FLORA AND VEGETATION SURVEY OF PROPOSED MINE EXTENSIONS AND ACCESS TRACKS AT THE XSTRATA COSMOS NICKEL PROJECT

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1. SUMMARY

Mattiske Consulting Pty Ltd was commissioned in November 2008 by URS Australia Pty Ltd to undertake two flora and vegetation surveys at the Xstrata Cosmos Nickel Project. This involved mapping vegetation in proposed mine extension areas and surveying for Declared Rare and Priority Flora on four proposed track routes.

Rare, Priority and Threatened Flora

No Declared Rare Flora species, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act* (1950) and as listed by the Department of Environment and Conservation (2008a) were located during either survey.

No Priority Species as defined by the Department of Environment and Conservation (2008a) were located during either survey.

No plant taxa pursuant to section 179 of the *Environmental Protection Biodiversity Conservation Act* (1999), as listed by the Department of Environment, Water, Heritage and the Arts (2008a) were located in any of the survey areas.

Vegetation mapping survey

A total of fifteen plant communities have been previously defined and mapped in the Cosmos Nickel Project survey area (Mattiske Consulting Pty Ltd 2005), of which five were recorded during the 2008 vegetation mapping survey.

The regional significance of the communities was determined by comparison with Pringle's (1994b) broad vegetation mapping in the eastern section of the Austin Botanical District. Communities A1 and A2 are well represented in the Wanjarri Nature Reserve. Community A6 did not match the communities defined by Pringle (1994b), but is floristically similar to drainage tract mulga shrublands, which are well reserved.

No Threatened Ecological Communities or Priority Ecological Communities as defined by the EPBC Act (1999) or the Department of Environment and Conservation (2008b) were located in either survey area.

2. INTRODUCTION

Mattiske Consulting Pty Ltd was commissioned in November 2008 by URS Australia Pty Ltd to undertake two flora and vegetation surveys at the Xstrata Cosmos Nickel Project. The first survey entailed mapping vegetation in an area of approximately 14.9km^2, including 3.9km^2 of proposed mine extension areas in the vicinity of the Cosmos mine, mine camp and Bellevue airstrip, to enable future expansion of infrastructure (Figure 1). This survey also incorporated information from surveys conducted from 2000 to 2005 on the survey area (Mattiske Consulting Pty Ltd 2000 to 2004). The second involved surveying vegetation for Declared Rare and Priority Flora on approximately 3.2km of proposed track routes located between the Vanguard, Henderson, Westralia, Paris and Bellevue pits to allow vegetation clearing for future pipeline installation (Figure 1).

This report encompasses the results from the current survey as well as results of vegetation mapping covering approximately 36.5km^2 in mining leases M36/24, M36/127, M36/180 and prospect P36/1076, undertaken by Mattiske Consulting Pty Ltd in 2004 and 2005. It also includes other flora and vegetation studies of the Cosmos Nickel Project previously conducted by Mattiske Consulting Pty Ltd (2000, 2001, 2003, and 2004). These results are compared with other studies of the local area (Mattiske 2000, 2001 and 2003) and the broader region (Pringle 1994b).

2.1. Location

The Cosmos Nickel Project is located approximately 40km northwest of Leinster in the Northeastern Goldfields of Western Australia in the Austin Botanical District of the Eremaean Province, as defined by Beard (1990).

2.2. Flora and Vegetation

The Eremaean Botanical Province is typified by plants from the families Mimosaceae (*Acacia* spp.), Myrtaceae (*Eucalyptus* spp.), Myoporaceae (*Eremophila* spp.), Chenopodiaceae (Samphires, Bluebushes, Saltbushes), Asteraceae (daisies) and Poaceae (grasses). The Austin Botanical District covers over 300,000 km^2 and is essentially Mulga (*Acacia aneura*) woodlands associated with red loams over siliceous hardpans on the plains (van Vreeswyk 1994), reducing to scrub on the rises and hills (Beard, 1990). Mulga and *Eremophila* shrublands dominate on stony plains whilst chenopod communities are more often associated with duplex soils (Pringle, 1994a).

