6 DISCUSSION

The significance of the vegetation and flora of the Study Area has been assessed at four scales: national, state, regional and local.

National significance refers to those features of the environment which are recognised under legislation as being of importance to the Australian community. Flora species and Threatened Ecological Communities (TECs) listed under the EPBC Act are regarded as nationally significant.

State significance refers to those features of the environment that are recognised under state legislation as being of importance to the Western Australian community. It includes species that are listed as Threatened under the WC Act and TECs and PECs listed by the DEC, or vegetation which supports fauna of scheduled status.

Regional significance addresses the representation of species and habitats at a biogeographical level. That is, species or habitat types that are endemic to the Hamersley sub-region or whose distributions are limited or unknown are considered regionally significant.

Vegetation and flora species are of local significance when their presence is confined to a very locallised area or a specialised habitat type that is not common in the local or regional contaxt and whose disturbance or removal may lead to local extinction.

6.1 FLORISTIC RICHNESS

Species richness is a fundamental measurement of community and regional diversity (Gotelli and Colwell 2001). It is the simplest representation of species diversity (Magurran 1988, Fowler and Cohen 1990) and is the basic indicator of diversity used for this survey.

Table 6.1 compares the floristic inventory recorded during the current survey to that recorded in other quadrat-based surveys conducted in the Pilbara. The most directly comparable survey was in 1998 of the Turee Study Area by ME Trudgen & Associates (1998) which was also a large scale survey. In ME Trudgen & Associates a larger area was survyed, encapusulating a greater range of habitats/landsystems which also resulted in a greater number of taxa recorded.

A comparison of survey intensity with that of the remaining previous projects is difficult due to the differing scales of survey sizes.

The survey intensity of the current study (0.85 quadrats/km^2) is considered adequate to the area surveyed; which is reflected in the high number of taxa recorded for its scale.

Table 6.1 – A Comparison of Floristic Richness of Study Area with Nearby Studies

Study Site	Date Surveyed	Number Quadrats Surveyed	Area (km^2)	Quadrats /km^2	Number Taxa Recorded	Number of Taxa/ km^2
Current study	June-August 2012	149	175	0.85	431	2.46
ME Trudgen & Associates 1998	May-Aug 2011	-	353	-	635	1.80
Biota 2010	May-12	37	10	3.70	262	26.20
Rio Tinto 2010	April-10	17	5	3.40	184	36.80
Biota 2006	May-04	41	19	2.16	429	22.58

6.1.1 Flora of National Significance

Lepidium catapycnon is the most significant taxon with regards to conservation status recorded within the current survey and is listed as vulnerable under the EPBC Act. Descriptions of the EPBC Act vulnerability codes can be found in Appendix D. Fourteen other collection points are lodged at the West Australian Herbarium, located within Western Australia and in close proximity each other. Based on collections from the current survey, this taxon is not abundant within the West Angelas Study Area, with 29 individuals from four locations recorded, however further targeted surveys have the potential to expand the known population. There is one known location from within the conservation estate.

Lepidium catapycnon appears to favour the outer edge of creek vegetation and rocky scree slopes that consist of orange-brown (terracotta) coloured clay-loam soil; and it is also favourable to areas where disturbance has exposed sub-soils, particularly of the calcareous type. Thirteen other locations of *Lepidium catapycnon* occur regionally within 40 km of the Study Area, suggesting that the taxon is likely to occur elsewhere within the Study Area (Figure 5.9 and Table 2.8).

The main threat to *L. catapycnon* is mining and exploration activities as its preferred habitat and the majority of recorded populations occur within mining and exploration tenements (Threatened Species Scientific Committee 2008). Processes which have been identified as potential threats to this species include roadworks, as it tends to prefer recently disturbed areas and colonises graded mining and exploration tracks (Threatened Species Scientific Committee 2008). The spread of the introduced species Ruby Dock (*Acetosa vesicaria*, which was also recorded within the Study Area) has been suggested to prevent establishment of this species in some areas (Threatened Species Scientific Committee 2008).

6.1.2 Flora of State Significance

Lepidium catapycnon, as above, is listed as Threatened (formerly Declared Rare Flora) under the WC Act.

6.1.3 Flora of Regional Significance

Thirteen Threatened and Priority Flora taxa were recorded by *ecologia* during the current survey: one Threatened (*Lepidium catapycnon*), three Priority 1 species (*Aristida jerichoensis* var. *subspinulifera, Brachyscome* sp. Wanna Munna Flats (S. van Leeuwen 4662) and *Brunonia* sp. long hairs (D.E. Symon 2440), two Priority 2 species (*Aristida lazaridis* and *Eremophila forrestii* subsp. Pingandy (M.E.

Trudgen 2662), six Priority 3 species (*Acacia* aff. *subtiliformis, Indigofera* sp. Gilesii (M.E. Trudgen 15869)*, Rhagodia* sp. Hamersley (M. Trudgen 17794), *Sida* sp. Barlee Range (S. van Leeuwen 1642), *Themeda* sp. Hamersley Station (M.E. Trudgen 11431) and *Triodia* sp. Mt Ella (M.E. Trudgen 12739) and one Priority 4 species (*Goodenia nuda*). Seven of these have been previously recorded by RT (but not by the DEC) within the Study Area. Table 6.2 summarises the known distribution and abundance of these taxa from all sources, including DEC records. Based on current records of the Western Australian Herbarium (Florabase), of the 13 species recorded within Greater West Angelas, five are not represented within the conservation estate (*Aristida jerichoensis* var. *subspinulifera*, *Brachyscome* sp. Wanna Munna Flats (S. van Leeuwen 4662), *Brunonia* sp. long hairs (D.E. Symon 2440), *Indigofera* sp. Gilesii (M.E. Trudgen 15869) and *Triodia* sp. Mt Ella (M.E. Trudgen 12739). It is possible that future studies in conservation reserves may result in the discovery of these taxa within their boundaries, but as this is not a certainty, these taxa are considered more vulnerable to mining activities, as there is no locality in which a representative population of the species can be preserved.

Aristida jerichoensis var. *subspinulifera* is a Priority One taxon with six known locations within the Pilbara bioregion. It was collected within the West Angelas Study Area, with an estimated 1948 individuals from 44 locations. Previous records for this taxon indicate that it can become locally common in preferred habitat, which is present within hardpan sandplains within the Study Area.

Brunonia sp. long hairs (D.E. Symon 2440), Priority One, was collected from 10 locations in the current survey, with 20 individuals recorded. It tends to occur as scattered individuals growing on floodplains and rangelands in red sandy-clay soils. *Brunonia* sp. long hairs is taxonomically similar to *Brunonia australis sensu lato*, which is a phenotypically plastic species occurring in a wide variety of environments across Australia, and is highly variable with respect to the degree of hairiness (Carolin 1992). Current advice form the Western Australian Herbarium is that the two are likely to be amalgamated in the future (Hislop 2012, *pers. comm.*), but as this change has not yet been adopted by the Western Australian Herbarium, *Brunonia* sp. long hairs is considered distinct and regarded as Priorty Flora species for in this study.

Records of two taxa represent significant range extensions; *Corymbia zygophylla* and *Euphorbia schultzii*. These range extensions may reflect the boundary of the species habitat, but are also likely to result from a lack of collection and/or lodgement. One other taxon has been recorded for the first time in the Pilbara Bioregion: *Maireana lanosa*. It is not considered a significant range extension as it does not exceed 100 km in distance from a known record; but it expands the population occurrence in terms of regional distribution.

Table 6.2 – Regional Distribution of Priority Flora Recorded during the Current Survey

Species	Status	RT Locations in Study Area	*ecologia* Locations in Study Area	Number of Individuals Recorded	Florabase (regional) records	Bioregions of occurrence	Records within Conservation Estates	Recorded abundance elsewhere
Lepidium catapycnon	T	0	4	29	14	Pilbara	1	Isolated populations
Aristida jerichoensis var. *subspinulifera*	P1	0	44	1948	6	Pilbara	0	Locally common
Brachyscome sp. Wanna Munna Flats (S. van Leeuwen 4662)	P1	0	2	2	10	Gascoyne, Pilbara	0	Uncommon
Brunonia sp. long hairs (D.E. Symon 2440)	P1	0	10	20	3	Central Ranges, Pilbara	0	Uncommon
Aristida lazaridis	P2	1	3	23	3	Pilbara	1	Rare
Eremophila forrestii subsp. Pingandy (M.E. Trudgen 2662)	P2	1	1	1	4	Pilbara	3	Common
Acacia aff. *subtiliformis*	P3	0	3	250	11	Pilbara	1	Locally abundant
Indigofera sp. Gilesii (M.E. Trudgen 15869)	P3	37	23	232	16	Central Ranges, Pilbara, Tanami	0	Common
Rhagodia sp. Hamersley (M. Trudgen 17794)	P3	7	31	81	23	Gascoyne, Pilbara	2	Common
Sida sp. Barlee Range (S. van Leeuwen 1642)	P3	6	7	42	30	Gascoyne, Pilbara	5	Locally Common
Themeda sp. Hamersley Station (M.E. Trudgen 11431)	P3	3	7	3505	20	Pilbara	1	Locally Uncommon
Triodia sp. Mt Ella (M.E. Trudgen 12739)	P3	39	9	300	14	Pilbara	0	Locally Common
Goodenia nuda	P4	0	2	2	37	Gascoyne, Pilbara	1	Locally Common

6.2 VEGETATION OF CONSERVATION SIGNIFICANCE

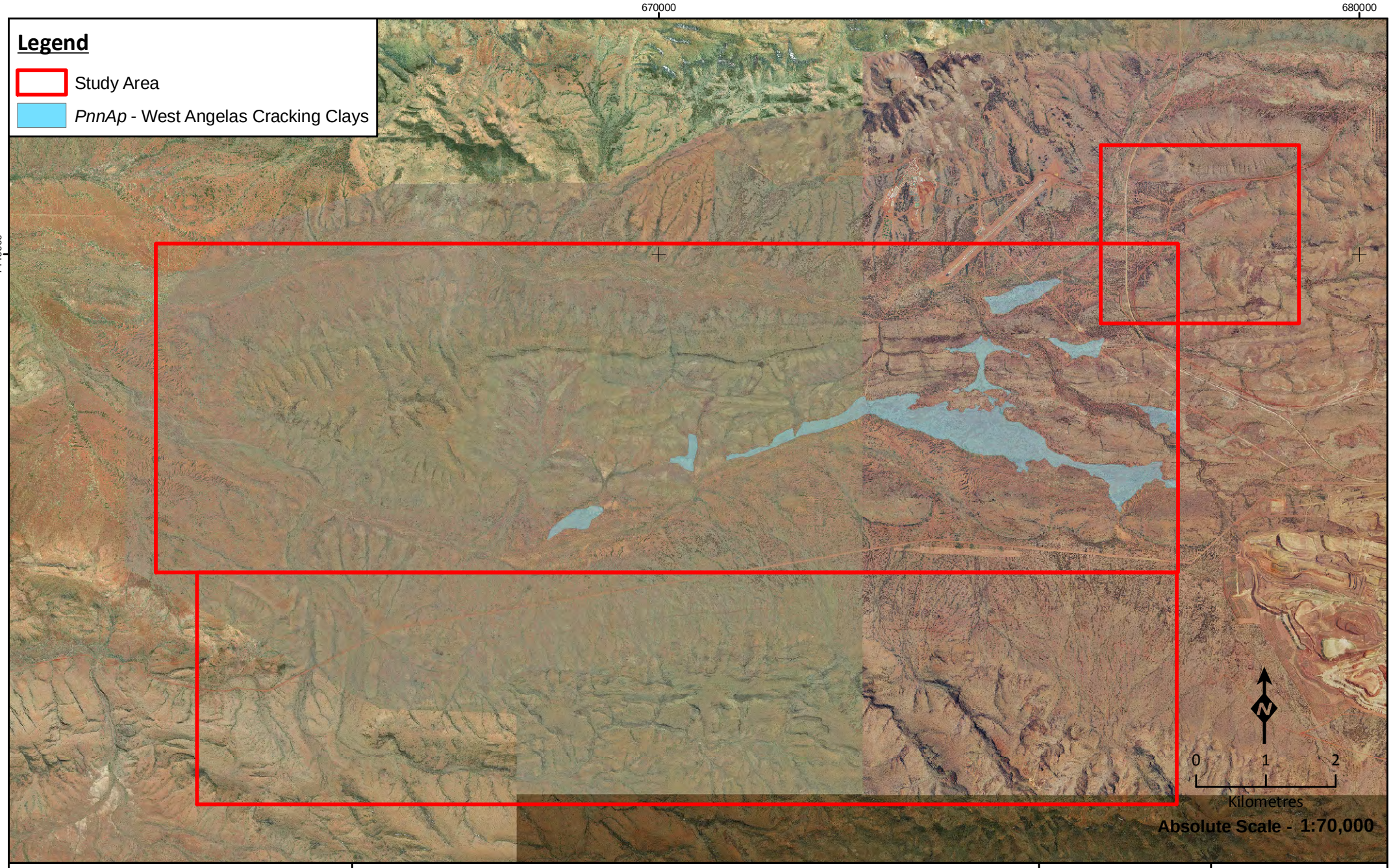
6.2.1 Vegetation of National Significance

National significance refers to those features of the environment which are recognised under legislation as being of importance to the Australian community. TECs listed under the EPBC Act are regarded as nationally significant. Currently, there are no nationally-listed TECs that occur within 40 km of the Study Area.

6.2.2 Vegetation of State Significance

State significance refers to those features of the environment that are recognised under State legislation as being of importance to the Western Australian community, in particular, communities listed as TECs or PECs. Ecological communities with insufficient information available to be considered a TEC, or which are rare but not currently threatened, are placed on the Priority list and referred to as PECs.

