophloia*	*subsp. leucophloia*	1.5	2-4
Eucalyptus	*gamophylla*		0.5	2-3
Goodenia	*cusackiana*		<1	0.15
Goodenia	*stobbsiana*		<1	0.2
Hakea	*chordophylla*		<1	1-2
Hybanthus	*aurantiacus*		<1	0.3
Maytenus	*sp. Mt Windell (S. van Leeuwen 846)*		<1	1-2
Mirbelia	*viminalis*		2	0.5-1
Paraneurachne	*muelleri*		<1	0.5
Peripleura	*virgata*		<1	0.2-0.3

Species			%Cover	Height
Pluchea	*dunlopii*		<1	0.4
Polygala	*isingii*		<1	0.05
Ptilotus	*calostachyus*		<1	0.2
Santalum	*lanceolatum*		<1	1-2
Scaevola	*browniana*	*subsp. browniana*	<1	0.3
Schizachyrium	*fragile*		<1	0.2
Senna	*glutinosa*	*subsp. glutinosa*	<1	1
Senna	*artemisioides*	*subsp. oligophylla*	<1	0.3
Sida	*sp. Golden calyces glabrous (H.N. Foote 32)*		<1	0.35
Stackhousia	*intermedia*		<1	0.1
Themeda	*triandra*		2.5	0.5
Triodia	*brizoides*		30	0.65
Triodia	*pungens*		<1	0.5-1
Triodia	*sp. Shovelanna Hill (S. van Leeuwen 3835)*		1	0.5

Site	ML - Site ML 25
Date	30/04/2011
Recorder	DB/JW
Photo	DB34, DB35
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	730411
Northing	7490294
Habitat	Gully (GUL)
Slope	Moderately Inclined (MO) (5°46' to 18°)
Aspect	210°
Soil	Sandy loam (brown)
Rock Type	Ironstone (outcropping)
% Leaves:Logs	
Vegetation Condition	Excellent
Disturbance Type	Fire (2-5yrs)
Fire Age	Moderate 2-5 yrs
Vegetation	Hummock Grassland of Triodia pungens with Open Scrub of Acacia tumida var. pilbarensis, Petalostylis labicheoides, Grevillea wickhamii subsp. hispidula with Low Woodland of Corymbia ferriticola subsp. ferriticola, Eucalyptus leucophloia subsp. leucophloia

	Species		%Cover	Height
Acacia	*tumida*	*var. pilbarensis*	10	2-4
Acacia	*maitlandii*		<1	1-2
Acacia	*spondylophylla*		<1	0.6
Astrotricha	*hamptonii*		<1	1.5
Atalaya	*hemiglauca*		<1	2
Cassytha	*capillaris*		<1	Cl
Clerodendrum	*floribundum*	*var. angustifolium*	<1	1
Corchorus	*lasiocarpus*	*subsp. lasiocarpus*	<1	0.5
Corymbia	*ferriticola*	*subsp. ferriticola*	15	3-6
Cymbopogon	*ambiguus*		<1	0.6
Cymbopogon	*obtectus*		<1	1
Dysphania	*rhadinostachya*		<1	0.1
Eriachne	*mucronata*		2	0.5
Eucalyptus	*leucophloia*	*subsp. leucophloia*	2	2-5
Grevillea	*wickhamii*	*subsp. hispidula*	10	2-5
Indigofera	*monophylla*		<1	0.6
Jasminum	*didymum*	*subsp. lineare*	<1	Cl
Paspalidium	*clementii*		<1	0.1
Petalostylis	*labicheoides*		20	2-3
Santalum	*lanceolatum*		<1	2.5
Senna	*glutinosa*	*subsp. glutinosa*	<1	1.5
Themeda	*triandra*		1	1
Triodia	*pungens*		60	<1
Triodia	*sp. Shovelanna Hill (S. van Leeuwen 3835)*		5	0.5

Site	ML - Site ML 26
Date	30/04/2011
Recorder	PS/GH
Photo	GH0096
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	732937
Northing	7488659
Habitat	Hillslope (HSL)
Slope	Steep (ST) (18°1' to 30°)
Aspect	240°
Soil	Sandy loam (brown)
Rock Type	Ironstone (cobbles, pebbles, boulders, some outcropping, clifflines
% Leaves:Logs	1:2
Vegetation Condition	Excellent
Disturbance Type	Fire (2-5yrs)
Fire Age	Moderate 2-5 yrs
Vegetation	Open Hummock Grassland of Triodia wiseana with Low Shrubland of Corchorus lasiocarpus subsp. lasiocarpus, Eremophila jucunda subsp. pulcherrima with Low Open Woodland of Eucalyptus leucophloia subsp. leucophloia

	Species		%Cover	Height
Acacia	*pruinocarpa*		0.5	0.5-4
Acacia	*pyrifolia*		<1	1
Acacia	*adoxa*	*var. adoxa*	<1	0.3
Aristida	*holathera*	*var. holathera*	<1	0.4
Capparis	*spinosa*	*var. nummularia*	<1	0.5
Cleome	*viscosa*		<1	0.5
Clerodendrum	*floribundum*	*var. angustifolium*	<1	1.5
Corchorus	*lasiocarpus*	*subsp. lasiocarpus*	8	0.7
Corymbia	*ferriticola*	*subsp. ferriticola*	<1	2
Cymbopogon	*obtectus*		<1	1
Dampiera	*candicans*		<1	0.4
Dysphania	*rhadinostachya*	*subsp. rhadinostachya*	<1	0.1
Eremophila	*jucunda*	*subsp. pulcherrima*	1	0.3-1
Eriachne	*mucronata*		10	0.3
Eucalyptus	*gamophylla*		2	4-6
Eucalyptus	*leucophloia*	*subsp. leucophloia*	3	4-6
Fimbristylis	*simulans*		<1	0.2
Gomphrena	*cunninghamii*		<1	0.25
Grevillea	*wickhamii*	*subsp. hispidula*	0.5	3
Oldenlandia	*crouchiana*		<1	0.2
Petalostylis	*labicheoides*		2	2-4
Polycarpaea	*longiflora*		<1	0.3
Prostanthera	*albiflora*		1.5	0.5
Ptilotus	*obovatus*		<1	0.4
Senna	*artemisioides*	*subsp. helmsii*	<1	0.2

Species			%Cover	Height
Sida	*sp. Golden calyces glabrous (H.N. Foote 32)*		<1	0.4
Sida	*Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)*		<1	1
Solanum	*horridum*		<1	0.3
Triodia	*wiseana*		15	0.5-1.5
Triumfetta	*leptacantha*		0.5	0.3

Site	ML - Site ML 27
Date	30/04/2011
Recorder	JB/EP
Photo	340
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	732533
Northing	7490600
Habitat	Hillslope (HSL)
Slope	Very Steep (VS) (30°1' to 45°)
Aspect	250°
Soil	Loamy sand (red)
Rock Type	Ironstone (outcrops, boulders, cobbles, pebbles)
% Leaves:Logs	0.5:0.5
Vegetation Condition	Excellent
Disturbance Type	Minimal
Fire Age	
Vegetation	Hummock Grassland of Triodia sp. Shovelanna Hill (S. Van Leeuwen 3835) with Low Open Woodland of Eucalyptus leucophloia subsp. leucophloia over Open Shrubland of Acacia pruinocarpa, Acacia bivenosa

	Species		%Cover	Height
Acacia	*pruinocarpa*		2.5	1-2
Acacia	*inaequilatera*		<1	2-3
Acacia	*bivenosa*		0.5	1
Eremophila	*jucunda*	*subsp. pulcherrima*	<1	0.5
Eriachne	*pulchella*		<1	0.2
Eriachne	*mucronata*		<1	0.35
Eucalyptus	*leucophloia*	*subsp. leucophloia*	6	4-8
Grevillea	*wickhamii*	*subsp. hispidula*	0.5	2-4
Ptilotus	*calostachyus*		<1	0.5-1
Ptilotus	*fusiformis*		<1	4
Senna	*glutinosa*	*subsp. pruinosa*	<1	1
Senna	*glutinosa*	*subsp. glutinosa*	<1	1
Tephrosia	*arenicola*		<1	1-2
Triodia	*pungens*		3	0.5-1
Triodia	*sp. Shovelanna Hill (S. van Leeuwen 3835)*		45	0.5-1

Site	ML - Site ML 28
Date	01/10/2011
Recorder	PS/EP
Photo	ML28
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	735724
Northing	7490084
Habitat	Hillcrest (HCR)
Slope	Gently Inclined (GE) (1°46' to 5°45')
Aspect	60°
Soil	Sandy clay loam (red)
Rock Type	Ironstone (cobbles, pebbles, some outcropping)
% Leaves:Logs	0.5:1
Vegetation Condition	Excellent
Disturbance Type	Tracks nearby; Drilling ops nearby
Fire Age	Old 5-10 yrs
Vegetation	Hummock Grassland of Triodia sp. Shovelanna Hill (S. Van Leeuwen 3835), Triodia pungens with High Shrubland of Grevillea wickhamii subsp. hispidula over Low Shrubland of Acacia hillianam Acacia spondylophylla, Calytrix carinata

	Species		%Cover	Height
Acacia	*spondylophylla*		10	0.8
Acacia	*hilliana*		15	0.2
Acacia	*pruinocarpa*		<1	2.5
Cayltrix	*carinata*		1	0.6
Corchorus	*lasiocarpus*	*subsp. lasiocarpus*	<1	0.3
Corymbia	*hamersleyana*		<1	2.5
Dysphania	*rhadinostachya*	*subsp. rhadinostachya*	<1	0.2
Eriachne	*pulchella*		<1	0.1
Eriachne	*mucronata*		1	0.5
Eucalyptus	*leucophloia*	*subsp. leucophloia*	1	3.-5
Goodenia	*triodiophila*		<1	0.3
Goodenia	*stobbsiana*		1	0.2
Grevillea	*wickhamii*	*subsp. hispidula*	10	1.5-4
Hakea	*chordophylla*		<1	1.5
Ptilotus	*calostachyus*		<1	0.4
Senna	*glutinosa*	*subsp. glutinosa*	<1	1
Trianthema	*glossostigma*		<1	0.05
Trichodesma	*zeylanicum*	*var. zeylanicum*	<1	1
Triodia	*sp. Shovelanna Hill (S. van Leeuwen 3835)*		60	0.4
Triodia	*wiseana*		<1	0.7
Triodia	*pungens*		<1	0.7

Site	ML - Site ML 29
Date	29/09/2011
Recorder	JB/DR
Photo	1672, ML29
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	736441
Northing	7491406
Habitat	Hillslope (HSL)
Slope	Steep (ST) (18°1' to 30°)
Aspect	50°
Soil	Silty loam (brown)
Rock Type	Ironstone (cobbles, pebbles, outcrops)
% Leaves:Logs	0:1
Vegetation Condition	Very Good
Disturbance Type	Drill tracks, pads (old)
Fire Age	Old 5-10 yrs
Vegetation	Hummock Grasland of Triodia wiseana, Triodia sp. Shovelanna Hill (S. Van Leeuwen 3835) with Low Shrubland of Acacia bivenosa with Low Open Woodland of Eucalyptus leucophloia subsp. leucophloia

	Species		%Cover	Height
Acacia	*bivenosa*		12	1
Aristida	*holathera*	*var. holathera*	<1	0.3
Dysphania	*rhadinostachya*	*subsp. rhadinostachya*	<1	0.1
Enneapogon	*polyphyllus*		<1	0.5
Enneapogon	*caerulescens*		<1	0.2
Eriachne	*pulchella*		<1	0.15
Eucalyptus	*leucophloia*	*subsp. leucophloia*	0.5	2-4
Gomphrena	*cunninghamii*		<1	0.1
Polycarpaea	*holtzei*		<1	0.01
Polycarpaea	*corymbosa*		<1	0.2
Ptilotus	*exaltatus*	*var. exaltatus*	<1	0.5
Ptilotus	*calostachyus*		<1	0.1
Schizachyrium	*fragile*		<1	0.3
Senna	*artemisioides*	*subsp. oligophylla*	<1	0.3
Senna	*glutinosa*	*subsp. luerssenii*	<1	0.8
Tribulus	*suberosus*		<1	0.5
Triodia	*wiseana*		35	0.8
Triodia	*sp. Shovelanna Hill (S. van Leeuwen 3835)*		30	0.5

Site	ML - Site ML 30
Date	02/10/2011
Recorder	JB/DR
Photo	1707, ML30
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	738815
Northing	7490413
Habitat	Flood-out (FLD)
Slope	Gently Inclined (GE) (1°46' to 5°45')
Aspect	
Soil	Sandy clay loam (red)
Rock Type	Ironstone; Chert (cobbles, pebbles)
% Leaves:Logs	<1:3
Vegetation Condition	Degraded
Disturbance Type	Livestock; Weeds
Fire Age	Moderate 2-5 yrs
Vegetation	Low Open Woodland of Acacia adsurgens, Acacia paraneura, Acacia pruinocarpa over Very Open Tussock Grassland of *Cenchrus ciliaris with Scattered Shrubs of Acacia adsurgens, Acacia pteraneura

	Species		%Cover	Height
**Cenchrus*	*ciliaris*		7	0.5
**Cenchrus*	*setiger*		<1	0.5
Abutilon	*otocarpum*		<1	0.25
Acacia	*pteraneura*		2	1-6
Acacia	*adsurgens*		3.5	6
Acacia	*synchronicia*		1	2-3.5
Acacia	*pruinocarpa*		0.5	2-6
Acacia	*dictyophleba*		<1	1.5
Aristida	*contorta*		<1	0.2
Atalaya	*hemiglauca*		<1	1-2.5
Boerhavia	*coccinea*		<1	0.2
Boerhavia	*repleta*		<1	0.1
Chrysopogon	*fallax*		<1	1
Corchorus	*sp.*		<1	0.2
Dysphania	*rhadinostachya*	*subsp. rhadinostachya*	<1	0.1
Eremophila	*lanceolata*		<1	0.4
Eucalyptus	*victrix*		<1	1.1
Euphorbia	*australis*		<1	0.1
Salsola	*australis*		<1	0.2
Sclerolaena	*cornishiana*		<1	0.2
Senna	*notabilis*		<1	0.35
Senna	*artemisioides*	*subsp. helmsii x oligophylla*	<1	0.5-1
Senna	*artemisioides*	*subsp. helmsii*	<1	0.5-1
Senna	*artemisioides*	*subsp. oligophylla*	<1	0.5-1