Boundaries between plant communities are often sharp and mostly associated with boundaries between landforms and their soils along the slope of the land (Pringle, 1994a). Greater diversity in plant communities is often found higher in the landscape where differential weathering and erosion occurs. Across slope, changes are usually more subtle (Pringle, 1994a).

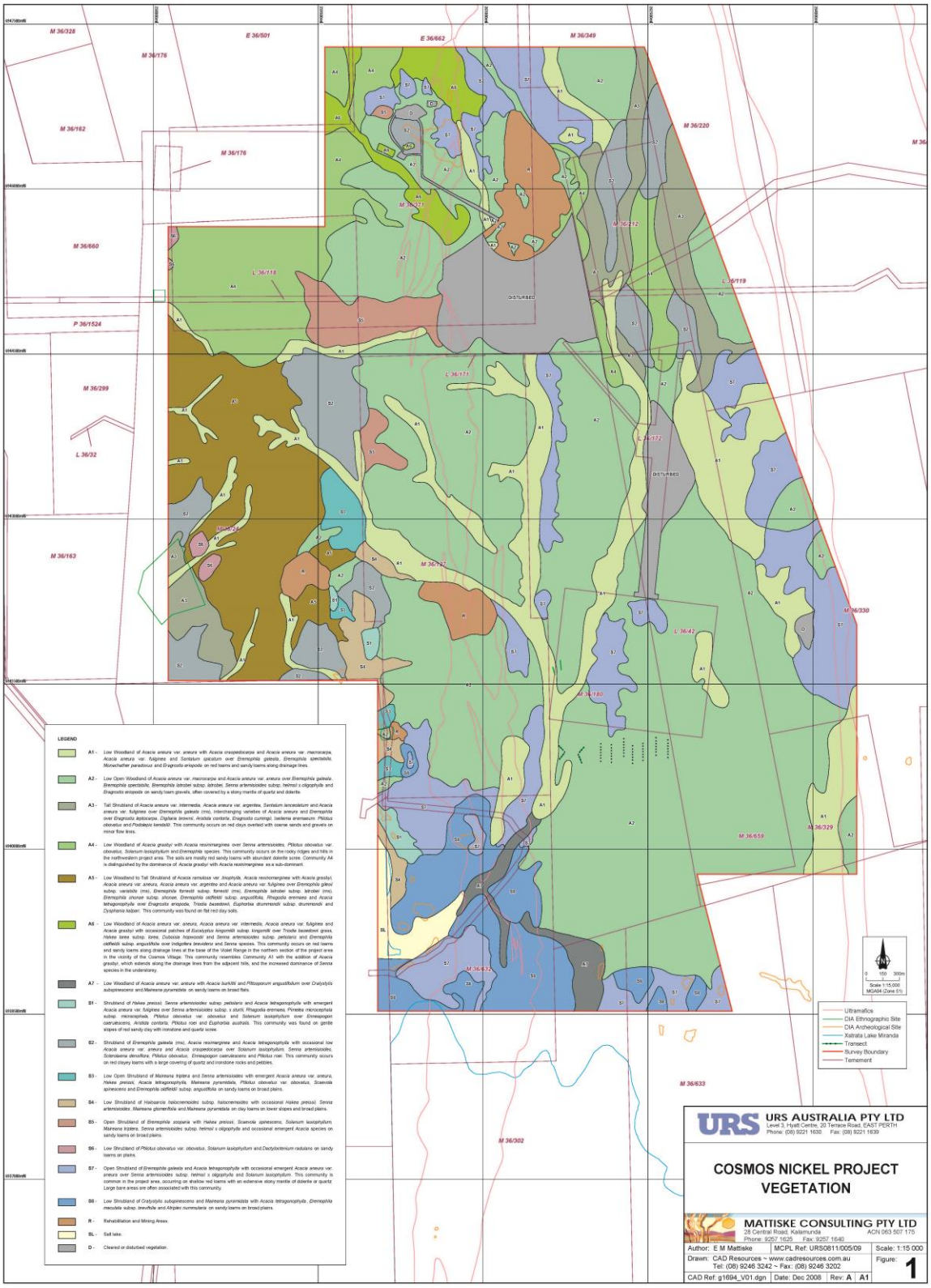
2.3. Topography and Soils

The survey areas overlies three land systems that have been defined by Pringle and van Vreeswyk (1994). The Laverton land system encompasses the greenstone, basalt and banded ironstone hills in the western part of the area. The Violet land system includes the moderately undulating to level plains of red sands or earths over either greenstone or hardpan in the central part of the area, and the level to slightly inclined plains in the east are part of the Jundee land system.

