FLORA AND VEGETATION SURVEY OF THE TURTLE AND RANGE PROJECTS.

(M08/272 & M08/273)

Prepared for
Onslow Metals Pty Ltd

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Draft

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1 Introduction

The Turtle and Range projects are owned by Onslow Metals Pty Ltd and are located approximately 70km southeast of the township of Onslow, and 25km southwest of Cane River. The company propose to undertake exploration drilling to further define potential mineral resources.

Botanica Consulting (BC) was commissioned by Keith Lindbeck and Associates (KLA) in March 2007 to conduct a flora and vegetation survey of the two tenements M08/272 (Range) and M08/273 (Turtle). The exploration drilling programme will consist of a total of 182 exploration drill holes, 107 exploration holes will be established at Range (M08/272) and 75 at Turtle (M08/273).

Vegetation mapping is included in Appendix 1. This survey follows from the previous flora survey undertaken in the same area in September 2004.

1.1 Climate and Soils

The survey area is located in the Carnarvon Botanical District of the Carnarvon Region which is situated in the Eremaean Province (Beard, 1990). The climate of this region is semi-arid bixeric (having two dry periods) at the coast becoming arid with summer and winter rain further inland (Beard, 1990). Annual precipitation is between 200 and 250mm (Beard, 1990).

The Carnarvon Region is characterised by gently undulating plains with mesa shaped remnants in the east and fields of longitudinal dunes. Hard alkaline red soils predominate in the plains with red sands in the dunefields (Beard, 1990).

1.2 Flora and Vegetation

The Carnarvon Botanical District is dominated by *Acacia* scrub and low woodland, becoming tree and shrub steppe in the north, with halophytes along the lower river courses (Beard, 1990).

2 Methods

Botanica Consulting was commissioned on the 15th June 2007 to conduct a flora and vegetation survey of the vegetation occurring within tenements M08/272 and M08/273. The survey area was approximately 170.5ha in total and was traversed via vehicle and foot where appropriate. The area was easily accessible via existing exploration gridlines throughout both tenements.

This flora survey of the study area was planned and implemented as far as practicable according to the Environmental Protection Authority (EPA) Guidance Statement No. 51 *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia*, (EPA, 2005).

Prior to the field survey, a combined search of DEC's Declared Rare and Priority Flora and the Western Australian Herbarium databases (DEC, 2007), was undertaken for species recorded within the known coordinates of the survey area (GDA94 50K 329708 7562563 and 50K 354069 7533282). The results of this search are listed in Appendix 2. There were three Priority species identified in the database search that may possibly occur on the site. These significant flora species were examined on the Western Australian Herbarium's Florabase prior to the survey (WAHERB, 2007). Specimens collected during the survey were identified with the aid of samples housed at the Western Australian Herbarium, and where necessary, specialists were consulted.

Table 1 represents the definitions of Declared Rare and Priority ratings under the *Wildlife Conservation Act (1950)* as extracted from Florabase (WAHERB, 2007).

Table 1: Definitions of Rare and Priority Flora Species

R: 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.
X: Declared Rare flora – Presumed Extinct Taxa Taxa which have not been collected, or otherwise verified, over the past 50 years despite thorough searching, or of which all known wild populations have been destroyed more recently, and have been gazetted as such.
1: 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 populations size, or being on lands under immediate threat, eg road verges, urban areas, farmland, active mineral leases, etc, or the plants are under threat, eg. From disease, grazing by feral animals, etc. May include taxa with threatened populations in protected lands. Such taxa are under consideration for declaration as "rare flora", but are in urgent need of further survey.
2: Priority Two – Poorly Known Taxa Taxa which are known from one of 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.
3: 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.
4: 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

Pictures and vegetation descriptions of the locations of the Priority flora (revealed in the databases search) were obtained from Florabase. These vegetation types were searched for during the survey and when/if they were observed during the survey, were traversed on foot specifically looking for the threatened flora associated with that vegetation description. The sample locations and GPS coordinates recorded during the survey are outlined in Appendix 4.