Species			%Cover	Height
Solanum	*lasiophyllum*		1	0.4
Sporobolus	*australasicus*		<1	0.1
Triodia	*pungens*		2.5	0.5-0.7

Site	ML - Site ML 31
Date	29/09/2011
Recorder	JB/DR
Photo	1673, ML31
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	736243
Northing	74905860
Habitat	Plain (PLA)
Slope	Gently Inclined (GE) (1°46' to 5°45')
Aspect	250°
Soil	Sandy loam (red)
Rock Type	Ironstone (scattered pebbles)
% Leaves:Logs	1:2
Vegetation Condition	Excellent
Disturbance Type	Access tracks in area; Drill pads in area
Fire Age	Very old >10 yrs
Vegetation	Closed Hummock Grassland of Triodia basedowii with Very Open Mallee of Eucalyptus gamophylla over High Open Shrubland of Acacia inaequilatera, Acacia ancistrocarpa, Acacia monticola over Low Open Shrubland of Acacia spondylophylla with Scattered Low Trees of Corymbia hamersleyana

	Species		%Cover	Height
**Cenchrus*	*ciliaris*		1	0.4
Acacia	*inaequilatera*		1.5	2.5-4
Acacia	*ancistrocarpa*		2.5	2-2.5
Acacia	*spondylophylla*		4.5	0.5-1
Acacia	*adsurgens*		1.5	2-3
Acacia	*tenuissima*		0.5	2
Acacia	*hilliana*		<1	0.5
Acacia	*monticola*		1.5	4
Anthobolus	*leptomerioides*		<1	1-2
Aristida	*holathera*	*var. holathera*	<1	0.4
Bonamia	*rosea*		<1	0.45
Cleome	*viscosa*		<1	0.5
Corchorus	*lasiocarpus*	*subsp. lasiocarpus*	<1	0.35
Corchorus	*sidoides*	*subsp. sidoides*	<1	0.2
Corymbia	*hamersleyana*		1	6-10
Dicrastylis	*cordifolia*		<1	0.5-1
Dodonaea	*coriacea*		0.5	1-1.5
Duperreya	*commixta*		<1	Cl
Eragrostis	*eriopoda*		<1	0.5
Eucalyptus	*gamophylla*		4	2-4
Euphorbia	*schultzii*		<1	0.2
Euphorbia	*biconvexa*		<1	0.3
Gomphrena	*affinis*	*subsp. Pilbarensis*	<1	0.4
Grevillea	*wickhamii*	*subsp. hispidula*	0.5	2-3
Hakea	*lorea*	*subsp. lorea*	<1	2

Species			%Cover	Height
Indigofera	*monophylla*		<1	0.3
Mirbelia	*viminalis*		<1	0.5-1
Mollugo	*molluginea*		<1	0.2
Paraneurachne	*muelleri*		<1	0.5
Petalostylis	*cassioides*		1	1-1.8
Pterocaulon	*sphaeranthoides*		<1	0.5
Ptilotus	*astrolasius*		<1	0.2
Ptilotus	*calostachyus*		<1	0.3
Scaevola	*parvifolia*	*subsp. pilbarae*	<1	0.25
Senna	*artemisioides*	*subsp. oligophylla*	0.5	0.5-1
Senna	*notabilis*		<1	0.2
Sida	*arenicola*		<1	0.2
Solanum	*phlomoides*		<1	0.1
Themeda	*triandra*		<1	0.7
Trachymene	*oleracea*		<1	0.5
Trianthema	*pilosa*		<1	0.1
Trichodesma	*zeylanicum*	*var. zeylanicum*	<1	1-2
Triodia	*pungens*		4	1
Triodia	*basedowii*		80	0.5-1

Site	ML - Site ML 32
Date	02/10/2011
Recorder	JB/DR
Photo	1709, ML32
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	739846
Northing	7490112
Habitat	Plain (PLA)
Slope	Very Gently Inclined (VG) (0°36' to 1°45')
Aspect	
Soil	Sandy loam (red)
Rock Type	Chert (scattered pebbles)
% Leaves:Logs	0.5:0.5
Vegetation Condition	Good
Disturbance Type	Access track; Drill pad; Weeds; Livestock
Fire Age	Old 5-10 yrs
Vegetation	Hummock Grassland of Triodia pungens with High Open Shrubland of Acacia pruinocarpa, Acacia synchronicia over Very Open Tussock Grassland of *Cenchrus ciliaris

	Species		%Cover	Height
**Cenchrus*	*ciliaris*		3.5	0.5
**Cenchrus*	*setiger*		<1	0.5-1
Acacia	*pruinocarpa*		3	3-6
Acacia	*pachyacra*		<1	2-3
Acacia	*tumida*	*var. pilbarensis*	<1	2
Acacia	*synchronicia*		1	2-4
Acacia	*dictyophleba*		<1	2-3
Aristida	*contorta*		<1	0.25
Aristida	*inaequiglumis*		<1	0.1
Aristida	*holathera*	*var. holathera*	<1	0.35
Boerhavia	*coccinea*		<1	0.2
Chrysopogon	*fallax*		<1	1
Codonocarpus	*cotinifolius*		<1	6
Corchorus	*sidoides*	*subsp. sidoides*	1	0.2
Enneapogon	*polyphyllus*		<1	0.2
Eragrostis	*eriopoda*		<1	0.4
Eremophila	*lanceolata*		<1	0.7
Eriachne	*aristidea*		<1	0.15
Euphorbia	*australis*		<1	0.1
Goodenia	*prostrata*		<1	0.1
Gossypium	*australe*		<1	1
Hakea	*lorea*	*subsp. lorea*	<1	1-2
Hibiscus	*sturtii*	*var. platychlamys*	<1	0.25
Polycarpaea	*corymbosa*		<1	0.2
Pterocaulon	*sphacelatum*		<1	0.3
Ptilotus	*exaltatus*	*var. exaltatus*	<1	0.3
Ptilotus	*astrolasius*		<1	0.3

Species			%Cover	Height
Ptilotus	*obovatus*		<1	0.5
Ptilotus	*calostachyus*		<1	0.25
Ptilotus	*helipteroides*		<1	0.3
Sclerolaena	*cornishiana*		<1	0.3
Senna	*notabilis*		<1	0.3
Senna	*artemisioides*	*subsp. helmsii*	<1	0.5
Senna	*glutinosa*	*subsp. pruinosa*	<1	1-1.5
Senna	*glutinosa*	*subsp. luerssenii*	<1	1.5
Senna	*artemisioides*	*subsp. oligophylla*	<1	0.3
Senna	*artemisioides*	*subsp. helmsii x oligophylla*	<1	0.8
Sida	*echinocarpa*		<1	0.35
Solanum	*lasiophyllum*		0.5	0.4
Tragus	*australianus*		<1	0.1
Tribulus	*macrocarpus*		<1	Cr
Triodia	*pungens*		45	0.5-1

Site	ML - Site ML 33
Date	29/09/2011
Recorder	JB/DR
Photo	1679, 1680, ML33
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	737136
Northing	7491136
Habitat	Duneslope (DUS)
Slope	Steep (ST) (18°1' to 30°)
Aspect	40°
Soil	Sand (red)
Rock Type	None evident
% Leaves:Logs	<1:6
Vegetation Condition	Very Good
Disturbance Type	Access tracks; Old drill pads
Fire Age	Old 5-10 yrs
Vegetation	Hummock Grassland of Triodia basedowii with High Shrubland of Acacia dictyophleba ovr Low Open Shrubland of Senna notabilis, Corchorus sidoides subsp. sidoides , Sida cardiophylla

	Species		%Cover	Height
Acacia	*dictyophleba*		12	2-3
Aristida	*holathera*	*var. holathera*	1.5	0.6
Corchorus	*sp. Indet*		0.5	0.35
Crotalaria	*cunninghamii*		<1	0.5-1
Dicrastylis	*cordifolia*		<1	0.4-1
Eragrostis	*eriopoda*		0.5	0.5
Eriachne	*gardneri*		-	-
Grevillea	*wickhamii*	*subsp. hispidula*	<1	2
Hakea	*lorea*	*subsp. lorea*	<1	3
Hibiscus	*brachychlaenus*		-	-
OPP COLL			-	-
Petalostylis	*cassioides*		1	0.5-1.8
Ptilotus	*polystachyus*		<1	1
Ptilotus	*latifolius*		<1	0.3
Senna	*notabilis*		4	0.3
Sida	*cardiophylla*		<1	0.5-1
Trianthema	*pilosa*		1.5	0.2
Trichodesma	*zeylanicum*	*var. zeylanicum*	<1	0.5-1
Triodia	*basedowii*		55	0.5-1

Site	ML - Site ML 34
Date	02/10/2011
Recorder	JB/DR
Photo	1711, ML34
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	739380
Northing	7489421
Habitat	Plain (PLA)
Slope	Gently Inclined (GE) (1°46' to 5°45')
Aspect	
Soil	Sandy loam (red)
Rock Type	None evident
% Leaves:Logs	3:1.5
Vegetation Condition	Degraded
Disturbance Type	Sandy loam plain; Fire - very old >10yrs
Fire Age	Very old >10 yrs
Vegetation	Tussock Grassland of *Cenchrus ciliaris with Low Open Woodland of Acacia pruinocarpa, Hakea lorea subsp. lorea, Acacia citrinoviridis over Very Open Tussock Grassland of Triodia pungens

	Species		%Cover	Height
**Cenchrus*	*ciliaris*		40	0.5
**Cenchrus*	*setiger*		<1	0.6-5
Acacia	*pruinocarpa*		3.5	4-8
Acacia	*citrinoviridis*		<1	3-5
Atalaya	*hemiglauca*		<1	6-8
Corymbia	*hamersleyana*		1	6-7
Eragrostis	*eriopoda*		<1	0.3
Hakea	*lorea*	*subsp. lorea*	3	5
Sclerolaena	*cornishiana*		<1	0.3
Solanum	*lasiophyllum*		1	0.3
Triodia	*pungens*		3.5	0.5-1
Triodia	*basedowii*		1.5	0.4

Site	ML - Site ML 35
Date	30/09/2011
Recorder	JB/DR
Photo	1684
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	733546
Northing	7495051
Habitat	Drainage Depression (DDE)
Slope	Gently Inclined (GE) (1°46' to 5°45')
Aspect	20°
Soil	Loamy sand (red)
Rock Type	Ironstone; Chert; Riverine gravels
% Leaves:Logs	8:6
Vegetation Condition	Good
Disturbance Type	Weeds; Access track; Drill pad
Fire Age	Old 5-10 yrs
Vegetation	Tussock Grassland of *Cenchrus ciliaris with High Shrubland of Acacia tumida var. pilbarensis, Grevillea wickhamii subsp. hispidula, Acacia pyrifolia over Open Hummock Grassland of Triodia pungens with Low Open Woodland of Corymbia hamersleyana

	Species		%Cover	Height
**Cenchrus*	*ciliaris*		35	0.7
**Cenchrus*	*setiger*		2	0.5-1
Acacia	*tumida*	*var. pilbarensis*	15	2-5
Acacia	*pyrifolia*		5	1-3.5
Acacia	*spondylophylla*		1	0.5-1
Acacia	*monticola*		0.5	2-3
Aristida	*holathera*	*var. holathera*	1	0.4
Atalaya	*hemiglauca*		0.5	2-2.5
Cleome	*viscosa*		<1	0.4
Corchorus	*lasiocarpus*	*subsp. lasiocarpus*	<1	0.2
Corymbia	*hamersleyana*		3	8
Cucumis	*maderaspatanus*		<1	Cl
Eragrostis	*eriopoda*		<1	0.4
Eriachne	*pulchella*		<1	0.1
Eriachne	*mucronata*		<1	0.35
Euphorbia	*schultzii*		<1	0.15
Euphorbia	*biconvexa*		<1	0.3
Gomphrena	*affinis*	*subsp. Pilbarensis*	<1	0.35
Gossypium	*robinsonii*		2	2-4
Gossypium	*australe*		<1	0.5-1
Grevillea	*wickhamii*	*subsp. hispidula*	1.5	1.5-2.5
Indigofera	*monophylla*		1	0.4
Mollugo	*molluginea*		<1	0.1
Paraneurachne	*muelleri*		1	0.3
Petalostylis	*cassioides*		<1	1-2
Polycarpaea	*longiflora*		<1	0.35

Species			%Cover	Height
Ptilotus	*exaltatus*	*var. exaltatus*	<1	0.4
Ptilotus	*astrolasius*		<1	0.4
Ptilotus	*obovatus*		<1	0.5
Salsola	*australis*		<1	0.5
Senna	*artemisioides*	*subsp. oligophylla*	<1	1-2
Solanum	*phlomoides*		<1	0.4
Tephrosia	*rosea*	*var. glabrior*	1	0.4
Themeda	*triandra*		<1	0.7
Trachymene	*oleracea*		<1	1.2
Tribulus	*macrocarpus*		<1	Cr
Trichodesma	*zeylanicum*	*var. zeylanicum*	<1	0.2-1
Triodia	*basedowii*		<1	0.5
Triodia	*sp. Shovelanna Hill (S. van Leeuwen 3835)*		<1	0.4
Triodia	*pungens*		12	0.5-1

Site	ML - Site ML 36
Date	02/10/2011
Recorder	JB/DR
Photo	1715, ML36
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	737705
Northing	7489525
Habitat	Dune (DUN)
Slope	Steep (ST) (18°1' to 30°)
Aspect	270°
Soil	Access track; Drill pad; Weeds; Fence posts
Rock Type	Sand (red)
% Leaves:Logs	<1:4.5
Vegetation Condition	Very Good
Disturbance Type	Access track; Drill pad; Weeds; Fence posts
Fire Age	Old 5-10 yrs
Vegetation	Hummock Grassland of Triodia schinzii, Triodia basedowii with High Open Shrubland of Acacia dictyophleba over Very Open Tussock Grassland of Aristida holathera var. holathera, *Cenchrus ciliaris