2.4. Climate

The Austin Botanical District is characterised by an arid climate with cool winters and hot, dry summers. Rain falls in both the hot and cool seasons (Beard, 1990), with the mean annual precipitation at Leinster being 274mm. Mean summer maximum temperatures are around 37ºC dropping to approximately 23ºC in winter. Mean minima are approximately 19ºC and 6ºC for summer and winter, respectively.

Figure 1: Vegetation Mapping of the Cosmos Nickel Project



Winter rainfall promotes the growth of annual species and the summer cyclonic rainfall tends to aid the growth of woody plants. However, the effectiveness of rainfall for overall plant growth is higher in winter when evaporative demand is lower due to the lower temperatures. Soil water is therefore available to plants for growth for longer periods of time (Gilligan, 1994).

2.5. Flora

Species of flora and fauna are defined as Rare or Priority conservation status where their populations are restricted geographically or threatened by local processes. The Department of Environment and Conservation recognises these threats of extinction and consequently applies regulations towards population and species protection.

Rare Flora species are gazetted under subsection 2 of section 23F of the *Wildlife Conservation Act* (1950) and therefore it is an offence to "take" or damage rare flora without Ministerial approval. Section 23F of the Wildlife Conservation Act (1950) defines "to take" as "… to gather, pick, cut, pull up, destroy, dig up, remove or injure the flora or to cause or permit the same to be done by any means."

Priority Flora are under consideration for declaration as 'rare flora', but are in urgent need of further survey (Priority One to Three) or require monitoring every 5-10 years (Priority Four). Appendix A presents the definitions of Declared Rare Flora and the four Priority ratings under the Wildlife Conservation Act (1950), as extracted from Department of Environment and Conservation (2008a).

Listed threatened species are a matter of national environmental significance under the Environmental Protection and Biodiversity Conservation Act (EPBC Act 1999) and are listed on the website of the Department of Environment, Water, Heritage and the Arts (2008a).

A person must not take an action that has, will have, or is likely to have a significant impact on a listed threatened species or ecological community, without approval from the Commonwealth Minister for the Environment and Heritage. Appendix A presents the definitions of the categories of threatened species under the EPBC Act (1999) (Department of Environment, Water, Heritage and the Arts 2008a).

3. OBJECTIVES

The general objective of the two surveys was (1) to map and undertake a flora and vegetation assessment of areas of the Xstrata Cosmos Nickel Project not previously mapped by Mattiske Consulting Pty Ltd, and (2) to undertake a Declared Rare and Priority Flora search of four tracks to be cleared for future pipeline installation. The specific objectives of the flora and vegetation survey were to:

- collect and identify the vascular plant species present in the survey areas;
- review the conservation status of the vascular plant species by reference to current literature and current listings by the Department of Environment and Conservation (2008a) and plant collections held at the Western Australian State Herbarium (Department of Environment and Conservation 2008a), and listed on the Department of Environment, Water, Heritage and the Arts web site under the EPBC Act (1999);
- define and map the native plant communities;
- provide recommendations on the local and regional significance of the plant communities; and
- prepare a report summarising the findings.

4. METHODS

4.1. Flora and Vegetation

Two experienced botanists from Mattiske Consulting Pty Ltd undertook the two flora and vegetation surveys over a three-day period in November 2008. The survey areas were traversed by vehicle and on foot where tracks were unavailable.

The use of a standard data collection form ensured all data was collected in a systematic and consistent manner in each survey. At each site the following records were made: topography, percentage litter cover, soil type, percentage bare ground, outcropping rocks and their type, pebble type and size and number of years since fire. For each species recorded, the average height and percentage foliage cover of species both alive and dead was noted.