BC used a method of partially combining both a random meander technique (Cropper, 1993) and a quantitative technique. The random meander technique was used on a whole across the survey area. This technique can allow for greater coverage than a plot based survey and is less time consuming (NPWS, 2001). As the name suggests, the random meander technique involves traversing areas of suitable habitat in no set pattern, but roughly back and forth, whilst recording the different species present. However partial use of the quantitative vegetation analysis was used (i.e. representative sample points used, although quadrats were not setup) via utilizing sample points that were marked with a GPS unit.

At each sample point, information recorded comprised the following:

-GPS location

-Photograph of vegetation

-Visual identification of plants

-Dominant species

-Collection and documentation of unknown plant specimens

-GPS location, photograph and collection of Threatened Flora if encountered.

Presence/absence data of species from sample sites of similar vegetation was then compiled forming the best representative vegetation group. Similar vegetation groups were recognised visually in the field.

2.1 Objectives

The objectives of this report were to:

- Traverse the survey area
- Identify and collect the vascular plant taxa in the survey area.
- Provide a description of the vegetation occurring within the survey area.
- Assess the vegetation condition according to Keighery (1994).

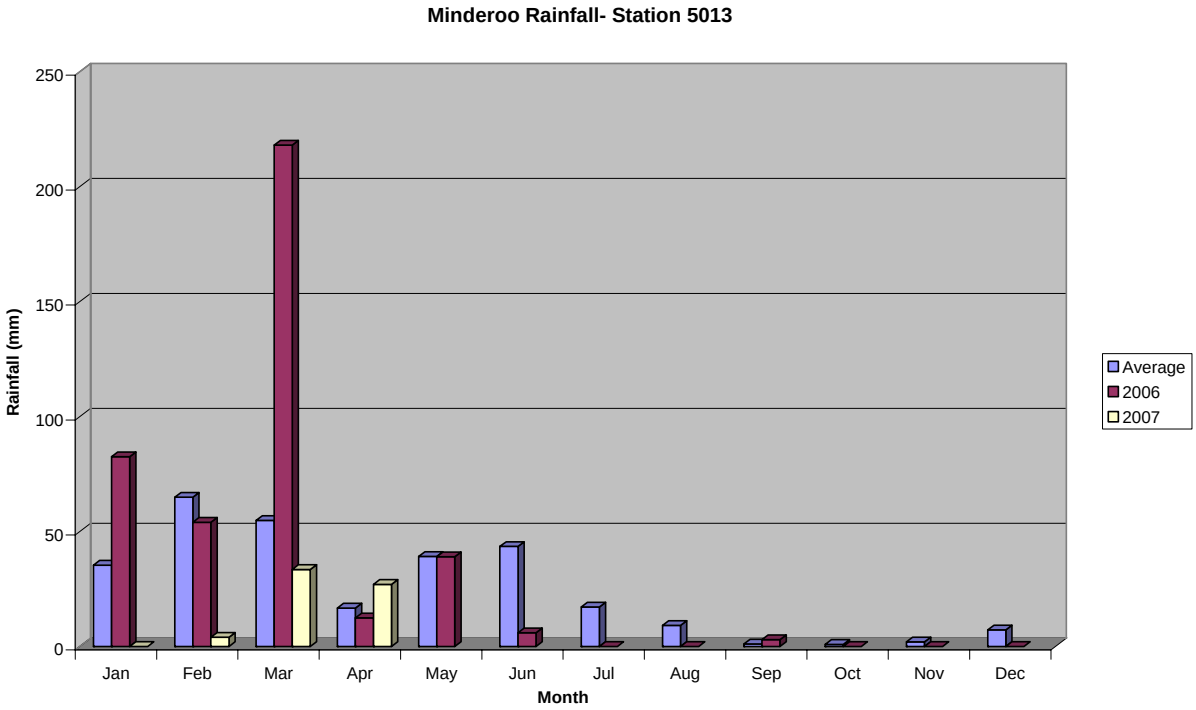
2.2 Limitations to the Survey

The main limitations to this survey are:

- The vegetation units for this study were based on visual descriptions of locations in the field. The distribution of these vegetation groups outside the study area is not known, however vegetation groups identified in the field were categorized via comparison to the best representative vegetation distributions throughout WA given on ANRA (DEWR, 2007).