	Species		%Cover	Height
**Cenchrus*	*ciliaris*		0.5	0.5
Acacia	*dictyophleba*		5.5	1-3
Acacia	*pachyacra*		1	3-6
Aristida	*holathera*	*var. holathera*	2	0.55
Bonamia	*rosea*		<1	0.3
Corchorus	*sidoides*	*subsp. sidoides*	1.5	0.2
Crotalaria	*cunninghamii*		<1	0.8-1.2
Eriachne	*gardneri*		<1	0.4
Euphorbia	*biconvexa*		<1	0.1
Ptilotus	*polystachyus*		<1	0.4
Ptilotus	*latifolius*		<1	0.3
Senna	*notabilis*		<1	0.4
Senna	*artemisioides*	*subsp. helmsii*	<1	1.2
Sida	*sp. Rabbit Flat (B. J. Carter 626)*		<1	0.2
Sida	*sp. Rabbit Flat (B. J. Carter 626)*		<1	0.3
Solanum	*lasiophyllum*		<1	0.5
Trianthema	*pilosa*		4	0.15
Trichodesma	*zeylanicum*	*var. zeylanicum*	1.5	1-1.5
Triodia	*schinzii*		4	1.5
Triodia	*basedowii*		20	1

Site	ML - Site ML 37
Date	30/09/2011
Recorder	JB/DR
Photo	1685, ML37
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	733907
Northing	7494210
Habitat	Plain (PLA)
Slope	Gently Inclined (GE) (1°46' to 5°45')
Aspect	150°
Soil	Loamy sand (red)
Rock Type	Ironstone; Chert (cobbles, pebbles)
% Leaves:Logs	<1:<1
Vegetation Condition	Excellent
Disturbance Type	Access track; Drill pads 600m away
Fire Age	Old 5-10 yrs
Vegetation	Closed Hummock Grassland of Triodia basedowii with High Open Shrubland of Acacia ancistrocarpa, Grevillea wickhamii subsp. hispidula, Hakea chordophylla with Scattered Mallee of Eucalyptus gamophylla

	Species		%Cover	Height
Acacia	*ancistrocarpa*		3	2-3
Acacia	*dictyophleba*		<1	2-3
Acacia	*pruinocarpa*		<1	3
Acacia	*pachyacra*		0.5	4
Acacia	*bivenosa*		<1	1-1.5
Aristida	*holathera*	*var. holathera*	<1	0.3
Cleome	*viscosa*		<1	0.3
Corchorus	*sidoides*	*subsp. sidoides*	<1	0.2
Cucumis	*maderaspatanus*		<1	Cl
Dicrastylis	*cordifolia*		<1	0.2
Dodonaea	*coriacea*		<1	0.5-1
Eragrostis	*eriopoda*		<1	0.4
Eriachne	*aristidea*		<1	0.4
Eriachne	*aristidea*		<1	0.15
Eucalyptus	*gamophylla*		1	2-3
Gossypium	*australe*		<1	1
Grevillea	*wickhamii*	*subsp. hispidula*	2	3-4
Hakea	*chordophylla*		0.5	3
Hybanthus	*aurantiacus*		<1	0.6
Mollugo	*molluginea*		<1	0.1
Petalostylis	*cassioides*		0.5	0.5-1.5
Pterocaulon	*sphaeranthoides*		<1	0.3
Ptilotus	*astrolasius*		<1	0.4
Ptilotus	*calostachyus*		<1	0.5
Scaevola	*parvifolia*	*subsp. pilbarae*	<1	0.2

Species			%Cover	Height
Senna	*artemisioides*	*subsp. oligophylla*	<1	0.5
Senna	*glutinosa*	*subsp. glutinosa*	<1	2.5
Senna	*notabilis*		<1	0.2
Sida	*arenicola*		<1	0.4
Solanum	*phlomoides*		<1	0.2
Solanum	*lasiophyllum*		<1	0.5
Trianthema	*pilosa*		<1	0.1
Trichodesma	*zeylanicum*	*var. zeylanicum*	<1	1.5
Triodia	*basedowii*		70	0.5-1

Site	ML - Site ML 38
Date	03/10/2011
Recorder	PS/DR
Photo	ML38
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	739023
Northing	7488299
Habitat	Stream Bed (STB)
Slope	Gently Inclined (GE) (1°46' to 5°45')
Aspect	330°
Soil	Loamy sand (red)
Rock Type	Riverine gravels
% Leaves:Logs	0.5:2.5
Vegetation Condition	Very Good
Disturbance Type	Weeds; Livestock; Vehicle tracks; Floods
Fire Age	Very old > 10 yrs
Vegetation	Open Shrubland of Acacia pyrifolia over Low Open Shrubland of Corchorus crozophorifolius, Cleome viscosa with Scattered Trees of Eucalyptus camaldulensis

	Species		%Cover	Height
**Argemone*	*ochroleuca*		0.5	0.6
**Cenchrus*	*ciliaris*		<1	0.5
Acacia	*pyrifolia*		2	2
Cleome	*viscosa*		1	0.5-1
Corchorus	*crozophorifolius*		4	1-2
Crotalaria	*medicacaginea*	*subsp. neglecta*	<1	1
Cucumis	*maderaspatanus*		<1	Cl
Eriachne	*pulchella*		<1	0.5
Eucalyptus	*leucophloia*	*subsp. leucophloia*	2	15
Euphorbia	*biconvexa*		<1	0.1
Gomphrena	*cunninghamii*		<1	0.2
Gossypium	*robinsonii*		<1	1-2
Phyllanthus	*maderaspatensis*		<1	0.3
Ptilotus	*exaltatus*	*var. exaltatus*	<1	0.6
Sida	*echinocarpa*		<1	0.5
Sisymbrium	*orientale*		<1	0.5
Tephrosia	*rosea*	*var. glabrior*	<1	0.4

Site	ML - Site ML 39
Date	30/09/2011
Recorder	JB/DR
Photo	1686
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	733134
Northing	7493853
Habitat	Hillslope (HSL)
Slope	Moderately Inclined (MO) (5°46' to 18°)
Aspect	0°
Soil	Silty loam (red)
Rock Type	Ironstone (cobbles, pebbles, outcrops)
% Leaves:Logs	0.5:1
Vegetation Condition	Very Good
Disturbance Type	Access track; Drill pad
Fire Age	Old 5-10 yrs
Vegetation	Hummock Grassland of Triodia sp. Shovelanna Hill (S. Van Leeuwen 3835), Triodia wiseana with Low Shrubland of Acacia spondylophylla with Low Open Woodland of Eucalyptus leucophloia subsp. leucophloia, Acacia pruinocarpa over High Open Shrubland of Acacia pruinocarpa. Grevillea wickhamii subsp. hispidula

	Species		%Cover	Height
Acacia	*pruinocarpa*		4	2-6
Acacia	*spondylophylla*		17	0.5-1
Acacia	*hilliana*		1	0.4
Acacia	*adsurgens*		1	1-3
Acacia	*monticola*		<1	3
Bulbostylis	*barbata*		<1	0.1
Calytrix	*carinata*		<1	1
Dysphania	*rhadinostachya*	*subsp. rhadinostachya*	<1	0.1
Eremophila	*latrobei*	*subsp. filiformis*	0.5	1.5-2
Eriachne	*pulchella*		<1	0.1
Eucalyptus	*leucophloia*	*subsp. leucophloia*	7	4-7
Goodenia	*triodiophila*		<1	0.3
Grevillea	*wickhamii*	*subsp. hispidula*	3	1-3
Santalum	*lanceolatum*		<1	1-2
Senna	*glutinosa*	*subsp. glutinosa*	<1	1
Tephrosia	*arenicola*		<1	1
Triodia	*sp. Shovelanna Hill (S. van Leeuwen 3835)*		32	0.55
Triodia	*wiseana*		32	1
Triodia	*pungens*		<1	0.5-1

Site	ML - Site ML 40
Date	03/10/2011
Recorder	JB/EP
Photo	1719, ML40
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	736579
Northing	7485696
Habitat	Hillcrest (HCR)
Slope	Very Gently Inclined (VG) (0°36' to 1°45')
Aspect	200°
Soil	Silty loam (red)
Rock Type	Ironstone (outcrops, cobbles, pebbles)
% Leaves:Logs	<1:<1
Vegetation Condition	Excellent
Disturbance Type	Fire (young 1-2 yrs); Hill marker
Fire Age	Young 1-2 yrs
Vegetation	Low Shrubland of Acacia spondylophylla, Acacia hilliana, Corchorus lasiocarpus subsp. lasiocarpus over Very Open Hummock Grassland of Triodia sp. Shovelanna Hill (S. Van Leeuwen 3835) with Scattered Low Trees of Eucalyptus leucophloia subsp. leucophloia, Hakea chordophylla, Acacia inaequilatera

	Species		%Cover	Height
Acacia	*hilliana*		6	0.15
Acacia	*spondylophylla*		12	0.3
Acacia	*inaequilatera*		0.5	2-5
Acacia	*adoxa*	*var. adoxa*	<1	0.15
Acacia	*pruinocarpa*		<1	1.2
Acacia	*arida*		<1	0.4
Amphipogon	*sericeus*		<1	0.2
Aristida	*holathera*	*var. holathera*	0.5	0.3
Corchorus	*lasiocarpus*	*subsp. lasiocarpus*	3	0.25
Dampiera	*candicans*		<1	0.4
Dodonaea	*coriacea*		<1	0.4
Eucalyptus	*leucophloia*	*subsp. leucophloia*	1	1-6
Eucalyptus	*gamophylla*		<1	1-2.5
Fimbristylis	*simulans*		<1	0.1
Fimbristylis	*dichotoma*		<1	0.25
Gomphrena	*cunninghamii*		<1	0.1
Goodenia	*triodiophila*		<1	0.1
Goodenia	*stobbsiana*		<1	0.2
Grevillea	*wickhamii*	*subsp. hispidula*	<1	0.5-1
Hakea	*chordophylla*		<1	2.5
Paraneurachne	*muelleri*		<1	0.35
Polycarpaea	*holtzei*		<1	0.05
Ptilotus	*calostachyus*		1	0.35-1.2
Ptilotus	*exaltatus*	*var. exaltatus*	<1	0.25
Ptilotus	*helipteroides*		<1	0.2

Species			%Cover	Height
Scaevola	*browniana*	*subsp. browniana*	<1	0.4
Schizachyrium	*fragile*		<1	0.15
Senna	*glutinosa*	*subsp. pruinosa*	<1	0.25
Sida	*cardiophylla*		<1	0.4
Sida	*arenicola*		<1	0.15
Solanum	*phlomoides*		<1	0.25
Solanum	*lasiophyllum*		<1	0.2
Trianthema	*glossostigma*		<1	0.02
Triodia	*sp. Shovelanna Hill (S. van Leeuwen 3835)*		8.5	0.1-0.6

Site	ML - Site ML 41
Date	30/09/2011
Recorder	JB/DR
Photo	1687, ML41
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	736276
Northing	7492359
Habitat	Plain (PLA)
Slope	Very Gently Inclined (VG) (0°36' to 1°45')
Aspect	40°
Soil	Loamy sand (red)
Rock Type	Ironstone; Chert (cobbles, pebbles)
% Leaves:Logs	5:1.5
Vegetation Condition	Very Good
Disturbance Type	Access track; Drill pad nearby
Fire Age	Old 5-10 yrs
Vegetation	High Shrubland of Acacia tumida var. pilbarensis, Acacia ancistrocarpa, Grevillea wickhamii subsp. hispidula over Open Hummock Grassland of Triodia basedowii, Triodia pungens with Scattered Low Trees of Corymbia hamersleyana

	Species		%Cover	Height
**Cenchrus*	*ciliaris*		3	0.4
Acacia	*ancistrocarpa*		6	2-2.5
Acacia	*pyrifolia*		0.5	1-2
Acacia	*bivenosa*		<1	1-1.5
Acacia	*inaequilatera*		<1	2-2.5
Acacia	*monticola*		<1	2.5
Acacia	*hilliana*		<1	0.5
Acacia	*spondylophylla*		1	0.5-1
Acacia	*tumida*	*var. pilbarensis*	4.5	2-4
Aristida	*holathera*	*var. holathera*	0.5	0.45
Aristida	*inaequiglumis*		<1	1.3
Boerhavia	*coccinea*		1.5	0.2
Bonamia	*rosea*		<1	0.3
Chrysopogon	*fallax*		<1	1
Cleome	*viscosa*		<1	0.4
Corchorus	*sidoides*	*subsp. sidoides*	<1	0.2
Corymbia	*hamersleyana*		1	7
Enneapogon	*polyphyllus*		<1	0.3
Eragrostis	*eriopoda*		2	0.4
Grevillea	*wickhamii*	*subsp. hispidula*	2	2-4
Hakea	*lorea*	*subsp. lorea*	<1	3
Hibiscus	*sturtii*	*var. platychlamys*	<1	0.3
Hybanthus	*aurantiacus*		<1	0.35
Indigofera	*monophylla*		<1	0.4
Mollugo	*molluginea*		1	0.1
Paraneurachne	*muelleri*		1.5	0.4

Species			%Cover	Height
Petalostylis	*cassioides*		1	1-2
Polycarpaea	*longiflora*		<1	0.2
Ptilotus	*astrolasius*		<1	0.3
Ptilotus	*obovatus*		<1	0.4
Ptilotus	*polystachyus*		<1	0.3
Ptilotus	*exaltatus*	*var. exaltatus*	<1	0.5
Scaevola	*parvifolia*	*subsp. pilbarae*	1	0.2
Senna	*artemisioides*	*subsp. oligophylla*	1	1
Senna	*artemisioides*	*subsp. oligophylla*	<1	0.3
Senna	*glutinosa*	*subsp. glutinosa*	<1	1
Senna	*notabilis*		<1	0.2
Sida	*fibulifera*		<1	0.2
Sida	*cardiophylla*		<1	0.6
Tephrosia	*densa*		<1	0.3
Themeda	*triandra*		1	0.5-1
Trianthema	*pilosa*		<1	0.2
Tribulus	*macrocarpus*		<1	Cr
Triodia	*pungens*		5	0.5-1
Triodia	*basedowii*		10	0.5-1

Site	ML - Site ML 42
Date	03/10/2011
Recorder	JB/EP
Photo	1731, 1732
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	734439
Northing	7486191
Habitat	Hillslope (HSL)
Slope	Very Steep (VS) (30°1' to 45°)
Aspect	20°
Soil	Silty clay loam (brown)
Rock Type	Ironstone (massive cliffs, outcrops, cobbles, pebbles, slatey)
% Leaves:Logs	<1:<1
Vegetation Condition	Excellent
Disturbance Type	Fire (Mod 2-5 yrs)
Fire Age	Moderate 2-5 yrs
Vegetation	Hummock Grassland of Triodia sp. Shovelanna Hill (S. Van Leeuwen 3835), Triodia wiseana with High Open Shrubloand of Petalostylis labicheoides, Acacia inaequilatr over Low Open Shrubland of Acacia arida, Corchorus lasiocarpus subsp. lasiocarpus