Vegetation mapping survey

Aerial photographs provided by URS Australia Pty Ltd were used to determine suitable 34 survey sites within representative vegetation communities. Flora and physical site factors were systematically recorded at these sites across an area of 50m by 50m, and collections of plant specimens were made where further identification was required. Aerial photographs supplied by URS Australia Pty Ltd were used to interpret and map the plant communities.

Track surveys (Declared Rare and Priority Flora search)

The proposed tracks were surveyed at points in 100m intervals along each track. Flora and physical site factors were recorded at each survey point in sites measuring 100m by 50m, 50m either side of the survey point along the track, 20m to each side of the track, and the track area itself which reached 10m in width.

All plant specimens collected during both field surveys were handled and identified in accordance with the requirements of the Western Australian Herbarium. Where necessary, specimens were compared with pressed specimens housed at the Western Australian Herbarium, and plant taxonomists with specialist skills were consulted. Nomenclature of recorded species follows that recommended by the Western Australian Herbarium (Department of Environment and Conservation 2008a).

5. RESULTS

5.1. Flora

A desktop survey of the area surrounding the Cosmos mine site indicated a range of Priority Flora have previously been found in the region, including *Acacia balsamea* (P4), *Baeckea* sp. Melita Station (P3), *Calytrix erosipetala* (P3), *Calytrix uncinata* (P3), *Eremophila pungens* (P4) and *Frankenia georgei* (P3). However, most of these species tend to occur on hilly terrain, breakaways and ridges, which did not occur within the survey areas.

Surveys conducted in 2000, 2003-2006 and 2008 by Mattiske Consulting have located a total of 268 taxa from 43 families (Mattiske Consulting Pty Ltd 2000 - 2006). Surveys conducted in 2000, 2003-2006 and 2008 by Mattiske Consulting have located a total of 268 taxa from 43 families (Mattiske Consulting Pty Ltd 2000 - 2006). In the two surveys conducted in 2008, a total of 50 taxa from 16 families were recorded. Species representation was highest amongst the families Myoporaceae (13 taxa) and Mimosaceae (9 taxa). One introduced (weed) species was recorded in the survey of the four tracks while no weed species were found during the vegetation mapping survey. This introduced (weed) species, *Citrullus lanata* (Pie Melon) is not a declared plant pursuant to section 37 of the *Agricultural and Related Resources Protection Act 1976* [WA].

No Declared Rare Flora species, pursuant to subsection (2) of section 23F of the Wildlife Conservation Act (1950) and as listed by the Department of Environment and Conservation (2008a) were located in either the vegetation mapping survey or the survey of the four tracks.

One Priority flora species, *Eremophila dendritica* (P3), was located in the area during the 2000 survey conducted by Mattiske Consulting, but no Priority Species as defined by the Department of Environment and Conservation (2008a) were located in the 2008 surveys, nor were any significant range extensions observed.

No plant taxa pursuant to section 179 of the Environmental Protection Biodiversity Conservation Act (1999), as listed by the Department of Environment, Water, Heritage and the Arts (2008a), were located in either survey area.

5.2. Vegetation mapping

A total of fifteen plant communities have previously been defined and mapped in the Cosmos Nickel Project (Mattiske Consulting Pty Ltd 2005), including seven *Acacia* woodland communities and eight shrubland communities. The areas previously surveyed included the majority of mining tenements M36/24 and M36/180, two sections of tenement M36/371 surrounding the Cosmos Mine village and adjacent to the mine itself, as well as tenement M36/127 and prospect P36/1076. In the current vegetation mapping survey, five of these communities (A1, A2, A4, A6 and S7) were recorded including three mulga and one other *Acacia* woodland community, and one shrubland community. Few of the grasses and other herbaceous species previously recorded within these communities were not observed during the 2008 survey due to grazing and dry conditions.

The fifteen plant communities as defined in previous work and in this recent survey are summarized below:

A1 - Low Woodland of *Acacia aneura* var. *aneura* with *Acacia craspedocarpa* and *Acacia aneura* var. *macrocarpa*, *Acacia aneura* var. *fuliginea* and *Santalum spicatum* over *Eremophila galeata*, *Eremophila spectabilis*, *Monachather paradoxus* and *Eragrostis eriopoda* on red loams and sandy loams along drainage lines.