- Field work was not completed at the EPA's recommended time period (ie Spring) for detecting most ephemeral flora for the survey, thus no germinants were recorded during the survey. However, above average rainfall had occurred in April 2007, and most perennial species were flowering (Figure 1). There was no rainfall recorded for May and June.

- In the opinion of BC the survey area was covered extensively but not exhaustively. BC estimate that approximately 90% of the flora species in the survey area were recorded. This estimation takes into account the intensity



of the survey work, the experience of the Botanist undertaking the work and the timing of the survey work.

Figure 1: Total monthly rainfall for Minderoo (Station # 5013), for 2006 and 2007 (BOM, 2007).

3 Results

One vegetation group was identified in the survey area, and was recognised as *Acacia* low open woodland over spinifex. The survey identified 20 Families, 28 Genera and 44 Species (Appendix 3).

3.1 *Acacia* Low Open Woodland over Spinifex

3.1.1 Flora

Flora recorded in the survey area was identified as *Acacia* low open woodland, and was represented by 20 Families, 28 Genera and 44 Species (Appendix 3).

No Declared Rare Flora species, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950)* and as listed by the DEC (McNamara, 2007) were found in the area surveyed.

No Priority Species as defined by the DEC (2007) were located during the survey. However the Priority 1 annual species *Helichrysum oligochaetum* has been recorded in 1992 by DEC located approximately 5 kms west from the survey area.

The area has no national environmental significance as defined by the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (DEWR, 2007a).

3.1.2 Vegetation

The vegetation recorded in this community was representative of *Acacia* low open woodland. Acacia species were dominant in the upperstorey of the survey area, including *Acacia ancistrocarpa, A. bivenosa, A. inaequilatera, A.synchronicia, A.trachycarpa and A.xiphophylla.* Other upperstorey species include *Hakea lorea ssp lorea and Corymbia zygophylla.*

Understorey species include *Ptilotus astrolasius var astrolasius, Mukia maderaspatana, Euphorbia australis, Senna glutinosa ssp pruinosa, S. notabilis, Cleome viscosa, Maireana georgei, Bonamia rosea, Sida rohlenae ssp rohlenae, Cullen leucochiates, Rhynchosia minima, Tephrosia uniovulata, Aristeda holathera var holathera, Eragrostic dielsii, E. eriopoda, Triodia lanigera, Solanum diversiflorum, S. lasiophyllum* and *Triumfetta chaetocarpa.*

This community occurs within the Acacia shrubland vegetation group, which extends over 9.5% of the state of Western Australia (DEWR, 2007).

Figure 1 shows the typical vegetation encountered during the survey. Figures 2 and 3 depict the Range and Turtle tenements.