	Species		%Cover	Height
Acacia	*arida*		5	0.2-0.4
Acacia	*inaequilatera*		1	1.5-3
Acacia	*pruinocarpa*		<1	1
Aristida	*holathera*	*var. holathera*	<1	0.3
Bulbostylis	*barbata*		<1	0.2
Cleome	*viscosa*		<1	0.3-0.4
Corchorus	*lasiocarpus*	*subsp. lasiocarpus*	0.5	0.4
Dampiera	*candicans*		<1	0.5
Dysphania	*rhadinostachya*	*subsp. rhadinostachya*	<1	0.05
Eriachne	*pulchella*		0.5	0.1
Eriachne	*mucronata*		<1	0.35
Eucalyptus	*leucophloia*	*subsp. leucophloia*	<1	0\5
Fimbristylis	*dichotoma*		<1	0.2
Gomphrena	*cunninghamii*		<1	0.2
Grevillea	*wickhamii*	*subsp. hispidula*	<1	1.5-2
Hakea	*chordophylla*		<1	2.5
Nicotiana	*benthamiana*		<1	0.4
Oldenlandia	*crouchiana*		<1	0.15
Paspalidium	*clementii*		<1	0.2
Petalostylis	*labicheoides*		1.5	1-2
Polycarpaea	*longiflora*		<1	0.2
Polycarpaea	*holtzei*		<1	0.05
Polygala	*isingii*		<1	0.05
Ptilotus	*calostachyus*		0.5	0.5-1
Schizachyrium	*fragile*		<1	0.2

Species			%Cover	Height
Triodia	*sp. Shovelanna Hill (S. van Leeuwen 3835)*		35	0.1-0.4
Triodia	*wiseana*		7	0.3-0.4

Site	ML - Site ML 43
Date	30/09/2011
Recorder	JB/DR
Photo	1688, ML43
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	738357
Northing	7489114
Habitat	Plain (PLA)
Slope	Gently Inclined (GE) (1°46' to 5°45')
Aspect	
Soil	Loamy sand (red)
Rock Type	None evident
% Leaves:Logs	2:1
Vegetation Condition	Very Good
Disturbance Type	Access track; Drill pad; Weed
Fire Age	Old 5- 10 yrs
Vegetation	Closed Hummock Grassland of Triodia basedowii with High Open Shrubland of Acacia pachyacra, Acacia dictyophleba over Scattered Shrubs of Petalostylis cassioides

	Species		%Cover	Height
Acacia	*pachyacra*		7	3-5
Acacia	*dictyophleba*		2	1-3.5
Acacia	*citrinoviridis*		<1	3
Aristida	*holathera*	*var. holathera*	<1	0.3
Bonamia	*rosea*		<1	0.25
Corymbia	*hamersleyana*		<1	4
Cymbopogon	*obtectus*		<1	0.2
Dicrastylis	*cordifolia*		<1	0.6
Eragrostis	*eriopoda*		<1	0.1
Eriachne	*aristidea*		<1	0.2
Hakea	*lorea*	*subsp. lorea*	<1	4
Petalostylis	*cassioides*		1.5	1-2
Senna	*notabilis*		<1	0.1
Triodia	*basedowii*		80	0.5-1
Acacia	*pachyacra*		7	3-5
Acacia	*dictyophleba*		2	1-3.5
Acacia	*citrinoviridis*		<1	3
Aristida	*holathera*	*var. holathera*	<1	0.3
Bonamia	*rosea*		<1	0.25
Corchorus	*sp.*		<1	0.1
Corymbia	*hamersleyana*		<1	4
Cymbopogon	*obtectus*		<1	0.2
Dicrastylis	*cordifolia*		<1	0.6
Eragrostis	*eriopoda*		<1	0.1
Eriachne	*aristidea*		<1	0.2
Hakea	*lorea*	*subsp. lorea*	<1	4
Petalostylis	*cassioides*		1.5	1-2

Species			%Cover	Height
Senna	*notabilis*		<1	0.1
Triodia	*basedowii*		80	0.5-1

Site	ML - Site ML 44
Date	03/10/2011
Recorder	JB/EP
Photo	1733, ML44
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	734858
Northing	7486776
Habitat	Flood-out (FLD)
Slope	Very Gently Inclined (VG) (0°36' to 1°45')
Aspect	60°
Soil	Loamy sand (brown)
Rock Type	Ironstone (scattered cobbles, pebbles)
% Leaves:Logs	2:1
Vegetation Condition	Good
Disturbance Type	Livestock; Weeds
Fire Age	Moderate 2-5 yrs
Vegetation	Hummock Grassland of Triodia pungens over Open Tussock Grassland of *Cenchrus ciliaris, Aristida holathera var. holathera with Open Shrubland of Acacia pyrifolia

	Species		%Cover	Height
**Cenchrus*	*ciliaris*		10	0.7
Abutilon	*dioicum*		<1	2.5
Acacia	*pyrifolia*		4.5	1-2.5
Aristida	*holathera*	*var. holathera*	<1	0.3
Aristida	*contorta*		<1	0.25
Atalaya	*hemiglauca*		<1	1
Boerhavia	*coccinea*		0.5	Cr 0.1
Cleome	*viscosa*		<1	0.4
Clerodendrum	*floribundum*	*var. angustifolium*	<1	2
Corchorus	*lasiocarpus*	*subsp. lasiocarpus*	<1	0.6
Dysphania	*rhadinostachya*	*subsp. rhadinostachya*	<1	0.15
Enneapogon	*polyphyllus*		<1	0.4
Enneapogon	*lindleyanus*		<1	0.4
Eremophila	*longifolia*		<1	0.5-1
Eriachne	*mucronata*		<1	0.4
Euphorbia	*biconvexa*		<1	0.15
Euphorbia	*schultzii*		<1	0.1
Euphorbia	*tannensis*	*subsp. eremophila*	<1	0.6
Gossypium	*robinsonii*		0.5	2
Grevillea	*wickhamii*	*subsp. hispidula*	<1	2.5
Indigofera	*monophylla*		<1	0.3
Mollugo	*molluginea*		<1	0.1
Polycarpaea	*corymbosa*		<1	0.1
Polycarpaea	*longiflora*		<1	0.25
Pterocaulon	*sphaeranthoides*		<1	0.3
Ptilotus	*exaltatus*	*var. exaltatus*	<1	0.3-1

Species			%Cover	Height
Ptilotus	*calostachyus*		<1	1.2
Ptilotus	*obovatus*		<1	0.4
Ptilotus	*astrolasius*		<1	0.35
Salsola	*australis*		<1	0.2-0.5
Schizachyrium	*fragile*		<1	0.1
Senna	*artemisioides*	*subsp. oligophylla*	<1	0.5
Senna	*artemisioides*	*subsp. helmsii*	<1	0.4
Sida	*Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)*		<1	1-2.5
Tephrosia	*densa*		<1	0.5
Trianthema	*pilosa*		<1	0.2
Trichodesma	*zeylanicum*	*var. zeylanicum*	<1	1-1.2
Triodia	*pungens*		38	0.5-1

Site	ML - Site ML 45
Date	01/10/2011
Recorder	JB/DR
Photo	1691, ML45
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	737677
Northing	7491712
Habitat	Levee (LEV)
Slope	Gently Inclined (GE) (1°46' to 5°45')
Aspect	
Soil	Loamy sand (brown)
Rock Type	Scattered riverine gravels
% Leaves:Logs	30:2.5
Vegetation Condition	Degraded
Disturbance Type	Weeds; Livestock
Fire Age	Very old >10 yrs
Vegetation	Closed Tussock Grassland of *Cenchrus ciliaris, *Cenchrus setiger with Low Open Forest of Acacia citrinoviridis, Atalaya hemiglauca, Hakea lorea subsp. lorea with Scattered Trees of Eucalyptus victrix

Species			%Cover	Height
**Cenchrus*	*ciliaris*		25	0.5
**Cenchrus*	*setiger*		45	0.5-1
Acacia	*citrinoviridis*		40	6-10
Atalaya	*hemiglauca*		2	4-7
Capparis	*lasiantha*		<1	Cl
Eucalyptus	*victrix*		1	10-12
Hakea	*lorea*	*subsp. lorea*	1.5	3-4

Site	ML - Site ML 46
Date	04/10/2011
Recorder	JB/EP
Photo	1741, ML47
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	737884
Northing	7490826
Habitat	Plain (PLA)
Slope	Very Gently Inclined (VG) (0°36' to 1°45')
Aspect	320°
Soil	Loamy sand (brown)
Rock Type	Chert; ironstone (scattered with tiny pebbly surface)
% Leaves:Logs	3:4
Vegetation Condition	Very Good
Disturbance Type	Drilling ops nearby; Access track; Livestock in area
Fire Age	Very old >10 yrs
Vegetation	Closed Tussock Grassland of *Cenchrus ciliaris, *Cenchrus setiger with Low Open Forest of Acacia citrinoviridis, Atalaya hemiglauca, Hakea lorea subsp. lorea with Scattered Trees of Eucalyptus victrix

	Species		%Cover	Height
Acacia	*pachyacra*		6	2-4
Acacia	*tumida*	*var. pilbarensis*	3.5	2-3
Acacia	*pruinocarpa*		0.5	3
Acacia	*dictyophleba*		0.5	2.5
Acacia	*inaequilatera*		0.5	2-3
Acacia	*ancistrocarpa*		6	2-3
Aristida	*holathera*	*var. holathera*	1.5	0.4
Aristida	*contorta*		<1	0.4
Cleome	*viscosa*		<1	0.4
Corchorus	*laniflorus*		<1	0.25
Cucumis	*maderaspatanus*		<1	Cl
Cymbopogon	*obtectus*		<1	1.2
Dicrastylis	*cordifolia*		<1	0.5
Enneapogon	*polyphyllus*		<1	0.3
Eragrostis	*eriopoda*		0.5	0.5
Eriachne	*aristidea*		<1	0.3
Eucalyptus	*gamophylla*		1	2.5-3
Gossypium	*australe*		<1	1
Grevillea	*wickhamii*	*subsp. hispidula*	1.5	1-3
Hakea	*lorea*	*subsp. lorea*	0.5	2-3
Hybanthus	*aurantiacus*		0.5	0.4
Indigofera	*monophylla*		<1	0.35
Mollugo	*molluginea*		<1	0.1
Paraneurachne	*muelleri*		<1	0.4
Petalostylis	*cassioides*		4	1.5-2.2
Ptilotus	*calostachyus*		<1	0.7
Ptilotus	*astrolasius*		0.5	0.3

Species			%Cover	Height
Ptilotus	*polystachyus*		<1	0.3
Senna	*notabilis*		<1	0.3
Senna	*artemisioides*	*subsp. oligophylla*	<1	1
Sida	*sp. Pilbara (A.A. Mitchell PRP1543)*		<1	0.5
Solanum	*lasiophyllum*		<1	0.6
Trianthema	*pilosa*		<1	0.1
Tribulus	*macrocarpus*		<1	Cr
Trichodesma	*zeylanicum*	*var. zeylanicum*	<1	1.5
Triodia	*basedowii*		17	0.5-1

Site	ML - Site ML 47
Date	01/10/2011
Recorder	JB/DR
Photo	1705, ML47
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	737884
Northing	7490826
Habitat	Flood-out (FLD)
Slope	Gently Inclined (GE) (1°46' to 5°45')
Aspect	
Soil	Loamy sand (red)
Rock Type	Scattered mixed riverine gravels
% Leaves:Logs	35:6
Vegetation Condition	Degraded
Disturbance Type	Weeds; Access track; Drill pads
Fire Age	Very old >10 yrs
Vegetation	Closed Tussock Grassland of *Cenchrus setiger, *Cenchrus ciliaris with Open Woodland of Ecualyptus victrix over Low Open Woodland of Acacia citrinoviridis, Atalaya hemiglauca

	Species		%Cover	Height
**Aerva*	*javanica*		<1	0.8
**Cenchrus*	*ciliaris*		15	0.5
**Cenchrus*	*setiger*		55	0.5-1
Acacia	*citrinoviridis*		5	6-10
Amaranthus	*undulatus*		<1	0.5
Aristida	*contorta*		<1	0.25
Atalaya	*hemiglauca*		1	1-8
Corchorus	*crozofolius*		<1	1
Cucumis	*maderaspatanus*		<1	Cl
Cullen	*leucochaites*		<1	2.5
Duperreya	*commixta*		<1	Cl
Eriachne	*pulchella*		<1	0.1
Eucalyptus	*victrix*		8	8-15
Euphorbia	*australis*		<1	0.5
Polycarpaea	*longiflora*		<1	0.25
Rhagodia	*eremaea*		<1	0.5-1
Salsola	*australis*		<1	0.4
Solanum	*lasiophyllum*		<1	0.3
Triodia	*pungens*		<1	1.3
Triodia	*wiseana*		<1	0.7

Site	ML - Site ML 48
Date	04/10/2011
Recorder	JB/EP
Photo	1742, ML48
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	735687
Northing	7492939
Habitat	Drainage Depression (DDE)
Slope	Very Gently Inclined (VG) (0°36' to 1°45')
Aspect	20°
Soil	Loamy sand (brown)
Rock Type	Mixed riverine gravels
% Leaves:Logs	4:2
Vegetation Condition	Good
Disturbance Type	Weeds; Access tracksl Livestock
Fire Age	Very old >10 yrs
Vegetation	Open Scrub of Acacia tumida var. pilbarensis, Acacia pyrifoliam Grevillea wickhamii subsp. hispidula over Open Tussock Grassland of *Cenchrus ciliaris, *Cenchrus setiger, Aristida holathera var. holathera over Very Open Hummock Grassland of Triodia pungens with Low Open Woodland of Corymbia hamersleyana