A2 - Low Open Woodland of *Acacia aneura* var. *macrocarpa* and *Acacia aneura* var. *aneura* over *Eremophila galeata, Eremophila spectabilis, Eremophila latrobei* subsp. *latrobei, Senna artemisioides* subsp. *helmsii* x *oligophylla* and *Eragrostis eriopoda* on sandy loam gravels, often covered by a stony mantle of quartz and dolerite.

A3 – Tall Shrubland of *Acacia aneura* var. *intermedia, Acacia aneura* var. *argentea, Santalum lanceolatum* and *Acacia aneura* var. *fuliginea* over *Eremophila galeata* (ms), interchanging varieties of *Acacia aneura* and *Eremophila* over *Eragrostis leptocarpa, Digitaria brownii, Aristida contorta, Eragrostis cumingii, Iseilema eremaeum. Ptilotus obovatus* and *Podolepis kendallii*. This community occurs on red clays overlaid with coarse sands and gravels on minor flow lines.

A4 - Low Woodland of *Acacia grasbyi* with *Acacia resinimarginea* over *Senna artemisioides, Ptilotus obovatus* var. *obovatus, Solanum lasiophyllum* and *Eremophila* species. This community occurs on the rocky ridges and hills in the northwestern project area. The soils are mostly red sandy loams with abundant dolerite scree. Community A4 is distinguished by the dominance of *Acacia grasbyi* with *Acacia resinimarginea* as a sub-dominant.

A5 – Low Woodland to Tall Shrubland of *Acacia ramulosa* var. *linophylla, Acacia resinomarginea* with *Acacia grasbyi, Acacia aneura* var. *aneura, Acacia aneura* var. *argentea* and *Acacia aneura* var. *fuliginea* over *Eremophila gilesii* subsp. *variabilis* (ms), *Eremophila forrestii* subsp. *forrestii* (ms), *Eremophila latrobei* subsp. *latrobei* (ms), *Eremophila shonae* subsp. *shonae, Eremophila oldfieldii* subsp. *angustifolia, Rhagodia eremaea* and *Acacia tetragonophylla* over *Eragrostis eriopoda, Triodia basedowii, Euphorbia drummondii* subsp. *drummondii* and *Dysphania kalpari.* This community was found on flat red clay soils.

A6 - Low Woodland of *Acacia aneura* var. *aneura, Acacia aneura* var. *intermedia, Acacia aneura* var. *fuliginea* and *Acacia grasbyi* with occasional patches of *Eucalyptus kingsmillii* subsp. *kingsmilli* over *Triodia basedowii* grass, *Hakea lorea* subsp. *lorea, Duboisia hopwoodii* and *Senna artemisioides* subsp. *petiolaris* and *Eremophila oldfieldii* subsp. *angustifolia* over *Indigofera brevidens* and *Senna* species. This community occurs on red loams and sandy loams along drainage lines at the base of the Violet Range in the northern section of the project area in the vicinity of the Cosmos Village. This community resembles Community A1 with the addition of *Acacia grasbyi*, which extends along the drainage lines from the adjacent hills, and the increased dominance of *Senna* species in the understorey.

A7 - Low Woodland of *Acacia aneura* var. *aneura* with *Acacia burkittii* and *Pittosporum angustifolium* over *Cratystylis subspinescens* and *Maireana pyramidata* on sandy loams on broad flats.

S1 – Shrubland of *Hakea preissii, Senna artemisioides* subsp. *petiolaris* and *Acacia tetragonophylla* with emergent *Acacia aneura* var. *fuliginea* over *Senna artemisioides* subsp. x *sturtii, Rhagodia eremaea, Pimelea microcephala* subsp. *microcephala, Ptilotus obovatus* var. *obovatus* and *Solanum lasiophyllum* over *Enneapogon caerulescens, Aristida contorta, Ptilotus roei* and *Euphorbia australis.* This community was found on gentle slopes of red sandy clay with ironstone and quartz scree.

S2 – Shrubland of *Eremophila galeata* (ms), *Acacia resimarginea* and *Acacia tetragonophylla* with occasional low *Acacia aneura* var. *aneura and Acacia craspedocarpa* over *Solanum lasiophyllum, Senna artemisioides, Sclerolaena densiflora, Ptilotus obovatus, Enneapogon caerulescens* and *Ptilotus roei*. This community occurs on red clayey loams with a large covering of quartz and ironstone rocks and pebbles.