One Priority 1 PEC; West Angelas Cracking-Clays, occurs extensively within the Study Area (Figure 2.7). This portion of the Study Area was relatively accessible and no new areas of this community were observed outside of previously defined locations. The biggest threat to this PEC is from mining activities and associated infrastructure (Kendrick 2001). In this survey it was identified as vegetation unit *AlAp* (*Aristida latifolia, Astrebla pectinata* and *Brachyachne convergens* tussock grassland with isolated *Salsola australis, Boerhavia paludosa* and *Ptilotus nobilis* subsp. *nobilis* forbs) and covers an area of 302.23 ha (Figure 6.1). The PEC is officially described by the DEC as "open tussock grasslands of *Astrebla pectinata*, *A. elymoides*, *Aristida latifolia*, in combination with *Astrebla squarrosa* and low scattered shrubs of *Sida fibulifera*, on basalt derived cracking-clay loam depressions and flowlines". The vegetation unit *AlAp* shares the dominant grasses of *Aristida latifolia* and *Astrebla pectinata*, but the remaining species typical of the PEC were not present as dominants. However, *Sida fibulifera* was recorded in five of the seven quadrats of this vegetation type, although not in high abundances. *Astrebla elymoides* was not recorded at all within the study area. This species is known to occur in the West Angelas PEC but is difficult to identify later in the season when tussock grass heads have dicintergrated. Specifically for tussock grassland communties the survey timing may not have been optimal.



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Distribution of PEC Unit *PnnAp* within the Greater West Angelas Study Area

Figure: 6.1
Project ID: 1457

Drawn: CP
Date: 23/11/2012

Coordinate System
Name: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Unique Map ID: CP173

A4

Assessment of the significance at a state level of the vegetation of the Study Area is constrained by the lack of mapping across the state at a scale comparable to the mapping conducted during the current survey. The only source of vegetation mapping available across the state is that conducted by Beard (and in some instances co-authors) at a scale of 1:1,000,000. Beard attempted to map the vegetation as it would have been prior to European settlement (Beard 1976). Subsequently this dataset has been digitised and reinterpreted by the Department of Agriculture and Food to provide an estimate of current representations of these vegetation units (Shepherd *et al*. 2001). The spatial data provides an insight into the loss of vegetation as a result of settlement, its preservation within the conservation estate and its natural abundance. It has been used in the evaluation of conservation priorities for vegetation by the Northern Agricultural Region Native Vegetation Management Plan (Department of Environment and Conservation 2008), the Australian National Resources Atlas Biodiversity Assessment (Department of Sustainability Environment Water Population and Communities 2009) and the Biodiversity Audit of Western Australia (Department of Conservation and Land Management 2003).

Table 6.3 details the extent of these units within the Study Area, State and within land managed by the DEC. Table 6.3 shows that units 18 and 82 occur extensively and are relatively well represented within the conservation estate. The combined area of units 18 and 82 within the Study Area is <0.5% of their total representation and therefore the vegetation is well represented outside of the Study Area.

Table 6.3 – Representation of Shepherd Vegetation Units Within the State and Study Area

Shepherd/Beard Units		Area* in Western Australia (km^2)	Conservation Reserves		Representation Within the Study Area	
No.	Beard Description		Total Area Within DEC Managed Lands** (km^2)	Total Extent within Cons. Reserves (%)	Extent* (km^2)	Total Extent Within Study Area (%)
18	*Acacia* open shrubland / Ptilotus mixed open forbland	199,807.3	12,440.8	6.2	89.7	0.04
82	Hummock grasslands, low tree steppe; snappy gum over *Triodia wiseana*	25,655.7	2,692.1	10.5	85.9	0.33

*The current Native Vegetation Extent dataset may contain some polygon errors such as overlaps (Department of Agriculture and Food).

** DEC Managed Lands as at June 2009

Vegetation is of conservation significance if it has "a role as a key habitat for threatened species" (EPA 2004, page 30). In this context the degree to which Priority taxa were localised to particular vegetation units was also assessed (Table 6.4).

Lepidium catapycnon (T) appears to have a high specificity to the vegetation unit *SggIrTw,* rocky hillslopes, accounting for 100% of all plants recorded. The vegetation unit *SggIrTw* is widespread in the study area (1,045 ha), and it is likely that the threatened species occurs in a particular habitat within the community. Nonetheless, this unit is significant due to the rarity of the species it supports. Similarly, *Aristida jerichoensis* var. *subspinulifera* (P1), although being present within 10 vegetation units, demonstrates a higher specificity to unit *AaTp* (sandy undulating plains) with 40.9% of locations and 57.9% of individuals recorded within this unit. *Indigofera* sp. Gilesii (M.E. Trudgen 15869) demonstrates specificity for the vegetation unit *SggTp,* rocky midslopes, with 47.8% of all locations and 31.9% of individuals recorded in this unit. *Sida* sp. Barlee Range (S. van Leeuwen 1642) favoured vegetation unit *AaPoTp,* which is only found in gullies and gorges, with 42.9% of the locations recorded in this unit.

Vegetation units *SggIrTw* (rocky hilltops) and *AaEcTp* (sandy plains) support five individual threatened and/or priority taxa. Collectively, these units account for eight out of the 13 Threatened and Priority Flora recorded in the survey: *Aristida jerichoensis* var. *subspinulifera*, *Brachyscome* sp. Wanna Munna Flats, *Brunonia* sp. long hairs, *Goodenia nuda, Indigofera* sp. Gilesii (M.E. Trudgen 15869), *Lepidium catapycnon*, *Rhagodia* sp. Hamersley and *Sida* sp. Barlee Range.

Table 6.4 – Assessment of Specificity of Priority Taxa to West Angelas Vegetation

Taxon	Status	Vegetation Unit	Records		Individuals	
			Count	%	Count	%
Lepidium catapycnon	T	*SggIrTw*	4	1.0	29	1.0
Aristida jerichoensis var. *subspinulifera*	P1	*AaAc*	5	11.4	201	10.1
		AaSaoTp	2	4.5	15	0.8
		AaTssp	1	2.3	5	0.3
		AaTp	18	40.9	1155	57.9
		AaEcTp	1	2.3	5	0.3
		AaTb	1	2.3	50	2.5
		EgSggTb	4	9.1	66	3.3
		AaTt	1	2.3	10	0.5
		PsTp	10	22.7	486	24.4
		SggIrTw	1	2.3	1	0.1
Brachyscome sp. Wanna Munna Flats (S. van Leeuwen 4662) PN	P1	*AaEcTp*	1	0.5	1	0.3
		PsTp	1	0.5	2	0.7
Brunonia sp. long hairs (D.E. Symon 2440)	P1	*AaAc*	1	10.0	5	13.9
		AaTp	1	10.0	2	5.6
		EllSggTw	1	10.0	2	5.6
		AaEcTp	4	40.0	9	25.0
		ApTssp	1	10.0	15	41.7
		EllSggTp	1	10.0	2	5.6
		SggAbTp	1	10.0	1	2.8
Aristida lazaridis	P2	*AaTp*	1	33.3	20	74.1
		AaTt	1	33.3	5	18.5
		PsTp	1	33.3	2	7.4
Eremophila forrestii subsp. Pingandy (M.E. Trudgen 2662)	P2	*AaTssp*	1	100.0	1	100.0
Acacia aff. *subtiliformis*	P3	*EllSggTw*	3	100.0	250	100.0
Indigofera sp. Gilesii (M.E. Trudgen 15869)	P3	*AaPoTp*	3	13.0	15	5.4
		ElAmTssp	2	8.7	27	9.7
		SggTp	11	47.8	89	31.9
		EgSggTp	4	17.4	45	16.1
		SggAbTp	1	4.3	2	0.7
		SggIrTw	2	8.7	101	36.2
Rhagodia sp. Hamersley (M. Trudgen 17794)	P3	*AaAc*	3	9.7	9	9.4
		AaEffTp	1	3.2	5	5.2
		AaSaoTp	2	6.5	6	6.3
		AaTp	6	19.4	13	13.5
		EllSggTw	2	6.5	4	4.2
		AaEcTp	2	6.5	8	8.3
		PsTp	8	25.8	29	30.2
		SggAbTp	1	3.2	2	2.1
		SggIrTw	6	19.4	20	20.8
Sida sp. Barlee Range (S. van Leeuwen 1642)	P3	*AaPoTp*	3	42.9	18	33.3
		EllSggTp	2	28.6	2	3.7
		SggIrTw	2	28.6	34	63.0
Themeda sp. Hamersley Station (M.E. Trudgen 11431) PN	P3	*AaTssp*	1	14.3	1000	28.3
		EllSggTw	1	14.3	500	14.1
		AlAp	5	71.4	2035	57.6
Triodia sp. Mt Ella (M.E. Trudgen	P3	*AaPoTp*	2	25.0	105	31.2

Taxon	Status	Vegetation Unit	Records		Individuals	
			Count	%	Count	%
12739)		*Tp*	2	25.0	82	24.3
		ElAmTssp	3	37.5	120	35.6
		SggTp	1	12.5	30	8.9
Goodenia nuda	P4	*AaEcTp*	1	50.0	5	71.4
		AaTb	1	50.0	2	28.6

6.2.3 Vegetation of Regional Significance

The regional inventory of the Pilbara Rangelands undertaken by Van Vreeswyk *et al.* (2004) and the Ashburton Rangelands surveyed by Payne *et al* (1982) provides some insight into the distribution of broad scale vegetation in a regional context. Of the seven land systems recorded within the Study Area, no single system represents more than one percent of the total land system mapped in the PIR and AIR. This indicates that each land system is represented well in a regional context.

6.2.3.1 Groundwater Dependent Ecosystems

Groundwater Dependent Ecosystems (GDEs) are defined by their dependence on groundwater for their continued survival. Dependence at any stage(s) during a lifecycle is considered sufficient to be defined as a GDE (Eamus 2009). Whilst some ecosystems may use groundwater reserves they may not be entirely dependent on them and hence are not defined as a GDE.

Of the four known types of GDEs described by Hatton *et al* (1998) (Terrestrial vegetation, River base flow systems, Wetlands and Aquifer/Cave ecosystems), only River base flow systems are present within the West Angelas Study Area. These ecosystems are characterised by the presence of species that have been found to rely on groundwater sources for water intake, known as phreatophytic species (Maunsell Australia 2006). Three species known to be phreatophytic are known to occur within the vicinity of the Study Area: *Eucalyptus camaldulensis* subsp. *refulgens*, *Melaleuca argentea* and *Eucalyptus victrix* (facultative phreatophyte). The degree to which *E. victrix* is an obligate phreatophyte is not well defined and may vary from location to location.

While *E. victrix* is the only phreatophytic species that was confirmed with reporoductive material within the West Angelas Study Area, *E. camaldulensis* is also known to be present along major drainage lines and is likely to occur within vegetation unit *AaPoTt*. This unit supports variable densities of *E. victrix* and therefore may be a vadophytic ecosystem (i.e. supporting plants that rely on moisture in the soil surface profile) or occasionally phreatophytic, and on this basis has been qualified as a potential GDE. Using the precautionary principles outlined in Position Statement 3, this vegetation unit is regarded as a potential GDE for this study. These vegetation units are localised to the Turee Creek area, which runs across the north of the Study Area (Figure 6.2).

6.2.3.2 Sheet-Flow Dependent Vegetation

Sheet-flow Dependent Vegetation

Groved and banded mulga communities growing on relatively flat plains are widely recognised as being dependent on patterns of surface water flow. The term "mulga" describes a group of *Acacia* species that were previously referred to as varieties of *Acacia aneura*. The species currently in this group include: *Acacia aneura*, *A. aptaneura*, *A. caesaneura*, *A. fuscaneura*, *A. incurvaneura*, *A. macraneura*, *A. mulganeura* and *A. pteraneura*. The species within the mulga group are bushy shrubs

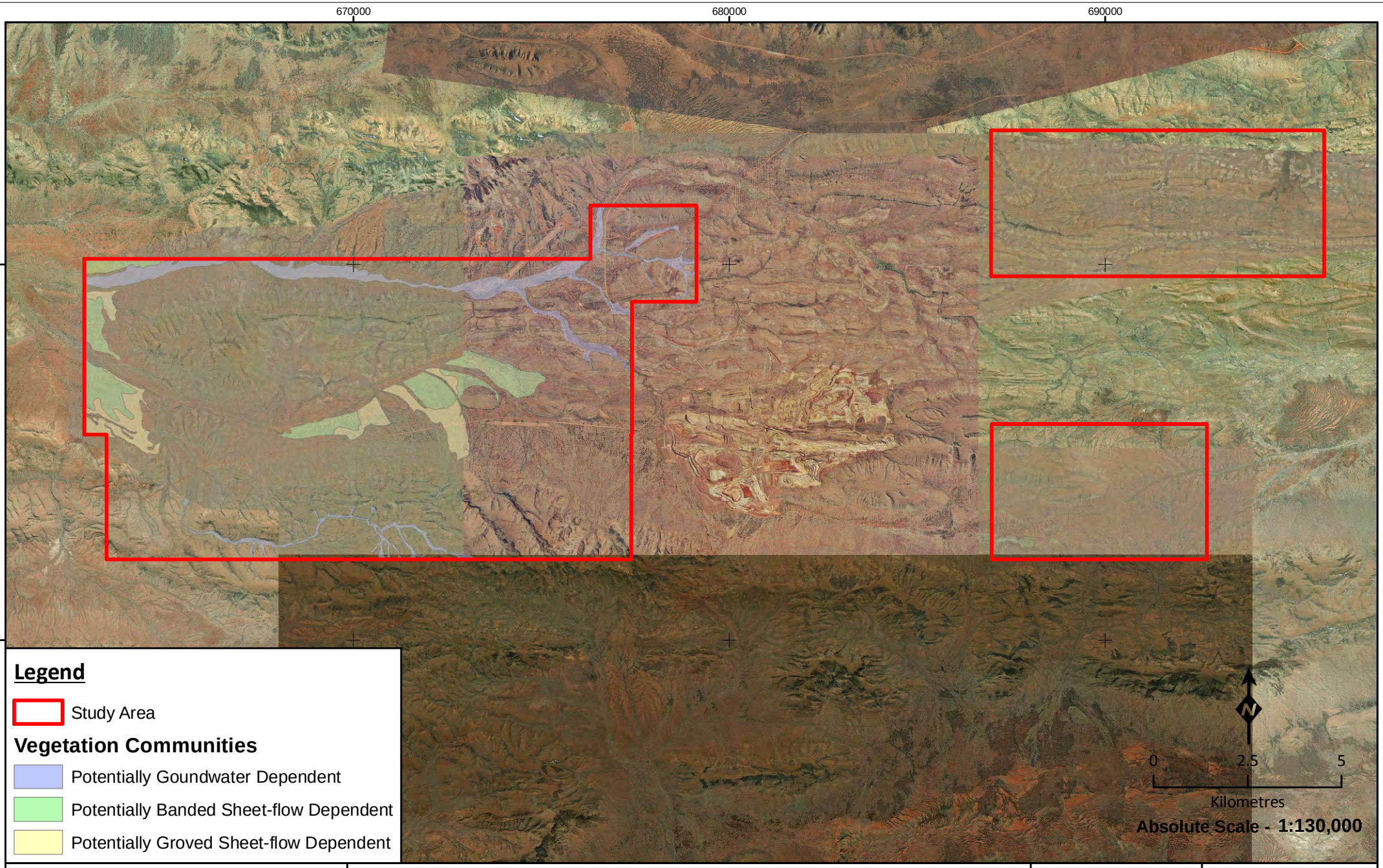
or trees ranging in height from 2-10 m, with considerable variation in growth form and phyllode morphology.