	Species		%Cover	Height
**Cenchrus*	*setiger*		8	0.8
**Cenchrus*	*ciliaris*		16	0.4
Abutilon	*dioicum*		<1	2
Acacia	*arida*		<1	2.5
Acacia	*tumida*	*var. pilbarensis*	25	1.5-6
Acacia	*inaequilatera*		<1	3-4
Acacia	*bivenosa*		<1	2-3
Acacia	*pachyacra*		<1	3.5
Acacia	*citrinoviridis*		0.5	3
Acacia	*adoxa*	*var. adoxa*	<1	0.3
Acacia	*pyrifolia*		4	1.5-5
Aristida	*holathera*	*var. holathera*	1	0.3-0.5
Aristida	*contorta*		0.5	0.2
Aristida	*inaequiglumis*		<1	1.3
Cleome	*viscosa*		<1	0.2-0.5
Corchorus	*incanus*	*subsp. Lithophilus*	<1	0.55
Corchorus	*crozofolius*		<1	1.2
Corymbia	*hamersleyana*		1	3-6
Enneapogon	*polyphyllus*		<1	0.35
Enneapogon	*lindleyanus*		<1	0.35
Eragrostis	*eriopoda*		<1	0.4
Eriachne	*pulchella*		<1	0.1
Euphorbia	*schultzii*		<1	0.1
Euphorbia	*tannensis*	*subsp. eremophila*	<1	0.45
Fimbristylis	*simulans*		<1	0.1

Species			%Cover	Height
Gomphrena	*cunninghamii*		<1	0.1
Gossypium	*robinsonii*		1	2
Grevillea	*wickhamii*	*subsp. hispidula*	1.5	3
Hakea	*lorea*	*subsp. lorea*	0.5	3-4
Hybanthus	*aurantiacus*		<1	0.3
Indigofera	*monophylla*		1	0.5
Mollugo	*molluginea*		<1	0.15
Paraneurachne	*muelleri*		1.5	0.4
Polycarpaea	*longiflora*		<1	0.3
Ptilotus	*exaltatus*	*var. exaltatus*	0.5	0.4-1
Ptilotus	*calostachyus*		<1	0.4
Ptilotus	*polystachyus*		<1	0.35
Ptilotus	*astrolasius*		<1	0.15
Salsola	*australis*		<1	0.3
Senna	*artemisioides*	*subsp. oligophylla*	<1	1.2
Stylobasium	*spathulatum*		<1	0.3
Tephrosia	*rosea*	*var. glabrior*	<1	0.2
Themeda	*triandra*		<1	0.5
Tribulus	*macrocarpus*		<1	Cr
Trichodesma	*zeylanicum*	*var. zeylanicum*	<1	1-2
Triodia	*pungens*		6	0.5
Triodia	*sp. Shovelanna Hill (S. van Leeuwen 3835)*		<1	0.3
Triodia	*basedowii*		<1	0.4
Waltheria	*indica*		<1	0.2

Site	ML - Site ML 49
Date	04/10/2011
Recorder	JB/EP
Photo	1743, ML49
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	735603
Northing	7492113
Habitat	Plain (PLA)
Slope	Very Gently Inclined (VG) (0°36' to 1°45')
Aspect	120°
Soil	Loamy sand (brown)
Rock Type	Chert (moderately common cobbles)
% Leaves:Logs	4:2.5
Vegetation Condition	Very Good
Disturbance Type	Livestock; Access track nearby; Weeds
Fire Age	Old 5-10 yrs
Vegetation	Open Tussock Grassland of Aristida holathera var. holathera, *Cenchrus ciliaris with High Open Shrubland of Acacia ancistrocarpa, Acacia inaequilatera, Grevillea wickhamii subsp. hispidula over Low Open Shrubland of Ptilotus astrolasius, Senna artemisioides subsp. oligophylla, Petalostylis cassioides

	Species		%Cover	Height
**Cenchrus*	*ciliaris*		<1	0.7
Acacia	*ancistrocarpa*		2.5	2-2.5
Acacia	*dictyophleba*		<1	2
Acacia	*inaequilatera*		1.5	3
Acacia	*pruinocarpa*		<1	0.25
Aristida	*holathera*	*var. holathera*	10	0.5
Aristida	*inaequiglumis*		0.5	1.5
Aristida	*contorta*		<1	0.3
Boerhavia	*coccinea*		<1	Cr 0.15
Cleome	*viscosa*		<1	0.3
Corchorus	*laniflorus*		1	0.2
Cucumis	*maderaspatanus*		<1	Cl
Dicrastylis	*cordifolia*		<1	0.5-1
Eragrostis	*eriopoda*		8	0.5
Eriachne	*aristidea*		<1	0.3
Euphorbia	*schultzii*		<1	0.1
Goodenia	*vilmoriniae*		<1	0.4
Gossypium	*australe*		<1	0.5-1.2
Grevillea	*wickhamii*	*subsp. hispidula*	1.5	2-3
Hakea	*chordophylla*		<1	3
Hakea	*lorea*	*subsp. lorea*	<1	2
Heliotropium	*pachyphyllum*		<1	0.2-0.3
Hybanthus	*aurantiacus*		0.5	0.5
Indigofera	*monophylla*		<1	0.7
Mollugo	*molluginea*		2	0.15

Species			%Cover	Height
Paraneurachne	*muelleri*		<1	0.5
Petalostylis	*cassioides*		4	1-2
Polycarpaea	*longiflora*		<1	0.25
Ptilotus	*calostachyus*		3.5	0.6
Ptilotus	*astrolasius*		4	0.35
Ptilotus	*exaltatus*	*var. exaltatus*	<1	0.3-0.4
Ptilotus	*polystachyus*		<1	0.6
Senna	*artemisioides*	*subsp. helmsii*	<1	0.5
Senna	*artemisioides*	*subsp. oligophylla*	1.5	0.5-1
Senna	*notabilis*		<1	0.05
Sida	*cardiophylla*		<1	0.4
Solanum	*phlomoides*		<1	0.25
Solanum	*lasiophyllum*		<1	0.5
Trianthema	*pilosa*		<1	0.2
Tribulus	*macrocarpus*		<1	Cr
Triodia	*basedowii*		2.5	0.5-1

Site	ML - Site ML 50
Date	04/10/2011
Recorder	PS/DR
Photo	ML50
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	725266
Northing	7497409
Habitat	Gully (GUL)
Slope	Steep (ST) (18°1' to 30°)
Aspect	20°
Soil	Sandy loam brown
Rock Type	Ironstone (cobbles, pebbles, outcrop, cliff)
% Leaves:Logs	0.5:1
Vegetation Condition	Excellent
Disturbance Type	Access track; Drill pad
Fire Age	Moderate 2-5 yrs
Vegetation	Hummock Grassland of Triodia pungens with Low Open Woodland of Corymbia ferriticola subsp. ferriticola, Eucalyptus leucophloia subsp. leucophloia, Acacia pruinocarpa over High Open Shrubland of Acacia tumida var. pilbarensis, Acacia pyrifolia, Gossypium robinsonii

	Species		%Cover	Height
Abutilon	*dioicum R.M. Barker ms*		1	2
Acacia	*pruinocarpa*		0.5	1-1.5
Acacia	*tumida*		7.5	2-4
Acacia	*monticola*		<1	1.5
Acacia	*pyrifolia*		1.5	1-2
Acacia	*spondylophylla*		<1	0.5
Amaranthus	*cuspidifolius*		<1	0.3
Aristida	*burbidgeae*		<1	0.4
Aristida	*holathera*	*var. holathera*	<1	0.4
Atalaya	*hemiglauca*		0.5	1-3
Capparis	*spinosa*	*var. nummularia*	<1	0.4
Cleome	*viscosa*		0.5	0.5
Corchorus	*laniflorus*		<1	0.5
Corchorus	*lasiocarpus*	*subsp. lasiocarpus*	<1	0.6
Corymbia	*ferriticiola*		1	6
Cucumis	*maderaspatanus*		<1	Cl
Cymbopogon	*ambiguus*		0.5	0.8
Cymbopogon	*procerus*		<1	0.5
Cyperus	*cunninghamii*	*subsp. cunninghamii*	<1	
Duperreya	*commixta*		<1	Cl
Enneapogon	*lindleyanus*		0.5	0.8
Eremophila	*longifolia*		<1	0.7
Eriachne	*lanata*		<1	0.4
Eriachne	*mucronata*		7.5	0.4

Species			%Cover	Height
Eucalyptus	*leucophloia*	*subsp. leucophloia*	1	7
Eucalyptus	*gamophylla*		<1	4
Euphorbia	*schultzii*		<1	0.15
Ficus	*brachypoda*		1	1.5
Gomphrena	*cunninghamii*		<1	0.2
Gossypium	*robinsonii*		2.5	1-2
Grevillea	*wickhamii*	*subsp. hispidula*	1.5	4
Hakea	*chordophylla*		<1	2
Hibiscus	*haynaldii*		1	1-1.8
Indigofera	*fractiflexa Peter G. Wilson & Rowe ms*		<1	0.5
Jasminum	*didymum*	*subsp. lineare*	0.5	Cl
Newcastelia	*sp. Hamersley Range (S. Van Leeuwen4264)*		0.5	0.5
Corchorus	*aff. tectus*		<1	0.4
Nicotiana	*benthamiana*		<1	0.3
Paraneurachne	*muelleri*		<1	3
Paspalidium	*clementii*		<1	0.1
Polycarpaea	*longiflora*		<1	0.3
Pterocaulon	*sphaeranthoides*		<1	0.4
Ptilotus	*obovatus*		<1	0.6
Ptilotus	*exaltatus*	*var. exaltatus*	<1	0.5
Senna	*glutinosa*	*subsp. glutinosa*	<1	1
Senna	*venusta*		<1	0.8
Senna	*artemisioides*	*subsp. oligophylla*	<1	0.5
Sida	*arenicola*		1	2
Stylobasium	*spathulatum*		5	1
Trichodesma	*zeylanicum*	*var. zeylanicum*	<1	1
Triodia	*pungens*		45	0.6
Triodia	*sp. Shovelanna Hill (S. van Leeuwen 3835)*		<1	0.4
Triumfetta	*leptacantha*		1	0.4

Site	ML - Site ML 51
Date	04/10/2011
Recorder	JB/EP
Photo	1744, ML51
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	730606
Northing	7496742
Habitat	Hillslope (HSL)
Slope	Moderately Inclined (MO) (5°46' to 18°)
Aspect	90°
Soil	Silty loam (red)
Rock Type	Pizolitic Ironstone (outcrops, boulders, cobbles, pebbles)
% Leaves:Logs	<1:<1
Vegetation Condition	Very Good
Disturbance Type	Access track nearby
Fire Age	Very old >10 yrs
Vegetation	Closed Hummock Grassland of Triodia wiseana, Triodia sp. Shovelanna Hill (S. Van Leeuwen 3835) with Open Shrubland of Acacia bivenosa

	Species		%Cover	Height
Acacia	*bivenosa*		2	1-2
Acacia	*ancistrocarpa*		<1	1.5
Acacia	*pachyacra*		<1	0.2
Acacia	*synchronicia*		<1	1.5-2
Eremophila	*latrobei*	*subsp. filiformis*	<1	1.5
Eriachne	*mucronata*		<1	0.35
Eriachne	*pulchella*		<1	0.1
Eucalyptus	*leucophloia*	*subsp. leucophloia*	<1	0.5-4
Goodenia	*stobbsiana*		<1	0.3
Nicotiana	*occidentalis*		<1	0.3
Paspalidium	*clementii*		<1	0.15
Senna	*glutinosa*	*subsp. pruinosa*	<1	2
Senna	*artemisioides*	*subsp. oligophylla*	<1	0.5-1
Senna	*glutinosa*	*subsp. glutinosa*	<1	1.5
Stenopetalum	*velutinum*		<1	0.3
Stylobasium	*spathulatum*		<1	3
Tribulus	*suberosus*		<1	0.5-1.5
Triodia	*wiseana*		75	0.5-1.5
Triodia	*sp. Shovelanna Hill (S. van Leeuwen 3835)*		0.5	0.4

Site	ML - Site ML 52
Date	04/10/2011
Recorder	PS/DR
Photo	ML52
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	726370
Northing	7498834
Habitat	Hillslope (HSL)
Slope	Moderately Inclined (MO) (5°46' to 18°)
Aspect	350°
Soil	Sandy loam (brown)
Rock Type	Ironstone (cobbles, pebbles, outcrops)
% Leaves:Logs	0.5:1
Vegetation Condition	Excellent
Disturbance Type	Access track; Fire (Mod 2-5 yrs); Drill pad
Fire Age	Moderate 2-5 yrs
Vegetation	Hummock Grassland of Triodia sp. Shovelanna Hill (S. Van Leeuwen 3835), Triodia pungens with Low Shrubland of Acacia spondylophylla, Grevillea wickhamii subsp. hispidula, Acacia hilliana with Scattered Low Trees of Eucalyptus leucophloia subsp. leucophloia, Corymbia hamersleyana

	Species		%Cover	Height
Acacia	*spondylophylla*		5	0.4
Acacia	*pruinocarpa*		<1	0.5-1
Acacia	*monticola*		1	0.5-1
Acacia	*hilliana*		2.5	0.3
Amphipogon	*sericeus*		<1	0.3
Aristida	*holathera*	*var. holathera*	<1	0.5
Cayltrix	*carinata*		<1	0.3
Corchorus	*lasiocarpus*	*subsp. lasiocarpus*	<1	0.6
Corymbia	*hamersleyana*		<1	10
Dampiera	*candicans*		0.5	0.4
Eriachne	*lanata*		0.5	0.7
Eriachne	*mucronata*		0.5	0.4
Eriachne	*pulchella*		<1	0.15
Eucalyptus	*leucophloia*	*subsp. leucophloia*	1.5	5-7
Goodenia	*stobbsiana*		<1	0.5
Grevillea	*wickhamii*	*subsp. hispidula*	5	0.5
Keraudrenia	*velutina*	*subsp. elliptica*	<1	0.4
Mirbelia	*viminalis*		2	0.5
Mollugo	*molluginea*		<1	0.1
Ptilotus	*calostachyus*		2.5	0.5
Ptilotus	*exaltatus*	*var. exaltatus*	<1	0.5
Santalum	*lanceolatum*		0.5	1-1.5
Senna	*glutinosa*	*subsp. glutinosa*	<1	0.5
Senna	*glutinosa*	*subsp. pruinosa*	<1	0.4
Sida	*arenicola*		<1	0.5

Species			%Cover	Height
Sida	*arenicola*		<1	0.5-1
Solanum	*phlomoides*		<1	0.5
Trianthema	*glossostigma*		0.5	0.2
Tribulus	*suberosus*		<1	0.5
Triodia	*sp. Shovelanna Hill (S. van Leeuwen 3835)*		30	0.6