S3 - Low Open Shrubland of *Maireana triptera* and *Senna artemisioides* with emergent *Acacia aneura* var. *aneura, Hakea preissii, Acacia tetragonophylla, Maireana pyramidata, Ptilotus obovatus* var. *obovatus, Scaevola spinescens* and *Eremophila oldfieldii* subsp. *angustifolia* on sandy loams on broad plains.

S4 - Low Shrubland of *Halosarcia halocnemoides* subsp. *halocnemoides* with occasional *Hakea preissii, Senna artemisioides, Maireana glomerifolia* and *Maireana pyramidata* on clay loams on lower slopes and broad plains.

S5 - Open Shrubland of *Eremophila scoparia* with *Hakea preissii, Scaevola spinescens, Solanum lasiophyllum, Maireana triptera, Senna artemisioides* subsp. *helmsii* x *oligophylla* and occasional emergent *Acacia* species on sandy loams on broad plains.

S6 - Low Shrubland of *Ptilotus obovatus* var. *obovatus, Solanum lasiophyllum* and *Dactyloctenium radulans* on sandy loams on plains.

S7 - Open Shrubland of *Eremophila galeata* and *Acacia tetragonophylla* with occasional emergent *Acacia aneura* var. *aneura* over *Senna artemisioides* subsp. *helmsii* x *oligophylla* and *Solanum lasiophyllum*. This community is common in the project area, occurring on shallow red loams with an extensive stony mantle of dolerite or quartz. Large bare areas are often associated with this community.

S8 - Low Shrubland of *Cratystylis subspinescens* and *Maireana pyramidata* with *Acacia tetragonophylla, Eremophila maculata* subsp. *brevifolia* and *Atriplex nummularia* on sandy loams on broad plains.

Additional mapping codes included R - rehabilitation and mining areas, SL - salt lakes and D for disturbed of cleared vegetation.

5.3. Significant Vegetation Communities

Plant communities are referred to as locally significant if:

- populations of Priority Flora occur within the plant community,
- the plant community is restricted to one or two locations within the project area and occur as small isolated communities, or
- the plant community supports a range extension of a particular population of taxa from previously recorded locations.

Plant communities are referred to as regionally significant if:

- populations of Declared Rare Flora occur within the plant community, or
- the plant community is restricted to specific landforms that are not located regularly in a regional context.

The plant communities mapped during the survey are well represented within the Austin Botanical District and no Threatened Ecological Communities or Priority Ecological Communities as defined by the Environmental Protection and Biodiversity Act (EPBC Act 1999) or the Department of Environment and Conservation (2008b and 2008c) were located.

6. DISCUSSION

Six surveys have been carried out in areas surrounding the Cosmos Nickel Mine by Mattiske Consulting in the years 2000, 2003, 2004, 2005, 2006 and 2008 (Mattiske Consulting Pty Ltd 2000 - 2006). In total, across all of these surveys, 268 taxa from 43 families have been recorded. In 2008, a total of 50 taxa from 16 families were recorded across both survey areas. As the two survey areas overlapped and demonstrated a high degree of similarity in terms of species recorded, summaries of taxa found in both surveys have been combined in Appendix B. The 50 taxa recorded in both survey areas are similar to those recorded on the wider Cosmos Nickel project areas (Mattiske Consulting Pty Ltd 2000 to 2006) (Appendix D).

A low number of annual and short lived species were recorded in both surveys area due to the dry conditions of the season in which the surveys were conducted. Notably, a number of Priority Flora with annual life histories were not recorded during the survey but are known to occur in the eastern section of the Austin Botanical District, namely *Gunniopsis propinqua* (P3), and *Vittadinia cervicularis* var. *oldfieldii* (P1). There is currently no information on the life history of *Goodenia lyrata* (P1) and *Goodenia stellata* (P4), which may occur in the area. The seasonal conditions at the time of the survey may have contributed to the absence of these species.