Sheet flows carry material (including seeds and other organic and inorganic debris) which is trapped by existing vegetation. his leads to the formation of a mosaic pattern of groves and banded vegetation with relatively bare areas in between. Thus the development and retention of mulga groves is directly dependent upon sheet flow. The different forms of Mulga (banded or groved) result from the position within the landscape and the availability of sheet flows of surface water. It is therefore thought that the susceptibility to alterations in sheet flow may also differ between banded and groved Mulga. However, both forms are potentially affected when sheet flow is disrupted within a landscape (University of Western Australia 2010).

Mulga has a root system that is adapted for taking up water from thin surface soils and has adaptations that concentrate soil water near the plant and conserve water within the plant. Consequently, the distribution and abundance of mulga is particularly influenced by soil moisture and the pattern of surface drainage (Paczkowska and Chapman, 2000). Construction can have an impact on sheet flow by creating a barrier on flow that increases the quantity of water on one side and decreases it on the other, or diverts the flow to a different area. Alterations to sheet-flow are likely to be greater in close proximity to the construction, but estimating impact is speculative and requires hydrogeological modelling. Until the shadow effect of a proposed development can be determined and the impact adequately assessed, a precautionary approach should be taken.

The diversion of sheet flow or concentration of sheet flow to particular areas is likely to deprive or waterlog soils, with deleterious impacts on mulga. Hence areas with very shallow topography, which commonly support mulga, are likely to be more susceptible. The current analysis has identified banded or groved mulga communities on shallow topography as potentially Sheet Flow Dependent Vegetation (SDV).

The vegetation unit *AaEcTp* (*Acacia* open woodland over *Eremophila* isolated shrubs over *Triodia* open grassland) supports groved and banded mulga communities and is considered likely to be sheet-flow dependent. The distribution of this unit is detailed in Figure 6.2. Other vegetation communities described in this survey are characterised by mulga species, but due to the fact that the trees do not occur in groved or banded patterns, they have not been included in the mapping.



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Sheet-flow and Groundwater Dependent Ecosystems of the West Angelas Study Area

Figure: 6.2
Project ID: 1457

Drawn: CP
Date: 23/11/2012

Coordinate System
Name: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Unique Map ID: CP150

A4

6.2.4 Vegetation of Local Significance

In a local context, vegetation can be considered significant if it is locally uncommon or is associated with habitats of local significance. Vegetation of local significance is not legislatively protected but is of conservation value if areas are restricted and have not been identified to occur outside the Study Area. The least extensive vegetation units locally are *AaEffTp* (141.54 ha) and *AmTw* (108.7 ha), which represent 0.80 % and 0.62% of the Study Area, respectively (Table 6.5).

Vegetation which supports rare flora is also considered locally significant. Vegetation units *AaPoTp, AaTp, SggTp* and *SggIrTw* all support Priority or Threatened flora. In particular, vegetation units *SggIrTw* (rocky hilltops) and *AaEcTp* (sandy plains) support five individual threatened and/or priority taxa. Collectively these units account for eight out of the 13 threatened and priority flora recorded in the survey: *Aristida jerichoensis* var. *subspinulifera*, *Brachyscome* sp. Wanna Munna Flats, *Brunonia* sp. long hairs, *Goodenia nuda, Indigofera* sp. Gilesii (M.E. Trudgen 15869), *Lepidium catapycnon*, *Rhagodia* sp. Hamersley and *Sida* sp. Barlee Range.

Table 6.5 – Local Extent of Vegetation Units within the West Angelas Study Area.

Unit	Landform	Vegetation Description	Area (ha)	% Total
AaAc	Floodplain/Drainage Line	*Acacia aptaneura* and *A. pruinocarpa* open woodland over *Aristida contorta* sparse tussock grassland over *Pterocaulon sphacelatum* and *Ptilotus nobilis* subsp. *nobilis* isolated forbs.	505.39	2.87
AaEffTp	Rocky Midslope	*Acacia aptaneura* and *A. pruinocarpa* open woodland over sparse *Eremophila fraseri* subsp. *fraseri* and *Acacia marramamba* sparse shrubland over *Triodia pungens* sparse hummock grassland.	141.54	0.80
AaPoTp	Gully	*Acacia aptaneura* open woodland over *Ptilotus obovatus* isolated shrubs over *Themeda triandra* and *Eriachne mucronata* open tussock grassland.	319.01	1.81
AaPoTt	Sandy Floodplain	*Acacia aptaneura* open woodland over *Ptilotus obovatus* sparse shrubland over *Themeda triandra* open tussock grassland.	706.06	4.01
AaSaoTp	Floodplain/Drainage Line	*Acacia aptaneura* and *A. ayersiana* open woodland over *Senna artemisioides* subsp. *oligophylla, S. glutinosa* subsp. *glutinosa* and *Eremophila forrestii* subsp. *forrestii* sparse shrubland over *Triodia pungens* open hummock grassland.	447.27	2.54
AaTssp	Rocky Footslope	*Acacia aptaneura* and *A. pruinocarpa* open woodland over *A. tetragonophylla, Senna glutinosa* subsp. *glutinosa* and *S. artemisioides* subsp. *oligophylla* isolated shrubs over *Triodia wiseana* and *T. pungens* open hummock grassland.	927.28	5.27
AaTp	Sandy Undulating Plain	*Acacia pruinocarpa, A. aptaneura* and *A. ayersiana* woodland over *Triodia pungens* open hummock grassland.	982.26	5.58
Tp	Rocky Midslope	*Eucalyptus leucophloia* subsp. *leucophloia* and *Acacia pruinocarpa* isolated trees over *Senna glutinosa* subsp. *glutinosa, A. bivenosa* and *Ptilotus rotundifolius* isolated shrubs over *Triodia pungens* or *T. basedowii* or *T.* sp. Mt Ella hummock grassland.	975.86	5.55
AaTb	Rocky Hilltop	*Acacia aptaneura* and *A. pruinocarpa* open woodland over *A. bivenosa* isolated shrubs *Triodia basedowii* and *T. pungens* open hummock grassland.	1,227.4	6.98
EllSggTw	Rocky Hilltop	*Eucalyptus leucophloia* subsp. *leucophloia* and *Acacia aptaneura* open woodland over *Senna glutinosa* subsp. *glutinosa* and *S. artemisioides* subsp. *oligophylla* open shrubland over *Triodia wiseana* or *T. pungens* open hummock grassland	1,215.97	6.91
EllAmTssp	Rocky Hilltop	*Eucalyptus leucophloia* subsp. *leucophloia* and *E. gamophylla* open woodland over *Acacia maitlandii, A. hamersleyensis, Keraudrenia velutina* and *Senna glutinosa* subsp. *glutinosa* open shrubland over *Triodia wiseana* and/or *T. pungens* and/or *T. basedowii* open hummock grassland.	108.7	0.62
AmTw	Sandy Plain/Riverbed	*Eucalyptus leucophloia* subsp. *leucophloia* isolated trees over *Acacia maitlandii* sparse shrubland over *Triodia wiseana* and *T. longiceps* hummock grassland.	1,769.85	10.06
AaEcTp	Rocky Midslope	*Acacia aptaneura* and *A. pruinocarpa* open woodland over *Eremophila caespitosa* and *Tribulus suberosus* isolated shrubs over *Triodia pungens* open hummock grassland	292.18	1.66
ApTssp	Gravely Plain	*Acacia pruinocarpa* and *Eucalyptus leucophloia* subsp. *leucophloia* open woodland over *Senna glutinosa* subsp. *glutinosa* and *A. maitlandii* isolated shrubs over *Triodia basedowii* or *T. pungens* or *T. wiseana* open hummock grassland.	,	8.60
SggTp	Rocky Midslope	*Eucalyptus leucophloia* subsp. *leucophloia* and *Corymbia hamersleyana* isolated trees over *Senna glutinosa* subsp. *glutinosa* and *Acacia maitlandii* sparse shrubland over *Triodia pungens* open hummock grassland.	210.6	1.20
EgSggTb	Floodplain/Drainage Line	*Eucalyptus gamophylla* and *Corymbia deserticola* subsp. *deserticola* open woodland over *Senna artemisioides* subsp. *oligophylla* and *Indigofera monophylla* sparse shrubland over *Triodia basedowii* and *T. pungens* open hummock grassland	309.52	1.76
EllSggTp	Rocky Hilltop	*Eucalyptus leucophloia* subsp. *leucophloia* and *Acacia marramambra* open woodland over *Senna glutinosa* subsp.	2,491.87	14.16

Unit	Landform	Vegetation Description	Area (ha)	% Total
		glutinosa open shrubland over *Triodia pungens* open hummock grassland		
AaTt	Sandy Floodplain	*Acacia aptaneura* and *Eucalyptus xerothermica* woodland over *Ptilotus obovatus* isolated shrubs over *Themeda triandra* open tussock grassland	391.54	2.23
AlAp	Sandy Plain	*Aristida latifolia, Astrebla pectinata* and *Brachyachne convergens* tussock grassland with isolated *Salsola australis, Boerhavia paludosa* and *Ptilotus nobilis* subsp. *nobilis* forbs	302.23	1.72
PsTp	Sandy Plain	*Acacia aptaneura* or *A. ayersiana* open woodland over *Pterocaulon sphacelatum* and *Dysphania kalparri* sparse forbland with *Triodia pungens* open hummock grassland	174.39	0.99
SggAbTp	Gravely Plain	*Acacia pruinocarpa* and *Eucalyptus leucophloia* subsp. *leucophloia* or *Corymbia hamersleyana* isolated trees over *Senna glutinosa* subsp. *glutinosa, Acacia bivenosa* and *Gossypium robinsonii* open shrubland over *Triodia pungens* hummock grassland	1,539.18	8.75
SggIrTw	Rocky Hilltop	*Acacia inaequilatera* isolated trees over *Senna glutinosa* subsp *glutinosa* and *Indigofera rugosa* open shrubland over *Triodia wiseana* hummock grassland	1,045.87	5.94
TOTAL			17,596.58	100

Shading highlights vegetation units considered to be of local conservation significance due to their rarity.

Shading highlights vegetation units considered to be of local conservation significance due to specificity of rare flora.

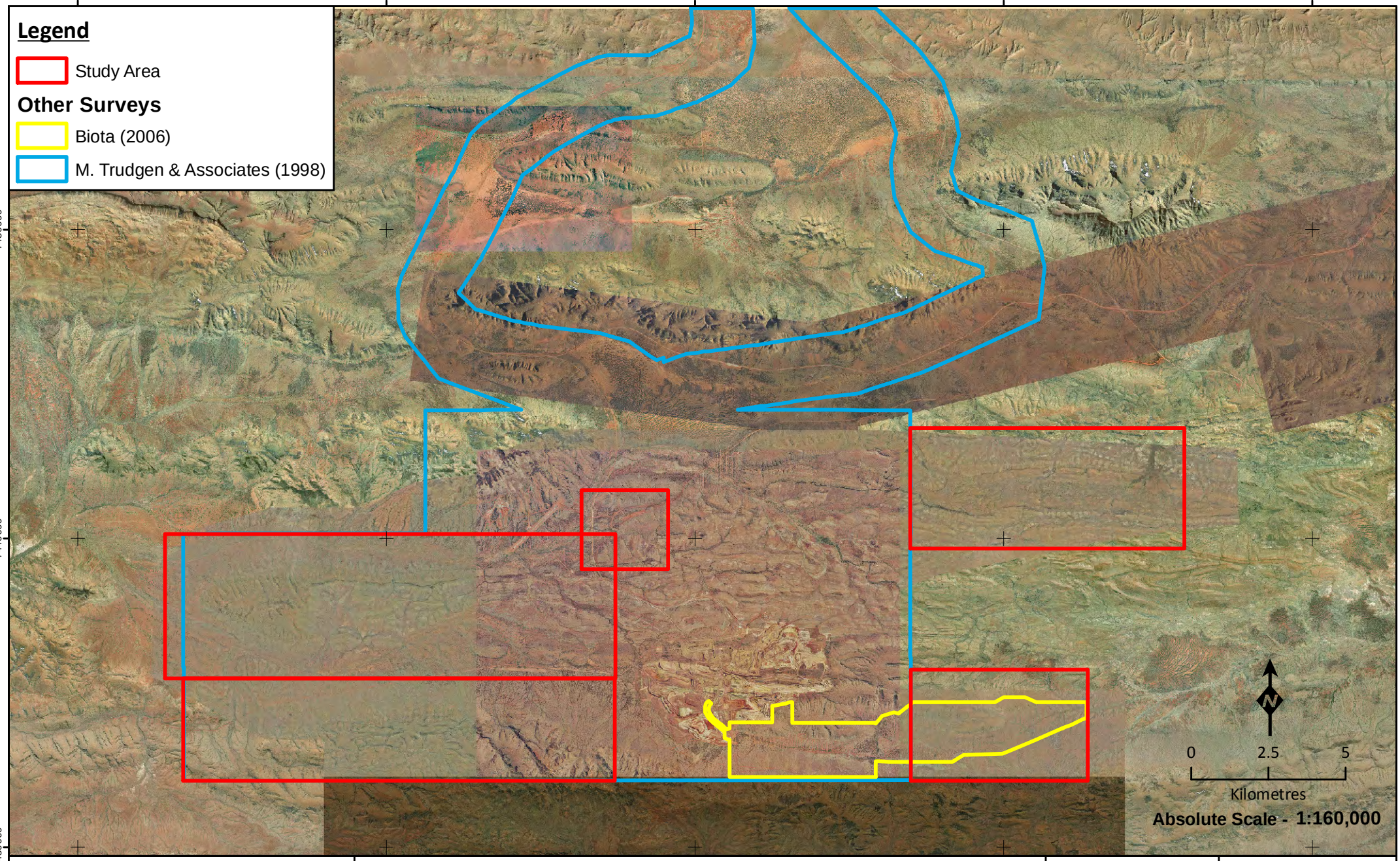
6.3 COMPARISON OF LOCAL VEGETATION COMMUNITIES

One hundred and fifty quadrats were used to define 22 vegetation units within the Study Area. All vegetation units from the ME Trudgen & Associates (1998), Biota (2006) and Biota (2010) surveys were compared with the current survey's data. The use of multivariate software SYSTAT™ was not possible in this instance as the species by site matrices were not available.