Site	ML - Site ML 53
Date	04/10/2011
Recorder	JB/EP
Photo	1746, ML53
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	729644
Northing	7497064
Habitat	Hillslope (HSL)
Slope	Moderately Inclined (MO) (5°46' to 18°)
Aspect	340°
Soil	Silty loam (red)
Rock Type	Pizolitic Ironstone (outcrops, cobbles, pebbles)
% Leaves:Logs	
Vegetation Condition	Very Good
Disturbance Type	Fire (Mod 2-5 yrs); Access tracks nearby; Old access track nearby
Fire Age	Moderate 2-5 yrs
Vegetation	Open Hummock Grassland of Triodia sp. Shovelanna Hill (S. Van Leeuwen 3835) over Open Herbs of Ptilotus calostachyus with Low Open Shrubland of Acacia spondylophylla, Acacia inaequilatera

	Species		%Cover	Height
Acacia	*inaequilatera*		<1	0.5-1
Acacia	*spondylophylla*		2	0.35
Amphipogon	*sericeus*		0.5	0.3
Aristida	*holathera*	*var. holathera*	<1	0.25
Calytrix	*carinata*		<1	0.4
Corchorus	*lasiocarpus*	*subsp. lasiocarpus*	<1	0.3
Corymbia	*hamersleyana*		<1	0.5
Dampiera	*candicans*		<1	0.3
Dysphania	*rhadinostachya*	*subsp. rhadinostachya*	<1	0.2
Enneapogon	*polyphyllus*		<1	0.1
Eriachne	*pulchella*		0.5	0.1
Eriachne	*aristidea*		<1	0.2
Eriachne	*mucronata*		<1	
Goodenia	*stobbsiana*		<1	0.25-0.4
Grevillea	*wickhamii*	*subsp. hispidula*	0.5	1-2
Hakea	*chordophylla*		<1	0.5
Hibiscus	*coatesii*		<1	0.05
Keraudrenia	*velutina*	*subsp. elliptica*	<1	0.5
Mollugo	*molluginea*		<1	0.1
Ptilotus	*calostachyus*		15	0.5-1
Ptilotus	*exaltatus*	*var. exaltatus*	<1	0.4
Ptilotus	*obovatus*		<1	0.2
Schizachyrium	*fragile*		<1	0.4
Senna	*glutinosa*	*subsp. glutinosa*	<1	1
Senna	*artemisioides*	*subsp. oligophylla*	<1	0.5
Solanum	*phlomoides*		<1	0.3

Species			%Cover	Height
Trianthema	*glossostigma*		<1	0.05
Triodia	*sp. Shovelanna Hill (S. van Leeuwen 3835)*		15	0.35-0.5
Triodia	*wiseana*		<1	0.5-0.8

Site	ML - Site ML 54
Date	05/10/2011
Recorder	PS/DR
Photo	ML54
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	726533
Northing	7497345
Habitat	Drainage Depression (DDE)
Slope	Gently Inclined (GE) (1°46' to 5°45')
Aspect	10°
Soil	Sandy loam (brown)
Rock Type	Ironstone (pebbles, cobbles)
% Leaves:Logs	1:1
Vegetation Condition	Degraded
Disturbance Type	Weeds; Access track
Fire Age	Old 5-10 yrs
Vegetation	Tussock Grassland of *Cenchrus ciliaris with High Open Shrubland of Acacia pyrifolia, Gossypium robinsonii, Corchorus lasiocarpus subsp. lasiocarpus over Low Open Shrubland of Acacia pyrifolia, Atalaya hemiglauca

	Species		%Cover	Height
**Cenchrus*	*ciliaris*		60	0.5
Abutilon	*dioicum R.M. Barker ms*		<1	1-2
Acacia	*pyrifolia*		5	1-3
Acacia	*tumida*	*var. pilbarensis*	0.5	2
Aristida	*holathera*	*var. holathera*	<1	0.4
Atalaya	*hemiglauca*		4	0.5-2
Cleome	*viscosa*		<1	0.5
Corymbia	*hamersleyana*		1	4-6
Cucumis	*maderaspatanus*		<1	Cl
Dysphania	*rhadinostachya*	*subsp. rhadinostachya*	<1	0.1
Eremophila	*longifolia*		<1	1.5
Euphorbia	*tannensis*	*subsp. eremophila*	<1	0.3
Gossypium	*robinsonii*		4	2-3.5
Grevillea	*wickhamii*	*subsp. hispidula*	0.5	2
Indigofera	*monophylla*		<1	0.3
Jasminum	*didymum*	*subsp. lineare*	<1	1
Polycarpaea	*longiflora*		<1	0.2
Ptilotus	*obovatus*		<1	1
Santalum	*lanceolatum*		<1	1.8
Senna	*artemisioides*	*subsp. oligophylla*	<1	0.5
Senna	*artemisioides*	*subsp. helmsii*	<1	0.2
Tephrosia	*rosea*	*var. glabrior*	<1	0.6
Trachymene	*oleracea*		<1	0.5
Tribulus	*macrocarpus*		<1	Cr

Species			%Cover	Height
Trichodesma	*zeylanicum*	*var. zeylanicum*	<1	0.2
Triodia	*pungens*		1.5	0.5-1

Site	ML - Site ML 55
Date	05/10/2011
Recorder	JB/EP
Photo	1755, ML55
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	728183
Northing	7497310
Habitat	Flood-out (FLD)
Slope	Very Gently Inclined (VG) (0°36' to 1°45')
Aspect	
Soil	Clay loam (orange)
Rock Type	Ironstone (cobbles, pebbles)
% Leaves:Logs	<1:2
Vegetation Condition	Good
Disturbance Type	Livestock; Weeds; Access tracks
Fire Age	
Vegetation	Hummock Grassland of Triodia basedowii, Triodia pungens over Very Open Tussock Grassland of *Cenchrus ciliaris, Aristida holathera var. holathera with Scattered Tall Shrubs of Acacia inaequilatera

	Species		%Cover	Height
**Cenchrus*	*ciliaris*		2.5	0.5-0.7
Acacia	*pyrifolia*		<1	0.8
Acacia	*spondylophylla*		<1	0.7
Acacia	*tumida*	*var. pilbarensis*	0.5	1-3
Acacia	*ancistrocarpa*		<1	1-2
Acacia	*inaequilatera*		2	1-3
Arsitdia	*holathera*	*var. holathera*	2	0.35
Boerhavia	*coccinea*		<1	Cr
Cleome	*viscosa*		<1	0.3
Corchorus	*laniflorus*		1.5	0.2
Dysphania	*rhadinostachya*	*subsp. rhadinostachya*	<1	0.1
Eragrostis	*eriopoda*		<1	0.5
Eriachne	*aristidea*		<1	0.2
Eriachne	*aristidea*		<1	0.15
Eucalyptus	*leucophloia*	*subsp. leucophloia*	<1	5
Eucalyptus	*gamophylla*		1	2
Euphorbia	*schultzii*		<1	0.1
Gossypium	*australe*		<1	0.5-1
Grevillea	*wickhamii*	*subsp. hispidula*	<1	0.5-1
Hibiscus	*sturtii*	*var. platychlamys*	<1	0.3
Hybanthus	*aurantiacus*		<1	0.5
Mollugo	*molluginea*		1.5	0.1
Perotis	*rara*		<1	0.1
Polycarpaea	*corymbosa*		<1	0.15
Ptilotus	*exaltatus*	*var. exaltatus*	4	0.5-1

Species			%Cover	Height
Ptilotus	*obovatus*		<1	0.4
Ptilotus	*calostachyus*		<1	0.6
Ptilotus	*astrolasius*		0.5	0.3
Senna	*artemisioides*	*subsp. oligophylla*	1	0.5-1
Sida	*arenicola*		<1	0.5
Tribulus	*macrocarpus*		<1	Cr
Triodia	*basedowii*		30	0.5-1
Triodia	*pungens*		1.5	0.2-0.7

Site	ML - Site ML 56
Date	05/10/2011
Recorder	PS/DR
Photo	ML56
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	726135
Northing	7496338
Habitat	Hillslope (HSL)
Slope	Moderately Inclined (MO) (5°46' to 18°)
Aspect	110°
Soil	Sandy loam (brown)
Rock Type	Ironstone (pebbles, cobbles, outcrops)
% Leaves:Logs	<1:0.5
Vegetation Condition	Very Good
Disturbance Type	Fire (Mod 2-5 yrs)
Fire Age	Moderate 2-5 yrs
Vegetation	Hummock Grassland of Triodia sp. Shovelanna Hill (s. Van leeuwen 3835), Triodia pungens with Low Shrubland of Ptilotus calostachyus, Acacia spondylophylla, Grevillea wickhamii subsp. hispidula with Low Open Woodland of Eucalyptus leucophloia subsp. leucophloia

	Species		%Cover	Height
Acacia	*spondylophylla*		10	0.7
Acacia	*pruinocarpa*		0.5	1-1.5
Amphipogon	*sericeus*		<1	0.4
Cleome	*viscosa*		<1	0.4
Clerodendrum	*floribundum*	*var. angustifolium*	<1	2
Corchorus	*lasiocarpus*	*subsp. lasiocarpus*	4	0.6
Corymbia	*hamersleyana*		<1	3
Dampiera	*candicans*		0.5	1
Dysphania	*rhadinostachya*	*subsp. rhadinostachya*	<1	0.3
Enneapogon	*polyphyllus*		<1	0.1
Eremophila	*jucunda*	*subsp. pulcherrima*	<1	0.3
Eriachne	*lanata*		0.5	1
Eriachne	*mucronata*		<1	0.5
Eriachne	*pulchella*		<1	0.3
Eucalyptus	*leucophloia*	*subsp. leucophloia*	2.5	3-8
Eucalyptus	*gamophylla*		1	1-3
Fimbristylis	*simulans*		<1	0.15
Goodenia	*stobbsiana*		<1	0.2
Grevillea	*wickhamii*	*subsp. hispidula*	0.5-1	1-2
Mirbelia	*viminalis*		0.5	0.5
Polycarpaea	*longiflora*		1	0.1
Ptilotus	*calostachyus*		10	1
Ptilotus	*fusiformis*		<1	0.4
Ptilotus	*exaltatus*	*var. exaltatus*	<1	0.5
Senna	*glutinosa*	*subsp. glutinosa*	<1	1

Species			%Cover	Height
Senna	*glutinosa*	*subsp. luerssenii*	<1	1
Sida	*arenicola*		0.5	2.5
Solanum	*phlomoides*		<1	0.3
Tephrosia	*arenicola*		0.5	1
Tribulus	*suberosus*		<1	0.5
Triodia	*sp. Shovelanna Hill (S. van Leeuwen 3835)*		30	0.5
Triodia	*pungens*		2.5	0.4

Site	ML - Site ML 57
Date	05/10/2011
Recorder	JB/EP
Photo	1756, ML57
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	728027
Northing	7496468
Habitat	Gully (GUL)
Slope	Steep (ST) (18°1' to 30°)
Aspect	10°
Soil	Sandy loam (brown)
Rock Type	Ironstone (cliffs, boulders, cobbles, pebbles)
% Leaves:Logs	4:7
Vegetation Condition	Excellent
Disturbance Type	Weeds
Fire Age	Moderate 2-5 yrs
Vegetation	Low Woodland of Corynbia ferriticola subsp. ferriticola, Eucalyptus leucophloia subsp. leucophloia over High Shrubland of Acacia tumida var. pilbarensis, Stylobasium spathulatum, Grevillea wickhamii subsp. hispidula over Open Tussock Grassland of Themeda triandra, Eriachne mucronata, Cymbopogon ambiguus over Open Hummock Grassland of Triodia pungens

	Species		%Cover	Height
**Cenchrus*	*ciliaris*		<1	0.3
Abutilon	*dioicum*		<1	0.2
Acacia	*spondylophylla*		2	0.5
Acacia	*tumida*	*var. pilbarensis*	2	1.5-3
Acacia	*monticola*		2.5	2.5
Acacia	*pruinocarpa*		1.5	0.2-4
Acacia	*bivenosa*		0.5	2
Acacia	*ancistrocarpa*		<1	2.5
Aristida	*burbidgeae*		0.5	0.45
Atalaya	*hemiglauca*		<1	2.5
Capparis	*spinosa*	*var. nummularia*	<1	1
Capparis	*lasiantha*		<1	0.6
Cleome	*viscosa*		<1	0.5
Clerodendrum	*floribundum*	*var. angustifolium*	<1	0.5-1.2
Corchorus	*lasiocarpus*	*subsp. lasiocarpus*	<1	0.5
Corymbia	*ferriticiola*		5	4-8
Cymbopogon	*ambiguus*		0.5	0.5-1
Cyperus	*hesperius*		<1	0.5
Duperreya	*commixta*		<1	Cl
Dysphania	*rhadinostachya*	*subsp. rhadinostachya*	<1	0.2
Eremophila	*jucunda*	*subsp. pulcherrima*	0.5	0.5
Eriachne	*mucronata*		8	0.35
Eriachne	*aristidea*		<1	0.15

Species			%Cover	Height
Eucalyptus	*leucophloia*	*subsp. leucophloia*	5	2-6
Euphorbia	*sp. Indet*		0.5	0.2
Ficus	*brachypoda*		<1	1.5
Gomphrena	*cunninghamii*		<1	0.15
Goodenia	*stobbsiana*		<1	0.5
Gossypium	*robinsonii*		0.5	2
Grevillea	*wickhamii*	*subsp. hispidula*	3	2-3
Hibiscus	*coatesii*		<1	2
Jasminum	*didymum*	*subsp. lineare*	<1	Cl
Mirbelia	*viminalis*		<1	0.5-1
Newcastelia	*sp. Mt Windell (S. van Leeuwen 846)*		<1	0.5
Paraneurachne	*muelleri*		<1	0.4
Paspalidium	*clementii*		0.5	0.2
Petalostylis	*labicheoides*		1	2-3
Ptilotus	*fusiformis*		<1	0.4
Rhodanthe	*margarethae*		<1	0.5-0.7
Senna	*glutinosa*	*subsp. glutinosa*	<1	1-1.5
Senna	*venusta*		<1	0.5
Sida	*arenicola*		2	1.5-2.5
Stylobasium	*spathulatum*		7	1-2
Tephrosia	*sp. Bungaroo Creek*		<1	1.5
Themeda	*triandra*		18	0.6
Trichodesma	*zeylanicum*	*var. zeylanicum*	<1	1.5
Triodia	*pungens*		25	0.7
Triodia	*wiseana*		<1	0.8
Triumfetta	*maconochieana*		<1	0.35