Figure 2: *Acacia* low open woodland over spinifex within the survey area

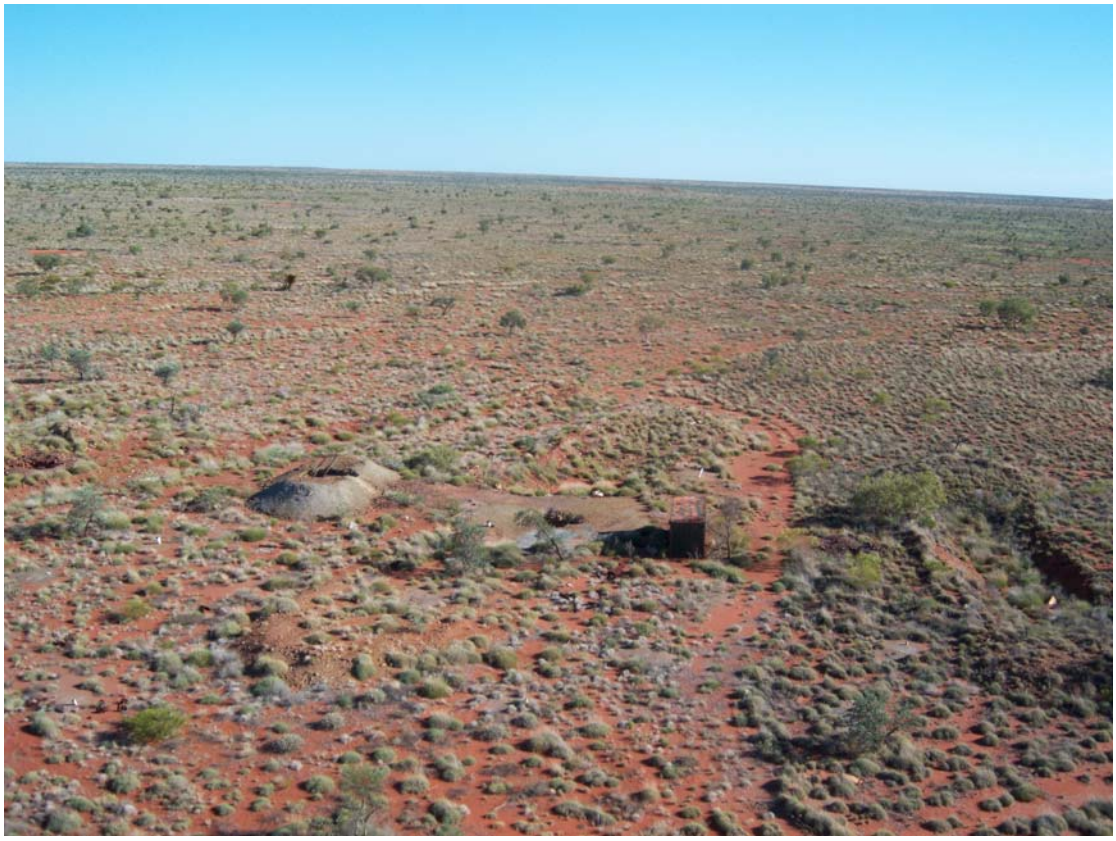


Figure 3: Range tenement area

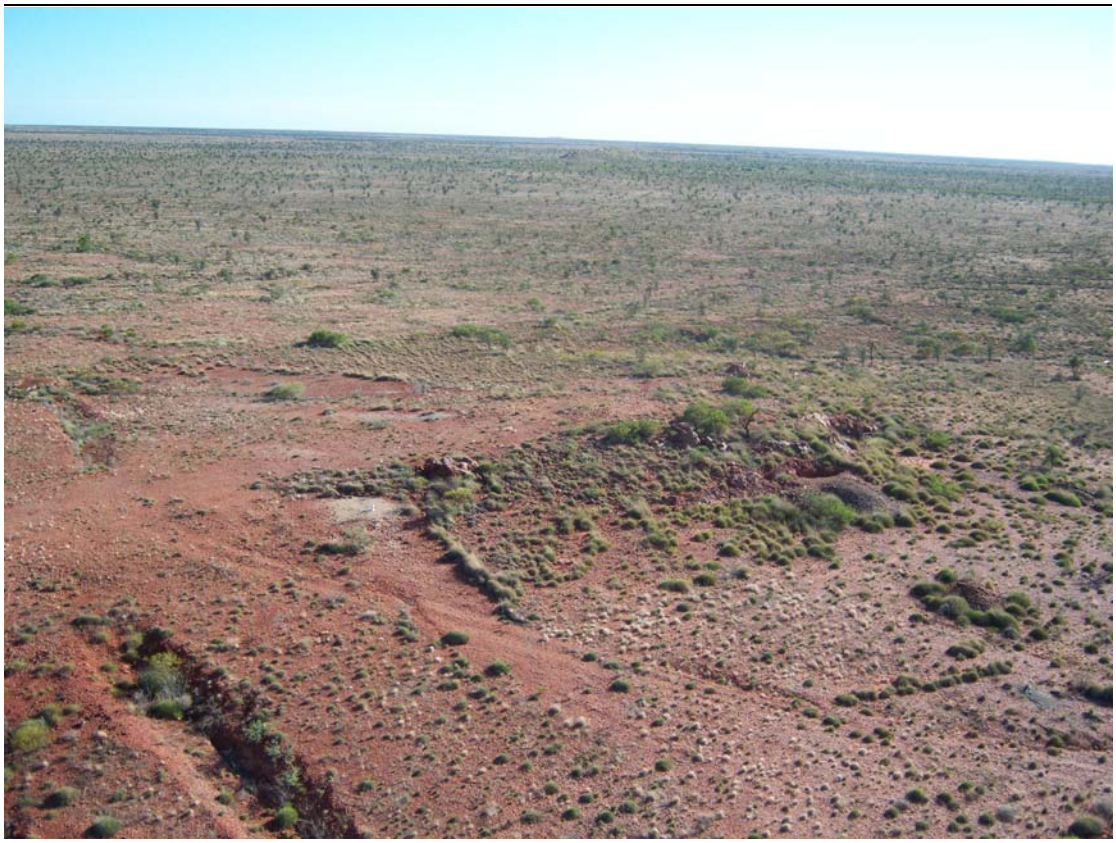


Figure 4: Turtle tenement area

3.2 Vegetation condition

The general health of the vegetation within the survey area was considered to be in "good" condition (Keighery, 1994). This rating indicates that the structure has been affected by multiple disturbances, and although retaining its basic structure, it has the ability to regenerate (Keighery, 1994). Disturbance was present in the form of historical exploration activities.

4 Discussion

The 2004 and 2007 survey of the Range and Turtle project tenements recorded a total of 20 Families, 28 Genera and 44 Species (Appendix 3). The dominant families were found to be Caesalpiniaceae, Malvaceae, Mimosaceae, Papilionaceae and Poaceae.

None of the species located were found to be out of their normal range of occurrence, in accordance with specimen collections housed at the WAHERB (WAHERB, 2007). Due to the timing of the flora survey, few annuals were collected, which are optimally present during the spring months. No new germinants were identified during the survey, which would normally be expected to be seen at this time.

No Declared Rare Flora species, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950)* and as listed in DEC (McNamara, 2007) were found in the area surveyed.