Vegetation communities were instead analysed by comparing the spatial data, vegetation descriptions and associated species to align the most similar units between each project. The species used to describe the vegetation units are paramount to the comparison, and it is possible, therefore, that the results drawn from this comparison would be different to results derived from species by site matrices data.

When vegetation units from the current survey (22 units from 150 quadrats) were compared to the ME Trudgen & Associates (1998) survey it was apparent that the quadrat density of the current survey allowed the majority of the vegetation to be mapped at a finer scale. Multiple vegetation units from the current survey were classified as the same under the broader units defined by ME Trudgen & Associates. The exception to this is the riverine/floodplain communities which were mapped at a finer scale by M. Trudgen & Associates when compared to the current survey. This is depicted in Table 6.6 where it can be seen that vegetation unit *AaPoTt* from the current survey is comparable to units 2cab, 2cac and 6/2ef from the ME Trudgen & Associates survey in the same area. The mapping boundaries of the ME Trudgen & Associates survey extended beyond that of the current survey resulting in just 29 of the 54 communities defined by ME Trudgen & Associates represented within the current Study Area. Table 6.6 depicts a comparison of units from each survey that are the most directly comparable, whilst also indicating regional distribution outside of the current Study Area.

Vegetation communities of the current survey were also co-analysed with units described in the 2006 Biota survey of Deposits E and F. The mapping of these two surveys was completed at a comparable scale and vegetation units corresponded well based on location, description and associated species as depicted in Table 6.7. Approximately 50% of the area surveyed by Biota falls outside of the current Study Area, although, of the 12 units described by Biota, 10 of the vegetation units identified in the current survey match well and are interpreted to be equivalent.



ecologia ENVIRONMENT

Location of West Angelas, M. Trudgen & Associates (1998) and Biota (2006) Study Areas

Figure: 6.3
Project ID: 1457

Drawn: CP
Date: 23/11/2012

Coordinate System
Name: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Unique Map ID: CP151

A4

Table 6.6 – Comparison of Trudgen & Associates Vegetation Units within the Study Area

ecologia 2012 Vegetation Units		ME Trudgen & Associates (1998) Vegetation Units		Area outside of Study Area (ha)
Vegetation Unit	**NVIS level VI Description**	**Vegetation Unit**	**NVIS level V Description**	
AaAc	*Acacia aptaneura* and *A. pruinocarpa* open woodland over *Aristida contorta* sparse tussock grassland over *Pterocaulon sphacelatum* and *Ptilotus nobilis* subsp. *nobilis* isolated forbs.	*6/2ef*	*Eucalyptus victrix* open woodland over *Acacia aneura* var. *longicarpa* scattered tall shrubs over *Enneapogon* sp. and *Eriachne benthamii* tussock grassland over *Eragrostis pergracilis* and *Aristida contorta*	978.55
		6adb215	*Aristida contorta* open annual tussock grassland	17.39
AaPoTp	*Acacia aptaneura* and *A. pruinocarpa* open woodland over sparse *Eremophila fraseri* subsp. *fraseri* and *Acacia marramamba* sparse shrubland over *Triodia pungens* sparse hummock grassland.	*5edaf*	*Acacia aneura* var. *longicarpa* and *Acacia rhondophloia* high shrubland over *Eremophila fraseri* ssp. *fraseri*, *Eremophila lachnocalyx* and *Eremophila exilifolia* shrubland over *Triodia pungens* open hummock grassland	0.00
AaPoTt	*Acacia aptaneura* open woodland over *Ptilotus obovatus* isolated shrubs over *Themeda triandra* and *Eriachne mucronata* open tussock grassland.	*2cab*	*Eucalyptus xerothermica* low open woodland over *Acacia pruinocarpa* scattered tall shrubs over *Maireana* spp. Scattered low shrubs over *Triodia pungens* open hummock grassland with *Themeda triandra* scattered tussock grass	81.79
		2cac	*Eucalyptus xerothermica* scattered low trees over *Acacia aneura* var. *longicarpa* and *Acacia* aff. *aneura* high shrubland over *Themeda triandra* and *Chrysopogon fallax* very open tussock grassland with *Triodia pungens* and *Triodia wiseana* scattered hummock grass	879.89
		6/2ef	*Eucalyptus victrix* open woodland over *Acacia aneura* var. *longicarpa* scattered tall shrubs over *Enneapogon* sp. and *Eriachne benthamii* tussock grassland over *Eragrostis pergracilis* and *Aristida contorta*	978.55
AaSaoTp	*Acacia aptaneura* and *A. ayersiana* open woodland over *Senna artemisioides* subsp. *oligophylla, S. glutinosa* subsp. *glutinosa* and *Eremophila forrestii* subsp. *forrestii* sparse shrubland over *Triodia pungens* open hummock grassland.	*5edacl*	*Eucalyptus gamophylla* scattered low trees over *Acacia bivenosa* and *Acacia pyrifolia* scattered tall shrubs over *Triodia pungens* and *Triodia longiceps* open hummock grassland	288.48
AaTssp	*Acacia aptaneura* and *A. pruinocarpa* open woodland over *A. tetragonophylla, Senna glutinosa* subsp. *glutinosa* and *S. artemisioides* subsp. *oligophylla* isolated shrubs over *Triodia wiseana* and *T. pungens* open hummock grassland.	*5edb*	*Acacia ayersiana*, *Acacia* aff. *aneura* (narrow green), *Acacia* Aff. *catenulata*, *Acacia* aff. *aneura* (grey, bushy form) and *Acacia* aff. *aneura* (scythe-shaped) high open shrubland over *Maireana* spp. low scattered shrubs over *Triodia pungens* very open hummock grassland	2,762.56
AaTp	*Acacia pruinocarpa, A. aptaneura* and *A. ayersiana* woodland over *Triodia pungens* open hummock grassland.	*6adb26*	*Acacia* aff. *aneura* (scythe-shaped; MET 15,743), *A. pruinocarpa* scattered tall shrubs over *Triodia pungens* open hummock grassland with *Themeda triandra* scattered tussock grasses	231.33

ecologia 2012 Vegetation Units		ME Trudgen & Associates (1998) Vegetation Units		Area outside of Study Area (ha)
Vegetation Unit	**NVIS level VI Description**	**Vegetation Unit**	**NVIS level V Description**	
		6adb213	*Acacia* aff. *aneura* (scythe-shaped; MET 15,743), *A. pruinocarpa*, A. aff. *aneura* (grey, bushy form; MET 15,732 high shrubland over *Eremophila forrestii* subsp. *forrestii* scattered shrubs over *Triodia pungens* very open hummock grassland	246.47
Tp	*Eucalyptus leucophloia* subsp. *leucophloia* and *Acacia pruinocarpa* isolated trees over *Senna glutinosa* subsp. *glutinosa, A. bivenosa* and *Ptilotus rotundifolius* isolated shrubs over *Triodia pungens* or *T. basedowii* or *T.* sp. Mt Ella hummock grassland.	*5edae*	*Scaervola acacioides* open shrubland over *Triodia pungens* open hummock grassland	108.22
EllSggTw	*Eucalyptus leucophloia* subsp. *leucophloia* and *Acacia aptaneura* open woodland over *Senna glutinosa* subsp. *glutinosa* and *S. artemisioides* subsp. *oligophylla* open shrubland over *Triodia wiseana* or *T. pungens* open hummock grassland	*8bj*	*Acacia aneura* var. *longicarpa* and *Acacia pruinocarpa* high open shrubland over *Acacia pyrifolia* and cassia *oligophylla* scattered shrubs over *Triodia wiseana* and *Triodia pungens* open hummock grassland	2,875.92
EllAmTssp	*Eucalyptus leucophloia* subsp. *leucophloia* and *E. gamophylla* open woodland over *Acacia maitlandii, A. hamersleyensis, Keraudrenia velutina* and *Senna glutinosa* subsp. *glutinosa* open shrubland over *Triodia wiseana* and/or *T. pungens* and/or *T. basedowii* open hummock grassland.	*5kdm1*	*Eucalyptus leucophloia* scattered low trees over *Triodia* aff. *basedowii* and *Triodia pungens* open hummock grassland	2,582.85
		5kdm2	*Eucalyptus leucophloia* and *Corymbia hamersleyana* low open woodland over *Acacia maitlandii* scattered shrubs over *Triodia wiseana* open hummock grassland	1,147.37
		5edac	*Eucalyptus gamophylla* scattered low trees over *Acacia bivenosa*, A. pyrifolia scattered tall shrubs over *Triodia pungens* open hummock grassland	3.35
AaEcTp	*Acacia aptaneura* and *A. pruinocarpa* open woodland over *Eremophila caespitosa* and *Tribulus suberosus* isolated shrubs over *Triodia pungens* open hummock grassland	*6adb26*	*Acacia* aff. *aneura* and *Acacia pruinocarpa* scattered tall trees over *Maireana* spp. scattered low shrubs over *Triodia pungens* open hummock grassland with *Themeda triandra* scattered tussock grass	231.33
AaTb	*Acacia aptaneura* and *A. pruinocarpa* open woodland over *A. bivenosa* isolated shrubs *Triodia basedowii* and *T. pungens* open hummock grassland.	*6adb232*	*Acacia aneura* var. *longicarpa* high shrubland over *Rhagodia* sp. Hamersley, *Ptilotus obovatus* open shrubland over *Digitaria brownii* scattered tussock grassland	201.59
SggTp	*Eucalyptus leucophloia* subsp. *leucophloia* and *Corymbia hamersleyana* isolated trees over *Senna glutinosa* subsp. *glutinosa* and *Acacia maitlandii* sparse shrubland over *Triodia pungens* open hummock grassland.	*5kdm3*	*Eucalyptus leucophloia* scattered low trees over *Acacia pruinocarpa* scattered tall shrubs over *Triodia pungens* open hummock grassland	209.82

ecologia 2012 Vegetation Units		ME Trudgen & Associates (1998) Vegetation Units		Area outside of Study Area (ha)
Vegetation Unit	**NVIS level VI Description**	**Vegetation Unit**	**NVIS level V Description**	
EgSggTb	*Eucalyptus gamophylla* and *Corymbia deserticola* subsp. *deserticola* open woodland over *Senna artemisioides* subsp. *oligophylla* and *Indigofera monophylla* sparse shrubland over *Triodia basedowii* and *T. pungens* open hummock grassland	*5eda*	*Corymbia deserticola* scattered low trees over *Acacia bivenosa*, *Acacia pruinocarpa* and *Hakea chordophylla* scattered tall shrubs over *Cassia prunosa* scattered shrubs over *Triodia* aff. *basedowii* and *Triodia pungens* open hummock grassland	1,898.14
SggAbTp	*Acacia pruinocarpa* and *Eucalyptus leucophloia* subsp. *leucophloia* or *Corymbia hamersleyana* isolated trees over *Senna glutinosa* subsp. *glutinosa, Acacia bivenosa* and *Gossypium robinsonii* open shrubland over *Triodia pungens* hummock grassland			
EllSggTp	*Eucalyptus leucophloia* subsp. *leucophloia* and *Acacia marramambra* open woodland over *Senna glutinosa* subsp. *glutinosa* open shrubland over *Triodia pungens* open hummock grassland	*5edad*	*Eucalyptus leucophloia* low open woodland over *Acacia* aff. *aneura*, *Acacia pruinocarpa* and *Acacia aneura* var. ?*aneura* open scrub over *Eremophila lachnocalyx* scattered shrubs over *Triodia pungens* open hummock grassland	199.33
		5kd3r	*Eucalyptus leucophloia* low open woodland over *Acacia pruinocarpa* scattered tall shrubs over *Triodia pungens* open hummock grassland.	0.00
AlAp	*Aristida latifolia, Astrebla pectinata* and *Brachyachne convergens* tussock grassland with isolated *Salsola australis, Boerhavia paludosa* and *Ptilotus nobilis* subsp. *nobilis* forbs	*8db/8dc*	*Astrebla pectinata*, *Astrebla elymoides* and *Aristida latifolia* open tussock grassland	166.06
		8dd	*Sida fibulifera* low scattered shrubs over *Astrebla squarrosa* tussock grassland	0.00

Note: Comparisons are based on aerial imagery and vegetation descriptions. Species by site matrices were not available for data comparison.