Surveys conducted in 2000, 2003-2006 and 2008 by Mattiske Consulting have located a total of 268 taxa from 43 families (Mattiske Consulting Pty Ltd 2000 - 2006). In the two surveys conducted in 2008, a total of 50 taxa from 16 families were recorded. Species representation was highest amongst the families Myoporaceae (13 taxa) and Mimosaceae (9 taxa). One introduced (weed) species was recorded in the survey of the four tracks while no weed species were found during the vegetation mapping survey. This introduced (weed) species, *Citrullus lanata* (Pie Melon) is not a declared plant pursuant to section 37 of the *Agricultural and Related Resources Protection Act 1976* [WA].

No Declared Rare Flora species, pursuant to subsection (2) of section 23F of the Wildlife Conservation Act (1950) and as listed by the Department of Environment and Conservation (2008a) were located in either the vegetation mapping survey or the survey of the four tracks.

One Priority species, *Eremophila dendritica* (P3), was located in the area during the 2000 survey conducted by Mattiske Consulting, but no Priority Species as defined by the Department of Environment and Conservation (2008a) were located in the 2008 surveys, nor were any significant range extensions observed.

No plant taxa pursuant to section 179 of the Environmental Protection Biodiversity Conservation Act (1999), as listed by the Department of Environment, Water, Heritage and the Arts (2008a), were located in either survey area.

A total of fifteen plant communities were defined and mapped in the Cosmos Nickel Project across an area of approximately 36.5km^2 during previous surveys (Mattiske Consulting Pty Ltd 2000 to 2005), five of which were recorded in the current survey area covering 3.9km^2. None of the communities are considered Threatened Ecological Communities as defined by the EPBC Act (1999) or the Department of Environment and Conservation (2008b). Most plant communities recorded were in good condition.

The communities recorded in 2008 were as follows:

Community A1 (Low Woodland of *Acacia aneura* var. *aneura* with *Acacia craspedocarpa* and *Acacia aneura* var. *macrocarpa, Acacia aneura* var. *fuliginea* and *Santalum spicatum* over *Eremophila galeata, Eremophila spectabilis, Monachather paradoxus* and *Eragrostis eriopoda* on red loams and sandy loams along drainage lines) is equivalent to the drainage tract mulga shrublands of Pringle (1994b). This community occurs along narrow, linear drainage lines within hardpan plains and is present in the eastern half of the wider survey area within the Cosmos Nickel Project area. Drainage tract mulga shrublands are well conserved in the Wanjarri Nature Reserve, about 25km to the northeast of the Cosmos Nickel Project.

Community A2 (Low Open Woodland of *Acacia aneura* var. *macrocarpa* and *Acacia aneura* var. *aneura* over *Eremophila galeata, Eremophila spectabilis, Eremophila latrobei* subsp. *latrobei, Senna artemisioides* subsp. *helmsii x oligophylla* and *Eragrostis eriopoda* on sandy loam gravels, often covered by a stony mantle of quartz and dolerite) occupies the stony plains adjacent to community A1 and is equivalent to Pringle's (1994b) 'lateritic' hardpan plain mulga shrublands. This community is represented in the southwest of the Wanjarri Nature Reserve. This community covers large areas to the south-east of the Cosmos mine and also occurs in small pockets to the west.

Community A4 (Low Woodland of *Acacia grasbyi* with *Acacia resinimarginea* over *Senna artemisioides, Ptilotus obovatus* var. *obovatus, Solanum lasiophyllum* and *Eremophila* species). This community occurs on the rocky ridges and hills in the northwest of the project area. The soils are mostly red sandy loams with abundant dolerite scree. Community A4 is distinguished by the dominance of *Acacia grasbyi* with *Acacia resinimarginea* as a sub-dominant.

Community A6 (Low Woodland of *Acacia aneura* var. *aneura, Acacia aneura* var. *intermedia, Acacia aneura* var. *fuliginea* and *Acacia grasbyi* with occasional patches of *Eucalyptus kingsmillii* subsp. *kingsmilli* over *Triodia basedowii* grass, *Hakea lorea* subsp. *lorea, Duboisia hopwoodii* and *Senna artemisioides* subsp. *petiolaris* and *Eremophila oldfieldii* subsp. *angustifolia* over *Indigofera brevidens* and *Senna* species) is floristically similar to Community A1 and with Pringle's drainage tract mulga shrublands (1994b), with the exception of the presence of *Acacia grasbyi,* which is abundant on the adjacent hills but extends to the lower slopes and plains along drainage lines. This community was not present in the 2004 survey and is located in drainage lines in the vicinity of Cosmos Village.