Several plant specimens found in the survey of the Range and Turtle tenements were sent to a botanical specialist but were unable to be identified beyond genus level, due to the lack of availability of flowering and/or fruiting materials. One specimen, identified as a *Sida* species, has the potential to be a Priority 3 species as listed by the DEC, but is unable to be identified further than genus level.

The *Acacia* Low open woodland vegetation community is not classified as a Threatened Ecological Community as listed under the *EPBC Act (1999)*.

4.1 Recommendations/Conclusions

The flora survey of the Range and Turtle project tenements recorded a total of 20 Families, 28 Genera and 44 Species. No Declared Rare Flora or Priority flora species were identified during the survey. One vegetation group was identified and recognised as *Acacia* low open woodland over spinifex. The *Acacia* Low open woodland vegetation community is not classified as a Threatened Ecological Community as listed under the *EPBC Act(1999).*

The Range and Turtle project tenements are not located within an Ecologically Sensitive Area and thus a Clearing Permit is not required. The total area required to be cleared is 5ha, which is unlikely to have any impact on the environmental values of the area.

In the event of clearing for mining practices, it is recommended that;

- Unnecessary clearing of vegetation beyond that strictly required is avoided.
- Any viable seed be collected for future rehabilitation work
- Topsoil should be removed and stored for future use in rehabilitation
- The risk of introducing invasive weeds minimized by maintaining vehicle hygiene or other suitable control.

5 Personnel involved

Jim Williams – Botanist
Eren Reid – Assistant Botanist
Rebecca Mason – Assistant Botanist
Sharnya Thomson – Consultant Botanist