Table 6.7 – Comparison of Biota (2006) Vegetation Units within the Study Area

Ecologia 2012 Vegetation Units		Biota (2006) Vegetation Units		Area out side of Study Area (ha)
Vegetation Unit	**NVIS level VI Description**	**Vegetation Unit**	**NVIS level V Description**	
SggAbTp	*Acacia pruinocarpa* and *Eucalyptus leucophloia* subsp. *leucophloia* or *Corymbia hamersleyana* isolated trees over *Senna glutinosa* subsp. *glutinosa, Acacia bivenosa* and *Gossypium robinsonii* open shrubland over *Triodia pungens* hummock grassland	*C1*	*Eucalyptus* spp. scattered low trees over *Acacia maitlandii*, *Gossypium robinsonii*, *Petalostylis labicheoides* shrubland over *Triodia pungens* open hummock grassland and *Eriachne mucronata*, *Themeda triandra* open tussock grassland	15.97
AaTt	*Acacia aptaneura* and *Eucalyptus xerothermica* woodland over *Ptilotus obovatus* isolated shrubs over *Themeda triandra* open tussock grassland	*C2*	*Eucalyptus xerothermica* low open woodland over *Acacia maitlandii*, *Petalostylis labicheoides*, *Rulingia luteiflora* shrubland to tall shrubland over *Triodia pungens* open hummock grassland	14.86
EllAmTssp	*Eucalyptus leucophloia* subsp. *leucophloia* and *E. gamophylla* open woodland over *Acacia maitlandii, A. hamersleyensis, Keraudrenia velutina* and *Senna glutinosa* subsp. *glutinosa* open shrubland over *Triodia wiseana* and/or *T. pungens* and/or *T. basedowii* open hummock grassland.	*H1*	*Eucalyptus leucophloia* low open woodland over *Acacia maitlandii*, A. *hamersleyensis* shrubland over *Triodia pungens* (T. wiseana) mid-dense hummock grassland	210.12
SggTp	*Eucalyptus leucophloia* subsp. *leucophloia* and *Corymbia hamersleyana* isolated trees over *Senna glutinosa* subsp. *glutinosa* and *Acacia maitlandii* sparse shrubland over *Triodia pungens* open hummock grassland.	*H2*	*Acacia catenulata* low woodland over *Triodia pungens* mid-dense hummock grassland	0.00
Tp	*Eucalyptus leucophloia* subsp. *leucophloia* and *Acacia pruinocarpa* isolated trees over *Senna glutinosa* subsp. *glutinosa, A. bivenosa* and *Ptilotus rotundifolius* isolated shrubs over *Triodia pungens* or *T. basedowii* or *T.* sp. Mt Ella hummock grassland.	*H3*	*Corymbia ferriticola*, *Eucalyptus leucophloia* low open woodland over *Triodia* sp. Mt Ella, *T. pungens* hummock grassland and *Eriachne mucronata* open tussock grassland	33.43
EllAmTssp	*Eucalyptus leucophloia* subsp. *leucophloia* and *E. gamophylla* open woodland over *Acacia maitlandii, A. hamersleyensis, Keraudrenia velutina* and *Senna glutinosa* subsp. *glutinosa* open shrubland over *Triodia wiseana* and/or *T. pungens* and/or *T. basedowii* open hummock grassland.	*H4*	*Eucalyptus leucophloia* low open woodland over *Triodia wiseana* midd-dense hummock grassland and *Themeda triandra* tussock grassland	0.00
		H5	*Eucalyptus gamophylla* low woodland over *Triodia* aff. *basedowii* (*T. pungens*) mid-dense hummock grassland	415.33
AaTp	*Acacia pruinocarpa, A. aptaneura* and *A. ayersiana* woodland over *Triodia pungens* open hummock grassland.	*M1*	*Acacia aneura* low open woodland over *Acacia bivenosa*, *Gossypium robinsonii*, *Sida* aff. *cardiophylla*, Scaevola parvifolia shrubland to low open shrubland over *Triodia* pungens, *T. schinzii* mid-dense hummock grassland	98.62

Ecologia 2012 Vegetation Units		Biota (2006) Vegetation Units		Area out side of Study Area (ha)
Vegetation Unit	**NVIS level VI Description**	**Vegetation Unit**	**NVIS level V Description**	
AaTb	*Acacia aptaneura* and *A. pruinocarpa* open woodland over *A. bivenosa* isolated shrubs *Triodia basedowii* and *T. pungens* open hummock grassland.	*M2*	*Acacia aneura* low open woodland over *Triodia* pungens, *T.* aff. *basedowii* mid-dense hummock grassland	23.63
		M5	*Acacia aneura* low closed forest over *Triodia pungens* mid-dense hummock grassland	0.00
PsTp	*Acacia aptaneura* or *A. ayersiana* open woodland over *Pterocaulon sphacelatum* and *Dysphania kalparri* sparse forbland with *Triodia pungens* open hummock grassland	*M3*	*Acacia aneura* woodland over *Maireana* villosa, *Ptilotus obovatus*, *Rhagodia* sp. Hamersley open to low open shrubland over *Triodia* sp. Mt Ella open hummock grassland	32.00
AaAc	*Acacia aptaneura* and *A. pruinocarpa* open woodland over *Aristida contorta* sparse tussock grassland over *Pterocaulon sphacelatum* and *Ptilotus nobilis* subsp. *nobilis* isolated forbs.	*M4*	*Acacia aneura*, *A. pruinocarpa* low closed forest to low woodland over *Eremophila forrestii*, *E. longifolia*, *Ptilotus obovatus*, *Rhagodia* sp. Hamersley low open shrubland to open shrubland over *Triodia pungens* open hummock grassland	223.85

Note: Comparisons are based on aerial imagery and vegetation descriptions. Species by site matrices were not available for data comparison

6.4 LAND DEGREDATION ANANYSIS

6.4.1 Erosion

The seven land systems present within the Study Area as mapped by Payne *et al* (1982) in the Regional Inventory of the Ashburton Rangelands and by Van Vreeswyk *et al*. (2004) in the Regional Inventory of the Pilbara Rangelands are categorised as being quite resistant to the processes of erosion (Van Vreeswyk *et al.* 2004). Van Vreeswyk *et al*. (2004) and Payne *et al* (1982) assessed the percentage of each land system that has been affected by erosion (Table 6.8). Each of the seven land systems have been subject to little or no erosion, the worst affected being the Wannamunna Land System with both minor (3%) and moderate (2%) erosion present in low levels. This data is further supported by observations made in the field where no serious erosion was observed in the Study Area.

Table 6.8 – Erosion as Assessed by Van Vreeswyk *et al*. (2004) and Payne *et al* (1982)

Land System	Description	No Erosion	Minor Erosion	Moderate Erosion
Boolgeeda	Stony lower slopes and plains below hill systems supporting hard and soft spinifex grasslands and mulga shrublands.	100%	0%	0%
Egerton	Dissected hardpan plains supporting mulga shrublands and hard spinifex hummock grasslands.	100%	0%	0%
Elimunna	Stony plains on basalt supporting Sparse *Acacia* and cassia shrublands and patchy tussock grasslands.	99%	1%	0%
Newman	Rugged jaspilite plateaux, ridges and mountains supporting hard.	99%	0.5%	0.5%
Platform	Dissected slopes and raised plains supporting hard spinifex grasslands.	100%	0%	0%
Rocklea	Basalt hills, plateaux, lowers slopes and minor stony plains supporting hard spinifex (and occasionally soft spinifex) grasslands.	100%	0%	0%
Wannamunna	Hardpan plains and internal drainage tracts supporting mulga shrublands and woodlands (and occasionally eucalypt woodlands).	95%	3%	2%

6.4.2 Spread of Weeds

Vegetation condition ratings within the Study Area were high, with 87% of assessed quadrats being in either excellent or very good condition (Figure 5.1) with the presence of weeds within the Study Area being minimal. This is reflected by the absence of livestock as the Study Area is not located on pastoral land. Figure 4.3 demonstrates that higher densities of weeds were recorded along the rivers and creeks. Drainage lines are a major source of transportation for the most prevalent weed species in the region: *Acetosa vesicaria, Bidens bipinnata, Cenchrus ciliaris* and *Acetosa vesicaria.* These species are likely to continue to spread naturally along the river system, but alterations to flow in both volume and direction will likely facilitate the spread further.

There was also evidence to suggest that *Bidens bipinnata* is also being spread to a small degree by native fauna. *Acetosa vesicaria* was sighted growing within the 3 m buffer of the rail corridor in Deposit G. Track work and other maintenance in these areas could facilitate the spread of this species via vehicles or personnel, as well as soil disturbance. Control methods such as brush-down procedures should be used when working in these areas of the rail.

6.4.3 Previous Disturbance

Previous disturbance within the Study Area was observed to be predominantly from clearing pertaining to previous exploration lines, drill pads, access tracks and associated infrastructure. Deposit G is the most disturbed as part of the rail and the main access road into the West Angelas Mine are within this site. Apart from the primary disturbance from the initial clearing footprint of this infrastructure, dust is also another source of disturbance in the area. West Angeles Mine currently has management plans in place to help control the impact and spread of dust.

6.5 SURVEY LIMITATIONS AND CONSTRAINTS

According to the EPA Guidance Statement 51; *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessments in Western Australia* (Environmental Protection Authority 2004), vegetation and flora surveys may be limited by several aspects. An assessment of these aspects with regard to this study is detailed in Table 6.9.

Table 6.9– Flora and Vegetation Survey Limitations

Aspect	Constraint	Comment
Sources of information and availability of contextual information (i.e. pre-existing background versus new material)	Minor	Broad scale (1:1,000,000) mapping by Shepherd *et al* (2006) based on the mapping by Beard (1975) is available. More recently the land systems (Van Vreeswyk *et al*. 2004) have been mapped which show also broad scale regional information on vegetation communities based on land systems. Information at a local context was available with the Biota Environmental Sciences surveys in 2006 and 2010 (Biota 2006, Biota 2010), and ME Trudgen & Associates (1998), providing regional data at comparable scale of survey intensity and vegetation mapping. The lack of Species x Site matrices resulted in the need for these surveys to be compared based on their descriptions and spatial position and not on cluster analysis.
The scope (i.e. what life forms were sampled)	Nil	The vascular flora of the Study Area was sampled in accordance with Guidance Statement 51.
Proportion of flora collected and identified (based on sampling, timing and intensity)	Minor	Species accumulation curve analysis suggests that 86-88% of the taxa expected to be present were recorded. Survey timing was considered optimal, with a high proportion of plants flowering and >99% of all collections fully identified. Twenty-four of a total 6,003 specimens were not identified to species level. However, access limitations in some areas may have reduced the total inventory to a minor degree.
Completeness and further work which might be needed *(*e.g. was the relevant area fully surveyed)	Minor	The quadrat density of 1 quadrat per 1.17 km^2 is considered adequate. Quadrats were broadly distributed throughout the Study Area, however the several areas where no vehicular access was possible and distances were too great to be achieved on foot, or where the steepness of escarpments precluded access. All vegetation units were represented with at least two quadrats and in many cases more than 10. Targeted surveys performed during the second were extremely beneficial to the survey with multiple locations of Priority Flora recorded.
Mapping reliability	Minor	For some areas, the aerial imagery as of lo resolution and was therefore blurry in its appearance, making defining vegetation community boundaries difficult at times. The number and distribution of quadrats is considered adequate for definition of vegetation within most areas, however since access to some areas was restricted, it remains possible that additional community types could be defined.
Timing/weather/season/cycle	Minor	The timing of the survey was optimal for most of the flora species with most recorded to be flowering or fruiting. However some of the tussock grasses collected were dry and lacked reproductive material, which resulted in challenges in completing identifications of these taxa. A survey carried out shortly following summer rains did not take place, which may have precluded the collection of some annuals and grasses.
Disturbances (e.g. fire, flood, accidental human intervention)	Nil	There were no natural or man-made interventions that constrained the survey.

Aspect	Constraint	Comment
Intensity (in retrospect, was the intensity adequate?)	Minor	The species accumulation curve suggests that 86-88 % of species present were collected. All vegetation units were mapped were represented by at least two quadrats. Quadrats were distributed across the Study Area at a density of 1 quadrat per 1.17 km^2; however the distribution was limited in some areas due to access constraints.
Resources	Nil	A total of 60 person-days were expended across the survey period. There was sufficient time to access all areas that could be accessed using a vehicle and foot traverses.
Access problems	Moderate	The majority of the survey area was easily accessed. However, the absence and poor condition of some tracks, as well as some vital tracks being recently rehabilitated required an investment of time and effort for accessing some areas on foot. The southeast and northwest areas of the larger study polygon and the centre-southeast area of the smaller study polygon were the least sampled areas due to access difficulties. Aerial imagery and landform mapping for this area indicate that the vegetation communities in the areas where access was restricted have been sampled elsewhere.
Experience levels (e.g. degree of expertise in plant identification to taxon level)	Nil	The Project was overseen by the Biological Sciences Manager who has over 14 years experience in biological assessments within Western Australia, the project manager and field leader have six and two years experience, respectively. Other botanists engaged in survey work have between 1 and 5 years experience in biological surveys. The two taxonomists responsible for identifications both have Doctorates in botanical taxonomy and have completed identifications for multiple, large scale projects within the Pilbara.

7 CONCLUSION

7.1 FLORA

Flora sampling adequacy was estimated using species accumulation curve analysis and extrapolation. Using this analysis it is estimated that between 86% and 88 % of the taxa present were recorded.

Four specimens of the EPBC Act and the WC Act (Declared Rare Flora) listed *Lepidium catapycnon* were collected opportunistically from four locations within Greater West Angelas. A total of 29 individuals were recorded. The presence of preferred habitats beyond the location where the four specimens were collected suggest that it is possible that more individuals could be present given that access to some areas was limited during the survey. Further targeted surveys would be advantageous in defining the population.

Of the thirteen Threatened and Priority Flora taxa, five are not represented within conservation estates (*Aristida jerichoensis* var. *subspinulifera*, *Brachyscome* sp. Wanna Munna Flats (S. van Leeuwen 4662), *Brunonia* sp. long hairs (D.E. Symon 2440), *Indigofera* sp. Gilesii (M.E. Trudgen 15869) and *Triodia* sp. Mt Ella (M.E. Trudgen 12739). These taxa are considered to be of higher conservation significance, irrespective of the fact that *Aristida jerichoensis* var. *subspinulifera* (P1), *Indigofera* sp. Gilesii (M.E. Trudgen 15869) (P3) and *Triodia* sp. Mt Ella (M.E. Trudgen 12739) (P3) are relatively widespread within the Study Area.

Records from the survey include one bioregional extension, *Maireana lanosa*, although only 44 km north of the known population. Records of two taxa represent range extensions; *Corymbia zygophylla* and *Euphorbia schultzii*. These taxa represent the extent of the distribution of their species and are also of conservation significance.

7.2 VEGETATION

One Priority 1 PEC, West Angelas Cracking-Clays, occurs within the Study Area. In this survey it was identified as vegetation unit *AlAp* (*Aristida* and *Astrebla* grassland). The boundaries of the larger area depicted in Figure 6.1 have been ground-truthed in the field.

Vegetation units *SggIrTw* (rocky hilltops) and *AaEcTp* (sandy plains) support five individual threatened and/or priority taxa including *Lepidium catapycnon* (T). Collectively these units account for eight out of the 13 threatened and priority flora recorded. This identifies the significance of unit *SggIrTw* (where *L. catapycnon* occurs), whist also indicating that unit *AaEcTp* is of particular conservation significance.