Site	ML - Site ML 58
Date	05/10/2011
Recorder	PS/DR
Photo	ML58
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	727136
Northing	7496404
Habitat	Valley Flat (VLF)
Slope	Moderately Inclined (MO) (5°46' to 18°)
Soil	Sandy loam (brown)
Rock Type	Ironstone (pebbles, cobbles)
% Leaves:Logs	5:0.5
Vegetation Condition	Excellent
Disturbance Type	Track; Drilling op nearby
Fire Age	Old 5-10 yrs
Vegetation	Closed Hummock Grassland of Triodia sp. Shovelanna Hill (S. Van Leeuwen 3835), Triodia pungens with High Shrubland of Acacia tumida var. pilbarensis, Petalostylis labicheoides, Grevillea wickhamii subsp. hispidula with Very Open Mallee of Eucalyptus gamophylla

	Species		%Cover	Height
Acacia	*bivenosa*		<1	1
Acacia	*tumida*	*var. pilbarensis*	8	1.5-4
Acacia	*spondylophylla*		<1	1.15
Aristida	*contorta*		<1	0.7
Aristida	*holathera*	*var. holathera*	<1	0.5
Aristida	*inaequiglumis*		0.5	1.2
Corymbia	*hamersleyana*		1.5	6
Dicrastylis	*cordifolia*		0.5	0.5
Duperreya	*commixta*		<1	Cl
Dysphania	*rhadinostachya*	*subsp. rhadinostachya*	<1	0.3
Eremophila	*longifolia*		<1	1
Eucalyptus	*gamophylla*		2.5	3-5
Fimbristylis	*simulans*		<1	0.15
Gossypium	*robinsonii*		<1	2.5
Grevillea	*wickhamii*	*subsp. hispidula*	4	1.5-3
Hakea	*chordophylla*		<1	0.5-3
Indigofera	*monophylla*		<1	1
Jasminum	*didymum*	*subsp. lineare*	<1	Cl
Petalostylis	*labicheoides*		7	1.5-4
Ptilotus	*calostachyus*		<1	0.8
Themeda	*triandra*		0.5	0.8
Tribulus	*suberosus*		<1	0.4
Trichodesma	*zeylanicum*	*var. zeylanicum*	<1	0.5
Triodia	*sp. Shovelanna Hill*		65	0.8
Triodia	*pungens*		15	1.3

Site	ML - Site ML 59
Date	05/10/2011
Recorder	JB/EP
Photo	1765, ML59
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	724469
Northing	7500620
Habitat	Flood-out (FLD)
Slope	Gently Inclined (GE) (1°46' to 5°45')
Aspect	250°
Soil	Sandy loam (brown)
Rock Type	Ironstone; Chert (slatey- cobbles, pebbles)
% Leaves:Logs	1:3
Vegetation Condition	Degraded
Disturbance Type	Fire (Mod 2-5 yrs); Weeds; Livestock; Access tracks; Drill pads
Fire Age	Moderate 2-5 yrs
Vegetation	Tussock Grassland of *Cenchrus ciliaris with Open Shrubland of Acacia pyrifolia, Stylobasium spathulatum over Very Open Hummock Grassland of Triodia pungens with Scattered Low Trees of Acacia inaequilatera, Corymbia hamersleyana

	Species		%Cover	Height
**Cenchrus*	*ciliaris*		50	0.6
**Cenchrus*	*setiger*		1	0.5-1
Acacia	*inaequilatera*		1	3.5
Acacia	*tumida*	*var. pilbarensis*	1	0.8-3.5
Acacia	*pyrifolia*		4	1-2.
Aristida	*holathera*	*var. holathera*	<1	0.4
Atalaya	*hemiglauca*		<1	1-2.5
Boerhavia	*coccinea*		<1	Cr
Cleome	*viscosa*		<1	0.5
Clerodendrum	*floribundum*	*var. angustifolium*	<1	1-2
Corchorus	*laniflorus*		<1	1.2
Corchorus	*lasiocarpus*	*subsp. lasiocarpus*	<1	0.5
Corymbia	*hamersleyana*		0.5	2-7
Cymbopogon	*procerus*		<1	1.2
Dysphania	*rhadinostachya*	*subsp. rhadinostachya*	<1	0.2
Eremophila	*longifolia*		<1	1-2
Eriachne	*aristidea*		<1	0.1
Eucalyptus	*gamophylla*		<1	1-2
Gomphrena	*cunninghamii*		<1	0.25
Gossypium	*robinsonii*		1	1-2
Grevillea	*wickhamii*	*subsp. hispidula*	1.5	1-3
Indigofera	*monophylla*		0.5	0.25
Notoleptopus	*decaisnei*		<1	0.3
Polycarpaea	*longiflora*		<1	0.25
Ptilotus	*exaltatus*	*var. exaltatus*	<1	0.5

Species			%Cover	Height
Ptilotus	*obovatus*		1.5	0.5-1
Ptilotus	*calostachyus*		<1	0.6
Ptilotus	*polystachyus*		<1	0.4
Ptilotus	*astrolasius*		<1	0.3
Rhagodia	*eremaea*		<1	1
Salsola	*australis*		<1	0.5
Senna	*artemisioides*	*subsp. oligophylla*	<1	1
Senna	*artemisioides*	*subsp. helmsii*	<1	0.6
Solanum	*phlomoides*		<1	0.2
Stylobasium	*spathulatum*		1	1-2
Tephrosia	*rosea*	*var. glabroir*	<1	0.4
Trachymene	*oleracea*		<1	0.4
Tribulus	*macrocarpus*		<1	Cr
Trichodesma	*zeylanicum*	*var. zeylanicum*	<1	0.5
Triodia	*pungens*		4	0.3-0.6

Site	ML - Site ML 60
Date	05/10/2011
Recorder	PS/DR
Photo	ML60
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	725137
Northing	7496572
Habitat	Breakaway (BRK)
Slope	Very Steep (VS) (30°1' to 45°)
Aspect	260°
Soil	Sandy loam (brown)
Rock Type	Ironstone (pebbles, cobbles, outcrops)
% Leaves:Logs	0.5:<1
Vegetation Condition	Excellent
Disturbance Type	Old tracks
Fire Age	Very old >10 yrs
Vegetation	Closed Hummock Grassland of Triodia brizioides, Triodia sp. Shovelanna Hill (S. Van Leeuwen 3835) with High Open Shrubland of Grevillea wickhamii subsp. hispidula, Acacia inaequilatera with Scattered Low Trees of Eucalyptus leucophloia subsp. leucophloia, Corymbia deserticola subsp. deserticola

	Species		%Cover	Height
Acacia	*spondylophylla*		0.5	1.5
Acacia	*inaequilatera*		1	1-3
Acacia	*pruinocarpa*		<1	1.5
Acacia	*bivenosa*		<1	1
Cleome	*viscosa*		<1	0.2
Corchorus	*lasiocarpus*	*subsp. lasiocarpus*	<1	0.7
Corymbia	*deserticola*	*subsp. deserticola*	1	5
Cymbopogon	*ambiguus*		2	0.8
Cyperus	*cunninghamii*	*subsp. cunninghamii*	<1	0.15
Enneapogon	*polyphyllus*		<1	0.5
Eriachne	*mucronata*		2.5	0.4
Eriachne	*pulchella*		<1	0.1
Eucalyptus	*leucophloia*	*subsp. leucophloia*	1	7
Grevillea	*wickhamii*	*subsp. hispidula*	0.5	4
Newcastelia	*sp. Hamersley Range*		0.5	0.5
Paspalidium	*clementii*		<1	0.2
Peripleura	*virgata*		<1	0.8
Ptilotus	*obovatus*		<1	1-1.5
Schizachyrium	*fragile*		<1	0.2
Senna	*glutinosa*	*subsp. glutinosa*	<1	0.5
Stylosbasium	*spathulatum*		<1	0.5-2
Triodia	*brizoides*		75	1
Triodia	*sp. Shovelanna Hill*		1	0.6
Triumfetta	*leptacantha*		<1	0.1

Site	ML - Site ML 61
Date	05/10/2011
Recorder	JB/EP
Photo	1767, 1768, ML61
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	725313
Northing	
Habitat	Drainage Depression (DDE)
Slope	Gently Inclined (GE) (1°46' to 5°45')
Aspect	50°
Soil	Sandy loam (red)
Rock Type	Ironstone; Riverine gravels (cobbles, pebbles)
% Leaves:Logs	10:8
Vegetation Condition	Very Good
Disturbance Type	Fire (Mod 2-5 yrs, Old 5-10 yrs); Livestock; Weeds; Access road
Fire Age	Moderate 2-5 yrs
Vegetation	Open Scrub of Acacia tumida var. pilbarensis, Acacia pyrifolia, Grevillea wickhamii subsp. hispidula over Low Shrubland of Tephrosia rosea var. glabrior, Indigofera monophylla, Corchorus laniflorus over Open Tussock Grassland of Cymbopogon procerus, *Cenchrus ciliaris, Aristida holathera var. holathera over Very Open Hummock Grassland of Triodia pungens

	Species		%Cover	Height
**Cenchrus*	*ciliaris*		6	0.7
Abutilon	*dioicum*		<1	2.5
Abutilon	*malviflorum*		<1	Cr
Acacia	*tumida*	*var. pilbarensis*	22	2-5
Acacia	*pyrifolia*		4	1-2.5
Acacia	*dictyophleba*		<1	2
Aristida	*holathera*	*var. holathera*	1	0.4
Aristida	*contorta*		<1	0.2
Aristida	*inaequiglumis*		<1	1
Atalaya	*hemiglauca*		<1	2
Atalaya	*hemiglauca*		<1	2.5
Cleome	*viscosa*		<1	0.5-0.6
Corchorus	*laniflorus*		1.5	0.5-1
Corchorus	*lasiocarpus*	*subsp. lasiocarpus*	1	1.3
Corchorus	*laniflorus*		<1	0.2
Cucumis	*maderaspatanus*		<1	Cl
Cymbopogon	*procerus*		7	1-1.5
Enneapogon	*lindleyanus*		<1	0.4
Eriachne	*aristidea*		<1	0.1
Euphorbia	*tannensis*	*subsp. eremophila*	<1	0.5
Euphorbia	*sp.*		<1	0.1
Gomphrena	*cunninghamii*		<1	0.3
Gossypium	*robinsonii*		<1	2.5
Grevillea	*wickhamii*	*subsp. hispidula*	1.5	1-3

Species			%Cover	Height
Indigofera	*monophylla*		7	0.5
Notoleptopus	*decaisnei*		<1	0.3
Phyllanthus	*maderaspatensis*		<1	0.1
Polycarpaea	*longiflora*		<1	0.3
Ptilotus	*polystachyus*		<1	1.2
Ptilotus	*exaltatus*	*var. exaltatus*	<1	1-1.5
Ptilotus	*obovatus*		0.5	0.5-1
Salsola	*australis*		<1	0.5-1
Sida	*echinocarpa*		<1	0.5-1
Solanum	*phlomoides*		<1	0.5
Tephrosia	*rosea*	*var. glabrior*	13	0.4-1
Themeda	*triandra*		<1	0.8
Trichodesma	*zeylanicum*	*var. zeylanicum*	3.5	1-2
Triodia	*pungens*		3	0.3-0.5

Site	ML - Site ML 62
Date	06/10/2011
Recorder	PS/DR
Photo	ML62
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	724654
Northing	7501475
Habitat	Plain (PLA)
Slope	Gently Inclined (GE) (1°46' to 5°45')
Soil	Sandy loam (brown)
Rock Type	Ironstone (cobbles, pebbles)
% Leaves:Logs	<1:0.5
Vegetation Condition	Very Good
Disturbance Type	Rail line; Drill pad <200m
Fire Age	Old 5-10 yrs
Vegetation	Hummock Grassland of Triodia basedowii with Low Shrubland of Ptilotus astrolasius, Bonamia rosea with High Open Shrubland of Acacia inaequilatera, Hakea chordophylla

	Species		%Cover	Height
Acacia	*inaequilatera*		5	1-4
Acacia	*synchronicia*		<1	1-1.3
Acacia	*pachyacra*		0.5	1-2
Aristida	*holathera*	*var. holathera*	<1	0.2
Bonamia	*rosea*		2	0.4
Cleome	*viscosa*		<1	0.5
Corchorus	*tectus*		0.5	0.3
Corymbia	*hamersleyana*		<1	1.5-3
Eragrostis	*eriopoda*		0.5	0.4
Eriachne	*pulchella*		<1	0.2
Eriachne	*aristidea*		<1	0.1
Eucalyptus	*gamophylla*		<1	2
Goodenia	*microptera*		<1	0.3
Grevillea	*wickhamii*	*subsp. hispidula*	0.5	1-2
Hakea	*chordophylla*		2.5	2-3
Heliotropium	*pachyphyllum*		<1	0.2
Indigofera	*monophylla*		<1	0.2
Mollugo	*molluginea*		0.5	0.1
Ptilotus	*astrolasius*		8	0.5
Ptilotus	*helipteroides*		0.5	0.4
Ptilotus	*exaltatus*	*var. exaltatus*	<1	0.5
Ptilotus	*calostachyus*		<1	0.5-1
Senna	*artemisioides*	*subsp. oligophylla*	<1	1
Sida	*arenicola*		<1	0.5
Trianthema	*pilosa*		<1	0.1
Triodia	*basedowii*		55	1

Site	ML - Site ML 63
Date	06/10/2011
Recorder	JB/EP
Photo	1771, ML63
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	728960
Northing	7495788
Habitat	Hillslope (HSL)
Slope	Moderately Inclined (MO) (5°46' to 18°)
Aspect	350°
Soil	Silty loam (red)
Rock Type	Ironstone (outcrops, boulders, cobbles, pebbles)
% Leaves:Logs	0.5:1
Vegetation Condition	Very Good
Disturbance Type	Fire (Young 1-2 yrs); Access track nearby
Fire Age	Young 1-2 yrs
Vegetation	Open Hummock Grassland of Triodia sp. Shovelanna Hill (S. Van Leeuwen 3835), Triodia pungens over Open Tussock Grassland of Eriachne lanata, Eriachne mucronata with Low Open Woodland of Eucalyptus leucophloia subsp. leucophloia