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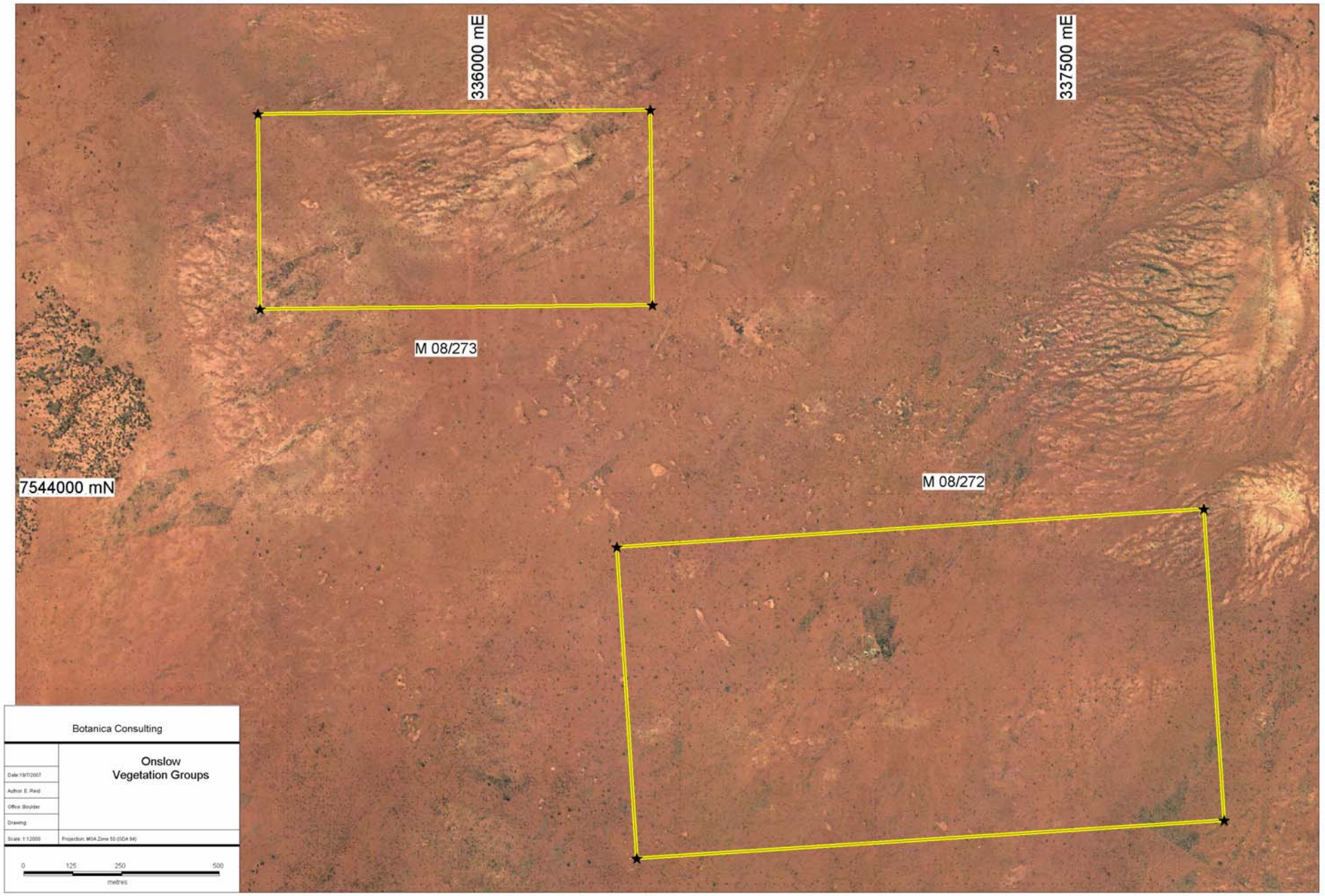
Appendix 1: Map of the Survey area outlining the identified vegetation group



Appendix 2: Results of the DEC Priority Flora database search of the survey area.