Vegetation unit *AaPoTt* supports variable densities of *E. victrix* and therefore may be a vadophytic ecosystem (i.e. supporting plants that rely on moisture in the soil surface profile) or occasionally phreatophytic (i.e. supporting plants that rely on groundwater reservoirs), and on this basis has been qualified as a potential GDE. The vegetation unit *AaEcTp* (*Acacia* open woodland over *Eremophila* isolated shrubs over *Triodia* open grassland) supports groved and banded mulga communities and is considered likely to be sheet-flow dependent. Both of these units are sensitive to changes in hydrology.

The least extensive vegetation units locally are *AaEffTp* (141.54 ha) and *AmTw* (108.7 ha), which represent 0.80 % and 0.62% of the Study Area respectively. These units are considered to be of local significance due to their limited representation in the local context.

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8 STUDY TEAM

The flora and vegetation assessment in this report was planned, coordinated and executed by:

Project Staff and Qualifications		
Kellie Honczar	BSc	Principal Ecologist
Renee Young	PhD (Botany)	Senior Botanist
Andrew Craigie	PhD (Botany)	Taxonomist and Botanist
Udani Sirisena	PhD (Botany)	Taxonomist
Matthew Macdonald	PhD (Botany)	Senior Botanist
Christopher Parker	BSc	Botanist
Heather Broad	BSc	Botanist

Licences - "Licence to Take Flora for Scientific Purposes"		
The vegetation and flora assessment described in this report was conducted under the authorisation of the following licences issued by the DEC:		
	Permit Number	**Valid Until**
Matthew Macdonald	SL 009996	30/04/2013
Andrew Craigie	SL 009990	30/04/2013
Christopher Parker	SL 009992	30/04/2013
Michelle Holmes	SL009998	30/04/2013
Matthew Macdonald	SL009996	30/04/2013
Heather Broad	SL009976	30/04/2013

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APPENDIX A EPBC AND DEC CONSERVATION CATEGORIES

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Table D.1 – Definition of codes for Threatened Ecological Communities

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

Table D.2 – Definition of codes for Priority Ecological Communities (DEC)

Code	Definition
P1: Priority One	Ecological communities with apparently few, small occurrences, all or most not actively managed for conservation (e.g. within agricultural or Pastoral lands, urban areas, active mineral leases) and for which current threats exist. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.
P2: Priority Two	Communities that are known from few small occurrences, all or most of which are actively managed for conservation (e.g. within national parks, conservation parks, nature reserves, State forest, unallocated Crown land, water reserves, etc.) and not under imminent threat of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.
P3: Priority Three	(i) Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or: (ii) Communities known from a few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or; (iii) Communities made up of large, and/or widespread occurrences that may or not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, and inappropriate fire regimes. Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.
P4: Priority Four	Ecological communities that are adequately known, Rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring. (a) Rare. Ecological communities known from few occurrences that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These communities are usually represented on conservation lands. (b) Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. (c) Ecological communities that have been removed from the list of threatened communities during the past five years. P5: Priority Five Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.
P5: Priority Five	Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

Table D.3 – Definition of Threatened Flora Species Categories under the *EPBC Act*

Conservation Code	Definition
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 cultivation, 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 to its life cycle and form.
Critically Endangered	The species is facing an extremely high risk of extinction in the wild 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 five years.

Table D.4 – Definition of Declared Rare and Priority Flora Categories under the *WC Act*

Conservation Code	Definition
DRF	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.
P1: Priority One	Poorly Known Taxa. Taxa which are known from one or a few (generally <5) populations which are under threat, either due to small population size, or being on lands under immediate threat, e.g. road verges, urban areas, farmland, active mineral leases, etc., or the plants are under threat, e.g. from disease, grazing by feral animals, etc. May include taxa with threatened populations on protected lands. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.
P2: Priority Two	Poorly Known Taxa. Taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.
P3: Priority Three	Poorly Known Taxa. Taxa which are known from several populations, and the taxa are not believed to be under immediate threat (i.e. not currently endangered), either due to the number of known populations (generally >5), or known populations being large, and either widespread or protected. Such taxa are under consideration for declaration as 'rare flora' but are in need of further survey.
P4: Priority Four	Rare Taxa. Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5-10 years.

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APPENDIX B COORDINATES OF FLORA QUADRATS

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Quadrat	Botanist	Date	Zone	Easting	Northing
2	Heather Broad	15/07/2012	50	677155	7439160
3	Christopher Parker	11/07/2012	50	664250	7434166
4	Renee Young	23/08/2012	50	676312	7432796
5	Matthew Macdonald	22/08/2012	50	677245	7438185
6	Heather Broad	15/07/2012	50	676964	7439410
7	Andrew Craigie	15/07/2012	50	677143	7440336
8	Renee Young	15/07/2012	50	677224	7439706
9	Renee Young	15/07/2012	50	676777	7439888
10	Andrew Craigie	15/07/2012	50	677202	7440980
11	Renee Young	11/07/2012	50	664936	7432362
12	Heather Broad	12/07/2012	50	669588	7436085
14	Heather Broad	11/07/2012	50	666335	7435014
15	Christopher Parker	11/07/2012	50	666386	7434420
16	Matthew Macdonald	23/08/2012	50	665255	7435767
17	Renee Young	11/07/2012	50	666127	7435443
18	Christopher Parker	13/07/2012	50	670256	7440041
19	Andrew Craigie	13/07/2012	50	670827	7440121
20	Heather Broad	11/07/2012	50	666544	7432889
21	Andrew Craigie	12/07/2012	50	668832	7436351
22	Renee Young	23/08/2012	50	675401	7433583
23	Heather Broad	23/08/2012	50	676745	7433348
24	Andrew Craigie	12/07/2012	50	665179	7437844
25	Heather Broad	11/07/2012	50	666551	7432511
26	Heather Broad	22/08/2012	50	665892	7437188
27	Andrew Craigie	12/07/2012	50	665237	7437562
28	Heather Broad	12/07/2012	50	663809	7437790
29	Christopher Parker	12/07/2012	50	663304	7437192
30	Andrew Craigie	23/08/2012	50	668967	7433839
31	Andrew Craigie	23/08/2012	50	666346	7432772
33	Matthew Macdonald	23/08/2012	50	668560	7433940
34	Heather Broad	23/08/2012	50	676579	7433252
35	Christopher Parker	13/07/2012	50	673632	7438909
36	Renee Young	13/07/2012	50	670777	7438782
37	Heather Broad	14/07/2012	50	687029	7442744
38	Heather Broad	14/07/2012	50	687256	7442411
40	Renee Young	14/07/2012	50	687384	7441660
41	Heather Broad	16/07/2012	50	687019	7440818
42	Matthew Macdonald	22/08/2012	50	676916	7438381
43	Andrew Craigie	13/07/2012	50	669629	7439904
44	Andrew Craigie	13/07/2012	50	672747	7439755
45	Heather Broad	10/07/2012	50	687314	7433554
46	Heather Broad	10/07/2012	50	687705	7433591
47	Andrew Craigie	22/08/2012	50	676625	7435967
48	Heather Broad	23/08/2012	50	673159	7435134
49	Renee Young	22/08/2012	50	670111	7435914
50	Christopher Parker	13/07/2012	50	673669	7437233
51	Christopher Parker	10/07/2012	50	687533	7432652
52	Andrew Craigie	10/07/2012	50	688661	7432669
53	Andrew Craigie and Heather Broad	12/07/2012	50	667899	7436212
54	Christopher Parker	12/07/2012	50	667459	7436044
55	Christopher Parker	15/07/2012	50	693252	7440857
56	Christopher Parker	15/07/2012	50	678032	7441255
57	Renee Young	22/08/2012	50	669044	7438284
58	Heather Broad	22/08/2012	50	666744	7437057
59	Andrew Craigie	22/08/2012	50	677184	7437539

Quadrat	Botanist	Date	Zone	Easting	Northing
60	Matthew Macdonald	22/08/2012	50	676676	7437576
61	Renee Young	13/07/2012	50	673215	7437869
62	Andrew Craigie	21/08/2012	50	675036	7437340
63	Heather Broad	21/08/2012	50	674380	7436772
64	Renee Young	22/08/2012	50	668923	7437248
65	Renee Young	13/07/2012	50	667686	7439468
66	Heather Broad	22/08/2012	50	671181	7437165
67	Andrew Craigie	15/07/2012	50	675707	7438599
68	Christopher Parker	15/07/2012	50	675904	7438645
69	Heather Broad	13/07/2012	50	671233	7439484
70	Christopher Parker	12/07/2012	50	662974	7436737
71	Renee Young	12/07/2012	50	663032	7439901
72	Renee Young	12/07/2012	50	662967	7439466
74	Heather Broad	12/07/2012	50	662935	7437760
75	Andrew Craigie	23/08/2012	50	664518	7436326
76	Heather Broad	15/07/2012	50	674804	7438827
77	Heather Broad	13/07/2012	50	672224	7439689
78	Heather Broad	13/07/2012	50	672023	7439634
79	Andrew Craigie	15/07/2012	50	675187	7438908
80	Matthew Macdonald	23/08/2012	50	664777	7435780
81	Andrew Craigie	23/08/2012	50	664292	7435990
82	Renee Young	15/07/2012	50	673920	7438834
84	Heather Broad	13/07/2012	50	667450	7440007
85	Matthew Macdonald	22/08/2012	50	674706	7436370
86	Christopher Parker	13/07/2012	50	670711	7439869
87	Christopher Parker	13/07/2012	50	673420	7439350
89	Renee Young	13/07/2012	50	672580	7439183
90	Renee Young	13/07/2012	50	672525	7439032
91	Andrew Craigie	22/08/2012	50	677313	7437373
92	Christopher Parker	11/07/2012	50	671795	7434819
93	Andrew Craigie	11/07/2012	50	665188	7433774
94	Christopher Parker	15/07/2012	50	675043	7439279
95	Matthew Macdonald	22/08/2012	50	676930	7437844
96	Heather Broad	15/07/2012	50	674566	7439117
97	Andrew Craigie	13/07/2012	50	672930	7439386
98	Andrew Craigie	10/07/2012	50	690021	7434193
99	Renee Young	10/07/2012	50	692404	7434579
100	Andrew Craigie	11/07/2012	50	665048	7433112
102	Andrew Craigie	11/07/2012	50	673591	7434348
103	Renee Young	11/07/2012	50	665617	7432674
104	Andrew Craigie	22/08/2012	50	676037	7437964
105	Christopher Parker	10/07/2012	50	689329	7433993
106	Andrew Craigie	10/07/2012	50	690813	7434491
107	Renee Young	10/07/2012	50	691959	7434259
108	Andrew Craigie	10/07/2012	50	687622	7432995
109	Renee Young	10/07/2012	50	692133	7434084
110	Renee Young	10/07/2012	50	688061	7433951
111	Andrew Craigie	10/07/2012	50	690781	7434606
112	Christopher Parker	10/07/2012	50	689514	7433871
113	Renee Young	10/07/2012	50	687687	7434485
114	Heather Broad	10/07/2012	50	691391	7433665
115	Heather Broad	10/07/2012	50	691478	7433848
116	Matthew Macdonald	25/08/2012	50	689743	7432298
117	Matthew Macdonald	25/08/2012	50	692296	7432269
118	Matthew Macdonald	25/08/2012	50	691903	7432228
119	Christopher Parker	10/07/2012	50	687390	7432574
120	Renee Young	25/08/2012	50	688668	7435466
121	Heather Broad	25/08/2012	50	690898	7435543

Quadrat	Botanist	Date	Zone	Easting	Northing
122	Heather Broad	25/08/2012	50	690568	7435562
123	Andrew Craigie	18/07/2012	50	691442	7435304
124	Andrew Craigie	18/07/2012	50	690998	7435051
125	Renee Young	25/08/2012	50	689448	7435600
126	Heather Broad	18/07/2012	50	692362	7435225
127	Heather Broad	18/07/2012	50	691897	7435262
128	Renee Young	14/07/2012	50	687617	7441806
129	Andrew Craigie	16/07/2012	50	687534	7441102
130	Andrew Craigie	12/07/2012	50	689733	7439848
131	Christopher Parker	17/07/2012	50	690405	7440055
132	Heather Broad	17/07/2012	50	690710	7440192
133	Heather Broad	17/07/2012	50	690774	7440465
134	Andrew Craigie	17/07/2012	50	689997	7440750
135	Christopher Parker	14/07/2012	50	694775	7442645
136	Andrew Craigie	14/07/2012	50	695085	7442608
137	Christopher Parker	14/07/2012	50	693742	7442990
138	Andrew Craigie	14/07/2012	50	694996	7443069
139	Christopher Parker	17/07/2012	50	691396	7441959
140	Heather Broad	16/07/2012	50	692860	7442223
141	Christopher Parker	16/07/2012	50	677807	7440841
142	Andrew Craigie	17/07/2012	50	691561	7441218
143	Heather Broad	24/08/2012	50	692043	7440355
144	Heather Broad	24/08/2012	50	691601	7440107
145	Christopher Parker	17/07/2012	50	690919	7440001
146	Andrew Craigie; Christopher Parker and Heather Broad	17/07/2012	50	689963	7441587
147	Heather Broad	17/07/2012	50	690015	7442078
148	Andrew Craigie	15/07/2012	50	694100	7441820
149	Andrew Craigie	16/07/2012	50	694618	7441708
151	Christopher Parker	14/07/2012	50	693738	7443431
152	Andrew Craigie	14/07/2012	50	695697	7443107
153	Heather Broad	16/07/2012	50	692827	7441627
154	Christopher Parker	16/07/2012	50	693821	7440864
155	Matthew Macdonald	24/08/2012	50	689478	7442994
156	Matthew Macdonald	24/08/2012	50	688740	7443153
160	Christopher Parker	16/07/2012	50	687010	7441224
200	Renee Young	23/08/2012	50	673438	7437317
201	Renee Young and Heather Broad	23/08/2012	50	677257	7442559