	Species		%Cover	Height
Acacia	*pruinocarpa*		<1	0.5
Acacia	*spondylophylla*		0.5	0.3-0.6
Acacia	*bivenosa*		<1	0.3-0.6
Aristida	*holathera*	*var. holathera*	<1	0.3
Calytrix	*carinata*		<1	0.1-0.5
Corchorus	*lasiocarpus*	*subsp. lasiocarpus*	2	0.5-0.8
Corymbia	*hamersleyana*		<1	1.5
Dampiera	*candicans*		<1	0.35
Dysphania	*rhadinostachya*	*subsp. rhadinostachya*	<1	0.1
Enneapogon	*polyphyllus*		<1	0.35
Eremophila	*jucunda*	*subsp. pulcherrima*	<1	0.4
Eriachne	*lanata*		6.5	0.45
Eriachne	*aristidea*		0.5	0.15
Eriachne	*mucronata*		3.5	0.35
Eriachne	*aristidea*		<1	0.2
Eucalyptus	*leucophloia*	*subsp. leucophloia*	3.5	3.5
Ficus	*brachypoda*		<1	0.5-1
Goodenia	*stobbsiana*		<1	0.2
Grevillea	*wickhamii*	*subsp. hispidula*	1	1.5-2
Hakea	*chordophylla*		<1	2.5
Nicotiana	*benthamiana*		<1	0.55
Paraneurachne	*muelleri*		0.5	0.4
Paspalidium	*clementii*		<1	0.1
Polycarpaea	*holtzei*		<1	0.05
Ptilotus	*calostachyus*		7.5	0.5-1

Species			%Cover	Height
Ptilotus	*exaltatus*	*var. exaltatus*	0.5	0.4
Ptilotus	*astrolasius*		0.5	0.3
Ptilotus	*fusiformis*		<1	0.4
Ptilotus	*clementii*		<1	0.5
Ptilotus	*rotundifolius*		<1	0.5
Schizachyrium	*fragile*		<1	0.2
Senna	*glutinosa*	*subsp. glutinosa*	<1	0.5-1
Senna	*glutinosa*	*subsp. luerssenii*	<1	0.5
Senna	*artemisioides*	*subsp. helmsii*	<1	0.6
Senna	*glutinosa*	*subsp. pruinosa*	0.5	1.2-2
Sida	*sp. Pilbara (A.A. Mitchell PRP1543)*		0.25	0.5
Sida	*sp. Golden calyces glabrous (H.N. Foote 32)*		<1	0.3
Solanum	*horridum*		<1	0.1
Solanum	*phlomoides*		<1	0.2
Trachymene	*oleracea*		<1	0.5-1
Triodia	*sp. Shovelanna Hill (S. van Leeuwen 3835)*		20	0.4
Triodia	*pungens*		6	0.3

Site	ML - Site ML 64
Date	06/10/2011
Recorder	JB/EP
Photo	ML64
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	725318
Northing	7500096
Habitat	Footslope (FOO)
Slope	Gently Inclined (GE) (1°46' to 5°45')
Aspect	210°
Soil	Loamy sand (brown)
Rock Type	None evident
% Leaves:Logs	0.5:1
Vegetation Condition	Very Good
Disturbance Type	Old track; Drill pads; Weeds
Fire Age	Old 5-10 yrs
Vegetation	Hummock Grassland of Triodia schinzii, Triodia basedowii with Open Mallee of Eucalyptus gamophylla with Low Open Woodland of Acacia inaequilatra, Hakea chordophylla, Corymbia hamersleyana

	Species		%Cover	Height
**Cenchrus*	*ciliaris*		1	0.5
Acacia	*inaequilatera*		3	1-3
Acacia	*dictyophleba*		<1	0.5
Acacia	*ancistrocarpa*		0.5	1-2
Acacia	*pruinocarpa*		<1	1
Acacia	*spondylophylla*		<1	0.8
Acacia	*tumida*	*var. pilbarensis*	<1	1
Aristida	*holathera*	*var. holathera*	<1	0.2
Bonamia	*rosea*		2.5	0.4
Chrysopogon	*fallax*		<1	1.2
Cleome	*viscosa*		<1	0.4
Corchorus	*lasiocarpus*	*subsp. lasiocarpus*	<1	0.5
Corymbia	*hamersleyana*		1	5
Dicrastylis	*cordifolia*		2.5	1
Eragrostis	*eriopoda*		<1	0.4
Eriachne	*gardneri*		<1	0.2
Eucalyptus	*gamophylla*		15	2-3
Eulalia	*aurea*		<1	0.5
Euphorbia	*schultzii*		<1	0.15
Goodenia	*microptera*		<1	0.2
Grevillea	*wickhamii*	*subsp. hispidula*	<1	1
Hakea	*chordophylla*		2	2-5
Hibiscus	*coatesii*		<1	0.5
Hybanthus	*aurantiacus*		<1	0.5
Indigofera	*monophylla*		<1	0.4
Clerodendrum	*floribundum*	*var. angustifolium*	1.5	0.3
Mollugo	*molluginea*		<1	0.1

Species			%Cover	Height
Paraneurachne	*muelleri*		7.5	0.5
Ptilotus	*astrolasius*		<1	0.5
Ptilotus	*calostachyus*		<1	1-1.5
Ptilotus	*exaltatus*	*var. exaltatus*	<1	0.4
Ptilotus	*obovatus*		<1	1
Ptilotus	*clementii*		<1	0.5
Scaevola	*browniana*	*subsp. browniana*	<1	0.2
Scaevola	*parvifolia*	*subsp. pilbarae*	<1	0.3
Scaevola	*spinescens*		<1	1
Senna	*artemisioides*	*subsp. oligophylla*	0.5	0.3
Sida	*cardiophylla*		<1	0.3
Sida	*arenicola*		<1	1.5
Trianthema	*pilosa*		<1	0.1
Trichodesma	*zeylanicum*	*var. zeylanicum*	<1	1.5
Triodia	*schinzii*		60	1-1.5
Triodia	*basedowii*		2	0.7

Site	ML - Site ML 65
Date	06/10/2011
Recorder	JB/EP
Photo	1772, ML65
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	729438
Northing	7495152
Habitat	Hillslope (HSL)
Slope	Steep (ST) (18°1' to 30°)
Aspect	90°
Soil	Silty loam (red)
Rock Type	Ironstone (outcrops, boulders, cobbles, pebbles)
% Leaves:Logs	<1:1
Vegetation Condition	Excellent
Disturbance Type	Access track nearby
Fire Age	Old 5-10 yrs
Vegetation	Closed Hummock Grassland of Triodia sp. Shovelanna Hill (S. Van Leeuwen 3835), Triodia wiseana, Triodia pungens with Low Open Woodland of Eucalyptus leucophloia subsp. leucophloia, Corymbia ferritifcola, Acacia aneura over High Open Shrubland of Grevillea wickhamii subsp. hispidula

	Species		%Cover	Height
Acacia	*pruinocarpa*		1.5	2-3
Acacia	*spondylophylla*		1.5	0.5-0.7
Acacia	*bivenosa*		<1	1
Acacia	*tenuissima*		1	2-4
Clerodendrum	*floribundum*	*var. angustifolium*	<1	1-2
Corchorus	*lasiocarpus*	*subsp. lasiocarpus*	<1	0.2
Corymbia	*ferriticola*	*subsp. ferriticola*	1.5	4
Cymbopogon	*ambiguus*		<1	
Dysphania	*rhadinostachya*	*subsp. rhadinostachya*	<1	0.2
Enneapogon	*polyphyllus*		<1	0.15
Eremophila	*jucunda*	*subsp. pulcherrima*	1.5	0.5-1
Eriachne	*lanata*		<1	0.3
Eriachne	*aristidea*		<1	0.15
Eriachne	*mucronata*		0.5	0.4
Eucalyptus	*leucophloia*	*subsp. leucophloia*	6	2.5-8
Grevillea	*wickhamii*	*subsp. hispidula*	6	2-5
Newcastelia	*sp. Mt Windell (S. van Leeuwen 846)*		<1	0.5-1
Senna	*glutinosa*	*subsp. glutinosa*	<1	1
Triodia	*sp. Shovelanna Hill (S. van Leeuwen 3835)*		50	0.2-0.6
Triodia	*wiseana*		10	0.5-1
Triodia	*pungens*		10	0.5-1.3

Site	ML - Site ML 66
Date	06/10/2011
Recorder	PS/DR
Photo	ML66
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	725775
Northing	7498017
Habitat	Hillslope (HSL)
Slope	Moderately Inclined (MO) (5°46' to 18°)
Aspect	180°
Soil	Sandy loam (brown)
Rock Type	Ironstone (pebbles, cobbles, outcrops)
% Leaves:Logs	0.5:0.5
Vegetation Condition	Excellent
Disturbance Type	Access track; Drill ops
Fire Age	Old 5-10 yrs
Vegetation	Low Open Heath of Acacia Spondylophylla. Acacia hilliana over Hummock Grassland of Triodia sp. Shovelanna Hill (S. Van leeuwen 3835), Triodia pungens with Low Open Woodland of Eucalyptus leucophloia subsp. leucophloia

	Species		%Cover	Height
Acacia	*spondylophylla*		25	0.3-1
Acacia	*hilliana*		15	0.2-0.5
Acacia	*pruinocarpa*		1	4
Bulbostylis	*barbata*		<1	0.02
Corchorus	*lasiocarpus*	*subsp. lasiocarpus*	<1	0.5
Eremophila	*latrobei*	*subsp. filiformis*	0.5	0.4
Eremophila	*jucunda*	*subsp. pulcherrima*	0.5	1
Eriachne	*aristidea*		<1	0.1
Eucalyptus	*leucophloia*	*subsp. leucophloia*	1	6
Eucalyptus	*gamophylla*		8	2-4
Goodenia	*triodiophila*		<1	0.4
Grevillea	*wickhamii*	*subsp. hispidula*	8	1-3
Hakea	*lorea*	*subsp. lorea*	<1	1
Ptilotus	*calostachyus*		<1	0.5
Ptilotus	*rotundifolius*		<1	1.
Senna	*glutinosa*	*subsp. glutinosa*	<1	2
Tribulus	*suberosus*		<1	0.1
Triodia	*sp. Shovelanna Hill (S. van Leeuwen 3835)*		55	0.8
Triodia	*pungens*		10	1

Site	ML - Site ML 67
Date	06/10/2011
Recorder	JB/EP
Photo	1775, ML67
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	726971
Northing	7495539
Habitat	Plain (PLA)
Slope	Gently Inclined (GE) (1°46' to 5°45')
Aspect	310°
Soil	Sandy loam (brown)
Rock Type	Ironstone (cobbles, pebbles)
% Leaves:Logs	<1:0.5
Vegetation Condition	Excellent
Disturbance Type	Old access track nearby
Fire Age	Old 5-10 yrs
Vegetation	Closed Hummock Grassland of Triodia basedowii, Triodia pungens with Very Open Mallee of Eucalyptus gamophylla over Scattered Shrubs of Acacia bivenosa, Senna artemisioides subsp. oligophylla

	Species		%Cover	Height
Acacia	*spondylophylla*		<1	0.5
Acacia	*tenuissima*		<1	1-1.5
Acacia	*bivenosa*		1.5	1-2
Acacia	*pyrifolia*		0.5	1-2
Acacia	*tumida*	*var. pilbarensis*	<1	2.5
Aristida	*holathera*	*var. holathera*	<1	0.2
Cleome	*viscosa*		<1	0.35-0.5
Dysphania	*rhadinostachya*	*subsp. rhadinostachya*	<1	0.15-0.5
Eriachne	*aristidea*		<1	0.5
Eucalyptus	*gamophylla*		7	1.5-3
Gossypium	*robinsonii*		0.5	2-3
Grevillea	*wickhamii*	*subsp. hispidula*	1	1-2
Hakea	*chordophylla*		<1	2-5
Jasminum	*didymum*	*subsp. lineare*	<1	Cl
Polycarpaea	*longiflora*		<1	0.25
Ptilotus	*calostachyus*		<1	0.5
Ptilotus	*exaltatus*	*var. exaltatus*	<1	0.5
Santalum	*lanceolatum*		<1	2-3.5
Senna	*artemisioides*	*subsp. oligophylla*	1.5	0.5-1.5
Solanum	*phlomoides*		<1	0.1
Stylobasium	*spathulatum*		<1	0.8-1.5
Trachymene	*oleracea*		<1	1.2
Triodia	*basedowii*		65	0.3-0.8
Triodia	*pungens*		8	0.1-1

Site	ML - Site ML 68
Date	06/10/2011
Recorder	PS/DR
Photo	ML68
Shape/Size	50m x 50m
Datum	GDA 94
Zone	50K
Easting	727816
Northing	7499391
Habitat	Plain (PLA)
Slope	Gently Inclined (GE) (1°46' to 5°45')
Aspect	50°
Soil	Sandy loam (brown)
Rock Type	Ironstone; Chert (pebbles, cobbles)
% Leaves:Logs	<1:0.5
Vegetation Condition	Good
Disturbance Type	Access track; Drill ops; Weeds; Livestock
Fire Age	Old 5-10 yrs
Vegetation	Low Shrubland of Ptilotus exaltatus var. exaltatus, Mollugo molluginea over Open Hummock Grassland of Triodia pungens, Triodia basedowii with High Open Shrubland of Acacia inaequilatera, Grevillea wickhamii subsp. hispidula

	Species		%Cover	Height
**Cenchrus*	*ciliaris*			
Acacia	*inaequilatera*			
Acacia	*pruinocarpa*			
Acacia	*dictyophleba*			
Acacia	*spondylophylla*			
Aristida	*holathera*	*var. holathera*		
Atalaya	*hemiglauca*			
Boerhavia	*coccinea*			
Corchorus	*lasiocarpus*	*subsp. lasiocarpus*		
Corchorus	*tectus*			
Corymbia	*hamersleyana*			
Dysphania	*rhadinostachya*	*subsp. rhadinostachya*		
Eragrostis	*eriopoda*			
Eucalyptus	*gamophylla*			
Gossypium	*australe*			
Grevillea	*wickhamii*	*subsp. hispidula*		
Hakea	*chordophylla*			
Hybanthus	*aurantiacus*			
Indigofera	*monophylla*			
Mollugo	*molluginea*			
Ptilotus	*exaltatus*	*var. exaltatus*		
Ptilotus	*astrolasius*			
Ptilotus	*obovatus*			
Ptilotus	*helipteroides*			

Species			%Cover	Height
Ptilotus	*aervoides*			
Senna	*artemisioides*	*subsp. oligophylla*		
Tribulus	*macrocarpus*			
Triodia	*pungens*			
Triodia	*basedowii*			