Genus	Species	Cons.Code
Helichrysum	oligochaetum	P1
Abutilon	trudgenii	P3
Sida	sp. Wittenoom (W.R. Barker 1962)	P3

Appendix 3: Species List of the survey area

Family	**Genus**	**Species**	***Acacia* low open woodland**
Amaranthaceae	*Ptilotus*	*astrolasius var. astrolasius*	*
Asteraceae	*Pluchea*	*dunlopii*	*
Asteraceae	*Streptoglossa*	*macrocephala*	*
Caesalpiniaceae	*Senna*	*artemisioides ssp. oligophylla x helmsii*	*
Caesalpiniaceae	*Senna*	*glutinosa spp. pruinosa*	*
Caesalpiniaceae	*Senna*	*notabilis*	*
Capparaceae	*Cleome*	*viscosa*	*
Chenopodiaceae	*Maireana*	*georgei*	*
Convolvulaceae	Bonamia	*rosea*	*
Cucurbitaceae	*Mukia*	*maderaspatana*	*
Euphorbiaceae	*Euphorbia*	*australis*	*
Goodeniaceae	*Goodenia*	*sp.*	*
Gyrostemonaceae	*Codonocarpos*	*cotinifolius*	*
Lauraceae	*Cassytha*	*filiformis*	*
Malvaceae	*Sida*	*echinocarpa*	*
Malvaceae	*Sida*	*rohlenae ssp. rohlenae*	*
Malvaceae	*Sida*	*sp.*	*
Mimosaceae	*Acacia*	*ancistrocarpa*	*
Mimosaceae	*Acacia*	*bivenosa*	*
Mimosaceae	*Acacia*	*inaequilatera*	*
Mimosaceae	*Acacia*	*pyrifolia var. pyrifolia*	*
Mimosaceae	*Acacia*	*stellaticeps*	*
Mimosaceae	*Acacia*	*synchronicia*	*
Mimosaceae	*Acacia*	*trachycarpa*	*
Mimosaceae	*Acacia*	*xiphophylla*	*
Molluginaceae	*Mollugo*	*molloginea*	*
Myrtaceae	*?Corymbia*	*hamersleyana*	*
Myrtaceae	*Corymbia*	*zygophylla*	*
Papilionaceae	*Cullen*	*leucochaites*	*
Papilionaceae	*? Indigofera*	*sp.*	*
Papilionaceae	*Rhynchosia*	*minima*	*
Papilionaceae	*Tephrosia*	*sp*	*
Papilionaceae	*Tephrosia*	*uniovulata*	*
Poaceae	*Aristida*	*holathera var. holathera*	*
Poaceae	*Aristida*	*latifolia*	*
Poaceae	*Eragrostis*	*dielsii*	*
Poaceae	*Eragrostis*	*eriopoda*	*
Poaceae	*Triodia*	*lanigera*	*
Proteaceae	*Grevillea*	*wickhamii ssp. hispidula*	*
Proteaceae	*Hakea*	*lorea ssp. lorea*	*
Solanaceae	*Solanum*	*diversiflorum*	*
Solanaceae	*Solanum*	*lasiophyllum*	*
Tiliaceae	*Corchorus ?*	*walcotii*	*
Tiliaceae	*Triumfetta*	*chaetocarpa*	*

Appendix 4: Sample locations and GPS coordinates recorded during the survey.

GDA94			
Zone	**Waypoint**	**Easting**	**Northing**
50K	165	313453	7578615
50K	166	336542	7563390
50K	167	341868	7558585
50K	168	339827	7550568
50K	169	339602	7550195
50K	170	336850	7545086
50K	171	336322	7544522
50K	172	336227	7544554
50K	173	336180	7544599
50K	174	336023	7544670
50K	175	335544	7544728
50K	176	335336	7544741
50K	177	336228	7544844
50K	178	336596	7544579
50K	179	336452	7544383
50K	180	336481	7544385
50K	181	336371	7544294
50K	182	336338	7544140
50K	183	336300	7543976
50K	184	336752	7543705
50K	185	336876	7543684
50K	186	338978	7542332
50K	187	337877	7543598
50K	188	339548	7541994
50K	189	339580	7541980
50K	190	340295	7541706
50K	191	340398	7541649
50K	192	340575	7541569
50K	193	340769	7541483
50K	194	342370	7539804
50K	195	343534	7537965
50K	196	347787	7538768
50K	AB	335639	7544655

Appendix 5: Photographs of Range and Turtle Tenements

Figure 4: Claypan within the Range Tenement

Figure 5: Landscape of Turtle Tenement