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APPENDIX C FLORA SPECIES RECORDED AT WEST ANGELAS

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Family	Taxon	Observation
Acanthaceae	*Dicladanthera forrestii*	
	Dipteracanthus australasicus subsp. *australasicus*	
	Harnieria kempeana subsp. *muelleri*	
Aizoaceae	*Trianthema glossostigma*	
Amaranthaceae	*Achyranthes aspera*	
	Alternanthera nana	
	Amaranthus cuspidifolius	
	Amaranthus mitchellii	
	Gomphrena affinis subsp. *pilbarensis*	
	Gomphrena canescens	
	Gomphrena cunninghamii	
	Gomphrena kanisii	
	Ptilotus aervoides	
	Ptilotus astrolasius	
	Ptilotus auriculifolius	
	Ptilotus calostachyus	
	Ptilotus carinatus	
	Ptilotus clementii	
	Ptilotus fusiformis	
	Ptilotus gomphrenoides	
	Ptilotus helipteroides	
	Ptilotus nobilis subsp. *nobilis*	
	Ptilotus obovatus	
	Ptilotus polystachyus	
	Ptilotus roei	
	Ptilotus rotundifolius	
	Ptilotus schwartzii var. *schwartzii*	
Apocynaceae	*Cynanchum floribundum*	
	Marsdenia australis	
	Rhyncharrhena linearis	
	Sarcostemma viminale subsp. *australe*	
Araliaceae	*Astrotricha hamptonii*	
	Trachymene oleracea subsp. *oleracea*	
	Trachymene pilbarensis	
Asteraceae	*Bidens bipinnata*	Invasive
	Brachyscome sp. Wanna Munna Flats (S. van Leeuwen 4662)	P1
	Calocephalus knappii	
	Calotis multicaulis	
	Calotis porphyroglossa	
	Chrysocephalum apiculatum	
	Chrysocephalum eremaeum	
	Chrysocephalum gilesii	
	Chrysocephalum pterochaetum	
	Flaveria trinervia	Invasive
	Peripleura arida	
	Peripleura hispidula var. *setosa*	
	Peripleura obovata	
	Pluchea dentex	
	Pluchea dunlopii	
	Pterocaulon serrulatum	
	Pterocaulon sphacelatum	
	Rhodanthe citrina	
	Rhodanthe floribunda	
	Rhodanthe margarethae	
	Sigesbeckia orientalis	Invasive

Family	Taxon	Observation
Asteraceae	*Streptoglossa bubakii*	
	Streptoglossa decurrens	
	Streptoglossa liatroides	
	Streptoglossa odora	
	Streptoglossa tenuiflora	
	Vittadinia eremaea	
Boraginaceae	*Halgania gustafsenii*	
	Heliotropium chrysocarpum	
	Heliotropium cunninghamii	
	Heliotropium heteranthum	
	Heliotropium inexplicitum	
	Heliotropium pachyphyllum	
	Heliotropium tenuifolium	
	Trichodesma zeylanicum	
	Trichodesma zeylanicum var. *zeylanicum*	
Brassicaceae	*Lepidium catapycnon*	T
	Lepidium pedicellosum	
	Lepidium phlebopetalum	
	Lepidium pholidogynum	
	Lepidium platypetalum	
Campanulaceae	*Isotoma petraea*	
	Lobelia heterophylla	
	Wahlenbergia tumidifructa	
Capparaceae	*Capparis lasiantha*	
	Capparis mitchellii	
	Capparis spinosa var. *nummularia*	
Caryophyllaceae	*Polycarpaea corymbosa*	
	Polycarpaea holtzei	
	Polycarpaea longiflora	
Celastraceae	*Denhamia cunninghamii*	
	Maytenus sp. Mt Windell (S. van Leeuwen 846)	
	Stackhousia intermedia	
Chenopodiaceae	*Dissocarpus paradoxus*	
	Dysphania glomulifera	
	Dysphania glomulifera subsp. *eremaea*	
	Dysphania kalpari	
	Dysphania rhadinostachya subsp. *rhadinostachya*	
	Enchylaena tomentosa var. *tomentosa*	
	Maireana georgei	
	Maireana lanosa	
	Maireana melanocoma	
	Maireana planifolia	
	Maireana tomentosa	
	Maireana triptera	
	Maireana villosa	
	Rhagodia eremaea	
	Rhagodia sp. Hamersley (M. Trudgen 17794) PN	P3
	Salsola australis	
	Sclerolaena convexula	
	Sclerolaena cornishiana	
	Sclerolaena eriacantha	
	Sclerolaena tetragona	
Cleomaceae	*Cleome viscosa*	
Convolvulaceae	*Convolvulus clementii*	
	Duperreya commixta	
	Evolvulus alsinoides	
	Evolvulus alsinoides var. *decumbens*	
	Evolvulus alsinoides var. *villosicalyx*	

Family	Taxon	Observation
	Ipomoea muelleri	
	Ipomoea polymorpha	
	Operculina aequisepala	
	Polymeria ambigua	
Cucurbitaceae	*Cucumis variabilis*	
Cyperaceae	*Bulbostylis barbata*	
	Cyperus cunninghamii subsp. *cunninghamii*	
	Fimbristylis dichotoma	
	Fimbristylis simulans	
Euphorbiaceae	*Adriana tomentosa* var. *tomentosa*	
	Euphorbia alsiniflora	
	Euphorbia australis	
	Euphorbia biconvexa	
	Euphorbia boophthona	
	Euphorbia drummondii	
	Euphorbia schultzii	
Fabaceae	*Acacia adoxa* var. *adoxa*	
	Acacia adsurgens	
	Acacia ancistrocarpa	
	Acacia aptaneura	
	Acacia atkinsiana	
	Acacia ayersiana	
	Acacia bivenosa	
	Acacia catenulata subsp. *occidentalis*	
	Acacia citrinoviridis	
	Acacia colei var. *colei*	
	Acacia cowleana	
	Acacia dictyophleba	
	Acacia eriopoda	
	Acacia hamersleyensis	
	Acacia inaequilatera	
	Acacia incurvaneura	
	Acacia macraneura	
	Acacia maitlandii	
	Acacia marramamba	
	Acacia minyura	
	Acacia monticola	
	Acacia pachyacra	
	Acacia pruinocarpa	
	Acacia pteraneura	
	Acacia pyrifolia	
	Acacia pyrifolia var. *pyrifolia*	
	Acacia rhodophloia	
	Acacia sibirica	
	Acacia aff. *subtiliformis*	P3
	Acacia synchronicia	
	Acacia tenuissima	
	Acacia tetragonophylla	
	Acacia validinervia	
	Crotalaria medicaginea var. *neglecta*	
	Crotalaria novae-hollandiae subsp. *novae-hollandiae*	
	Cullen leucochaites	
	Gastrolobium grandiflorum	
	Glycine canescens	
	Gompholobium oreophilum	
	Indigofera fractiflexa	
	Indigofera georgei	
	Indigofera sp. Gilesii (M.E. Trudgen 15869)	P3

Family	Taxon	Observation
Fabaceae	*Indigofera monophylla*	
	Indigofera rugosa	
	Isotropis forrestii	
	Mirbelia viminalis	
	Petalostylis labicheoides	
	Rhynchosia minima	
	Senna artemisioides subsp. *filifolia*	
	Senna artemisioides subsp. *helMSii*	
	Senna artemisioides subsp. *oligophylla*	
	Senna artemisioides subsp. *x artemisioides*	
	Senna ferraria	
	Senna glutinosa subsp. *glutinosa*	
	Senna glutinosa subsp. *pruinosa*	
	Senna glutinosa subsp. *x luerssenii*	
	Senna hamersleyensis	
	Senna notabilis	
	Senna pleurocarpa var. *angustifolia*	
	Senna sericea	
	Senna sp. Meekatharra (E. Bailey 1-26)	
	Senna stricta	
	Senna symonii	
	Swainsona kingii	
	Swainsona maccullochiana	
	Templetonia egena	
	Tephrosia clementii	
	Tephrosia densa	
	Tephrosia rosea var. *glabrior*	
	Tephrosia supina	
	Vachellia farnesiana	Invasive
	Vigna sp. Hamersley Clay (A.A. Mitchell PRP 113)	
Goodeniaceae	*Brunonia* sp. long hairs (D.E. Symon 2440) PN	P1
	Dampiera candicans	
	Goodenia microptera	
	Goodenia muelleriana	
	Goodenia nuda	P4
	Goodenia scaevolina	
	Goodenia stellata	
	Goodenia stobbsiana	
	Goodenia tenuiloba	
	Goodenia triodiophila	
	Scaevola browniana subsp. *browniana*	
	Scaevola parvifolia	
	Scaevola parvifolia subsp. *pilbarae*	
	Scaevola spinescens	
Gyrostemonaceae	*Codonocarpus cotinifolius*	
Haloragaceae	*Haloragis gossei*	
	Haloragis gossei var. *gossei*	
	Haloragis gossei var. *inflata*	
Hemerocallidaceae	*Corynotheca micrantha*	
Lamiaceae	*Clerodendrum floribundum*	
	Clerodendrum floribundum var. *angustifolium*	
	Newcastelia sp. *Hamersley Range (S. van Leeuwen 4264)*	
	Spartothamnella teucriiflora	
Lauraceae	*Cassytha capillaris*	
Loranthaceae	*Amyema hilliana*	
	Amyema miquelii	
Malvaceae	*Abutilon amplum*	
	Abutilon cryptopetalum	

Family	Taxon	Observation
Malvaceae	*Abutilon cunninghamii*	
	Abutilon dioicum	
	Abutilon fraseri subsp. *fraseri*	
	Abutilon lepidum	
	Abutilon leucopetalum	
	Abutilon macrum	
	Abutilon otocarpum	
	Abutilon oxycarpum	
	Abutilon trudgenii MS	
	Androcalva luteiflora	
	Corchorus crozophorifolius	
	Corchorus lasiocarpus	
	Corchorus lasiocarpus subsp. *parvus*	
	Corchorus sidoides subsp. *sidoides*	
	Corchorus tridens	
	Gossypium australe	
	Gossypium robinsonii	
	Hibiscus burtonii	
	Hibiscus coatesii	
	Hibiscus gardneri	
	Hibiscus sturtii	
	Hibiscus sturtii var. *campylochlamys*	
	Hibiscus sturtii var. *platychlamys*	
	Hibiscus trionum	
	Keraudrenia velutina	
	Malvastrum americanum	Invasive
	Melhania oblongifolia	
	Sida arenicola	
	Sida arsiniata	
	Sida echinocarpa	
	Sida ectogama	
	Sida fibulifera	
	Sida sp. Barlee Range (S. van Leeuwen 1642) PN	P3
	Sida sp. dark green fruit (S. van Leeuwen 2260)	
	Sida sp. Golden calyces glabrous (H.N. Foote 32)	
	Sida sp. Pilbara (A.A. Mitchell PRP 1543)	
	Sida sp. Shovelanna Hill (S. van Leeuwen 3842)	
	Sida sp. spiciform panicles (E. Leyland s.n. 14/8/1990	
	Sida sp. Supplejack Station (T.S. Henshall 2345)	
	Sida sp. verrucose glands (F.H. Mollemans 2423)	
	Sida spinosa	
	Sida trichopoda	
	Triumfetta leptacantha	
	Waltheria indica	
Marsileaceae	*Marsilea hirsuta*	
Moraceae	*Ficus brachypoda*	
Myrtaceae	*Calytrix carinata*	
	Corymbia candida	
	Corymbia deserticola subsp. *deserticola*	
	Corymbia hamersleyana	
	Corymbia zygophylla	
	Eucalyptus gamophylla	
	Eucalyptus leucophloia	
	Eucalyptus leucophloia subsp. *leucophloia*	
	Eucalyptus pilbarensis	
	Eucalyptus socialis subsp. *eucentrica*	
	Eucalyptus trivalva	
	Eucalyptus victrix	

Family	Taxon	Observation
Myrtaceae	*Eucalyptus xerothermica*	
	Melaleuca eleuterostachya	
Nyctaginaceae	*Boerhavia coccinea*	
	Boerhavia paludosa	
Oleaceae	*Jasminum didymum* subsp. *lineare*	
Phyllanthaceae	*Notoleptopus decaisnei*	
	Phyllanthus erwinii	
	Phyllanthus maderaspatensis	
Pittosporaceae	*Pittosporum angustifolium*	
Poaceae	*Acrachne racemosa*	
	Amphipogon sericeus	
	Aristida burbidgeae	
	Aristida contorta	
	Aristida holathera var. *holathera*	
	Aristida ingrata	
	Aristida jerichoensis var. *subspinulifera*	P1
	Aristida latifolia	
	Aristida lazaridis	P2
	Aristida obscura	
	Astrebla pectinata	
	Bothriochloa ewartiana	
	Brachyachne ciliaris	
	Brachyachne convergens	
	Cenchrus ciliaris	Invasive
	Chloris pectinata	
	Chrysopogon fallax	
	Cymbopogon ambiguus	
	Cymbopogon obtectus	
	Cymbopogon procerus	
	Dichanthium sericeum	
	Digitaria brownii	
	Digitaria ctenantha	
	Enneapogon avenaceus	
	Enneapogon caerulescens	
	Enneapogon intermedius	
	Enneapogon lindleyanus	
	Enneapogon pallidus	
	Enneapogon polyphyllus	
	Enneapogon robustissimus	
	Eragrostis cumingii	
	Eragrostis desertorum	
	Eragrostis dielsii	
	Eragrostis eriopoda	
	Eragrostis falcata	
	Eragrostis pergracilis	
	Eragrostis setifolia	
	Eragrostis tenellula	
	Eragrostis xerophila	
	Eriachne helmsii	
	Eriachne lanata	
	Eriachne mucronata	
	Eriachne pulchella subsp. *dominii*	
	Eriachne pulchella subsp. *pulchella*	
	Eulalia aurea	
	Ischaemum albovillosum	
	Iseilema eremaeum	
	Iseilema membranaceum	
	Iseilema vaginiflorum	