Community S7 (Open Shrubland of *Eremophila galeata* and *Acacia tetragonophylla* with occasional emergent *Acacia aneura* var. *aneura* over *Senna artemisioides* subsp. *helmsii* x *oligophylla* and *Solanum lasiophyllum*) is equivalent to Pringle's stony *Acacia – Eremophila* shrublands (1994b). This community is found extensively in the region and is well represented in the Wanjarri Nature Reserve. No species of particular conservation value are known to occur in this community (Pringle 1994b), and in the survey area it often had low species diversity. The treeless structure of this community may be due to shallow stoney soils or in some instances the presence of dead trees (Mulga) suggesting recent climatic stress may have contributed to tree decline. This community occurred in the south of the current survey area.

Although no introduced species were recorded during the vegetation mapping survey in 2008, previous surveys have indicated the presence of relatively small numbers of weeds. Little to no weed infestation should assist in maintaining the quality of the vegetation, providing initial hygiene measures are undertaken before ground disturbance.

A Priority 3 taxon, *Eremophila dendritica,* was located in a survey undertaken in 2000 (Mattiske Consulting Pty Ltd 2000), but this species was not recorded in the 2008 survey, and no other Priority Species as defined by the Department of Environment and Conservation (2008a) were located during this survey. Additionally, no Declared Rare Flora species, pursuant to subsection (2) of section 23F of the Wildlife Conservation Act (1950) and as listed by the Department of Environment and Conservation (2008a) were located during the survey. No plant taxa pursuant to section 179 of the Environmental Protection Biodiversity Conservation Act (1999), as listed by the Department of Environment, Water, Heritage and the Arts (2008a) were located in the survey area.

Vegetation found on Banded Ironstone Formation in the Violet Range, which crosses into the western side of the Cosmos Nickel Project area, have been listed as Priority Ecological Communities by the Department of Environment and Conservation (2008d) due to their significant ecological value (Department of Environment and Conservation 2007). However, no Banded Iron Formations were observed in either of these surveys, and no other Priority Ecological Communities as defined by the Environmental Protection and Biodiversity Act (EPBC Act 1999) or the Department of Environment and Conservation (2008b and 2008c) were located. Additionally, no Threatened Ecological Communities were found (Department of Environment and Conservation 2008b and 2008c; Department of Environment, Water, Heritage and the Arts 2008b).

Track survey (Declared Rare and Priority Flora search)

The tracks surveyed are situated to the south of the Cosmos Mine site. The longest track, the Vanguard to Henderson Pipeline, extends 1.43km between the Vanguard and Henderson Pits. The Westralia Offshoot commences from approximately halfway between the Vanguard and Henderson Pits and continues 660m to the Westralia Pit. The Paris Offshoot extends 660m between the Westralia and Paris Pits, and the Bellevue Offshoot runs 440m from the north end of the Paris Pit and alongside its eastern edge to the Bellevue Pit.

The four tracks surveyed had been cleared previously for mining operations, as such, vegetation growing on the tracks was already highly disturbed, sparse and in poor condition. Vegetation surveyed in the 20m to each side of the tracks demonstrated better health and condition, although evidence of long-term prospecting and other mining activities in these areas suggested that it was also somewhat disturbed and not in pristine condition.

6.1. Recommendations

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

- Avoid unnecessary clearing of vegetation beyond that strictly required, particularly in sections of the survey area where trees are present, as they provide habitats for many species;
- Collect any viable seed for future rehabilitation work;
- Remove topsoil, log debris and leaf litter for future use in rehabilitation programs. If possible, stockpiled topsoil should be directly replaced on disturbed areas; and
- Maintain vehicle hygiene or utilise other suitable methods of weed control to reduce the risk of introducing and spreading invasive weeds.

8. ACKNOWLEDGEMENTS

The authors would like to thank David Niven from Xstrata Nickel for his assistance with this project.