Family	Taxon	Observation
Poaceae	*Panicum decompositum*	
	Panicum effusum	
	Panicum laevinode	
	Paraneurachne muelleri	
	Paspalidium basicladum	
	Paspalidium clementii	
	Paspalidium constrictum	
	Paspalidium rarum	
	Perotis rara	
	Setaria dielsii	
	Setaria surgens	
	Sporobolus australasicus	
	Themeda sp. Hamersley Station (M.E. Trudgen 11431) PN	P3
	Themeda triandra	
	Tragus australianus	
	Triodia basedowii	
	Triodia brizoides	
	Triodia longiceps	
	Triodia melvillei	
	Triodia pungens	
	Triodia sp. Mt Ella (M.E. Trudgen 12739)	P3
	Triodia wiseana	
	Tripogon loliiformis	
	Triraphis mollis	
	Urochloa occidentalis var. *occidentalis*	
	Yakirra australiensis	
	Yakirra australiensis var. *australiensis*	
Polygalaceae	*Polygala isingii*	
Portulacaceae	*Calandrinia* sp. The Pink Hills (F. Obbens FO 19/06)	
	Portulaca oleracea	Invasive
Proteaceae	*Grevillea berryana*	
	Grevillea stenobotrya	
	Grevillea wickhamii	
	Grevillea wickhamii subsp. *hispidula*	
	Hakea chordophylla	
	Hakea lorea subsp. *lorea*	
Pteridaceae	*Cheilanthes lasiophylla*	
	Cheilanthes sieberi subsp. *sieberi*	
Rhamnaceae	*Cryptandra monticola*	
	Ventilago viminalis	
Rubiaceae	*Oldenlandia crouchiana*	
	Psydrax latifolia	
	Psydrax suaveolens	
	Spermacoce brachystema	
Santalaceae	*Exocarpos sparteus*	
	Santalum lanceolatum	
	Santalum spicatum	
Sapindaceae	*Dodonaea coriacea*	
	Dodonaea lanceolata var. *lanceolata*	
	Dodonaea pachyneura	
	Dodonaea viscosa subsp. *mucronata*	
	Dodonaea viscosa subsp. *spatulata*	
Scrophulariaceae	*Eremophila caespitosa*	
	Eremophila clarkei	
	Eremophila cuneifolia	
	Eremophila exilifolia	
	Eremophila forrestii subsp. *forrestii*	
	Eremophila forrestii subsp. Pingandy (M.E. Trudgen 2662)	P2

Family	Taxon	Observation
Scrophulariaceae	*Eremophila fraseri* subsp. *fraseri*	
	Eremophila galeata	
	Eremophila jucunda subsp. *pulcherrima*	
	Eremophila lanceolata	
	Eremophila latrobei	
	Eremophila latrobei subsp. *filiformis*	
	Eremophila latrobei subsp. *latrobei*	
	Eremophila longifolia	
	Eremophila phyllopoda subsp. *obliqua*	
	Eremophila platycalyx subsp. *pardalota*	
	Eremophila tietkensii	
Solanaceae	*Nicotiana benthamiana*	
	Nicotiana occidentalis	
	Nicotiana simulans	
	Solanum centrale	
	Solanum horridum	
	Solanum lasiophyllum	
	Solanum phlomoides	
	Solanum sturtianum	
Surianaceae	*Stylobasium spathulatum*	
Violaceae	*Hybanthus aurantiacus*	
Zygophyllaceae	*Tribulus astrocarpus*	
	Tribulus hirsutus	
	Tribulus macrocarpus	
	Tribulus occidentalis	
	Tribulus suberosus	
	Zygophyllum eichleri	
	Zygophyllum iodocarpum	

APPENDIX D COORDINATES OF PRIORITY FLORA AT WEST ANGELAS

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Species	Status	Zone	Easting	Northing	Number of plants
Acacia aff. *subtiliformis*	P3	50	668980	7438136	120
		50	668950	7438192	10
		50	668906	7438285	120
Aristida jerichoensis var. *subspinulifera*	P1	50	677203	7440980	10
		50	687314	7433555	30
		50	673160	7435134	5
		50	688661	7432670	10
		50	662974	7436737	5
		50	673920	7438834	5
		50	677314	7437374	10
		50	691479	7433849	10
		50	689743	7432298	10
		50	691904	7432228	10
		50	687390	7432574	5
		50	691443	7435305	10
		50	693821	7440864	5
		50	689229	7432625	20
		50	688666	7443264	1
		50	691399	7432870	10
		50	687804	7432698	6
		50	691532	7432839	5
		50	687467	7432718	100
		50	687911	7433195	50
		50	687463	7433153	20
		50	691430	7432855	20
		50	687528	7433614	50
		50	688590	7432715	50
		50	688445	7432704	30
		50	691194	7432900	1
		50	687468	7433386	100
		50	691475	7432849	5
		50	690693	7432924	1
		50	687835	7433535	1
		50	688387	7432677	50
		50	689426	7432862	6
		50	688612	7433353	20
		50	687809	7432691	100
		50	689375	7432556	1000
		50	688885	7432701	5
		50	688301	7432615	1
		50	689526	7432891	2
		50	687463	7433153	100
		50	691662	7432824	10
		50	690208	7435391	50
		50	689267	7432603	30
		50	687468	7433386	20
		50	688741	7432699	5
Aristida lazaridis	P2	50	694996	7443069	5
		50	689585	7432449	20
		50	688575	7432716	2
Brachyscome sp. Wanna Munna Flats (S. van Leeuwen 4662) PN	P1	50	688703	7432676	1
		50	674380	7436772	2
Brunonia sp. long hairs (D.E. Symon 2440) PN	P1	50	664936	7432362	2
		50	663304	7437192	5
		50	663032	7439901	2
		50	673669	7437233	5
		50	677224	7439706	2

Species	Status	Zone	Easting	Northing	Number of plants
		50	673438	7437317	15
		50	669408	7433885	1
		50	691903	7432228	1
		50	668858	7438440	1
		50	668657	7437327	2
Eremophila forrestii subsp. Pingandy (M.E. Trudgen 2662)	P2	50	676965	7438393	1
Goodenia nuda	P4	50	673438	7437317	5
		50	688964	7435518	2
Indigofera sp. Gilesii (M.E. Trudgen 15869)	P3	50	690781	7434606	15
		50	689514	7433871	2
		50	689653	7433877	3
		50	689632	7433869	10
		50	689310	7433800	16
		50	678032	7441255	15
		50	689963	7441587	16
		50	690998	7441857	1
		50	691049	7441944	1
		50	691203	7441994	10
		50	691229	7441997	4
		50	691240	7441996	1
		50	688927	7443254	100
		50	690382	7441946	12
		50	690401	7441890	10
		50	690408	7441885	10
		50	689919	7441031	1
		50	687791	7434256	2
		50	688725	7433695	5
		50	689007	7435225	1
		50	689050	7434996	15
		50	689055	7434985	14
		50	689065	7434969	15
Lepidium catapycnon	T	50	688710	7443257	20
		50	688715	7443269	1
		50	688716	7443281	1
		50	688685	7443292	7
Rhagodia sp. Hamersley (M. Trudgen 17794) PN	P3	50	691478	7433848	2
		50	671233	7439484	2
		50	672580	7439183	2
		50	676135	7435721	3
		50	676538	7435987	1
		50	677340	7435770	5
		50	676625	7435967	5
		50	674706	7436370	5
		50	676519	7435975	5
		50	688643	7443253	1
		50	688669	7443262	1
		50	688772	7443255	1
		50	688894	7443243	4
		50	688927	7443254	6
		50	688948	7443252	4
		50	688962	7443250	3
		50	689046	7443256	4
		50	691903	7432228	5
		50	687430	7432920	5
		50	687435	7432957	1
		50	687437	7432975	1
		50	687435	7432990	1

Species	Status	Zone	Easting	Northing	Number of plants
		50	687474	7433203	5
		50	687803	7434230	1
		50	687917	7433186	2
		50	688055	7432954	8
		50	688511	7433194	6
		50	690364	7432322	1
		50	691515	7432320	4
		50	691647	7432290	1
		50	691872	7432200	1
Sida sp. Barlee Range (S. van Leeuwen 1642) PN	P3	50	694100	7441820	5
		50	668560	7433940	10
		50	691335	7441998	3
		50	691350	7441983	1
		50	692537	7442144	1
		50	692644	7442173	4
		50	692649	7442186	30
Themeda sp. Hamersley Station (M.E. Trudgen 11431) PN	P3	50	675904	7438645	5
		50	675043	7439279	15
		50	675036	7437340	15
		50	677034	7437867	~500
		50	672958	7437985	1000
		50	674453	7438046	1000
		50	674839	7437923	1000
Triodia sp. Mt Ella (M.E. Trudgen 12739)	P3	50	690781	7434606	30
		50	668560	7433940	5
		50	675528	7433693	50
		50	668709	7434062	100
		50	676312	7432796	32
		50	691966	7442312	50
		50	691899	7442318	20
		50	691875	7442317	50

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APPENDIX E RARE AND PRIORITY FLORA REPORT FORMS

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APPENDIX F WEED CATEGORIES

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Table G.1 - Control Codes for Declared Plants in Western Australia

Priority	Requirements
P1 Prohibits movement	The movement of plants or their seeds is prohibited within the State. This prohibits the movement of contaminated machinery and produce including livestock and fodder.
P2 Aim is to eradicate infestation	Treat all plants to destroy and prevent propagation each year until no plants remain. The infested area must be managed in such a way that prevents the spread of seed or plant parts on or in livestock, fodder, grain, vehicles and/or machinery.
P3 Aims to control infestation by reducing area and/or density of infestation	The infested area must be managed in such a way that prevents the spread of seed or plant parts within and from the property on or in livestock, fodder, grain, vehicles and/or machinery. Treat to destroy and prevent seed set for all plants:- - Within 100 metres inside of the boundaries of the infestation. - Within 50 metres of roads and high-water mark on waterways. - Within 50 metres of sheds, stock yards and houses. Treatment must be done prior to seed set each year. Of the remaining infested area:- - Where plant density is 1-10 per hectare treat 100% of infestation. - Where plant density is 11-100 per hectare treat 50% of infestation. - Where plant density is 101-1000 per hectare treat 10% of infestation. Properties with less than 2 hectares of infestation must treat the entire infestation. Additional areas may be ordered to be treated.
P4 Aims to prevent infestation spreading beyond existing boundaries of infestation	The infested area must be managed in such a way that prevents the spread of seed or plant parts within and from the property on or in livestock, fodder, grain, vehicles and/or machinery. Treat to destroy and prevent seed s*et al*. l plants:- - Within 100 metres inside of the boundaries of the infested property - Within 50 metres of roads and high-water mark on waterways - Within 50 metres of sheds, stock yards and houses Treatment must be done prior to seed set each year. Properties with less than 2 hectares of infestation must treat the entire infestation. Additional areas may be ordered to be treated. Special considerations In the case of P4 infestations where they continue across property boundaries there is no requirement to treat the relevant part of the property boundaries as long as the boundaries of the infestation as a whole are treated. There must be agreement between neighbours in relation to the treatment of these areas.
P5	Infestations on public lands must be controlled.

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APPENDIX G LOCATION OF WEEDS RECORDED AT WEST ANGELAS

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Taxon	Zone	Easting	Northing
Acetosa vesicaria	50	670282	7439512
Bidens bipinnata	50	688661	7432669
	50	692404	7434579
	50	687622	7432995
	50	691478	7433848
	50	666551	7432511
	50	671795	7434819
	50	669588	7436085
	50	662967	7439466
	50	663340	7437261
	50	670256	7440041
	50	670827	7440121
	50	669629	7439904
	50	672747	7439755
	50	673669	7437233
	50	671233	7439484
	50	667450	7440007
	50	673420	7439350
	50	672580	7439183
	50	672525	7439032
	50	672930	7439386
	50	677143	7440336
	50	676777	7439888
	50	693252	7440857
	50	674804	7438827
	50	675187	7438908
	50	675043	7439279
	50	674566	7439117
	50	687534	7441102
	50	677807	7440841
	50	689733	7439848
	50	690405	7440055
	50	690919	7440001
	50	691442	7435304
	50	674380	7436772
	50	665892	7437188
	50	676625	7435967
	50	670111	7435914
	50	677184	7437539
	50	668923	7437248
	50	671181	7437165
	50	676037	7437964
	50	666346	7432772
	50	670282	7439512
	50	676538	7435978
	50	670245	7439842
	50	670290	7439432
	50	694470	7443294
	50	676131	7435725
	50	675457	7438797
	50	677339	7435770
	50	690693	7439991
	50	693338	7440912
	50	663126	7437338
	50	674534	7439138

Taxon	Zone	Easting	Northing
	50	671919	7439437
Bidens bipinnata	50	671996	7439530
	50	672245	7439314
	50	674681	7438937
	50	670797	7438950
	50	685963	7441614
	50	677188	7440257
	50	671144	7436941
	50	672760	7437834
	50	671976	7437503
	50	671876	7437376
	50	671720	7437424
	50	671667	7437390
	50	671508	7437270
	50	671595	7437248
	50	671643	7437271
	50	672628	7437571
	50	672742	7437635
Cenchrus ciliaris	50	676037	7437964
Cenchrus setiger	50	677095	7440194
Flaveria trinervia	50	671233	7439484
	50	677143	7440336
Malvastrum americanum	50	663340	7437261
	50	670827	7440121
	50	669629	7439904
	50	667450	7440007
	50	673420	7439350
	50	672930	7439386
	50	677143	7440336
	50	674804	7438827
	50	674566	7439117
	50	677807	7440841
	50	689733	7439848
	50	690919	7440001
	50	676037	7437964
	50	666346	7432772
	50	689097	7440761
	50	670282	7439512
	50	670290	7439432
	50	663126	7437338
	50	674534	7439138
	50	671919	7439409
	50	674681	7438937
	50	677245	7440321
Portulaca oleracea	50	687622	7432995
	50	668832	7436351
	50	662974	7436737
	50	669629	7439904
	50	673669	7437233
	50	671233	7439484
	50	672580	7439183
	50	694775	7442645
	50	677143	7440336
	50	674804	7438827
	50	675043	7439279
	50	687019	7440818

Taxon	Zone	Easting	Northing
	50	677807	7440841
	50	689733	7439848
	50	675036	7437340
Portulaca oleracea	50	676131	7435725
	50	687031	7441098
Sigesbeckia orientalis	50	665237	7437562
	50	687534	7441102
	50	694100	7441820
	50	691064	7441959
Vachellia farnesiana	50	677203	7437782
	50	674110	7437917

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APPENDIX H SITE DESCRIPTIONS

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APPENDIX I SPECIES X SITE MATRIX

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